



**NOVOSENSE**

# **NOVOSENSE**

## **Product Selection Guide**

► **Sensor**

► **Signal Chain**

► **Power Management**

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# About NOVOSENSE

NOVOSENSE Microelectronics (NOVOSENSE, SSE Stock Code 688052) is a highly robust & reliable analog and mixed signal Chip company. Since its establishment in 2013, the company has been focusing on sensor, signal chain, and power management, providing comprehensive semiconductor products and solutions, which are widely used in automotive, industrial, information communication and consumer electronics markets.

With the mission of "Sense & Drive the Future, Build a Green, Smart and Connected World with Semiconductors", the company is committed to providing chip-level solutions to link the digital world and the real world.

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**"Sense and Drive the Future,  
Build a Green, Smart and  
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Semiconductors"**

# Contents

## ▲ Temperature Sensor & Temperature and Humidity Sensor 01

|                                                                                                                             |    |
|-----------------------------------------------------------------------------------------------------------------------------|----|
| NST1001: D-NTC® Digital Pulse Output Temperature Sensor                                                                     | 04 |
| NST1002: D-NTC Single Bus-type Digital Temperature Sensor                                                                   | 05 |
| NST175: Digital Temperature Sensor with I <sup>2</sup> C Port in Industrial-qualified Package                               | 06 |
| NST175-Q1: Digital Temperature Sensor with I <sup>2</sup> C/SMBus Port in Automotive-Grade Standard Packaging               | 07 |
| NST1075: Small-size High-precision Digital Temperature Sensor                                                               | 08 |
| NST118: Small Ultra-high-precision Digital Temperature Sensor with I <sup>2</sup> C Port                                    | 09 |
| NST117: Small-size High-precision Digital Temperature Sensor with I <sup>2</sup> C Port                                     | 10 |
| NST112: High-precision Low-power I <sup>2</sup> C Port Digital Temperature Sensor with Ultra-small SOT563 and DSBGA Package | 11 |
| NST103: Digital Temperature Sensor with I <sup>2</sup> C Port in Wafer-level Package                                        | 12 |
| NST461: Small-size High-precision I <sup>2</sup> C Interface Remote and Local Digital Temperature Sensor                    | 13 |
| NST1412/NST1413: High-precision Remote and Local Temperature Sensors with Digital Interface in Industrial-qualified Package | 14 |
| NST7719: High-precision Remote and Local Temperature Sensors with Digital Interface in Industry-standard Package            | 15 |
| NST20/NST60/NST235/NST86: High-precision and Low-power Analog Output Temperature Sensor                                     | 16 |
| NST60-Q1/NST86-Q1/NST235-Q1 Automotive-qualified High-precision and Low-power Analog Output Temperature Sensor              | 17 |

|                                                                                                      |    |
|------------------------------------------------------------------------------------------------------|----|
| NSHT30: High-precision, Low-power I <sup>2</sup> C Digital Interface Temperature and Humidity Sensor | 18 |
|------------------------------------------------------------------------------------------------------|----|

|                                                                                                                             |    |
|-----------------------------------------------------------------------------------------------------------------------------|----|
| NST30-Q1: Automotive-qualified High-precision, Low-power I <sup>2</sup> C Digital Interface Temperature and Humidity Sensor | 19 |
|-----------------------------------------------------------------------------------------------------------------------------|----|

## ▲ MEMS Pressure Sensor 20

|                                                                      |    |
|----------------------------------------------------------------------|----|
| NSPGL1 series: Automotive-qualified Integrated Gauge Pressure Sensor | 22 |
|----------------------------------------------------------------------|----|

|                                                                          |    |
|--------------------------------------------------------------------------|----|
| NSPAS3M series: Automotive-qualified Integrated Absolute Pressure Sensor | 23 |
|--------------------------------------------------------------------------|----|

|                                                                         |    |
|-------------------------------------------------------------------------|----|
| NSPAS3 series: Automotive-qualified Integrated Absolute Pressure Sensor | 24 |
|-------------------------------------------------------------------------|----|

|                                                                         |    |
|-------------------------------------------------------------------------|----|
| NSPAS1 series: Automotive-qualified Integrated Absolute Pressure Sensor | 25 |
|-------------------------------------------------------------------------|----|

|                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------|----|
| NSPAS5 series: Automotive-grade Integrated Corrosion-resistant Absolute Pressure Sensor (range can be customized) | 26 |
|-------------------------------------------------------------------------------------------------------------------|----|

|                                                                                |    |
|--------------------------------------------------------------------------------|----|
| NSPGS2 series: Integrated Gauge Pressure Sensor with Air Nozzle in SOP Package | 27 |
|--------------------------------------------------------------------------------|----|

|                                                                                     |    |
|-------------------------------------------------------------------------------------|----|
| NSPGD1 (M) series: Integrated Gauge Pressure Sensor with Air Nozzle in DIP8 Package | 28 |
|-------------------------------------------------------------------------------------|----|

|                                                                    |    |
|--------------------------------------------------------------------|----|
| NSPDSx series: Dual-nozzle Integrated Differential Pressure Sensor | 29 |
|--------------------------------------------------------------------|----|

|                                                               |    |
|---------------------------------------------------------------|----|
| NSPGS5 series: Single-nozzle Integrated Gauge Pressure Sensor | 30 |
|---------------------------------------------------------------|----|

|                                                                                        |    |
|----------------------------------------------------------------------------------------|----|
| NSP183x: High-performance and High-reliability MEMS Differential Pressure Sensor Wafer | 31 |
|----------------------------------------------------------------------------------------|----|

|                                                                                    |    |
|------------------------------------------------------------------------------------|----|
| NSP163x: High-performance and High-reliability MEMS Absolute Pressure Sensor Wafer | 32 |
|------------------------------------------------------------------------------------|----|

### ▲ Integrated Current Sensor 33

|                                                                                               |    |
|-----------------------------------------------------------------------------------------------|----|
| NSM2011/2012/2013/2015/2016/2017/2019: Chip-level Current Sensor with Integrated Current Path | 36 |
| NSM2110/2111/2112/2113/2115/2117/2119 Integrated Current Sensors                              | 37 |
| NSM2311 Module-Alternative Current Sensor with Integrated Current Path                        | 38 |

### ▲ Linear Hall Current Sensor 39

|                                     |    |
|-------------------------------------|----|
| NSM2031: Linear Hall Current Sensor | 41 |
| NSM2032: Linear Hall Current Sensor | 42 |
| NSM2033: Linear Hall Current Sensor | 43 |
| NSM2034: Linear Hall Current Sensor | 44 |
| NSM2020: Linear Hall Current Sensor | 45 |

### ▲ Magnetic Position Sensor 46

|                                  |    |
|----------------------------------|----|
| NSM301x: Hall-based Angle Sensor | 49 |
| NSM101x: Hall Switch&Latch       | 50 |
| NSM107x: Hall Switch             | 51 |
| NSM105x: xMR Switches & Latches  | 52 |

### ▲ Industrial Pressure Transmitter Signal Conditioning Chip 53

|                                                                                             |    |
|---------------------------------------------------------------------------------------------|----|
| NSA2860/NSA2860X: Industrial Transmitter Signal Processing Chip Supporting 4~20mA Output    | 55 |
| NSA2862X: Analog Front-end Chip for Low-power Digital Industrial Sensor                     | 56 |
| NSC2860X: Capacitive Industrial Transmitter Signal Processing Chip Supporting 4~20mA Output | 57 |

### ▲ Pressure Sensor Signal Conditioning Chip 58

|                                                                                                       |    |
|-------------------------------------------------------------------------------------------------------|----|
| NSA2200: Digital Output Pressure Sensor Interface Chip                                                | 60 |
| NSA2300: Pressure Sensor Interface Signal Conditioning Chip Compatible with Analog and Digital Output | 61 |
| NSA2302: Pressure Sensor Interface Signal Conditioning Chip Compatible with Analog and Digital Output | 62 |
| NSA2860/NSA2860X: Industrial Transmitter Signal Processing Chip Supporting 4~20mA Output              | 63 |
| NSA2862X: Analog Front-end Chip for Low-power Digital Industrial Sensor                               | 64 |
| NSC2860X: Capacitive Industrial Transmitter Signal Processing Chip Supporting 4~20mA Output           | 65 |
| NSA9260(X): Signal Conditioning Chip for Resistive Bridge Automobile Pressure Sensor                  | 66 |
| NSC9260(X): Signal Conditioning Chip for Capacitive Automobile Pressure Sensor                        | 67 |
| NSC9262: Capacitive Automobile Pressure Sensor Signal Conditioning Chip Supporting LIN BUS            | 68 |
| NSC9264: Capacitive Automobile Pressure Sensor Signal Conditioning Chip Supporting SENT BUS           | 69 |

### ▲ MEMS Microphone Signal Conditioning Chip 70

|                                                                         |    |
|-------------------------------------------------------------------------|----|
| NSC6272/NSC6273: Analog Output MEMS Microphone Signal Conditioning Chip | 72 |
| NSC6280: Analog Output MEMS Microphone Signal Conditioning Chip         | 73 |
| NSC6360: Digital PDM Output MEMS Microphone Signal Conditioning Chip    | 74 |
| NSC6362: Digital PDM Output MEMS Microphone Signal Conditioning Chip    | 75 |
| NSC6364: I2S Interface Digital MEMS Microphone Signal Conditioning Chip | 76 |



---

### ▲ Infrared PIR Sensor Signal Conditioning Chip 77

---

NSA3166: Digital Output PIR Sensor Signal Conditioning Chip 78

---

### ▲ Thermopile Sensor Signal Conditioning Chip 79

---

NSA3300: Thermopile Sensor Signal Conditioning Chip 80

---

### ▲ Magnetic Sensor Signal Conditioning Chip 81

---

NSA5312: Magnetic Sensor Signal Conditioning Chip/Programmable Instrumentation Amplifier 82

---

### ▲ Industrial and Automotive SoC 83

---

Embedded Motor Driver SoC for Automotive Electronic Actuators 84

---

### ▲ General Signal Chain 85

---

NSREF30/31xx: High-precision, Low-tempco, Low-noise, Low-power Voltage Reference 87

---

NSOPA901x/NSOPA901xQ: High Voltage General Purpose Operational Amplifiers 90

---

NSOPA905x/NSOPA905xQ: High Voltage General Purpose Operational Amplifiers 91

---

NSOPA910x/NSOPA910xQ: High Voltage General Purpose Operational Amplifiers 92

---

NSOPA801x/NSOPA801xQ: Low Voltage, General Purpose, Low-power Operational Amplifiers 93

---

NSOPA805x/NSOPA805xQ: Low Voltage, General Purpose, Low-power Operational Amplifiers 94

---

NSOPA810x/NSOPA810Q: Low Voltage, General Purpose, Low-power Operational Amplifiers 95

---

NSOPA240x Automotive Operational Amplifier with High Current Output for Resolver Drive 96

---

NSOPA084 36V General-purpose Operational Amplifiers 97

---

NSCSA240 Current Sense Amplifier 99

---

NSCSA285 Current Sense Amplifier 100

---

NSAD1148/NSAD1147/NSAD1146: 16-bit, Delta-Sigma( $\Delta$ - $\Sigma$ ), Analog-to-Digital Converters (ADCs) 102

---

NSAD1249/NSAD1248/NSAD1247/NSAD1246 24-bit, Delta-Sigma( $\Delta$ - $\Sigma$ ), Analog-to-Digital Converters (ADCs) 103

---

|                                                                                    |            |
|------------------------------------------------------------------------------------|------------|
| <b>▲ Isolated RS-485 Transceiver</b>                                               | <b>104</b> |
| NSI8308xE: Isolated Half-Duplex/-Full-Duplex 485 Transceiver with High Reliability | 105        |
| NIRS485: Cost-optimized Isolated 485 Transceiver                                   | 106        |
| <b>▲ Isolated CAN Transceiver</b>                                                  | <b>107</b> |
| NSI1050: High-Performance Isolated CAN Transceiver                                 | 108        |
| NSI1042/1052: High-Performance Isolated CAN Transceiver                            | 109        |
| <b>▲ Isolated I<sup>2</sup>C</b>                                                   | <b>110</b> |
| NSI8100NC/NSI8100: High Reliability Bidirectional I <sup>2</sup> C Isolators       | 111        |
| <b>▲ I<sup>2</sup>C Interface</b>                                                  | <b>112</b> |
| NCA9511: I <sup>2</sup> C Hot-swappable BUS and SMBUS Buffer                       | 114        |
| NCA9306: I <sup>2</sup> C and SMBUS Voltage Level Converter                        | 115        |
| NCA9617A: I <sup>2</sup> C and SMBUS Dual Bidirectional Buffer                     | 116        |
| NCA9545: 4-channel I <sup>2</sup> C-BUS Switch with Interrupt Logic and Reset      | 117        |
| NCA9546: 4-channel I <sup>2</sup> C Switch with Reset                              | 118        |
| NCA9548: 8-channel I <sup>2</sup> C Switch with Reset                              | 119        |
| NCA9555: I <sup>2</sup> C 16-bit GPIO Expansion                                    | 120        |
| NCA9534B: I <sup>2</sup> C 8-bit GPIO Expansion                                    | 121        |
| NCA9539-Q1: Automotive I <sup>2</sup> C 16-bit GPIO Expansion                      | 122        |
| <b>▲ RS-485 Transceiver</b>                                                        | <b>123</b> |
| NCA34xx: high robust RS485 half/full duplex transceiver                            | 124        |
| NCA3176: High Robust Half-Duplex 485 Transceiver                                   | 125        |

|                                                                                                                 |            |
|-----------------------------------------------------------------------------------------------------------------|------------|
| <b>▲ CAN Transceiver</b>                                                                                        | <b>126</b> |
| NCA1042: Fail-Safe CAN Transceiver Supporting CAN FD and BUS Wakeup                                             | 129        |
| NCA1042B-Q1: Automotive CAN BUS Transceiver Supporting CAN FD and BUS Wakeup                                    | 130        |
| NCA1051/N: Fail-Safe CAN Transceiver Supporting CAN FD and BUS Wakeup                                           | 131        |
| NCA1043B-Q1: Automotive CAN BUS Transceiver Supporting CAN FD and Battery Back-up                               | 132        |
| NCA1145-Q1: Automotive CAN BUS Transceiver Supporting CAN FD and Local Interconnect                             | 133        |
| NCA1462-Q1: Automotive CAN SIC with Ringing Suppression Function                                                | 134        |
| NCA1044-Q1: Automotive High-speed CAN Transceiver with Standby Mode                                             | 135        |
| NCA1057-Q1: Automotive High-speed CAN Transceiver                                                               | 136        |
| NCA1042C-Q1: Automotive High-speed CAN Transceiver with Standby Mode                                            | 137        |
| NCA1042C: High-speed CAN Transceiver with Standby Mode                                                          | 138        |
| NCA1051C: High-speed CAN Transceiver                                                                            | 139        |
| NCA1043B-Q1: Automotive High Speed CAN with Standby and Sleep Mode                                              | 140        |
| <b>▲ LIN Transceiver</b>                                                                                        | <b>141</b> |
| NCA1021S-Q1: Automotive LIN BUS Transceiver                                                                     | 143        |
| <b>▲ Digital Isolator</b>                                                                                       | <b>144</b> |
| NSI822X/ NSI823X/NSI824X/NSI826X: Enhanced Dual/Triple/Quad/Six-Channel Digital Isolators with High Reliability | 147        |

|                                                                                                                                              |            |                                                                                       |            |
|----------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------|------------|
| NSI822XC/ NSI823XC/NSI824XC/<br>NSI826XC: Cost-effective Enhanced<br>Dual/Triple/Quad/Six-Channel Digital<br>Isolators with High Reliability | 148        | NSIP6055x-Q1: Automotive Grade<br>Transformer Driver for Isolated Power<br>Supplies   | 166        |
| NIRS2x: Cost-optimized Dual-channel<br>Digital Isolator with High Reliability                                                                | 149        |                                                                                       |            |
| NIRS31: Cost-optimized Triple-channel<br>Digital Isolator with High Reliability                                                              | 150        |                                                                                       |            |
| <b>▲ Digital Isolator with Integrated<br/>Isolated Power Supply</b>                                                                          | <b>151</b> | <b>▲ Isolated ADC</b>                                                                 | <b>167</b> |
| NSIP882x/NSIP892x/NSIP884x/NSIP894x:<br>Dual/Quad-Channel Digital Isolator with<br>Integrated Isolated DC-DC Power Supply                    | 153        | NSI1306: Isolated Current Sampling<br>ADC with High Reliability                       | 169        |
| NIRSP31: Low Cost Triple-Channel Digital<br>Isolator with Integrated Isolated DC-DC<br>Power Supply                                          | 154        | NSI1305: Isolated Current Sampling<br>ADC with High Reliability                       | 170        |
|                                                                                                                                              |            | NSI1303: Isolated ADC with Integrated<br>Internal Clock with High Reliability         | 171        |
| <b>▲ Isolated 485 with Integrated<br/>Isolated Power Supply</b>                                                                              | <b>155</b> | <b>▲ Isolated Current Amplifier</b>                                                   | <b>172</b> |
| NSIP83086: Isolated RS-485 Transceiver<br>With Integrated Isolated DC-DC Power<br>Supply                                                     | 157        | NSI1200/NSI1300: Isolated Current<br>Sampling Amplifier with High Reliability         | 173        |
|                                                                                                                                              |            | NSI1400: Cost-effective Isolation Current<br>Sampling Amplifier with High Reliability | 174        |
| <b>▲ Isolated CAN with Integrated<br/>Isolated Power Supply</b>                                                                              | <b>158</b> | <b>▲ Isolated Voltage Amplifier</b>                                                   | <b>175</b> |
| NSIP1042: Isolated CAN Transceiver With<br>Integrated Isolated DC-DC Power Supply                                                            | 159        | NSI1311: Isolated Voltage Sampling<br>Amplifier With High Reliability                 | 176        |
|                                                                                                                                              |            | NSI1312: Isolated Voltage Sampling<br>Amplifier With High Reliability                 | 177        |
| <b>▲ Solid-State Relay</b>                                                                                                                   | <b>160</b> | <b>▲ Isolated Error Amplifier</b>                                                     | <b>178</b> |
| NSI7258: 1700V 50mA Solid-State Relay                                                                                                        | 161        | NSI3190: Isolated Error Amplifier with<br>High Reliability                            | 179        |
| <b>▲ Transformer Driver</b>                                                                                                                  | <b>162</b> | <b>▲ Isolated Comparator</b>                                                          | <b>180</b> |
| NSIP6051: Transformer Driver for Isolated<br>Power Supplies                                                                                  | 163        | NSI22C1x: High-speed isolated<br>comparators                                          | 181        |
| NSIP6051-Q1: Automotive Grade<br>Transformer Driver for Isolated Power<br>Supplies                                                           | 164        |                                                                                       |            |
| NSIP6055x: Transformer Driver for<br>Isolated Power Supplies                                                                                 | 165        |                                                                                       |            |

|                                                                                                    |            |                                                                                              |            |
|----------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------|------------|
| <b>▲ Isolated Half-bridge Driver</b>                                                               | <b>182</b> | <b>▲ Non-isolated Half-bridge Gate Driver</b>                                                | <b>207</b> |
| NSI66x2: Isolated Dual-channel Gate Driver                                                         | 188        | NSD1624x High Voltage Half-bridge Gate Driver                                                | 209        |
| NSI6602V/NSI6602N: Second - generation High-performance Isolated Dual-channel Gate Driver          | 189        | NSD1224x: 120V Half-bridge Gate Driver                                                       | 210        |
| NSI6642: Second-generation High-performance Isolated Dual-channel Gate Driver Supporting PWM Input | 190        |                                                                                              |            |
| NSI6602M: Isolated Dual-channel Gate Driver with Integrated Miller Clamp                           | 191        | <b>▲ GaN Intergrated Power Stage &amp; Gate Driver</b>                                       | <b>211</b> |
|                                                                                                    |            | NSG65N15K: GaN Intergrated Power Stage IC                                                    | 213        |
| <b>▲ Isolated Single-channel Gate Driver</b>                                                       | <b>192</b> | NSD2621x: High Voltage Half-bridge GaN Driver IC                                             | 214        |
| NSI6801: Opto-compatible Isolated Single-channel Gate Driver                                       | 194        |                                                                                              |            |
| NSI68010/11: Cost-effective Opto-compatible Isolated Single-channel Gate Driver                    | 195        | <b>▲ Brushed DC Motor Driver</b>                                                             | <b>215</b> |
| NSI6601/NSI6601M: Isolated Single-channel Gate Driver                                              | 196        | NSD731x/NSD731x-Q1: 40V Peak Current 3.6A Brushed DC Motor Driver IC                         | 217        |
| NSI6801M: Opto-compatible Isolated Single-channel Gate Driver with Miller Clamp                    | 197        | NSD7314/NSD7314-Q1: 40V Peak Current 6A Brushed DC Motor Driver IC                           | 218        |
|                                                                                                    |            | NSD8312/NSD8310/NSD8308/NSD8306/ – Q1: 40V 12/10/8/6-channel Half-bridge Driver IC           | 219        |
| <b>▲ Smart Isolated Gate Driver Integrated with DESAT Protection</b>                               | <b>198</b> |                                                                                              |            |
| NSI6611/NSI6651: Smart Isolated Gate Driver Integrated with DESAT Protection                       | 200        | <b>▲ Brushed DC Motor Pre-Driver</b>                                                         | <b>220</b> |
| NSI67x0: Smart Isolated Gate Driver Integrated with Isolated Analog Sensing                        | 201        | NSD3604/NSD3608-Q1: 40V Multi-channel Half-bridge Pre-driver                                 | 221        |
| NSI68515: Opto-compatible Smart Isolated Gate Driver Integrated with DESAT Protection              | 202        | NSD3602-Q1 40V 2 Channel Half-Bridge Pre-driver for BDC Motor                                | 222        |
|                                                                                                    |            |                                                                                              |            |
| <b>▲ Non-isolated Low-side Gate Driver</b>                                                         | <b>203</b> | <b>▲ Micro-stepping Stepper Motor</b>                                                        | <b>223</b> |
| NSD1026V: Dual-channel Low-side Gate Driver                                                        | 205        | NSD8381-Q1: 40V 32 Micro-step Stepper Motor Driver                                           | 224        |
| NSD1015T/MT: Smart Single-channel Low-side Gate Driver Integrated with DESAT Protection            | 206        | NSD8389-Q1: 40V 256 Micro-step Stepper Motor Driver                                          | 225        |
|                                                                                                    |            |                                                                                              |            |
|                                                                                                    |            | <b>▲ Low-side Driver/Switch</b>                                                              | <b>226</b> |
|                                                                                                    |            | NSD5604E/NSD5604/NSD5604NE /NSD5604N: 55V Four-channel Low-side Relay and Solenoid Driver IC | 228        |



|                                                                                                 |            |                                                                                                                  |            |
|-------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------|------------|
| NSD56008-Q1: 8-channel Low-side Relay and Solenoid Driver                                       | 229        |                                                                                                                  |            |
| Automotive 40V Single Channel 90mΩ Intelligent Low Side Switch NSE11409 Series                  | 230        |                                                                                                                  |            |
| NSD12409 – Q1 Automotive 40V Dual-channel 90mΩ Intelligent Low-Side Switch                      | 231        |                                                                                                                  |            |
| NSD11416/12416/12416A – Q1 Automotive 40V Single/Dual-channel 160mΩ Intelligent Low-side Switch | 232        |                                                                                                                  |            |
| NSD11430/12430/12430A – Q1 Automotive 40V Single/Dual-channel 300mΩ Intelligent Low-side Switch | 233        |                                                                                                                  |            |
| <b>▲ SiC Diode</b>                                                                              | <b>234</b> |                                                                                                                  |            |
| NPD0x0N120A: 1200V SiC Diode Series                                                             | 236        |                                                                                                                  |            |
| <b>▲ SiC MOSFET</b>                                                                             | <b>237</b> |                                                                                                                  |            |
| NPC0x0N120A: 1200V SiC MOSFET Series                                                            | 238        |                                                                                                                  |            |
| <b>▲ LDO Linear Regulator</b>                                                                   | <b>239</b> |                                                                                                                  |            |
| Automotive 40V 150/300/500mA LDO NSR31/33/35 Series with Ultra Low-Quiescent Current            | 243        |                                                                                                                  |            |
| Automotive 5.5V 500mA/1A LDO NSR30x0x-Q1 Series with Low Noise and High PSRR                    | 244        |                                                                                                                  |            |
| Automotive 300mA Single-channel and Dual-channel Antenna Load Protection LDO NSE5701/2 Series   | 245        |                                                                                                                  |            |
| Automotive 50mA/100mA/300mA/400mA Tracking LDO NSE4250/4/3/1 Series                             | 246        |                                                                                                                  |            |
| Automotive 40V 500mA/300mA LDO NSR37xxx Series Integrated with Selectable Watchdog              | 247        |                                                                                                                  |            |
|                                                                                                 |            | <b>▲ DC-DC Switching Converter</b>                                                                               | <b>248</b> |
|                                                                                                 |            | Industrial 100V High-voltage High-efficiency Asynchronous Buck Converter NSR10Axx Series                         | 252        |
|                                                                                                 |            | Automotive and Industrial 40V 2A/2.5A/3.5A High-efficiency Asynchronous Buck Converter NSR104xx Series           | 253        |
|                                                                                                 |            | Automotive and Industrial 60V 2.5A/3.5A High-voltage High-efficiency Asynchronous Buck Converter NSR106xx Series | 254        |
|                                                                                                 |            | <b>▲ Voltage Monitoring Reset IC Series</b>                                                                      | <b>255</b> |
|                                                                                                 |            | Industrial low-Iq Programmable-delay Voltage Monitoring Reset IC Series NSR7808                                  | 258        |
|                                                                                                 |            | <b>▲ Smart High Side Switch</b>                                                                                  | <b>259</b> |
|                                                                                                 |            | Automotive 40V Single/Dual/Quad Channel Intelligent High-side Switch NSE34xxx/NSE35xxx Series                    | 263        |
|                                                                                                 |            | <b>▲ LED Driver</b>                                                                                              | <b>264</b> |
|                                                                                                 |            | Automotive 40V/450mA Single-channel Linear LED Driver NSL2161x                                                   | 266        |
|                                                                                                 |            | Automotive 40V Three-channel Linear LED Driver with Thermal Sharing Function NSL2163x                            | 267        |
|                                                                                                 |            | Automotive 20V 12-channel Linear LED Driver NSL21912                                                             | 268        |
|                                                                                                 |            | Automotive 16-channel Linear LED Driver NSL23716x                                                                | 269        |
|                                                                                                 |            | Automotive 16/24-channel Linear LED Driver NSL21916/24                                                           | 270        |

# Temperature Sensor / Temperature and Humidity Sensor



# Temperature Sensor

| Part number | Product description                                                                                     | Package      | Temperature range | Supply voltage | Working current | Port type              | Max. resolution | Max. precision | Typical application                                                                                                                                                                                                                                                          |
|-------------|---------------------------------------------------------------------------------------------------------|--------------|-------------------|----------------|-----------------|------------------------|-----------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NST1001     | High-precision dual-pin digital pulse output temperature sensor                                         | TO-92S/DFN-2 | -50°C~150°C       | 1.65V~5.5V     | 30μA            | Pulse count output     | 0.0625°C        | ±0.2°C         | NTC replacement, quick response probe, 2-wire temperature probe, gas meter temperature compensation, wearable and IoT temperature measurement                                                                                                                                |
| NST1001HA   | High-precision dual-pin digital pulse output temperature sensor with maximum accuracy of ±0.2°C         | DFN-2        | -50°C~150°C       | 1.65V~5.5V     | 30μA            | Pulse count output     | 0.0625°C        | ±0.1°C         | NTC replacement, quick response probe, 2-wire temperature probe, gas meter temperature compensation, wearable and IoT temperature measurement                                                                                                                                |
| NST1002     | High-precision single-BUS digital temperature sensor                                                    | TO-92S/DFN-2 | -50°C~150°C       | 1.7V~5.5V      | 30μA            | One wire protocol      | 0.0078125°C     | ±0.1°C         | NTC replacement, quick response probe, 2-wire temperature probe, glucometer, wearable and IoT temperature measurement                                                                                                                                                        |
| NST175      | Digital temperature sensor with I <sup>2</sup> C/SMBUS interface in industrial-qualified package        | MSOP-8/SOP-8 | -55°C~125°C       | 1.62V~5.5V     | 30μA            | I <sup>2</sup> C/SMBUS | 0.0625°C        | ±0.5°C         | LM75/TMP75 replacement, server temperature measurement, battery temperature measurement, SSD temperature measurement, board-level temperature measurement                                                                                                                    |
| NST175-Q1   | Digital temperature sensor with I <sup>2</sup> C/SMBUS interface in automotive-grade standard packaging | MSOP-8/SOP-8 | -40°C~150°C       | 1.62V~5.5V     | 30μA            | I <sup>2</sup> C/SMBUS | 0.0625°C        | ±0.2°C         | Automotive air conditioning system, automotive infotainment system, air flow sensor, battery management system BMS, engine control unit, on-board HID lamp, airbag control unit                                                                                              |
| NST1075     | Small-size high-precision digital temperature sensor                                                    | WS08         | -55°C~125°C       | 1.62V~5.5V     | 30μA            | I <sup>2</sup> C/SMBUS | 0.0625°C        | ±0.5°C         | TMP75 replacement, server temperature measurement, routers, communication base stations, board-level temperature measurement                                                                                                                                                 |
| NST118      | Small-size high-precision digital temperature sensor with I <sup>2</sup> C/SMBUS port                   | DFN-6        | -40°C~125°C       | 1.71V~3.6V     | 6.5μA           | I <sup>2</sup> C/SMBUS | 0.0625°C        | ±0.1°C         | x117 substitution, wearable temperature monitoring, medical thermometer, battery temperature measurement, industrial IoT, environmental monitoring, etc.                                                                                                                     |
| NST117      | Small-size high-precision digital temperature sensor with I <sup>2</sup> C port                         | DFN-6        | -55°C~125°C       | 1.62V~5.5V     | 30μA            | I <sup>2</sup> C/SMBUS | 0.0625°C        | ±0.2°C         | x117 series substitution, wearable temperature monitoring, medical thermometer, battery temperature measurement, industrial Internet of Things, environmental monitoring, etc.                                                                                               |
| NST112-DSTR | SOT563 is a high-accuracy and low-power digital temperature sensor with a I <sup>2</sup> C/SMBUS port   | SOT563       | -40°C~125°C       | 1.71V~3.6V     | 6.5μA           | I <sup>2</sup> C/SMBUS | 0.0625°C        | ±0.5°C         | 1X2 series substitution, board level temperature measurement, server temperature measurement, battery temperature measurement, SSD temperature measurement, IoT temperature monitoring, etc.                                                                                 |
| NST112x     | WLCSP is a high-accuracy and low-power digital temperature sensor with a I <sup>2</sup> C/SMBUS port    | DSBGA-4      | -40°C~125°C       | 1.5V~3.6V      | 5.7μA           | I <sup>2</sup> C/SMBUS | 0.015625°C      | ±0.1°C         | 1X2 series substitution, wearable temperature monitoring, board level temperature measurement, server temperature measurement, battery temperature measurement, SSD temperature measurement, IoT temperature monitoring, etc.                                                |
| NST103      | WLCSP is a low-power digital temperature sensor with a I <sup>2</sup> C/SMBUS port                      | DSBGA-4      | -40°C~125°C       | 1.5V~3.6V      | 3μA             | I <sup>2</sup> C/SMBUS | 1°C             | ±1°C           | X103 series substitution, mobile phone, laptop, SOLID-state disk, server, telecommunication, set-top box, sensor, low power environment                                                                                                                                      |
| NST461      | High-precision and high-resolution I <sup>2</sup> C/SMBUS remote and local temperature sensors (1L+1R)  | WQFN-10      | -40°C~125°C       | 2.1V~3.6V      | 37μA            | I <sup>2</sup> C/SMBUS | 0.0625°C        | ±0.5°C         | X461/451 substitution, X4x1 compatibility, laptop, desktop, solid-state drive, server, telecommunication, Industrial Internet of Things, etc.                                                                                                                                |
| NST1412     | High-precision I <sup>2</sup> C/SMBUS remote and local temperature sensors (1L+1R)                      | MSOP-10      | -40°C~125°C       | 3V~3.6V        | 37μA            | I <sup>2</sup> C/SMBUS | 0.125°C         | ±0.5°C         | EMC1412 substitution, laptop, desktop, solid-state drive, server, telecommunication, Industrial Internet of Things, etc.                                                                                                                                                     |
| NST1413     | High-precision I <sup>2</sup> C/SMBUS remote and local temperature sensors (1L+2R)                      | MSOP-10      | -40°C~125°C       | 3V~3.6V        | 37μA            | I <sup>2</sup> C/SMBUS | 0.125°C         | ±0.5°C         | EMC1413 substitution, laptop, desktop, solid-state drive, server, telecommunication, Industrial Internet of Things, etc.                                                                                                                                                     |
| NST7719     | High-precision I <sup>2</sup> C/SMBUS remote and local temperature sensors (1L+2R)                      | MSOP-10      | -40°C~125°C       | 3V~3.6V        | 37μA            | I <sup>2</sup> C/SMBUS | 0.125°C         | ±0.5°C         | NCT7719 substitution, laptop, desktop, server, telecommunication, Industrial Internet of Things, etc.                                                                                                                                                                        |
| NST20       | High-precision, low-power analog output temperature sensor (negative temperature coefficient)           | SC70-5       | -55°C~130°C       | 2.4V~5.5V      | 20μA            | Analog output          | -11.77mV/°C     | ±0.5°C         | X20 series substitution, laptop temperature monitoring, smart phone temperature measurement, temperature monitoring of portable medical devices, industrial Internet of Things and power system, power module temperature measurement, environmental monitoring & HVAC, etc. |

| Part number | Product description                                                                                                        | Package        | Temperature range | Supply voltage | Working current | Port type     | Max. resolution | Max. precision | Typical application                                                                                                                                                                                                                                                           |
|-------------|----------------------------------------------------------------------------------------------------------------------------|----------------|-------------------|----------------|-----------------|---------------|-----------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NST86       | High-precision, low-power analog output temperature sensor (negative temperature coefficient)                              | SC70-5         | -50°C~150°C       | 2.4V~5.5V      | 20μA            | Analog output | -10.9mV/°C      | ±0.5°C         | X86 series substitution, laptop temperature monitoring, smart phone temperature measurement, temperature monitoring of portable medical devices, industrial Internet of Things and power system, power module temperature measurement, environmental monitoring & HVAC, etc.  |
| NST86-Q1    | Automotive-grade high precision, low power consumption analog output temperature sensor (negative temperature coefficient) | SC70-5         | -40°C~150°C       | 2.4V~5.5V      | 20μA            | Analog output | -10.9mV/°C      | ±0.5°C         | Car audio host, car infotainment system, electric power steering (EPS), battery management system (BMS), gear shifting system, gasoline engine                                                                                                                                |
| NST235      | High-precision, low-power analog output temperature sensor (positive temperature coefficient)                              | SC70-5 SOT23-3 | -40°C~150°C       | 2.3V~5.5V      | 20μA            | Analog output | 10mV/°C         | ±0.5°C         | X235 series substitution, laptop temperature monitoring, smart phone temperature measurement, temperature monitoring of portable medical devices, industrial Internet of Things and power system, power module temperature measurement, environmental monitoring & HVAC, etc. |
| NST235-Q1   | Automotive-grade high precision, low power consumption analog output temperature sensor (positive temperature coefficient) | SOT23-3        | -40°C~150°C       | 2.3V~5.5V      | 20μA            | Analog output | 10mV/°C         | ±0.5°C         | Car audio host, car infotainment system, electric power steering (EPS), battery management system (BMS), gear shifting system, gasoline engine                                                                                                                                |
| NST60       | High-precision, low-power analog output temperature sensor (positive temperature coefficient)                              | SOT23-3        | -40°C~125°C       | 2.4V~5.5V      | 20μA            | Analog output | 6.25mV/°C       | ±0.5°C         | X60 series substitution, laptop temperature monitoring, smart phone temperature measurement, temperature monitoring of portable medical devices, industrial Internet of Things and power system, power module temperature measurement, environmental monitoring & HVAC, etc.  |
| NST60-Q1    | Automotive-grade high precision, low power consumption analog output temperature sensor (positive temperature coefficient) | SOT23-3        | -40°C~125°C       | 2.4V~5.5V      | 20μA            | Analog output | 6.25mV/°C       | ±0.5°C         | Car audio host, car infotainment system, electric power steering (EPS), battery management system (BMS), gear shifting system, gasoline engine                                                                                                                                |

## Temperature and Humidity Sensor

| Part number | Product description                                                                                     | Package | Temperature range | Relative humidity (RH) range | Supply voltage | Working current | Port type | Max. resolution | Max. precision | Typical application                                                                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------|---------|-------------------|------------------------------|----------------|-----------------|-----------|-----------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSHT30-CLAR | High-precision, Low-power I <sup>2</sup> C Digital Interface Temperature and Humidity Sensor            | LGA     | -40°C~125°C       | 0%RH~100%RH                  | 2.0V~5.5V      | 3.2μA           | 1°C       | /               | ±0.3°C         | Humidifier/dehumidifierWhite goodsIntelligent constant temperature and humidity controllerVentilatorsSmart agricultureCold chain logisticsHydrographAutomobile intelligent fog removal system |
| NSHT30-QDNR | High-precision, Low-power I <sup>2</sup> C Digital Interface Temperature and Humidity Sensor            | DFN     | -40°C~125°C       | 0%RH~100%RH                  | 2.0V~5.5V      | 3.2μA           | 1°C       | /               | ±0.3°C         | Humidifier/dehumidifierWhite goodsIntelligent constant temperature and humidity controllerVentilatorsSmart agricultureCold chain logisticsHydrographAutomobile intelligent fog removal system |
| NSHT30-Q1   | Automotive High-precision, Low-power I <sup>2</sup> C Digital Interface Temperature and Humidity Sensor | DFN     | -40°C~125°C       | 0%RH~100%RH                  | 2.0V~5.5V      | 3.2μA           | 1°C       | N/A             | ±0.3°C         | Window fog removal, Automotive HVAC control module, Automotive Lidar,Battery Management System, Automotive                                                                                    |



## NST1001: D-NTC® Digital Pulse Output Temperature Sensor

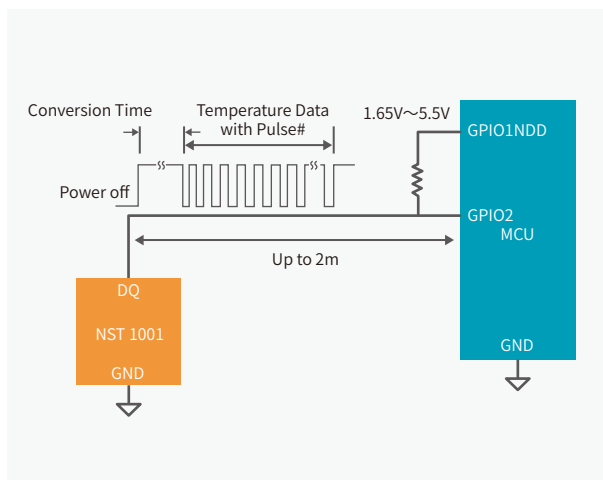
### ◆ Product introduction

NST1001 is a high-precision double-pin digital output temperature sensor. NST1001 features pulse counting digital output and high precision in a wide temperature range, which can be directly connected with MCU, while ensuring measurement accuracy and reducing overhead. The NST1001 device supports a maximum accuracy of  $\pm 0.75^{\circ}\text{C}$  over temperatures ranging from  $-50^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ , while providing extremely high resolution ( $0.0625^{\circ}\text{C}$ ) without system calibration or hardware/software compensation. The pulse-counting digital port is designed for direct connection to GPIO or comparator inputs to simplify component implementation. Simple two-pin architecture is adopted. So the NST1001 device can be easily converted into a two-wire temperature probe.

### ◆ Product feature

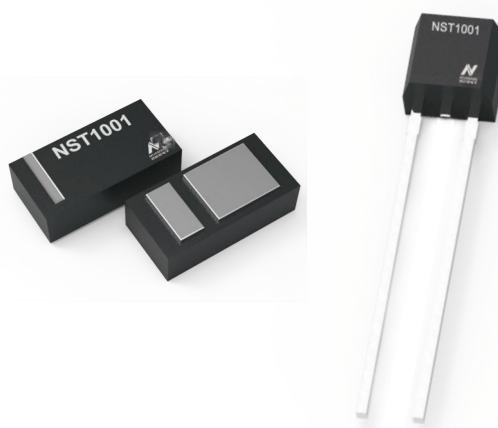
- Operating temperature range:  $-50^{\circ}\text{C}\sim 150^{\circ}\text{C}$
- High accuracy in full temperature range  
 $25^{\circ}\text{C}\sim 45^{\circ}\text{C}$ :  $\pm 0.2^{\circ}\text{C}$  (typical) @ NST1001  
 $25^{\circ}\text{C}\sim 45^{\circ}\text{C}$ :  $\pm 0.2^{\circ}\text{C}$  (max.) @ NST1001HA  
 Accuracy within range  $-20^{\circ}\text{C}\sim 85^{\circ}\text{C}$ :  $\pm 0.5^{\circ}\text{C}$  (max.)  
 Accuracy within range  $-50^{\circ}\text{C}\sim -20^{\circ}\text{C}$ :  $\pm 0.75^{\circ}\text{C}$  (max.)  
 Accuracy within range  $85^{\circ}\text{C}\sim 150^{\circ}\text{C}$ :  $\pm 0.75^{\circ}\text{C}$  (max.)
- High resolution:  $0.0625^{\circ}\text{C}$  (1 LSB)
- Quick temperature response: silicone oil  $\tau_{63\%} 0.21\text{S}$  (DFN2L)
- Single temperature conversion time: 50mS
- Ultra-low power consumption: 30 $\mu\text{A}$  operating current, zero standby power consumption
- Supply voltage range: 1.65V to 5.5V
- Pulse count type digital output to reduce the AD conversion port on master side
- Support dual pin simplified temperature measurement solution
- DFN2L ultra small packaging, with same resistance size as 0603

### ◆ Functional block diagram



### ◆ Package

- TO-92S (4mm x 3mm)
- DFN2L (1.6mm x 0.8mm)



### ◆ Application



Power  
metering



Gas meter temperature  
measurement



Smart  
closetool



Digital  
temperature probes



Smart  
wearable devices,



Industrial  
Internet of things



Battery  
temperature detection



## NST1002: D-NTC single bus-type digital temperature sensor

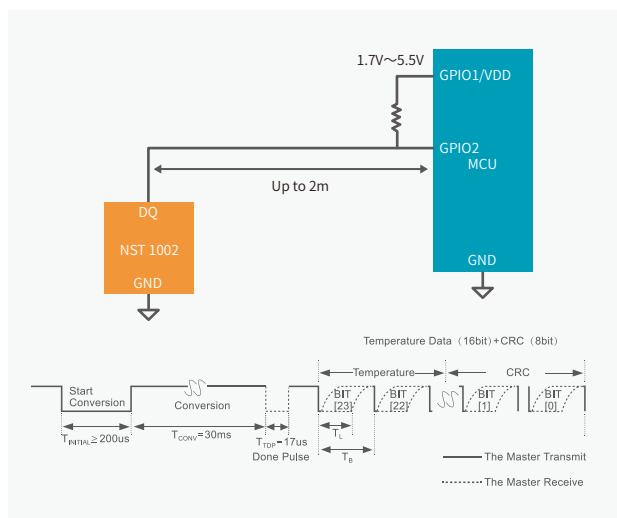
### ◆ Product introduction

NST1002 is a high-precision dual-pin single bus-type temperature sensor. NST1002 has a single bus protocol output interface and high precision in a wide temperature range. It can be directly connected with MCU to ensure the measurement accuracy and reduce the overhead. The NST1002 device supports a maximum accuracy of  $\pm 0.5^{\circ}\text{C}$  over temperatures ranging from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ , while providing extremely high resolution ( $0.0078125^{\circ}\text{C}$ ) without system calibration or hardware/software compensation. The digital interface of the single bus protocol is designed to connect directly to GPIO, simplifying hardware design. The simple dual-pin architecture enables the NST1002 device to be easily converted into a two-wire temperature probe.

### ◆ Product feature

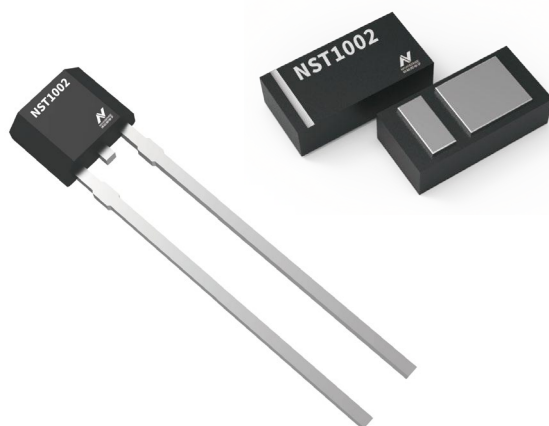
- Operating temperature range:  $-50^{\circ}\text{C}$  to  $150^{\circ}\text{C}$
- High accuracy over  $-50^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ 
  - DFN-2L
  - $0^{\circ}\text{C} \sim 85^{\circ}\text{C}$ :  $\pm 0.1^{\circ}\text{C}$  (typical)  $\pm 0.25^{\circ}\text{C}$  (max.)
  - $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$ :  $\pm 0.5^{\circ}\text{C}$  (max.)
  - $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$ :  $\pm 0.5^{\circ}\text{C}$  (max.) @  $3.3\text{V}$
- TO-92S-2L
- $0^{\circ}\text{C} \sim 85^{\circ}\text{C}$ :  $\pm 0.2^{\circ}\text{C}$  (typical)
- $-20^{\circ}\text{C} \sim 85^{\circ}\text{C}$ :  $\pm 0.35^{\circ}\text{C}$  (max.)
- $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$ :  $\pm 0.7^{\circ}\text{C}$  (max.)
- $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$ :  $\pm 0.7^{\circ}\text{C}$  (max.) @  $3.3\text{V}$
- High resolution:  $0.0078125^{\circ}\text{C}$  (1 LSB)
- Quick temperature response:  $0.27\text{s}$  (DFN2L)
- Single temperature conversion time:  $32\text{ms}$
- Ultra-low power consumption:  $30\mu\text{A}$  operating current, zero standby power consumption
- Supply voltage range:  $1.7\text{V}$  to  $5.5\text{V}$
- Single bus protocol digital output, without AD conversion port
- Support dual pin simplified temperature measurement solution
- DFN2L ultra small packaging, with same size as  $0603$  resistance

### ◆ Functional block diagram



### ◆ Package

- TO-92S (4mm x 3mm)
- DFN2L (1.6mm x 0.8mm)



### ◆ Application



Ammeter



Gas meter temperature measurement



Intelligent closetool



Home appliances



Glucometer



Digital temperature probe



Intelligent wearables



Industrial Internet of Things



Battery temperature detection

## NST175: Digital Temperature Sensor with I<sup>2</sup>C Port in Industrial-qualified Package

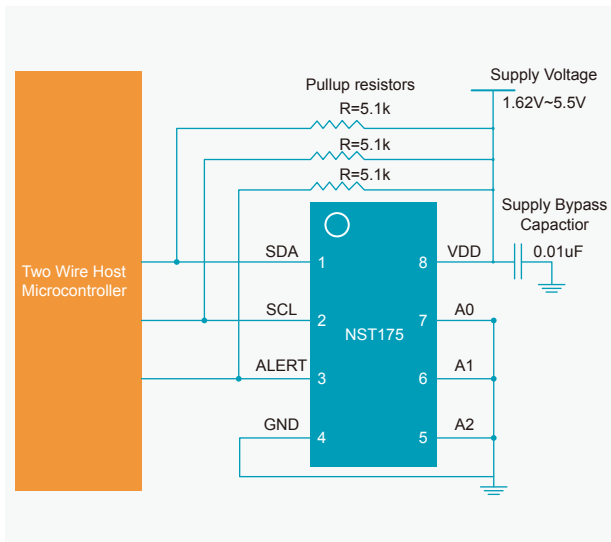
### ◆ Product introduction

The NST175 is a low-power, high-precision digital temperature sensor ideal as an alternative to negative temperature coefficient (NTC) and positive temperature coefficient (PTC) thermistors. The device provides typical accuracy of  $\pm 0.5^{\circ}\text{C}$  without calibration or signal adjustment from external components. NST175 temperature sensor is a highly linear product, which can sense the temperature without complex calculation or lookup. The on-chip 12-bit analog-to-digital converter (ADC) provides resolution as low as  $0.0625^{\circ}\text{C}$ . The NST175 is compatible with SMBUS and I<sup>2</sup>C, allowing a maximum of 27 devices to be connected to one BUS and supporting the SMBUS alarm function. The NST175 has a rated operating range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  and is ideal for extended temperature measurement in a wide range of communications, computing, consumer products, Internet of Things, environmental, industrial and instrumentation applications. NST175 comes in industry-qualified MSOP8 and SOP8 packages.

### ◆ Product feature

- Maintain high accuracy in  $-40^{\circ}\text{C}$ 至 $125^{\circ}\text{C}$  wide temperature range:
  - $20^{\circ}\text{C}$ ~ $85^{\circ}\text{C}$ :  $+0.2^{\circ}\text{C}$  (typical)  $\pm 0.5^{\circ}\text{C}$  (max.)
  - $40^{\circ}\text{C}$ ~ $125^{\circ}\text{C}$ :  $\pm 0.5^{\circ}\text{C}$  (typical)  $\pm 1^{\circ}\text{C}$  (max.)
- Resolution range: 9~12 bits, configurable by the user up to  $0.0625^{\circ}\text{C}$
- Up to 27 device addresses supported
- Wide supply voltage range: 1.62V to 5.5V
- Working current: 27 $\mu\text{A}$  (typical)
- Turn-off current: 0.2 $\mu\text{A}$  (typical)
- Digital port: compatible with SMBus, I<sup>2</sup>C

### ◆ Functional block diagram



### ◆ Package

- MSOP8 (3.0mm x 3.0mm)
- SOP8 (4.9mm x 3.91mm)



### ◆ Application



System temperature monitoring



Computer peripherals overheating protection



Laptop



IoT application



Communication device



Power supply temperature monitoring



Thermostat control



Environmental monitoring, heating ventilation air conditioning (HVAC)

## NST175-Q1: I<sup>2</sup>C/SMBus Interface Digital Temperature Sensor with Automotive-Grade Standard Packaging

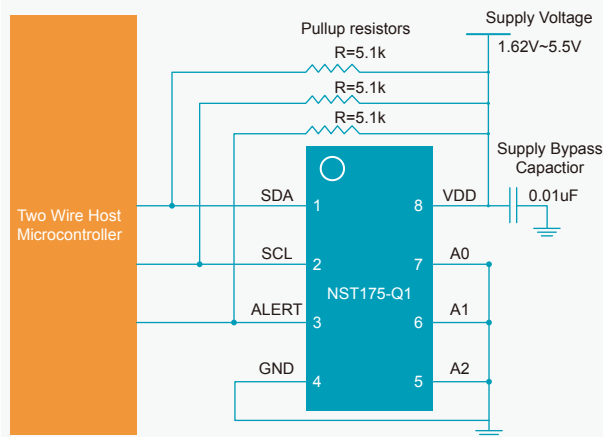
### ◆ Product introduction

The NST175-Q1 is a low-power, high-precision digital temperature sensor ideal as an alternative to negative temperature coefficient (NTC) and positive temperature coefficient (PTC) thermistors. The device provides max accuracy of  $\pm 0.5^{\circ}\text{C}$  without calibration or signal adjustment from external components. NST175-Q1 temperature sensor is a highly linear product, which can sense the temperature without complex calculation or lookup. The on-chip 12-bit analog-to-digital converter (ADC) provides resolution as low as  $0.0625^{\circ}\text{C}$ . The NST175 is compatible with SMBus and I<sup>2</sup>C, allowing a maximum of 27 devices to be connected to one BUS and supporting the SMBus alarm function. The NST175 has a rated operating range of  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  and is ideal for extended temperature measurement in a wide range of automotive applications. NST175-Q1 comes in industry-qualified MSOP8 and SOP8 packages.

### ◆ Product feature

- Maintain high accuracy in full temperature range:
  - $-20^{\circ}\text{C} \sim 85^{\circ}\text{C}$ :  $\pm 0.2^{\circ}\text{C}$  (typical)
  - $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$ :  $\pm 1^{\circ}\text{C}$  (max.)
- Maximum resolution  $0.0625^{\circ}\text{C}$ , optional
- Up to 27 device addresses supported
- Wide supply voltage range: 1.62V to 5.5V
- Working current:  $30\mu\text{A}$  (typical)
- Turn-off current:  $0.1\mu\text{A}$  (typical)
- Digital port: compatible with SMBus, I<sup>2</sup>C
- AEC-Q100 Grade0

### ◆ Functional block diagram



### ◆ Package

- SOP8 (4.9mm x 3.91mm)



### ◆ Application



Car air conditioning system



Automotive infotainment systems



Air flow sensor



Battery Management System (BMS)



Engine control unit



Car HID lights



Airbag control unit

## NST1075: Small-size high-precision digital temperature sensor

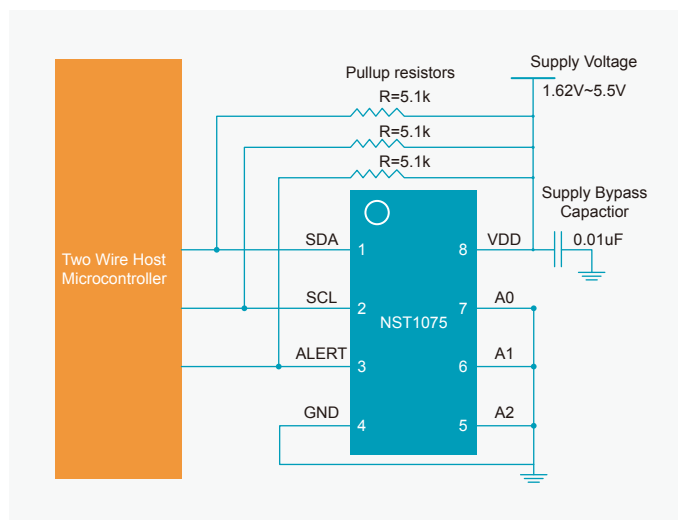
### ◆ Product introduction

The NST1075 is a low-power, high-precision digital temperature sensor ideal as an alternative to negative temperature coefficient (NTC) and positive temperature coefficient (PTC) thermistors. The device provides typical accuracy of  $\pm 0.5^{\circ}\text{C}$  without calibration or signal adjustment from external components. NST1075 temperature sensor is a highly linear product, which can sense the temperature without complex calculation or lookup. The on-chip 12-bit analog-to-digital converter (ADC) provides resolution as low as  $0.0625^{\circ}\text{C}$ . The NST1075 is compatible with SMBUS and I<sup>2</sup>C interface, allowing a maximum of 27 devices to be connected to one bus and supporting the SMBus alarm function. The NST1075 has an operating temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  and is ideal for extended temperature measurement in a wide range of communications, computing, consumer products, Internet of Things, environmental, industrial and instrumentation applications. NST1075 is packaged with WSON8 and the size is  $2.0\text{mm}\times 2.0\text{mm}$ , which can better meet the temperature measurement requirements of miniaturized devices such as routers.

### ◆ Product feature

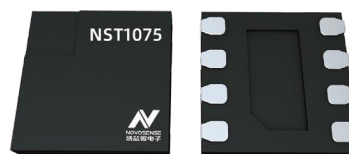
- Maintain high accuracy in wide temperature range:
  - $-55^{\circ}\text{C}\sim 125^{\circ}\text{C}$
  - $20^{\circ}\text{C}\sim 85^{\circ}\text{C}$ :  $\pm 0.5^{\circ}\text{C}$  (typical)
  - $-20^{\circ}\text{C}\sim 85^{\circ}\text{C}$ :  $\pm 1^{\circ}\text{C}$  (max)
  - $-55^{\circ}\text{C}\sim 125^{\circ}\text{C}$ :  $\pm 1.5^{\circ}\text{C}$  (max)
- Maximum resolution:  $0.0625^{\circ}\text{C}$ , optional
- Up to 27 device addresses supported
- Wide supply voltage range:  $1.62\text{V}$  to  $5.5\text{V}$
- Working current:  $30\mu\text{A}$  (typical)
- Turn-off current:  $0.2\mu\text{A}$  (typical)
- Digital port: Compatible with SMBUS, I<sup>2</sup>C

### ◆ Functional block diagram



### ◆ Package

- WSON8 ( $2.0\text{mm}\times 2.0\text{mm}$ )



### ◆ Application



System temperature monitoring



Computer peripherals overheating protection



Server



IoT application



Communication device



Power supply temperature monitoring



Thermostat control



Environmental monitoring, heating ventilation air conditioning (HVAC)

## NST118: Small Ultra-high-precision Digital Temperature Sensor with I<sup>2</sup>C Port

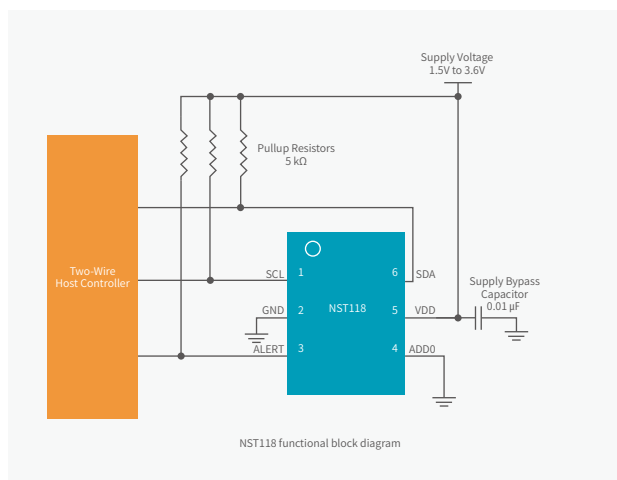
### ◆ Product introduction

NST118 is a low power-consumption ultra-high-precision digital temperature sensor. It is an ideal substitute for negative temperature coefficient (NTC) and positive temperature coefficient (PTC) thermistors. The NST118 has I<sup>2</sup>C and SMBUS compatible ports, supports up to four device addresses, and has programmable alarm and SMBUS reset capabilities. It achieves accuracy up to  $\pm 0.2^{\circ}\text{C}$  (Max) in the range of  $25^{\circ}\text{C}$  to  $45^{\circ}\text{C}$  without calibration. The NST118 has low power consumption, which minimizes the impact of spontaneous heat on measurement accuracy. The NST118 temperature sensor is highly linear and does not require recombination calculations or lookup to derive the temperature. The 12-bit on-chip analog-to-digital conversion provides resolution up to  $0.0625^{\circ}\text{C}$ . The NST118 temperature sensor operates from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  and is suitable for consumer products, industrial equipment, Internet of Things and automotive markets. The NST118's DNF(2mm x 2mm) package is also compatible with the NST117.

### ◆ Product feature

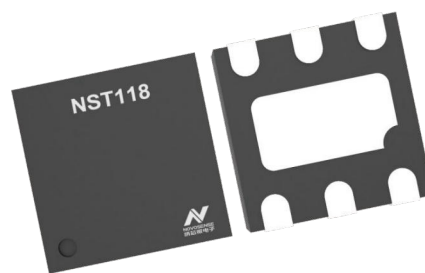
- High accuracy in  $-40^{\circ}\text{C}$  ~  $125^{\circ}\text{C}$  wide temperature range
- Ultra precision at  $25^{\circ}\text{C}$  ~  $45^{\circ}\text{C}$   $\pm 0.2^{\circ}\text{C}$  (maximum)
- I<sup>2</sup>C/ SMBUS compatible port
- 12-bit ADC, maximum resolution:  $0.0625^{\circ}\text{C}$
- User programmable over-temperature alarm threshold
- Low static current:  
Working current  $2.9\mu\text{A}@1\text{Hz}$  in operating mode (typical)  
Turn-off current  $0.5\mu\text{A}$  in shutdown mode (typical)
- Input voltage range:  $1.71\text{V}$  to  $3.6\text{V}$   
Digital port: compatible with SMBUS, I<sup>2</sup>C

### ◆ Functional block diagram



### ◆ Package

- DFN6(2mmx2mm)



### ◆ Application



Wearable devices  
(TWS, watches, bracelets, etc.)



Laptop



Industrial Internet  
of Things (IoT)



Communication  
infrastructure



Power  
system monitor



Environmental  
monitoring and HVAC



## NST117: Small-size High-precision Digital Temperature Sensor with I<sup>2</sup>C Port

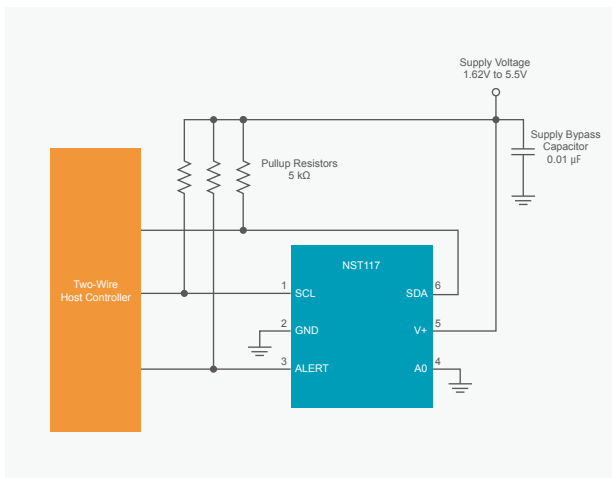
### ◆ Product introduction

The NST117 is a low-power, high-precision digital temperature sensor ideal as an alternative to negative temperature coefficient (NTC) and positive temperature coefficient (PTC) thermistors. The device provides typical accuracy of  $\pm 0.2^{\circ}\text{C}$  without calibration or signal adjustment from external components. NST117 temperature sensor is a highly linear product, which can sense the temperature without complex calculation or lookup. The on-chip 12-bit analog-to-digital converter (ADC) provides resolution as low as  $0.0625^{\circ}\text{C}$ . The NST117 is compatible with SMBUS and I<sup>2</sup>C, allowing a maximum of 3 devices to be connected to one BUS and supporting the SMBUS alarm function. The NST117 has a rated operating range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  and is ideal for extended temperature measurement in a wide range of communications, computing, consumer products, Internet of Things, environmental, industrial and instrumentation applications. NST117 comes in industry-standard DFN-6 packages.

### ◆ Product feature

- Maintain high accuracy in full temperature range:  
 $30^{\circ}\text{C} \sim 45^{\circ}\text{C}$ :  $\pm 0.2^{\circ}\text{C}$  (typical)  
 $-20^{\circ}\text{C} \sim 85^{\circ}\text{C}$ :  $\pm 0.5^{\circ}\text{C}$  (typical)  
 $-55^{\circ}\text{C} \sim 125^{\circ}\text{C}$ :  $\pm 2^{\circ}\text{C}$  (max.)
- Maximum resolution  $0.0625^{\circ}\text{C}$ , optional
- Up to 3 device addresses supported
- Wide supply voltage range: 1.62V to 5.5V
- Working current:  $30\mu\text{A}$  (typical)
- Turn-off current:  $0.1\mu\text{A}$  (typical)
- Digital port: compatible with SMBUS, I<sup>2</sup>C

### ◆ Functional block diagram

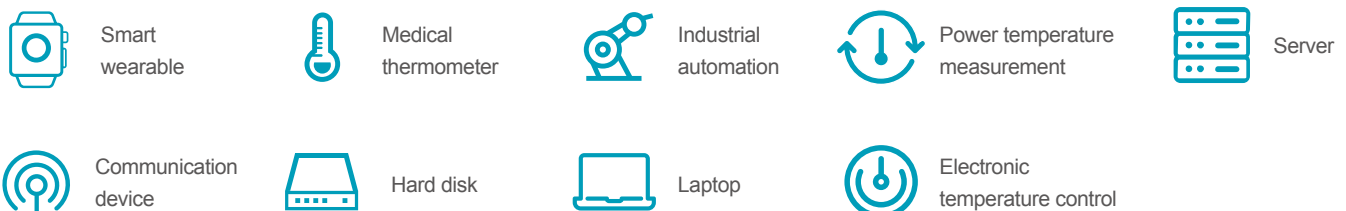


### ◆ Package

- DFN6 (2mm\*2mm)



### ◆ Application



## NST112: High-precision Low-power I<sup>2</sup>C Port Digital Temperature Sensor with Ultra-small SOT563 and DSBGA Package

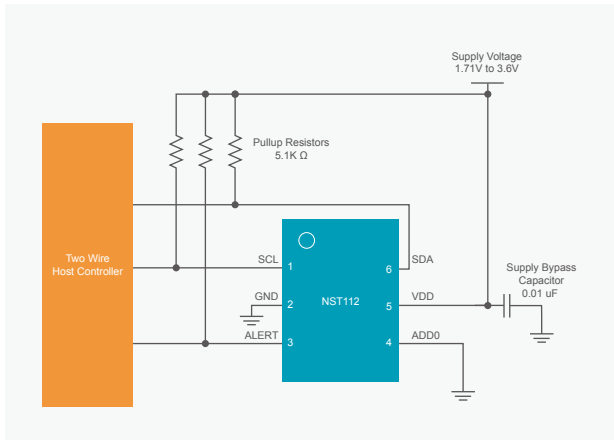
### ◆ Product introduction

NST112 is a low power-consumption high-precision digital temperature sensor. It is suitable for substitution of negative temperature coefficient and positive temperature coefficient thermistor. The NST112 has an port compatible with I<sup>2</sup>C and SMBUS, programmable alarm and SMBUS reset functions, and supports up to four devices on a single BUS. In addition, it achieves accuracy up to  $\pm 0.5^{\circ}\text{C}$  in the range of  $-20^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  without calibration. The NST112 temperature sensor is highly linear and does not require recombination calculations or lookup to derive the temperature. The NST112 features 12bit analog-to-digital conversion and provides up to  $0.0625^{\circ}\text{C}$  resolution. The NST112 temperature sensor can operate normally in the temperature range of  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ , which makes it suitable for operation in communications, computers, consumer products, environmental, industrial and instrumentation. The NST112 is an extremely low-power sensor that can be used for temperature measurement applications in the Internet of Things. The NST112 is available in both SOT563 and DSBGA(4) packages, with the DSBGA(4) achieving output accuracy up to  $\pm 0.1^{\circ}\text{C}$  at temperature range.

### ◆ Product feature

- Operating temperature range:  $-40^{\circ}\text{C}\sim 150^{\circ}\text{C}$
- High accuracy in  $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$  wide temperature range:
  - $25^{\circ}\text{C} \sim 45^{\circ}\text{C}$ :  $\pm 0.1^{\circ}\text{C}$  (typ.)@DSBGA
  - $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$ :  $\pm 1^{\circ}\text{C}$  (max.)@DSBGA
  - $-20^{\circ}\text{C}\sim 85^{\circ}\text{C}$ :  $\pm 0.5^{\circ}\text{C}$  (typ.)
  - $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$ :  $\pm 1^{\circ}\text{C}$  (max.)
- I<sup>2</sup>C/ SMBUS compatible port
- 12-bit ADC, maximum resolution:  $0.0625^{\circ}\text{C}$ @SOT563
- 14-bit ADC, maximum resolution:  $0.015625^{\circ}\text{C}$ @DSBGA
- Over-temperature alarm value presetting
- Ultra-low static power consumption
  - $2.9\mu\text{A}@1\text{Hz}$
  - $6.5\mu\text{A}@4\text{Hz}$
- Supply voltage range: 1.71 V to 3.6 V with SOT563 package, 1.5V to 3.6V with DSBGA package
- Digital output

### ◆ Functional block diagram

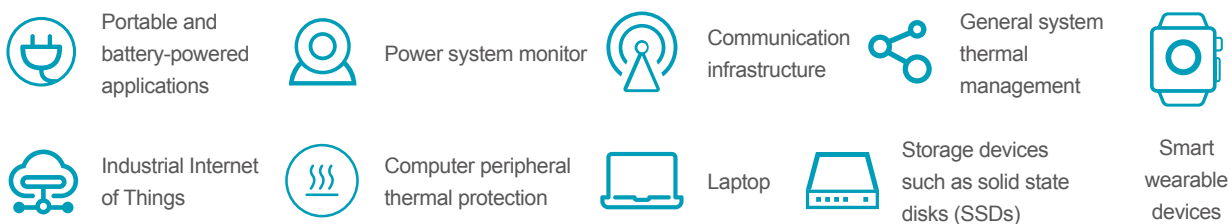


### ◆ Package

- SOT563(6) (1.6mm x 1.2mm)
- DSBGA(4) (0.75mm x 0.75mm)



### ◆ Application



# NST103: Digital Temperature Sensor with I<sup>2</sup>C Port in Wafer-level Package

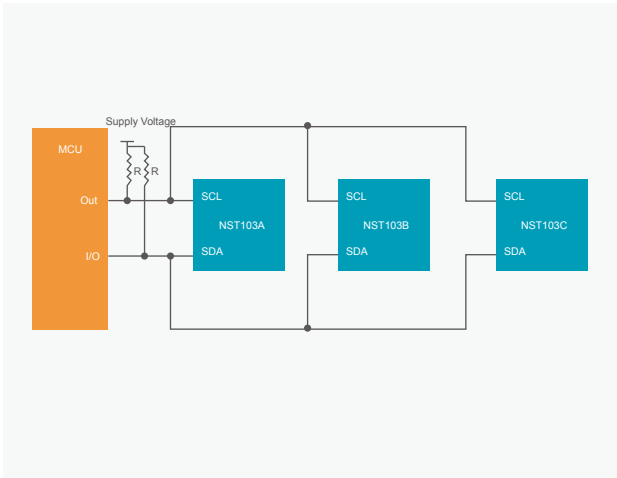
## Product introduction

The NST103 is a digital output temperature sensor in a 4-pins wafer chip scale package (WCSP). The resolution of NST103 reading temperature can reach 1°C. The NST103 has a two-wire port compatible with both I<sup>2</sup>C and SMBUS ports. In addition, the port supports multiple device access (MDA) commands, allowing the master to simultaneously communicate with multiple devices on the BUS without having to send commands individually to each NST103 on the BUS. It can connect up to 8 NST103s in parallel and be easily read by the host. The NST103 is particularly ideal for space-constrained, power-sensitive applications that have multiple temperature measurement areas that must be monitored. The specified operating temperature range of NST103 is -40°C to 125°C.

## Product feature

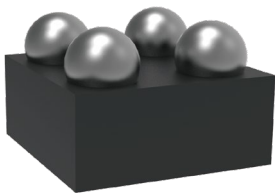
- Multiple device access (MDA)
- Global read/write operations
- I<sup>2</sup>C/ SMBUS compatible
- 8-bit ADC, resolution: 1°C
- Precision: The typical value is ±1°C(-10°C to 100°C)  
Maximum error in the whole temperature range: ±3°C
- Low static current: In operating mode, the current is 3μA@0.25Hz  
The turn-off current in shutdown mode is 1.0μA
- Input voltage range: 1.5V to 3.6V
- Digital output

## Functional block diagram



## Package

- WLCSP (DSBGA) (0.75mm x 0.75mm)



## Application



## NST461: Small-size High-precision I<sup>2</sup>C Interface Remote and Local Digital Temperature Sensor

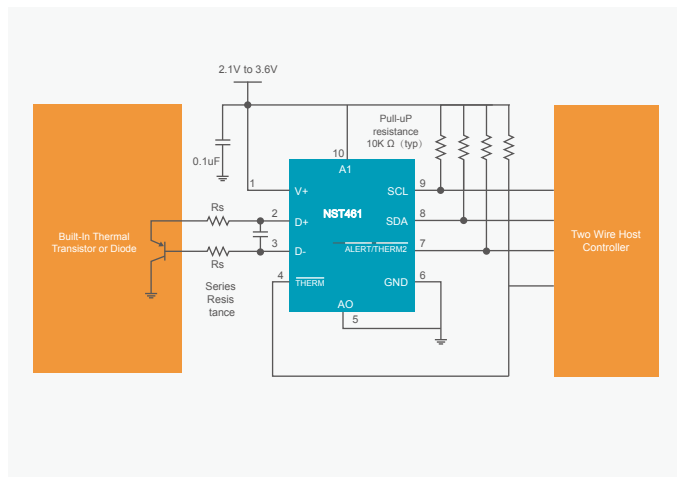
### ◆ Product introduction

NST461 is a remote temperature sensor monitor with built-in local temperature sensor. The transistors connected to its remote temperature sensors are usually low-cost NPN or PNP type transistors or substrate thermal transistors and diodes, which are essential components of microcontrollers, microprocessors or FPGAs. On-chip 12-bit analog-to-digital conversion provides resolution up to 0.0625°C for local and remote temperature sensors. The NST461 is compatible with I<sup>2</sup>C and SMBus interfaces, supports programmable pin addresses for up to nine devices, and has programmable alarm and SMBUS reset capabilities. NST461 includes series resistance cancellation, programmable non-ideal factor ( $\eta$  factor), programmable offset, programmable temperature limit, programmable digital filter, diode fault detection and temperature alarm, improving output accuracy and noise performance, and providing a reliable solution for thermal monitoring. With an operating voltage range of 2.1V to 3.6V and a temperature range of -40 °C to 125 °C, the NST461 is ideal for multi-position, high-precision temperature measurements in a wide range of applications, including communications, computing, instrumentation and industry.

### ◆ Product feature

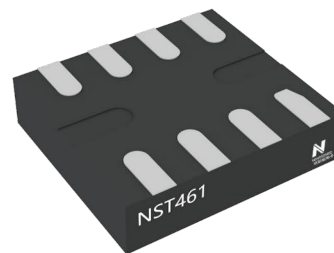
- Remote temperature detector:  $\pm 1.6^{\circ}\text{C}$  max. accuracy error
- Local temperature monitor:  $\pm 1.5^{\circ}\text{C}$  max. accuracy error
- 12-bit ADC, resolution: 0.0625°C
- Power supply and logic voltage range: 2.1 V to 3.6 V
- 37 $\mu\text{A}$  working current (1 SPS)
- 4 $\mu\text{A}$  shutoff current
- Series resistance error elimination
- $\eta$ -factor and offset correction
- Programmable digital filter
- Diode fault detection
- SMBUS and I<sup>2</sup>C serial interface
- Compatible with programmable pin addresses

### ◆ Functional block diagram

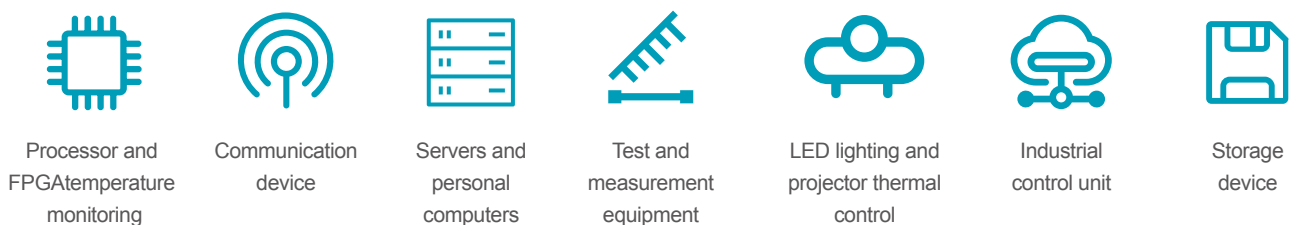


### ◆ Package

- WQFN(10) (2.0mm x 2.0mm)



### ◆ Application



## NST1412/NST1413: High-precision Remote and Local Temperature Sensors with Digital Interface in Industrial-qualified Package

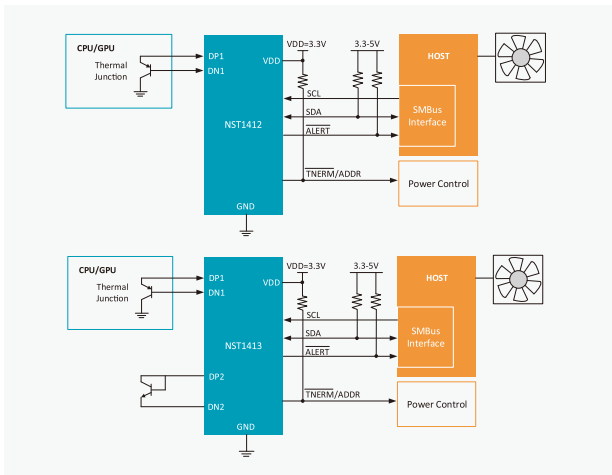
### ◆ Product introduction

NST1412 and NST1413 are remote temperature sensor monitors with built-in local temperature sensors. The transistors connected to its remote temperature sensors are usually low-cost NPN or PNP type transistors and diodes, which are essential components of microcontrollers, microprocessors or FPGAs. For local and remote temperature sensors, 11-bit on-chip analog-to-digital conversion provides resolution up to 0.125 °C. The NST141x two-wire serial interface is compatible with I<sup>2</sup>C and SMBUS interfaces and can use up to nine different pin programmable addresses. In addition, NST141x integrates additional features such as series resistance cancellation, programmable non-ideal factor ( $\eta$  factor), programmable offset, programmable temperature limits, programmable digital filters, diode fault detection and temperature alarm to improve accuracy and noise resistance, achieving a reliable thermal monitoring solution. With an operating voltage range of 3V to 3.6V and a temperature range of -40 °C to 125 °C, the NST141x is ideal for multi-position, high-precision temperature measurements in a wide range of applications, including communications, computing, instrumentation and industry. The NST1412 supports single channel local and single channel remote temperature monitoring, and the NST1413 supports single channel local and dual-channels remote temperature monitoring.

### ◆ Product feature

- Remote temperature detector:
  - ±1°C max precision (-10°C < T<sub>Diode</sub> < 105°C)
  - 11-bit ADC, resolution: 0.125°C
  - Support diode filter capacitors up to 1nF
- Local temperature monitor:
  - ±1°C precision (-10°C < T<sub>Diode</sub> < 105°C)
  - 11-bit ADC, resolution: 0.125°C
- Automatic remote diode type identification and optimization setting
- Series resistance cancellation
- Programmable temperature threshold alarm
- I<sup>2</sup>C/SMBUS digital output

### ◆ Functional block diagram

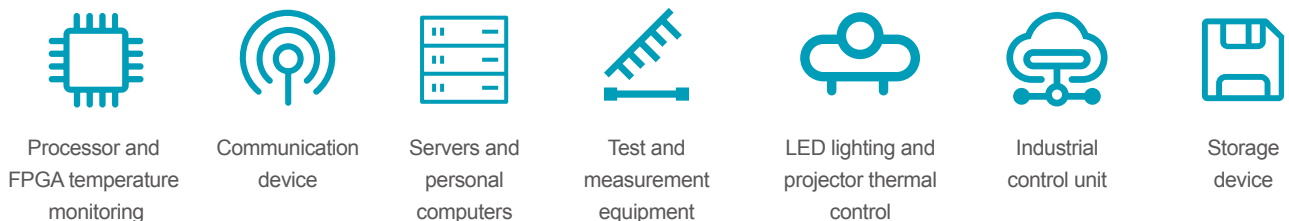


### ◆ Package

- NST1412 - MSOP(8) (3.0mm x 3.0mm)
- NST1413 - MSOP(10) (3.0mm x 3.0mm)



### ◆ Application





# NST7719: High-precision remote and local temperature sensors with digital interface in industry-standard package

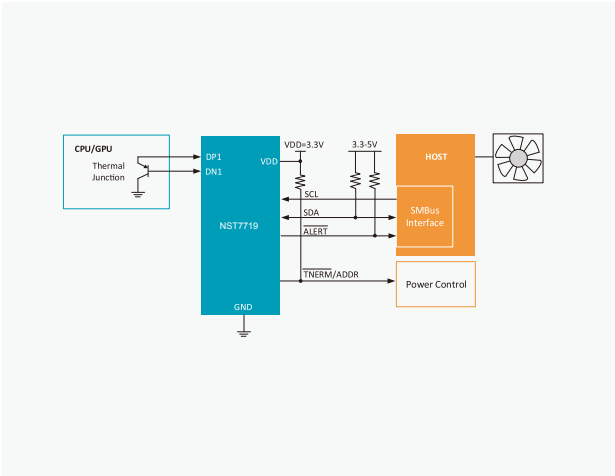
## Product introduction

NST7719 is a remote temperature sensor monitor with built-in local temperature sensor. The transistors connected to its remote temperature sensors are usually low-cost NPN or PNP type transistors and diodes, which are essential components of microcontrollers, microprocessors or FPGAs. For local and remote temperature sensors, 11-bit on-chip analog-to-digital conversion provides resolution up to 0.125°C. The NST7719 two-wire serial interface is compatible with I<sup>2</sup>C and SMBUS interfaces with up to six different pin-programmable addresses. In addition, NST7719 integrates personalized features such as series resistance cancellation, programmable non-ideal factor ( $\eta$  factor), programmable offset, programmable temperature limits, programmable digital filters, diode fault detection and temperature alarm to improve accuracy and noise resistance, achieving a reliable thermal monitoring solution. With an operating voltage range of 3V to 3.6V and a temperature range of -40°C to 125°C, the NST7719 is ideal for multi-position, high-precision temperature measurements in a wide range of applications, including communications, computing, instrumentation and industry. It supports one-way local and two-way remote temperature monitoring.

## Product feature

- Remote temperature detector:
  - $\pm 1.5^{\circ}\text{C}$  max precision ( $-10^{\circ}\text{C} < T_{\text{Diode}} < 105^{\circ}\text{C}$ )
  - 11-bit ADC, resolution:0.125°C
  - Support diode filter capacitors up to 1nF
- Local temperature monitor:
  - $\pm 1.5^{\circ}\text{C}$  max precision ( $-10^{\circ}\text{C} < T_{\text{Diode}} < 105^{\circ}\text{C}$ )
- 11-bit ADC, resolution:0.125°C
- Automatic remote diode type identification and optimization setting
- Series resistance elimination
- Programmable temperature threshold alarm
- I<sup>2</sup>C/SMBUS digital output

## Functional block diagram



## Package

- MSOP-10 (3.0mm×3.0mm)



## Application

|                                           |                      |                                |                     |                                            |                         |                |
|-------------------------------------------|----------------------|--------------------------------|---------------------|--------------------------------------------|-------------------------|----------------|
|                                           |                      |                                |                     |                                            |                         |                |
| Processor and FPGA temperature monitoring | Communication device | Servers and personal computers | Measuring equipment | LED lighting and projector thermal control | Industrial control unit | Storage device |

## NST20/NST60/NST235/NST86: High-precision and Low-power Analog Output Temperature Sensor

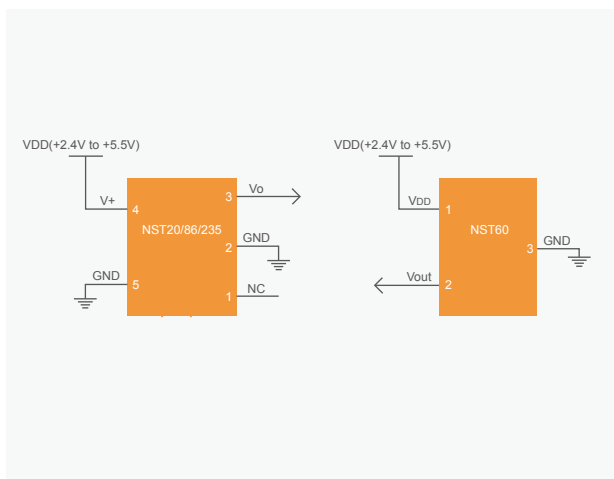
### ◆ Product introduction

NST20/60/235/86 is a series of precision CMOS integrated circuit linear analog output temperature sensor. Input voltages range is from 2.4V to 5.5V. The maximum temperature error in the whole temperature range is within  $\pm 2.5^{\circ}\text{C}$  (excluded NST60). 20 $\mu\text{A}$  typical operating mode current and 0.1 $\mu\text{A}$  typical turn-off current can greatly reduce the power loss of battery-powered equipment. Class-AB output drivers provide a powerful maximum output of 500 $\mu\text{A}$ , which can drive capacitive loads up to 1000pF, and can be directly connected to the ADC sample-hold input end. With excellent accuracy and a powerful linear output driver, the NST20/60/235/86 analog output temperature sensor is an extremely cost-effective alternative to passive thermistors.

### ◆ Product feature

- Operating temperature range:
  - NST20:  $-55^{\circ}\text{C} \sim 130^{\circ}\text{C}$
  - NST60:  $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$
  - NST235:  $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$
  - NST86:  $-50^{\circ}\text{C} \sim 150^{\circ}\text{C}$
- High accuracy:  $\pm 1.5^{\circ}\text{C}$  (typical)
- Wide input voltage range: 2.4V~5.5V
- Output drive capacity: 500 $\mu\text{A}$
- Output short circuit protection
- Analog output parameter:
  - NST20:  $-11.77\text{mV}/^{\circ}\text{C}$  negative slope output
  - NST60:  $6.25\text{mV}/^{\circ}\text{C}$  positive slope output
  - NST235:  $10\text{mV}/^{\circ}\text{C}$  positive slope output
  - NST86:  $-10.9\text{mV}/^{\circ}\text{C}$  negative slope output
- Low static current:
  - Operating mode current 20 $\mu\text{A}$  (typical)
  - Turn-off current 0.1 $\mu\text{A}$  (typical)

### ◆ Functional block diagram

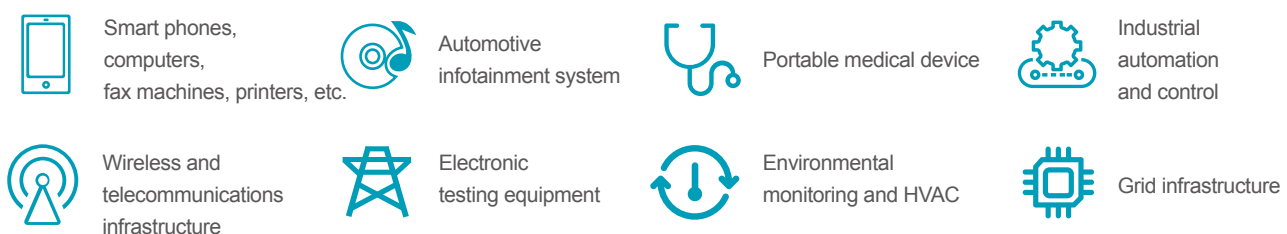


### ◆ Package

- SOT23(3) (2.9mmx1.3mm)
- SC70(5) (2.0mmx1.25mm)



### ◆ Application



## NST60-Q1/NST86-Q1/NST235-Q1 Automotive-grade high precision, low power analog output temperature sensor

### ◆ Product introduction

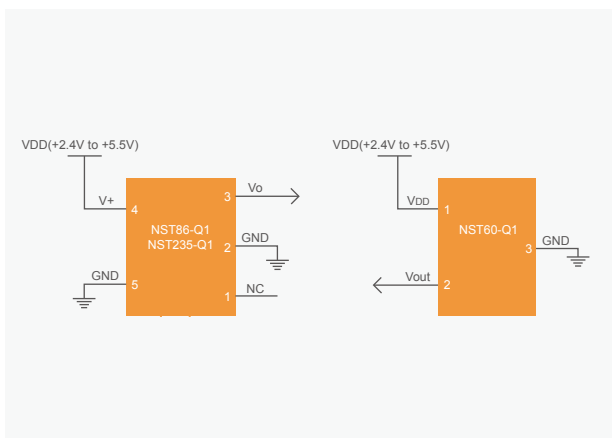
The NST60-Q1/NST86-Q1/NST235-Q1 series represent a range of automotive-grade precision CMOS integrated circuit linear analog output temperature sensors. They feature an input voltage range from 2.4V to 5.5V. Across the full temperature range, the maximum temperature error is within  $\pm 2.5^{\circ}\text{C}$  for the NST86-Q1/235-Q1 and  $\pm 4^{\circ}\text{C}$  for the NST60-Q1. With a typical quiescent current of  $20\mu\text{A}$  and a typical shutdown current of  $0.1\mu\text{A}$ , these sensors minimize power consumption in battery-powered devices.

The Class AB output driver provides a robust maximum output of  $500\mu\text{A}$ , capable of driving capacitive loads up to  $1000\text{pF}$  and connecting directly to the sample-and-hold input of analog-to-digital converters. With its exceptional accuracy and powerful linear output driver, the NST60 analog output temperature sensor offers a highly cost-effective alternative to passive thermistors.

### ◆ Product feature

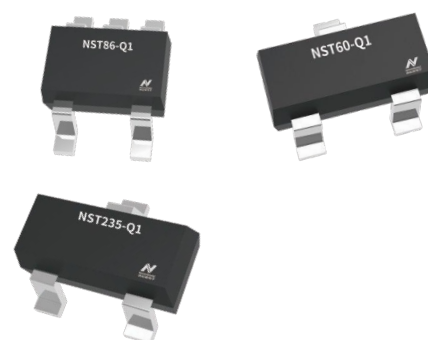
- Operating temperature range:  
NST60-Q1:  $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$   
NST235-Q1:  $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$   
NST86-Q1:  $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$
- High precision:  
NST235-Q1:  $\pm 0.5^{\circ}\text{C}$  (typical)  
NST60-Q1:  $\pm 1.5^{\circ}\text{C}$  (typical)  
NST86-Q1:  $\pm 1.5^{\circ}\text{C}$  (typical)
- Wide input voltage range: 2.4V~5.5V
- Output drive capability:  $500\mu\text{A}$
- Output short circuit protection
- Analog output parameters:  
NST60-Q1:  $6.25\text{mV}/^{\circ}\text{C}$  positive slope output  
NST235-Q1:  $10\text{mV}/^{\circ}\text{C}$  positive slope output  
NST86-Q1:  $-10.9\text{mV}/^{\circ}\text{C}$  negative slope output
- Low quiescent current:  
Operating mode current is  $20\mu\text{A}$  (typical)  
Off-mode current is  $0.1\mu\text{A}$  (typical)
- AEC-Q  
NST235-Q1: AEC-Q100 Grade1  
NST60-Q1: AEC-Q100 Grade1  
NST86-Q1: AEC-Q100 Grade0

### ◆ Functional block diagram



### ◆ Package

- SOT23(3) (2.9mmx1.3mm)
- SC70(5) (2.0mmx1.25mm)



### ◆ Application



Car audio host



car infotainment system



electric power steering (EPS)



battery management system (BMS)



gear shifting system



gasoline engine

## NSHT30: High-precision, Low-power I<sup>2</sup>C Digital Interface Temperature and Humidity Sensor

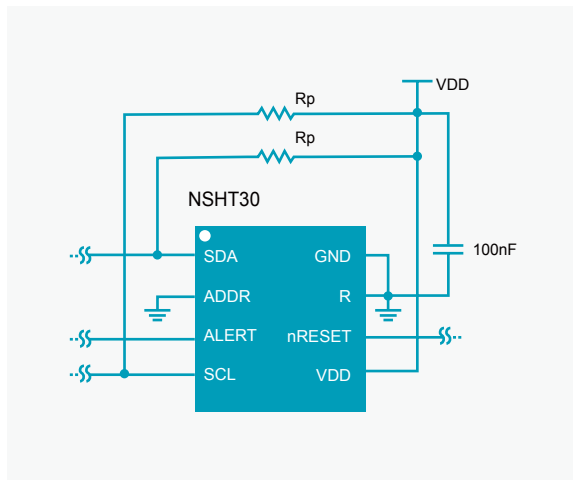
### ◆ Product introduction

NSHT30 is a CMOS-MEMS-based relative humidity (RH) and temperature sensor. NSHT30 integrates a complete sensor system on a single chip, including capacitive relative humidity sensor, CMOS temperature sensor and signal processor and I<sup>2</sup>C digital communication interface, in the DFN and LGA packages of 2.5mm2.5mm0.9mm. The communication mode of its I<sup>2</sup>C interface, extremely small package and low power consumption characteristics allow NSHT30 to be more widely integrated into a variety of applications. In addition, NSHT30's I<sup>2</sup>C interface features two unique, selectable I<sup>2</sup>C addresses, communication rates up to 1MHz, and a wide voltage operating range, making NSHT30 more compatible in a variety of application environments. It also has programmable interrupt thresholds that can provide alarms and system awakenings without the need for a microcontroller to continuously monitor the system.

### ◆ Product feature

- Relative humidity (RH) sensor:  
Working range: 0%RH~100%RH  
Accuracy: ±3%RH (typ.)
- Temperature sensor:  
Operating temperature range: -40°C~125°C  
Accuracy: ±0.3°C (typ.)
- Digital output for relative humidity and temperature compensation
- Wide supply voltage range: 2.0V~5.5V
- I<sup>2</sup>C digital interface, communication rate up to 1MHz  
2 optional addresses  
Data protection with CRC check
- Low-power: average current: 3.2μA
- 8-Pin LGA and DFN package available
- AEC-Q100 qualified (DFN package)

### ◆ Functional block diagram



### ◆ Package

- DFN-8 (2.5mm x 2.5mm x 0.9mm)
- LGA-8 (2.5mm x 2.5mm x 0.9mm)



### ◆ Application



## NSHT30-Q1 Automotive High-precision, Low-power I<sup>2</sup>C Digital Interface Temperature and Humidity Sensor

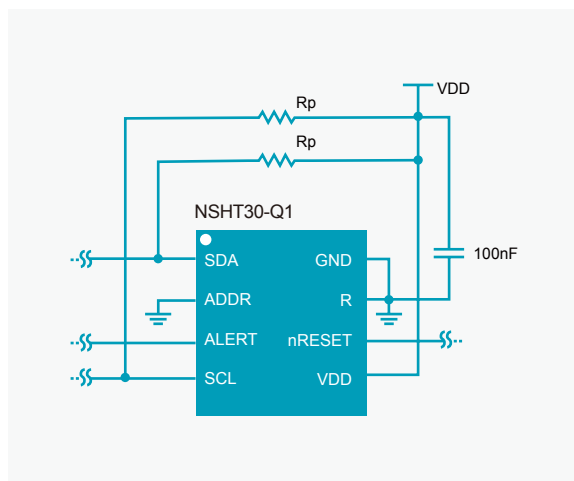
### ◆ Product introduction

NSHT30-Q1 is a CMOS-MEMS based automotive grade relative humidity RH and temperature sensor. NSHT30-Q1 integrates a complete sensor system on a single chip, including capacitive relative humidity sensors, CMOS temperature sensors and signal processors as well as I<sup>2</sup>C digital communication interfaces. It is packaged in a 2.5mm2.5mm0.9mm DFN package. The communication method of its I<sup>2</sup>C interface, extremely small package and low power consumption characteristics make the NSHT30 more widely integrated into various automotive applications. In addition, the NSHT30's I<sup>2</sup>C interface has two unique and selectable I<sup>2</sup>C addresses with a maximum communication rate of 1MHz and wide voltage operating range, making it more compatible in various application environments. At the same time, it has a programmable interrupt threshold that can provide alarm and system wake-up without requiring a microcontroller to continuously monitor the system.

### ◆ Product feature

- Relative humidity RH sensor:  
Operating range: 0%RH to 100%RH  
Accuracy:  $\pm 3\%$  RH typical value
- Temperature sensor:  
Operating temperature range:  $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$   
Accuracy:  $\pm 0.3^{\circ}\text{C}$  typical value
- Digital output with relative humidity and temperature compensation
- Wide power supply voltage range: 2.0V~5.5V
- I<sup>2</sup>C digital interface, communication rate up to 1MHz  
Two optional addresses  
Data protection with CRC check
- Low power consumption: average current 3.2 $\mu\text{A}$
- 8-Pin DFN package
- AEC-Q100 Grade1

### ◆ Functional block diagram

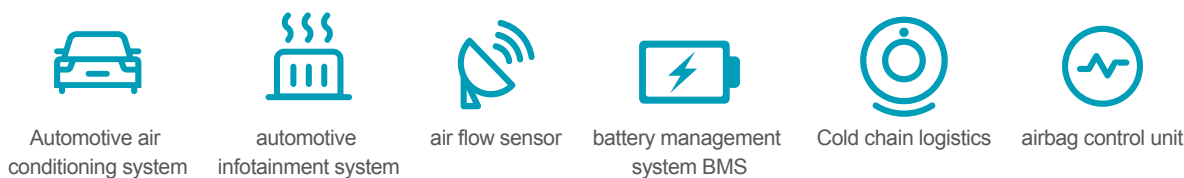


### ◆ Package

- DFN-8 (2.5mm x 2.5mm x 0.9mm)
- LGA-8 (2.5mm x 2.5mm x 0.9mm)



### ◆ Application





# MEMS Pressure Sensor





# MEMS Pressure Sensor

| Part number | Product description                                                                                            | Package                                  | Temperature range | Supply voltage | Operation current | Pressure range   | Output type                         | Accuracy   | Typical application                                                                                                                                                                                                                       |
|-------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|----------------|-------------------|------------------|-------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSPGL1      | Automotive integrated gauge pressure sensor (range can be customized)                                          | Ceramic module                           | -40°C~130°C       | 4.5V~5.5V      | 2.9mA             | 0~±5kPa /±100kPa | Absolute / Ratio-metric             | ±1.6% F.S. | FTPS fuel vapor pressure, KPS crankcase ventilation pressure detection, vacuum boosting system, industrial control                                                                                                                        |
| NSPAS3M     | Automotive-qualified integrated absolute pressure sensor (range can be customized)                             | SOP-8 (7.0mmx7.0mm)                      | -40°C~125°C       | 4.5V~5.5V      | 3.1mA             | 10kPa~400kPa     | Absolute / Ratio-metric             | ±1.5% F.S. | Motorcycle intake manifold pressure sensor, ECU atmospheric monitoring, seat pressure detection, canister desorption pressure detection, gas/refrigerant leak detection, industrial vacuum degree detection                               |
| NSPAS3      | Automotive integrated gauge pressure sensor module (range can be customized)                                   | SOP-8 (7.0mmx7.0mm)                      | -40°C~130°C       | 4.5V~5.5V      | 3.1mA             | 10kPa~400kPa     | Absolute / Ratio-metric             | ±0.5% F.S. | Motorcycle/automobile TMAP sensor, canister desorption pressure detection, ECU atmospheric monitoring, battery pack pressure detection, seat pressure detection, industrial vacuum degree detection                                       |
| NSPAS1      | Automotive integrated gauge pressure sensor module (range can be customized)                                   | SOP-8 (7.3mmx7.3mm)                      | -40°C~125°C       | 4.5V~5.5V      | 3.1mA             | 10kPa~400kPa     | Absolute / Ratio-metric             | ±0.5% F.S. | Motorcycle/automobile TMAP sensor, canister desorption pressure detection, ECU atmospheric monitoring, battery pack pressure, seat pressure detection, industrial vacuum degree detection                                                 |
| NSPAS5      | Automotive-grade Integrated Corrosion-resistant Absolute Pressure Sensor (range can be customized)             | SOP-8 (7.0mmx7.0mm)                      | -40°C~130°C       | 4.5V~5.5V      | 2.9mA             | 10kPa~400kPa     | Absolute / Ratio-metric             | ±0.5% F.S. | EGR-TMAP exhaust gas recirculation pressure detection(The corrosion- resistant version is under development)                                                                                                                              |
| NSPGS2      | Gauge pressure sensor integrated with air nozzle in SOP-6 package (range can be customized)                    | Single air nozzle SOP-6 (7.0mmx7.0mm)    | -40°C~70°C        | 3V~5.5V        | 2.5mA             | -100kPa~250kPa   | Analog/I <sup>2</sup> C /SPI        | ±1% F.S.   | Coffee machine, health pot, vacuum cleaner, vacuum juicer and other small household appliances, air cushion bed, massage chair, smart sphygmomanometer and other health care applications, industrial control, and IoT pressure detection |
| NSPGD1(M)   | Gauge pressure sensor integrated with air nozzle in DIP-8 package (range can be customized)                    | Single air nozzle DIP-8 (10.4mmx10.4mm)  | 0°C~70°C          | 3V~5.5V        | 2.5mA             | -10kPa~10kPa     | Analog /I <sup>2</sup> C/ Frequency | ±1% F.S.   | Washing machine, dishwasher, water purifier and other household appliances, pressure switch, negative pressure vacuum detection, gas pressure detection ventilator, oxygen generator, anesthesia instrument, biological safety cabinet    |
| NSPDS5/7    | Differential pressure sensor with dual air nozzle in SOIC-16 package (range can be customized)                 | Dual air nozzle SOIC-16 (10.3mmx7.5mm)   | -20°C~70°C        | 3V~5.5V        | 2.4mA             | ±500Pa~±250kPa   | Analog/I <sup>2</sup> C             | ±1% F.S.   | Fire fighting residual pressure monitoring, ventilator, oxygen generator, anesthesia instrument, HVAC/AV, biological safety cabinet, environmental monitoring, industrial micro differential pressure detection, etc.                     |
| NSPDS9      | Ultra-low range differential pressure sensor with dual air nozzle in SOIC-16 package (range can be customized) | Dual air nozzle SOIC-16 (10.3mmx7.5mm)   | -20°C~70°C        | 3V~5.5V        | 2.4mA             | ±125Pa~±500Pa    | Analog/I <sup>2</sup> C             | ±1% F.S.   | Fire fighting residual pressure monitoring, ventilator, oxygen generator, anesthesia instrument, HVAC/AV, biological safety cabinet and other micro differential pressure detection                                                       |
| NSPGS5      | Differential gauge pressure sensor with single air nozzle in SOIC-16 package (range can be customized)         | Single air nozzle SOIC-16 (10.3mmx7.5mm) | -20°C~70°C        | 3V~5.5V        | 2.9mA             | -10kPa~10kPa     | Analog/I <sup>2</sup> C             | ±1% F.S.   | Ventilator, oxygen generator, anesthesia instrument, biosafety cabinet, etc.                                                                                                                                                              |

| Part number | Product description                                                                                                                | Package                      | Temperature range | Supply voltage | Bridge arm resistance | Pressure range      | Output type                | Accuracy    | Typical application                                                                                                                     |
|-------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------|----------------|-----------------------|---------------------|----------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| NSP1830     | High-performance and high-reliability MEMS differential pressure sensor (range can be customized)                                  | MEMS wafer (1.8x1.8x0.4mm)   | -40°C~125°C       | 5V             | 6.3kΩ                 | 0kPa~±100kPa/500kPa | analog voltage output (mV) | ±0.05% F.S. | White household appliances, medical electronics, automotive electronics, industrial control                                             |
| NSP1831     | High-performance and high-reliability MEMS micro differential pressure sensor (range can be customized)                            | MEMS wafer (2x2x0.4mm)       | -40°C~125°C       | 5V             | 5.3kΩ                 | 0kPa~±6kPa /±10kPa  | analog voltage output (mV) | ±0.2% F.S.  | White household appliances, medical electronics, automotive electronics, industrial control                                             |
| NSP1832     | High-performance and high-reliability automotive-qualified MEMS differential pressure sensor with PT pad (range can be customized) | MEMS wafer (1.65x1.65x0.4mm) | -40°C~150°C       | 5V             | 5.3kΩ                 | 0kPa~±5kPa /±100kPa | analog voltage output (mV) | ±0.2% F.S.  | EVAP/FTPS fuel steam, GPF/DPF vehicle exhaust detection                                                                                 |
| NSP1833     | High-performance and high-reliability MEMS micro differential pressure sensor (range can be customized)                            | MEMS wafer (2.5x2.5x0.4mm)   | -40°C~85°C        | 5V             | 5.3kΩ                 | 0kPa~±1kPa          | analog voltage output (mV) | ±0.2% F.S.  | White household appliances, medical electronics, industrial control                                                                     |
| NSP1630     | High-performance and high-reliability absolute pressure sensor (range can be customized)                                           | MEMS wafer (1x1x0.4mm)       | -40°C~125°C       | 5V             | 5.3kΩ                 | 0kPa~200kPa         | analog voltage output (mV) | ±0.1% F.S.  | TMAP intake manifold pressure detection, BPS battery pack pressure detection                                                            |
| NSP1631     | High-performance and high-reliability large-range absolute pressure sensor (range can be customized)                               | MEMS wafer (1x1x0.4mm)       | -40°C~125°C       | 5V             | 5.3kΩ                 | 0kPa~500kPa         | analog voltage output (mV) | ±0.1% F.S.  | Turbo-TMAP pressurized intake pressure detection                                                                                        |
| NSP1632     | High-performance and high-reliability automotive-qualified MEMS absolute pressure sensor with PT pad (range can be customized)     | MEMS wafer (1x1x0.4mm)       | -40°C~150°C       | 5V             | 5.3kΩ                 | 0kPa~100kPa/200kPa  | analog voltage output (mV) | ±0.1% F.S.  | TMAP intake manifold pressure detection, BPS battery pack pressure detection, and EGR-TMAP exhaust gas recirculation pressure detection |

## NSPGL1 series: Automotive-qualified Integrated Gauge Pressure Sensor

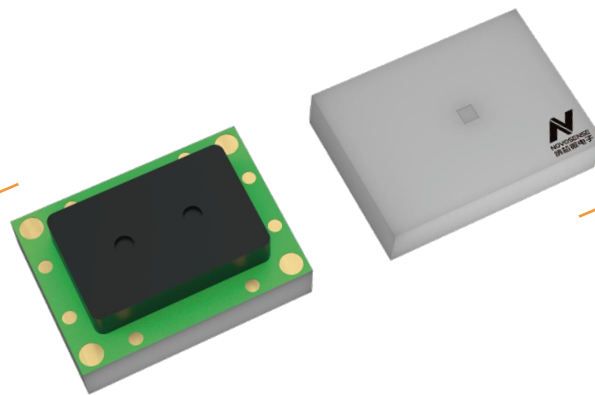
### ◆ Product introduction

NSPGL1 series is a calibrated differential pressure sensor launched by NOVOSENSE for automotive fuel vapor pressure detection and exhaust differential pressure detection. The product adopts automotive-qualified signal conditioning chip to calibrate and compensate the precious metal MEMS die output, which can convert pressure signals in a specific range into analog output voltage. Its unique ceramic substrate packaging process makes the product resistant to oil vapor and other media corrosion, MEMS die is independent packaging and flexible design. This product can provide standard output in the temperature range from -40°C to 130°C without customer calibration, which can accelerate the process of product development and mass production. The integrated package is convenient for usage and flexible for multi-applications. It is not only suitable for automobile fuel steam pressure detection and engine exhaust emission SCR system (National V and VI emission standards), but also suitable for industrial control and instrumentation and other fields.

### ◆ Product feature

- Operating temperature range: -40°C~130°C
- Pressure range  $\pm 5\text{kPa} \sim \pm 100\text{kPa}$ , which can be customized
- The comprehensive accuracy in the full temperature range is better than  $\pm 1.6\%\text{F.S.}$  ( $\pm 0.18\text{kPa}$ )
- Support 5V power supply and direct power supply within 18V in absolute voltage output mode
- Support -24V to 28V over voltage and reverse voltage protection
- Fluorinated gel protection, compatible with oil and gas environment
- Support absolute output/proportional output, with output curve customized
- It can be calibrated many times, with the function of factory reset adjustment
- Package: ceramic module package (7.5mm x 10.2mm)

### ◆ Package



### ◆ Application



FTPS fuel steam pressure detection



DPF vacuum assisted pressure detection



VBS vacuum boosting system sensor



Crankcase ventilation pressure sensor



Negative pressure vacuum detection



Gas pressure monitoring

## NSPAS3M series: Automotive-qualified Integrated Absolute Pressure Sensor

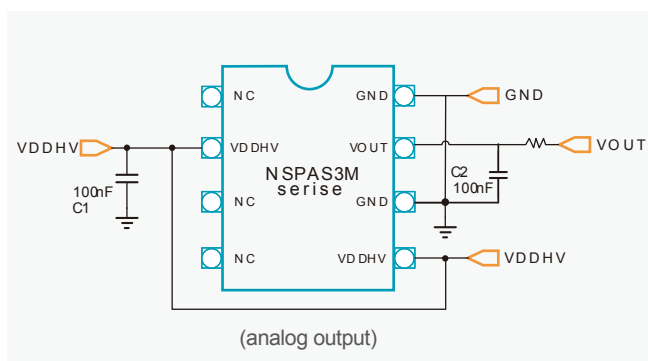
### ◆ Product introduction

The NSPAS3M series is a submillisecond responsive absolute pressure sensor product for the motorcycle intake manifold pressure sensor market. The product adopts automotive-qualified signal conditioning chips to calibrate and compensate the MEMS die output, which can convert pressure signals from 10kPa to 400kPa into analog output signals with a customized output range from 0 to 5V. While ensuring excellent reliability of the product, it integrates two chips into one package, greatly reducing the package size. At the same time, this products can provide standard output within the accuracy range in its operation temperature range without customer calibration, which can accelerate the process of product development and mass production; this product complies with the AEC-Q100 reliability standard.

### ◆ Product feature

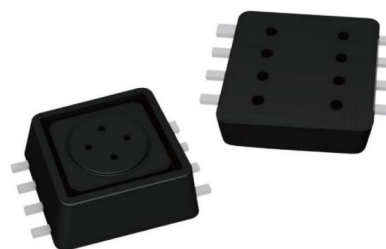
- Width operating temperature range:  $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$
- High accuracy in full temperature range:
  - Better than  $\pm 1.5\%\text{F.S.}$  in the range of  $0^{\circ}\text{C}\sim 85^{\circ}\text{C}$
  - Better than  $\pm 1.5\%\text{F.S.}$  in the range of  $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$
- Support -24V to 28V over voltage and reverse voltage protection
- Support 5V power supply and direct power supply within 18V in absolute voltage output mode
- Fluorinated gel protection, compatible with oil and gas environment
- Faster response time less than 1ms
- Support absolute output/ratio-metric output, with output curve customized
- Pressure range: 10kPa~400kPa, which can be customized
- AEC-Q100 qualified

### ◆ Functional block diagram

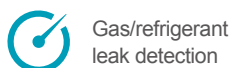
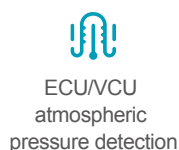
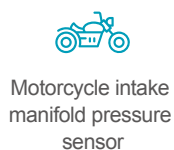


### ◆ Package

SOP-8 (7.0mm x 7.0mm)



### ◆ Application



## NSPAS3 series: Automotive-qualified Integrated Absolute Pressure Sensor

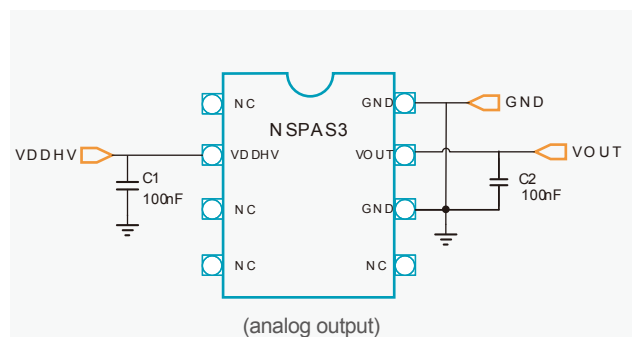
### ◆ Product introduction

The NSPAS3 series is a calibrated absolute pressure sensor launched by NOVOSENSE for the automotive intake manifold pressure sensor. The product adopts automotive-qualified signal conditioning chips to calibrate and compensate the MEMS die output, which can convert pressure signals from 10kPa to 400kPa into analog output signals with a customized output range from 0 to 5V. While ensuring excellent reliability of the product, it integrates two chips into one package, greatly reducing the package size. At the same time, this products can provide standard output within the accuracy range in its operation temperature range without customer calibration, which can accelerate the process of product development and mass production; this product complies with the AEC-Q100 reliability standard.

### ◆ Product feature

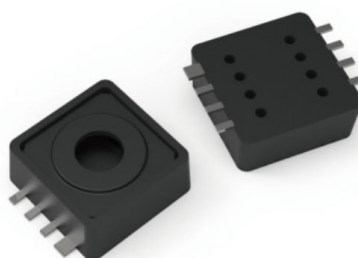
- Width operating temperature range:  $-40^{\circ}\text{C}\sim 130^{\circ}\text{C}$
- High accuracy in full temperature range:
  - Better than  $\pm 1\%\text{F.S.}$  in the range of  $0^{\circ}\text{C}\sim 85^{\circ}\text{C}$
  - Better than  $\pm 1.5\%\text{F.S.}$  in the range of  $-40^{\circ}\text{C}\sim 130^{\circ}\text{C}$
- Support -24V to 28V over voltage and reverse voltage protection
- Fluorinated gel protection, compatible with oil and gas environment
- Faster response time less than 0.8ms
- Support absolute output/ratio-metric output, with output curve customized
- Disconnection detection, output clamping, output alarm function
- Pressure range: 10kPa~400kPa, which can be customized
- AEC-Q100 qualified
- range can be customized

### ◆ Functional block diagram



### ◆ Package

SOP-8 (7.0mm x 7.0mm)



### ◆ Application



Motorcycle three-in-one sensor



Vehicle TMAP intake pressure detection



BPS battery pack thermal runaway pressure detection



Seat air bag pressure detection



Canister desorption pressure detection



ECU/VCU atmospheric pressure detection



EGR-TMAP exhaust gas recirculation pressure detection (The corrosion-resistant version is under development)



Gas/refrigerant leak detection



Pressure transmitter



Industrial vacuum degree testing

## NSPAS1 series: Automotive-qualified Integrated Absolute Pressure Sensor

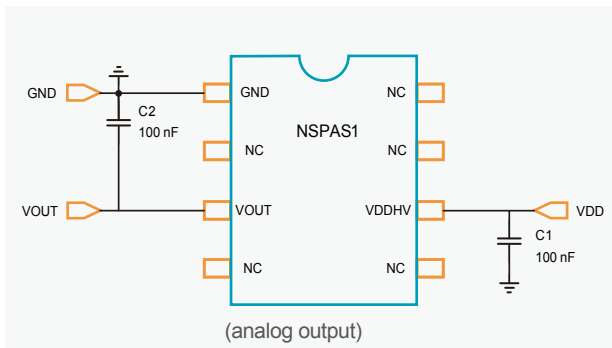
### ◆ Product introduction

NSPAS1 is a calibrated absolute pressure sensor launched by NOVOSENSE for vehicle intake pressure, NEV vacuum boosting system and motorcycle electronic injection. The product adopts automotive-qualified signal conditioning chip to calibrate and compensate the output of MEMS piezoresistive die, ensuring excellent reliability of the product while integrating the two chips to greatly reduce the package size. At the same time, this product can provide standard output in its operation temperature range without customer calibration, which can accelerate the process of product development and mass production; the product complies with the AEC-Q100 reliability standard.

### ◆ Product feature

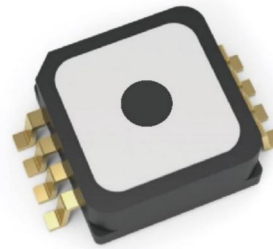
- Operating temperature range:  $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$
- High accuracy in full temperature range:
  - Better than  $\pm 1\%\text{F.S.}$  in the range of  $-0^{\circ}\text{C}\sim 85^{\circ}\text{C}$
  - Better than  $\pm 1.5\%\text{F.S.}$  in the range of  $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$
- Support  $-24\text{V}$  to  $28\text{V}$  over voltage and reverse voltage protection
- Fluorinated gel protection, compatible with oil and gas environment
- Faster response time less than  $0.8\text{ms}$
- Support absolute output/ratio-metric output, with output curve customized
- Disconnection detection, output clamping, output alarm function
- Pressure range  $10\text{kPa}\sim 400\text{kPa}$ , which can be customized
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Package

SOP-8 (7.3mm x 7.3mm)



### ◆ Application



Motorcycle three-in-one sensor



Canister desorption pressure detection



Vehicle TMAP intake pressure detection



ECU/VCU atmospheric pressure detection



BPS battery pack thermal runaway pressure detection



Seat air bag pressure detection



Gas/refrigerant leak detection



Pressure transmitter



Industrial vacuum degree testing



## NSPAS5 series: Automotive-grade Integrated Corrosion-resistant Absolute Pressure Sensor (range can be customized)

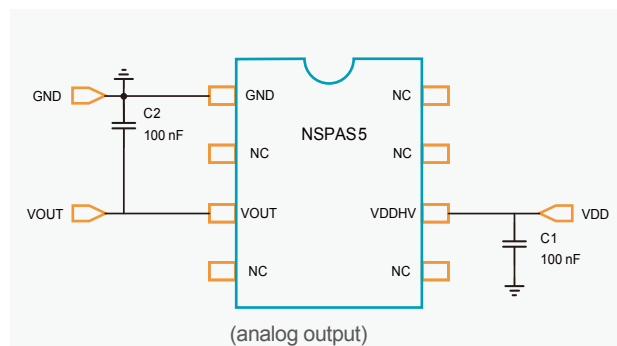
### ◆ Product introduction

The NSPAS5 series is an automotive-grade integrated corrosion-resistant absolute pressure sensor launched by NOVOSENSE. This product uses automotive-grade signal conditioning chips to calibrate and compensate the output of MEMS cores, converting pressure signals ranging from 10kPa to 400kPa into analog output signals with a customizable output range of 0~5V. While ensuring the excellent reliability of the product, integrating and packaging two chips greatly reduces the package size. At the same time, the conditioned product can provide standard output within a precise range over a temperature range, eliminating the need for customers to calibrate sensors and accelerating the process of product development and mass production. The product meets AEC-Q100 reliability standards.

### ◆ Product feature

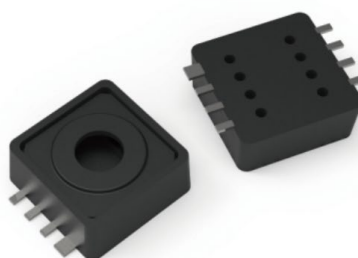
- Wide operating temperature range: -40°C~130°C
- High accuracy in full temperature range:  
Better than +1%F.S. in the range of 0°C~85°C  
Better than +1.5%FS.in the range of -40°C~130°C
- Support -24V to 28V over voltage and reverse voltage protection
- Fluorinated gel protection, compatible with oil and gas environment
- Corrosion-resistant
- Faster response time less than 0.8ms
- Support absolute output/ratio-metric output, with output curve customized
- Disconnection detection, output clamping, output alarm function
- Pressure range: 10kPa~400kPa, which can be customized
- AEC-Q100 qualified
- Range can be customized

### ◆ Functional block diagram



### ◆ Package

SOP-8 (7.0mm x 7.0mm)



### ◆ Application



EGR-TMAP exhaust gas recirculation pressure detection  
(The corrosion-resistant version is under development)

## NSPGS2 series: Integrated Gauge Pressure Sensor with Air Nozzle in SOP Package

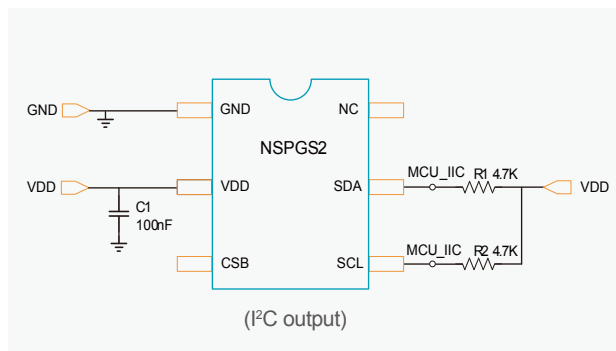
### ◆ Product introduction

NSPGS2 is a calibrated gauge pressure sensor launched by NOVOSENSE for the market of small household appliances and healthcare equipment. This series of products adopts high-performance signal conditioning chip to calibrate and compensate the temperature and pressure of MEMS piezoresistive die. It comes in SOP6 package form with vertical air nozzle for easy soldering and use. This series of pressure sensors can convert pressure signals from -100kPa to +250kPa into analog/digital output signals with a customized output range. They are suitable for pressure detection of non-corrosive gases compatible with the structural materials of pressure sensitive components, especially for small household appliances, healthcare, industry and the IoT.

### ◆ Product feature

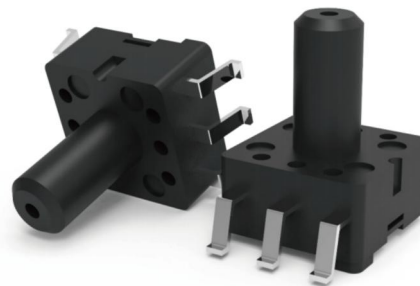
- Customizable range: -100kPa ~+250kPa
- Wide temperature range: -40°C~70°C
- The comprehensive accuracy in the full temperature range is better than  $\pm 2.5\%$
- Analog voltage output/ I<sup>2</sup>C digital output/SPI
- High stability, 100% calibration, temperature compensation
- Packaging with single air nozzle, easy to install and seal
- Front air intake for chips avoid blockage

### ◆ Functional block diagram

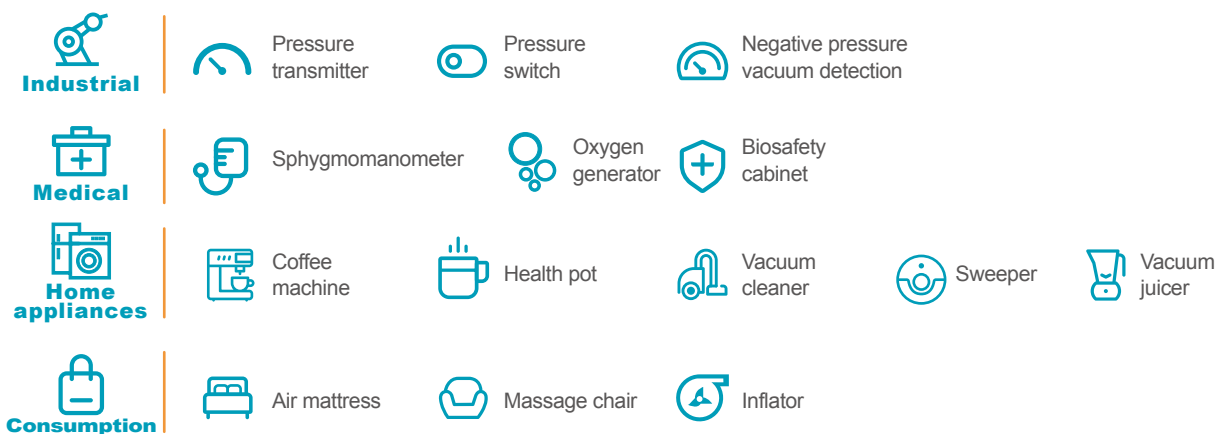


### ◆ Package

SOP-6 (6.3mm x 7.0mm)



### ◆ Application



## NSPGD1(M) series: Integrated Gauge Pressure Sensor with Air Nozzle in DIP8 Package

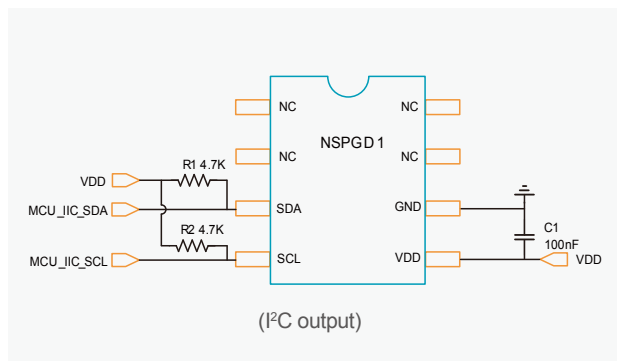
### ◆ Product introduction

NSPGD1(M) is a series of calibrated gauge pressure sensors launched by NOVOSENSE for the home appliance and medical market. The series of products adopts high-performance signal conditioning chip to calibrate and compensate the temperature and pressure of MEMS piezoresistive die output. The NSPGD1 series integrated pressure sensor has an optional pressure range from -10kPa to +10kPa. It adopts DIP8 package form with air nozzle, which is convenient for soldering and use. It is suitable for gauge pressure detection of non-corrosive gases compatible with pressure sensitive components, especially for non-contact liquid level detection. It is also suitable for industrial, IoT and other fields. This series pressure sensor supports analog output /I<sup>2</sup>C digital output and unique frequency output, which is more flexible for multi-applications.

### ◆ Product feature

- Customizable range: -10kPa ~ +10kPa
- Wide temperature range: 0°C~70°C
- The comprehensive accuracy in the full temperature range is better than ± 2.5%
- Analog voltage /I<sup>2</sup>C digital output/frequency output
- High stability, 100% calibration, temperature compensation
- DIP package with air nozzle, easy to install and seal
- Front air intake for chips avoid blockage
- Internal waterproof moisture-proofing treatment

### ◆ Functional block diagram



### ◆ Package

DIP-8 (10.4mm x 10.4mm)



### ◆ Application



Washing machine



Dishwasher



Coffee machine



Water purifier



Pressure switch



Negative pressure vacuum detection



Gas pressure detection



Ventilator



Oxygen generator



Anesthesia apparatus



Biosafety cabinet

## NSPDSx series: Dual-nozzle Integrated Differential Pressure Sensor

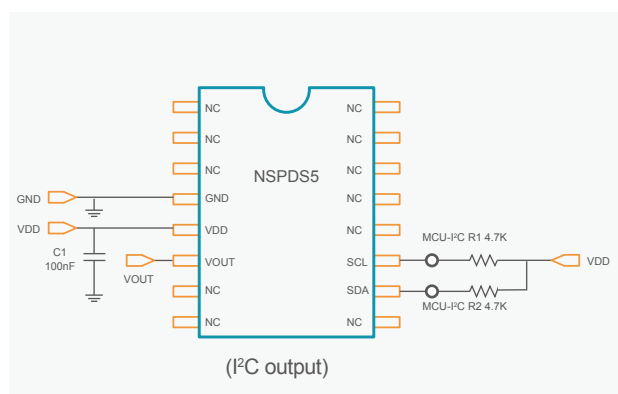
### ◆ Product introduction

The NSPDSx is a calibrated pressure sensor launched by NOVOSENSE for the differential pressure monitoring market. The series of products adopts high-performance signal conditioning chips to calibrate and compensate the temperature and pressure of advanced MEMS piezoresistive die. JEDEC-standard SOIC-16 package with double vertical barb air nozzle is adopted for convenient soldering and use. The NSPDSx series integrated pressure sensors have an optional pressure range from  $\pm 125\text{Pa}$  to  $\pm 250\text{kPa}$ , which are suitable for the pressure detection of non-corrosive gases compatible with the structural materials of pressure sensing elements, and also for consumer, medical, industrial and IoT fields. This pressure sensors supports analog output /I<sup>2</sup>C digital output and can be installed directly on standard printed circuit boards for multi-applications.

### ◆ Product feature

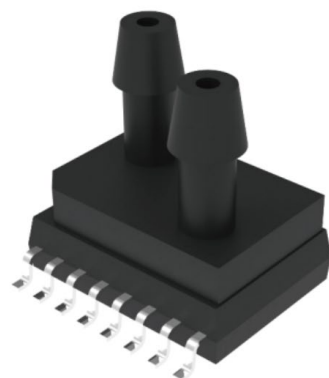
- Supply voltage: 3V~5.5V
- Operating temperature range: -20°C~70°C
- High accuracy in full temperature range, and customizable pressure range
  - NSPDS9:  $\pm 125\text{Pa} \sim \pm 500\text{Pa}$ ,  $\pm 1\%\text{F.S.}$
  - NSPDS5/7:  $\pm 500\text{Pa} \sim \pm 250\text{kPa}$ ,  $\pm 1\%\text{F.S.}$
- Optional output mode (analog /I<sup>2</sup>C digital output)
- High stability, 100% calibration, temperature compensation
- Dual vertical barb air nozzle package, easy to install and seal

### ◆ Functional block diagram

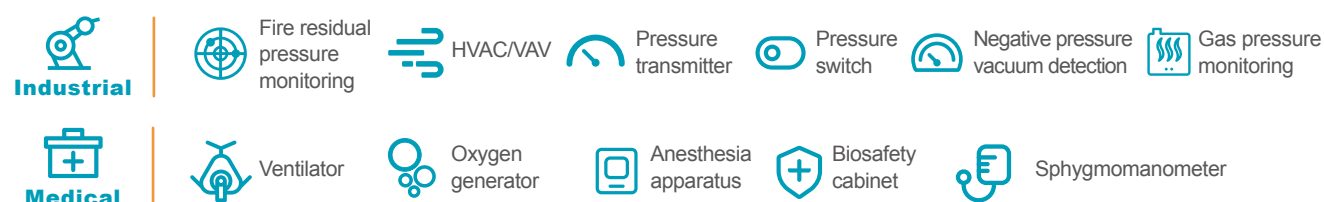


### ◆ Package

SOIC-16 (7.5mm x 10.3mm)



### ◆ Application



## NSPGS5 series: Single-nozzle Integrated Gauge Pressure Sensor

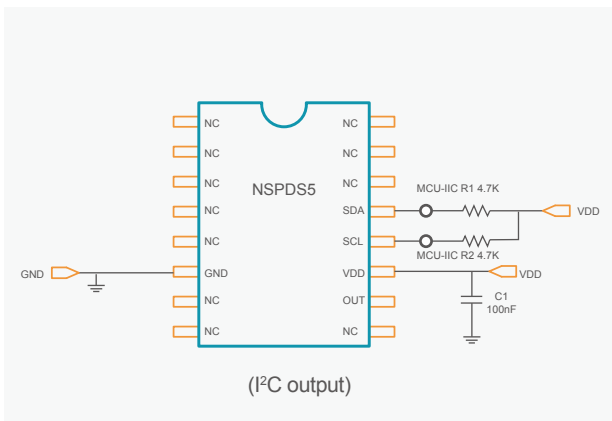
### ◆ Product introduction

The NSPGS5 series is a calibrated pressure sensor launched by NOVOSENSE for the gauge pressure monitoring market. The series of products adopts high-performance signal conditioning chips to calibrate and compensate the temperature and pressure of advanced MEMS piezoresistive die. JEDC-standard SOIC-16 package with single nozzle is adopted for convenient soldering and use. The NSPGS5 series integrated pressure sensors have an optional pressure range from -10kPa to +10kPa, supporting analog output. They are suitable for the pressure detection of non-corrosive gases compatible with the structural materials of pressure sensing elements, and also for consumer, medical, industrial and IoT fields.

### ◆ Product feature

- Supply voltage: 3V~5.5V
- Operating temperature range: -20°C~85°C
- Customizable range: -10kPa~+10kPa
- The comprehensive accuracy in the full temperature range is better than  $\pm 1\%$ F.S.
- Output mode optional (analog /I<sup>2</sup>C digital output)
- High stability, 100% calibration, temperature compensation
- Single vertical nozzle package, easy to install and seal

### ◆ Functional block diagram



### ◆ Package

SOIC-16 (7.5mm x 10.3mm)



### ◆ Application



Gas pressure detection



Pressure switch



Negative pressure vacuum detection



Ventilator



Sphygmomanometer



Oxygen generator



Anesthesia apparatus



Biosafety cabinet

## NSP183x: High-performance and High-reliability MEMS Differential Pressure Sensor Wafer

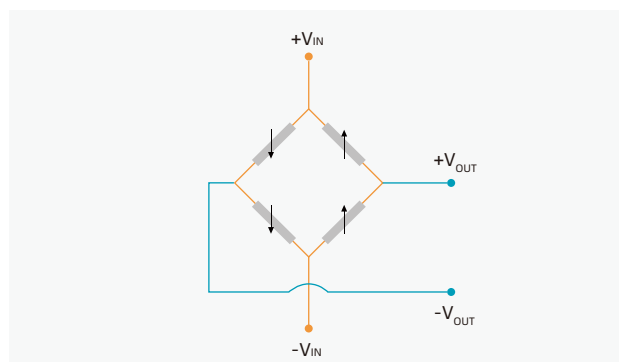
### ◆ Product introduction

NOVOSENSE NSP183x series MEMS differential pressure sensor wafer is mainly made via the piezoresistive effect of silicon with NOVOSENSE independent R&D MEMS micro machining process design. The sensor wafer manufacturing platform is qualified by IATF16949, and the front/back side of every wafer pass AOI tested which compiles with AEC-Q103 standards. This series of MEMS wafers can realize differential pressure detection, which can be widely used in automotive electronics, medical electronics, white household appliances and industrial control fields. Meanwhile, NOVOSENSE also launched unique precious metal differential pressure MEMS series products, which mainly adopts precious metal double-pad structure design and stability enhanced shielding layer technology, and specially used in automotive exhaust system and other harsh environment.

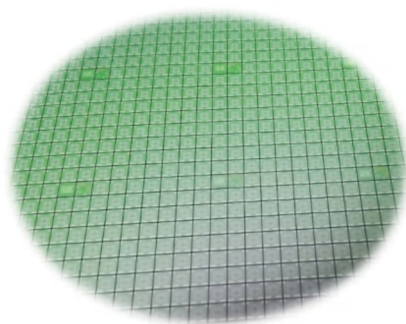
### ◆ Product feature

- Operating temperature range:  $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ ,  $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$  and  $-40^{\circ}\text{C}\sim 150^{\circ}\text{C}$
- Pressure range:  $0\text{kPa}\sim \pm 1\text{kPa}$ ,  $0\text{kPa}\sim \pm 6\text{kPa}$ ,  $\pm 10\text{kPa}$  and  $0\text{kPa}\sim \pm 100\text{kPa}/\pm 500\text{kPa}$
- The accuracy and stability in the life cycle are better than 1%F.S.
- Automotive-qualified IATF16949-certified process platform
- Comply with RoHS & REACH and halogen-free requirements
- Compiles with AEC-Q103 standard

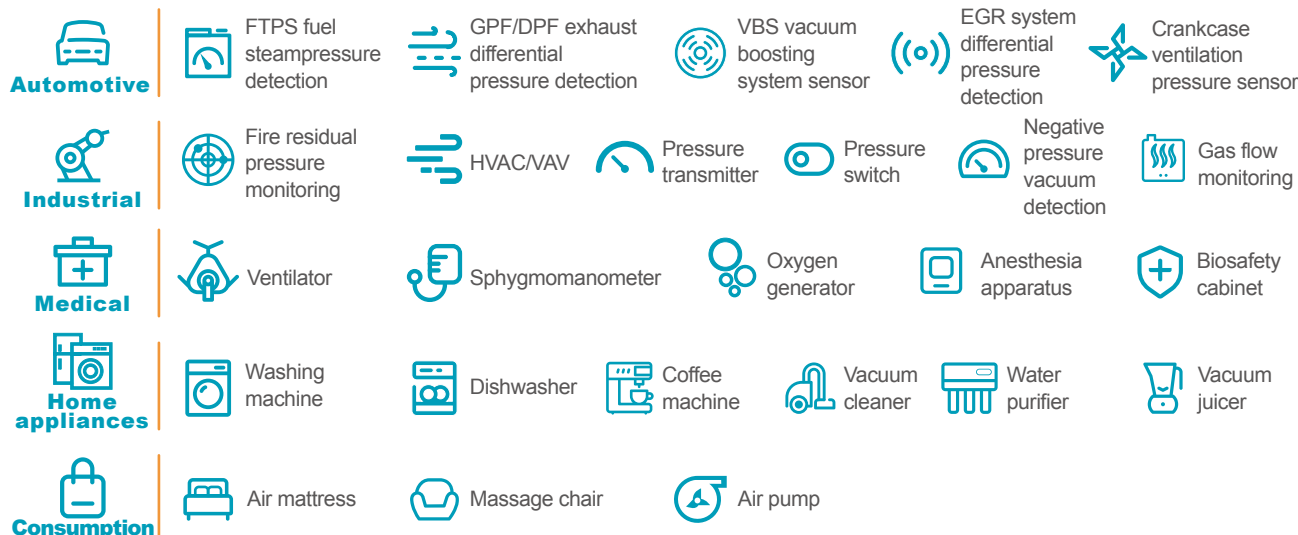
### ◆ Functional block diagram



### ◆ Package



### ◆ Application





## NSP163x: High-performance and High-reliability MEMS Absolute Pressure Sensor Wafer

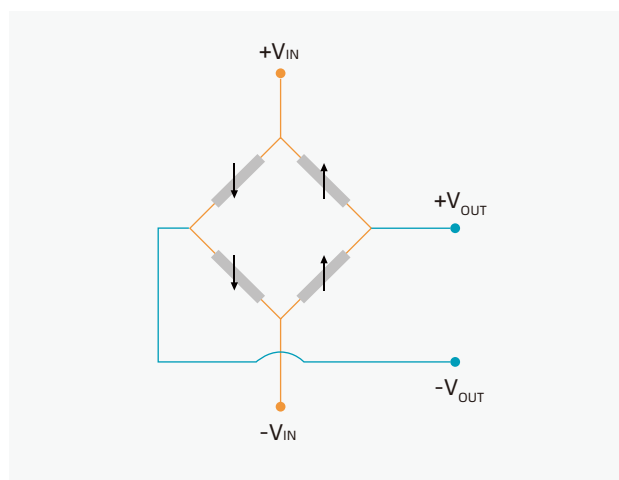
### ◆ Product introduction

NOVOSENSE NSP163x series MEMS absolute pressure sensor wafer is mainly designed by using the piezoresistive effect of silicon with independently developed MEMS micromachining process. The sensor wafer manufacturing platform is qualified by IATF16949, and the front/back side of every wafer pass AOI tested which complies with AEC-Q103 standards. This series of MEMS wafers can realize absolute pressure detection, which can be widely used in automotive electronics, medical electronics, white household appliances and industrial control fields. Meanwhile, NOVOSENSE also launched a unique series of precious metal MEMS products, which are specially used in harsh environment such as automotive exhaust system.

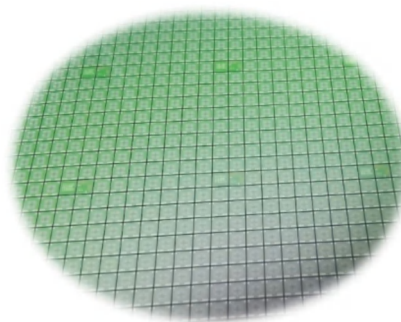
### ◆ Product feature

- Operating temperature range:  $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$ ,  $-40^{\circ}\text{C}\sim 150^{\circ}\text{C}$
- Pressure range: 0kPa~100kPa/200kPa/500kPa
- The accuracy and stability in the life cycle are less than 1%F.S.
- Automotive-qualified IATF16949-certified process platform
- Comply with RoHS & REACH and halogen-free requirements
- Complies with AEC-Q103 standard

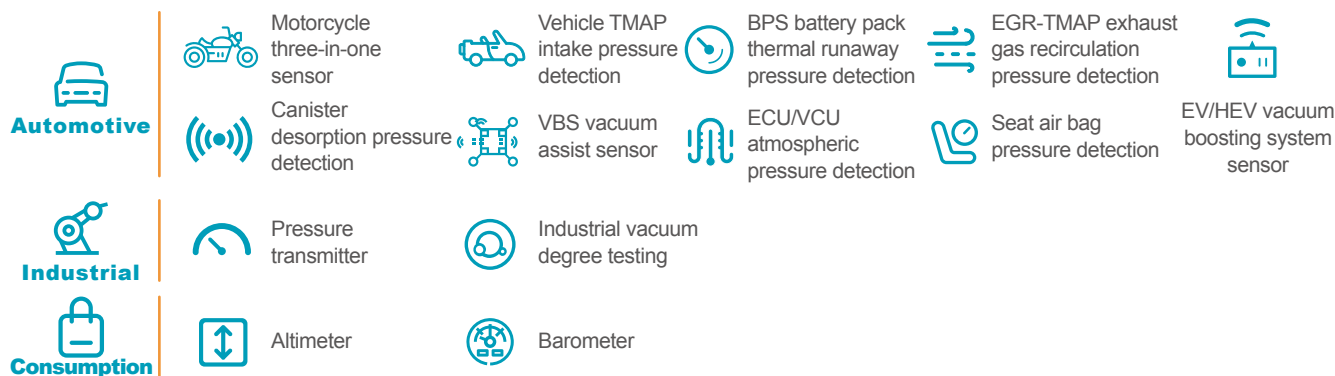
### ◆ Functional block diagram



### ◆ Package



### ◆ Application





# Integrated Current Sensor





# Integrated Current Sensor

| Part number | Product feature                                                                                                                                                                                              | Package | Range ability | Supply voltage | Isolation voltage / operating voltage | Creepage distance / electric clearance | Temperature range | Signal bandwidth / response time | Typical application                                                                                                                                                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------|----------------|---------------------------------------|----------------------------------------|-------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSM2011     | Wide current range available<br>AC/DC measurement<br>Conduction resistance as low as 0.85mOhm<br>Proportional output +/-2% current measurement accuracy                                                      | SOW-16  | 10~100A       | 3.3V/5V        | 5000Vrms@1min<br>1550VDC<br>(1097VAC) | 8mm/8mm                                | -40°C<br>~125°C   | 240kHz<br>/2.2µs                 | Photovoltaic inverter<br>Automotive OBC, DC/DC, charging gun, PTC heater<br>Industrial inverter<br>Power supply<br>Service robot<br>Unmanned aerial vehicle<br>Two-wheeled vehicle |
| NSM2012     | Wide current range available<br>AC/DC measurement<br>Support proportional output or fixed output Reference voltage output +/-2% current measurement accuracy                                                 | SOP-8   | 2.5~65A       | 3.3V/5V        | 3000Vrms@1min<br>600VDC<br>(424VAC)   | 4mm/4mm                                | -40°C<br>~125°C   | 400kHz<br>/1.5µs                 |                                                                                                                                                                                    |
| NSM2013     | Wide current range available<br>AC/DC measurement<br>Conduction resistance as low as 0.85mOhm<br>Fixed output Reference voltage output +/-2% current measurement accuracy                                    | SOW-16  | 10~100A       | 3.3V/5V        | 5000Vrms@1min<br>1550VDC<br>(1097VAC) | 8mm/8mm                                | -40°C<br>~125°C   | 240kHz<br>/2.2µs                 |                                                                                                                                                                                    |
| NSM2015     | Wide current range available<br>AC/DC measurement<br>Conduction resistance as low as 0.85mOhm<br>Fixed output Reference voltage output Integrated over-current protection +/-2% current measurement accuracy | SOW-16  | 10~100A       | 3.3V/5V        | 5000Vrms@1min<br>1550VDC<br>(1097VAC) | 8mm/8mm                                | -40°C<br>~125°C   | 320kHz<br>/1.5µs                 |                                                                                                                                                                                    |
| NSM2016     | Wide current range available<br>AC/DC measurement<br>Fixed output Integrated over-current protection +/-2% current measurement accuracy                                                                      | SOP-8   | 20~50A        | 3.3V/5V        | 3000Vrms@1min<br>600VDC<br>(424VAC)   | 4mm/4mm                                | -40°C<br>~125°C   | 380kHz<br>/1.5µs                 |                                                                                                                                                                                    |
| NSM2017     | Wide current range available<br>AC/DC measurement<br>Conduction resistance as low as 0.85mOhm<br>Support proportional output or fixed output<br>Integrated over-current protection                           | SOW-16  | 20~65A        | 3.3V/5V        | 5000Vrms@1min<br>1550VDC<br>(1097VAC) | 8mm/8mm                                | -40°C<br>~125°C   | 320kHz<br>/1.5µs                 |                                                                                                                                                                                    |
| NSM2019     | Wide current range available<br>AC/DC measurement<br>Conduction resistance as low as 0.27mOhm<br>Support proportional output or fixed output<br>Integrated over-current protection                           | SOW-10  | 20~200A       | 3.3V/5V        | 5000Vrms@1min<br>1618VDC<br>(1144VAC) | 8.2mm/8.2mm                            | -40°C<br>~150°C   | 320kHz<br>/1.5µs                 |                                                                                                                                                                                    |
| NSM2110     | Multiple selectable current ranges<br>AC/DC measurement<br>Low continuity resistance down to 1.2mΩ<br>Fixed output<br>Integrated overcurrent protection<br>+/-2% current measurement accuracy                | SOP-8   | 5~65A         | 3.3V/5V        | 3000Vrms@1min<br>600VDC<br>(424VAC)   | 4mm/4mm                                | -40°C<br>~150°C   | 1MHz<br>/400ns                   | PV inverter<br>Energy storage<br>Automobile OBC, DC/DC, charging gun, PTC heater<br>Industrial inverter<br>Power supply<br>Service robot<br>Drone<br>Two-wheeled vehicle           |
| NSM2111     | Multiple selectable current ranges<br>AC/DC measurement<br>Continuity resistance as low as 0.27mΩ<br>Fixed output<br>Reference voltage output<br>+/-2% current measurement accuracy                          | SOW-10  | 20~200A       | 3.3V/5V        | 5000Vrms@1min<br>1618VDC<br>(1144VAC) | 8.2mm/8.2mm                            | -40°C<br>~150°C   | 1MHz<br>/400ns                   |                                                                                                                                                                                    |
| NSM2112     | Multiple selectable current ranges<br>AC/DC measurement<br>Continuity resistance as low as 1.2mΩ<br>Proportional output/Fixed output (+reference voltage output)<br>+/-2% current measurement accuracy       | SOP-8   | 5~65A         | 3.3V/5V        | 3000Vrms@1min<br>600VDC<br>(424VAC)   | 4mm/4mm                                | -40°C<br>~150°C   | 1MHz<br>/400ns                   |                                                                                                                                                                                    |

| Part number | Product feature                                                                                                                                                                                                          | Package | Range ability | Supply voltage | Isolation voltage / operating voltage | Creepage distance / electric clearance | Temperature range | Signal bandwidth / response time | Typical application                                                                                                                                                         |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------|----------------|---------------------------------------|----------------------------------------|-------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSM2113     | Multiple selectable current ranges<br>AC/DC measurement<br>Continuity resistance as low as 0.27mΩ<br>Fixed output<br>Reference voltage output<br>Integrated overcurrent protection<br>+/-2% current measurement accuracy | SOW-10  | 20~200A       | 3.3V/5V        | 5000Vrms@1min<br>1618VDC<br>(1144VAC) | 8.2mm/8.2mm                            | -40°C<br>~150°C   | 1MHz<br>/400ns                   | PV inverter<br>Energy storage<br>Automobile OBC,<br>DC/DC, charging gun, PTC heater<br>Industrial inverter<br>Power supply<br>Service robot<br>Drone<br>Two-wheeled vehicle |
| NSM2115     | Multiple selectable current ranges<br>AC/DC measurement<br>Continuity resistance as low as 1mΩ<br>Proportional output<br>Integrated overcurrent protection<br>+/-2% current measurement accuracy<br>Enhanced insulation  | SOW-16  | 10~100A       | 3.3V/5V        | 5000Vrms@1min<br>1550VDC<br>(1097VAC) | 8mm/8mm                                | -40°C<br>~150°C   | 1MHz<br>/400ns                   |                                                                                                                                                                             |
| NSM2117     | Multiple selectable current ranges<br>AC/DC measurement<br>Continuity resistance as low as 0.85mΩ<br>Fixed output<br>Reference voltage output<br>Integrated overcurrent protection<br>+/-2% current measurement accuracy | SOW-16  | 10~100A       | 3.3V/5V        | 5000Vrms@1min<br>1550VDC<br>(1097VAC) | 8mm/8mm                                | -40°C<br>~150°C   | 1MHz<br>/400ns                   |                                                                                                                                                                             |
| NSM2119     | Multiple selectable current ranges<br>AC/DC measurement<br>Continuity resistance as low as 0.85mΩ<br>Fixed output<br>Reference voltage output<br>Integrated overcurrent protection<br>+/-2% current measurement accuracy | SOW-16  | 10~100A       | 3.3V/5V        | 5000Vrms@1min<br>1550VDC<br>(1097VAC) | 8mm/8mm                                | -40°C<br>~150°C   | 1MHz<br>/400ns                   |                                                                                                                                                                             |
| NSM2311     | 50~200A Wide current range available<br>AC/DC measurement<br>Conduction resistance as low as 0.1mΩ<br>Support Ratiometric and fix mode<br>+/-1.5% current measurement accuracy                                           | DIP-5L  | 50~200A       | 3.3V/5V        | 5000Vrms@1min<br>1358VDC<br>(960VAC)  | 6.9mm/6.9mm                            | -40°C<br>~150°C   | 147KHz<br>/2.3s                  | Photovoltaic inverter, Industrial inverter, Power supply, Service robot, Unmanned aerial vehicle, Two-wheeled vehicle                                                       |

## NSM2011/2012/2013/2015/2016/2017/2019: Chip-level Current Sensor with Integrated Current Path

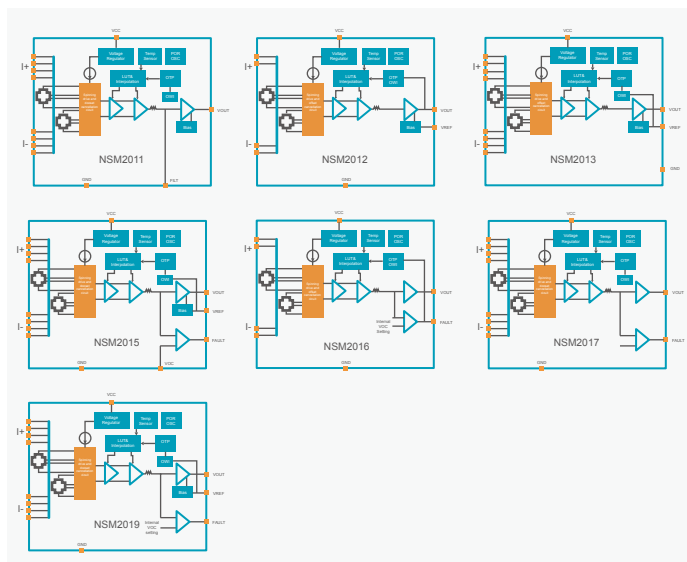
### ◆ Product introduction

NSM201x series is a chip-level current sensor under 200A launched by NOVOSENSE which is mainly used for isolation measurement of current under 200A.

### ◆ Product feature

- Wide current range available 2.5A~200A
- AC/DC input
- 3.3V/5V single power supply
- Input conduction impedance as low as to 0.27mOhm
- $\pm 2\%$  current measurement accuracy
- Withstand up to 20kA surge current (8 $\mu$ s /20 $\mu$ s surge current waveform)
- Multiple output type
  - Single-end proportional output
  - Pseudo difference fixed output
- Two types of package
  - SOP8 package: 600VDC working isolation voltage / 3000 Vrms @ 1min withstand isolation voltage (NSM2012/NSM2016)
  - SOW16 package: 1550VDC working insulation voltage / 5000 Vrms @ 1 min withstand isolation voltage (NSM2011/NSM2013/NSM2015/NSM2017)
  - SOW10 package: 1618VDC working isolation voltage / 5000 Vrms @ 1min withstand isolation voltage (NSM2019)
- Overcurrent protection OCD output (NSM2015/NSM2016/NSM2017/NSM2019)
- Overcurrent protection response in micro seconds
- Overcurrent protection threshold is configurable

### ◆ Functional block diagram



### ◆ Safety certificate

- UL62368/EN62368 safety certification

### ◆ Package



NSM2012/2016: SOP8



NSM2011/2013/2015 /2017: SOW16



NSM2019: SOW10

### ◆ Application



OBC



DC/DC



PTC heater



Charging gun



PDU



PV inverter



Industrial frequency converter



Power supply (UPS, SMPS)



PDU



Service robots



Drones



Two-wheeled vehicles



Vacuum cleaners

## NSM2110/2111/2112/2113/2115/2117/2119 Integrated Current Sensors

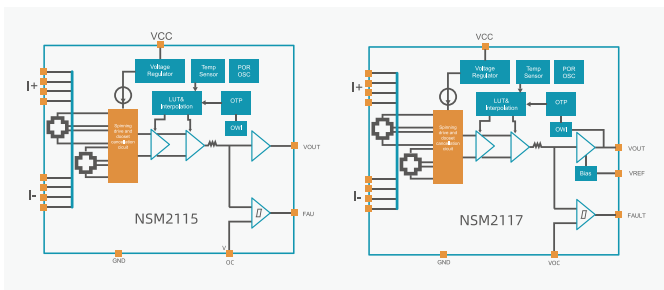
### ◆ Product introduction

The NSM211x series of high-bandwidth integrated current sensors from Naxinwei are primarily based on the Hall effect principle, using isolation to convert currents within  $\pm 200\text{A}$  into linear voltage outputs. They are suitable for various isolated current sampling applications, such as PV input side of photovoltaic string inverters, current detection for MPPT (Maximum Power Point Tracking), and AC side current detection. They are also used for busbar current and phase current sampling in industrial frequency converters, UPS and server power supplies, isolated current sampling in charging piles, current detection for automotive OBC PFC, resonant cavity current detection, and more.

### ◆ Product feature

- Multiple selectable current ranges: 5A to 200A
- AC/DC input
- 3.3V/5V single power supply
- Up to 1MHz bandwidth, response time <500ns
- Input continuity resistance as low as 0.27m $\Omega$
- $\pm 2\%$  current measurement accuracy
- Able to withstand surge lightning currents of up to 20kA (8 $\mu$ s/20 $\mu$ s surge current waveform)
- Multiple output types:
  - Single-ended proportional output
  - Pseudo-differential fixed output
- Three packaging forms:
  - Narrow-body SOIC 8-pin package: 600VDC working isolation voltage / 3000 Vrms @ 1min withstand isolation voltage (NSM2110/NSM2112)
  - Wide-body SOIC 16-pin package: 1550VDC working isolation voltage / 5000 Vrms @ 1 min withstand isolation voltage (NSM2115/NSM2117/NSM2119)
  - Wide-body SOIC 10-pin package: 1618VDC working isolation voltage / 5000 Vrms @ 1 min withstand isolation voltage (NSM2111/NSM2113)
- Overcurrent protection OCD output (NSM2110/NSM2113/NSM2115/NSM2117/NSM2119):
  - Nanosecond-level overcurrent protection response speed
  - Configurable overcurrent protection threshold

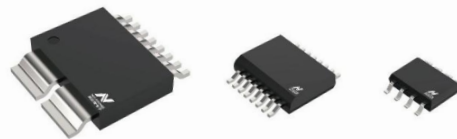
### ◆ Functional block diagram



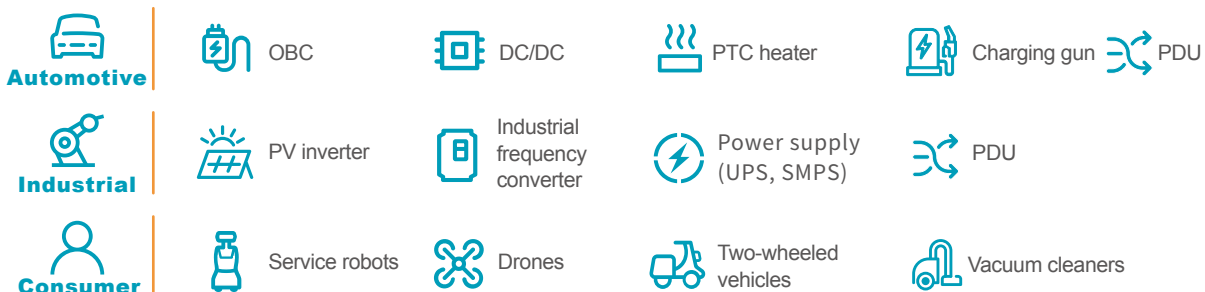
### ◆ Safety certificate

- UL62368/EN62368 safety standard certification

### ◆ Package



### ◆ Application





## NSM2311 High Performance Module-Alternative Current Sensor with Integrated Current Path

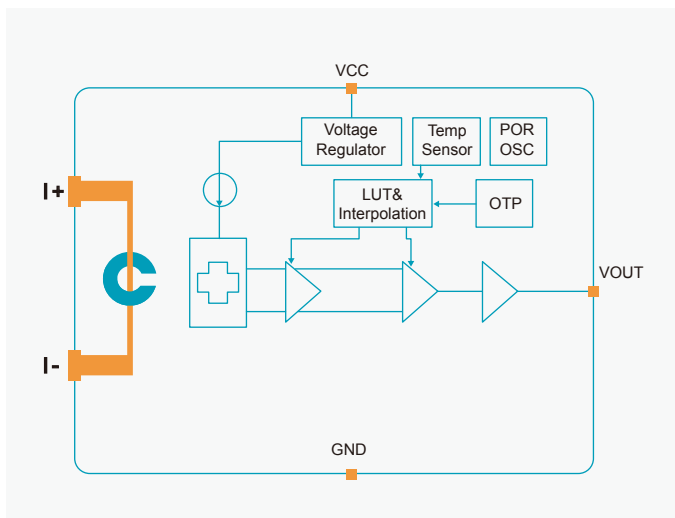
### ◆ Product introduction

NSM2311 is a high performance module-alternative current sensor which is mainly used for isolation measurement of current under 200A, to achieve a compact, low-cost, and high-precision sensing solution.

### ◆ Product feature

- 50~200A Wide current range available
- AC/DC input
- 3.3V/5V single power supply
- 100μOhm low Input conduction impedance
- ±2% sensitivity error over temperature
- ±5mV offset error over temperature
- 2.3s response time
- 150KHz signal bandwidth
- Ratiometric or fixed output
- ±8KV ESD(HBM)
- DIP-5L package: 1358VDC working isolation voltage / 5000 Vrms @ 1 min Withstand isolation voltage
- Withstand up to over 20kA surge current (8μs /20μs surge current waveform)
- 6.9mm Creepage distance
- 6.9mm Clearance distance
- -40~150°C operating temperature range

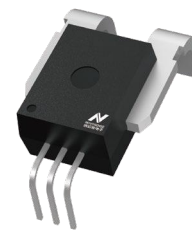
### ◆ Functional block diagram



### ◆ Safety Certification

- UL62368/EN62368 safety certification

### ◆ Package



### ◆ Application



industrial frequency converter



PDU



PV inverter



power supply (UPS, SMPS, etc.)





# Linear Hall Current Sensor



# Linear Hall Current Sensor

| Part number | Product feature                                                                                                                                                                                                                                                        | Package | Package thickness | Pin forms                                    | Sensitivity range | Supply voltage | Temperature range | Signal bandwidth / response time | Typical application                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------|----------------------------------------------|-------------------|----------------|-------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------|
| NSM2031     | AC/DC measurement<br>Support proportional output or fixed output<br>Overcurrent protection output<br>Sensitivity drift $<\pm 2\%$<br>Zero drift $<\pm 10\text{mV}$<br>Multiple pin bending forms                                                                       | TO94    | 1.0mm             | L-shaped bend (BL, BS)<br>V-shaped bend (BV) | 0.5~15mV/G        | 3.3V/5V        | - 40°C<br>~150°C  | 240kHz<br>/2.2μs                 | Electric drive system for electric vehicle<br>Open-loop current sensor module<br>Electric two-wheeled vehicle  |
| NSM2032     | AC/DC measurement<br>Support proportional output or fixed output<br>Optional reference voltage output<br>Sensitivity drift $<\pm 1.5\%$<br>Zero drift $<\pm 5\text{mV}$<br>Multiple pin bending forms<br>Supports overvoltage, undervoltage, and open ground diagnosis | TO94    | 1.0mm             | L-shaped bend (BL, BS)<br>V-shaped bend (BV) | 0.5~30mV/G        | 3.3V/5V        | - 40°C<br>~150°C  | 400kHz/<br>1.5μs                 | Electric drive system for electric vehicle<br>Open-loop current sensor module<br>Electric two-wheeled vehicle  |
| NSM2033     | AC/DC measurement<br>Support proportional output or fixed output<br>Optional reference voltage output<br>Sensitivity drift $<\pm 1.5\%$<br>Zero drift $<\pm 5\text{mV}$<br>Multiple pin bending forms<br>Supports overvoltage, undervoltage, and open ground diagnosis | TO94    | 1.0mm             | L-shaped bend (BL, BS)<br>V-shaped bend (BV) | 0.5~30mV/G        | 3.3V/5V        | - 40°C<br>~150°C  | 400kHz/<br>1.5μs                 | Electric drive system for electric vehicle<br>Open-loop current sensor module<br>Electric two-wheeled vehicle  |
| NSM2034     | AC/DC Measurement<br>Fixed output<br>Reference voltage output<br>Sensitivity drift $<\pm 1\%$<br>Zero drift $<\pm 5\text{mV}$                                                                                                                                          | TO94    | 1.6mm             | N/A                                          | 0.5~30mV/G        | 3.3V/5V        | - 40°C<br>~150°C  | 400kHz/<br>1.5us                 | Electric drive system for electric vehicle<br>Open-loop current sensor module<br>Electric two-wheeled vehicle  |
| NSM2020     | Coreless solution AC/DC measurement<br>Support proportional output or fixed output<br>Reference voltage output<br>overcurrent protection output<br>Low Sensitivity drift                                                                                               | TSSOP8  | 1.6mm             | N/A                                          | 0.5~30mV/G        | 3.3V/5V        | - 40°C<br>~150°C  | 600KHz/<br>2us                   | Electric drive system for electric vehicle , Open-loop current sensor module ,<br>Electric two-wheeled vehicle |

## NSM2031: Linear Hall Current Sensor

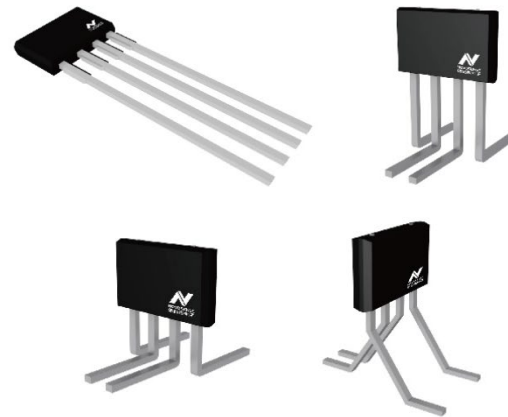
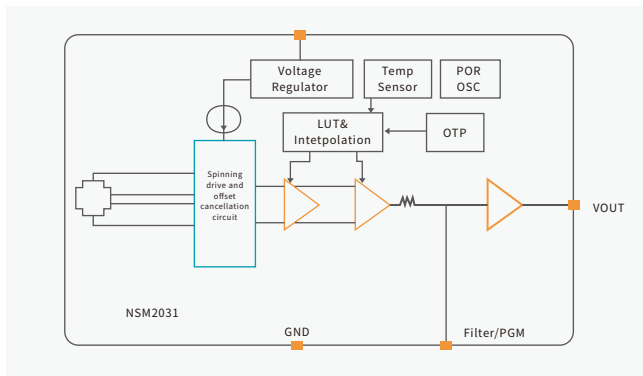
### ◆ Product introduction

NSM2031 linear Hall effect current sensor chip can provide a high-precision solution for large range current detection based on magnetic ring. It is widely used in the phase current detection of electric vehicle electric drive system and the large current detection of current module in industrial system.

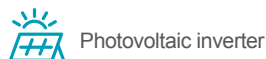
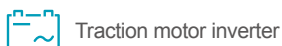
### ◆ Product feature

- Automotive-qualified meet AEC - Q100 Grade0 requirements
- Working environment temperature: - 40 °C ~ 150 °C
- Wide programmable sensitivity range: 0.5 ~ 15 mV/G
- High precision, low temperature drift
  - Sensitivity error  $< \pm 2\%$  over the whole temperature range
  - Zero drift  $< \pm 10$  mV in the whole temperature range
- Industry-leading noise performance
- High bandwidth and fast response
  - 3dB 240kHz bandwidth model, response time 2.2 $\mu$ s
- Industry leading ESD performance
  - HBM:  $\pm 8$ kV
  - CDM:  $\pm 2$ kV
- 1 mm, TO94 package and a variety of pin bent form
- Support proportional output or fixed output
- Overcurrent protection output, users can configure over-current protection output threshold for the current range of 50% to 200%
- Different models the optional power supply, 3.3 V or 5 V single power supply work
- Comply with RoHS standard packaging

### ◆ Functional block diagram



### ◆ Application



## NSM2032: Linear Hall Current Sensor

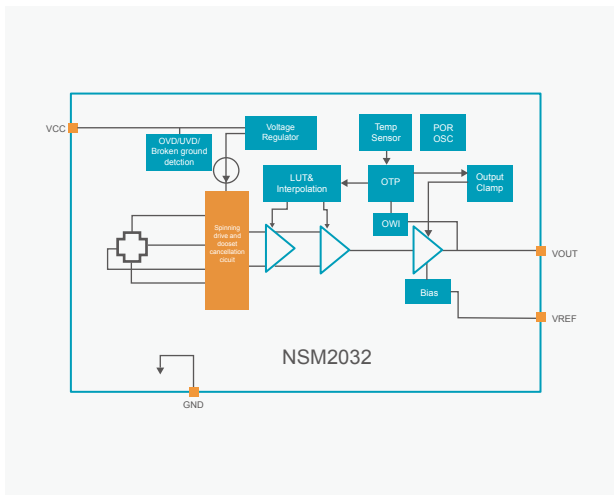
### ◆ Product introduction

NSM2032 linear Hall effect current sensor chip can provide a high-precision solution for large range current detection based on magnetic ring. It is widely used in the phase current detection of electric vehicle electric drive system and the large current detection of current module in industrial system.

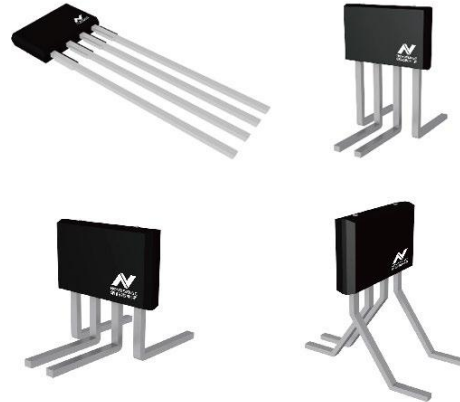
### ◆ Product feature

- Automotive-qualified meet AEC - Q100 Grade0 requirements
- Working environment temperature: - 40 °C ~ 150 °C
- Wide programmable sensitivity range: 0.5 ~ 30 mV/G
- High precision, low temperature drift
  - Sensitivity error <±1.5% over the whole temperature range
  - Zero drift <±5 mV in the whole temperature range
- Industry-leading noise performance
- High bandwidth and fast response
  - 3dB 400kHz bandwidth model, response time 1.5μs
- Various diagnostic modes, overvoltage, undervoltage, open circuit and so on
- Industry leading ESD performance
  - HBM: ±8kV
  - CDM: ±2kV
- 1 mm TO94 package and a variety of pin bent form
- Support proportional output or fixed output
- Optional reference voltage output
- Different models the optional power supply, 3.3 V or 5 V single power supply work
- Comply with RoHS standard packaging

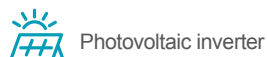
### ◆ Functional block diagram



### ◆ Package



### ◆ Application





## NSM2033: Linear Hall Current Sensor

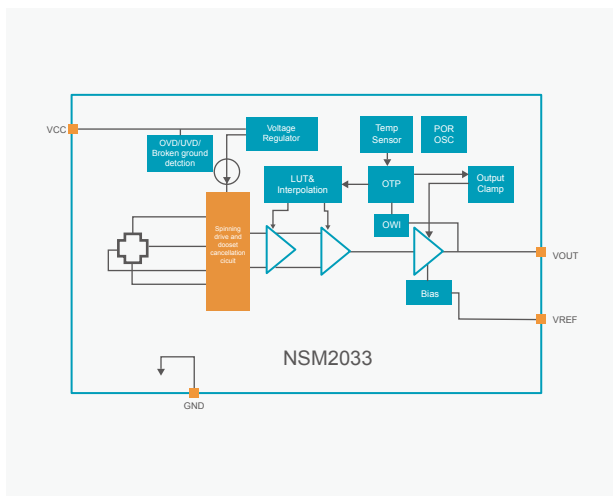
### ◆ Product introduction

NSM2033 linear Hall effect current sensor chip can provide a high-precision solution for large range current detection based on magnetic ring. It is widely used in the phase current detection of electric vehicle electric drive system and the large current detection of current module in industrial system.

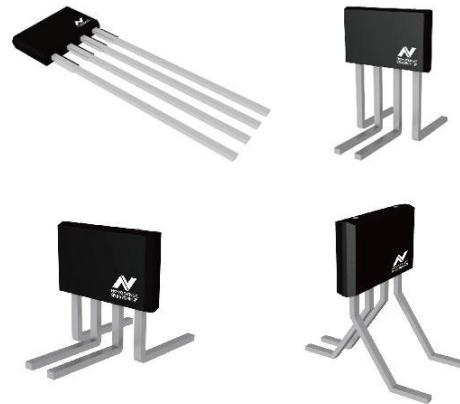
### ◆ Product feature

- Automotive-qualified meet AEC - Q100 Grade0 requirements
- Working environment temperature:  $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$
- Wide programmable sensitivity range:  $0.5 \sim 30 \text{ mV/G}$
- High precision, low temperature drift
  - Sensitivity error  $< \pm 1.5\%$  over the whole temperature range
  - Zero drift  $< \pm 5 \text{ mV}$  in the whole temperature range
- Industry-leading noise performance
- High bandwidth and fast response
  - 3dB 240kHz bandwidth model, response time  $1.5\mu\text{s}$
- Various diagnostic modes, overvoltage, undervoltage, open circuit and so on
- Industry leading ESD performance
  - HBM:  $\pm 8\text{kV}$
  - CDM:  $\pm 2\text{kV}$
- 1 mm TO94 package and a variety of pin bent form
- Support proportional output or fixed output
- Optional reference voltage output
- Different models the optional power supply, 3.3 V or 5 V single power supply work
- Comply with RoHS standard packaging

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



## NSM2034: Linear Hall Current Sensor

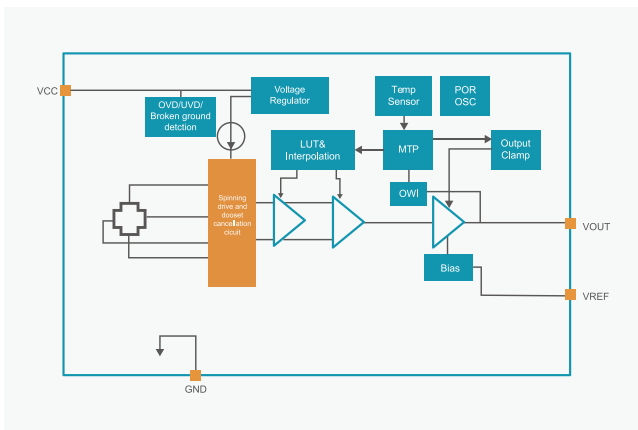
### ◆ Product introduction

The NSM2034 linear Hall effect current sensor chip provides a high-precision solution for current detection based on magnetic core, widely used in current sensor modules in industrial systems.

### ◆ Product feature

- Operating ambient temperature:  $-40^{\circ}\text{C}$  to  $150^{\circ}\text{C}$
- Wide programmable sensitivity range: 0.5 to 30 mV/G
- High precision, low temperature drift  
Sensitivity error  $< \pm 1\%$  over the entire temperature range  
Zero drift  $< \pm 5$  mV over the entire temperature range
- Industry-leading noise performance
- High bandwidth and fast response  
-3dB bandwidth for the 400kHz model, response time of 1.5 $\mu\text{s}$
- Multiple diagnostic modes covering overvoltage, undervoltage, open circuit, etc.
- Industry-leading ESD performance  
HBM:  $\pm 8\text{kV}$   
CDM:  $\pm 2\text{kV}$
- 1.6mm TO94 package
- Fixed output
- Reference voltage output
- Different power supply options available: 3.3V or 5V single power supply operation
- Encapsulation compliant with RoHS standards

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Industrial motor control



Photovoltaic inverter

## NSM2020: Coreless High bandwidth Differential Hall-Effect Current Sensor

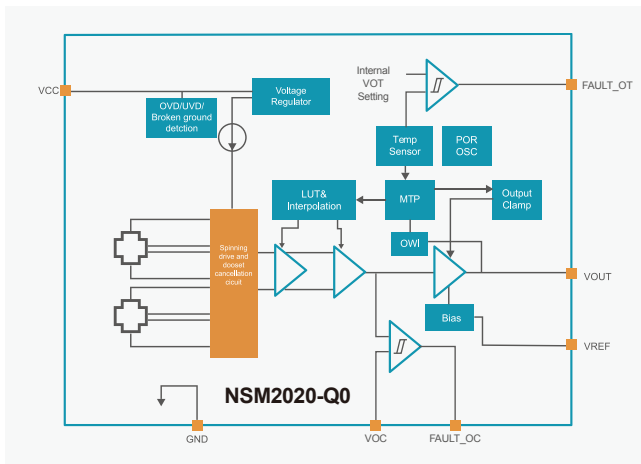
### ◆ Product introduction

sensor. provides a highly accurate method of measuring 100 A to >2000 A flowing through a busbar or a PCB without needing a concentrator core or a U-Shaped Magnetic Shield. Reducing system complexity, bill of material (BOM) cost and weight

### ◆ Product feature

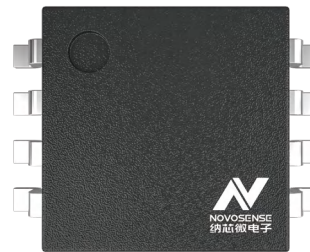
- Working environment temperature: - 40 °C ~ 150 °C
- Wide programmable sensitivity range: 0.5 ~ 30 mV/G
- High precision, low temperature drift
- Sensitivity error  $\leq \pm 1.5\%$  over the whole temperature range
- Zero drift  $\leq \pm 10$  mV in the whole temperature range
- 3mVRms Industry-leading noise performance
- High bandwidth and fast response
- 3dB 600kHz bandwidth model
- Response time 2 $\mu$ s
- Industry leading ESD performance :HBM:  $\pm 8$ kV , CDM:  $\pm 2$ kV
- Support proportional output or fixed output
- Reference output (Only in fixed mode)
- Different models the optional power supply, 3.3V or 5V single power supply work
- Broken-Ground detection , Over current detection ,
- Under/Over-Voltage detection
- Comply with RoHS standard packaging
- AEC-Q100 Grade 0 qualified

### ◆ Functional block diagram



### ◆ Package

- TSSOP8



### ◆ Application



Traction Inverter



# Magnetic Position Sensor



## Hall-based Angle Sensor

| Part number | Product feature                                                                                                                                                                                                                                                   | Package | Range ability                                                  | Supply voltage | Interface form                                                                                                                                   | Accuracy of angle measurement                                      | Response time                                            | Temperature range | Typical application                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSM3011     | The axial angle is measured based on planar Hall<br>Differential Hall detection can resist external stray magnetic field<br>Provide OWI user-programmable communication port<br>Automotive-qualified model and industrial-qualified model available               | SOP-8   | 0~360°<br>Support user defined small range measurement as well | 3.3V/5V        | 14-bit linear DAC analog output<br>12-bit resolution PWM output                                                                                  | ±1°<br>The accuracy can reach ±0.2° after four-section calibration | 120μs (10μs after dynamic Angle compensation is enabled) | -40°C ~150°C      | <b>Automotive:</b><br>Valve angle sensor (throttle, EGR, ball valve, expansion valve, etc.)<br>Accelerator pedal angle sensor<br>Electronic gear shifter<br>Wiper position sensor<br>Body height sensor<br><br><b>Industrial:</b><br>Industrial steering gear angle sensor<br>Non-contact rotary button switch<br><br><b>Consumer:</b><br>Home printer<br>Hand-held marking gun<br>Moving curtain angle detection |
| NSM3012     | The axial angle is measured based on planar Hall<br>Differential Hall detection can resist external stray magnetic field<br>Provide SPI and OWI user-programmable communication interfaces<br>Automotive-qualified model and industrial-qualified model available | SOP-8   | 0~360°<br>Support user defined small range measurement as well | 3.3V/5V        | 14-bit linear DAC analog output<br>12-bit resolution PWM output<br>Three-line or four-line communication                                         | ±1°<br>The accuracy can reach ±0.2° after four-section calibration | 120μs (10μs after dynamic Angle compensation is enabled) | -40°C ~150°C      |                                                                                                                                                                                                                                                                                                                                                                                                                   |
| NSM3013     | The axial angle is measured based on planar Hall<br>Differential Hall detection can resist external stray magnetic field<br>Provide OWI user-programmable communication port<br>Automotive-qualified model and industrial-qualified model available               | SOP-8   | 0~360°<br>Support user defined small range measurement as well | 3.3V/5V        | 14-bit linear DAC analog output<br>12-bit resolution PWM output<br>UVW output<br>Z-direction programmable threshold judgment switch output (SON) | ±1°<br>The accuracy can reach ±0.2° after four-section calibration | 120μs (10μs after dynamic Angle compensation is enabled) | -40°C ~150°C      |                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Hall-effect Switches & Latches

| Part number | Key features                                                                                  | Package      | Interface             | Short circuit protection | Thermal shut down | Bop/Brp (Gauss)                                                   | Supply voltage | Supply current | Supply current of low power version | Operating temperature range | AEC-Q100 | ISO 26262 | Typical Application            |
|-------------|-----------------------------------------------------------------------------------------------|--------------|-----------------------|--------------------------|-------------------|-------------------------------------------------------------------|----------------|----------------|-------------------------------------|-----------------------------|----------|-----------|--------------------------------|
| NSM1011     | Unipolar hall switch, Planar Hall effect, Overvoltage and reverse voltage protection, 3 wire  | SOT23 /TO92S | Open Drain            | Yes                      | Yes               | ± 15 / ± 5, ± 35 / ± 25, ± 75 / ± 65, ± 100 / ± 90, ± 150 / ± 130 | 2.7~28V        | 2.5mA          | 63μA                                | -40~150°C                   | Grade 0  | ASIL A    | Solid-state switch             |
| NSM1012     | Omnipolar hall switch, Planar Hall effect, Overvoltage and reverse voltage protection, 3 wire | SOT23 /TO92S | Open Drain            | Yes                      | Yes               | ± 15 / ± 5, ± 35 / ± 25, ± 75 / ± 65, ± 100 / ± 90, ± 150 / ± 130 | 2.7~28V        | 2.5mA          | 63μA                                | -40~150°C                   | Grade 0  | ASIL A    | Solid-state switch             |
| NSM1013     | Hall latch, Planar Hall effect, Overvoltage and reverse voltage protection, 3 wire            | SOT23 /TO92S | Open Drain            | Yes                      | Yes               | ± 15, ± 35, ± 75, ± 100, ± 150                                    | 2.7~28V        | 2.5mA          | 63μA                                | -40~150°C                   | Grade 0  | ASIL A    | 3-phase BLDC motor commutation |
| NSM1071     | Unipolar Hall switch, Planar Hall effect, 3 wire, Low power consumption version available     | SOT23 /TO92S | Open drain/ Push-pull | N/A                      | N/A               | ± 19 / ± 14, ± 26 / ± 21, ± 36 / ± 26, ± 42 / ± 34                | 1.65~5.5V      | 1.4mA          | 1.5uA                               | -40~125°C                   | NO       | N/A       | Solid-state switch             |
| NSM1072     | Omnipolar Hall switch, Planar Hall effect, 3 wire, Low power consumption version available    | SOT23 /TO92S | Open drain/ Push-pull | N/A                      | N/A               | ± 19 / ± 14, ± 26 / ± 21, ± 36 / ± 26, ± 42 / ± 34                | 1.65~5.5V      | 1.4mA          | 1.5uA                               | -40~125°C                   | NO       | N/A       | Solid-state switch             |



## xMR Switches & Latches

| Part Number | Key Features                                                          | Package     | Interface             | Bop/Brp (Gauss)                                                                                      | Supply Voltage | Supply Current           | AEC-Q100 | Operating Temperature Range | Typical Application |
|-------------|-----------------------------------------------------------------------|-------------|-----------------------|------------------------------------------------------------------------------------------------------|----------------|--------------------------|----------|-----------------------------|---------------------|
| NSM1051     | Unipolar TMR switch, High sensitivity, Low power consumption, 3 wire  | SOT23 /T092 | Open drain/ Push-pull | $\pm 9 / \pm 5, \pm 14 / \pm 10, \pm 18 / \pm 13, \pm 35 / \pm 25, \pm 50 / \pm 40, \pm 75 / \pm 65$ | 1.8~5.5V       | 1.5uA, 1uA, 0.5uA, 0.2uA | NO       | -40~125°C                   | Solid-state switch  |
| NSM1052     | Omnipolar TMR switch, High sensitivity, Low power consumption, 3 wire | SOT23 /T092 | Open drain/ Push-pull | $\pm 9 / \pm 5, \pm 14 / \pm 10, \pm 18 / \pm 13, \pm 35 / \pm 25, \pm 50 / \pm 40, \pm 75 / \pm 65$ | 1.8~5.5V       | 1.5uA, 1uA, 0.5uA, 0.2uA | NO       | -40~125°C                   | Solid-state switch  |
| NSM1053     | TMR latch, High sensitivity, Low power consumption, 3 wire            | SOT23 /T092 | Open drain/ Push-pull | $\pm 9, \pm 14, \pm 18, \pm 35, \pm 50, \pm 75$                                                      | 1.8~5.5V       | 1.5uA, 1uA, 0.5uA, 0.2uA | NO       | -40~125°C                   | Magnetic encoder    |

## NSM3011/3012/3013: Hall-based Angle Sensor

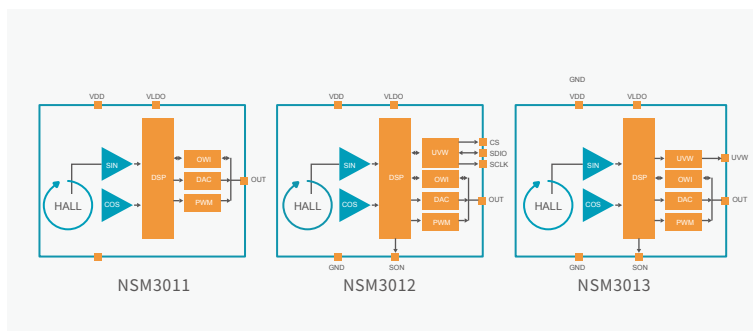
### ◆ Product introduction

The NSM301x is a non-contact rotation angle sensor that supports accurate rotation angle measurement of 360° in ambient temperatures ranging from -40°C to 150°C. This series is based on planar Hall array, which converts the angle position information of bipolar magnet into analog voltage, PWM, SPI and other output forms through internal DSP. The NSM301x provides SPI and OWI interfaces for signal path configuration as well as erasable programming register blocks (MTP). It has an automatic gain (AGC) adjustment module that can adjust the gain of the signal path to accommodate different mechanical constraints and magnetic fields. This approach provides maximum flexibility in system design because it can be integrated directly into existing architectures, providing high accuracy. The chip supports 3.3V, 5V power supply voltage (different power supply versions)

### ◆ Product feature

- Operating temperature: -40°C to 150°C
- Various output interface forms: 14-bit linear DAC analog output or 12-bit resolution PWM output, SPI output UVW output, Z-direction programmable threshold judgment switch output (SON)
- Provide SPI and OWI user-programmable communication interfaces
- Provide angle output with accuracy of  $\pm 1^\circ$
- Support four-section fitting one by one, with fit accuracy up to  $\pm 0.2^\circ$
- Built-in automatic gain compensation circuit to compensate the gain loss caused by the temperature characteristics of the magnet and the Z-direction installation position tolerance
- It has abnormal diagnosis function
- Differential Hall detection can resist external stray magnetic field
- NOVOSENSE's new chopper and spin current excitation technology make angular temperature drift very small
- Automotive-qualified and industrial-qualified model available, with automotive-qualified model meeting AEC - Q100 reliability standard

### ◆ Functional block diagram



### ◆ Package

SOP8



### ◆ Application

|                       |                                                                       |                                  |                                |                       |                    |
|-----------------------|-----------------------------------------------------------------------|----------------------------------|--------------------------------|-----------------------|--------------------|
| <b>Automotive</b><br> | Valve angle sensor (throttle, EGR, ball valve, expansion valve, etc.) | Accelerator pedal angle sensor   | Electronic gear shifter        | Wiper position sensor | Body height sensor |
| <b>Industrial</b><br> | Industrial steering gear angle sensor                                 | Non-contact rotary button switch |                                |                       |                    |
| <b>Consumer</b><br>   | Home printer                                                          | Hand-held marking gun            | Moving curtain angle detection |                       |                    |

# NSM1011/1012/1013 Hall Switch&Latches

## Product introduction

NSM101x is 3-wire fixed sensitivity Hall switch&Latches, which is automotive-grade magnetic sensors based on the planar Hall-effect to support high-precision, contactless digital position measurement within an ambient temperature range of -40°C to 150°C.It meets the requirements of AEC-Q100 and are developed according to the ISO 26262:2011 standard and its functional safety level meets up to ASIL A.

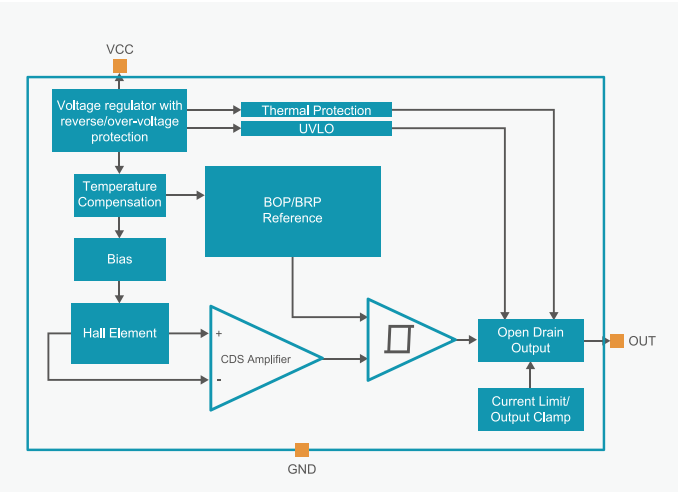
The NSM101x series consists of 3 product models, namely NSM1011 (unipolar Hall switch), NSM1012 (omnipolar Hall switch), and NSM1013 (Hall latch), which allow users to select different switching points, magnetic polarity, output polarity, normal power consumption and low power consumption modes, temperature compensation coefficients of magnet materials, package forms, etc.

Product Features

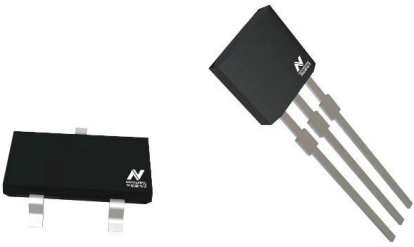
## Product feature

- AEC-Q100 Grade 0 qualified
- ASIL A functional safety complianceOperating ambient temperature: -40°C~150°C
- Absolute maximum rating - supply voltage range: -20~38V
- Operating voltage range: 2.7~28V
- ESD (HBM): ±8kV
- Support low power consumption mode, with supply currents as low as 65μA
- Optional parameters:  
Different operate /release point  
Magnetic polarity : South, North  
Output polarity : High, Low  
Temperature compensation coefficient: Flat, SmCo, NdFeB, Ferrite  
Power mode: Continuous, Low power

## Functional block diagram



## Package



## Application



BLDC Motor  
Commutation



Wiper home/end  
position sensor  
Seat/windows/sunroof motors



Trunk/door/liftgate  
motors



Lighting  
actuation sensor

# NSM1071/1072 Hall Switch

## Product introduction

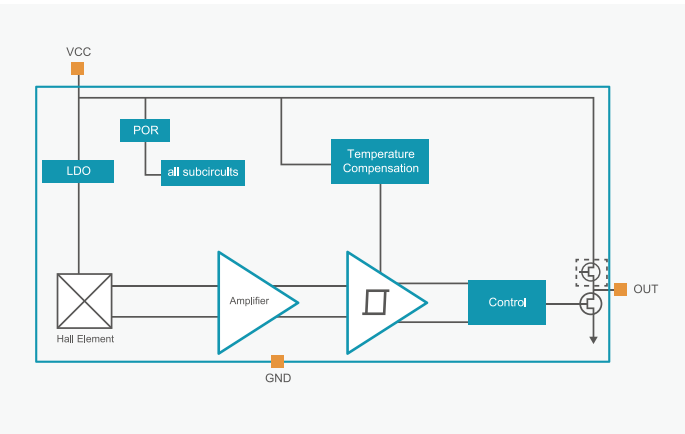
NSM107x is a 3-wire fixed sensitivity Hall switch, which are industrial-grade magnetic sensors based on the planar Hall-effect to support high-precision, contactless digital position measurement within an ambient temperature range of -40°C to 125°C. The low power version of the NSM107x with 20Hz sampling frequency has an operating current as low as 1.5μA at the common supply voltage of 3.3V, making it suitable for battery-powered applications such as IOT devices.

The NSM107x series consists of 2 product models, namely NSM1071 (unipolar Hall switch) and NSM1072 (omnipolar Hall switch), which allow users to select different switching points, power consumption modes, output interfaces, package forms, etc.

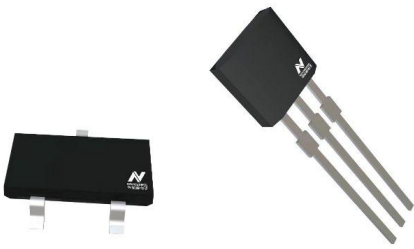
## Product feature

- Operating ambient temperature: -40°C~125°C
- Operating voltage range: 1.65~5.5V  
ESD(HBM): ±4kV
- Optional parameters:  
Different operate/release points  
Power consumption modes:regular power consumption version, low power consumption version (20Hz)  
Output interface: Open-drain, Push-pull

## Functional block diagram



## Package



## Application



Proximity switch



Wake-up switch



Speed detection

## NSM1051/1052/1053 xMR Switches & Latches

### ◆ Product introduction

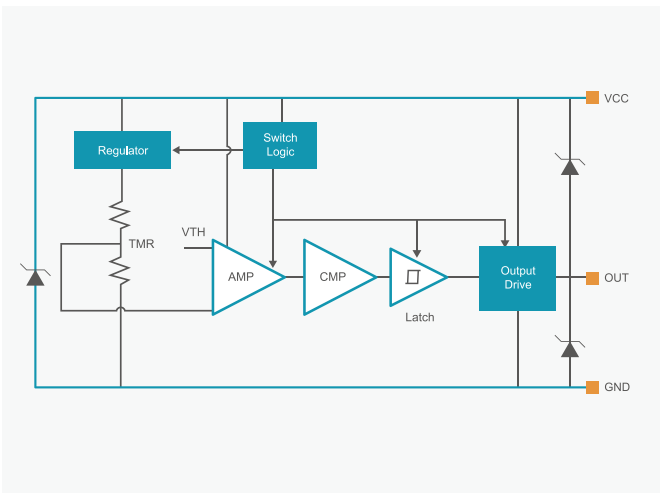
NSM105x is a 3-wire fixed sensitivity TMR switch/latches, which is industrial-grade magnetic sensors based on the tunnel magnetoresistance (TMR) effect to support high-precision, contactless digital position measurement within an ambient temperature range of -40°C to 125°C. NSM105x features extremely low power consumption, with operating currents as low as 1.5μA for the 5kHz sampling frequency version and 200nA for the 156Hz sampling frequency version.

The NSM105x series consists of 3 product models, namely NSM1051 (unipolar TMR switch), NSM1052 (omnipolar TMR switch), and NSM1053 (TMR latch), which allow users to select different switching points, magnetic polarity, output polarity, low power modes, output interfaces, and package forms.

### ◆ Product feature

- Operating ambient temperature: -40°C~125°C
- Operating voltage range: 1.8~5.5V
- ESD (HBM): ±4kV
- Extremely low power consumption, with supply currents as low as 200nA
- Optional parameters:
  - Different operate /release points
  - Magnetic polarity: South, North
  - Output polarity : High, Low
  - Sampling frequency: 5kHz, 2.5kHz, 1.25kHz, 156Hz
  - Output interface: Open-drain, Push-pull

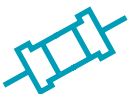
### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Reed switch replacement



Liquid level detection



Proximity switch



Water, gas, heat meter



Speed detection



Wake-up switch



# Industrial Pressure Transmitter Signal Conditioning Chip



# Industrial Pressure Transmitter Signal Conditioning Chip

| Part number        | Product description                                                                      | Sensor input type supported                                                                                              | Package | Temperature range | Supply voltage                                                                                               | Output type                                                                                                                   | Power Shunt Down function supported | Non-volatile memory | Typical application                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------|-------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSA2860<br>_SSOP16 | General industrial resistance pressure transmitter signal conditioning chip              | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | SSOP16  | -40~150°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage output<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>OWI                            | No                                  | EEPROM              | Analog output industrial pressure transmitter<br>Analog output industrial RTD temperature transmitter<br>BUS-type industrial pressure transmitter<br>BUS-type industrial RTD temperature transmitter |
| NSA2860<br>_TSSOP  | General industrial resistance pressure transmitter signal conditioning chip              | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | TSSOP20 | -40~150°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage output<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>I <sup>2</sup> C<br>SPI<br>OWI | No                                  | EEPROM              | Analog output industrial pressure transmitter<br>Analog output industrial RTD temperature transmitter<br>BUS-type industrial pressure transmitter<br>BUS-type industrial RTD temperature transmitter |
| NSA2860<br>X-QQNR  | General EMC-enhanced industrial resistance pressure transmitter signal conditioning chip | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | QFN20   | -40~125°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>I <sup>2</sup> C<br>SPI<br>OWI        | No                                  | EEPROM              | Analog output industrial pressure transmitter<br>Analog output industrial RTD temperature transmitter<br>BUS-type industrial pressure transmitter<br>BUS-type industrial RTD temperature transmitter |
| NSA2862<br>X-DQNR  | General EMC-enhanced industrial resistance pressure transmitter signal conditioning chip | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | QFN20   | -40~105°C         | 2.7~5.5V                                                                                                     | I <sup>2</sup> C<br>SPI<br>OWI                                                                                                | Yes                                 | EEPROM              | BUS-type industrial pressure transmitter<br>BUS-type industrial RTD temperature transmitter<br>IOT industrial transmitter                                                                            |
| NSC2860<br>X-DQNR  | General industrial capacitive pressure transmitter signal conditioning chip              | apacitive pressure sensor                                                                                                | QFN20   | -40~125°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage output<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>I <sup>2</sup> C<br>SPI<br>OWI | No                                  | EEPROM              | Capacitive industrial pressure transmitter                                                                                                                                                           |





## NSA2862X: Analog Front-end Chip for Low-power Digital Industrial Sensor

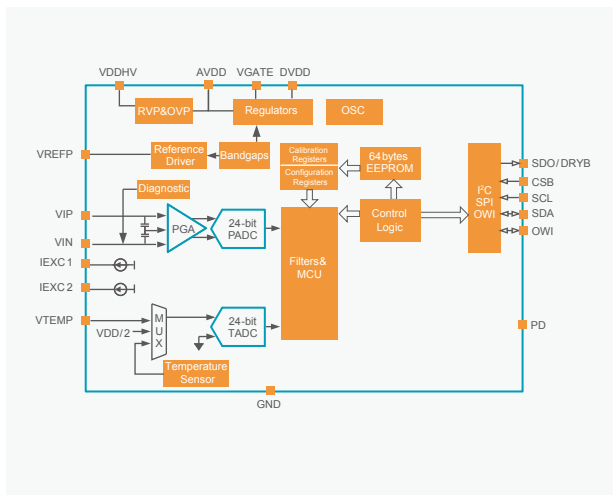
### ◆ Product introduction

The NSA2862X is an analog front-end chip specially developed for digital industrial transmitters or IIoT industrial sensors requiring low sleep power consumption. NSA2862X has an internal integrated bridge drive, dual constant current source drive, PGA and 24-bit high-precision ADC, which can be easily used for interface bridge pressure sensors or temperature sensors such as RTD/TC. Its integrates customer-programmable digital calibration logic and EEPROM, so that customers can easily carry out sensor assembly calibration and calibration coefficient saving. The NSA2862X has a dedicated PD pin that can be used in industrial wireless sensor applications to set the chip to a low-power off state with 100nA static sleep current. Over the past few years, the chip has been widely used in industrial pressure IoT meters, and its reliability and stability has been fully verified in the industrial field by a large number of shipments.

### ◆ Product feature

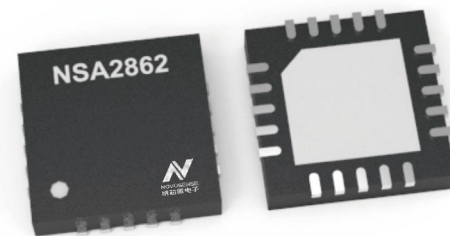
- Integrated bridge drive, high precision PGA, 24-bit high precision ADC, supporting proportional measurement, strain gauge type or resistance bridge sensor input
- Integrated dual constant current source output, supporting three-wire or four-wire RTD temperature sensor input
- Integrated external JFET controller, supporting 24V industrial loop power supply mode for direct power supply
- Support SPI BUS or I<sup>2</sup>C digital interface, which is used as digital transmitter analog front-end
- Digital sensor calibration mode, supporting up to the third-order sensor nonlinear calibration and second-order temperature coefficient calibration
- Power Down mode is supported. The static current in sleep mode is at 100nA level at room temperature

### ◆ Functional block diagram



### ◆ Package

- NSA2862X\_DQNR: QFN20



### ◆ Application



Industrial pressure transmitter and temperature transmitter



Industrial field instrument analog front-end



PLC/DCS analog input and output





# Pressure Sensor Signal Conditioning Chip



# Pressure Sensor Signal Conditioning Chip

| Part number     | Product description                                                                               | Sensor input type supported                                                                                              | Package               | Temperature range | Supply voltage                                                                                               | Output type                                                                                                                   | Non-volatile memory | Key words of selection                                          | Typical application                                                                                                                                                                                  |
|-----------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NSA2200         | General low-cost voltage/resistance bridge signal conditioning chip                               | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor                                        | KGD                   | -40~125°C         | 1.8~5.5V                                                                                                     | I <sup>2</sup> C<br>SPI<br>OWI                                                                                                | OTP                 | Low-cost digital output                                         | Altimeter<br>Consumer pressure gauge                                                                                                                                                                 |
| NSA2300         | General low-cost voltage/resistance bridge signal conditioning chip                               | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor                                        | SOP8<br>MSOP10<br>KGD | -40~125°C         | 1.8~5.5V                                                                                                     | Analog voltage<br>I <sup>2</sup> C<br>SPI<br>OWI                                                                              | OTP                 | Low-cost analog + digital output                                | Altimeter<br>Consumer pressure gauge<br>Additional automotive pressure sensor<br>ear/forehead thermometer (thermopile sensor)                                                                        |
| NSA2302         | General low-cost voltage/resistance bridge signal conditioning chip                               | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor (with bias voltage)                    | MSOP10<br>KGD         | -40~125°C         | 3~5.5V<br>High-voltage direct power supply is supported with an external JFET                                | Analog voltage<br>I <sup>2</sup> C<br>SPI<br>OWI                                                                              | EEPROM              | Low cost analog + digital output, rewritable EEPROM             | Additional automotive pressure sensor<br>ear/forehead thermometer (thermopile sensor)                                                                                                                |
| NSA2860 _SSOP16 | General industrial resistance pressure transmitter signal conditioning chip                       | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | SSOP16                | -40~150°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage output<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>OWI                            | EEPROM              | Industrial transmitter, cost optimized version                  | Analog output industrial pressure transmitter<br>Analog output industrial RTD temperature transmitter                                                                                                |
| NSA2860 _TSSOP  | General industrial resistance pressure transmitter signal conditioning chip                       | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | TSSOP20               | -40~150°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage output<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>I <sup>2</sup> C<br>SPI<br>OWI | EEPROM              | Industrial transmitter, full function                           | Analog output industrial pressure transmitter<br>Analog output industrial RTD temperature transmitter<br>BUS-type industrial pressure transmitter<br>BUS-type industrial RTD temperature transmitter |
| NSA2860 X-QQNR  | General EMC-enhanced industrial resistance pressure transmitter signal conditioning chip          | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | QFN20                 | -40~125°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>I <sup>2</sup> C<br>SPI<br>OWI        | EEPROM              | Industrial transmitter, small package                           | Analog output industrial pressure transmitter<br>Analog output industrial RTD temperature transmitter<br>BUS-type industrial pressure transmitter<br>BUS-type industrial RTD temperature transmitter |
| NSA2862 X-DQNR  | General EMC-enhanced industrial resistance pressure transmitter signal conditioning chip          | Wheatstone bridge pressure sensor<br>Strain gage<br>General voltage output sensor<br>PT100/PT1000 RTD temperature sensor | QFN20                 | -40~125°C         | 3~5.5V                                                                                                       | I <sup>2</sup> C<br>SPI<br>OWI                                                                                                | EEPROM              | IoT pressure sensor                                             | BUS-type industrial pressure transmitter<br>BUS-type industrial RTD temperature transmitter<br>IOT industrial transmitter                                                                            |
| NSC2860 X-DQNR  | General industrial capacitive pressure transmitter signal conditioning chip                       | Capacitive pressure sensor                                                                                               | QFN20                 | -40~125°C         | 3~5.5V with external JFET can support 4~20mA loop power supply (compatible with 24V industrial power supply) | Analog voltage output<br>Industrial transmitter standard<br>0~5V/0~10V/4~20mA output<br>PWM<br>I <sup>2</sup> C<br>SPI<br>OWI | EEPROM              | Capacitive input industrial pressure level transmitter          | Capacitive industrial pressure transmitter                                                                                                                                                           |
| NSA9260         | High-reliability automotive-qualified resistance pressure sensor conditioning chip                | Wheatstone bridge resistance pressure sensor                                                                             | SSOP16                | -40~150°C         | 4.5-5.5V external JFET                                                                                       | Analog voltage<br>PWM<br>OWI                                                                                                  | EEPROM              | Automotive pressure ordinary analog output type                 | Automotive pressure sensor                                                                                                                                                                           |
| NSA9260X        | EMC-enhanced high-reliability automotive-qualified resistance pressure sensor conditioning chip   | Wheatstone bridge resistance pressure sensor                                                                             | SSOP16                | -40~150°C         | 4.5-5.5V external JFET                                                                                       | Analog voltage<br>PWM<br>OWI                                                                                                  | EEPROM              | Automotive pressure EMC-enhanced analog output type             | Automotive pressure sensor                                                                                                                                                                           |
| NSC9260         | High-reliability automotive-qualified capacitive pressure sensor conditioning chip                | Capacitive pressure sensor                                                                                               | SSOP16                | -40~150°C         | 4.5-5.5V external JFET                                                                                       | Analog voltage<br>PWM<br>OWI                                                                                                  | EEPROM              | Automotive capacitance pressure ordinary analog output type     | Automotive pressure sensor                                                                                                                                                                           |
| NSC9260X        | EMC-enhanced high-reliability automotive-qualified capacitive pressure sensor conditioning chip   | Capacitive pressure sensor                                                                                               | SSOP16                | -40~150°C         | 4.5-5.5V external JFET                                                                                       | Analog voltage<br>PWM<br>OWI                                                                                                  | EEPROM              | Automotive capacitance pressure EMC-enhanced analog output type | Automotive pressure sensor                                                                                                                                                                           |
| NSC9262         | LIN-interface High-reliability automotive-qualified resistance pressure sensor conditioning chip  | Capacitive pressure sensor                                                                                               | SSOP16                | -40~150°C         | 7~18V                                                                                                        | OWI<br>LIN                                                                                                                    | EEPROM              | Automotive capacitance pressure LIN output type                 | Automotive pressure sensor                                                                                                                                                                           |
| NSC9264         | SENT-interface High-reliability automotive-qualified resistance pressure sensor conditioning chip | Capacitive pressure sensor                                                                                               | SSOP16                | -40~150°C         | 4.5~5.5V                                                                                                     | OWI<br>SENT                                                                                                                   | EEPROM              | Automotive capacitance pressure SENT output type                | Automotive pressure sensor                                                                                                                                                                           |

## NSA2200: Digital Output Pressure Sensor Interface Chip

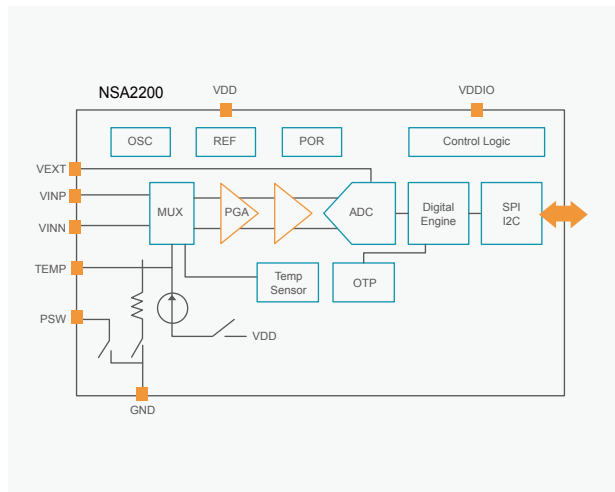
### ◆ Product introduction

NSA2200 is an interface chip for low-cost pressure sensors. It integrates pressure sensor bridge driver, with high precision PGA, 24-bit ADC, customer programmable digital calibration logic and customer-writable OTP. NSA2200 supports sensor nonlinear fitting calibration as well as temperature compensation for sensor sensitivity and bias errors. The supply method of this chip is wafer Know Good Die. Customers can choose to seal NSA2200 with their own pressure sensor sensitive source in one package. After calibration, it can be used as digital output pressure sensor.

### ◆ Product feature

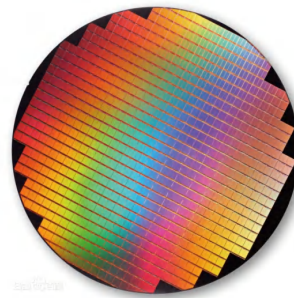
- Integrated bridge drive, high precision PGA, 24-bit high precision ADC, supporting proportional measurement, strain gauge type or resistance bridge sensor input
- Support sensor diagnosis and output clamp function
- Excellent noise performance:  $600\text{nV}@\text{OSR} = 1024\text{X}$ , Gain = 32X (equivalent to input noise) Calibration accuracy: 0.05% FSO (support second order temperature coefficient and third order nonlinear calibration)
- High-precision internal temperature sensor, (absolute accuracy  $< 0.5^{\circ}\text{C}$ , resolution  $< 0.01^{\circ}\text{C}$ ); support a variety of external temperature sensors (diode, two-terminal thermistor, three terminal thermistor, etc.)
- Support 1.8V to 5.5V power supply
- Support sleep working mode to greatly reduce MCU load. The static current under sleep is at 200nA level at room temperature, and supports Power Down of external bridge power supply.
- Support SPI BUS or I<sup>2</sup>C digital interface output

### ◆ Functional block diagram



### ◆ Package

- KGD



### ◆ Application



Consumer/industrial pressure sensor modules (washing machine level/pressure cooker/coffee machine/soybean milk machine, etc.)



Barometer



Altimeter



Weather forecaster



Electronic weight scale

## NSA2300: Pressure Sensor Interface Signal Conditioning Chip Compatible with Analog and Digital Output

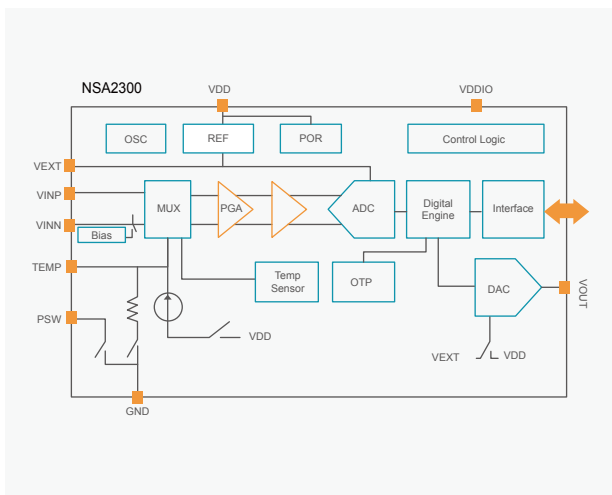
### ◆ Product introduction

NSA2300 is a low-cost pressure sensor interface chip, with both analog output and digital output supported. It integrates pressure sensor bridge driver, with high precision PGA, 24-bit ADC, customer programmable digital calibration logic and customer-writable OTP. NSA2300 supports sensor nonlinear fitting calibration as well as temperature compensation for sensor sensitivity and bias errors. The packaging mode of this chip is SO8 or MSOP10, and the shipment mode of wafer Know Good Die can also be provided.

### ◆ Product feature

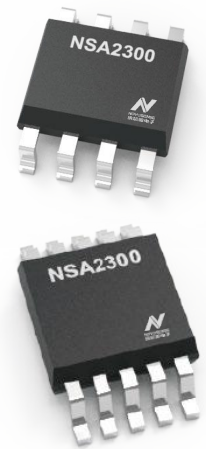
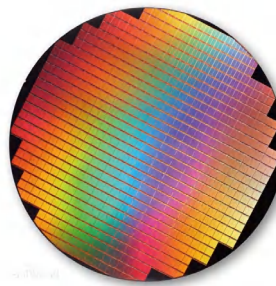
- Integrated bridge drive, high precision PGA, 24-bit high precision ADC, supporting proportional measurement, strain gauge type or resistance bridge sensor input
- Support sensor diagnosis and output clamp function
- Excellent noise performance:  $600\text{nV}@OSR = 1024X$ , Gain = 32X (equivalent to input noise) Calibration accuracy: 0.05% FSO (support second order temperature coefficient and third order nonlinear calibration)
- High-precision internal temperature sensor, (absolute accuracy  $< 0.5^{\circ}\text{C}$ , resolution  $< 0.01^{\circ}\text{C}$ ); support a variety of external temperature sensors (diode, two-terminal thermistor, three terminal thermistor, etc.)
- Support 1.8V to 5.5V power supply
- Support sleep working mode to greatly reduce MCU load. The static current under sleep is at 200nA level at room temperature, and supports Power Down of external bridge power supply.
- Support SPI BUS or I<sup>2</sup>C digital interface output, with analog proportional/fixed output mode.

### ◆ Functional block diagram



### ◆ Package

- SOP8, MSOP10, KGD



### ◆ Application



Consumer/industrial pressure sensor modules  
(washing machine level/pressure  
cooker/coffee machine/soybean milk machine, etc.)



Barometer



Altimeter



Weather  
forecaster



Electronic  
weight scale



Automobile additional  
pressure sensor module



## NSA2302: Pressure Sensor Interface Signal Conditioning Chip Compatible with Analog and Digital Output

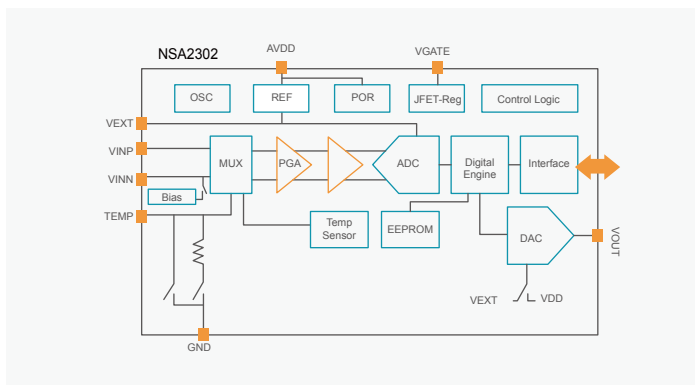
### ◆ Product introduction

The NSA2302 is a highly integrated, low-cost, high-precision interface chip designed for bridge sensors to collect, amplify and calibrate sensor signals. The NSA2302 integrates a low-noise gauge amplifier (PGA), a low-power 24-bit  $\Sigma$ - $\Delta$  ADC, a DSP for digital calibration, and a 12-bit DAC. The NSA2302 supports second-order temperature drift calibration for sensor zero temperature, sensitivity and up to third-order nonlinear calibration, with digital calibration accuracy up to 0.1%. The calibration logic is based on the calibration parameters stored in the internal EEPROM and calculated by the built-in DSP. The NSA2302 also supports direct high-voltage supply applications with an internal JFET controller. The NSA2302 supports both I<sup>2</sup>C/SPI digital output and analog output, and supports one-wire interface (OWI) multiplexing analog pins for post-sensor calibration.

### ◆ Product feature

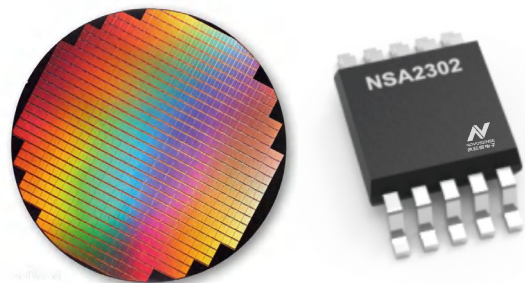
- Integrated bridge drive, high precision PGA, 24-bit high precision ADC, supporting proportional measurement, strain gauge type or resistance bridge sensor input
- Support sensor diagnosis and output clamp function
- Excellent noise performance: 600nV@OSR = 1024X, Gain = 32X (equivalent to input noise) Calibration accuracy: 0.05% FSO (support second order temperature coefficient and third order nonlinear calibration)
- High-precision internal temperature sensor, (absolute accuracy < 0.5°C, resolution < 0.01°C); support a variety of external temperature sensors (diode, two-terminal thermistor, three terminal thermistor, etc.)
- VDD supports 3V to 5.5V power supply and external high-voltage power supply through JFET controller
- Support sleep working mode to greatly reduce MCU load. The static current under sleep is at 200nA level at room temperature, and supports Power Down of external bridge power supply.
- Support SPI BUS or I<sup>2</sup>C digital interface output, with analog proportional output

### ◆ Functional block diagram



### ◆ Package

- MSOP10, KGD



### ◆ Application



Automobile additional pressure sensor (A/C pressure sensor/TMAP sensor)



Consumer/industrial pressure sensor modules (washing machine level/pressure cooker/coffee machine/soybean milk machine, etc.)



# NSA2860/NSA2860X: Industrial Transmitter Signal Processing Chip Supporting 4~20mA Output

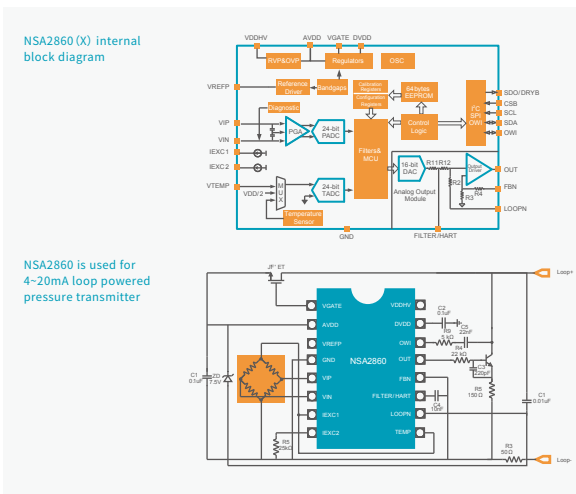
## Product introduction

NSA2860 (X) is a specially developed ASSP chip for 4~20mA current output or 0~5V/0~10V voltage output industrial transmitter. NSA2860 (X) has an internal integrated bridge drive, dual constant current source drive, PGA and 24-bit high-precision ADC, which can be easily used for interface bridge pressure sensors or temperature sensors such as RTD/TC. The chip integrates the customer programmable digital calibration logic, and also provides a convenient OWI interface that can communicate directly with the analog line of 4~20mA, making it convenient for the customer to calibrate the sensor after assembly and save the calibration coefficient. In addition, the NSA2860 (X) also integrates with an external JFET controller, which can be used directly under standard industrial loop power supply conditions of 24V without the need for an additional power controller. In the past few years, this chip has been widely used in industrial pressure transmitters, industrial temperature transmitters and other field instruments, and its reliability and stability has been fully verified by a large number of shipments in the industrial field.

## Product feature

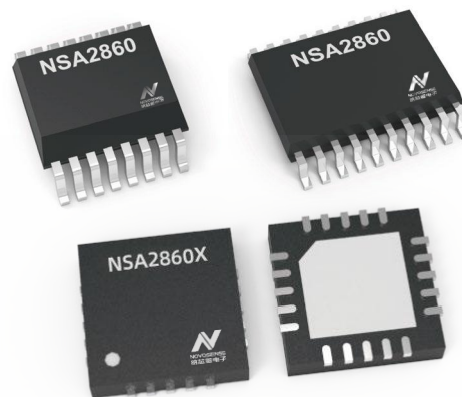
- Integrated bridge drive, high precision PGA, 24-bit high precision ADC, supporting proportional measurement, strain gauge type or resistance bridge sensor input
- Integrated dual constant current source output, supporting three-wire or four-wire RTD temperature sensor input
- Integrated external JFET controller, supporting 24V industrial loop power supply mode for direct power supply
- Support 4 to 20mA output or 0 to 5V/0 to 10V analog output
- Support 4 to 20mA output or 0 to 5V/0 to 10V analog output
- Support SPI BUS or I<sup>2</sup>C digital interface, which can also be used as digital transmitter analog front-end
- OWI interface, which can support customer calibration after assembly in the case of two-wire 4~20mA connection
- Digital sensor calibration mode, supporting up to the third-order sensor nonlinear calibration and second-order temperature coefficient calibration
- Low static current, with 1.5mA working current perfectly supporting 4-20mA loop power supply
- The power pin VDDHV can withstand high voltage shocks up to 28V to achieve high reliability in industrial field applications

## Functional block diagram



## Package

- NSA2860\_SSOP16: SSOP16
- NSA2860\_TSSOP: TSSOP20
- NSA2860X-QQNR: QFN20



## Application



Industrial pressure transmitter and temperature transmitter



Industrial field instrument analog front-end



PLC/DCS analog input/output

## NSA2862X: Analog Front-end Chip for Low-power Digital Industrial Sensor

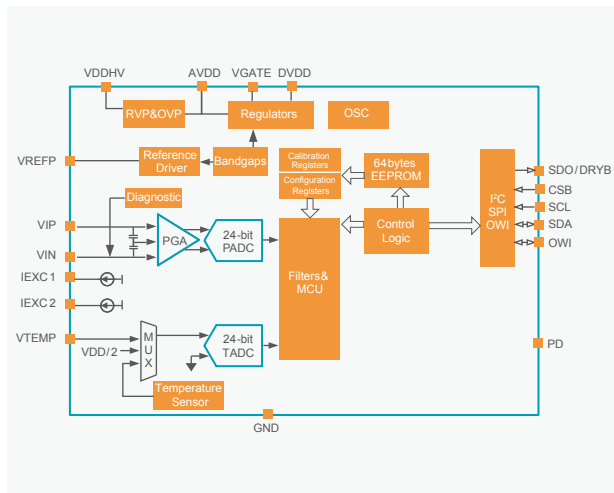
### ◆ Product introduction

The NSA2862X is an analog front-end chip specially developed for digital industrial transmitters or IIoT industrial sensors requiring low sleep power consumption. NSA2862X has an internal integrated bridge drive, dual constant current source drive, PGA and 24-bit high-precision ADC, which can be easily used for interface bridge pressure sensors or temperature sensors such as RTD/TC. Its integrates customer-programmable digital calibration logic and EEPROM, so that customers can easily carry out sensor assembly calibration and calibration coefficient saving. The NSA2862X has a dedicated PD pin that can be used in industrial wireless sensor applications to set the chip to a low-power off state with 100nA static sleep current. Over the past few years, the chip has been widely used in industrial pressure IoT meters, and its reliability and stability has been fully verified in the industrial field by a large number of shipments.

### ◆ Product feature

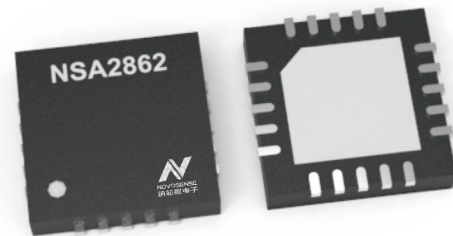
- Integrated bridge drive, high precision PGA, 24-bit high precision ADC, supporting proportional measurement, strain gauge type or resistance bridge sensor input
- Integrated dual constant current source output, supporting three-wire or four-wire RTD temperature sensor input
- Support SPI BUS or I<sup>2</sup>C digital interface, which is used as digital transmitter analog front-end
- Digital sensor calibration mode, supporting up to the third-order sensor nonlinear calibration and second-order temperature coefficient calibration
- Power Down mode is supported. The static current in sleep mode is at 100nA level at room temperature

### ◆ Functional block diagram



### ◆ Package

- QFN20



### ◆ Application



Industrial pressure transmitter and temperature transmitter



Industrial field instrument analog front-end



PLC/DCS analog quantity input and output

# NSC2860X: Capacitive Industrial Transmitter Signal Processing Chip Supporting 4~20mA Output

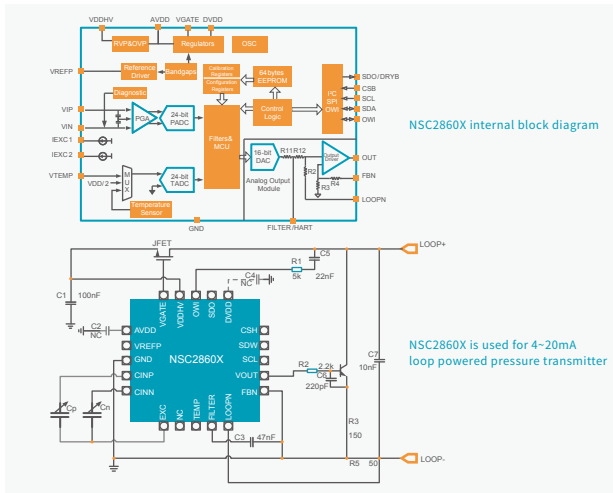
## ◆ Product introduction

NSC2860X is an ASSP chip specially developed for 4~20mA current output or 0~5V voltage output industrial transmitter. NSC2860X has an integrated capacitive voltage conversion circuit, which specially designed for interface capacitive pressure sensors. It integrates the customer programmable digital calibration logic, and also provides a convenient OWI interface that can communicate directly with the analog line of 4~20mA, making it convenient for the customer to calibrate the sensor after assembly and save the calibration coefficient. In addition, the NSC2860X also integrates with an external JFET controller, which can be used directly under standard industrial loop power supply conditions of 24V without the need for an additional power controller. Over the past few years, the chip has been widely used in application of industrial capacitive pressure transmitter, and its reliability and stability has been fully verified in the industrial field by a large number of shipments.

## ◆ Product feature

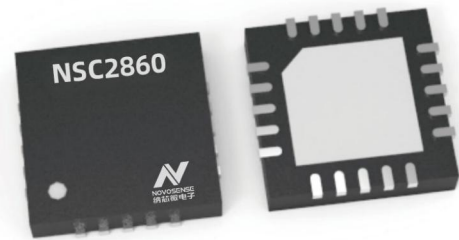
- Integrated capacitive voltage conversion circuit, supporting capacitive pressure sensor interface
- Integrated external JFET controller, supporting 24V industrial loop power supply mode for direct power supply
- Support 4 to 20mA output or 0 to 5V/0 to 10V analog output
- Support SPI BUS or I<sup>2</sup>C digital interface, which can also be used as digital transmitter analog front-end
- OWI interface, which can support customer calibration after assembly in the case of two-wire 4~20mA connection
- Digital sensor calibration mode, supporting up to the third-order sensor nonlinear calibration and second-order temperature coefficient calibration
- Low static current, with 1.5mA working current perfectly supporting 4-20mA loop power supply
- The power pin VDDHV can withstand high voltage shocks up to 28V to achieve high reliability in industrial field applications

## ◆ Functional block diagram



## ◆ Package

- NSC2860X-DQNR: QFN20



## ◆ Application



Industrial capacitive pressure transmitter

## NSA9260(X): Signal Conditioning Chip for Resistive Bridge Automobile Pressure Sensor

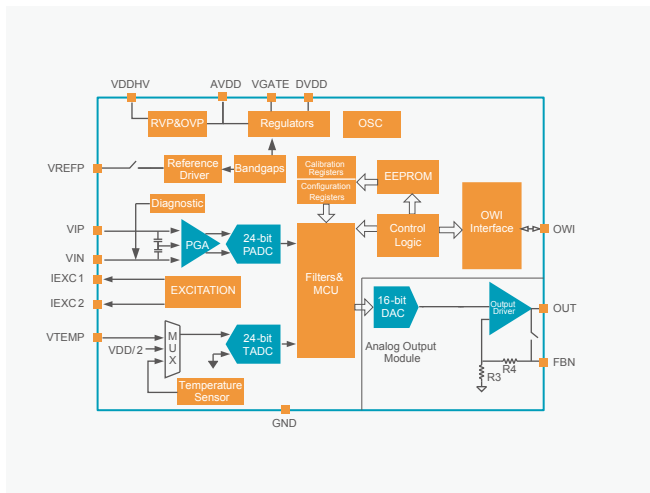
### ◆ Product introduction

NSA9260 (X) is an EMC enhanced AECQ100 compliant high integration chip for signal conditioning of resistance bridge automotive pressure sensors. The NSA9260 (X) adopts a high-precision variable gain instrument amplifier and a 24-bit ADC to form the main signal measurement channel, and a 24-bit ADC to form the auxiliary temperature measurement channel. With built-in digital processing engine, the NSA9260X supports second-order temperature drift calibration and the highest third-order nonlinear calibration for sensor zero temperature and sensitivity of the sensor. The calibration accuracy can be up to 0.1%, and its calibration coefficients are stored in a set of programmable EEPROMs. NSA9260X supports over-voltage and reverse-voltage protection, analog voltage output and PWM output, as well as sensor diagnosis.

### ◆ Product feature

- Support -24V to 28V over voltage and reverse voltage protection for automotive sensor applications
- Integrated bridge drive, high precision PGA, 24-bit high precision ADC, supporting proportional measurement, strain gauge type or resistance bridge sensor input
- Support sensor diagnosis and output clamp function
- High-precision 1X ~ 256X variable gain instrument amplifier, up to 8x digital gain
- Built-in digital processor-based sensor calibration logic, supporting post-customer calibration, up to third-order nonlinear calibration and second-order temperature sensitivity and offset calibration
- Calibration data can be stored in EEPROM, p multiple times programmable
- Ratio-metric or absolute voltage output, supporting PWM output as well
- Enhanced EMC performance
- Proprietary OWI communication mode, supporting calibration after sensor assembly
- Operating temperature range: -40°C ~ 150°C, compatible with AECQ100 standard

### ◆ Functional block diagram



### ◆ Package

- SSOP16



### ◆ Application



Auto pressure sensor module  
(TMAP, automotive air conditioning pressure,  
oil pressure sensor, brake pressure sensor, etc.)



Industrial transmitter

## NSC9260(X): Signal Conditioning Chip for Capacitive Automobile Pressure Sensor

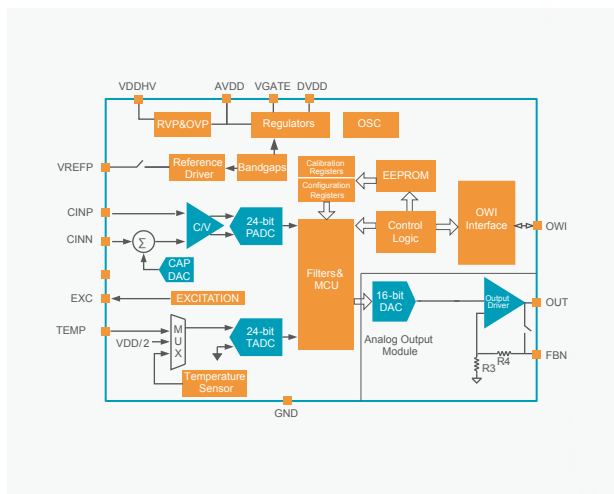
### ◆ Product introduction

NSC9260 (X) is an EMC enhanced AECQ100 compliant high integration chip for signal conditioning of capacitive automotive pressure sensors. The NSC9260 (X) adopts a capacitance voltage conversion circuit and a 24-bit ADC to form the main signal measurement channel, and a 24-bit ADC to form the auxiliary temperature measurement channel. With built-in digital processing engine, the NSC9260X supports second-order temperature drift calibration and the highest third-order nonlinear calibration for sensor zero temperature and sensitivity of the sensor. The calibration accuracy can be up to 0.1%, and its calibration coefficients are stored in a set of programmable EEPROMs. NSC9260 (X) supports over-voltage and reverse-voltage protection, analog voltage output and PWM output, which is mainly used in automotive capacitive pressure sensors for measuring pressure values above 1MPa.

### ◆ Product feature

- Support -24V to 28V over voltage and reverse voltage protection for automotive sensor applications
- It integrates C/V capacitive voltage conversion circuit and 24-bit high-precision ADC, which can easily measure capacitance of capacitive pressure sensor, calculate and convert it to pressure.
- Built-in digital processor-based sensor calibration logic, supporting post-customer calibration, up to third-order nonlinear calibration and second-order temperature sensitivity and offset calibration
- Calibration data can be stored in EEPROM, multiple times programmable
- Ratio-metric or absolute voltage output, supporting PWM output
- Enhanced EMC performance
- Proprietary OWI communication mode, supporting calibration after sensor assembly
- Operating temperature range: -40°C ~ 150°C, compatible with AECQ100 standard

### ◆ Functional block diagram



### ◆ Package

- SSOP16



### ◆ Application



Auto capacitive pressure sensor module  
(automotive air conditioning  
pressure, brake pressure, etc.)



## NSC9262: Capacitive Automobile Pressure Sensor Signal Conditioning Chip Supporting LIN BUS

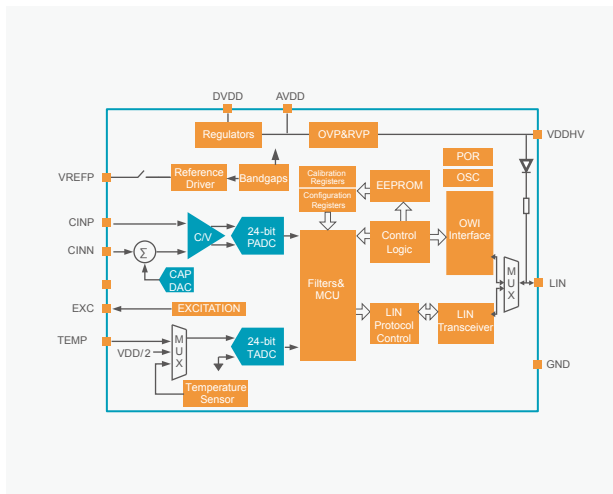
### ◆ Product introduction

NSC9262 is an EMC enhanced AECQ100 compliant high integration chip for signal conditioning of capacitive automotive pressure sensors, with LIN BUS interface provided. NSC9262 adopts a capacitance voltage conversion circuit and a 24-bit ADC to form the main signal measurement channel, and a 24-bit ADC to form the auxiliary temperature measurement channel. With built-in digital processing engine, the NSC9262 supports second-order temperature drift calibration and the highest third-order nonlinear calibration for sensor zero temperature and sensitivity of the sensor. The calibration accuracy can be up to 0.1%, and its calibration coefficients are stored in a set of programmable EEPROMs. NSC9262 supports over voltage and reverse voltage protection, supports LIN BUS interface and meets LIN BUS specifications. It is mainly used in the application of capacitive pressure sensors for measuring pressure values above 1MPa in automobiles.

### ◆ Product feature

- Support -40V to 40V over voltage and reverse voltage protection for automotive sensor applications
- It integrates C/V capacitive voltage conversion circuit and 24-bit high-precision ADC, which can easily measure capacitance of capacitive pressure sensor, calculate and convert it to pressure.
- Built-in digital processor-based sensor calibration logic, supporting customer calibration, up to third-order nonlinear calibration and second-order temperature sensitivity and offset calibration
- Calibration data can be stored in EEPROM, programmable multiple times
- Meet the LIN BUS specification 1.3/2.0/2.1
- Proprietary OWI communication mode, supporting calibration after sensor assembly
- Operating temperature range: -40°C ~ 150°C, compatible with AEC-Q100 standard

### ◆ Functional block diagram



### ◆ LIN BUS certification

- LIN BUS certification LIN1.3/2.0/2.1

### ◆ Package

- SSOP16



### ◆ Application



Automotive capacitive air conditioning pressure sensor module

## NSC9264: Capacitive Automobile Pressure Sensor Signal Conditioning Chip Supporting SENT BUS

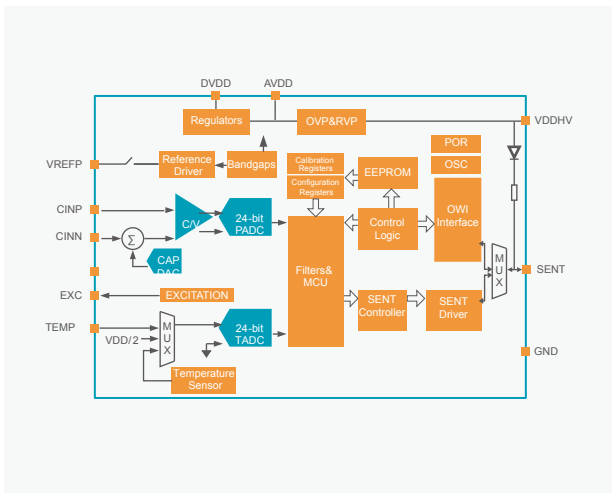
### ◆ Product introduction

The NSC9264 is an EMC-enhanced AECQ100 high-integration chip for signal conditioning of capacitive automotive pressure sensors with a SENT BUS interface. NSC9264 adopts a capacitance voltage conversion circuit and a 24-bit ADC to form the main signal measurement channel, and a 24-bit ADC to form the auxiliary temperature measurement channel. With built-in digital processing engine, the NSC9264 supports second-order temperature drift calibration and the highest third-order nonlinear calibration for sensor zero temperature and sensitivity of the sensor. The calibration accuracy can be up to 0.1%, and its calibration coefficients are stored in a set of programmable EEPROMs. NSC9264 supports over voltage and reverse voltage protection, supports SENT BUS interface and meets SAE J2716 BUS specifications. It is mainly used in the application of capacitive pressure sensors for measuring pressure values above 1MPa in automobiles.

### ◆ Product feature

- Support -24V to 24V over voltage and reverse voltage protection for automotive sensor applications
- It integrates C/V capacitive voltage conversion circuit and 24-bit high-precision ADC, which can easily measure capacitance of capacitive pressure sensor, calculate and convert it to pressure.
- Built-in digital processor-based sensor calibration logic, supporting customer calibration, up to third-order nonlinear calibration and second-order temperature sensitivity and offset calibration
- Calibration data can be stored in EEPROM, programmable multiple times
- Meet SAE J2716 protocol specification, meet fast and slow channel output and provide diagnostic function
- Proprietary OWI communication mode, supporting calibration after sensor assembly
- Operating temperature range: -40°C ~ 150°C, compatible with AECQ100 standard

### ◆ Functional block diagram



### ◆ Package

- SSOP16



### ◆ Application



Automotive capacitive pressure sensor module

# MEMS Microphone Signal Conditioning Chip



# MEMS Microphone Signal Conditioning Chip

| Part number | Product description                                                        | Product feature                                                                                                                                                                                                                                               | Supply voltage/current                    | AOP       | Bias range / step size          | Gain range/ step size                                 | Noise    | Output mode | Typical application                                                                                |
|-------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------|---------------------------------|-------------------------------------------------------|----------|-------------|----------------------------------------------------------------------------------------------------|
| NSC6272     | Analog output MEMS microphone signal conditioning chip                     | Low cost analog output MEMS microphone signal conditioning<br>Bias adjustment step length 0.3V<br>Gain adjustment step 0.5dB                                                                                                                                  | 1.6V~3.6V /125μA                          | 128dBV    | 7.5V~16V/0.3V                   | -4dB~11dB/ 0.5dB                                      | 4μVrms   | Analog      | TWS headset<br>Smart television<br>Smart household appliances<br>Smart speaker                     |
| NSC6273     | Analog output MEMS microphone signal conditioning chip                     | Low cost analog output MEMS microphone signal conditioning<br>Bias adjustment step length 0.3V<br>Gain adjustment step 0.5dB                                                                                                                                  | 2.3V~3.6V /125μA                          | 130dBV    | 7.5V~16V/0.3V                   | -4dB~11dB/ 0.5dB                                      | 4μVrms   | Analog      | TWS headset<br>Smart television<br>Smart household appliances<br>Smart speaker                     |
| NSC6280     | Analog output MEMS microphone signal conditioning chip                     | Enhanced analog output MEMS microphone signal conditioning<br>Bias adjustment step length 0.3V<br>Gain adjustment step 0.5dB<br>Increase EMI anti-interference of high frequency signal, make it more suitable for use in mobile phone and other applications | 1.6V~3.6V /120μA                          | 132dBV    | 6V~15.5V/0.3V                   | -1.5dB~11dB /0.5dB                                    | 4μVrms   | Analog      | Mobile/PAD                                                                                         |
| NSC6360     | Digital output MEMS microphone signal conditioning chip                    | Enhanced digital output MEMS microphone signal conditioning<br>Enhanced power supply PSRR                                                                                                                                                                     | 1.62V~3.6V /330μA@ 768kHz,750μA @2.4MHz   | 117dBF.S. | 7.6V~15.9V /1.18V               | 9dB~17dB/ 0.6dB                                       | 4.5μVrms | Digital     | Laptop<br>Smart speaker                                                                            |
| NSC6362     | Digital output MEMS microphone signal conditioning chip                    | Enhanced digital output MEMS microphone signal conditioning<br>Enhanced power supply PSRR                                                                                                                                                                     | 1.62V~3.6V /330μA@ 768kHz,780μA @2.4MHz   | 120dBF.S. | 7.5V~14.4V/0.3V; 15V~19.2V/0.6V | 0dB~23dB/ 0.5dB                                       | 3μVrms   | Digital     | Laptop<br>Smart speaker                                                                            |
| NSC6364     | Digital output MEMS microphone signal conditioning chip with I2S interface | I2S interface<br>Multiple modes including performance, low power and standby mode<br>Low power consumption<br>Suitable for mini size package                                                                                                                  | 1.65V~3.6V /540μA@ 3.072MHz, 285μA@768kHz | 120dBSPL  | 4.7V~12.7V/0.5                  | AGain: 4.9dB~15.7 dB/1.8dB-DGain: -1.9dB~3.8 dB/0.5dB | 4μVrms   | Digital     | Wearable devices<br>Remote control<br>Internet of Things<br>Smart home appliances<br>Game consoles |

## NSC6272/NSC6273: Analog Output MEMS Microphone Signal Conditioning Chip

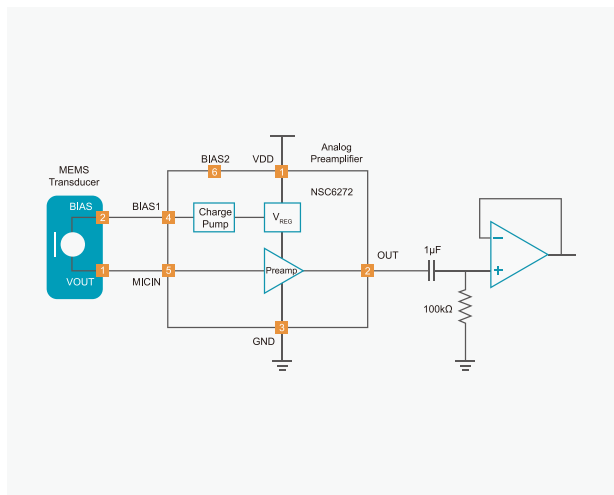
### ◆ Product introduction

NSC6272/NSC6273 is a MEMS microphone preamplifier. The NSC6272/NSC6273 features an integrated low-noise offset MEMS microphone circuit, as well as a high-performance analog preamplifier that provides true sound quality and supports flexible microphone systems. The bias voltage and analog preamplifier gain can be adjusted via an internal fuse bank (OTP), so the NSC6272/NSC6273 can support MEMS sensors with different parameters. It can also increase yields and provide better sensitivity consistency. The NSC6272/NSC6273 has two output pads for bias voltage at different positions, one of which can be selected as required at the top plate of the MEMS microphone. The AOP performance of NSC6273 is 130dBV, which is improved compared to 128dBV of NSC6272.

### ◆ Product feature

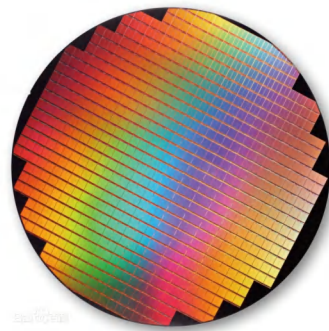
- Working voltage: 1.6V~3.6V for NSC6272, 2.3V~3.6V for NSC6273
- Current drain: 125 $\mu$ A typ.
- Equivalent input noise: 4 $\mu$ Vrms (-108dBV)
- Gain adjustment (OTP): -4dB~11dB with 0.5dB/Step
- Frequency response: 20Hz~20kHz
- Bias voltage: 7.5V~16V with 0.3V/Step
- Working temperature: -40°C~85°C

### ◆ Functional block diagram



### ◆ Package

- KGD



### ◆ Application



TWS headset



Smart television



Smart household appliances



Smart speaker



## NSC6280: Analog Output MEMS Microphone Signal Conditioning Chip

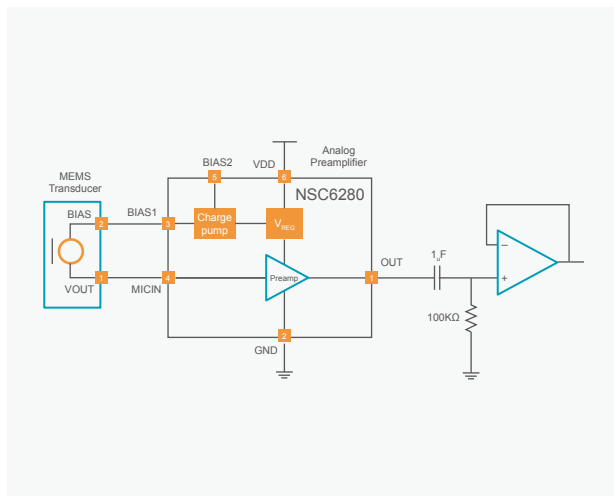
### ◆ Product introduction

NSC6280 is a MEMS microphone preamplifier. The NSC6280 features an integrated low-noise offset MEMS microphone circuit, as well as a high-performance analog preamplifier that provides true sound quality and supports flexible microphone systems. The bias voltage and analog preamplifier gain can be adjusted via an internal fuse bank (OTP), so the NSC6280 can support MEMS sensors with different parameters. It can also increase yields and provide better sensitivity consistency. The NSC6280 has two output pads for bias voltage at different positions, one of which can be selected as required at the top plate of the MEMS microphone. In addition, the NSC6280 is used for relatively high-end mobile phone applications. This chip has been subjected optimization in respect of high-frequency EMI interference and yield in mass production.

### ◆ Product feature

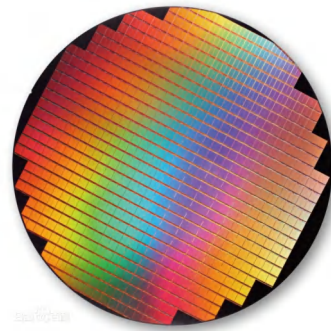
- Working voltage: 1.6V~3.6V
- Current drain: 120 $\mu$ A typ.
- Equivalent input noise: 4 $\mu$ Vrms (-108dBV)
- Gain adjustment (OTP): -4dB~11dB with 0.5dB/Step
- Frequency response: 20Hz~20kHz
- Bias voltage: 6V~15.5V with 0.3V/Step
- Working temperature: -40°C~85°C

### ◆ Functional block diagram



### ◆ Package

- KGD



### ◆ Application



Cellphone



PAD products

# NSC6360: Digital PDM Output MEMS Microphone Signal Conditioning Chip

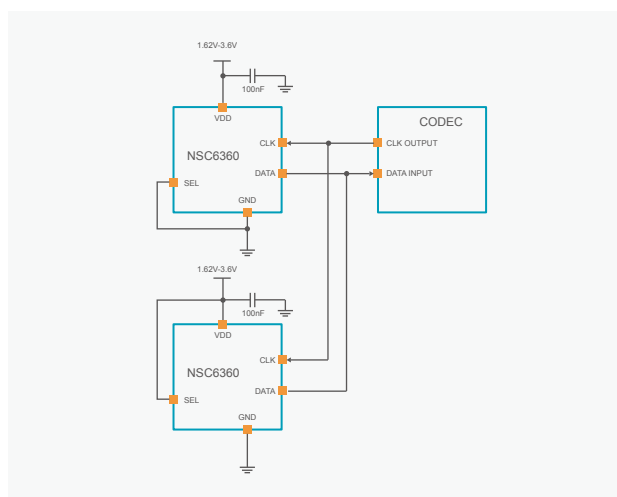
## ◆ Product introduction

The NSC6360 is a PDM output preamplifier for MEMS digital microphones. The chip integrates a low noise bias circuit for MEMS microphones and a high performance analog pre-amplifier circuit to provide high quality audio signal output and high flexibility for MEMS microphones. The built-in OTP is adjustable for bias and gain, so the NSC6360 supports MEMS microphone sensors with different parameters for better sensitivity consistency. Customers can integrate the chip into the MEMS digital microphone chip for audio signal conditioning. The NSC6360 chip has an extremely low startup and wake time of 20ms, programmable gain bias voltage, and left and right channel polarity. The NSC6360 supports dynamic current adjustment based on the input clock frequency, so it can be used in different power modes. The operating voltage of the chip ranges from 1.6V to 3.6V, and its operating modes include sleep mode, low voltage mode and normal mode.

## ◆ Product feature

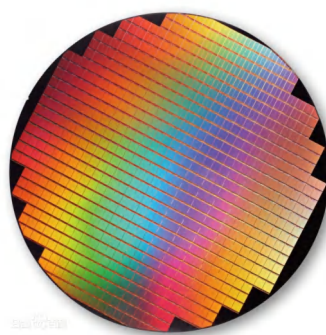
- Working voltage: 1.6V~3.6V
- Working mode: sleep mode, low voltage mode, and normal mode
- Current drain: 300μA @768kHz, 750uA@2.4MHz
- Equivalent input noise: 4.5μVrms (-107dBV)
- Gain adjustment (OTP): 9dB ~ 17dBFS with 0.6dB/Step
- Bias voltage: 7.6V ~ 15.9V with 1.18V/Step
- Working temperature: -40°C ~ 85°C

## ◆ Functional block diagram



## ◆ Package

- KGD



## ◆ Application



Laptop



Cellphone



Smart speaker

## NSC6362: Digital PDM Output MEMS Microphone Signal Conditioning Chip

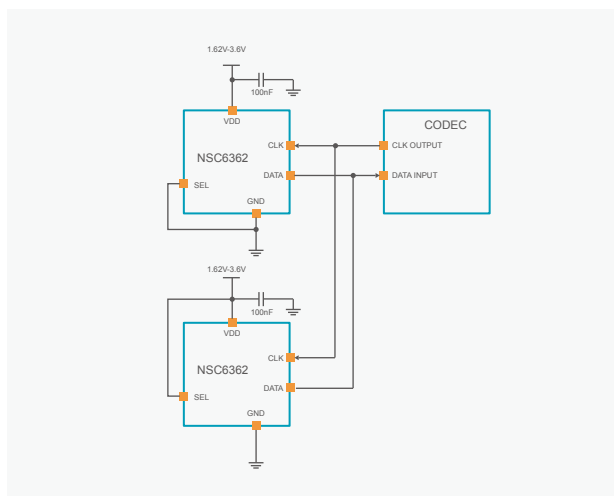
### ◆ Product introduction

The NSC6362 is a PDM output preamplifier for MEMS digital microphones. The chip integrates a low noise bias circuit for MEMS microphones and a high-performance analog pre-amplifier circuit to provide high quality audio signal output and high flexibility for MEMS microphones. The built-in OTP is adjustable for bias voltage and gain, so the NSC6362 supports MEMS microphone sensors with different parameters for better sensitivity consistency. Customers can integrate the chip into the MEMS digital microphone chip for audio signal conditioning. The NSC6362 chip has an extremely low startup and wake time of 20ms, programmable gain, bias voltage and left and right channel polarity. The NSC6362 supports dynamic current adjustment based on the input clock frequency, so it can be used in different power modes. The operating voltage of the chip ranges from 1.62V to 3.6V, and its operating modes include sleep mode, low voltage mode and normal mode.

### ◆ Product feature

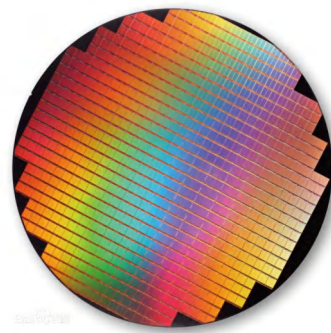
- Working voltage: 1.62V~3.6V
- Working mode: sleep mode, low voltage mode, and normal mode
- Current drain: 330μA @768kHz, 780uA@2.4MHz
- Equivalent input noise: 3μVrms (-110dBV)
- Gain adjustment (OTP): 0dB~23dBFS with 0.5dB/Step
- Bias voltage: 7.5V~19.2V with 1.3V/Step
- Working temperature: -40°C~85°C

### ◆ Functional block diagram



### ◆ Package

- KGD



### ◆ Application



Laptop



Cellphone



Smart speaker

## NSC6364: I2S Interface Digital MEMS Microphone Signal Conditioning Chip

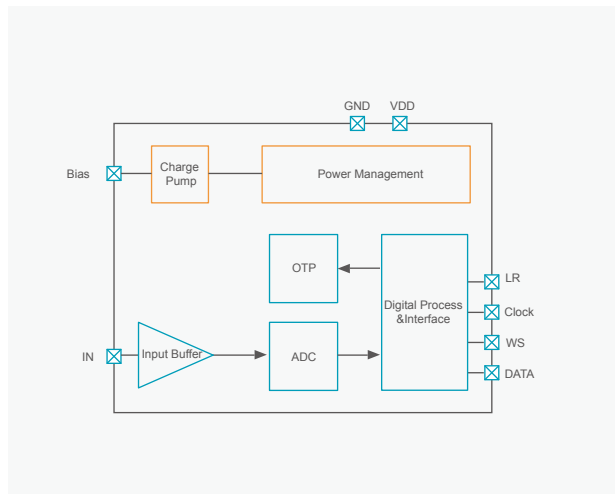
### ◆ Product introduction

NSC6364 is an I2S interface silicon microphone conditioning chip for wearable devices, smart home appliances and the Internet of Things. Depending on specific MEMS microphones, the SNR can reach more than 63dB, and it has sleep, low power consumption and performance modes to meet the needs of Always Listening to the system in real time. Compared with the traditional PDM interface silicon microphone +ADC solution, this product can significantly reduce the system cost and power consumption of acoustic acquisition channel.

### ◆ Product feature

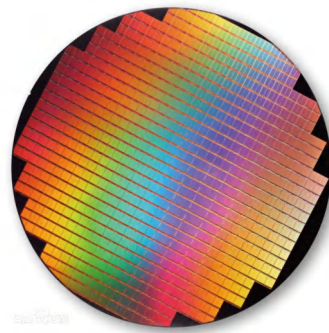
- I2S output, SNR up to 67dB
- Operating voltage range: 1.65V~3.6V
- Ultra-low power consumption
- BIAS adjustable, 4.7V~12.7V
- Analog gain adjustable, 4.9dB~+15.7dB
- Digital gain adjustable, -1.9dB~+3.8dB
- Grain size, 600um x 900um
- HBM ESD, ±4kV
- Operating temperature, -40°C~85°C
- Three working modes: Sleep, low power consumption and performance
- Good RF resistance

### ◆ Functional block diagram



### ◆ Package

- KGD



### ◆ Application



Wearables



Remote control



IoT



Intelligence  
appliance



Game  
machine



## Infrared PIR Sensor Signal Conditioning Chip

| Part number | Probe fitting mode | Output mode                      | Product feature                                                   | Package | Temperature range | Supply voltage/ current | Start (minimum) trigger threshold | Product sub-material No. / Order No. | Output mode        | Typical application                                   |
|-------------|--------------------|----------------------------------|-------------------------------------------------------------------|---------|-------------------|-------------------------|-----------------------------------|--------------------------------------|--------------------|-------------------------------------------------------|
| NSA3166     | External type      | Digital out-put/switching output | Register configuration for judging the threshold and opening time | DFN8    | -40~85°C          | 1.6V~4.5V /6μA          | 50μV                              | NSA3166_C DNR                        | Digital and Binary | Smart lighting/Smart doorbell Smart security (camera) |



## Infrared PIR Sensor Signal Conditioning Chip



|                                          |                                              |                                            |                                          |                               |                                                          |                                          |
|------------------------------------------|----------------------------------------------|--------------------------------------------|------------------------------------------|-------------------------------|----------------------------------------------------------|------------------------------------------|
| MEMS Microphone Signal Conditioning Chip | Infrared PIR Sensor Signal Conditioning Chip | Thermopile Sensor Signal Conditioning Chip | Magnetic Sensor Signal Conditioning Chip | Industrial and Automotive SoC | General Signal Chain                                     |                                          |
|                                          |                                              |                                            |                                          |                               |                                                          |                                          |
| Temperature Sensor & Humidity Sensor     | MEMS Pressure Sensor                         | Integrated Current Sensor                  | Linear Hall Current Sensor               | Magnetic Position Sensor      | Industrial Pressure Transmitter Signal Conditioning Chip | Pressure Sensor Signal Conditioning Chip |

# Thermopile Sensor Signal Conditioning Chip



## NSA3300: Thermopile Sensor Signal Conditioning Chip

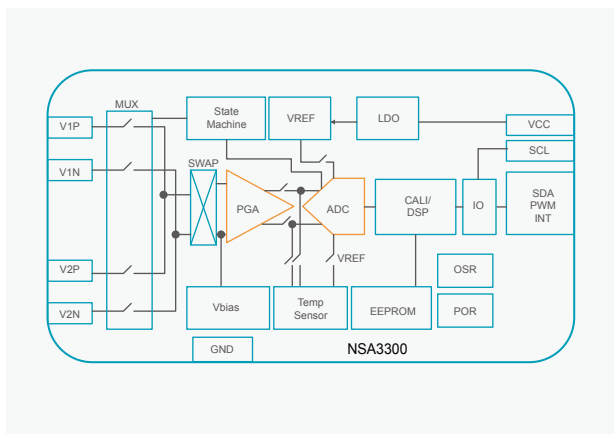
### ◆ Product introduction

NSA3300 is a signal conditioning chip for thermopile sensor, which is mainly used to interface thermopile sensor and convert the sensor output into digital. The internal digital engine can automatically calculate the voltage output of the thermopile sensor into temperature value. Based on the data of the LUT which is programmed by the user, the end customer can directly read the temperature value through the I<sup>2</sup>C interface from the IC. The chip has low-noise instrument amplifier PGA, 24bit  $\Sigma$ - $\Delta$  ADC and DSP calibration algorithm. It can measure the target temperature within the range of -70 °C to 380 °C and meet the accuracy error of 1% in the whole temperature range, accuracy of  $\pm 0.2^{\circ}\text{C}$  in the range of 35 °C to 42 °C for human body temperature measurement, and the highest resolution of 0.01 °C/LSB. The chip also can support ADC raw data to be readout without any DSP processing. The internal ambient temperature sensor on the chip can offer a high precision temperature measurement within  $\pm 0.2^{\circ}\text{C}$  error in the range between 0~40 °C. The NSA3300 supports two differential signal inputs and has four working modes: continuous single-channel sensor and ambient temperature combined output, continuous dual-channel sensor and ambient temperature combined output, continuous dual-channel sensor output, and sleep mode. In the dual-channel application scenario, the application is mainly NDIR.

### ◆ Product feature

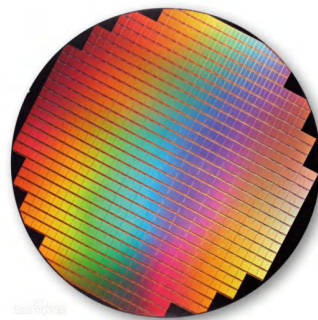
- High-precision signal amplification PGA, adjustable gain from 8x to 128x, and equivalent input noise less than 3 $\mu\text{V}_{\text{rms}}$
- Integrated high-precision temperature sensor, with accuracy up to  $\pm 0.2^{\circ}\text{C}$  in room temperature range from 0 °C to 40 °C
- Built-in EEPROM for 32-point LUT input, with digital linear interpolation between two points
- Support client sensor post-calibration, with sensitivity, offset and non-linearity compensation
- Support direct I<sup>2</sup>C reading of the target temperature, which can be configured as the temperature binary output mode
- Low power consumption, with sleep current of 5 $\mu\text{A}$
- Wafer-level supply, with small die size: 1mm x 1.5mm

### ◆ Functional block diagram



### ◆ Package

- KGD



### ◆ Application





# Magnetic Sensor Signal Conditioning Chip



## NSA5312: Magnetic Sensor Signal Conditioning Chip/Programmable Instrumentation Amplifier

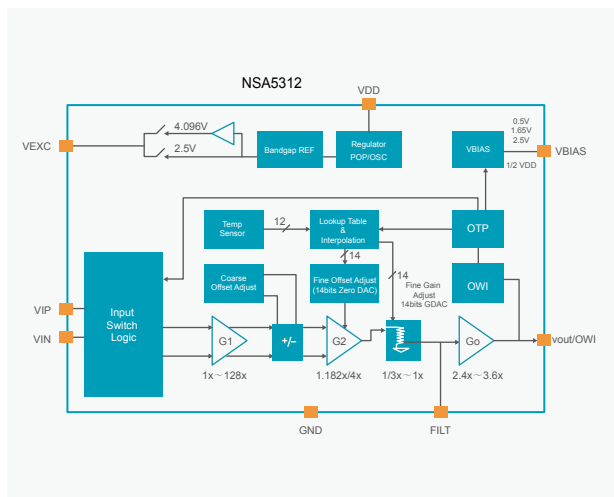
### ◆ Product introduction

The NSA5312 is a user programmable instrumentation amplifier. It is mainly used to provide voltage type drive signal for Wheatstone bridge sensors (such as TMR sensors), and amplify, calibrate and compensate the output signal to ensure that the sensor can get high linear output accuracy in a wide temperature range.

### ◆ Product feature

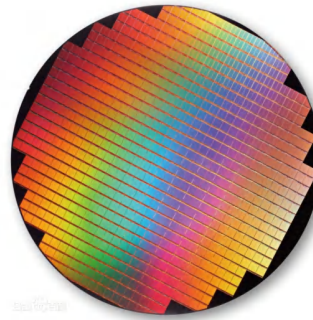
- Provide 2.5V / 4.096V voltage excitation
- Provide 0.9456~1843x programmable gain setting
- Provide 14-bit sensor sensitivity and offset calibration
- Provide sensor temperature calibration based on lookup table
- Programmable output signal bandwidth, with maximum signal bandwidth is about 600kHz
- Fast response time <1μs
- Proportional output and fixed output are available. The output reference voltage is available in 0.5V/1.65V/2.5V.
- Provide user programmable interface OWI, and support customer module level post-calibration

### ◆ Functional block diagram



### ◆ Package

- KGD



### ◆ Application



Current sensor module



Pressure sensor module



Industrial transmitter



# Industrial and Automotive SoC





## NSUC1610: Embedded Motor Driver SoC for Automotive Electronic Actuators

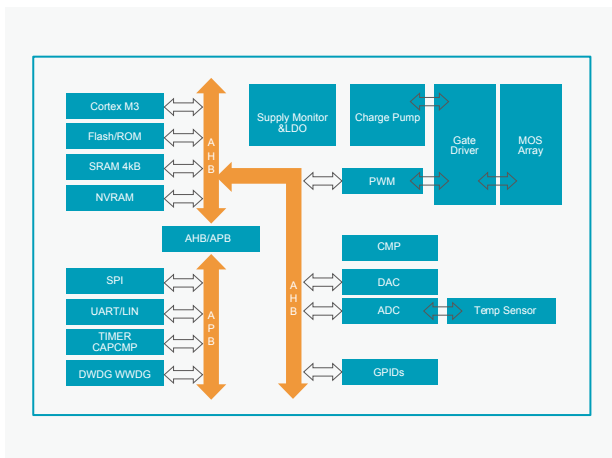
### ◆ Product introduction

NSUC1610 is an integrated drive and 4-way half-bridge microcontroller, mainly used to control low-power DC motor, can support the drive of DC brush motor, DC brushless motor, stepper motor, etc., widely used in new energy vehicles. The chip adopts advanced high temperature and high voltage process, the maximum temperature can be supported to 175°C, the maximum voltage withstand to 40V, and has overvoltage protection function, LIN port can support -40V~40V, BVDD pin can support -0.3~40V. The chip uses the ARM Cortex-M3 core, which uses separate data buses and address buses to improve the efficiency of fetching instructions and data.

### ◆ Product feature

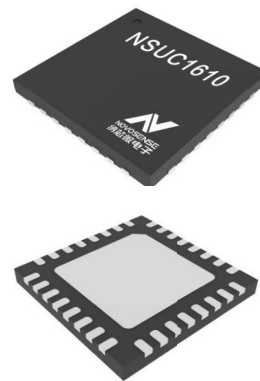
- Cortex M3 processor, the compiler environment uses Keil standard compiler and development tools, common programmer resources, easy development and debugging
- Car battery 12V direct power supply, chip power supply can withstand 40V short-term overvoltage
- Integrated power level MOSFETs (4 half-bridges), drive current up to 1A (500mOhm R<sub>ds(on)</sub>), integrated the corresponding gate drive and high-end MOSFET drive required charge pump power supply
- Integrated configurable DAC to configure comparator thresholds for overcurrent protection and microstep control of stepper motors
- and the LIN interface meets the requirements of  $\pm 40V$  over-voltage. In addition, there is a GPIO that can support high voltage (12V), which is convenient for customers to use high voltage PWMIO directly to do motor control
- Dual temperature sensor: one on the power side for overtemperature shutdown, and the other on the low-voltage side for chip temperature detection
- Wafer junction temperature up to 175°C meets the vehicle Grade 0 application target

### ◆ Functional block diagram



### ◆ Package

- QFN32 5mm×5mm



### ◆ Application



# General Signal Chain





## Series Voltage References

| Part number               | Package  | Qualification | Operating Voltage | Operating Temperature | Output Voltage | Initial Accuracy | Drift (Max.) | Noise (uVpp) | Noise (uVpp)   | Status               |
|---------------------------|----------|---------------|-------------------|-----------------------|----------------|------------------|--------------|--------------|----------------|----------------------|
| <a href="#">NSREF3140</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 4.0V           | 0.20%            | 15           | 33           | NSREF3140-DSTR | Active and preferred |
| <a href="#">NSREF3133</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 3.3V           | 0.20%            | 15           | 33           | NSREF3133-DSTR | Active and preferred |
| <a href="#">NSREF3130</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 3.0V           | 0.20%            | 15           | 28           | NSREF3130-DSTR | Active and preferred |
| <a href="#">NSREF3125</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 2.5V           | 0.20%            | 15           | 22           | NSREF3125-DSTR | Active and preferred |
| <a href="#">NSREF3120</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 2.0V           | 0.20%            | 15           | 19           | NSREF3120-DSTR | Active and preferred |
| <a href="#">NSREF3112</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 1.2V           | 0.20%            | 15           | 9            | NSREF3112-DSTR | Active and preferred |
| <a href="#">NSREF3040</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 4.0V           | 0.20%            | 35           | 33           | NSREF3040-DSTR | Active and preferred |
| <a href="#">NSREF3033</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 3.3V           | 0.20%            | 35           | 30           | NSREF3033-DSTR | Active and preferred |
| <a href="#">NSREF3030</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 3.0V           | 0.20%            | 35           | 28           | NSREF3030-DSTR | Active and preferred |
| <a href="#">NSREF3025</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 2.5V           | 0.20%            | 35           | 22           | NSREF3025-DSTR | Active and preferred |
| <a href="#">NSREF3020</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 2.0V           | 0.20%            | 35           | 19           | NSREF3020-DSTR | Active and preferred |
| <a href="#">NSREF3012</a> | SOT23-3L | Industrial    | 1.8V~5.5V         | -40 C~125 C           | 1.2V           | 0.20%            | 35           | 9            | NSREF3012-DSTR | Active and preferred |

## NSREF30/31xx: High-precision, Low-tempco, Low-noise, Low-power Voltage Reference

### ◆ Product introduction

The NSREF30/31XX is a family of precision, low power, low dropout, series voltage references available in the tiny 3-pin SOT-23 package. The NSREF30XX offers 0.2% initial accuracy, 35 ppm/°C max tempco. The NSREF31XX offers 0.2% initial accuracy, 15 ppm/°C max tempco.

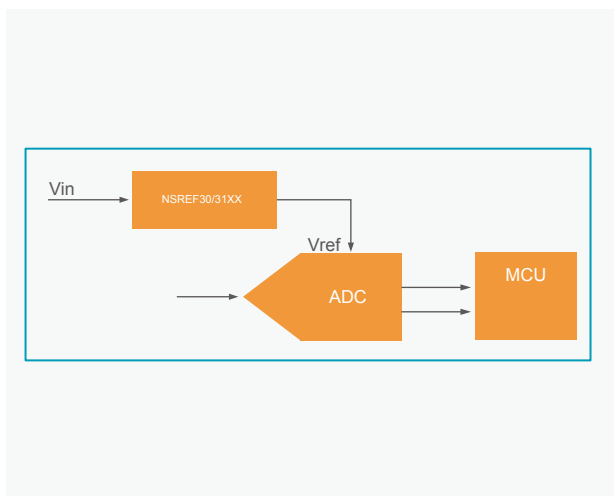
The NSREF30/31XX does not require a load capacitor, yet is stable with capacitive loads and load and can sink or source up to  $\pm 10$  mA of output current, can operate on supplies down to 1 mV above the output voltage. and output only 20  $\mu$ Vpp noise (2.5V version), and consume only 130  $\mu$ A. All models are specified for the wide temperature range of -40°C to +125°C, and could offer both industry and auto grade versions.

The NSREF30/31XX family is widely used in solar, digital power, industry sensor and control system, portable battery power system.

### ◆ Product feature

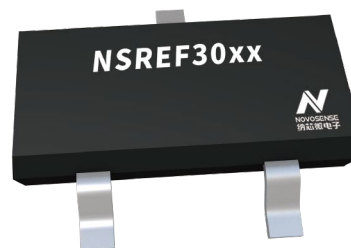
- Auto and industry grade
- Supply voltage: 1.8V~5.5V
- Low dropout voltage: 1mV
- Initial accuracy: 0.2%
- temp drift: NSREF31xx---5ppm/°C Type, 15ppm/°C Max, NSREF30xx---10ppm/°C Type, 35ppm/°C Max
- Output Noise@2.5V: 20 $\mu$ Vpp
- Quiescent Current @2.5V : 140  $\mu$ A
- Line regulation @2.5V :20ppm/V
- Load regulation:3ppm/mA(source) ; 9ppm/mA(sink)
- -40°C to 125° C

### ◆ Functional block diagram



### ◆ Package

- SOT23-3



### ◆ Application



Industry automation



Field instruments



Solar/UPS/BMS



Smart grid



Portable Instruments



Medical



# General Purpose Operational Amplifiers

| Part number | Package         | Number of channel | Operating Voltage | Operating Temperature | I <sub>q</sub> (typ at 25 °C) (μA) | Input common mode Voltage range | Output voltage range |
|-------------|-----------------|-------------------|-------------------|-----------------------|------------------------------------|---------------------------------|----------------------|
| NSOPA8011   | SOT23-5, SC70-5 | 1                 | 1.8~5.5           | -40 °C~125 °C         | 77                                 | Rail to Rail                    | Rail to Rail         |
| NSOPA8012   | SOP8, MSOP8     | 2                 | 1.8~5.5           | -40 °C~125 °C         | 77                                 | Rail to Rail                    | Rail to Rail         |
| NSOPA8014   | SOP14, TSSOP14  | 4                 | 1.8~5.5           | -40 °C~125 °C         | 77                                 | Rail to Rail                    | Rail to Rail         |
| NSOPA8011Q  | SOT23-5, SC70-5 | 1                 | 1.8~5.5           | -40 °C~125 °C         | 77                                 | Rail to Rail                    | Rail to Rail         |
| NSOPA8012Q  | SOP8, MSOP8     | 2                 | 1.8~5.5           | -40 °C~125 °C         | 77                                 | Rail to Rail                    | Rail to Rail         |
| NSOPA8014Q  | SOP14, TSSOP14  | 4                 | 1.8~5.5           | -40 °C~125 °C         | 77                                 | Rail to Rail                    | Rail to Rail         |
| NSOPA8051   | SOT23-5, SC70-5 | 1                 | 1.8~5.5           | -40 °C~125 °C         | 380                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8052   | SOP8, MSOP8     | 1                 | 1.8~5.5           | -40 °C~125 °C         | 380                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8054   | SOP14, TSSOP14  | 1                 | 1.8~5.5           | -40 °C~125 °C         | 380                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8051Q  | SOT23-5, SC70-5 | 1                 | 1.8~5.5           | -40 °C~125 °C         | 380                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8052Q  | SOP8, MSOP8     | 1                 | 1.8~5.5           | -40 °C~125 °C         | 380                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8054Q  | SOP14, TSSOP14  | 1                 | 1.8~5.5           | -40 °C~125 °C         | 380                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8101   | SOT23-5, SC70-5 | 1                 | 1.8~5.5           | -40 °C~125 °C         | 680                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8102   | SOP8, MSOP8     | 2                 | 1.8~5.5           | -40 °C~125 °C         | 680                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8104   | SOP14, TSSOP14  | 4                 | 1.8~5.5           | -40 °C~125 °C         | 680                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8101Q  | SOT23-5, SC70-5 | 1                 | 1.8~5.5           | -40 °C~125 °C         | 680                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8102Q  | SOP8, MSOP8     | 2                 | 1.8~5.5           | -40 °C~125 °C         | 680                                | Rail to Rail                    | Rail to Rail         |
| NSOPA8104Q  | SOP14, TSSOP14  | 4                 | 1.8~5.5           | -40 °C~125 °C         | 680                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9011   | SOT23-5, SC70-5 | 1                 | 2.7~40            | -40 °C~125 °C         | 140                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9012   | SOP8, MSOP8     | 2                 | 2.7~40            | -40 °C~125 °C         | 140                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9014   | SOP14, TSSOP14  | 4                 | 2.7~40            | -40 °C~125 °C         | 140                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9011Q  | SOT23-5, SC70-5 | 1                 | 2.7~40            | -40 °C~125 °C         | 140                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9012Q  | SOP8, MSOP8     | 2                 | 2.7~40            | -40 °C~125 °C         | 140                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9014Q  | SOP14, TSSOP14  | 4                 | 2.7~40            | -40 °C~125 °C         | 140                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9051   | SOT23-5, SC70-5 | 1                 | 2.7~40            | -40 °C~125 °C         | 540                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9052   | SOP8, MSOP8     | 2                 | 2.7~40            | -40 °C~125 °C         | 540                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9054   | SOP14, TSSOP14  | 4                 | 2.7~40            | -40 °C~125 °C         | 540                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9051Q  | SOT23-5, SC70-5 | 1                 | 2.7~40            | -40 °C~125 °C         | 540                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9052Q  | SOP8, MSOP8     | 2                 | 2.7~40            | -40 °C~125 °C         | 540                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9054Q  | SOP14, TSSOP14  | 4                 | 2.7~40            | -40 °C~125 °C         | 540                                | Rail to Rail                    | Rail to Rail         |
| NSOPA9101   | SOT23-5, SC70-5 | 1                 | 2.7~40            | -40 °C~125 °C         | 2500                               | Rail to Rail                    | Rail to Rail         |
| NSOPA9102   | SOP8, MSOP8     | 2                 | 2.7~40            | -40 °C~125 °C         | 2500                               | Rail to Rail                    | Rail to Rail         |
| NSOPA9104   | SOP14, TSSOP14  | 4                 | 2.7~40            | -40 °C~125 °C         | 2500                               | Rail to Rail                    | Rail to Rail         |
| NSOPA9101Q  | SOT23-5, SC70-5 | 1                 | 2.7~40            | -40 °C~125 °C         | 2500                               | Rail to Rail                    | Rail to Rail         |
| NSOPA9102Q  | SOP8, MSOP8     | 2                 | 2.7~40            | -40 °C~125 °C         | 2500                               | Rail to Rail                    | Rail to Rail         |
| NSOPA9104Q  | SOP14, TSSOP14  | 4                 | 2.7~40            | -40 °C~125 °C         | 2500                               | Rail to Rail                    | Rail to Rail         |

| Vos<br>(max at 25°C)(mV) | dVos/dT<br>(typ)( $\mu$ V/C) | IB<br>(typ at 25°C) (pA) | PSRR<br>(typ at 25°C) (dB) | CMRR<br>(typ at 25°C) (dB) | f=10kHz,en<br>(nV/srHz) | GBP (MHz) | Slew rate<br>(V/ $\mu$ s) | Isc(mA)(source)<br>at 25°C typ |
|--------------------------|------------------------------|--------------------------|----------------------------|----------------------------|-------------------------|-----------|---------------------------|--------------------------------|
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 22                      | 1.5       | 2                         | 63                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 22                      | 1.5       | 2                         | 63                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 22                      | 1.5       | 2                         | 63                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 22                      | 1.5       | 2                         | 63                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 22                      | 1.5       | 2                         | 63                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 22                      | 1.5       | 2                         | 63                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 15                      | 5         | 10                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 15                      | 5         | 10                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 15                      | 5         | 10                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 15                      | 5         | 10                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 15                      | 5         | 10                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 15                      | 5         | 10                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 10                      | 10        | 15                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 10                      | 10        | 15                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 10                      | 10        | 15                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 10                      | 10        | 15                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 10                      | 10        | 15                        | 43                             |
| 0.55                     | 0.7                          | 5                        | 104                        | 89                         | 10                      | 10        | 15                        | 43                             |
| 2.3                      | 3                            | 15                       | 120                        | 90                         | 22                      | 1         | 2                         | 55                             |
| 2.3                      | 3                            | 15                       | 120                        | 90                         | 22                      | 1         | 2                         | 55                             |
| 2.3                      | 3                            | 15                       | 120                        | 90                         | 22                      | 1         | 2                         | 55                             |
| 2.3                      | 3                            | 15                       | 120                        | 90                         | 22                      | 1         | 2                         | 55                             |
| 2.3                      | 3                            | 15                       | 120                        | 90                         | 22                      | 1         | 2                         | 55                             |
| 2.3                      | 3                            | 15                       | 120                        | 90                         | 22                      | 1         | 2                         | 55                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 6         | 11                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 6         | 11                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 6         | 11                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 6         | 11                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 6         | 11                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 6         | 11                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 10        | 30                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 10        | 30                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 10        | 30                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 10        | 30                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 10        | 30                        | 85                             |
| 1.2                      | 0.5                          | 15                       | 120                        | 90                         | 10                      | 10        | 30                        | 85                             |

## NSOPA901x/NSOPA901xQ: High Voltage General Purpose Operational Amplifiers

### ◆ Product introduction

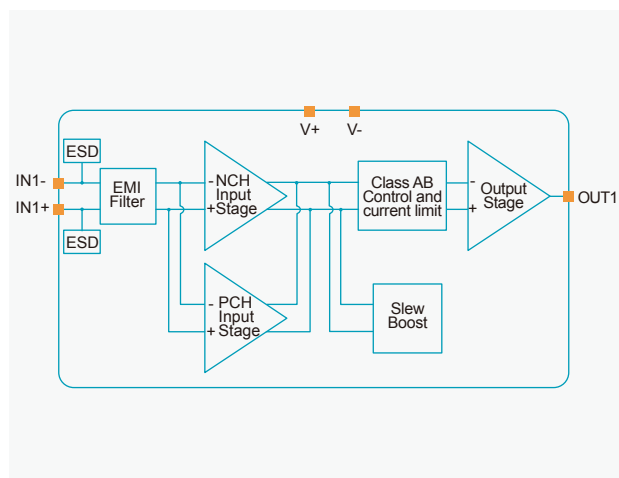
The NSOPA901x/NSOPA901xQ series is a family of high voltage (40 V) general purpose operational amplifiers. These devices offer exceptional DC precision and AC performance, including rail-to-rail input/output, low offset ( $\pm 200 \mu\text{V}$ , typical), low offset drift ( $\pm 3 \mu\text{V}/^\circ\text{C}$ , typical), low noise ( $10.5 \text{ nV}/\sqrt{\text{Hz}}$  and  $6 \mu\text{VPP}$ ), and 6MHz bandwidth.

The NSOPA901x family of op amps is available in standard packages (SOT-23, MSOP, SOP, and TSSOP), and is specified from  $-40^\circ\text{C}$  to  $125^\circ\text{C}$ .

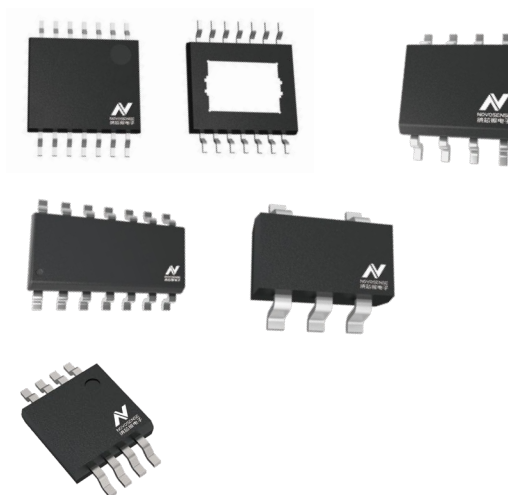
### ◆ Product feature

- Wide supply:  $\pm 1.35 \text{ V}$  to  $\pm 20 \text{ V}$ ,  $2.7 \text{ V}$  to  $40 \text{ V}$
- Low offset voltage:  $400 \mu\text{V}$  typ.
- Low offset voltage drift:  $\pm 3 \mu\text{V}/^\circ\text{C}$  typ.
- Low quiescent current:  $140 \mu\text{A}$  per amplifier
- Unity-gain stable
- AEC-Q100 qualified for automotive applications
- Gain-bandwidth product:  $1 \text{ MHz}$
- Slew rate:  $2 \text{ V}/\mu\text{s}$  typ.
- Robust EMIRR performance: EMI/RFI filters on input and supply pins
- Differential and common-mode input voltage range to supply rail pulse-friendly/comparator inputs 1 Amplifier operates with differential inputs up to supply rail 2 Amplifier can be used in open-loop or as comparator
- Extended temperature range:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Multiplexed data-acquisition systems



Test and measurement equipment



ADC driver amplifiers



SAR ADC reference buffers



Programmable logic controllers



High-side and low-side current sensing

## NSOPA905x/NSOPA905xQ: High Voltage General Purpose Operational Amplifiers

### ◆ Product introduction

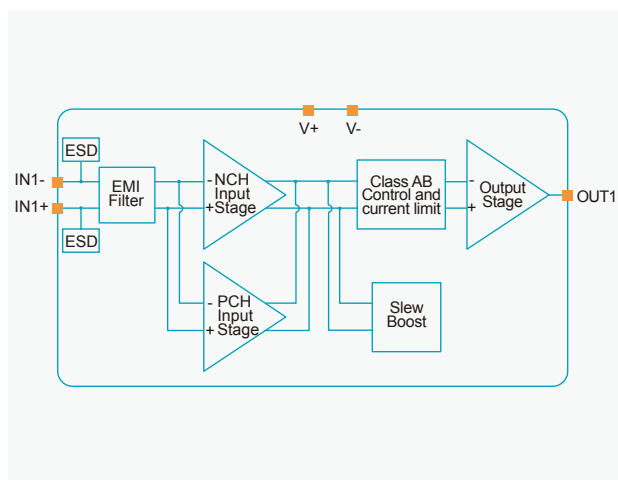
The NSOPA905x/NSOPA905xQ series is a family of high voltage (40 V) general purpose operational amplifiers. These devices offer exceptional DC precision and AC performance, including rail-to-rail input/output, low offset ( $\pm 200 \mu\text{V}$ , typical), low offset drift ( $\pm 0.5 \mu\text{V}/^\circ\text{C}$ , typical), low noise ( $10.5 \text{ nV}/\sqrt{\text{Hz}}$  and  $6 \mu\text{VPP}$ ), and 6MHz bandwidth.

The NSOPA905x family of op amps is available in standard packages (SOT-23, MSOP, SOP, and TSSOP), and is specified from  $-40^\circ\text{C}$  to  $125^\circ\text{C}$ .

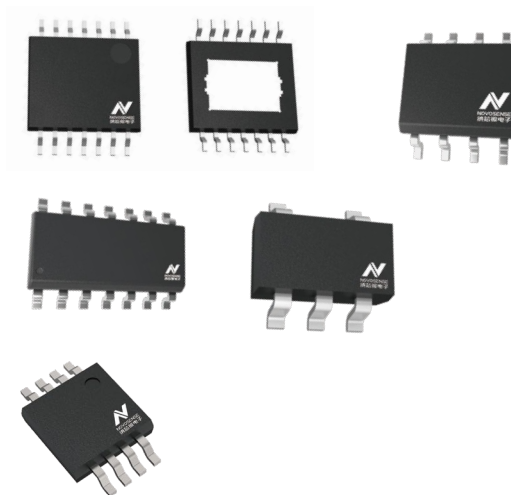
### ◆ Product feature

- Wide supply:  $\pm 1.35 \text{ V}$  to  $\pm 20 \text{ V}$ ,  $2.7 \text{ V}$  to  $40 \text{ V}$
- Low offset voltage:  $200 \mu\text{V}$  typ
- Low offset voltage drift:  $\pm 0.5 \mu\text{V}/^\circ\text{C}$  typ
- Low quiescent current:  $600 \mu\text{A}$  per amplifier
- Unity-gain stable
- AEC-Q100 qualified for automotive applications
- Gain-bandwidth product:  $5 \text{ MHz}$
- High slew rate:  $12 \text{ V}/\mu\text{s}$  typ
- Robust EMIRR performance: EMI/RFI filters on input and supply pins
- Differential and common-mode input voltage range to supply rail pulse-friendly/comparator inputs 1 Amplifier operates with differential inputs up to supply rail 2 Amplifier can be used in open-loop or as comparator
- Extended temperature range:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Multiplexed data-acquisition systems



Test and measurement equipment



ADC driver amplifiers



SAR ADC reference buffers



Programmable logic controllers



High-side and low-side current sensing

## NSOPA910x/NSOPA910xQ: High Voltage General Purpose Operational Amplifiers

### ◆ Product introduction

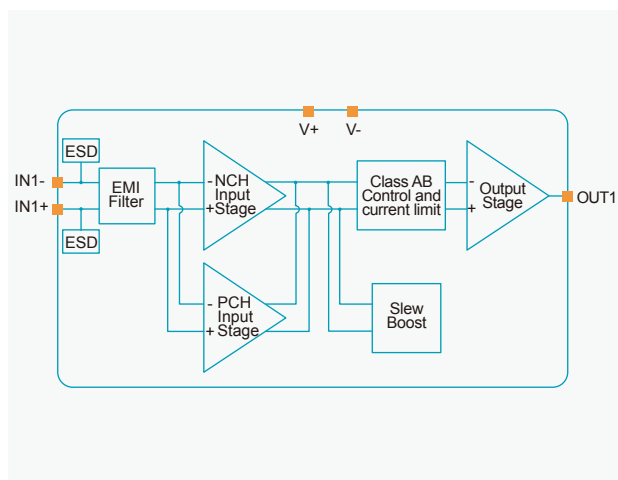
The NSOPA910x/NSOPA910xQ series is a family of high voltage (40 V) general purpose operational amplifiers. These devices offer exceptional DC precision and AC performance, including rail-to-rail input/output, low offset ( $\pm 200 \mu\text{V}$ , typical), low offset drift ( $\pm 0.5 \mu\text{V}/^\circ\text{C}$ , typical), low noise ( $10.5 \text{ nV}/\sqrt{\text{Hz}}$  and  $6 \mu\text{VPP}$ ), and 6MHz bandwidth.

The NSOPA910x of op amps is available in standard packages (SOT-23, MSOP, SOP, and TSSOP), and is specified from  $-40^\circ\text{C}$  to  $125^\circ\text{C}$ .

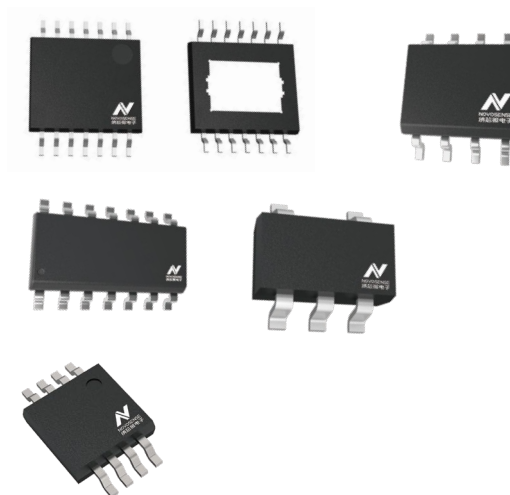
### ◆ Product feature

- Wide supply:  $\pm 1.35 \text{ V}$  to  $\pm 20 \text{ V}$ ,  $2.7 \text{ V}$  to  $40 \text{ V}$
- Low offset voltage:  $200 \mu\text{V}$  typ
- Low offset voltage drift:  $\pm 0.5 \mu\text{V}/^\circ\text{C}$  typ
- Quiescent current:  $2.5 \text{ mA}$  per amplifier
- Unity-gain stable
- AEC-Q100 qualified for automotive applications
- Gain-bandwidth product:  $10 \text{ MHz}$
- High slew rate:  $30 \text{ V}/\mu\text{s}$  typ
- Robust EMIRR performance: EMI/RFI filters on input and supply pins
- Differential and common-mode input voltage range to supply rail Pulse-friendly/comparator inputs 1 Amplifier operates with differential inputs up to supply rail 2 Amplifier can be used in open-loop or as comparator
- Extended temperature range:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Multiplexed data-acquisition systems



Test and measurement equipment



ADC driver amplifiers



SAR ADC reference buffers



Programmable logic controllers



High-side and low-side current sensing



## NSOPA801x/NSOPA801xQ: Low Voltage, General Purpose, Low-power Operational Amplifiers

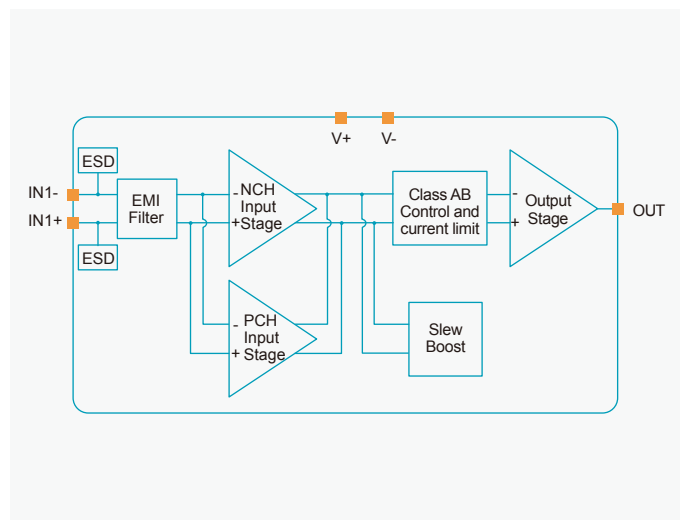
### ◆ Product introduction

The NSOPA801x/NSOPA801xQ series is a low voltage (1.8 V to 5.5 V), general purpose, low-power operational amplifiers (op amps) with rail-to-rail input and output swing capabilities. These op amps provide a cost-effective solution for low-voltage operation and high capacitive-load drive are required. The capacitive-load drive of the NSOPA801x/NSOPA801xQ series is 1nF, and the resistive open-loop output impedance makes stabilization easier with much higher capacitive loads. The robust design of the NSOPA801x/NSOPA801xQ series simplifies circuit design. The op amps feature unity-gain stability, an integrated RFI and EMI rejection filter, and no-phase reversal in overdrive conditions. Micro-size packages, such as SC70-5, along with industry-standard packages such as SOT23-5L, SOP, MSOP, and TSSOP packages.

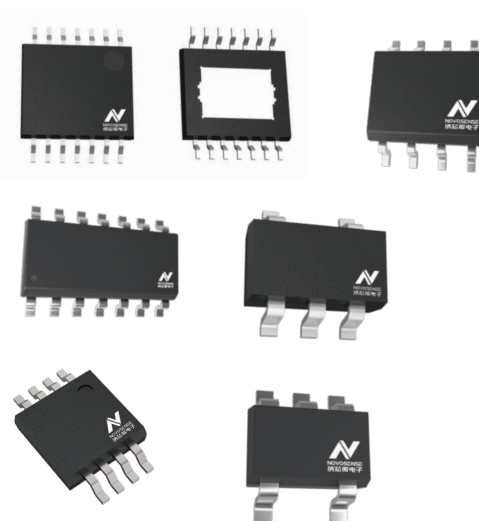
### ◆ Product feature

- Supply voltage range: 1.8V to 5.5V
- Rail-to-rail input and output
- Low input offset voltage:  $\pm 0.55$  mV (typical)
- Gain-bandwidth product: 1.5 MHz
- Unity-gain stable
- Low broadband noise: 22 nV/ $\sqrt{\text{Hz}}$  (typical)
- Low input bias current: 5 pA (typical)
- Low quiescent current: 78  $\mu\text{A}/\text{Ch}$  (typical)
- Internal RFI and EMI filter
- Extended temperature range:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Sensor signal conditioning



Power Delivery: UPS/ Power module/Solar



Inverter/Servo/ PLC/Motor driver



Low-side current sensing



ASIC Input or Output Amplifiers

## NSOPA805x/NSOPA805xQ: Low Voltage, General Purpose, Low-power Operational Amplifiers

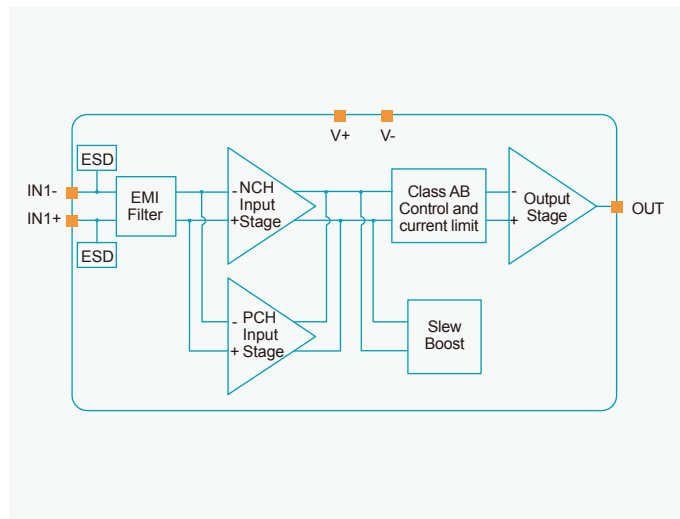
### ◆ Product introduction

The NSOPA805x/NSOPA805xQ series is a low voltage (1.8 V to 5.5 V), general purpose, low-power operational amplifiers (op amps) with rail-to-rail input and output swing capabilities. These op amps provide a cost-effective solution for low-voltage operation and high capacitive-load drive are required. The capacitive-load drive of the NSOPA805x/NSOPA805xQ series is 1nF, and the resistive open-loop output impedance makes stabilization easier with much higher capacitive loads. The robust design of the NSOPA805x/NSOPA805xQ series simplifies circuit design. The op amps feature unity-gain stability, an integrated RFI and EMI rejection filter, and no-phase reversal in overdrive conditions. Micro-size packages, such as SC70-5, along with industry-standard packages such as SOT23-5L, SOP, MSOP, and TSSOP packages.

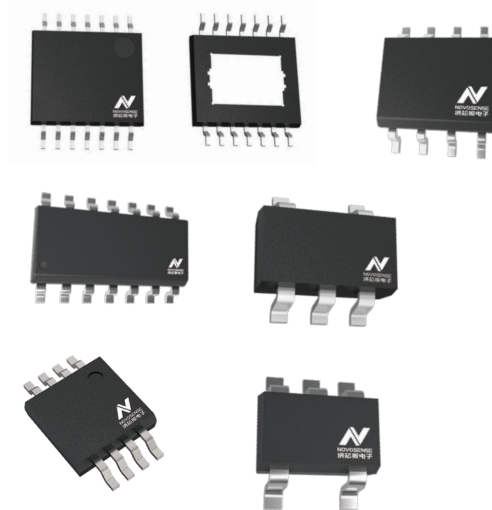
### ◆ Product feature

- Supply voltage range: 1.8V to 5.5V
- Rail-to-rail input and output
- Low input offset voltage:  $\pm 0.5$  mV (typical)
- Gain-bandwidth product: 5 MHz
- Unity-gain stable
- Low broadband noise: 15 nV/ $\sqrt{\text{Hz}}$  (typical)
- Low input bias current: 5 pA (typical)
- Low quiescent current: 380  $\mu\text{A}/\text{Ch}$  (typical)
- Internal RFI and EMI filter
- Extended temperature range:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Sensor signal conditioning



Power Delivery: UPS/  
Power module/Solar



Inverter/Servo/  
PLC/Motor driver



Low-side current sensing



ASIC Input or  
Output Amplifiers

## NSOPA810x/NSOPA810Q: Low Voltage, General Purpose, Low-power Operational Amplifiers

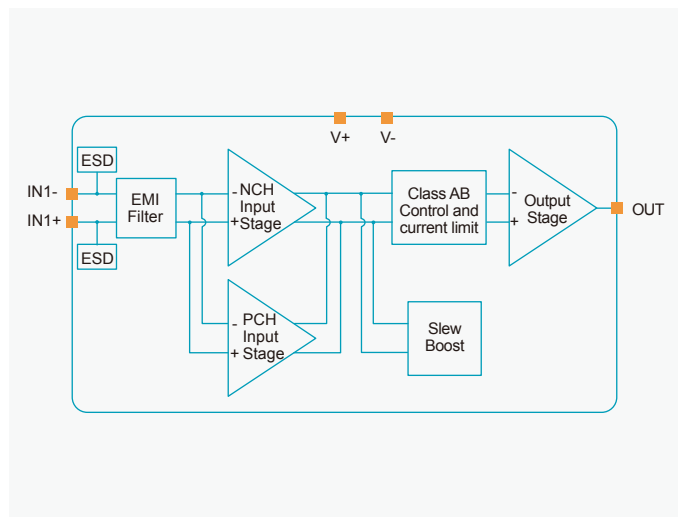
### ◆ Product introduction

The NSOPA810x/NSOPA810Q series is a low voltage (1.8 V to 5.5 V), general purpose, low-power operational amplifiers (op amps) with rail-to-rail input and output swing capabilities. These op amps provide a cost-effective solution for low-voltage operation and high capacitive-load drive are required. The capacitive-load drive of the NSOPA810x/NSOPA810Q series is 1nF, and the resistive open-loop output impedance makes stabilization easier with much higher capacitive loads. The robust design of the NSOPA810x/NSOPA810Q series simplifies circuit design. The op amps feature unity-gain stability, an integrated RFI and EMI rejection filter, and no-phase reversal in overdrive conditions. Micro-size packages, such as SC70-5, along with industry-standard packages such as SOT23-5L, SOP, MSOP, and TSSOP packages.

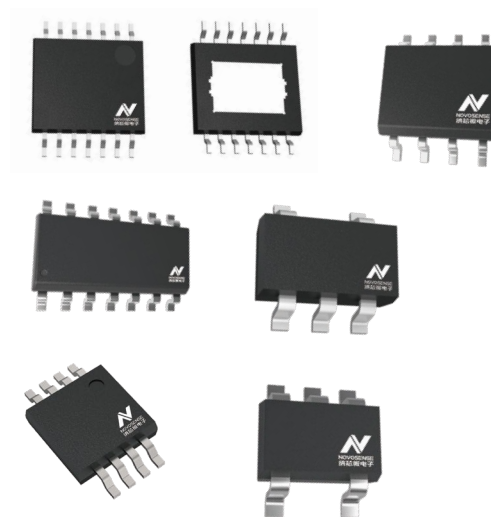
### ◆ Product feature

- Supply voltage range: 1.8V to 5.5V
- Rail-to-rail input and output
- Low input offset voltage:  $\pm 0.3$  mV (typical)
- Gain-bandwidth product: 10 MHz
- Unity-gain stable
- Low broadband noise: 10 nV/ $\sqrt{\text{Hz}}$  (typical)
- Low input bias current: 5 pA (typical)
- Low quiescent current: 680  $\mu\text{A}/\text{Ch}$  (typical)
- Internal RFI and EMI filter
- Extended temperature range:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Sensor signal conditioning



Power Delivery: UPS/Power module/Solar



Inverter/Servo/PLC/Motor driver



Low-side current sensing



ASIC Input or Output Amplifiers

## NSOPA240x Automotive Operational Amplifier with High Current Output for Resolver Drive

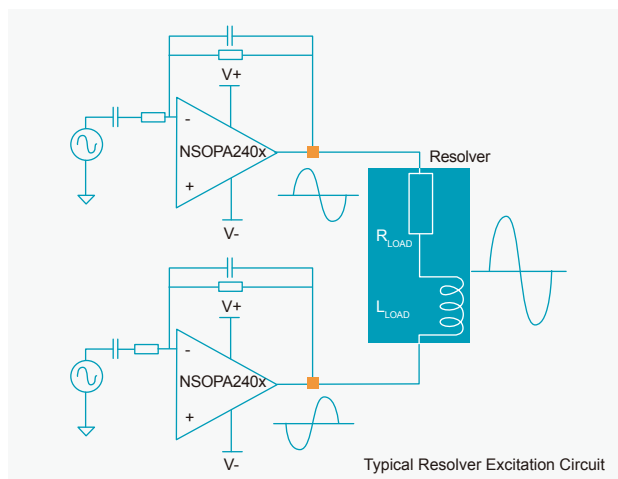
### ◆ Product introduction

The NSOPA2401/NSOPA2402 are single/dual CMOS operational amplifiers combined full swing input and output. Current limiting and over temperature detection enhance overall system robustness when driving analog signals over wires that are susceptible to faults. It outputs typically up to 400mA of peak-to-peak current to drive low resistance load including inductance load such as angle resolver, lineout cable and piezo actuator. In addition, it has enhanced RF noise immunity.

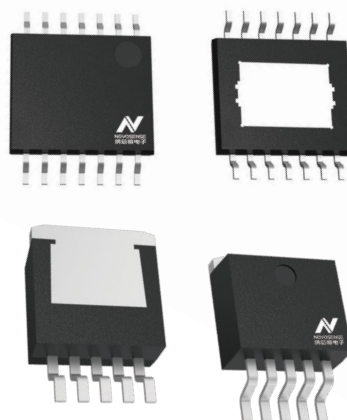
### ◆ Product feature

- AEC Q-100 Qualified for Grade 1: TA from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- Low offset voltage: 0.6 mV (typical)
- High output current drive: 400mA, continuous
- Wide power supply voltage range: 4.5V to 36V
- Over temperature shutdown
- Output current limit
- Over current alarm (NSOPA2402 only)
- Shutdown pin for low Iq application
- 9.5MHz gain bandwidth with 7.5V/ $\mu\text{s}$  slew rate
- Internal RF/EMI filter
- Package: 14-pin HTSSOP, 5-pin TO252

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



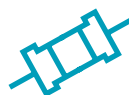
Resolver-based automotive applications



Inverter and motor control



Motor driver



Linear power booster



Servo drive power stage module

## NSOPA084 36V General-purpose Operational Amplifiers

### ◆ Product introduction

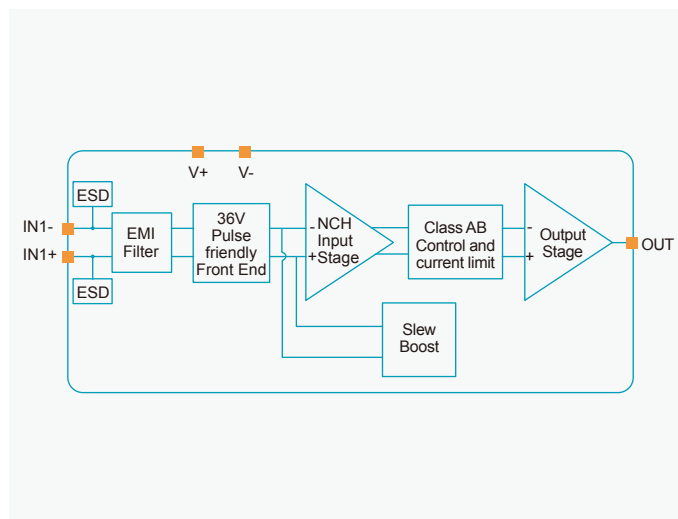
The NSOPA084 provide industry-leading performance over TL084 devices.

These devices provide outstanding value for cost-sensitive applications, with features including low offset (0.5mV, typical), high slew rate (30V/μs), and common-mode input to the positive supply. High ESD (2kV, HBM), integrated EMI and RF filters, and operation across the full -40°C to 125°C enable the NSOPA084 devices to be used in the most rugged and demanding applications.

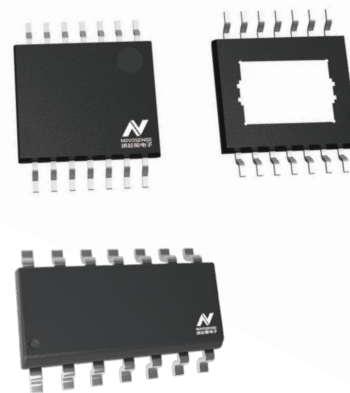
### ◆ Product feature

- High slew rate: 30 V/μs typ
- Unity-gain bandwidth: 6 MHz
- Low offset voltage: 0.5 mV typ
- Low offset voltage drift: 1 μV/°C typ
- Low power consumption: 650 μA/ch typ
- High common-mode rejection (CMRR): 109 dB
- Wide common-mode and differential voltage ranges
- Common-mode input voltage range includes V+
- Low input bias and offset currents
- Low noise:  $e_n = 15 \text{ nV}/\sqrt{\text{Hz}}$  (typ) at 10 kHz
- Output short-circuit protection
- Low total harmonic distortion: -105 dB typ
- Pulse friendly/comparator input
- Amplifier can be used in open-loop or as comparator
- Wide supply voltage: ±2.25 V to ±18 V, 4.5 V to 36 V
- RoHS and REACH Compliance

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



General-purpose  
amplification



Power control and  
monitoring



Active filters



Industrial/  
process control



Data acquisition



# Current Sense Amplifier

| Part number  | Input Common Mode Voltage Min (V) | Input Common Mode Voltage Max (V) | VCC (V) | Vos (max at 25°C) (mV) | dVos/dT (typ)( $\mu$ V/C) | Gain (V/V)     | Gain Error (max at 25°C) (%) | Gain drift (Typ) (ppm/°C%) | CMRR (Typ) (dB) | GBP (kHz)                                              | Slew Rate (V/ $\mu$ s) | Package        | Features      |
|--------------|-----------------------------------|-----------------------------------|---------|------------------------|---------------------------|----------------|------------------------------|----------------------------|-----------------|--------------------------------------------------------|------------------------|----------------|---------------|
| NSCSA240Ax   | -4                                | 80                                | 2.7~5.5 | 25                     | 0.06                      | 20,50,100,200  | 0.1                          | 2                          | 135             | 600 @ G=20<br>550 @ G=50<br>500 @ G=100<br>450 @ G=200 | 4                      | SOP8<br>TSSOP8 | PWM rejection |
| NSCSA240Ax-Q | -4                                | 80                                | 2.7~5.5 | 25                     | 0.06                      | 20,50,100,200  | 0.1                          | 2                          | 135             | 600 @ G=20<br>550 @ G=50<br>500 @ G=100<br>450 @ G=200 | 4                      | SOP8<br>TSSOP8 | PWM rejection |
| NSCSA285Ax   | 3                                 | 76                                | 3~5.5   | 12                     | 0.15                      | 12.5,20,50,100 | 0.2                          | 20                         | 140             | 90                                                     | 0.6                    | MSOP8          | Dual channel  |

## NSCSA240 Current Sense Amplifier

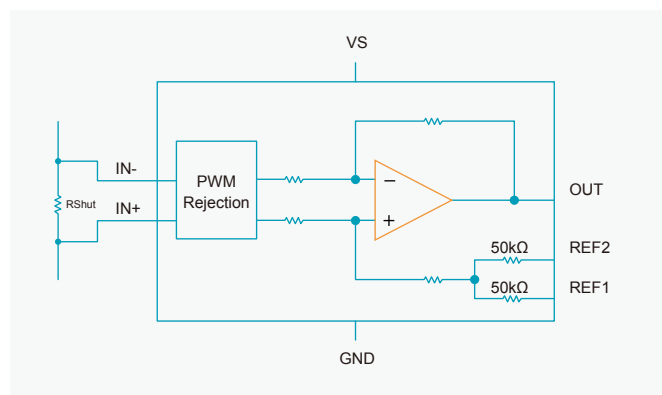
## ◆ Product introduction

The NSCSA240 is a high-precision, bidirectional current sense amplifier that can measure voltage drops across shunt resistors over a wide common mode range from  $-4\text{ V}$  to  $80\text{ V}$ , independent of the supply voltage. The high-precision current measurement is achieved through a combination of low offset voltage ( $\pm 5\text{ }\mu\text{V}$  typical), small gain error (0.05%, typical) and a high DC CMRR (135 dB, typical). The NSCSA240 is designed for high voltage, bidirectional measurements in switching systems that see large common-mode voltage transients at the device's inputs. The enhanced PWM rejection circuitry inside the NSCSA240 ensures minimal signal disturbance at the output due to the common mode voltage transitions at the input.

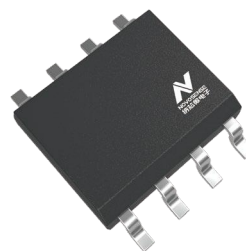
### ◆ Product feature

- Operating Temperature Range:  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Enhanced PWM Rejection
- Wide Common-Mode Range:  $-4\text{ V}$  to  $80\text{ V}$
- GBW:  $450\sim 600\text{kHz}$
- Excellent CMRR:
  - 135-dB DC CMRR (Typical)
  - 90-dB AC CMRR at  $50\text{ kHz}$
- Accuracy:
  - Gain Error:  $0.05\%$  (Typical)
  - Offset Voltage:  $\pm 5\mu\text{V}$  (Typical)
- Gain Options:
  - NSCSA240A1:  $20\text{ V/V}$
  - NSCSA240A2:  $50\text{ V/V}$
  - NSCSA240A3:  $100\text{ V/V}$
  - NSCSA240A4:  $200\text{ V/V}$
- AEC-Q100 qualified for automotive applications

### ◆ Functional block diagram



## ◆ Package



## ◆ Application



Power supply unit



## Motor controls



Solar inverter



Telecom Equipment



Domain Controller



# Analog-to-digital Converters (ADC)

| Part number | Features                                                     | Input Channels | REF Channels | Input Voltage Range (V) | AVDD (V) | Internal reference accuracy (%) | Internal reference temperature drift (ppm/°C) | INL (ppmFS)                           | Gain Error (% of FSR)                     | Gain Drift (ppm/°C) | Programmable Gain | Package |
|-------------|--------------------------------------------------------------|----------------|--------------|-------------------------|----------|---------------------------------|-----------------------------------------------|---------------------------------------|-------------------------------------------|---------------------|-------------------|---------|
| NSAD1249    | High precision, 24-Bit, ADC with Internal Reference and IDAC | 12             | 3            | AVSS ~ AVDD             | 3 ~ 5    | 0.02                            | 3                                             | 5 @ gain = 1~16<br>10 @ Gain = 32~128 | 0.01 @ gain = 1~16<br>0.1 @ Gain = 64~128 | 2                   | 1~128             | TSSOP28 |
| NSAD1248    | High precision, 24-Bit, ADC with Internal Reference and IDAC | 8              | 3            | AVSS ~ AVDD             | 3 ~ 5    | 0.02                            | 3                                             | 5 @ gain = 1~16<br>10 @ Gain = 32~128 | 0.01 @ gain = 1~16<br>0.1 @ Gain = 64~128 | 2                   | 1~128             | TSSOP28 |
| NSAD1247    | High precision, 24-Bit, ADC with Internal Reference and IDAC | 4              | 2            | AVSS ~ AVDD             | 3 ~ 5    | 0.02                            | 3                                             | 5 @ gain = 1~16<br>10 @ Gain = 32~128 | 0.01 @ gain = 1~16<br>0.1 @ Gain = 64~128 | 2                   | 1~128             | TSSOP20 |
| NSAD1246    | High precision, 24-Bit, ADC with Internal Reference          | 2              | 1            | AVSS ~ AVDD             | 3 ~ 5    | 0.02                            | 3                                             | 5 @ gain = 1~16<br>10 @ Gain = 32~128 | 0.01 @ gain = 1~16<br>0.1 @ Gain = 64~128 | 2                   | 1~128             | TSSOP16 |
| NSAD1148    | High precision, 24-Bit, ADC with Internal Reference and IDAC | 8              | 3            | AVSS ~ AVDD             | 3 ~ 5    | 0.1                             | 3                                             | 5 @ gain = 1~16<br>10 @ Gain = 32~128 | 0.01 @ gain = 1~16<br>0.1 @ Gain = 64~128 | 2                   | 1~128             | TSSOP28 |
| NSAD1147    | High precision, 24-Bit, ADC with Internal Reference and IDAC | 8              | 3            | AVSS ~ AVDD             | 3 ~ 5    | 0.1                             | 3                                             | 5 @ gain = 1~16<br>10 @ Gain = 32~128 | 0.01 @ gain = 1~16<br>0.1 @ Gain = 64~128 | 2                   | 1~128             | TSSOP20 |
| NSAD1146    | High precision, 16-Bit, ADC with Internal Reference          | 8              | 3            | AVSS ~ AVDD             | 3 ~ 5    | 0.1                             | 3                                             | 5 @ gain = 1~16<br>10 @ Gain = 32~128 | 0.01 @ gain = 1~16<br>0.1 @ Gain = 64~128 | 2                   | 1~128             | TSSOP16 |

## NSAD1148/NSAD1147/NSAD1146: 16-bit, Delta-Sigma( $\Delta$ - $\Sigma$ ), Analog-to-Digital Converters (ADCs)

### ◆ Product introduction

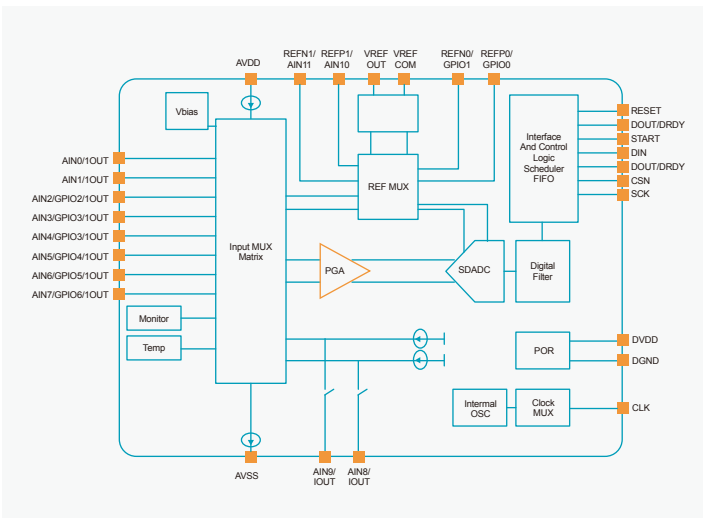
The NSAD1148/NSAD1147/NSAD1146 are low power, low noise, 16-bit, delta-sigma( $\Delta$ - $\Sigma$ ), analog-to-digital converters (ADCs). The device contains a capacitive programmable gain amplifier (capacitive PGA), with gains of 1, 2, 4, 8, 16, 32, 64 and 128, which allows to achieve rail-to-rail common-mode input range for all gains. These ADCs feature configurable digital filters with low latency conversion and can achieve 50 Hz and 60 Hz simultaneous rejections.

The NSAD114x family have high level of integration. The device integrates a high accuracy, low-drift, 2.048-V bandgap reference, two independent programmable excitation current sources (IDACs) which allow for RTD excitation. supports up to 12 inputs that can be connected to PGA in any combination for design flexibility. In addition, these devices include features such as sensor burn-out detection, biasing voltage for thermocouple, internal temperature sensor and up to 8 general-purpose I/Os.

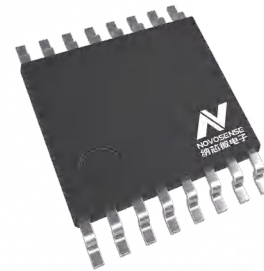
### ◆ Product feature

- Integrated capacitive PGA with programmable gain (1 to 128), achieves rail-to-rail input range for all gains
- Low-latency (single cycle settling) filter options
- Simultaneous 50Hz and 60Hz rejection at data rate 2.5Hz, 5Hz, 10Hz, 20Hz in low-latency filter option
- Two independent internal excitation current source with range 50uA to 1500uA
- Internal 2.048V bandgap reference with  $\pm 0.02\%$  initial accuracy and 3 ppm/ $^{\circ}\text{C}$  temperature drift
- Internal 4.096MHz oscillator with  $\pm 1\%$  Accuracy
  - Internal Temperature Sensor with  $\pm 1\%$  accuracy
  - System monitors
- Self offset and system calibration
- Up to 8 general-purpose I/Os
- Analog Supply: Unipolar (3~5 V) or Bipolar ( $\pm 1.5 \sim \pm 2.5$  V)
- Digital Supply: 3 V to 3.6 V

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Temperature measurement  
(RTD, Thermocouples)



Pressure measurement



Factory Automation and  
Industrial process control



Instrumentation



## NSAD1249/NSAD1248/NSAD1247/NSAD1246 24-bit, Delta-Sigma( $\Delta\Sigma$ ), Analog-to-Digital Converters (ADCs)

### ◆ Product introduction

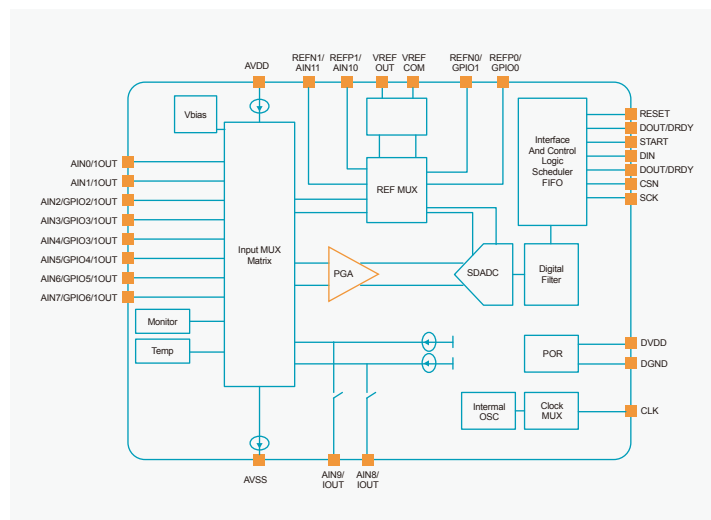
The NSAD1249/NSAD1248/NSAD1247/NSAD1246 are low power, low noise, 24-bit, delta-sigma( $\Delta\Sigma$ ), analog-to-digital converters (ADCs). The device contains a capacitive programmable gain amplifier (capacitive PGA), with gains of 1, 2, 4, 8, 16, 32, 64 and 128, which allows to achieve rail-to-rail common-mode input range for all gains. These ADCs feature configurable digital filters with low-latency conversion and can achieve 50 Hz and 60 Hz simultaneous rejections.

The NSAD124x family have high level of integration. The device integrates a high accuracy, low-drift, 2.048-V bandgap reference, two independent programmable excitation current sources (IDACs) which allow for RTD excitation. supports up to 12 inputs that can be connected to PGA in any combination for design flexibility. In addition, these devices include features such as sensor burn-out detection, biasing voltage for thermocouple, reference monitor, PGA rail detection circuits, internal temperature sensor and up to 8 general-purpose I/Os.

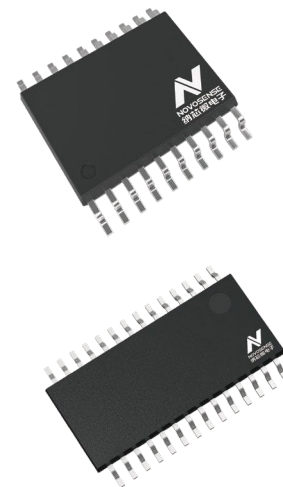
### ◆ Product feature

- Integrated capacitive PGA with programmable gain (1 to 128), achieves rail-to-rail input range for all gains
- SINC3 and low-latency (single cycle settling) filter options
- Simultaneous 50Hz and 60Hz rejection at data rate 2.5Hz, 5Hz, 10Hz, 20Hz in low-latency filter option
- Two independent internal excitation current source with range 10uA to 2000uA
- Internal 2.048V bandgap reference with  $\pm 0.02\%$  initial accuracy and 3 ppm/ $^{\circ}\text{C}$  temperature drift
- Internal 4.096MHz oscillator with  $\pm 1\%$  Accuracy
- Internal Temperature Sensor with  $\pm 1\%$  accuracy
- System monitors and fault detection circuits
- Self offset and system calibration
- Up to 8 general-purpose I/Os
- SPI interface with optional CRC
- Analog Supply: Unipolar (3~5 V) or Bipolar ( $\pm 1.5\sim\pm 2.5$  V)
- Digital Supply: 3 V to 3.6 V

### ◆ Functional block diagram



### ◆ Package



### ◆ Application



Temperature measurement  
(RTD, Thermocouples)



Pressure measurement



Factory Automation and  
Industrial process control



Instrumentation

# Isolated RS-485 Transceiver

| NSI8038x Series Isolated RS-485 Transceiver |           |        |                    |     |                     |              |                 |                                  |              |
|---------------------------------------------|-----------|--------|--------------------|-----|---------------------|--------------|-----------------|----------------------------------|--------------|
|                                             | Part No.  | Duplex | ISO Rating (kVrms) | ESD | Max DataRate (Mbps) | No. of Nodes | Isolation Grade | Operating Temperature Range (°C) | Package Type |
| RS-485                                      | NSI83085E | Half   | 5                  | 16  | 0.5                 | 256          | Reinforced      | -40~105                          | SOW-16       |
|                                             | NSI83086E | Full   | 5                  | 16  | 16                  | 256          | Reinforced      | -40~105                          | SOW-16       |
|                                             | NIRS485   | Half   | 3                  | 8   | 1                   | 256          | Basic           | -40~105                          | SSOP-16      |



## NSI8308xE: Isolated Half-Duplex/Full-Duplex 485 Transceiver with High Reliability

### Product introduction

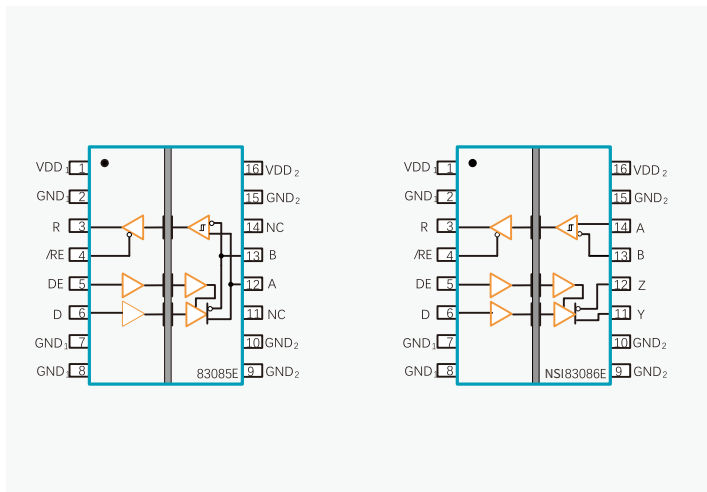
NSI8308xE is a family of isolated RS-485 transceivers based on NOVOSENSE digital isolated transceiver technology, where the NSI83085E is a half-duplex RS-485 transceiver and the NSI83086E is a full-duplex RS-485 transceiver. Both devices are safety certified by UL1577 support 5kVrms insulation withstand voltages, and feature low emission, low power consumption and high immunity to electromagnetic interference. The BUS pins on the BUS side of the NSI83086E is designed with  $\pm 10\text{kV}$  ESD protection to ground at system level. This product is designed with a fail-safe circuit that ensures the receiver output is logic high when the receiver input is disconnected or shorted. It features a receiver input impedance of 1/8 unit load, allowing up to 256 transceivers to be connected to the BUS.

The data rate of NSI83085E is 12Mbps, and the data rate of NSI83086E is 16Mbps, and the products reduce EMI and reflection by optimizing the slew rate.

### Product feature

- Dielectric strength 5000Vrms
- Up to 5000Vrms Insulation voltage
- VDD1 supply voltage: 2.5V to 5.5V
- High CMTI:  $\pm 150\text{kV}/\mu\text{s}$
- High system level EMC performance:  
BUS pins conforming to IEC61000-4-2 $\pm 10\text{kV}$  ESD
- Fail-safe receiver
- Supporting 256 transceivers
- Isolation Barrier Life: >60 years
- Operating temperature:  $-40^{\circ}\text{C}$  to  $105^{\circ}\text{C}$
- RoHS compliant package: SOW-16

### Pinout & Package



### Application



Industrial  
automation system



Isolated 485  
communication system



Smart ammeters  
and water meters



Security and  
surveillance systems

|                                                    |                                                    |                   |                    |                    |                            |                            |                          |                       |
|----------------------------------------------------|----------------------------------------------------|-------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|-----------------------|
| Isolated RS-485 Transceiver                        | Isolated CAN Transceiver                           | Isolated FC       | FC Interface       | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Isolated Power Supply |
| Isolated 485 with Integrated Isolated Power Supply | Isolated CAN with Integrated Isolated Power Supply | Solid-State Relay | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator   |

## NIRS485: Cost-optimized Isolated 485 Transceiver

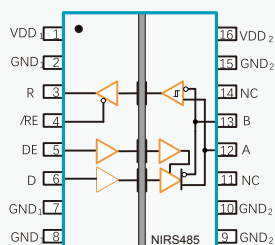
### ◆ Product introduction

NIRS485 is an isolated half-duplex RS-485 based on NOVOSENSE digital isolated transceiver technology. It is safety certified by UL1577 support 3kVrms insulation withstand voltages, and features low emission, low power consumption and high immunity to electromagnetic interference. The BUS pins on the BUS side of the NIRS485 is designed with  $\pm 8\text{kV}$  ESD protection to ground at system level. This device is designed with a fail-safe circuit that ensures the receiver output is logic high when the receiver input is disconnected or shorted. It features a receiver input impedance of 1/8 unit load, allowing up to 256 transceivers to be connected to the BUS. The data rate of NIRS485 is 1Mbps. The NIRS485 reduces EMI and reflections by optimizing the slew rate.

### ◆ Product feature

- Up to 3000Vrms Insulation voltage
- BUS side supply voltage: 3.0V to 5.5V
- VDD1 supply voltage: 2.5V to 5.5V
- High CMTI:  $\pm 100\text{kV}/\mu\text{s}$
- High system level EMC performance:  
BUS pins conforming to IEC61000-4-2 $\pm 8\text{kV}$  ESD
- Fail-safe receiver
- Supporting 256 transceivers
- Isolation Barrier Life: >60 years
- Operating temperature:  $-40^{\circ}\text{C}$  to  $105^{\circ}\text{C}$
- RoHS compliant package: SSOP-16

### ◆ Pinout & Package



### ◆ Application



Battery  
management system



Isolated 485  
communication system



Smart ammeters  
and water meters

|                                                    |                                                    |                   |                    |                    |                            |                            |                          |                                                        |
|----------------------------------------------------|----------------------------------------------------|-------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|--------------------------------------------------------|
| Isolated RS-485 Transceiver                        | Isolated CAN Transceiver                           | Isolated iC       | FC Interface       | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Digital Isolator with Integrated Isolated Power Supply |
| Isolated 485 with Integrated Isolated Power Supply | Isolated CAN with Integrated Isolated Power Supply | Solid-State Relay | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator                                    |



## Isolated CAN Transceiver

| NSI1050 isolated CAN transceiver |          |               |                    |         |                     |             |                   |                                  |              |
|----------------------------------|----------|---------------|--------------------|---------|---------------------|-------------|-------------------|----------------------------------|--------------|
|                                  | Part No. | Part No.      | ISO Rating (kVrms) | ESD(kV) | Max DataRate (Mbps) | No.of Nodes | Fail Safe         | Operating Temperature Range (°C) | Package Type |
| CAN                              | NSI1050  | NSI1050-DDBR  | 3                  | 8       | 1                   | 110         | Idle, Open, Short | -40~125                          | DUB-8        |
|                                  | NSI1050  | NSI1050-DSWR  | 5                  | 8       | 1                   | 110         | Idle, Open, Short | -40~125                          | SOW-16       |
|                                  | NSI1042  | NSI1042-DSWVR | 5                  | 8       | 5                   | 110         | Idle, Open, Short | -40~125                          | SOW-8        |
|                                  | NSI1042  | NSI1042-DSWR  | 5                  | 8       | 5                   | 110         | Idle, Open, Short | -40~125                          | SOW-16       |
|                                  | NSI1052  | NSI1052-DSWR  | 5                  | 8       | 5                   | 110         | Idle, Open, Short | -40~125                          | SOW-16       |

## Isolated CAN Transceiver





## NSI1050: High-Performance Isolated CAN Transceiver

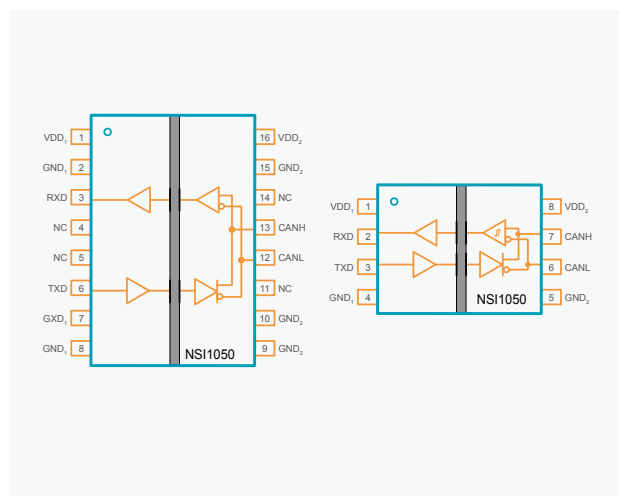
### ◆ Product introduction

NSI1050 is an isolated CAN transceiver that is fully compatible with ISO11898-2. NSI1050 integrates a two-channel digital isolator and a high-performance CAN transceiver. The digital isolator uses silicon oxide isolation based on NOVOSENSE capacitance isolation technology. Highly integrated solutions simplify system design and improve reliability. NSI1050 device is safety certified by UL1577 support 5kVrms insulation withstand voltages, and feature high electromagnetic immunity and low emission. NSI1050 supports data transmission rates of up to 1Mbps and can support at least 110 CAN nodes. NSI1050 is designed with thermal protection and transmission data dominant timeout protection.

### ◆ Product feature

- Fully compatible with ISO11898-2
- Up to 5000Vrms Insulation voltage
- Power supply voltage
  - VDD1: 2.5V to 5.5V
  - VDD2: 4.5V to 5.5V
- BUS protection voltage -40V to +40V
- Transmission data (TXD) dominant timeout protection
- Overcurrent and thermal protection
- Data transmission rates up to 1Mbps
- High CMTI: 100kV/μs
- Low loop delay: <220ns
- Enhanced system level ESD, EFT, surge immunity
- Operating temperature: -40°C to 125°C
- RoHS compliant package: SOW-16, DUB-8

### ◆ Pinout & Package



### ◆ Application



Industrial  
automation system



Isolated  
CAN BUS



Communication

|                                           |                                           |                   |                    |                    |                            |                            |                          |                                               |
|-------------------------------------------|-------------------------------------------|-------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|-----------------------------------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Solid-State Relay | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator                           |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply | Isolated iC       | iC Interface       | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Digital Isolator with Integrated Power Supply |

## NSI1042/1052: High-Performance Isolated CAN Transceiver

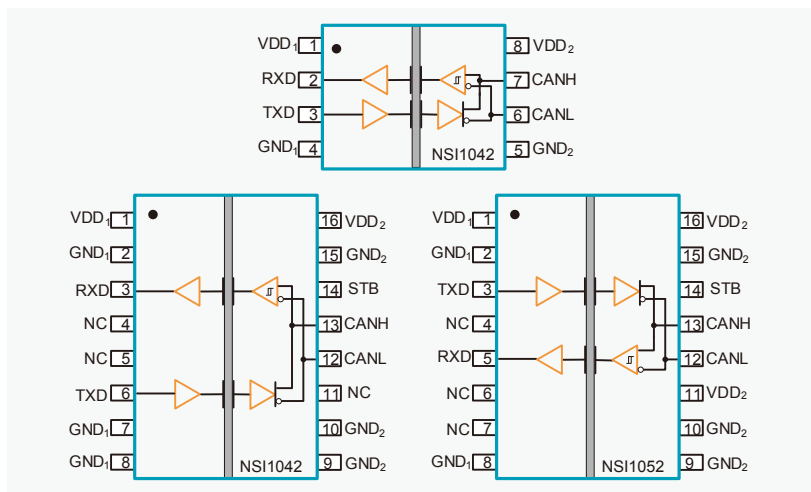
### ◆ Product introduction

NSI1042 is an isolated CAN transceiver that is fully compatible with ISO11898-2. NSI1042 integrates a two-channel digital isolator and a high-performance CAN transceiver. The digital isolator uses silicon oxide isolation based on NOVOSENSE capacitance isolation technology. Highly integrated solutions simplify system design and improve reliability. NSI1042 device is safety certified by UL1577 support 5kVrms insulation withstand voltages, and feature high electromagnetic immunity and low emission. NSI1042 supports CAN FD with data rate up to 5Mbps and can support at least 110 CAN nodes. NSI1042 is designed with thermal protection and transmission data dominant timeout protection.

### ◆ Product feature

- Fully compatible with ISO11898-2
- Up to 5000Vrms Insulation voltage
- Power supply voltage
- VDD1: 2.5V to 5.5V
- VDD2: 4.5V~5.5V
- BUS protection voltage -70V to +70V
- Overcurrent and thermal protection
- Communication rate up to 5Mbps
- High CMTI: 150kV /  $\mu$ s
- Low loop delay: <220ns
- Enhanced system level ESD, EFT, surge immunity
- Standby mode: NSI1052
- Operating temperature: -40°C to 125°C
- RoHS compliant package: SOW-8, SOW-16

### ◆ Pinout & Package

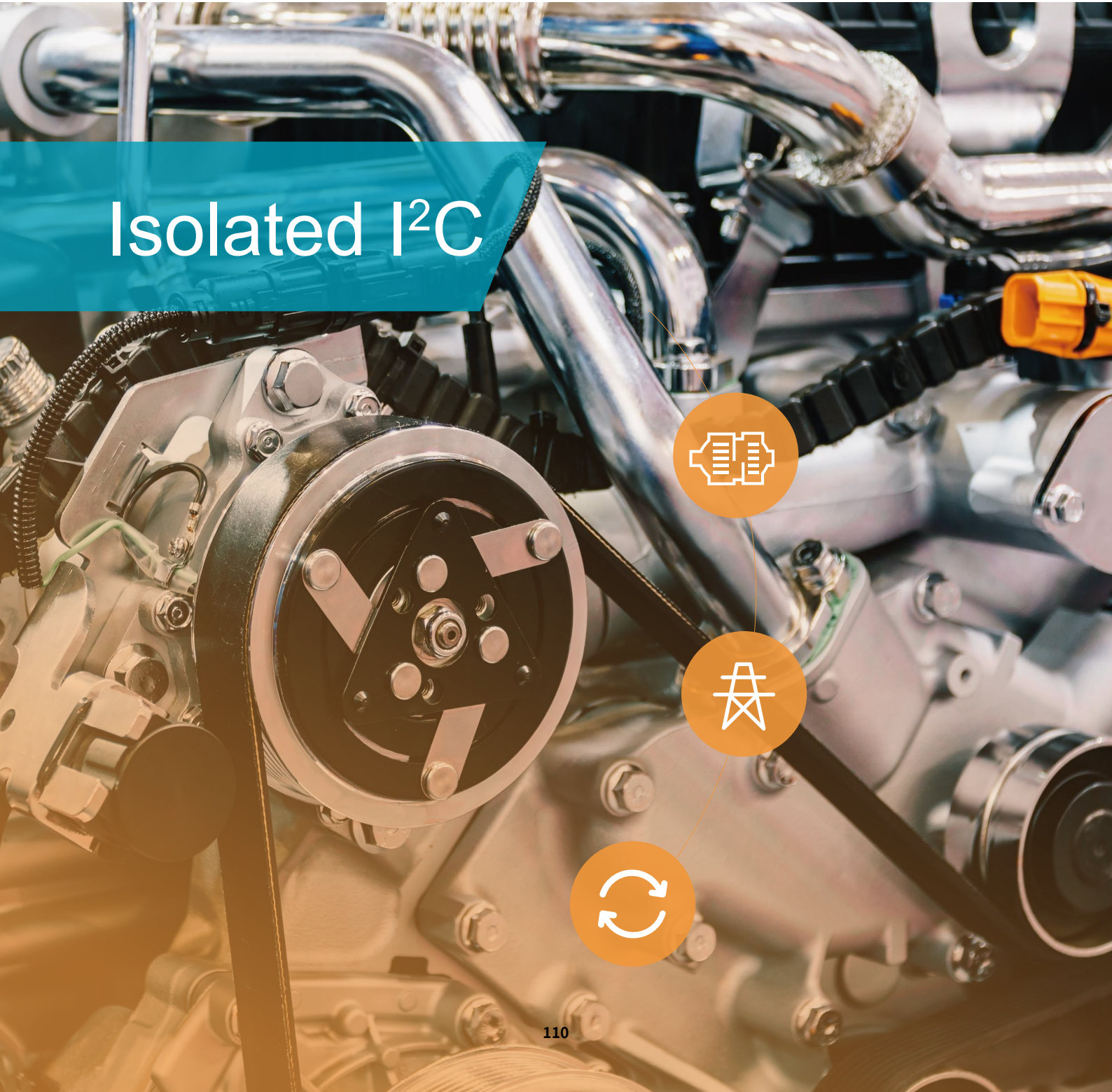


### ◆ Application



# Isolated I<sup>2</sup>C

| NSI810x Isolated I <sup>2</sup> C |           |                    |         |                        |                     |          |                                  |              |
|-----------------------------------|-----------|--------------------|---------|------------------------|---------------------|----------|----------------------------------|--------------|
|                                   | Part No.  | ISO Rating (kVrms) | ESD(kV) | Bidirectional Channels | Max DataRate (Mbps) | AEC-Q100 | Operating Temperature Range (°C) | Package Type |
| I <sup>2</sup> C                  | NSI8100N  | 3.75               | 6       | 2                      | 2                   |          | -40~125                          | SOP-8        |
|                                   | NSI8100W  | 5                  | 6       | 2                      | 2                   |          | -40~125                          | SOW-16       |
|                                   | NSI8100NC | 3.75               | 6       | 2                      | 2                   |          | -40~125                          | SOP-8        |



Isolated I<sup>2</sup>C





## NSI8100NC/NSI8100: High Reliability Bidirectional I<sup>2</sup>C Isolators

### ◆ Product introduction

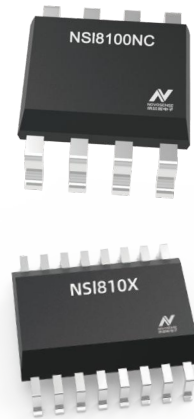
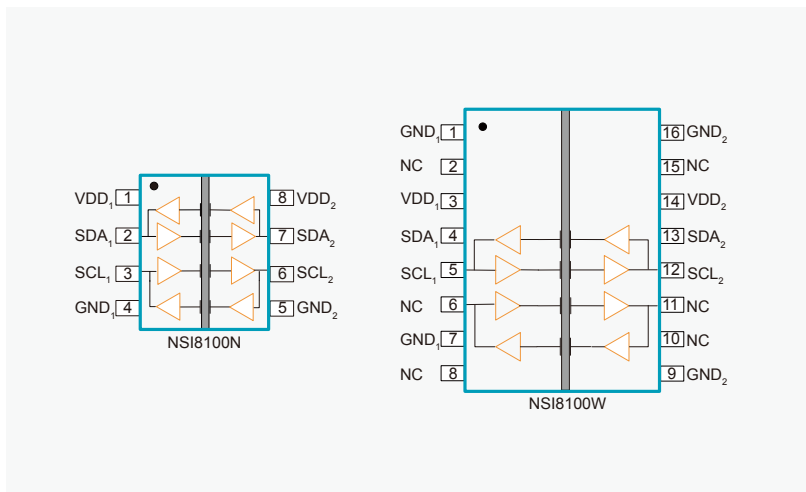
The NSI810x series are high reliability bidirectional I<sup>2</sup>C digital isolators. The NSI810x devices are safety certified by UL1577 support several insulation withstand voltages (3.75kVrms, 5kVrms), and features high electromagnetic immunity and low emission characteristics. They Support I<sup>2</sup>C clock at a frequency up to 2MHz, the common mode transient immunity (CMTI) is up to 150kV/μs. The wide power supply range allows them to be directly connected to digital interfaces such as most of the MCUs, and can easily provide bidirectional level conversion. Its excellent system-level electromagnetic compatibility (EMC) performance enhances its reliability and stability. NSI8100 provides dual-channel bidirectional isolation.

NSI8100NC is a bidirectional I<sup>2</sup>C digital isolator that provides dual-channel bidirectional isolation with high reliability. It is safety certified by UL1577 support 5kVrms insulation withstand voltages, and features high electromagnetic immunity and low emission. They Support I<sup>2</sup>C clock at a frequency up to 2MHz, the common mode transient immunity (CMTI) is up to 100kV/μs. The wide power supply range allows them to be directly connected to digital interfaces such as most of the MCUs, and can easily provide bidirectional level conversion. Its excellent system-level electromagnetic compatibility (EMC) performance enhances its reliability and stability.

### ◆ Product feature

- Up to 3750/5000Vrms Insulation voltage
- I<sup>2</sup>C clock rate: up to 2MHz
- Wide power supply range: 2.5V to 5.5V
- High common mode transient immunity (CMTI): ±150kV/μs
- High system level EMC performance: system level electrostatic discharge (ESD), burst immunity (EFT), surge protection
- Chip-level ESD performance: HBM: ±6kV
- Isolation Barrier Life: >60 years
- Wide operating temperature range: -40°C to 125°C
- RoHS compliant package: SOP-8, SOW-16

### ◆ Pinout & Package



### ◆ Application



I<sup>2</sup>C level converter



Isolated I<sup>2</sup>C, PMBUS, SMBUS interface applications



Power over Ethernet (POE)



Motor control



Power Supply System



# I<sup>2</sup>C Interface





## I<sup>2</sup>C Interface

| I <sup>2</sup> C Hot-swappable NCA9511 Series |          |              |              |              |              |                       |                                  |              |
|-----------------------------------------------|----------|--------------|--------------|--------------|--------------|-----------------------|----------------------------------|--------------|
|                                               | Part No. | VCC1(min)(V) | VCC1(max)(V) | VCC2(min)(V) | VCC2(max)(V) | Frequency (Max) (kHz) | Operating Temperature Range (°C) | Package Type |
| Hot Swappable Buffer                          | NCA9511  | 2.7          | 5.5          | 2.7          | 5.5          | 400                   | -40~105                          | MSOP-8       |
|                                               |          |              |              |              |              |                       |                                  | SOP-8        |

| I <sup>2</sup> C Level Converter NCA9306 Series |          |              |              |              |              |                       |                                  |              |
|-------------------------------------------------|----------|--------------|--------------|--------------|--------------|-----------------------|----------------------------------|--------------|
|                                                 | Part No. | VCC1(min)(V) | VCC1(max)(V) | VCC2(min)(V) | VCC2(max)(V) | Frequency (Max) (kHz) | Operating Temperature Range (°C) | Package Type |
| voltage-level shifter                           | NCA9306  | 1.2          | 3.3          | 1.8          | 5.5          | 400                   | -40~85                           | VSSOP-8      |
|                                                 |          |              |              |              |              |                       |                                  | TSSOP-8      |

| I <sup>2</sup> C Buffer NCA9617A Series |          |              |              |              |              |                       |                                  |              |
|-----------------------------------------|----------|--------------|--------------|--------------|--------------|-----------------------|----------------------------------|--------------|
|                                         | Part No. | VCC1(min)(V) | VCC1(max)(V) | VCC2(min)(V) | VCC2(max)(V) | Frequency (Max) (kHz) | Operating Temperature Range (°C) | Package Type |
| Level-Translating Repeater              | NCA9617A | 0.8          | 5.5          | 2.2          | 5.5          | 1000                  | -40~85                           | MSOP8        |

| I <sup>2</sup> C switch NCA954x series |          |         |             |             |                       |           |                         |                                  |              |
|----------------------------------------|----------|---------|-------------|-------------|-----------------------|-----------|-------------------------|----------------------------------|--------------|
|                                        | Part No. | Channel | VCC(min)(V) | VCC(max)(V) | Frequency (Max) (kHz) | Addresses | Features                | Operating Temperature Range (°C) | Package Type |
| I <sup>2</sup> C-BUS switch            | NCA9545  | 4       | 2.3         | 5.5         | 400                   | 4         | Interrupt Pin Reset Pin | -40~85                           | TSSOP-20     |
|                                        | NCA9546  | 4       | 2.3         | 5.5         | 400                   | 8         | Reset Pin               | -40~85                           | TSSOP-16     |
|                                        | NCA9548  | 8       | 2.3         | 5.5         | 400                   | 8         | Reset Pin               | -40~85                           | TSSOP-24     |

| I <sup>2</sup> C GPIO expansion for NCA95xx series |             |         |             |             |                       |           |                          |                                  |          |              |
|----------------------------------------------------|-------------|---------|-------------|-------------|-----------------------|-----------|--------------------------|----------------------------------|----------|--------------|
|                                                    | Part No.    | Channel | VCC(min)(V) | VCC(max)(V) | Frequency (Max) (kHz) | Addresses | Features                 | Operating Temperature Range (°C) | AEC-Q100 | Package Type |
| I <sup>2</sup> C GPIO Expander                     | NCA9555     | 16      | 2.3         | 5.5         | 400                   | 8         | Interrupt Pin LED Driver | -40~85                           |          | TSSOP-24     |
|                                                    | NCA9534B    | 8       | 2.3         | 5.5         | 400                   | 8         | Interrupt Pin LED Driver | -40~85                           |          | TSSOP-16     |
|                                                    |             |         |             |             |                       |           |                          |                                  |          | SOW-16       |
|                                                    | NCA953 9-Q1 | 16      | 1.65        | 5.5         | 400                   | 4         | Interrupt Pin LED Drive  | -40~85                           | ✓        | TSSOP-24     |

## NCA9511: I<sup>2</sup>C Hot-swappable BUS and SMBUS Buffer

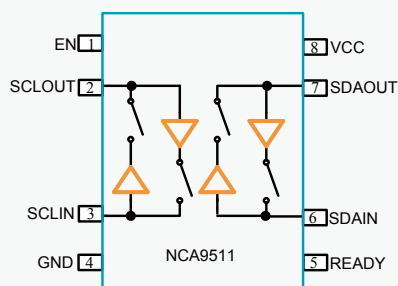
### ◆ Product introduction

NCA9511 is a hot-swappable I<sup>2</sup>C BUS buffer that supports insertion of I/O cards into a powered backplane without damaging the data or the clock BUS. The control circuit prevents the backplane side I<sup>2</sup>C line (input) from connecting to the card side I<sup>2</sup>C line (output) until a stop command or BUS idle condition occurs on the backplane and there is no BUS contention on the card. After the connection is established, the device will provide bidirectional buffering, thus keeping the capacitance of the backplane and that of the card separate. During insertion, the SDA and SCL lines are pre-charged to 1V to minimize the current required to charge the parasitic capacitance of the device. When the I<sup>2</sup>C BUS is idle, the NCA9511 can be put into shutdown mode by setting the EN pin low, thereby reducing power consumption. When EN is pulled high, NCA9511 resumes normal operation. It also includes an open-drain READY output pin that indicates that the backplane is connected to the card side. When READY is high, SDAIN and SCLIN are connected to SDAOUT and SCLOUT. When both sides are disconnected, READY is low.

### ◆ Product feature

- Supporting bidirectional data transmission signal of I<sup>2</sup>C BUS
- The operating supply voltage range is from 2.7V to 5.5V  
The TA ambient temperature range is from -40°C to 105°C
- 1-V pre-charge on all SDA and SCL lines prevents corruption during live insertion
- Compatible with standard mode and fast mode I<sup>2</sup>C devices
- Supporting clock stretching, arbitration and synchronization
- I<sup>2</sup>C BUS high-impedance state when VCC is powered down
- Operating temperature: -40°C to 105°C
- RoHS compliant package: MSOP-8, SOP-8

### ◆ Pinout & Package



### ◆ Application



Telecom switching equipment



Server



Enterprise switch



Base station



Industrial automation equipment

## NCA9306: I<sup>2</sup>C and SMBUS Voltage Level Converter

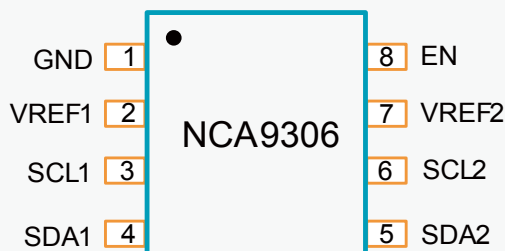
### ◆ Product introduction

The NCA9306 device is a dual-channel bidirectional I<sup>2</sup>C and SMBUS voltage level converter with an enable (EN) input that enables bidirectional voltage conversion from 1.2V to 5V without the need of a direction pin. The switch is designed with a low on-state resistance (RON), allowing connections to be made with minimal propagation delay. When EN is high, the translator switch is ON, and the SCL1 and SDA1 I/O are connected to the SCL2 and SDA2 I/O, respectively, allowing bidirectional data flow between ports. When EN is low, the translator switch is off, and a high-impedance state exists between ports. the NCA9306 device can be used to isolate a 400kHz BUS from a 100kHz BUS by controlling the EN pin to disconnect the slower BUS during fast-mode communication.

### ◆ Product feature

- 2-bit bidirectional converter for SDA and SCL lines in I<sup>2</sup>C applications
- Compatible with I<sup>2</sup>C and System Management BUS (SMBUS)
- Allowing level conversion between the following voltages
  - 1.2V VREF1 and 1.8V, 2.5V, 3.3V or 5V VREF2
  - 1.8V VREF1 and 2.5V, 3.3V or 5V VREF2
  - 2.5V VREF1 and 3.3V or 5V VREF2
  - 3.3V VREF1 and 5V VREF2
- Allowing bidirectional voltage conversion without direction pin
- Open drain I<sup>2</sup>C I/O ports (SCL1, SDA1, SCL2 and SDA2)
- Latch-up performance exceeds 100 mA per JESD 78, Class II
- ESD protection exceeds JESD 22
- 2000V Human Body Model (A114-A)
- 1000V charging device model (C101)
- Operating temperature: -40°C to 105°C
- RoHS compliant package: VSSOP-8, TSSOP-8

### ◆ Pinout & Package



### ◆ Application



I<sup>2</sup>C, SMBUS, PMBUS, MDIO, UART, low-speed SDIO, GPIO and other bidirectional signal interfaces



Server



Router  
(telecom switching equipment)



Personal computer



Industrial automation

## NCA9617A: I<sup>2</sup>C and SMBUS Dual Bidirectional Buffer

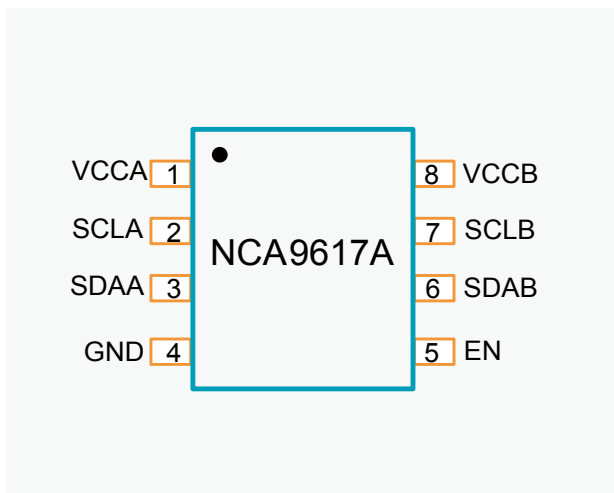
### ◆ Product introduction

NCA9617A is a BiCMOS dual bidirectional buffer designed for I<sup>2</sup>C BUS and SMBUS systems. The device allows bidirectional voltage level conversion (up-conversion and down-conversion modes) between low voltages (as low as 0.8V) and higher voltages (2.2V to 5.5V) in hybrid applications. During level conversion, this device extends I<sup>2</sup>C and similar BUS systems without impairing system performance.

### ◆ Product feature

- Dual-channel Bidirectional I<sup>2</sup>C Buffer
- Standard mode, fast mode (400kHz) and fast mode+ (1MHz) optional
- I<sup>2</sup>C operates voltage level conversion from 0.8V to 5.5V and from 2.5V to 5.5V
- Open-drain I<sup>2</sup>C I/O
- Clock stretching and multi-master arbitration supported on device
- Latch-up performance exceeds 100 mA per JESD 78, Class II
- ESD protection exceeds JESD 22 5500V Human Body Model (A114-A) 1500V charging device model (C101)
- Operating temperature: -40°C to 105°C
- RoHS compliant package: MSOP-8

### ◆ Pinout & Package



### ◆ Application



Server



Router  
(telecom switching equipment)



Industrial equipment



Integrated with  
a number of I<sup>2</sup>C  
slave devices or products with long PCB wiring

|                                                    |                                                    |                           |                    |                    |                            |                            |                          |                                                        |
|----------------------------------------------------|----------------------------------------------------|---------------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|--------------------------------------------------------|
| Isolated RS-485 Transceiver                        | Isolated CAN Transceiver                           | Isolated I <sup>2</sup> C | PC Interface       | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Digital Isolator with Integrated Isolated Power Supply |
| Isolated 485 with Integrated Isolated Power Supply | Isolated CAN with Integrated Isolated Power Supply | Solid-State Relay         | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator                                    |

## NCA9545: 4-channel I<sup>2</sup>C-BUS Switch with Interrupt Logic and Reset

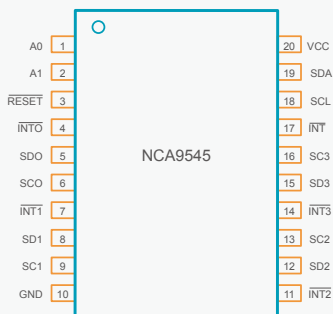
### ◆ Product introduction

The NCA9545 is a quad bidirectional translating switch controlled via the I<sup>2</sup>C BUS. The SCL/SDA upstream pair fans out to four downstream pairs, or channels. Any individual SCN/SDN channel or combination of channels can be selected, depending on the contents of the programmable control registers. Four interrupt inputs (INT3 to INT0) are provided, one for each of the downstream pairs. One interrupt (INT) output can be used as an AND operation of four interrupt inputs. A low-level on reset (RESET) input enables the NCA9545 to recover from a prolonged low state of any down-link I<sup>2</sup>C BUS. Pulling RESET low resets the I<sup>2</sup>C state machine and deselects all channels, as does the internal power-on reset function. With a on gate built into the switch, the VCC terminal can be used to limit the maximum voltage delivered by NCA9545. This allows each channel to use a different BUS voltage so that parts with voltage of 1.8V, 2.5V or 3.3V can communicate with parts with voltage of 5V without any additional protection. External pull-up resistors pull the BUS up to the desired voltage level for each channel. All I/O terminals can withstand 5.5 V.

### ◆ Product feature

- 1-of-4 bidirectional translating switches
- Compatible with I<sup>2</sup>C BUS and SMBUS
- Active-low reset inputs
- 2 address pins, supporting 4 different addresses
- The operating supply voltage range is from 1.65V to 5.5V
- Low standby current
- Supports hot insertion
- Latch-up performance exceeds 100 mA per JESD 78
- ESD protection exceeds JESD 22 2000V Human Body Model (A114-A) 1000V charging device model (C101)
- Operating temperature: -40°C to 105°C
- RoHS compliant package: TSSOP-20

### ◆ Pinout & Package



### ◆ Application



Server



Router  
(telecom switching equipment)



Factory  
automation



Products with I<sup>2</sup>C  
slave address conflicts  
(e.g. multiple, identical temp sensors)

|                                                    |                                                    |                           |                            |                    |                            |                            |                          |                       |
|----------------------------------------------------|----------------------------------------------------|---------------------------|----------------------------|--------------------|----------------------------|----------------------------|--------------------------|-----------------------|
| Isolated RS-485 Transceiver                        | Isolated CAN Transceiver                           | Isolated I <sup>2</sup> C | I <sup>2</sup> C Interface | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Isolated Power Supply |
| Isolated 485 with Integrated Isolated Power Supply | Isolated CAN with Integrated Isolated Power Supply | Solid-State Relay         | Transformer Driver         | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator   |



## NCA9546: 4-channel I<sup>2</sup>C Switch with Reset

### ◆ Product introduction

NCA9546 is a quad-channel bidirectional switch controlled by I<sup>2</sup>C BUS. The SCL/SDA upstream pair fans out to four downstream pairs, or channels. Any single SCN/SDN channel or combination of channels can be selected, depending on the contents of the programmable control registers.

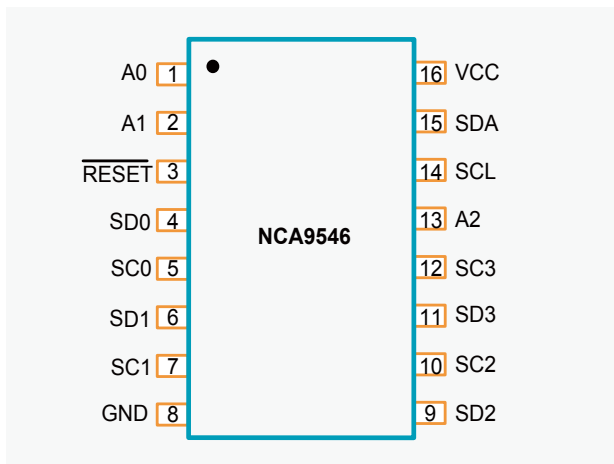
A low-level on reset (RESET) input enables the NCA9546 to recover from a prolonged low state of any down-link I<sup>2</sup>C BUS. Pulling RESET low resets the I<sup>2</sup>C state machine and deselects all channels, as does the internal power-on reset function.

The pass gates of the switches are constructed such that the VCC terminal can be used to limit the maximum high voltage, which will be passed by the NCA9546. This allows each channel to use a different BUS voltage so that parts with voltage of 1.8V, 2.5V or 3.3V can communicate with parts with voltage of 5V without any additional protection. External pull-up resistors pull the BUS up to the desired voltage level for each channel. All I/O terminals can withstand 5.5 V.

### ◆ Product feature

- 1-of-4 bidirectional translating switches
- Compatible with I<sup>2</sup>C BUS and SMBUS
- Active-low reset input
- 3 address terminals, allowing up to 8 devices to be connected to the I<sup>2</sup>C BUS
- Channel selection via I<sup>2</sup>C BUS, any combination is OK
- Allowing voltage level conversion between 1.8V, 2.5V, 3.3V and 5V buses
- Operating supply voltage range is 1.7 V to 5.5 V
- Withstand voltage input of 5.5 V
- Clock frequency of 0 to 400kHz
- Latch-up performance exceeds 100 mA per JESD 78 ESD protection exceeds JESD 22 2000V Human Body Model (A114-A) 1000V charging device model (C101)
- Operating temperature: -40°C to 105°C
- RoHS compliant package: TSSOP-16

### ◆ Pinout & Package



### ◆ Application



Server



Router  
(telecom switching equipment)



Factory  
automation



Products with I<sup>2</sup>C  
slave address conflicts  
(e.g. multiple, identical temp sensors)

|                                           |                                           |                           |                    |              |                            |                            |                          |                     |
|-------------------------------------------|-------------------------------------------|---------------------------|--------------------|--------------|----------------------------|----------------------------|--------------------------|---------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated I <sup>2</sup> C | Transformer Driver | Isolated ADC | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply | Solid-State Relay         |                    |              |                            |                            |                          |                     |

## NCA9548: 8-channel I<sup>2</sup>C Switch with Reset

### ◆ Product introduction

NCA9548 is an eight-channel bidirectional switch controlled by I<sup>2</sup>C BUS. The SCL/SDA upstream pair fans out to eight downstream pairs, or channels. Any single SCN/SDN channel or combination of channels can be selected, depending on the contents of the programmable control registers.

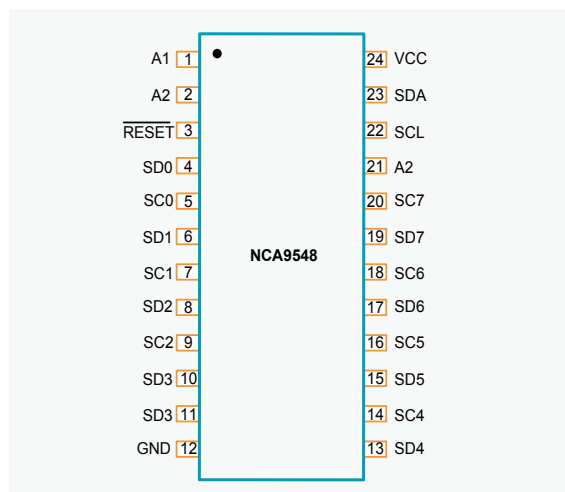
A low-level on reset (RESET) input enables the NCA9548 to recover from a prolonged low state of any down-link I<sup>2</sup>C BUS. Pulling RESET low resets the I<sup>2</sup>C state machine and deselects all channels, as does the internal power-on reset function.

The pass gates of the switches are constructed such that the VCC terminal can be used to limit the maximum high voltage, which will be passed by the NCA9548. This allows each channel to use a different BUS voltage so that parts with voltage of 1.8V, 2.5V or 3.3V can communicate with parts with voltage of 5V without any additional protection. External pull-up resistors pull the BUS up to the desired voltage level for each channel. All I/O terminals can withstand 5.5 V.

### ◆ Product feature

- 1-of-8 bidirectional translating switches
- Compatible with I<sup>2</sup>C BUS and SMBUS
- Active-low reset input
- 3 address terminals, allowing up to 8 devices to be connected to the I<sup>2</sup>C BUS
- Channel selection via I<sup>2</sup>C BUS, any combination is OK
- Allowing voltage level conversion between 1.8V, 2.5V, 3.3V and 5V buses
- Operating supply voltage range is 1.65 V to 5.5 V
- Withstand voltage input of 5.5 V
- Clock frequency of 0 to 400kHz
- Latch-up performance exceeds 100mA per JESD 78 ESD protection exceeds JESD 22 2000V Human Body Model (A114-A) 1000V charging device model (C101)
- Operating temperature: -40°C to 105°C
- RoHS compliant package: TSSOP-24

### ◆ Pinout & Package



### ◆ Application



Server



Router  
(telecom switching equipment)



Factory  
automation



Products with I<sup>2</sup>C  
slave address conflicts

## NCA9555: I<sup>2</sup>C 16-bit GPIO Expansion

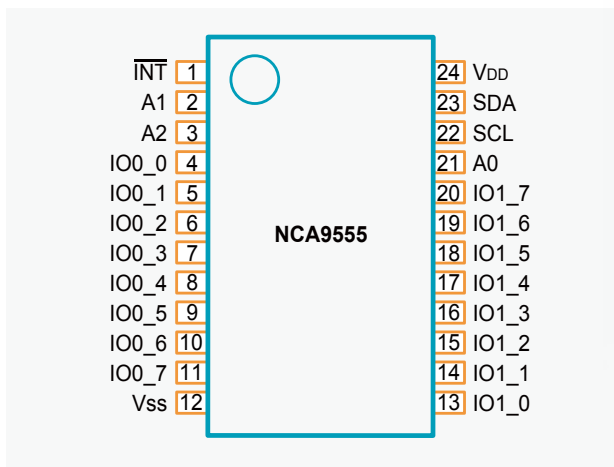
### ◆ Product introduction

NCA9555 is a 24-pin CMOS device that provides 16-bit general purpose parallel I<sup>2</sup>C BUS number input/output GPIO expansion. It provides a simple solution to the additional I/O requirements of applications such as ACPI power switches, sensors, buttons, LEDs and fans. NCA9555 consists of two 8-bit configurations (input or output selection). Input, output and polarity inversion (high-level on or low-level on) registers. By writing to the I/O's configuration bits, the system host can enable I/O as input or output. The data of each input or output is stored in the corresponding input or output register. The polarity of the read register can be inverted with the Polarity inversion register. All registers can be read by the system host. NCA9555 open-drain interrupt output is activated when any input state differs from its corresponding input port register state and is used to indicate to the main equipment of the system that the output state has changed. A power-on reset sets the registers to their default values and initializes the state machine of the device. Three hardware pins (A0, A1, A2) change the fixed I<sup>2</sup>C BUS address and allow up to eight devices to share the same I<sup>2</sup>C BUS.

### ◆ Product feature

- The operating supply voltage range is from 2.3V to 5.5V
- I<sup>2</sup>C to parallel port expander
- Polarity inversion register
- Active low interrupt output
- Compatible with most MCUs
- 16 I/O pins, 16 inputs by default
- Low standby current
- ESD protection exceeds JESD 22 2000V Human Body Model (A114-A) 1000V charging device model (C101)
- 3 address pins, supporting 8 different addresses
- Clock frequency of 0 to 400kHz
- Latch-up performance exceeds 100mA
- Operating temperature: -40°C to 85°C
- RoHS compliant package: TSSOP-24

### ◆ Pinout & Package



### ◆ Application



Server



Router  
(telecom switching equipment)



Personal  
computer



Personal  
electronics



Factory  
automation



Products with  
GPIO-constrained  
processors

## NCA9534B: I<sup>2</sup>C 8-bit GPIO Expansion

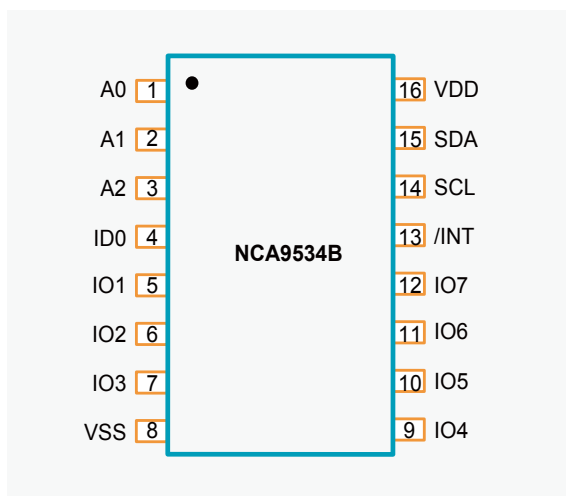
### ◆ Product introduction

NCA9534B is a 16-pin CMOS device that provides 8-bit general purpose parallel I<sup>2</sup>C BUS number input/output GPIO expansion. It provides a simple solution to the additional I/O requirements of applications such as ACPI power switches, sensors, buttons, LEDs and fans. NCA9534B consists of one 8-bit configurations (input or output selection). Input, output and polarity inversion (high-level on or low-level on) registers. By writing to the I/O's configuration bits, the system host can enable I/O as input or output. The data of each input or output is stored in the corresponding input or output register. The polarity of the read register can be inverted with the Polarity Inversion register. All registers can be read by the system host. NCA9534B open-drain interrupt output is activated when any input state differs from its corresponding input port register state and is used to indicate to the main equipment of the system that the output state has changed. A power-on reset sets the registers to their default values and initializes the state machine of the device. Three hardware pins (A0, A1, A2) change the fixed I<sup>2</sup>C BUS address and allow up to eight devices to share the same I<sup>2</sup>C BUS.

### ◆ Product feature

- The operating supply voltage range is from 2.3V to 5.5V
- I<sup>2</sup>C to parallel port expander
- Polarity inversion register
- Active low interrupt output
- Compatible with most MCUs
- 8 I/O pins, 8 inputs by default
- Low standby current
- ESD protection exceeds JESD 22 2000V Human Body Model (A114-A) 1000V charging device model (C101)
- 3 address pins, supporting 8 different addresses
- Clock frequency of 0 to 400kHz
- Latch-up performance exceeds 100mA
- Operating temperature: -40°C to 85°C
- RoHS compliant package: SOW-16, TSSOP-16

### ◆ Pinout & Package



### ◆ Application



Server



Router  
(telecom switching equipment)



Personal  
computer



Personal  
electronics



Factory  
automation



Products with  
GPIO-constrained  
processors

## NCA9539-Q1: Automotive I<sup>2</sup>C 16-bit GPIO Expansion

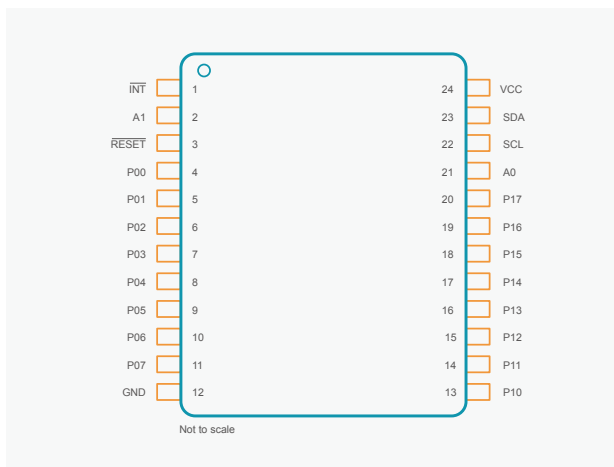
### ◆ Product introduction

NCA9539-Q1 is a 16-pin CMOS device that provides 8-bit general purpose parallel I<sup>2</sup>C BUS number input/output GPIO expansion. It provides a simple solution to the additional I/O requirements of applications such as ACPI power switches, sensors, buttons, LEDs and fans. NCA9539-Q1 consists of two 8-bit configurations (input or output selection). Input, output and polarity inversion (high-level on or low-level on) registers. By writing to the I/O's configuration bits, the system host can enable I/O as input or output. The data of each input or output is stored in the corresponding input or output register. The polarity of the read register can be inverted with the Polarity Inversion register. All registers can be read by the system host. NCA9539-Q1 open-drain interrupt output is activated when any input state differs from its corresponding input port register state and is used to indicate to the main equipment of the system that the output state has changed. A power-on reset sets the registers to their default values and initializes the state machine of the device. Two hardware pins (A0, A1) change the fixed I<sup>2</sup>C BUS address and allow up to four devices to share the same I<sup>2</sup>C BUS.

### ◆ Product feature

- The operating supply voltage range is from 1.65V to 5.5V
- I<sup>2</sup>C to parallel port expander
- Polarity inversion register
- Active low interrupt output
- Compatible with most MCUs
- 16 I/O pins, 16 inputs by default
- Low standby current
- ESD protection exceeds JESD 22 2000V Human Body Model (A114-A) 1000V charging device model (C101)
- 2 address pins, supporting 4 different addresses
- Clock frequency of 0 to 400kHz
- Latch-up performance exceeds 100mA per JESD 78
- Operating temperature: -40°C to 125°C
- RoHS compliant package: TSSOP-24

### ◆ Pinout & Package



### ◆ Application



In-vehicle infotainment system, advanced driver assistance system (ADAS)



Automotive body electronics, hybrid electric vehicle (HEV), electric vehicle (EV) and powertrain



Industrial automation, factory automation, building automation, test & measurement, electronic point of sale (EPOS)



I<sup>2</sup>C GPIO expansion

|                                           |                                           |              |                    |              |                            |                            |                          |                     |
|-------------------------------------------|-------------------------------------------|--------------|--------------------|--------------|----------------------------|----------------------------|--------------------------|---------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated i2C | Transformer Driver | Isolated ADC | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply |              |                    |              |                            |                            |                          |                     |



## RS-485 Transceiver

| NCA34xx Series RS-485 Transceiver |          |        |                    |     |                     |              |                       |                                  |                  |
|-----------------------------------|----------|--------|--------------------|-----|---------------------|--------------|-----------------------|----------------------------------|------------------|
|                                   | Part No. | Duplex | Supply Voltage (V) | ESD | Max DataRate (Mbps) | No. of Nodes | Bus Common Voltage(V) | Operating Temperature Range (°C) | Package Type     |
| RS-485                            | NCA3485  | Half   | 3~5.5              | 10  | 0.5                 | 256          | -7~12                 | -40~105°C                        | SOP-8            |
|                                   | NCA3491  | Full   | 3~5.5              | 10  | 16                  | 256          | -7~12                 | -40~105°C                        | SOP-14           |
|                                   | NCA3176  | Half   | 3~5.5              | 20  | 20                  | 256          | -7~12                 | -40~125°C                        | SOP-8<br>TSSOP-8 |



RS-485 Transceiver

# NCA34xx: high robust RS485 half/full duplex transceiver

## Product introduction

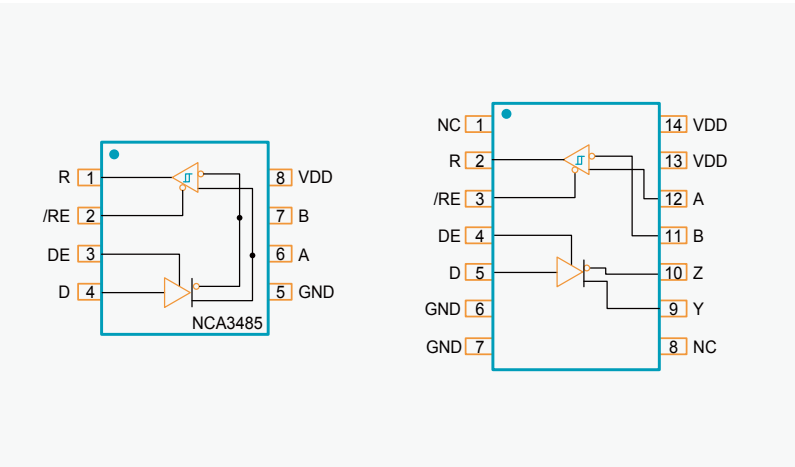
NCA34xx is high robust RS485 transceiver. NCA3485 is a half-duplex RS-485 transceiver. NCA3491 is a full-duplex RS-485 transceiver. The devices have a 1/8-unit-load receiver input impedance that allows up to 256 transceivers on the bus. The data rate of the device is up to 12Mbps.

The Bus pins are protected from  $\pm 10\text{kV}$  system level ESD to GND. These devices feature fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted.

## Product feature

- Power supply voltage: 3.0V to 5.5V
- High system level EMC performance:  
Bus Pins meet IEC61000-4-2  $\pm 10\text{kV}$  ESD
- Fail-safe protection receiver
- Up to 256 transceivers on the bus
- Operation temperature:  $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$
- RoHS-compliant packages:  
SOP8  
SOP14

## Pinout & Package



## Application



# NCA3176: High Robust Half-Duplex 485 Transceiver

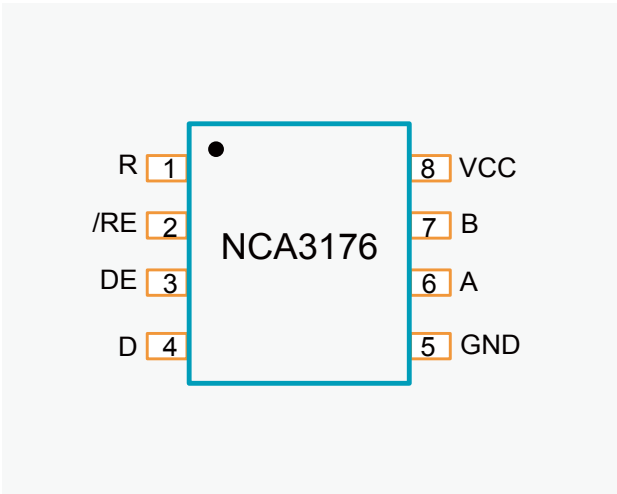
## Product introduction

NCA3176 is a half-duplex RS-485 transceiver with high robust. NCA3491 allows up to 256 transceivers on the bus. The data rate of the device is up to 20Mbps. The Bus pins are protected from  $\pm 20\text{kV}$  system level ESD to GND, and integrated IEC EFT (Noise Immunity) . These devices feature fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or short, and avoid the line faults.

## Product feature

- Power supply voltage: 3.0V to 5.5V
- High system level EMC performance:  
Bus Pins meet IEC61000-4-2  $\pm 20\text{kV}$  ESD
- Fail-safe protection receiver
- Up to 256 transceivers on the bus
- Operation temperature:  $-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$
- RoHS-compliant packages:  
SOP-8  
TSSOP-8

## Pinout & Package



## Pinout & Package

- SOP-8: 4.9mm\*3.9mm;
- TSSOP-8: 3mm\*3mm

## Application







# CAN Transceiver

# CAN Transceiver

| CAN transceiver |               |                 |                                                 |         |                     |              |                |                                  |          |              |
|-----------------|---------------|-----------------|-------------------------------------------------|---------|---------------------|--------------|----------------|----------------------------------|----------|--------------|
|                 | Part No.      | Part No.        | Power Supply Voltage                            | ESD(kV) | Max DataRate (Mbps) | No. of Nodes | Low Power Mode | Operating Temperature Range (°C) | AEC-Q100 | Package Type |
| CAN             | NCA1042       | NCA1042-DSPR    | VIO: 3~5.5V<br>VCC: 4.5~5.5V                    | 8       | 5                   | 110          | Standby        | -40~125                          |          | SOP-8        |
|                 | NCA1042B/A-Q1 | NCA1042B-Q1SPR  | VIO: 3~5.5V<br>VCC: 4.5~5.5V                    | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | SOP-8        |
|                 |               | NCA1042A-Q1SPR  |                                                 |         |                     |              |                |                                  |          | DFN-8        |
|                 |               | NCA1042B-Q1DNR  |                                                 |         |                     |              |                |                                  |          |              |
|                 |               | NCA1042A-Q1DNHR |                                                 |         |                     |              |                |                                  |          |              |
|                 | NCA1042BN-Q1  | NCA1042BN-Q1SPR | VIO: 3~5.5V<br>VCC: 4.5~5.5V                    | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | SOP-8        |
|                 |               | NCA1042BN-Q1DNR |                                                 |         |                     |              |                |                                  |          | DFN-8        |
|                 | NCA1051       | NCA1051-DSPR    | VIO: 3~5.5V<br>VCC: 4.5~5.5V                    | 5       | 5                   | 110          | Silent         | -40~125                          |          | SOP-8        |
|                 | NCA1051N      | NCA1051N-DSPR   | VCC: 4.5~5.5V                                   | 5       | 5                   | 110          | Silent         | -40~125                          |          | SOP-8        |
|                 | NCA1051A-Q1   | NCA1051A-Q1SPR  | VIO: 3~5.5V<br>VCC: 4.5~5.5V                    | 8       | 5                   | 110          | Silent         | -40~125                          | ✓        | SOP-8        |
|                 | NCA1051N-Q1   | NCA1051N-Q1SPR  | VIO: 3~5.5V<br>VCC: 4.5~5.5V                    | 8       | 5                   | 110          | Silent         | -40~125                          | ✓        | SOP-8        |
|                 | NCA1043B-Q1   | NCA1043B-Q1SPKR | VBAT: 4.5~40V<br>VIO: 2.8~5.5V<br>VCC: 4.5~5.5V | 8       | 5                   | 110          | Standby Sleep  | -40~125                          | ✓        | SOP-14       |
|                 |               | NCA1043B-Q1DNKR |                                                 |         |                     |              |                |                                  |          | DFN-14       |
|                 | NCA1145-Q1    | NCA1145-Q1SPKR  | VBAT: 4.5~28V<br>VIO: 2.8~5.5V<br>VCC: 4.5~5.5V | 8       | 5                   | 110          | Standby Sleep  | -40~125                          | ✓        | SOP-14       |
|                 |               | NCA1145-Q1DNKR  |                                                 |         |                     |              |                |                                  |          | DFN-14       |
|                 | NCA1462-Q1    | NCA1462-Q1SPR   | VIO: 1.7~5.5V<br>VCC: 4.5~5.5V                  | 8       | 8                   | 110          | Standby        | -40~125                          | ✓        | SOP8         |
|                 | NCA1462-Q1    | NCA1462-Q1DNR   | VIO: 1.7~5.5V<br>VCC: 4.5~5.5V                  | 8       | 8                   | 110          | Standby        | -40~125                          | ✓        | DFN8         |
|                 | NCA1044-Q1    | NCA1044-Q1SPR   | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V                  | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | SOP8         |
|                 | NCA1044-Q1    | NCA1044-Q1DNR   | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V                  | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | DFN8         |
|                 | NCA1044-Q1    | NCA1044N-Q1SPR  | VCC: 4.5~5.5V                                   | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | SOP8         |
|                 | NCA1044-Q1    | NCA1044N-Q1DNR  | VCC: 4.5~5.5V                                   | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | DFN8         |
|                 | NCA1057-Q1    | NCA1057-Q1SPR   | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V                  | 8       | 5                   | 110          | NA             | -40~125                          | ✓        | SOP8         |
|                 | NCA1057-Q1    | NCA1057-Q1DNR   | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V                  | 8       | 5                   | 110          | NA             | -40~125                          | ✓        | DFN8         |
|                 | NCA1057-Q1    | NCA1057N-Q1SPR  | VCC: 4.5~5.5V                                   | 8       | 5                   | 110          | NA             | -40~125                          | ✓        | SOP8         |
|                 | NCA1057-Q1    | NCA1057N-Q1DNR  | VCC: 4.5~5.5V                                   | 8       | 5                   | 110          | NA             | -40~125                          | ✓        | DFN8         |
|                 | NCA1042C-Q1   | NCA1042C-Q1SPR  | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V                  | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | SOP8         |
|                 | NCA1042C-Q1   | NCA1042C-Q1DNR  | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V                  | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | DFN8         |
|                 | NCA1042C-Q1   | NCA1042CN-Q1SPR | VCC: 4.5~5.5V                                   | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | SOP8         |
|                 | NCA1042C-Q1   | NCA1042CN-Q1DNR | VCC: 4.5~5.5V                                   | 8       | 5                   | 110          | Standby        | -40~125                          | ✓        | DFN8         |



| CAN transceiver |             |                 |                                              |         |                     |              |                |                                  |          |              |
|-----------------|-------------|-----------------|----------------------------------------------|---------|---------------------|--------------|----------------|----------------------------------|----------|--------------|
| CAN             | Part No.    | Part No.        | Power Supply Voltage                         | ESD(kV) | Max DataRate (Mbps) | No. of Nodes | Low Power Mode | Operating Temperature Range (°C) | AEC-Q100 | Package Type |
|                 | NCA1042C    | NCA1042C-DSPR   | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V               | 8       | 5                   | 110          | Standby        | -40~125                          |          | SOP8         |
|                 | NCA1042C    | NCA1042CN-DSPR  | VCC: 4.5~5.5V                                | 8       | 5                   | 110          | Standby        | -40~125                          |          | SOP8         |
|                 | NCA1051C    | NCA1051C-DSPR   | VIO: 1.8~5.5V<br>VCC: 4.5~5.5V               | 8       | 5                   | 110          | NA             | -40~125                          |          | SOP8         |
|                 | NCA1051C    | NCA1051CN-DSPR  | VCC: 4.5~5.5V                                | 8       | 5                   | 110          | NA             | -40~125                          |          | SOP8         |
|                 | NCA1043B-Q1 | NCA1043B-Q1SPKR | VBAT:4.5~40V<br>VCC:4.5~5.5V<br>VIO:2.8~5.5V | 8       | 5                   | 110          | Standby /Sleep | -40~125                          | ✓        | SOP14        |
|                 | NCA1043B-Q1 | NCA1043B-Q1DNKR | VBAT:4.5~40V<br>VCC:4.5~5.5V<br>VIO:2.8~5.5V | 8       | 5                   | 110          | Standby /Sleep | -40~125                          | ✓        | DFN14        |

## NCA1042: Fail-Safe CAN Transceiver Supporting CAN FD and BUS Wakeup

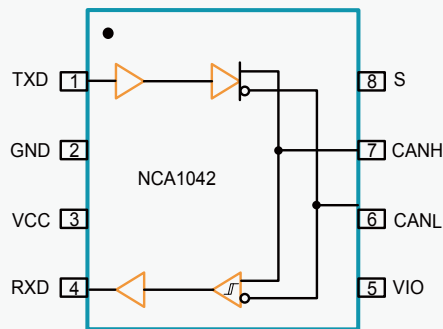
### ◆ Product introduction

NCA1042 is a high-speed CAN transceiver that provides an interface between a controller area network (CAN) protocol controller and a physical two-wire CAN BUS, it can support at least 110 CAN nodes. NCA1042 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. Reliable communication is achieved in CAN FD fast phase networks with data rates up to 5 Mbps. NCA1042 is designed with thermal protection and transmission data explicit timeout protection.

### ◆ Product feature

- Fully compatible with ISO11898-2
- I/O voltage range supports 3.3V and 5V MCU
- Power supply voltage  
VIO: 3V to 5.5V  
VDD: 4.5V~5.5V
- -70V to +70V BUS fault protection
- Transmission data (TXD) dominant timeout protection
- BUS dominant time out function in standby mode
- Ultra-low current standby mode with wake-up function
- Overcurrent and thermal protection
- Data rate: up to 5Mbps
- Low loop delay: <200ns
- Operating temperature: -40°C to 125°C
- RoHS compliant package: SOP-8

### ◆ Pinout & Package



### ◆ Application



Industrial automation, controls, sensors and drive systems



Building, security and climate control automations



Electric bicycle/ electric motorcycle system

## CANopen

Standards for CAN BUS, such as CANopen, DeviceNet, NMEA2000, ARNIC825, ISO11783 and CANaerospace

|                                           |                                           |                   |                    |                    |                            |                            |                          |                                               |
|-------------------------------------------|-------------------------------------------|-------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|-----------------------------------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated I/C      | I/C Interface      | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Digital Isolator with Integrated Power Supply |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply | Solid-State Relay | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator                           |

## NCA1042B-Q1: Automotive CAN BUS Transceiver Supporting CAN FD and BUS Wakeup

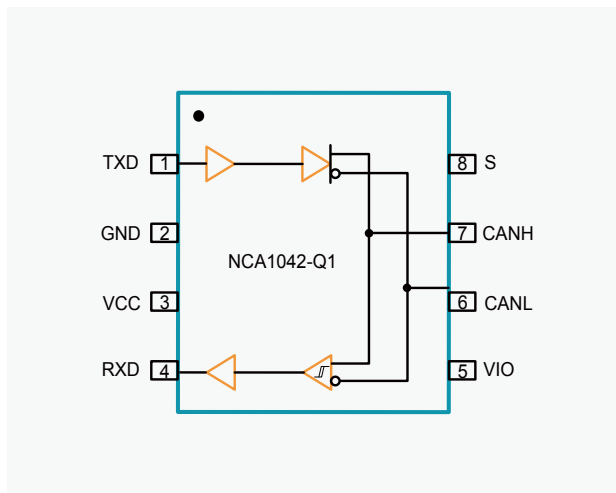
### ◆ Product introduction

NCA1042B-Q1 is a high-speed CAN transceiver that provides an interface between a controller area network (CAN) protocol controller and a physical two-wire CAN BUS, it can support at least 110 CAN nodes. NCA1042B-Q1 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. Reliable communication is achieved in CAN FD fast phase networks with data rates up to 5 Mbps. NCA1042B-Q1 is designed with thermal protection and transmission data explicit timeout protection.

### ◆ Product feature

- Fully compatible with ISO11898-2
- I/O voltage range supports 3.3V and 5V MCU
- Power supply voltage
  - VIO: 3V to 5.5V
  - VCC: 4.5V to 5.5V
- -58V to 58V BUS fault protection
- Transmission data (TXD) dominant timeout protection
- BUS dominant time out function in standby mode
- Ultra-low current standby mode with wake-up function
- Overcurrent and thermal protection
- Data rate: up to 5Mbps
- Low loop delay: <200ns
- Operating temperature: -40°C to 125°C
- AEC-Q100 certified
- RoHS compliant package: SOP-8, DFN-8

### ◆ Pinout & Package



### ◆ Application



Automotive  
and Transportation

|                                           |                                           |             |                    |              |                            |                            |                          |                                                  |
|-------------------------------------------|-------------------------------------------|-------------|--------------------|--------------|----------------------------|----------------------------|--------------------------|--------------------------------------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated iC | Transformer Driver | Isolated ADC | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator                              |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply |             |                    |              |                            |                            |                          | Isolated Comparator with Integrated Power Supply |

## NCA1051/N: Fail-Safe CAN Transceiver Supporting CAN FD and BUS Wakeup

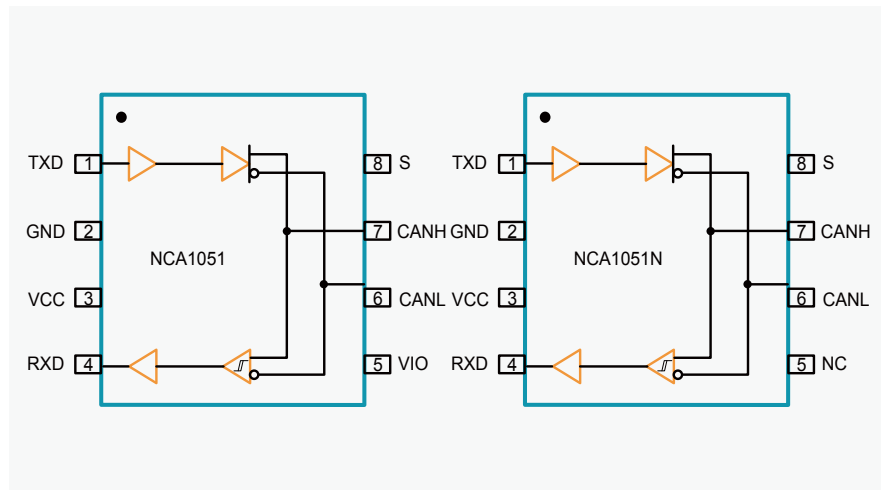
### ◆ Product introduction

NCA1051/N is a high-speed CAN transceiver that provides an interface between a controller area network (CAN) protocol controller and a physical two-wire CAN BUS, it can support at least 110 CAN nodes. NCA1051 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. Reliable communication is achieved in CAN FD fast phase networks with data rates up to 5 Mbps. The NCA1051 provides thermal protection and transmit data dominant time out function. These features make the NCA1051 an excellent choice for all types of HS-CAN networks, in nodes that do not require a silent mode with wake-up capability via the BUS.

### ◆ Product feature

- Fully compatible with ISO11898-2
- Ideal passive behavior to the CAN BUS when the supply voltage is off
- I/O voltage range supports 3.3V and 5V MCU
- Power supply voltage
- VIO (NCA1051): 3V to 5.5V  
VCC: 4.5V to 5.5V
- -45V to 45V BUS fault protection
- Transmission data (TXD) dominant timeout protection
- Overcurrent and thermal protection
- Data rate: up to 5Mbps
- Low loop delay: <200ns
- Operating temperature: -40°C to 125°C
- RoHS compliant package: SOP-8

### ◆ Pinout & Package



### ◆ Application



5Mbps operation in highly loaded CAN networks down to 10 kbps networks using TXD DTO



Industrial automation, controls, sensors and drive systems



Building, security and climate control automations

**CANopen**

Standards for CAN BUS, such as CANopen, DeviceNet, NMEA2000, ARNIC825, ISO11783 and CANaerospace

## NCA1043B-Q1: Automotive CAN BUS Transceiver Supporting CAN FD and Battery Back-up

### ◆ Product introduction

NCA1043B-Q1 is a high-speed CAN transceiver that provides an interface between a controller area network (CAN) protocol controller and a physical two-wire CAN BUS, it can support at least 110 CAN nodes. NCA1043B-Q1 is designed to meet the requirements of high-speed CAN applications in the automotive industry, providing differential transmit and receive capability to (a microcontroller with) a CAN protocol controller. The NCA1043B-Q1 offers excellent Electro Magnetic Compatibility (EMC) and ElectroStatic Discharge (ESD) performance, ultra-low power consumption and passive performance when the power supply voltage is off. Further features include:

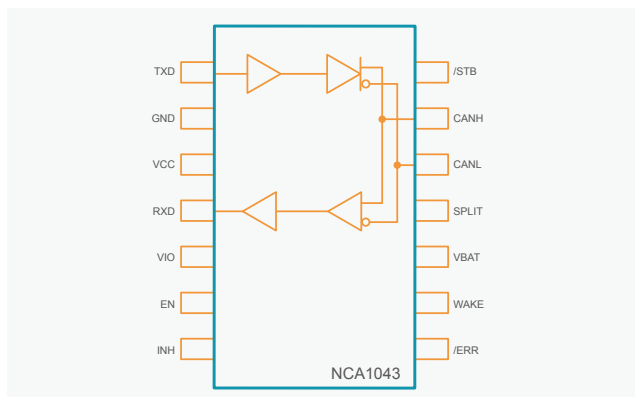
- Low-power management controls the power supply throughout the node while supporting local and remote wake-up with wake-up source recognition
- Various protection and diagnostic functions, including BUS short circuit detection and battery connection detection
- Supporting MCU of 3V to 5V

NCA1043B-Q1 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. Reliable communication is achieved in CAN FD fast phase networks with data rates up to 5 Mbps. The NCA1043B-Q1 provides thermal protection and transmit data dominant time out function. These features make the NCA1043B-Q1 the ideal choice for high speed CAN networks containing nodes that need to be available all times, even when the internal VIO and VCC supplies are switched off.

### ◆ Product feature

- Fully compatible with ISO11898-2/-5
- Standby and sleep modes
- Even if the whole node loses power, the local and remote wake-up functions are still supported
- Suitable for 12 V and 24 V systems
- Data rate up to 5 Mbps
- Power supply voltage
  - VBAT: 4.5V to 40V
  - VCC: 4.5V to 5.5V
  - VIO: 2.8V~5.5V
- -58V to 58V BUS fault protection
- Common mode voltage range:  $\pm 30V$
- Low loop delay: <250ns
- BUS pins support 8kV HBM ESD, 4kV IEC
- Low power consumption standby mode: 10 $\mu$ A
- Undervoltage and overtemperature protection
- Operating temperature: -40°C to 125°C
- AEC-Q100 certified
- RoHS compliant package: SOP-14, DFN-14

### ◆ Pinout & Package



### ◆ Application

  
Applicable to  
12V/24V system

  
Vehicle and  
transportation

  
Advanced driver  
assistance system(ADAS)

  
Infotainment  
system

  
Instrument cluster

  
Body Electronics  
and Lighting

|                             |                          |                                           |                           |                    |                    |                            |                            |                          |                                                  |
|-----------------------------|--------------------------|-------------------------------------------|---------------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|--------------------------------------------------|
| Isolated RS-485 Transceiver | Isolated CAN Transceiver | Isolated CAN with Integrated Power Supply | Solid-State Relay         | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator with Integrated Power Supply |
|                             |                          |                                           | Isolated I <sup>2</sup> C | FC Interface       | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         |                                                  |



## ◆ Product introduction

## ◆ Product feature

- ## ◆ Pinout & Package



133

## NCA1462-Q1: Automotive CAN SIC with Ringing Suppression Function

### ◆ Product introduction

NCA1462-Q1 is a high-speed CAN transceiver with Normal and Standby modes and a VIO supply pin. It meets the physical layer requirements of the ISO 11898-2:2016 high speed CAN specification and the CiA 601-4 Signal Improvement Capability (SIC) specification, and are fully interoperable with high-speed Classical CAN and CAN FD transceivers.

The CAN signal improvements significantly reduce signal ringing on the network, enabling reliable CAN FD communication at 5 Mbps in larger topologies. In addition, the NCA1462-Q1 has a much tighter bit timing symmetry, enabling CAN FD communication up to 8 Mbps.

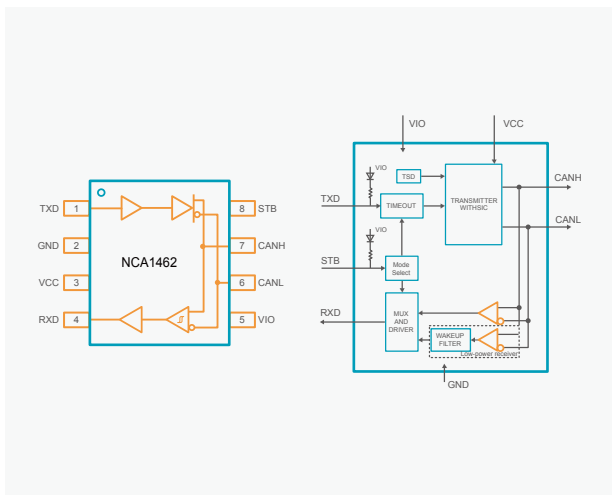
The NCA1462-Q1 is intended as a simple replacement for high-speed Classical CAN and CAN FD transceivers, such as the NCA1042.

### ◆ Product feature

- ISO 11898-2 and CiA601-4 and CAN SIC
- AEC-Q100 qualified, Grade 1
- Compatible with Data Rate up to 8Mbps
- DC Bus-Fault Protection:  $\pm 58V$
- Common Mode Range:  $\pm 30V$
- VIO support: down to 1.7V, up to 5.5V
- Package: SOP8, DFN8



### ◆ Pinout & Package



### ◆ Application



Automotive gateway



Body control modules



Advanced Driver Assistance Systems (ADAS)



Infotainment



Cluster

## NCA1044-Q1: Automotive High-speed CAN Transceiver with Standby Mode

### ◆ Product introduction

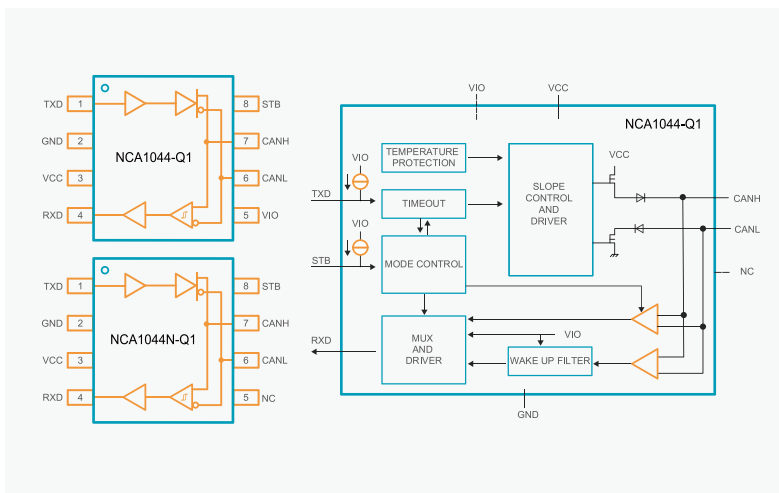
The NCA1044-Q1 is a high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The NCA1044-Q1 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. This implementation enables reliable communication in the CAN FD fast phase at data rates up to 5 Mbit/s. The NCA1044-Q1 provides thermal protection and transmit data dominant time out function.

### ◆ Product feature

- ISO 11898-2 conformed
- AEC-Q100 qualified, Grade 1
- Compatible with Data Rate up to 5Mbps
- DC Bus-Fault Protection:  $\pm 58V$
- Common Mode Range:  $\pm 30V$
- VIO support: down to 1.8V, up to 5.5V
- Package: SOP8, DFN8



### ◆ Pinout & Package



### ◆ Application



Highly loaded CAN networks down to 10 kbps networks



Automotive gateway



Body control modules



Advanced Driver Assistance Systems (ADAS)



Infotainment system

## NCA1057-Q1: Automotive High-speed CAN Transceiver

### ◆ Product introduction

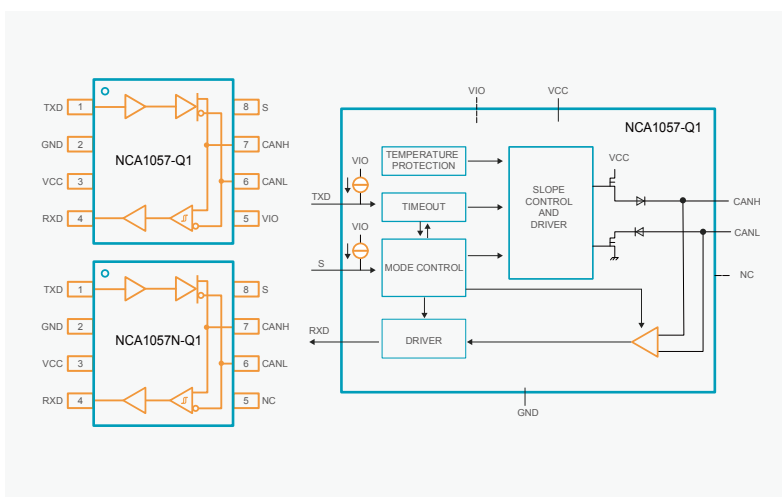
The NCA1057-Q1 is a high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The NCA1057-Q1 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. This implementation enables reliable communication in the CAN FD fast phase at data rates up to 5 Mbit/s. The NCA1057-Q1 provides thermal protection and transmit data dominant time out function.

### ◆ Product feature

- ISO 11898-2 conformed
- AEC-Q100 qualified, Grade 1
- Compatible with Data Rate up to 5Mbps
- DC Bus-Fault Protection:  $\pm 58V$
- Common Mode Range:  $\pm 30V$
- VIO support: down to 1.8V, up to 5.5V
- Package: SOP8, DFN8



### ◆ Pinout & Package



### ◆ Application



Highly loaded CAN networks down to 10 kbps networks



Automotive gateway



Body control modules



Advanced Driver Assistance Systems (ADAS)



Infotainment system

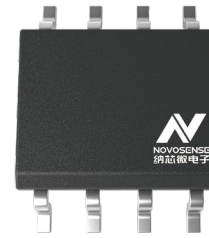
## NCA1042C-Q1: Automotive High-speed CAN Transceiver with Standby Mode

### ◆ Product introduction

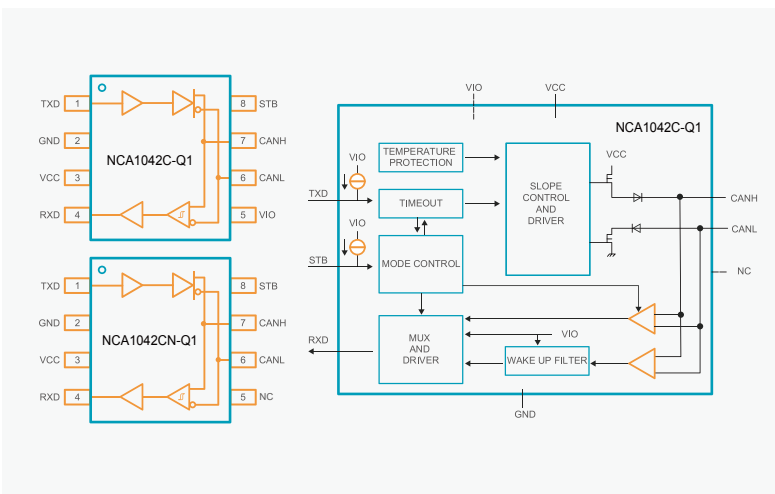
The NCA1042C-Q1 is a high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The NCA1042C-Q1 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. This implementation enables reliable communication in the CAN FD fast phase at data rates up to 5 Mbit/s. The NCA1042C-Q1 provides thermal protection and transmit data dominant time out function.

### ◆ Product feature

- ISO 11898-2 conformed
- AEC-Q100 qualified, Grade 1
- Compatible with Data Rate up to 5Mbps
- DC Bus-Fault Protection:  $\pm 58V$
- Common Mode Range:  $\pm 30V$
- VIO support: down to 1.8V, up to 5.5V
- Package: SOP8, DFN8



### ◆ Pinout & Package



### ◆ Application



Highly loaded CAN networks down to 10 kbps networks



Automotive gateway



Body control modules



Advanced Driver Assistance Systems (ADAS)



Infotainment system



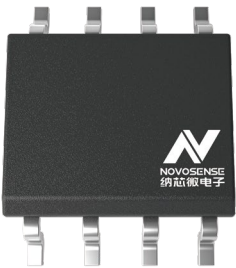
# NCA1042C: High-speed CAN Transceiver with Standby Mode

## ◆ Product introduction

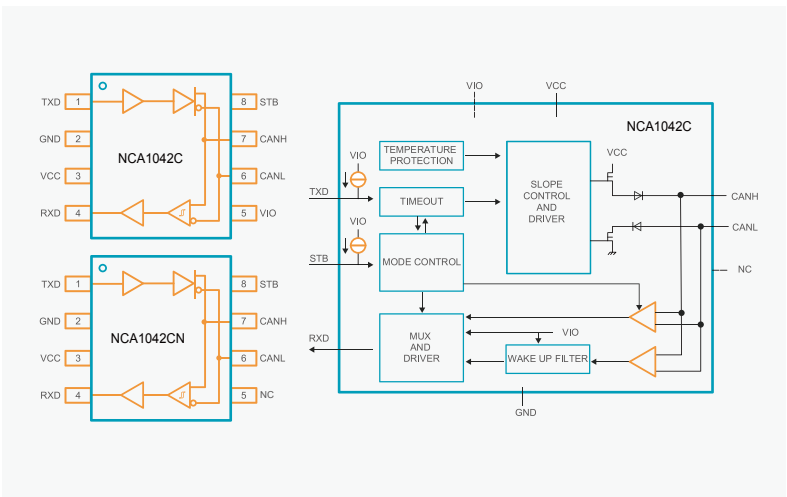
The NCA1042C is a high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The NCA1042C implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. This implementation enables reliable communication in the CAN FD fast phase at data rates up to 5 Mbit/s. The NCA1042C provides thermal protection and transmit data dominant time out function.

## ◆ Product feature

- ISO 11898-2 conformed
- Improve the bus signal by reducing ringing
- Compatible with Data Rate up to 5Mbps
- DC Bus-Fault Protection:  $\pm 70V$
- Common Mode Range:  $\pm 30V$
- VIO support: down to 1.8V, up to 5.5V
- Package: SOP8



## ◆ Pinout & Package



## ◆ Application



Highly loaded CAN networks down to 10 kbps networks



Industrial automation, control, sensors, and drive systems



Building, security, and climate control automation

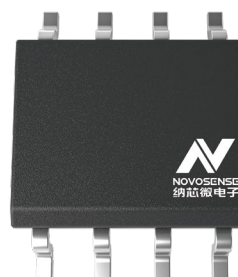
## NCA1051C: High-speed CAN Transceiver

### ◆ Product introduction

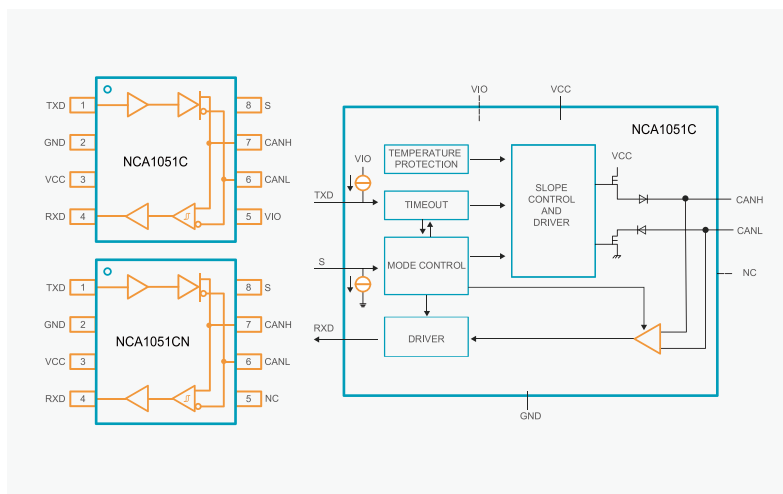
The NCA1051C is a high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The NCA1051C implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. This implementation enables reliable communication in the CAN FD fast phase at data rates up to 5 Mbit/s. The NCA1051C provides thermal protection and transmit data dominant time out function.

### ◆ Product feature

- ISO 11898-2 conformed
- Compatible with Data Rate up to 5Mbps
- DC Bus-Fault Protection:  $\pm 70V$
- Common Mode Range:  $\pm 30V$
- VIO support: down to 1.8V, up to 5.5V
- Package: SOP8



### ◆ Pinout & Package



### ◆ Application



Highly loaded CAN networks down to 10 kbps networks



Industrial automation, control, sensors, and drive systems



Building, security, and climate control automation

## NCA1043B-Q1: Automotive High Speed CAN with Standby and Sleep Mode

### ◆ Product introduction

The NCA1043B high-speed CAN transceiver provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The transceiver is designed for high-speed CAN applications in the automotive industry, providing differential transmit and receive capability to (a microcontroller with) a CAN protocol controller.

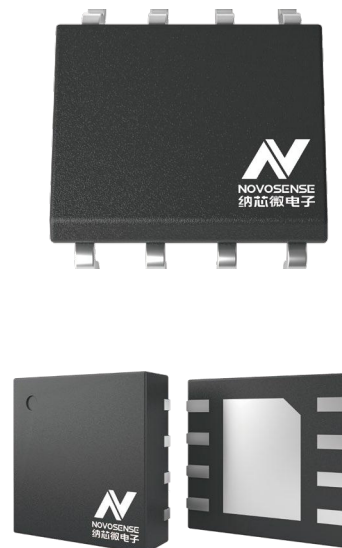
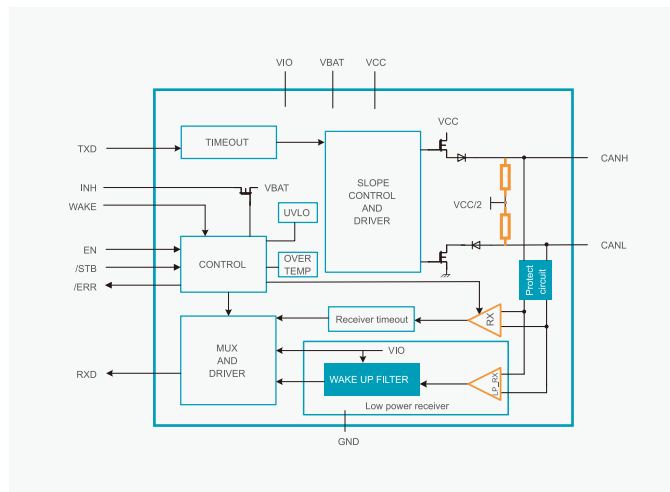
The NCA1043B offers excellent Electro Magnetic Compatibility (EMC) and ElectroStatic Discharge (ESD) performance, very low power consumption, and passive behavior when the supply voltage is turned off.

These features make the NCA1043B the ideal choice for high-speed CAN networks containing nodes that need to be available all times, even when the internal VIO and VCC supplies are switched off.

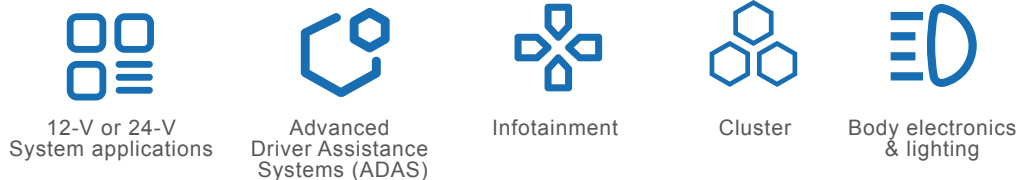
### ◆ Product feature

- ISO11898-2 standard and SAE J2284-1 to SAE J2284-5
- AEC-Q100 Qualified
- I/O voltage range supports 3V and 5V MCU
- DC Bus-Fault Protection:  $\pm 58V$
- Transmit data (TXD) dominant time out function
- Bus dominant time out function
- Low-power management controls the power supply throughout the node while supporting local and remote wake-up with wake-up source recognition
- Package: SOP14, DFN14

### ◆ Pinout & Package



### ◆ Application



|                             |                          |                                           |                   |                    |                    |                            |                            |                          |                                                  |
|-----------------------------|--------------------------|-------------------------------------------|-------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|--------------------------------------------------|
| Isolated RS-485 Transceiver | Isolated CAN Transceiver | Isolated CAN with Integrated Power Supply | Solid-State Relay | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator with Integrated Power Supply |
|                             |                          |                                           | Isolated I/O      | FC Interface       | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         |                                                  |



# LIN Transceiver

## LIN Transceiver

| LIN transceiver |              |                 |                      |         |                     |                        |              |                                  |          |              |
|-----------------|--------------|-----------------|----------------------|---------|---------------------|------------------------|--------------|----------------------------------|----------|--------------|
|                 | Part No.     | Part No.        | Power Supply Voltage | ESD(kV) | Max DataRate (kbps) | BUS Voltage Protection | Wake-up      | Operating Temperature Range (°C) | AEC-Q100 | Package Type |
| LIN             | NCA1021 S-Q1 | NCA1021 S-Q1SPR | VBAT: 5.5~27V        | 8       | 20                  | -40~+40                | Local/Remote | -40~150                          | ✓        | SOP14        |
|                 |              | NCA1021 S-Q1DNR | VBAT: 5.5~27V        | 8       | 20                  | -40~+40                | Local/Remote | -40~150                          | ✓        | DFN14        |



## NCA1021S-Q1: Automotive LIN BUS Transceiver

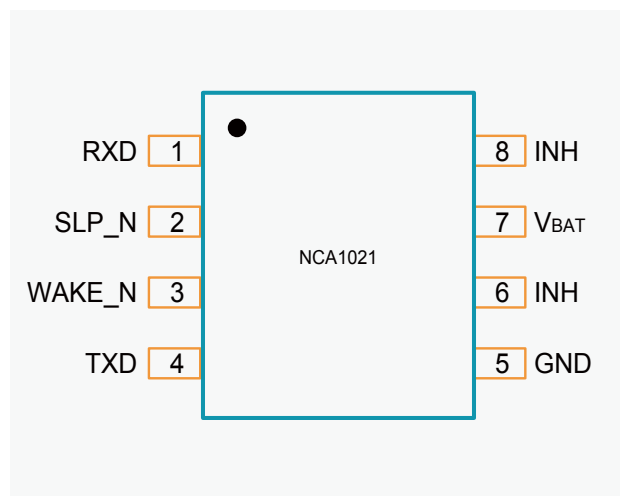
## ◆ Product introduction

NCA1021S-Q1 is a LIN transceiver that supports low power consumption and multiple wake-up functions, supporting up to 20kbps for sending and receiving communication. NCA1021S-Q1 is designed with a low power consumption sleep mode and supports remote and local wake-up functions via LIN BUS or other pins. The device can also use the INH output pin as a flag to control the working status of other devices in the local system to achieve low-power operation of the system. NCA1021S-Q1 controls the status of the LIN BUS through the TXD pin and reports the status of the BUS through its open drain RXD output pin. The device converts the signal received by TXD into a LIN BUS signal through waveform shaping and slew rate adjustment to reduce Electro Magnetic Emission (EME).

◆ **Product feature**

- Fully compatible with ISO17987-4
- Ultra-low electromagnetic emission (EME)
- Supporting 12V systems
- Input level compatible with 3.3V and 5 V devices
- -40V to 40V BUS fault protection
- Wake-up source identification (local or remote)
- Integrated with LIN pull-up resistor
- Transmit data (TXD) dominant time out function
- Data rate: up to 20Kbps
- AEC-Q100 certified
- Operating temperature: -40°C to 150°C
- RoHS compliant package: SOP-8

## ◆ Pinout & Package



## ◆ Application



## Body Electronics and Lighting



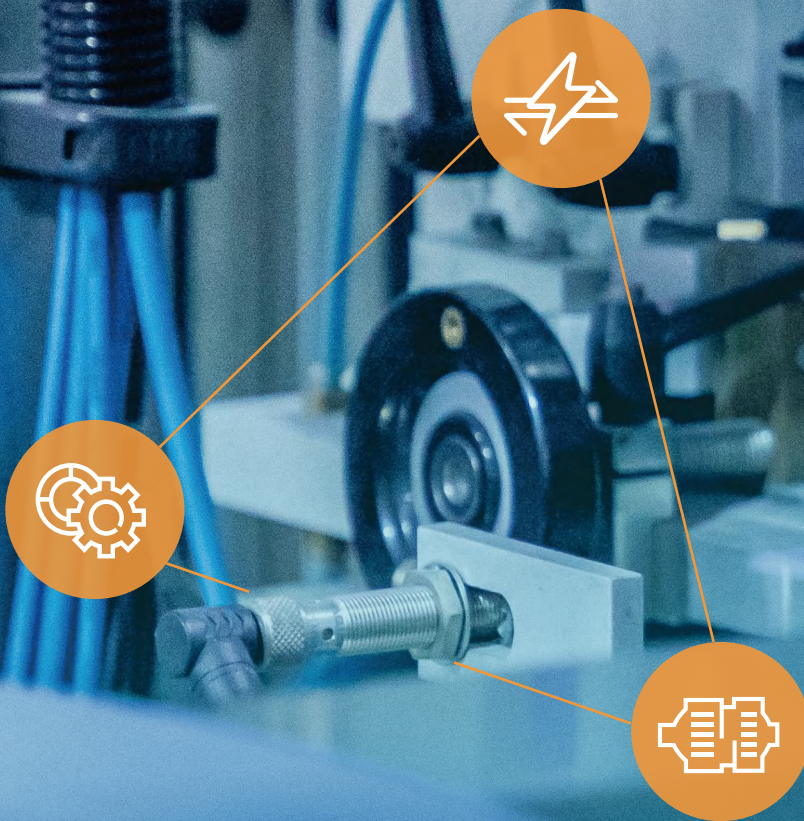
## Automotive Infotainment System and Instrument Cluster



## Hybrid, electric and powertrain systems



# Digital Isolator





# Digital Isolator

| <b>NSI82xx Series High Performance Multi-Channel Digital Isolator Chip</b><br>Speed 150Mbps; Propagation delay 10ns; Output and input voltage range 2.5 to 5.5V;<br>Operating temperature range -40 to 125 °C, and it has passed UL1577 certification |          |           |                    |                          |                     |                |      |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|--------------------|--------------------------|---------------------|----------------|------|----------|--------------|
|                                                                                                                                                                                                                                                       | Part No. | Part No.  | ISO Rating (kVrms) | Forward/Reverse Channels | Max DataRate (Mbps) | Default Output |      | AEC-Q100 | Package Type |
|                                                                                                                                                                                                                                                       |          |           |                    |                          |                     | LOW            | HIGH |          |              |
| Single Channel                                                                                                                                                                                                                                        | NSI8210  | NSI8210Nx | 3.75               | 1/0                      | 150                 | ✓              | ✓    | ✓        | SOP-8        |
|                                                                                                                                                                                                                                                       |          | NSI8210Dx | 2                  | 1/0                      | 150                 | ✓              | ✓    |          | DFN-8        |
| Dual Channel                                                                                                                                                                                                                                          | NSI8220  | NSI8220Nx | 3.75               | 2/0                      | 150                 | ✓              | ✓    | ✓        | SOP-8        |
|                                                                                                                                                                                                                                                       |          | NSI8220Wx | 5                  | 2/0                      | 150                 | ✓              | ✓    | ✓        | SOP-8        |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           |                    |                          |                     |                |      |          | SOWW-16      |
|                                                                                                                                                                                                                                                       | NSI8221  | NSI8221Nx | 3.75               | 1/1                      | 150                 | ✓              | ✓    | ✓        | SOP-8        |
|                                                                                                                                                                                                                                                       |          | NSI8221Wx | 5                  | 1/1                      | 150                 | ✓              | ✓    | ✓        | SOW-8        |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           |                    |                          |                     |                |      |          | SOWW-16      |
|                                                                                                                                                                                                                                                       | NSI8222  | NSI8222Nx | 3.75               | 0/2                      | 150                 | ✓              | ✓    | ✓        | SOP-8        |
|                                                                                                                                                                                                                                                       |          | NSI8222Wx | 5                  | 0/2                      | 150                 | ✓              | ✓    | ✓        | SOW-8        |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           |                    |                          |                     |                |      |          | SOWW-16      |
| Triple Channel                                                                                                                                                                                                                                        | NSI8230  | NSI8230Wx | 5                  | 3/0                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOWW-16      |
|                                                                                                                                                                                                                                                       | NSI8231  | NSI8240Wx | 5                  | 3/1                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOWW-16      |
| Quad Channel                                                                                                                                                                                                                                          | NSI8240  | NSI8240Wx | 5                  | 4/0                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOWW-16      |
|                                                                                                                                                                                                                                                       |          | NSI8240Sx | 3                  | 4/0                      | 150                 | ✓              | ✓    |          | SSOP-16      |
|                                                                                                                                                                                                                                                       |          | NSI8240Nx | 3.75               | 4/0                      | 150                 | ✓              | ✓    | ✓        | SOP-16       |
|                                                                                                                                                                                                                                                       | NSI8241  | NSI8241Wx | 5                  | 3/1                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOWW-16      |
|                                                                                                                                                                                                                                                       |          | NSI8241Sx | 3                  | 3/1                      | 150                 | ✓              | ✓    | ✓        | SSOP-16      |
|                                                                                                                                                                                                                                                       |          | NSI8241Nx | 3.75               | 3/1                      | 150                 | ✓              | ✓    |          | SOP-16       |
|                                                                                                                                                                                                                                                       | NSI8242  | NSI8242Wx | 5                  | 2/2                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          |           | 5.7                |                          |                     |                |      |          | SOWW-16      |
|                                                                                                                                                                                                                                                       |          | NSI8242Sx | 3                  | 2/2                      | 150                 | ✓              | ✓    | ✓        | SSOP-16      |
|                                                                                                                                                                                                                                                       |          | NSI8242Nx | 3.75               | 2/2                      | 150                 | ✓              | ✓    |          | SOP-16       |
| Six Channel                                                                                                                                                                                                                                           | NSI8260  | NSI8260Wx | 5                  | 6/0                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          | NSI8260Sx | 3                  | 6/0                      | 150                 | ✓              | ✓    | ✓        | SSOP-16      |
|                                                                                                                                                                                                                                                       | NSI8261  | NSI8261Wx | 5                  | 5/1                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          | NSI8261Sx | 3                  | 5/1                      | 150                 | ✓              | ✓    | ✓        | SSOP-16      |
|                                                                                                                                                                                                                                                       | NSI8262  | NSI8262Wx | 5                  | 4/2                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          | NSI8262Sx | 3                  | 4/2                      | 150                 | ✓              | ✓    | ✓        | SSOP-16      |
|                                                                                                                                                                                                                                                       | NSI8263  | NSI8263Wx | 5                  | 3/3                      | 150                 | ✓              | ✓    | ✓        | SOW-16       |
|                                                                                                                                                                                                                                                       |          | NSI8263Sx | 3                  | 3/3                      | 150                 | ✓              | ✓    | ✓        | SSOP-16      |
|                                                                                                                                                                                                                                                       | NSI8266  | NSI8266Wx | 5                  | 0/6                      | 150                 | ✓              | ✓    |          | SOW-16       |
|                                                                                                                                                                                                                                                       |          | NSI8266Sx | 3                  | 0/6                      | 150                 | ✓              | ✓    | ✓        | SSOP-16      |

### NSI82xxC Series Cost-effective Multi-Channel Digital Isolator Chip

Speed 150Mbps; Propagation delay 10ns; Output and input voltage range 2.5 to 5.5V;  
Operating temperature range -40 to 125 °C, and it has passed UL1577 certification

|                   | Part No. | Part No.        | ISO Rating<br>(kVrms) | Forward<br>/Reverse<br>Channels | Max DataRate<br>(Mbps) | Default Output |      | Package Type |
|-------------------|----------|-----------------|-----------------------|---------------------------------|------------------------|----------------|------|--------------|
|                   |          |                 |                       |                                 |                        | LOW            | HIGH |              |
| Single<br>Channel | NSI8210  | NSI8210Cx-DSPR  | 3.75                  | 1/0                             | 100                    | ✓              | ✓    | SOP-8        |
|                   |          | NSI8210Cx-DSWVR | 5                     | 1/0                             | 100                    | ✓              | ✓    | SOW-8        |
| Dual<br>Channel   | NSI8220  | NSI8220Cx-DSPR  | 3.75                  | 2/0                             | 100                    | ✓              | ✓    | SOP-8        |
|                   |          | NSI8220Cx-DSWVR | 5                     | 2/0                             | 100                    | ✓              | ✓    | SOW-8        |
|                   |          | NSI8220Cx-DSWR  | 5                     | 2/0                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8221  | NSI8221Cx-DSPR  | 3.75                  | 1/1                             | 100                    | ✓              | ✓    | SOP-8        |
|                   |          | NSI8221Cx-DSWVR | 5                     | 1/1                             | 100                    | ✓              | ✓    | SOW-8        |
|                   |          | NSI8221Cx-DSWR  | 5                     | 1/1                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8222  | NSI8222Cx-DSPR  | 3.75                  | 0/2                             | 100                    | ✓              | ✓    | SOP-8        |
|                   |          | NSI8222Cx-DSWVR | 5                     | 0/2                             | 100                    | ✓              | ✓    | SOW-8        |
|                   |          | NSI8222Cx-DSWR  | 5                     | 0/2                             | 100                    | ✓              | ✓    | SOW-16       |
|                   |          |                 |                       |                                 |                        |                |      |              |
| Triple<br>Channel | NSI8230  | NSI8230Cx-DSWR  | 5                     | 3/0                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8231  | NSI8231Cx-DSWR  | 5                     | 2/1                             | 100                    | ✓              | ✓    | SOW-16       |
| Quad<br>Channel   | NSI8240  | NSI8240Cx-DSPR  | 3.75                  | 4/0                             | 100                    | ✓              | ✓    | SOIC-16N     |
|                   |          | NSI8240Cx-DSWR  | 5                     | 4/0                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8241  | NSI8241Cx-DSWR  | 5                     | 3/1                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8242  | NSI8242Cx-DSWR  | 5                     | 2/2                             | 100                    | ✓              | ✓    | SOW-16       |
| Six<br>Channel    | NSI8260  | NSI8260Cx-DSWR  | 5                     | 6/0                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8261  | NSI8261Cx-DSWR  | 5                     | 5/1                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8262  | NSI8262Cx-DSWR  | 5                     | 4/2                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8263  | NSI8263Cx-DSWR  | 5                     | 3/3                             | 100                    | ✓              | ✓    | SOW-16       |
|                   | NSI8266  | NSI8266Cx-DSWR  | 5                     | 0/6                             | 100                    | ✓              | ✓    | SOW-16       |

### NIRSxx Series Low Cost Multi-Channel Digital Isolator Chip with Basic Insulation But High Reliability

Output and input voltage range 2.5 to 5.5V; Operating temperature range -40 to 125 °C, and it has passed UL1577 certification

|                   | Part No.      | ISO Rating<br>(kVrms) | Forward/Reverse<br>Channels | Max DataRate<br>(Mbps) | CMTI(kV/us) | Default Output |      | Package Type |
|-------------------|---------------|-----------------------|-----------------------------|------------------------|-------------|----------------|------|--------------|
|                   |               |                       |                             |                        |             | LOW            | HIGH |              |
| Dual<br>Channel   | NIRS20N1-DSPR | 3                     | 2/0                         | 1                      | 100         |                | ✓    | SOP-8        |
|                   | NIRS21N1-DSPR | 3                     | 1/1                         | 1                      | 100         |                | ✓    | SOP-8        |
|                   | NIRS22N1-DSPR | 3                     | 0/2                         | 1                      | 100         |                | ✓    | SOP-8        |
| Triple<br>Channel | NIRS31-DSSR   | 3                     | 2/1                         | 1                      | 100         |                | ✓    | SSOP-16      |

## NSI822X/ NSI823X/NSI824X/NSI826X: Enhanced Dual/Triple/Quad/Six-Channel Digital Isolators with High Reliability

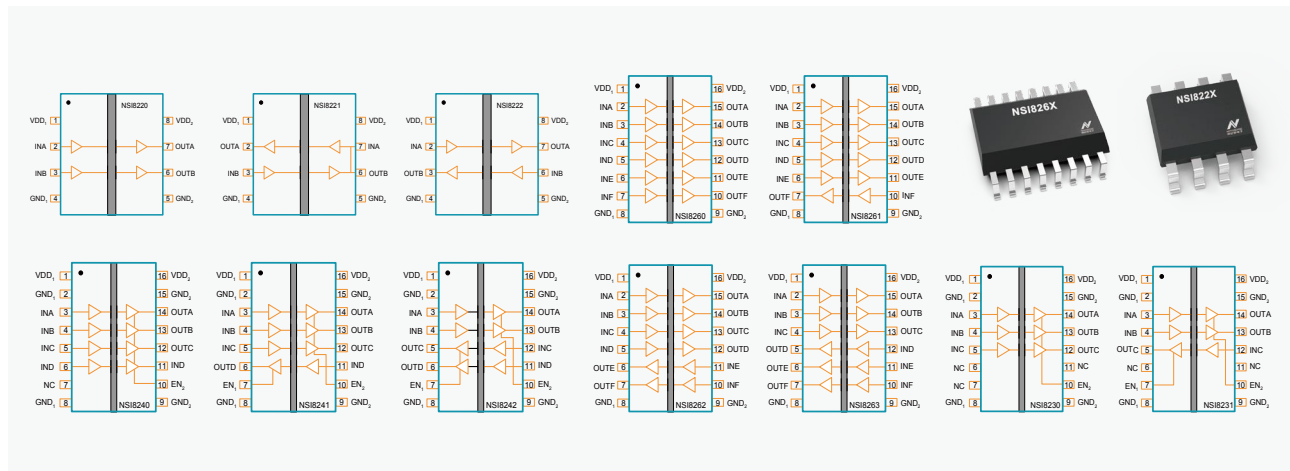
### ◆ Product introduction

NSI822X/NSI823X/NSI824X/NSI826X are cost-effective dual/triple/quad/six-channel digital isolators with high reliability. This series of products have passed UL1577 safety certification, support several insulation withstand voltage (3kVrms, 3.75kVrms, 5kVrms, 5.7kVrms), while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of the product is up to 150Mbps, and the common mode transient immunity (CMTI) is up to 200kV/us. It provides digital channel direction configuration and the default output level configuration when the input power is lost. The wide power supply voltage range of this series of devices supports direct connection with most digital interfaces, making it easy for level conversion. Excellent system-level EMC performance improves operation reliability and stability. AEC-Q100 (level 1) options are available for all devices.

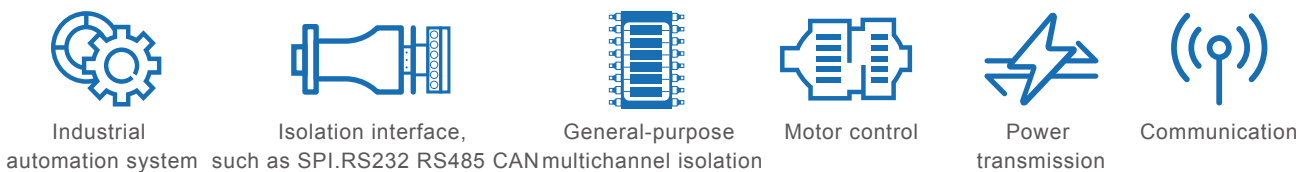
### ◆ Product feature

- Isolation withstand voltage 3000Vrms, 3750Vrms, 5000Vrms, 5700Vrms
- VDE Reinforced Isolation Certification
- Data rate: DC to 150Mbps
- High CMTI:  $\pm 200\text{kV}/\mu\text{s}$
- AEC Q100 (Grade 1) is applicable to all devices
- Chip-level ESD: HBM:  $\pm 8\text{kV}$
- Enhanced ESD, EFT, surge protection at system level
- Lifetime of isolated gate: > 60 years
- Low propagation delay typical <15ns
- Low power consumption: 1.5mA/ch (1 Mbps)
- Operating temperature: -55 to 125°C
- RoHS-compliant packages: SOP-8, SOP-16, SSOP-16, SOW-8, SOW-16, and SOWW-16

### ◆ Pinout & Package



### ◆ Application





## NSI822XC/ NSI823XC/NSI824XC/NSI826XC: Cost-effective Enhanced Dual/Triple/Quad/Six-Channel Digital Isolators with High Reliability

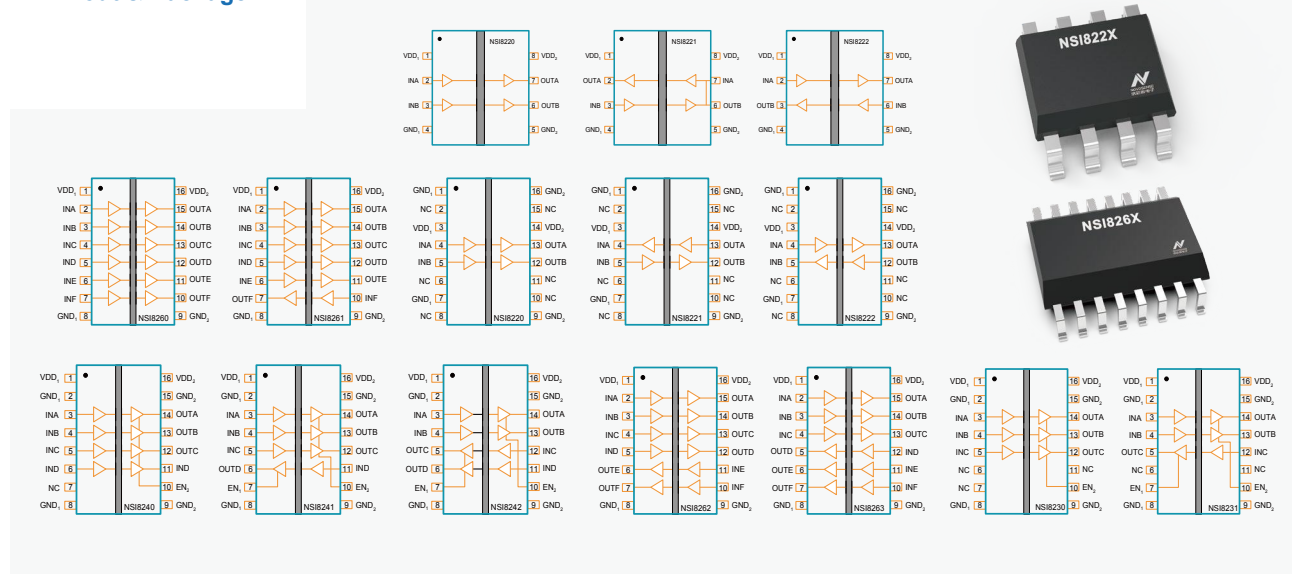
### ◆ Product introduction

NSI822XC/NSI823XC/NSI824XC/NSI826XC are cost-effective dual/triple/quad/six-channel digital isolators with high reliability. This series of products have passed UL1577 safety certification, several insulation withstand voltage (3.75kVrms, 5kVrms), while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of the product is up to 100Mbps, and the common mode transient immunity (CMTI) is up to 200kV/us. It provides digital channel direction configuration and the default output level configuration when the input power is lost. The wide power supply voltage range of this series of devices supports direct connection with most digital interfaces, making it easy for level conversion. Excellent system-level EMC performance improves operation reliability and stability. The MSL rating of the device is MSL 3.

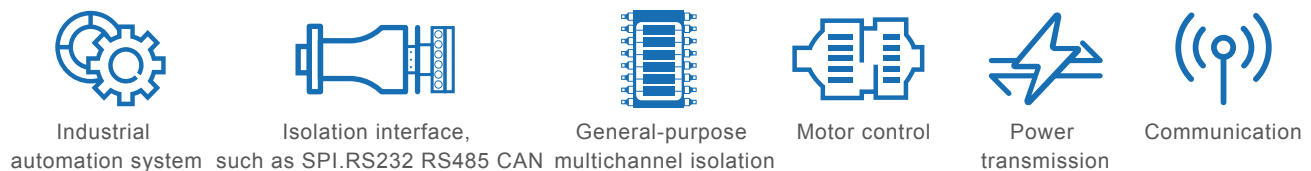
### ◆ Product feature

- Isolation withstand voltage 3750Vrms, 5000VRMS
- VDE Reinforced Isolation Certification
- Data rate: DC to 100Mbps
- High CMTI:  $\pm 150\text{kV}/\mu\text{s}$
- Chip-level ESD: HBM:  $\pm 8\text{kV}$
- Enhanced ESD, EFT, surge protection at system level
- Lifetime of isolated gate: > 60 years
- Low propagation delay typical <15ns
- Low power consumption: 1.5mA/ch(1 Mbps)
- Operating temperature: -40 to 125°C
- RoHS compliant package: SOP-8, SOW-8, SOW-16

### ◆ Pinout & Package



### ◆ Application



## NIRS2x: Cost-optimized Dual-channel Digital Isolator with High Reliability

### ◆ Product introduction

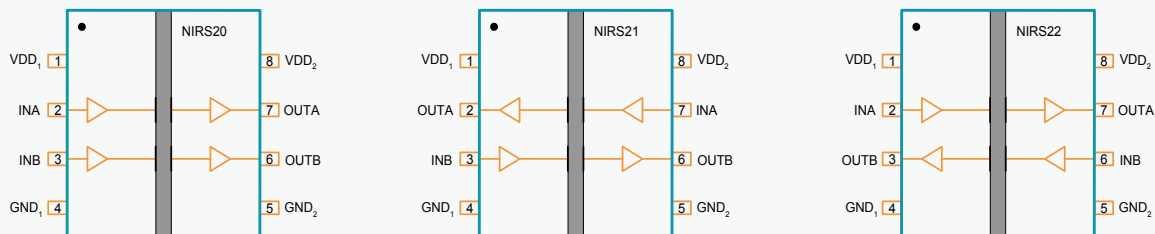
NIRS2x is a cost-optimized dual-channel digital isolator with high reliability. The NIRS2x device is safety certified by UL1577 support 3kVrms insulation withstand voltages, while providing high electromagnetic immunity and low emissions at low power consumption. The data rate of NIRS2x is up to 500kbps, and the common mode transient immunity (CMTI) is up to 100kV/us. NIRS2x allows digital channel direction configuration and provide a default output high level when input power is lost. The wide power supply voltage range of NIRS2x supports direct connection with most digital interfaces, making it easy for level conversion. Its high system-level EMC performance enhances its reliability and stability.

### ◆ Product feature

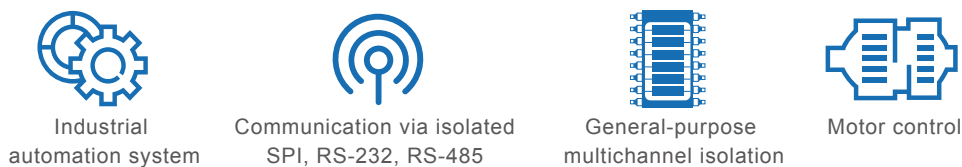
- Up to 3000Vrms insulation voltage
- Data rate: DC to 500kbps
- Power supply voltage: 2.5V to 5.5V
- High CMTI:  $\pm 100\text{kV}/\mu\text{s}$
- Chip-level EMC performance: HBM:  $\pm 6\text{kV}$
- High system level EMC performance:  
Enhanced system level ESD, EFT, and surge immunity
- Maximum Surge Isolation Voltage  $V_{IOSM}=6153\text{Vpk}$
- Low power consumption: 1mA/ch (500kbps)
- Low transmission delay: <500ns
- Lifetime of isolated gate: > 60 years
- Operating temperature:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- RoHS compliant package: SOP-8



### ◆ Pinout & Package



### ◆ Application



## NIRS31: Cost-optimized Triple-channel Digital Isolator with High Reliability





# Digital Isolator with Integrated Isolated Power Supply

# Digital Isolator with Integrated Isolated Power Supply

| NSIP88xx/NSIP89xx Series Multi-Channel Digital Isolator Chip with Integrated Isolated Power Supply                                                                  |          |                 |                    |                          |                     |                |           |              |                 |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|--------------------|--------------------------|---------------------|----------------|-----------|--------------|-----------------|----------|
| Speed 150Mbps; Propagation delay 10ns; Output and input voltage range 3.3 to 5.5V; Operating temperature range -40 to 125°C, and it has passed UL1577 certification |          |                 |                    |                          |                     |                |           |              |                 |          |
|                                                                                                                                                                     | Part No. | Part No.        | ISO Rating (kVrms) | Forward/Reverse Channels | Max DataRate (Mbps) | Default Output |           | CMTI (kV/us) | Features        | Pacakage |
|                                                                                                                                                                     |          |                 |                    |                          |                     | LOW (W0)       | HIGH (W1) |              |                 |          |
| Dual Channel                                                                                                                                                        | NSIP8821 | NSIP8821W1-DSWR | 5                  | 1/1                      | 150                 |                | ✓         | 150          | Split Logic VDD | SOW-16   |
|                                                                                                                                                                     | NSIP8841 | NSIP8841W1-DSWR | 5                  | 3/1                      | 150                 |                | ✓         | 150          | Split Logic VDD | SOW-16   |
| Quad Channel                                                                                                                                                        | NSIP8842 | NSIP8842W0-DSWR | 5                  | 2/2                      | 150                 | ✓              |           | 150          | Split Logic VDD | SOW-16   |
|                                                                                                                                                                     | NSIP8842 | NSIP8842W1-DSWR | 5                  | 2/2                      | 150                 |                | ✓         | 150          | Split Logic VDD | SOW-16   |
|                                                                                                                                                                     | NSIP8844 | NSIP8844W1-DSWR | 5                  | 0/4                      | 150                 |                | ✓         | 150          | Split Logic VDD | SOW-16   |
| Dual Channel                                                                                                                                                        | NSIP8921 | NSIP8921W0-DSWR | 5                  | 1/1                      | 150                 | ✓              |           | 150          | Power Disable   | SOW-16   |
|                                                                                                                                                                     | NSIP8921 | NSIP8921W1-DSWR | 5                  | 1/1                      | 150                 |                | ✓         | 150          | Power Disable   | SOW-16   |
| Quad Channel                                                                                                                                                        | NSIP8940 | NSIP8940W0-DSWR | 5                  | 4/0                      | 150                 | ✓              |           | 150          | Power Disable   | SOW-16   |
|                                                                                                                                                                     | NSIP8941 | NSIP8941W0-DSWR | 5                  | 3/1                      | 150                 | ✓              |           | 150          | Power Disable   | SOW-16   |
|                                                                                                                                                                     | NSIP8941 | NSIP8941W1-DSWR | 5                  | 3/1                      | 150                 |                | ✓         | 150          | Power Disable   | SOW-16   |
|                                                                                                                                                                     | NSIP8942 | NSIP8942W1-DSWR | 5                  | 2/2                      | 150                 |                | ✓         | 150          | Power Disable   | SOW-16   |
|                                                                                                                                                                     | NSIP8944 | NSIP8944W0-DSWR | 5                  | 0/4                      | 150                 | ✓              |           | 150          | Power Disable   | SOW-16   |
|                                                                                                                                                                     | NSIP8944 | NSIP8944W1-DSWR | 5                  | 0/4                      | 150                 |                | ✓         | 150          | Power Disable   | SOW-16   |

| NIRSP31 Low Cost Triple-Channel Digital Isolator Chip with Integrated Isolated Power Supply |         |          |                              |                    |                          |                     |             |                |                       |              |
|---------------------------------------------------------------------------------------------|---------|----------|------------------------------|--------------------|--------------------------|---------------------|-------------|----------------|-----------------------|--------------|
|                                                                                             | Product | Part No. | Power Supply Voltage         | Iso Rating (kVrms) | Forward/Reverse Channels | Max DataRate (Mbps) | CMTI(kV/us) | Default Output | Operating Temperature | Package Type |
| Isolated Power                                                                              | NIRSP31 | NIRSP31  | 4.5V to 5.5V                 | 3                  | 2/1                      | 20                  | 50          | High           | -40~125°C             | LGA-18       |
|                                                                                             |         | NIRSP31V | 3.0V to 3.6V<br>4.5V to 5.5V | 3                  | 2/1                      | 20                  | 50          | High           | -40~125°C             | LGA-18       |



## NSIP882x/NSIP892x/NSIP884x/NSIP894x: Dual/Quad-Channel Digital Isolator with Integrated Isolated DC-DC Power Supply

### ◆ Product introduction

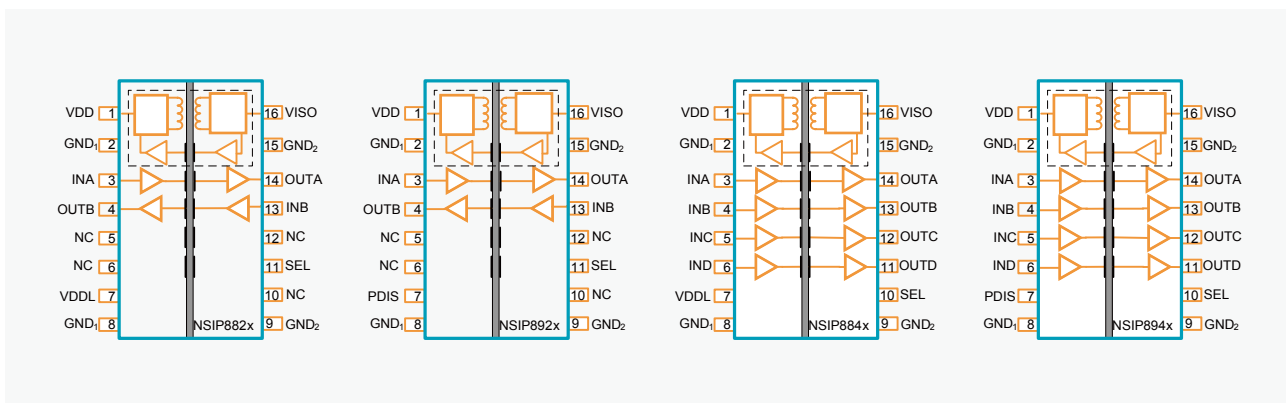
NSIP882x/NSIP892x/NSIP884x/NSIP894x is a dual/quad-channel digital isolator with integrated isolated DC-DC power supply. The isolation DC-DC power supply can provide up to 500mW of output power on the on-chip transformer. The feedback PWM signal is sent to the primary side by a digital isolator based on NOVOSENSE capacitance isolation technology. Highly integrated solutions simplify system design and improve reliability. The products are safety certified by UL1577 support 5kVrms withstand voltages, while providing high electromagnetic immunity and low emissions. The data rate of this series of products is up to 150Mbps, and the common mode transient immunity (CMTI) is up to 150kV/us. The NSIP882x devices provide 5V to 5V, 5V to 3.3V, 3.3V to 3.3V conversion mode, the output voltage can be set by SEL pin. The logical level of digital isolators on left side can be set by VDDL pin which can support the application when the supply voltage and I/O voltage level are different.

### ◆ Product feature

- Up to 5000Vrms insulation voltage
- Supply voltage: 3.3V to 5.5V
- 5V to 5V, 5V to 3.3V, 100mA load current
- 3.3V to 3.3V, 60mA load current
- Overcurrent and thermal protection
- Data rate: DC to 150Mbps
- High CMTI: 150kV/us
- Propagation delay: <15ns
- High system level EMC performance: Enhanced system level ESD, EFT, and surge immunity
- Operating temperature: -40°C to 125°C
- RoHS compliant package: SOW16



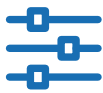
### ◆ Pinout & Package



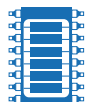
### ◆ Application



Industrial  
automation system



Isolated SPI,  
RS232, RS485



Universal  
Multi-Channel Isolator

## NIRSP31/V: Low Cost Triple-Channel Digital Isolator with Integrated Isolated DC-DC Power Supply

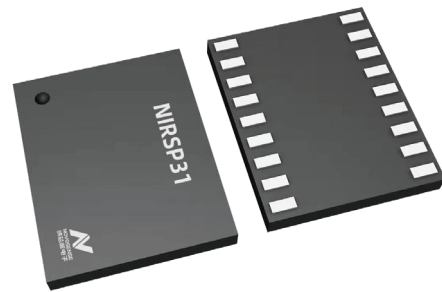
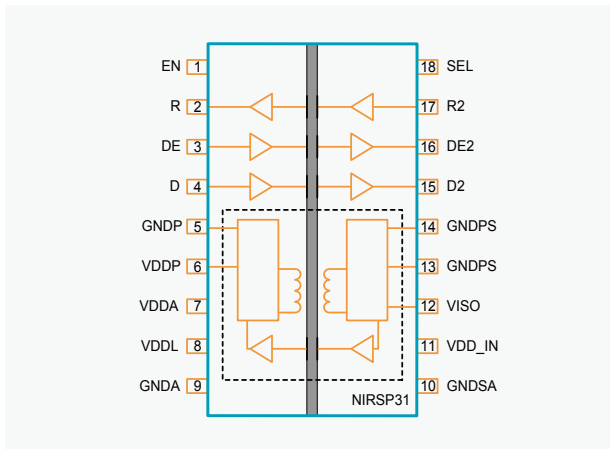
### ◆ Product introduction

NIRSP31/V is a low cost triple-channel digital isolator with integrated isolated DC-DC power supply. The isolated DC-DC converter provides stable output voltage and up to 400mW output power by closed-loop control and transformer on chip. The feedback PWM signal is transmitted to the primary side by a digital isolator based on NOVOSENSE capacitance isolation technology. Highly integrated solutions simplify system design and improve reliability. The NIRSP31 device supports 3kVrms insulation withstand voltages, and features improved electromagnetic immunity and low emission. The data rate of the NIRSP31/V is up to 20Mbps, and the common-mode transient immunity (CMTI) is up to 50kV/us. For NIRSP31 device, 5V to 5V/ 3.3V conversion modes are allowed, for NIRSP31V device, 5V to 5V/ 3.3V conversion modes, 3.3V to 3.3V conversion modes are allowed, both output voltage can be set through SEL pin.

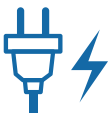
### ◆ Product feature

- Insulation voltage up to 3000Vrms
- Supply voltage:
  - NIRSP31V: 3V to 3.6V, 4.5V to 5.5V
  - NIRSP31: 4.5V to 5.5V
- Load Current:
  - 80mA @5V->5V/3.3V
  - 45mA @3.3V->3.3V
- Overcurrent and thermal protection
- Data transmission rate: DC to 20Mbps
- High CMTI: 50kV/us
- Propagation delay: <75ns
- Operating temperature: -40°C to 125°C
- RoHS compliant package: LGA18

### ◆ Pinout & Package



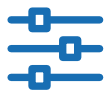
### ◆ Application



Industrial  
BMS System



Industrial  
automation system



Isolated SPI,  
RS232, RS485



General-purpose  
multichannel isolation

# Isolated 485 with Integrated Isolated Power Supply



## Isolated 485 with Integrated Isolated Power Supply

| NSIP83086: Isolated RS485 Transceiver with Integrated Isolated Power Supply |            |                                 |                    |         |                     |              |                                                                |                       |                  |
|-----------------------------------------------------------------------------|------------|---------------------------------|--------------------|---------|---------------------|--------------|----------------------------------------------------------------|-----------------------|------------------|
|                                                                             | Part No.   | Power Supply Voltage            | ISO Rating (kVrms) | ESD(kV) | Max DataRate (Mbps) | CMTI (kV/us) | VISO Output(V)                                                 | Operating Temperature | Package Type     |
| Isolated Power                                                              | NSIP83086  | VDD: 4.5~5.5V<br>VDDL: 1.8~5.5V | 5                  | 8       | 16                  | 150          | 5                                                              | -40~105 °C            | SOW-16<br>SOW-20 |
|                                                                             | NSIP83086V | VDD: 3~5.5V<br>VDDL: 1.8~5.5V   | 5                  | 8       | 16                  | 150          | 3.3                                                            | -40~105 °C            | SOW-16<br>SOW-20 |
|                                                                             | NSIP83086C | VDD: 3~5.5V<br>VDDL: 1.8~5.5V   | 5                  | 8       | 16                  | 150          | 3.3<br>SEL=5V/Float-<br>ing, VISO=5V<br>SEL=GND2,<br>VISO=3.3V | -40~105 °C            | SOW-20           |

## NSIP83086/V/C: Isolated RS-485 Transceiver With Integrated Isolated DC-DC Power Supply

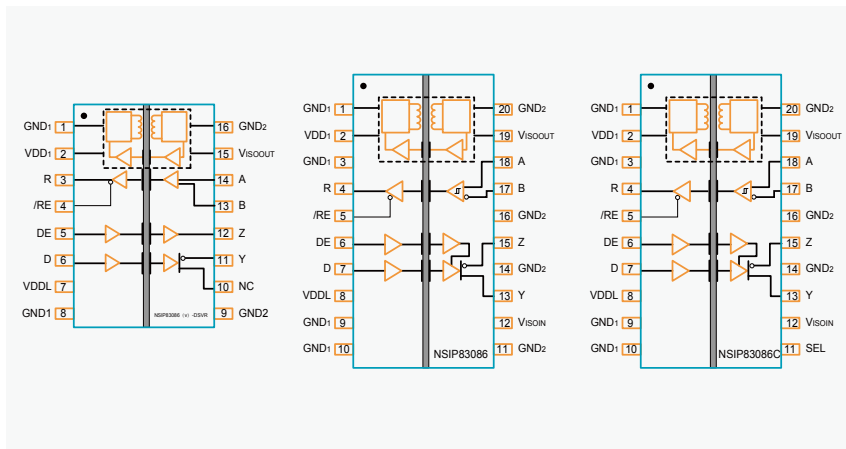
### ◆ Product introduction

NSIP83086/V/C is a full duplex isolated RS-485 transceiver with integrated isolated DC-DC power supply with high reliability. Isolated DC-DC power supply can be based on on-chip transformer, the feedback PWM signal is transmitted to the primary side by a digital isolator based on NOVOSENSE capacitance isolation technology. Highly integrated solutions simplify system design and improve reliability. NSIP83086/V/C support 5kVrms insulation withstand voltages, while the high integrated solution can help to simplify system design and improve reliability. The bus pins on the bus side of the NSIP83086/V/C is designed with  $\pm 8\text{kV}$  ESD protection to GND2 at system level. This device is designed with a fail-safe circuit that ensures the receiver output is logic high when the receiver input is disconnected or shorted. It features a receiver input impedance of 1/8 unit load, allowing up to 256 transceivers to be connected to the bus.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- It is with integrated isolated DC-DC power supply
- I/O voltage range supports 1.8V to 5V MCU
- Power supply voltage:
  - VDD: 4.5V to 5.5V(NSIP83086)
  - VDD: 3V to 5.5V(NSIP83086V/C)
  - VDDL: 1.8V to 5.5V
- Overcurrent and thermal protection
- High CMTI: 150kV/us
- Data transmission rate: 16Mbps
- Supporting 256 transceivers
- High system level EMC performance:
  - BUS Pins w.r.t to GND2 meet IEC61000-4-2  $\pm 8\text{kV}$
  - Other Pins w.r.t to GND2 meet IEC61000-4-2  $\pm 7\text{kV}$
- Operating temperature:  $-40^{\circ}\text{C}$  to  $105^{\circ}\text{C}$
- RoHS compliant package: SOW16, SOW20

### ◆ Pinout & Package



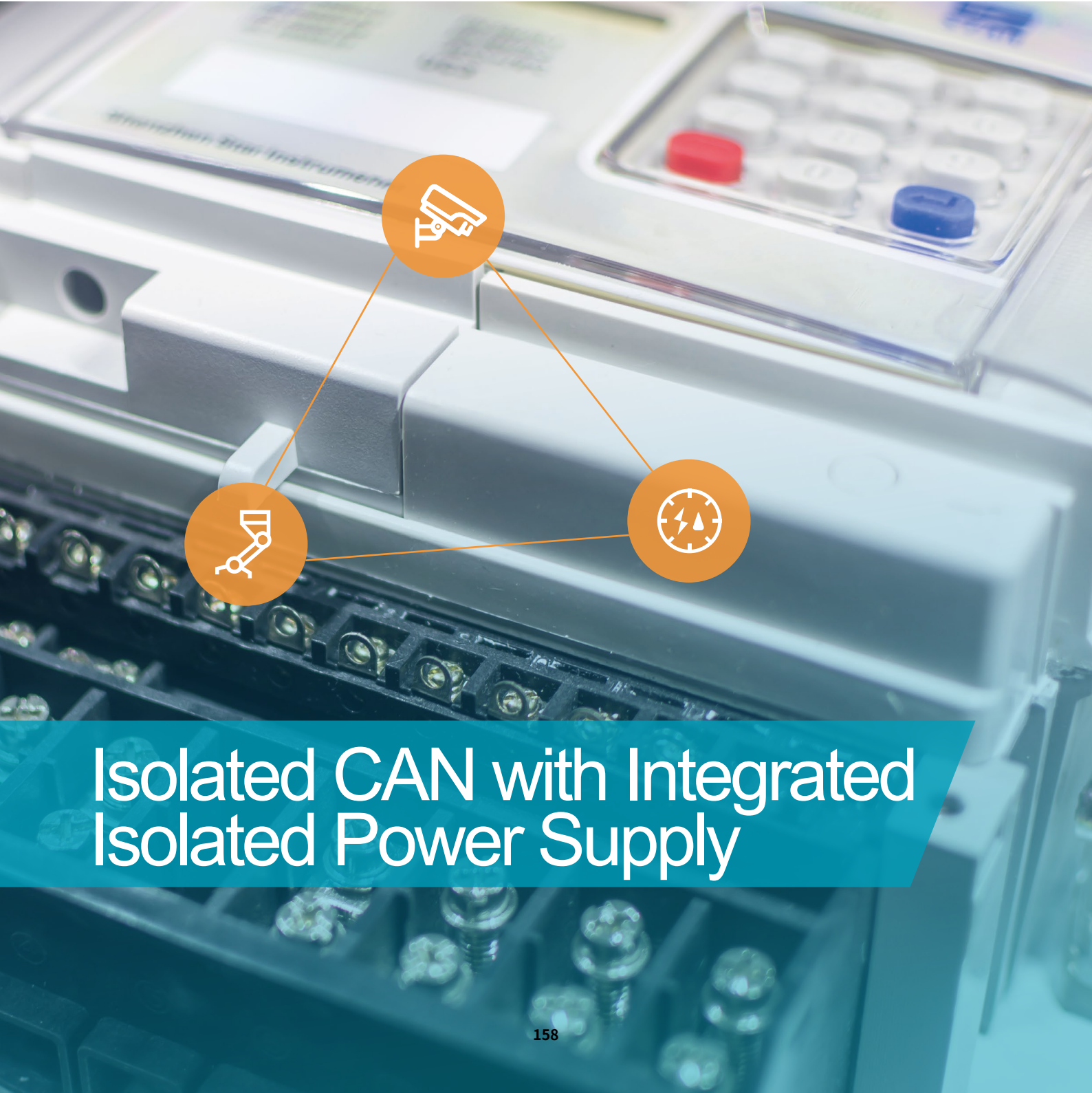
### ◆ Application





# Isolated CAN with Integrated Isolated Power Supply

| NSIP1042: CAN Transceiver Chip with Integrated Isolated Power Supply |          |                      |                    |         |                     |              |                     |                       |              |
|----------------------------------------------------------------------|----------|----------------------|--------------------|---------|---------------------|--------------|---------------------|-----------------------|--------------|
|                                                                      | Part No. | Power Supply Voltage | ISO Rating (kVrms) | ESD(kV) | Max DataRate (Mbps) | CMTI (kV/us) | Logic Level Voltage | Operating Temperature | Package Type |
| Isolated Power                                                       | NSIP1042 | 4.5V to 5.5V         | 5                  | 5       | 5                   | 150          | 1.8V to 5.5V        | -40~105°C             | SOW-20       |



Isolated CAN with Integrated Isolated Power Supply

## NSIP1042: Isolated CAN Transceiver With Integrated Isolated DC-DC Power Supply

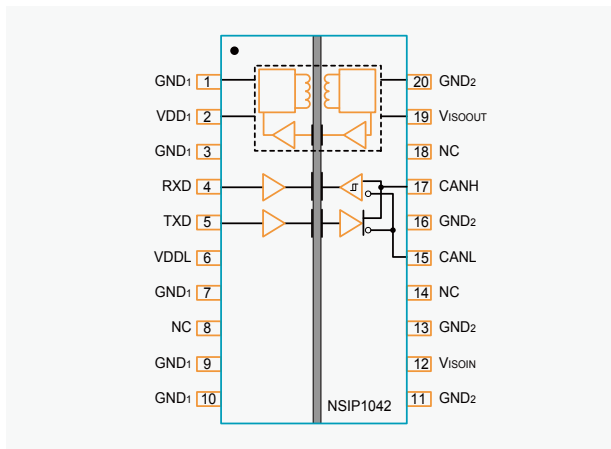
### ◆ Product introduction

NSIP1042 is a CAN transceiver with integrated isolated DC-DC power supply with high reliability. The feedback PWM signal is transmitted to the primary side by a digital isolator based on NOVOSENSE capacitance isolation technology. Highly integrated solutions simplify system design and improve reliability. NSIP1042 is safety certified by UL1577 support 5kVrms insulation withstand voltages, while the high integrated solution can help to simplify system design and improve reliability. The BUS pins on the BUS side of the NSIP1042 is designed with  $\pm 5\text{kV}$  ESD protection to GND2 at system level. NSIP1042 can support data transmission rates of up to 5Mbps, while providing thermal protection and explicit timeout protection for transmission data.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- ISO-Power integrated isolated dc-to-dc converter
- Supply voltage: 4.5V to 5.5V
- Overcurrent and thermal protection High
- CMTI: 150kV/us
- Data transmission rate: 5Mbps
- High system level EMC performance:  
BUS pins conforming to IEC61000-4-2 $\pm 5\text{kV}$  ESD
- Operating temperature:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- RoHS compliant package: SOW20

### ◆ Pinout & Package



### ◆ Application



Industrial  
automation system



Smart ammeters  
and water meters



Security and  
surveillance systems

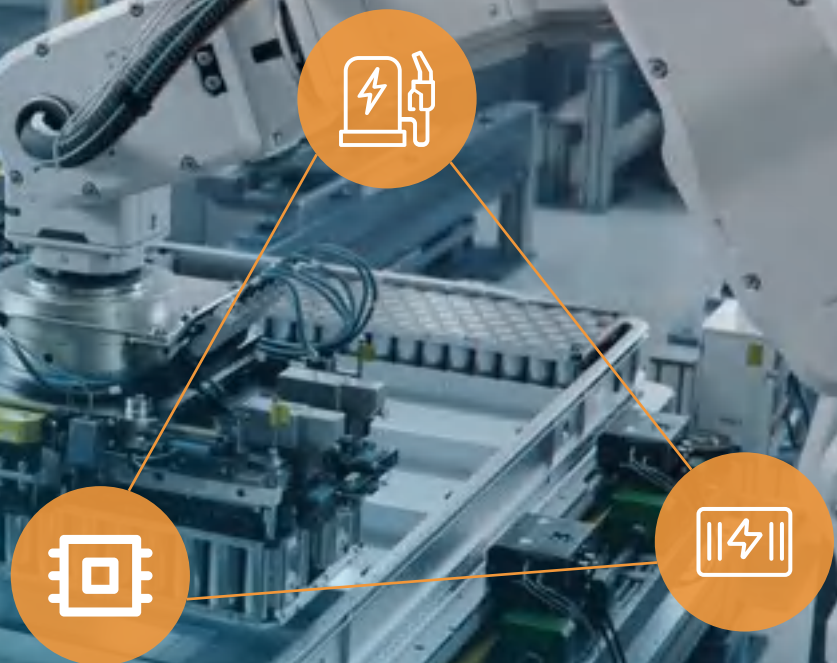
|                                           |                                           |                        |                    |              |                            |                            |                          |                     |
|-------------------------------------------|-------------------------------------------|------------------------|--------------------|--------------|----------------------------|----------------------------|--------------------------|---------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated $\mu\text{C}$ | Transformer Driver | Isolated ADC | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply |                        |                    |              |                            |                            |                          |                     |



## Solid-State Relay

| Solid-State Relay |                                           |          |                    |                    |                            |                        |                      |                        |                                  |              |            |
|-------------------|-------------------------------------------|----------|--------------------|--------------------|----------------------------|------------------------|----------------------|------------------------|----------------------------------|--------------|------------|
| Part numbe        | Withstand isolation voltage (VISO) (Vrms) | FET      | Number of channels | Supply voltage (V) | Input forward current (mA) | Break down voltage (V) | I <sub>max</sub> (A) | Gate drive voltage (V) | Operating temperature range (°C) | Package type | Rating     |
| NSI7258           | 5000                                      | Internal | 1                  | N/A                | 7-20                       | 1700                   | 0.05                 | N/A                    | -40~125                          | SOW12        | Industrial |

## Solid-State Relay



## NSI7258: 1700V 50mA Solid-State Relay

### Product introduction

The NSI7258 is a single-channel solid-state relay (SSR), which is pin-compatible for popular photo MOSFET. The SSR turns ON with a minimum input current of 5.5mA. It can conduct 30mA current at ON state, with resistance less than 250Ω. The SSR turns off with an input voltage of 0.5V or less. It can withstand 1000V voltage at OFF state, with less than 1μA leakage current. The NSI7258 uses NOVOSENSE's high reliability isolation technology. While the input circuit imitates the characters of LEDs, it has performance advantages compared to standard photo MOSFET, including better reliability and aging performance, higher working temperature, shorter turn-on and turn-off delay. As a result, the NSI7258 is suitable to replace photo MOSFET in high reliability system.

### Product feature

- Normally open (1-Form-A) solid state relay
- Up to 5000Vrms Insulation voltage
- Breakdown voltage: 1700V
- OFF state leakage current: <1μA at 1000V
- ON state resistance: <250Ω at 10mA load current
- Input forward threshold current: <5.5mA
- Turn on time: <0.3ms
- Turn off time: <0.05ms
- Integrated MOSFETs with 0.6 mA avalanche rating
- RoHS-compliant Packages: SOW12
- Creepage and clearance ≥ 8mm (input-output)
- Creepage and clearance ≥ 5.91mm (between drain pins of MOSFETs)
- Meets CISPR32 Class B and CISPR 25 Class 5 EMI limits without ferrite beads on a 2-layer PCB

### Pinout & Package

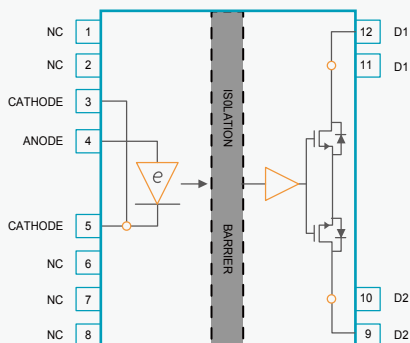
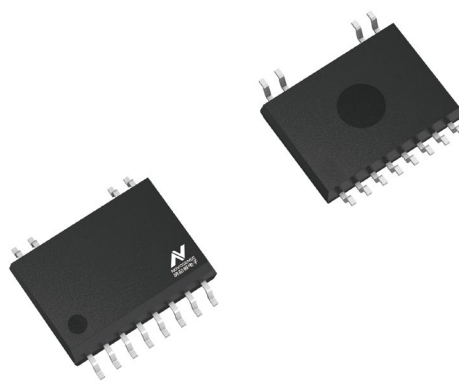


Figure 1.NSI7258 Block Diagram



### Application



Solid-state Relay



EV Charging Station



Energy Storage System



Solar Energy System

## Transformer Driver for Isolated Power Supplies

| Transformer Driver for Isolated Power Supplies |                            |                           |                           |            |                                  |              |            |
|------------------------------------------------|----------------------------|---------------------------|---------------------------|------------|----------------------------------|--------------|------------|
| Part number                                    | I <sub>out</sub> (typ) (A) | V <sub>in</sub> (min) (V) | V <sub>in</sub> (max) (V) | Soft start | Operating temperature range (°C) | Package type | Rating     |
| NSIP6051                                       | 350mA (max)                | 2.25                      | 5.5                       | N          | -40~125                          | SOT-23 (5)   | Industrial |
| NSIP6051-Q1                                    | 350mA (max)                | 2.25                      | 5.5                       | N          | -40~125                          | SOT-23 (5)   | Automotive |
| NSIP6055x                                      | 1.36A (max)                | 2.25                      | 5.5                       | Y          | -40~125                          | SOT-23 (6)   | Industrial |
| NSIP6055x-Q1                                   | 1.36A (max)                | 2.25                      | 5.5                       | Y          | -40~125                          | SOT-23 (6)   | Automotive |



# Transformer Driver



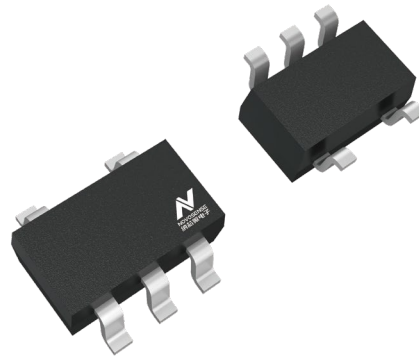
## NSIP6051: Transformer Driver for Isolated Power Supplies

### ◆ Product introduction

The NSIP6051 is a push-pull transformer driver specially designed for small size, low-power isolation power supply with low standby power consumption. Its periphery only needs to match simple input and output filter capacitors, isolation transformer and rectifier circuits. Its internal integrated oscillator provides a pair of high precision complementary signals to drive two N-channel MOSFETs. The internal design of the chip follows a symmetrical structure, which can effectively ensure the high symmetry of the two power MOSFETs and avoid magnetic bias during the working process of the circuit. Ultra-low noise and EMI are achieved by slew rate control of the output switch voltage and through Spread Spectrum Clocking (SSC). The internal protection features include over current protection, under-voltage lockout, thermal shutdown and break-before-make circuitry. The NSIP6051 is available in a small SOT-23 (5) package, and is specified for operation at temperatures from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

### ◆ Product feature

- Push-pull driver for transformers
- Single 3.3-V or 5-V supply
  - 5-V Supply: 350 mA (Max)
  - 3.3-V Supply: 150 mA (Max)
- Thermal shutdown and over-current protection (OCP)
- Spread Spectrum Clocking
- Small 5-Pin SOT-23 Package



### ◆ Pinout & Package

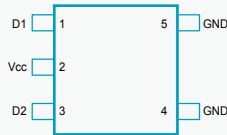


Figure 1. NSIP6051

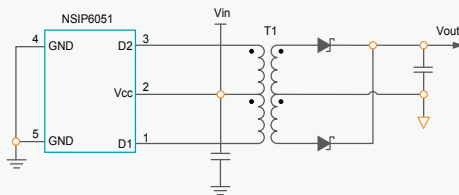


Figure 2. Simplified Schematic

### ◆ Application



Isolated interface power supply for CAN, RS-485, RS-422, RS-232, SPI, I2C, Low-Power LAN



Industrial automation



Process control



Medical equipment

## NSIP6051-Q1: Automotive Grade Transformer Driver for Isolated Power Supplies

### ◆ Product introduction

The NSIP6051-Q1 is an automotive grade push-pull transformer driver specially designed for small size, low-power isolation power supply with low standby power consumption. The periphery of the circuit only requires simple input and output filter capacitors, isolation transformer, and rectifier circuits. Its internal integrated oscillator provides a pair of high precision complementary signals to drive two N-channel MOSFETs. The internal design of the chip follows a symmetrical structure, which can effectively ensure the high symmetry of the two power MOSFETs and avoid magnetic bias during the working process of the circuit. Ultra-low noise and EMI are achieved by slew rate control of the output switch voltage and through Spread Spectrum Clocking (SSC). The internal protection features include over current protection, under-voltage lockout, thermal shutdown and break-before-make circuitry. The NSIP6051 is available in a small SOT-23 (5) package, and is specified for operation at temperatures from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

### ◆ Product feature

- Push-pull driver for transformers
- Support 2.25V to 5.5V supply
- Ultra-low EMI
- Over-current protection (OCP)
- Over temperature protection
- Spread spectrum clocking
- Slew-rate control
- Small 5-pin SOT-23 package
- AEC-Q100 Grade 1 Qualified
- RoHS & REACH Compliance

### ◆ Pinout & Package

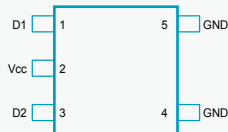


Figure 1. NSIP6051

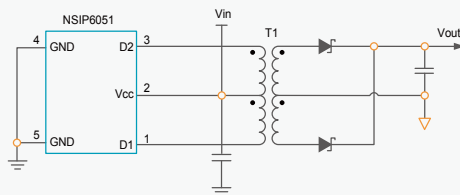
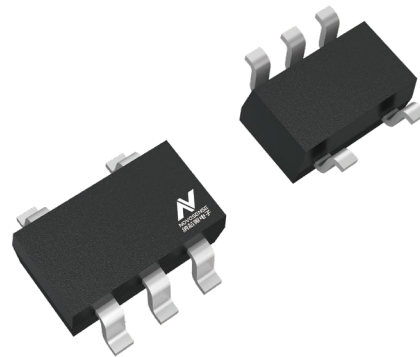


Figure 2. Simplified Schematic



### ◆ Application



Isolated interface power supply for I2C, CAN, RS-485, RS-422, RS-232, SPI, Low-Power LAN



IGBT gate drive power supply

## NSIP6055x: Transformer Driver for Isolated Power Supplies

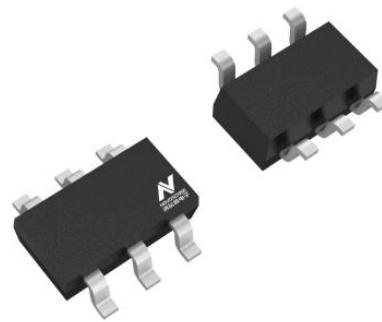
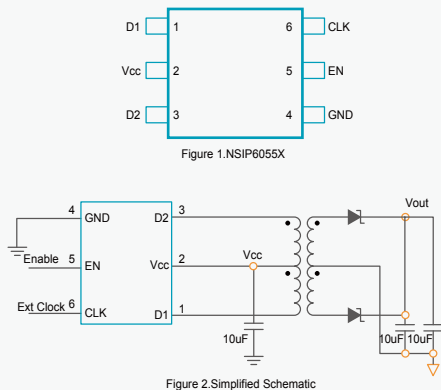
### ◆ Product introduction

The NSIP6055x is a push-pull transformer driver specially designed for small size, low-power isolation power supply with low standby power consumption. The periphery of the circuit only requires simple input and output filter capacitors, isolation transformer, and rectifier circuits. Its internal integrated oscillator provides a pair of high precision complementary signals to drive two N-channel MOSFETs. The internal design of the chip follows a symmetrical structure, which can effectively ensure the high symmetry of the two power MOSFETs and avoid magnetic bias during the working process of the circuit. Ultra-low noise and EMI are achieved by slew rate control of the output switch voltage and through Spread Spectrum Clocking (SSC). The internal protection features include over current protection, under-voltage lockout, thermal shutdown and break-before-make circuitry. NSIP6055A has a 160 kHz internal oscillator for applications that need to minimize emissions. NSIP6055B has a 420 kHz internal oscillators for application that require higher efficiency and smaller transformer size. The NSIP6055x is available in a small SOT-23 (6) package, and is specified for operation at temperatures from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

### ◆ Product feature

- Push-pull driver for transformers
- Support 2.25V to 5.5V supply
- High output drive: 1A at 5V supply
- Precision internal oscillator options: 160 kHz (NSIP6055A) and 420 kHz (NSIP6055B)
- Ultra-low EMI
- Over-current protection (OCP)
- Over temperature protection
- Soft-start to reduce In-rush current
- Spread Spectrum Clocking
- Slew-rate control
- Small 6-Pin SOT-23 Package
- RoHS & REACH Compliance

### ◆ Pinout & Package



### ◆ Application



Isolated interface power supply for CAN, RS-485, RS-422, RS-232, SPI, I2C, Low-Power LAN



Industrial automation



Process control



Medical equipment



IGBT gate drive power supply

|                                           |                                           |                   |               |                    |              |                            |                            |                          |                     |
|-------------------------------------------|-------------------------------------------|-------------------|---------------|--------------------|--------------|----------------------------|----------------------------|--------------------------|---------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated I2C      | I2C Interface | Transformer Driver | Isolated ADC | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply | Solid-State Relay |               |                    |              |                            |                            |                          |                     |

## NSIP6055x-Q1: Automotive Grade Transformer Driver for Isolated Power Supplies

### ◆ Product introduction

The NSIP6055x-Q1 is an automotive grade push-pull transformer driver specially designed for small size, low-power isolation power supply with low standby power consumption. The periphery of the circuit only requires simple input and output filter capacitors, isolation transformer, and rectifier circuits. Its internal integrated oscillator provides a pair of high precision complementary signals to drive two N-channel MOSFETs. The internal design of the chip follows a symmetrical structure, which can effectively ensure the high symmetry of the two power MOSFETs and avoid magnetic bias during the working process of the circuit. Ultra-low noise and EMI are achieved by slew rate control of the output switch voltage and through Spread Spectrum Clocking (SSC). The internal protection features include over current protection, under-voltage lockout, thermal shutdown and break-before-make circuitry. NSIP6055A has a 160 kHz internal oscillator for applications that need to minimize emissions. NSIP6055B has a 420 kHz internal oscillators for application that require higher efficiency and smaller transformer size. The NSIP6055x is available in a small SOT-23 (6) package, and is specified for operation at temperatures from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

### ◆ Product feature

- Push-pull driver for transformers
- Support 2.25V to 5.5V supply
- High output drive: 1A at 5V supply
- Precision internal oscillator options: 160 kHz (NSIP6055A) and 420 kHz (NSIP6055B)
- Ultra-low EMI
- Over-current protection (OCP)
- Over temperature protection
- Soft-start to reduce In-rush current
- Spread Spectrum Clocking
- Slew-rate control
- Small 6-Pin SOT-23 Package
- AEC-Q100 Grade 1 Qualified
- RoHS & REACH Compliance

### ◆ Pinout & Package

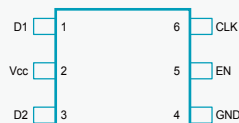


Figure 1. NSIP6055X

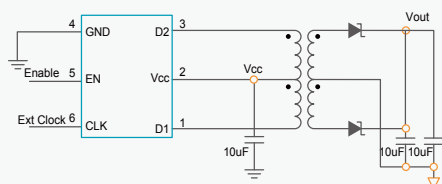
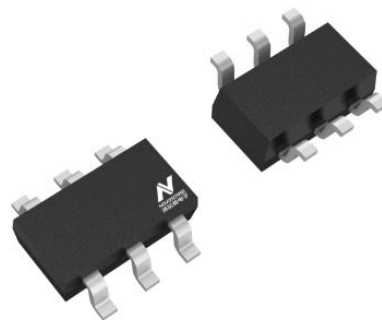


Figure 2. Simplified Schematic



### ◆ Application

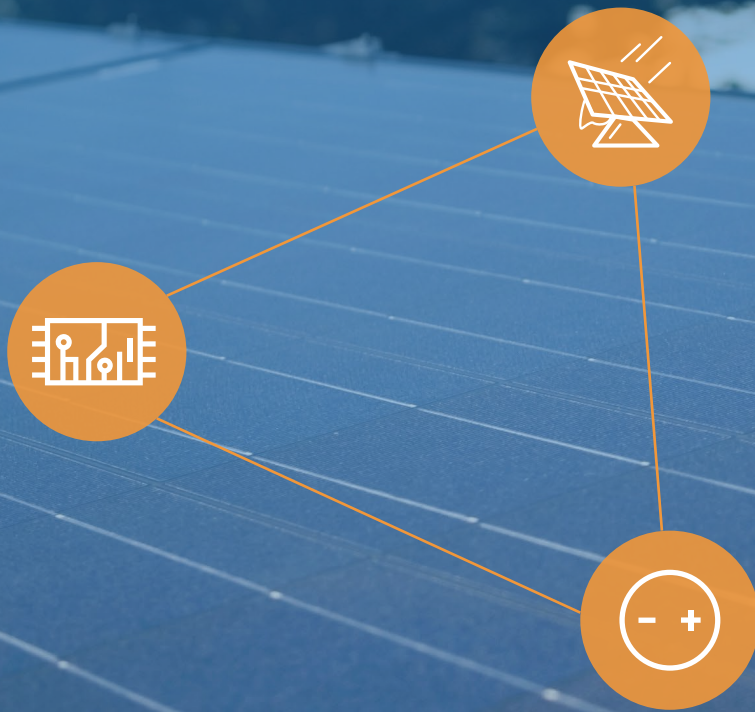


Isolated interface power supply for I2C, CAN, RS-485, RS-422, RS-232, SPI, Low-Power LAN



IGBT gate drive power supply

# Isolated ADC





## Isolated ADC

| NSI1305/6 Isolated ADC Series |          |            |                    |                        |              |                                        |              |                                  |              |
|-------------------------------|----------|------------|--------------------|------------------------|--------------|----------------------------------------|--------------|----------------------------------|--------------|
|                               | Part No. | Part No.   | ISO Rating (kVrms) | Linear Input Range(mV) | Input Type   | Output Type                            | CMTI (kV/μs) | Operating Temperature Range (°C) | Package Type |
| Isolated Modulator            | NSI1306  | NSI1306M25 | 5                  | -250~250               | Differential | Digital (clock rising edge effective)  | 150          | -40~125                          | SOW-8        |
|                               |          |            |                    |                        |              |                                        |              |                                  | SOW-16       |
|                               |          | NSI1306M05 | 5                  | -250~250               | Differential | Digital (clock falling edge effective) | 150          | -40~125                          | SOW-8        |
|                               |          |            |                    |                        |              |                                        |              |                                  | SOW-16       |
|                               | NSI1305  | NSI1305M25 | 5                  | -250~250               | Differential | Digital (clock falling edge effective) | 150          | -40~125                          | SOW-8        |
|                               |          |            |                    |                        |              |                                        |              |                                  | SOW-16       |

| NSI1303x Isolated ADC Series |         |            |                    |                        |              |                                        |              |                                      |                                  |                 |
|------------------------------|---------|------------|--------------------|------------------------|--------------|----------------------------------------|--------------|--------------------------------------|----------------------------------|-----------------|
|                              | Product | Part No.   | ISO Rating (kVrms) | Linear Input Range(mV) | Input Type   | Output Type                            | CMTI (kV/μs) | Differential Input Resistance (kohm) | Operating Temperature Range (°C) | Package         |
| Isolated Modulator           | NSI1303 | NSI1303E0x | 5                  | -50~50                 | Differential | Manchester                             | 150          | 4.9                                  | -40~125                          | SOW-8           |
|                              |         | NSI1303E2x | 5                  | -250~250               | Differential | Manchester                             | 150          | 22                                   | -40~125                          |                 |
|                              |         | NSI1303M0x | 5                  | -50~50                 | Differential | Uncoded (clock rising edge effective)  | 150          | 4.9                                  | -40~125                          | SOW-8<br>SOW-16 |
|                              |         | NSI1303M2x | 5                  | -250~250               | Differential |                                        | 150          | 22                                   | -40~125                          |                 |
|                              |         | NSI1303D0x | 5                  | -50~50                 | Differential | Uncoded (clock falling edge effective) | 150          | 4.9                                  | -40~125                          |                 |
|                              |         | NSI1303D2x | 5                  | -250~250               | Differential |                                        | 150          | 22                                   | -40~125                          |                 |

## NSI1306: Isolated Current Sampling ADC with High Reliability

### ◆ Product introduction

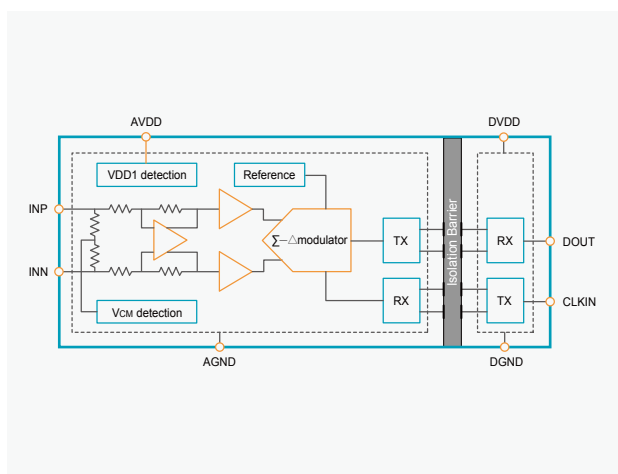
NSI1306 is a high-performance  $\Sigma$ - $\Delta$  modulator with output separated from input based on the NOVOSENSE capacitive isolation technology. The linear differential input signal range of the device is  $\pm 50\text{mV}$  (full scale  $\pm 64\text{mV}$ ) or  $\pm 250\text{mV}$  (full scale  $\pm 320\text{mV}$ ). Differential inputs are ideal for shunt resistance-based current detection in high voltage applications that require isolation.

The analog input is amplified and continuously sampled by a second-order  $\Sigma$ - $\Delta$  modulator and then converted to a high-speed, single-bit data stream. The output data is synchronized with the external clock, the rising edge of the clock is valid, and the frequency range is 5MHz to 21MHz. By using an appropriate digital filter (such as a sinc3 filter) to extract the bit stream, the device can achieve 16-bit resolution and 86dB/82.5dB signal-to-noise ratio (SNR) with a 20MHz master clock under the condition of 78.125KPS. The fail-safe function includes input common mode overvoltage detection and VDD1 missing detection, simplifying system design and diagnosis.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- Clock frequency: 5MHz to 21MHz
- Linear input range of  $\pm 50\text{mV}$  or  $\pm 250\text{mV}$
- Excellent DC performance:
  - Offset error:  $\pm 50\text{ }\mu\text{V}$  or  $\pm 100\text{ }\mu\text{V}$ (Max)
  - Offset drift:  $-0.5$  to  $1.5\text{ }\mu\text{V}/^\circ\text{C}$ (Max)
  - Gain error:  $0.2\%$ (Max)
  - Gain drift:  $\pm 40\text{ppm}/^\circ\text{C}$ (Max)
- SNR: 82.5dB or 86dB(Typ)
- High CMTI:  $150\text{kV}/\text{us}$ (Typ)
- System-level diagnostic capabilities:
  - AVDD monitoring
  - Input common mode overvoltage detection
  - Operating temperature:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$

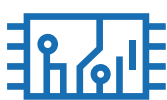
### ◆ Pinout & Package



### ◆ Application



Shunt current monitoring



AC motor control



Power and solar inverters



UPS



Onboard charger

## NSI1305: Isolated Current Sampling ADC with High Reliability

### ◆ Product introduction

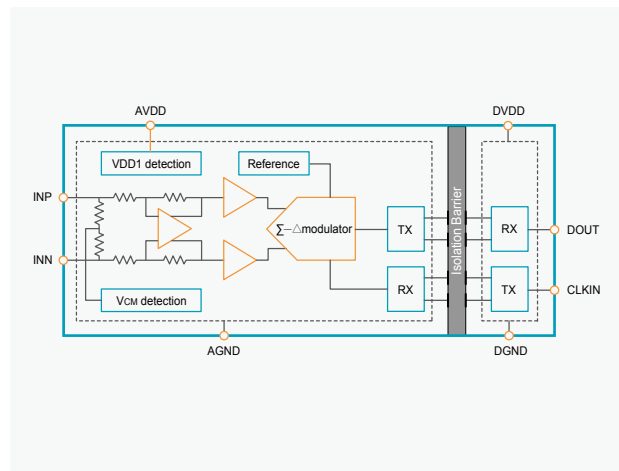
NSI1305 is a high-performance  $\Sigma$ - $\Delta$  modulator with output separated from input based on the NOVOSENSE capacitive isolation technology. The linear differential input signal range of the device is  $\pm 50\text{mV}$  (full scale  $\pm 64\text{mV}$ ) or  $\pm 250\text{mV}$  (full scale  $\pm 320\text{mV}$ ). Differential inputs are ideal for shunt resistance-based current detection in high voltage applications that require isolation.

The analog input is amplified and continuously sampled by a second-order  $\Sigma$ - $\Delta$  modulator and then converted to a high-speed, single-bit data stream. The output data is synchronized with the external clock, the falling edge of the clock is valid, and the frequency range is 5MHz to 21MHz. By using an appropriate digital filter (such as a sinc3 filter) to extract the bit stream, the device can achieve 16-bit resolution and 86dB/82.5dB signal-to-noise ratio (SNR) with a 20MHz master clock under the condition of 78.125KPS. The fail-safe function includes input common mode overvoltage detection and VDD1 missing detection, simplifying system design and diagnosis.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- Clock frequency: 5MHz to 21MHz
- Linear input range of  $\pm 50\text{mV}$  or  $\pm 250\text{mV}$
- Excellent DC performance:
  - Offset error:  $\pm 50\text{ }\mu\text{V}$  or  $\pm 100\text{ }\mu\text{V}$ (Max)
  - Offset drift:  $-0.5$  to  $1.5\text{ }\mu\text{V}/^\circ\text{C}$ (Max)
  - Gain error: 0.2%(Max)
  - Gain drift:  $\pm 40\text{ppm}/^\circ\text{C}$ (Max)
- SNR: 82.5dB or 86dB(Typ)
- High CMTI:  $150\text{kV}/\mu\text{s}$ (Typ)
- System-level diagnostic capabilities:
  - AVDD monitoring
  - Input common mode overvoltage detection
- Operating temperature:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$

### ◆ Pinout & Package



### ◆ Application



Shunt current monitoring



AC motor control



Power and solar inverters



UPS



Onboard charger

|                             |                          |                                           |                   |                    |              |                            |                            |                          |                     |
|-----------------------------|--------------------------|-------------------------------------------|-------------------|--------------------|--------------|----------------------------|----------------------------|--------------------------|---------------------|
| Isolated RS-485 Transceiver | Isolated CAN Transceiver | Isolated CAN with Integrated Power Supply | Solid-State Relay | Transformer Driver | Isolated ADC | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator |
| Isolated RS-485 Transceiver | Isolated CAN Transceiver | Isolated CAN with Integrated Power Supply | Isolated I/O      | I/O Interface      | Isolated ADC | Isolated Current Amplifier | Isolated Voltage Amplifier | Digital Isolator         | Isolated Comparator |

## NSI1303: Isolated ADC with Integrated Internal Clock with High Reliability

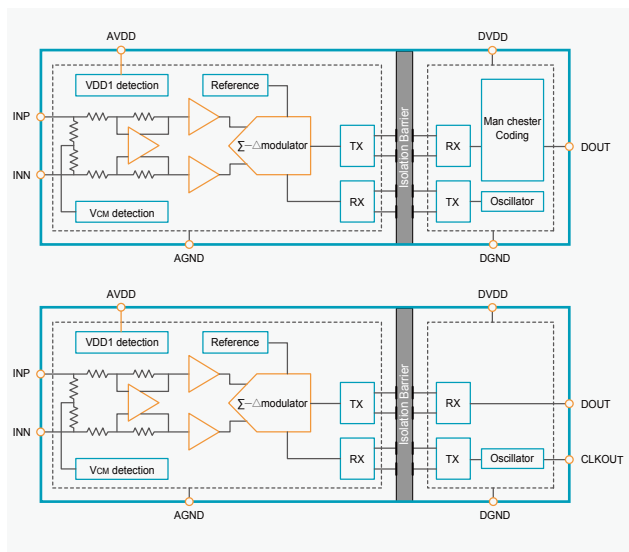
### ◆ Product introduction

NSI1303 is a high-performance  $\Sigma$ - $\Delta$  modulator with output separated from input based on the NOVOSENSE capacitive isolation technology. The linear differential input signal range of the device is  $\pm 50\text{mV}$  (full scale  $\pm 64\text{mV}$ ) or  $\pm 250\text{mV}$  (full scale  $\pm 320\text{mV}$ ). The analog input is continuously sampled by a second-order  $\Sigma$ - $\Delta$  modulator and then converted to a high-speed, single-bit data stream. The output bit data stream of NSI1303 is synchronized with its internal clock, in this process, Manchester encoding (NSI1303Ex) is used or the data is leaving as unencoded (NSI1303M/Dx). By using an appropriate digital filter (such as a sinc3 filter) to extract the bit stream, the device can achieve 16-bit resolution and 86dB/82.5dB signal-to-noise ratio (SNR) under the condition of 78.125KPS. The output of Manchester coded NSI1303Ex supports single-wire data and clock transmission, regardless of the setting and holding time requirements of the receiving device.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- Options of 10MHz and 20MHz internal clocks
- Linear input range of  $\pm 50\text{mV}$  or  $\pm 250\text{mV}$
- Excellent DC performance:  
Offset error and drift:  $\pm 50\mu\text{V}$  or  $\pm 100\mu\text{V}$  (Max) ,  $\pm 1\mu\text{V}/^\circ\text{C}$  (Max)  
Gain error and drift:  $\pm 0.2\%$  (Max),  $\pm 40\text{ppm}/^\circ\text{C}$  (Max)
- High CMTI:  $150\text{kV}/\mu\text{s}$  (Typ)
- System-level diagnostic capabilities:  
AVDD monitoring  
Input common mode overvoltage detection
- Operating temperature:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$
- RoHS compliant package: SOW-8(300mil), SOW-16(300mil)

### ◆ Pinout & Package



### ◆ Application



Shunt current monitoring



AC motor control



UPS

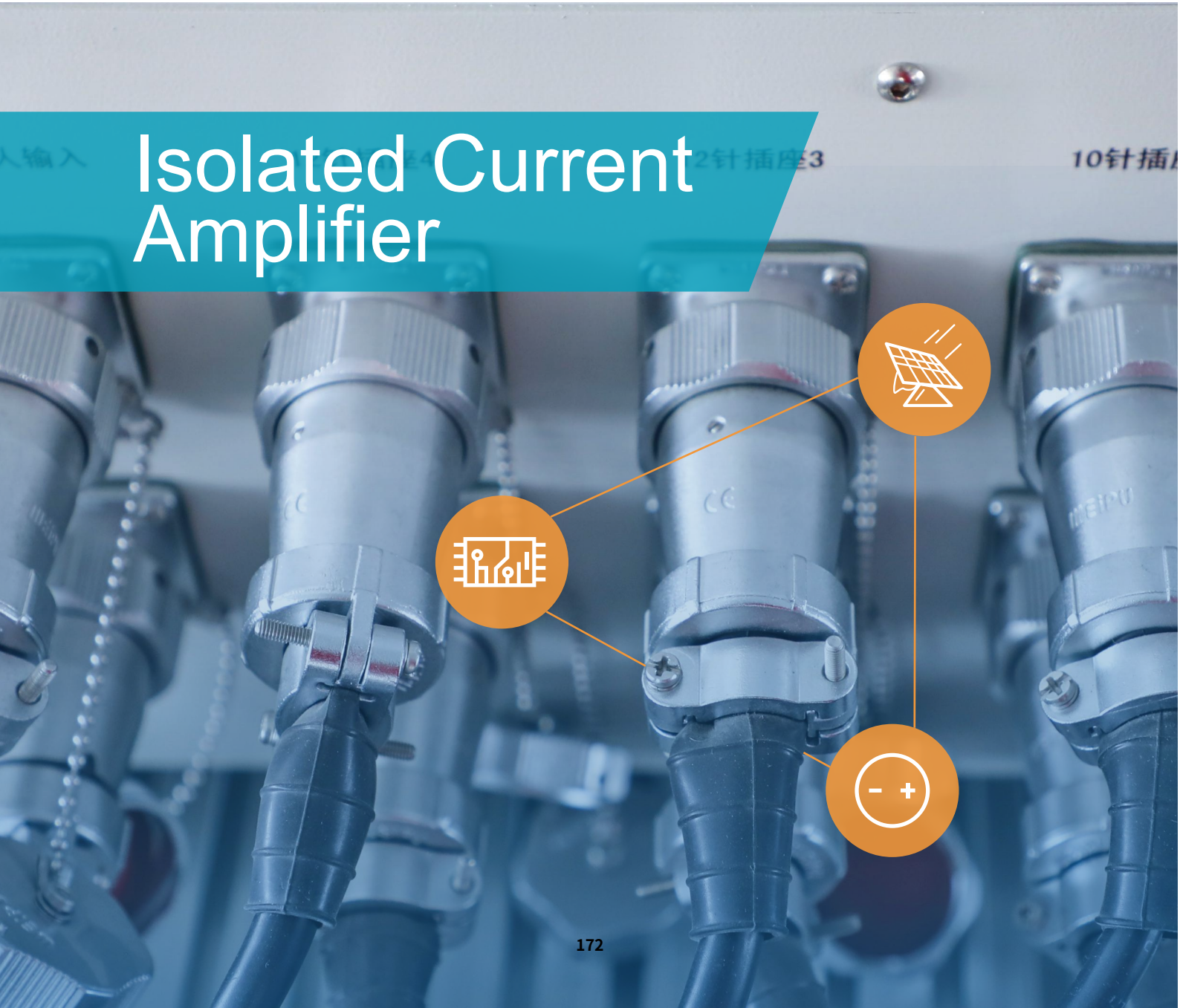


Onboard charger

|                                           |                                           |                           |                           |                             |                            |                            |                          |                       |
|-------------------------------------------|-------------------------------------------|---------------------------|---------------------------|-----------------------------|----------------------------|----------------------------|--------------------------|-----------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated I <sup>2</sup> C | Transformer Driver        | Isolated ADC                | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator   |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply | Solid-State Relay         | Isolated I <sup>2</sup> C | Isolated RS-485 Transceiver | Isolated CAN Transceiver   | Isolated LIN Transceiver   | Digital Isolator         | Isolated Power Supply |

# Isolated Current Amplifier

| Isolated Current Amplifier Series |                      |            |                    |                        |      |              |                               |              |          |                                  |         |
|-----------------------------------|----------------------|------------|--------------------|------------------------|------|--------------|-------------------------------|--------------|----------|----------------------------------|---------|
|                                   | Product              | Part No.   | ISO Rating (kVrms) | Linear Input Range(mV) | Gain | Input Type   | Output Type                   | CMTI (kV/μs) | AEC-Q100 | Operating Temperature Range (°C) | Package |
| Isolated Current Amplifier        | NSI1300              | NSI1300D05 | 5                  | -50~50                 | 8.2  | Differential | Differential                  | 150          | ✓        | -40~125                          | SOW-8   |
|                                   |                      | NSI1300D25 |                    | -250~250               |      |              |                               |              |          |                                  |         |
|                                   | NSI1200              | NSI1200    | 5                  | -250~250               | 8    | Differential | Differential                  | 150          | ✓        | -40~125                          | SOW-8   |
|                                   |                      |            |                    |                        |      |              |                               |              |          |                                  | DUB-8   |
|                                   | NSI1400/<br>NSI1200C | NSI1400    | 5                  | -250~250               | 8.2  | Differential | Differential/<br>Single-ended | 150          |          | -40~125                          | SOW-8   |
|                                   |                      |            | 3                  |                        | 8.2  |              |                               |              |          |                                  | SOP-8   |
|                                   |                      | NSI1200C   | 5                  |                        | 8    |              |                               |              |          |                                  | DUB-8   |





## NSI1200/NSI1300: Isolated Current Sampling Amplifier with High Reliability

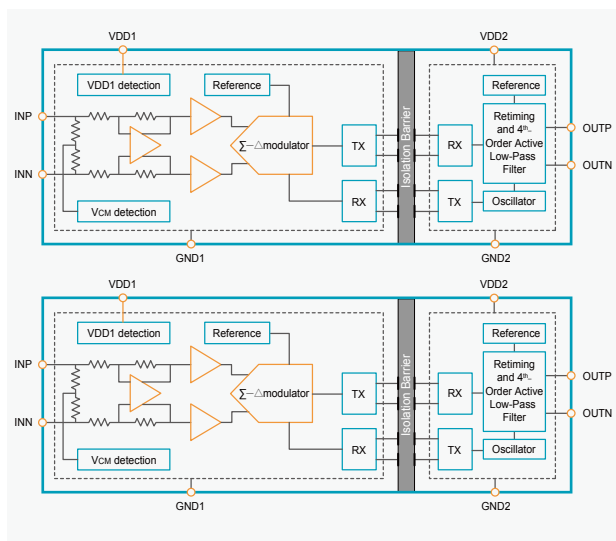
### Product introduction

NSI1200/NSI1300 is a high-performance isolated amplifier with output separated from input based on the NOVOSENSE capacitive isolation technology. This series of products are designed with linear differential input signal of  $\pm 50\text{mV}$  (NSI1300D05, full scale  $\pm 64\text{mV}$ ) or  $\pm 250\text{mV}$  (NSI1200/NSI1300D25, full scale  $\pm 320\text{mV}$ ). The fail-safe function includes input common mode overvoltage detection and VDD1 missing detection, simplifying system design and diagnosis. The fixed gain of the NSI1200/NSI1300 is 8/8.2 and provides a differential analog output. Low offset and gain drift ensure accuracy over the entire temperature range. High common-mode transient immunity ensures that the device is able to provide accurate and reliable measurements even in the presence of high-power switching such as in motor control applications.

### Product feature

- Linear input range of  $\pm 50\text{mV}$  or  $\pm 250\text{mV}$
- Fixed gain: 8 for NSI1200, and 8.2 for NSI1300
- Ultralow offset error and drift:
  - NSI1200:  $\pm 0.5\text{mV}(\text{Max})$ ,  $\pm 4\mu\text{V}/^\circ\text{C}(\text{Max})$
  - NSI1300D05:  $\pm 0.1\text{mV}(\text{Max})$ ,  $-0.8\sim 1\mu\text{V}/^\circ\text{C}(\text{Max})$
  - NSI1300D25:  $\pm 0.2\text{mV}(\text{Max})$ ,  $-2\sim 4\mu\text{V}/^\circ\text{C}(\text{Max})$
- Ultralow gain error and drift:
  - $\pm 0.3\%(\text{Max})$ ,  $\pm 50\text{ppm}/^\circ\text{C}(\text{Max})$
- SNR: 86dB(Typ)
- Wide bandwidth:
  - 100kHz for NSI1200
  - 310kHz for NSI1300
- High CMTI: 150kV/us
- Operating temperature:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$
- Package compliant with RoHS:
  - SOW-8(300mil)(NSI1200 & NSI1300), DUB8(NSI1200 only)

### Functional Block Diagram



### Application



Shunt current monitoring



AC motor control



Power and solar inverters



UPS



Onboard charger

## NSI1400/NSI1200C: Cost-Effective Isolated Current Sampling Amplifier with High Reliability

### ◆ Product introduction

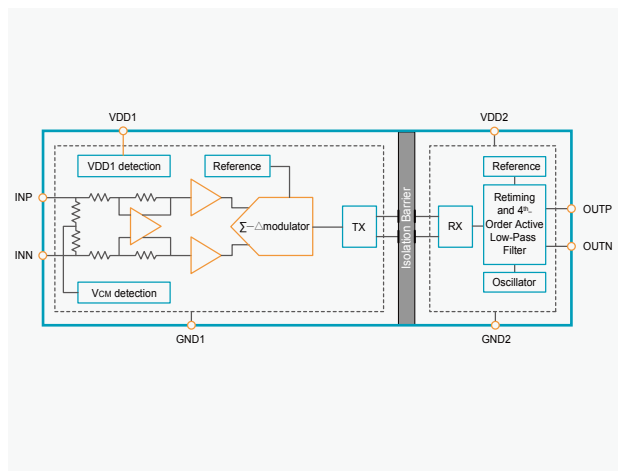
NSI1400/NSI1200C is an cost-effective isolated amplifier with output separated from input based on the NOVOSENSE capacitive isolation technology. This product is designed with linear differential input signal of  $\pm 250\text{mV}$  (full scale  $\pm 320\text{mV}$ ). Differential inputs are ideal for shunt resistance-based current detection in high voltage applications that require isolation.

The fixed gain of the NSI1400 is 8.2, the fixed gain of the NSI1200C is 8, and differential analog input is made available as well. Low offset and gain drift ensure accuracy over the entire temperature range. High common-mode transient immunity ensures that the device is able to provide accurate and reliable measurements even in the presence of high-power switching such as in motor control applications. The fail-safe function includes input common mode overvoltage detection and VDD1 missing detection, simplifying system design and diagnosis.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- Linear input range of  $\pm 250\text{mV}$
- Low offset error and drift:
  - $\pm 0.5\text{mV}$  (Max),  $\pm 5\mu\text{V}/^\circ\text{C}$  (Max) for NSI1200C,
  - $\pm 4\mu\text{V}/^\circ\text{C}$  (Max) for NSI1400
- Low gain error and drift:  $\pm 0.3\%$ (Max),  $\pm 30\text{ppm}/^\circ\text{C}$ (Max)
- Low non-linearity and drift:  $\pm 0.05\%$ (Max),  $\pm 1\text{ppm}/^\circ\text{C}$ (Typ)
- SNR: 72dB(Typ, BW=100kHz)
- Bandwidth: 220kHz(Typ)
- High CMTI: 125kV/us(Typ)
- System-level diagnostic capabilities: VDD1 monitoring
- Input common mode overvoltage detection
- Operating temperature:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$
- Package compliant with RoHS: SOP-8(150mil), SOW-8(300mil), DUB-8(NSI1200 Only)

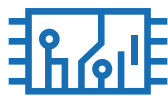
### ◆ Functional block diagram



### ◆ Application



Shunt current monitoring



AC motor control



Power and solar inverters



UPS



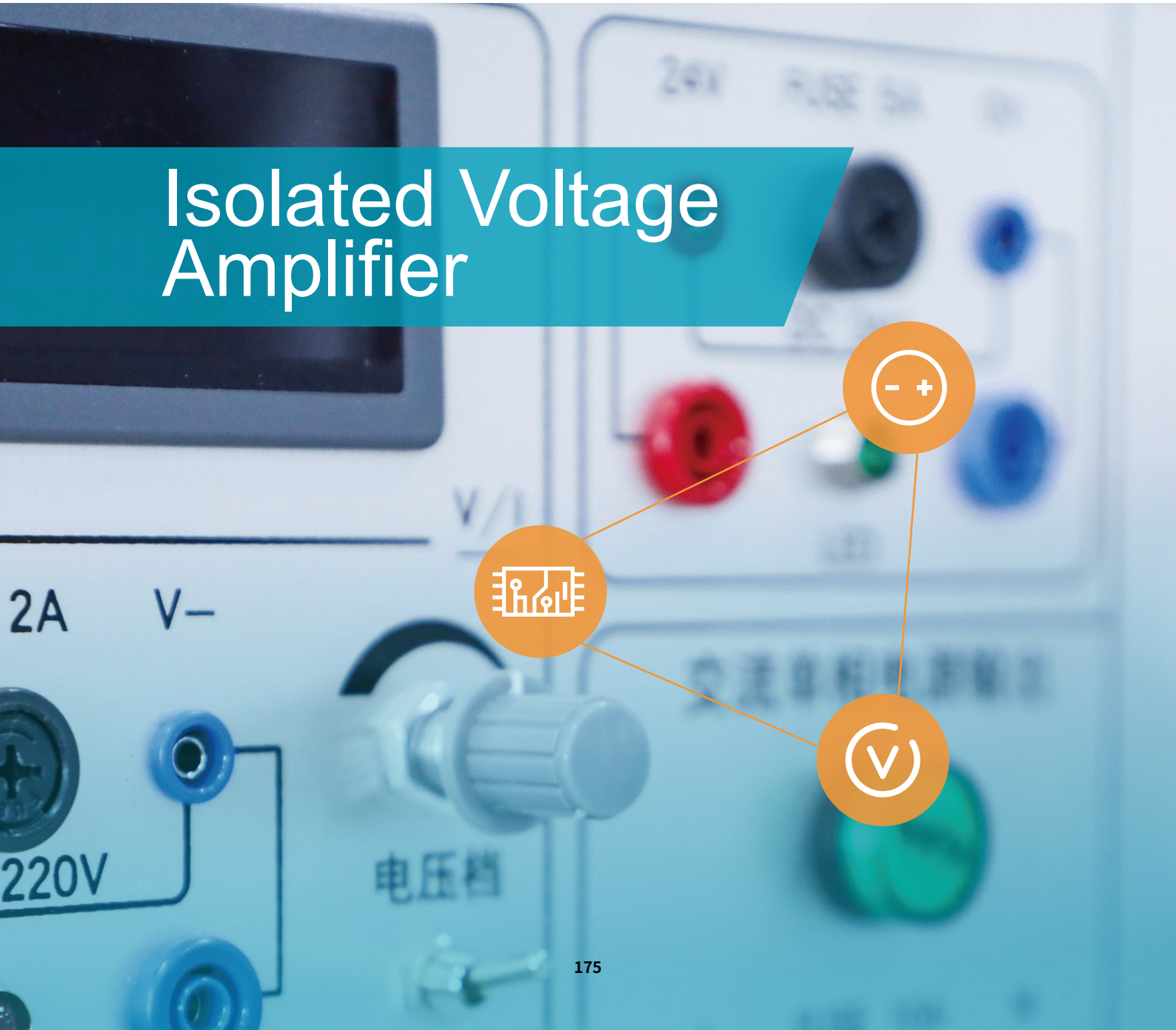
Onboard charger

|                             |                          |                                           |                           |                    |                    |                            |                            |                          |                                               |
|-----------------------------|--------------------------|-------------------------------------------|---------------------------|--------------------|--------------------|----------------------------|----------------------------|--------------------------|-----------------------------------------------|
| Isolated RS-485 Transceiver | Isolated CAN Transceiver | Isolated CAN with Integrated Power Supply | Solid-State Relay         | Transformer Driver | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator                           |
| Isolated RS-485 Transceiver | Isolated CAN Transceiver | Isolated CAN with Integrated Power Supply | Isolated I <sup>2</sup> C | FC Interface       | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Digital Isolator with Integrated Power Supply |

# Isolated Voltage Amplifier

| Isolation Voltage Amplifier Series |          |          |                    |                        |              |              |              |          |                                  |              |
|------------------------------------|----------|----------|--------------------|------------------------|--------------|--------------|--------------|----------|----------------------------------|--------------|
|                                    | Part No. | Part No. | ISO Rating (kVrms) | Linear Input Range(mV) | Input Type   | Output Type  | CMTI (kV/μs) | AEC-Q100 | Operating Temperature Range (°C) | Package Type |
| Isolated Amplifier                 | NSI1311  | NSI1311  | 5                  | 20~2000                | Single-ended | Differential | 150          | ✓        | -40~125                          | SOW-8        |
|                                    | NSI1312  | NSI1312D | 5                  | -1200~1200             | Differential | Differential | 150          |          | -40~125                          | SOW-8        |
|                                    |          |          |                    |                        |              |              |              |          |                                  | SOP-8        |
|                                    |          | NSI1312S | 5                  | -1200~1200             | Differential | Single-ended | 150          |          | -40~125                          | SOW-8        |
|                                    |          |          |                    |                        |              |              |              |          |                                  | SOP-8        |

## Isolated Voltage Amplifier



## NSI1311: Isolated Voltage Sampling Amplifier with High Reliability

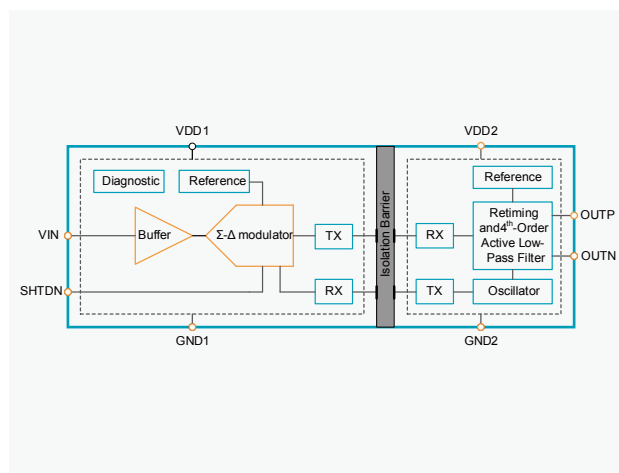
### ◆ Product introduction

NSI1311 is a high-performance isolated amplifier with output separated from input based on the NOVOSENSE capacitive isolation technology. The device is designed with a single-ended input signal range of 0.1V to 2V. The high input impedance of the NSI1311 makes it ideal for connection to high voltage resistive dividers or other voltage signal sources with high output impedance. The fixed gain of the device is 1, and differential analog input is made available as well. Low offset and gain drift ensure accuracy over the entire temperature range. High common-mode transient immunity ensures that the device is able to provide accurate and reliable measurements even in the presence of high-power switching such as in motor control applications. The fail-safe function (high-side supply voltage loss detection) simplifies the design and diagnostics of the system.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- Linear input range of 0.02 to 2V
- Fixed gain: 1
- Ultralow offset error and drift:  $\pm 1.5\text{mV}(\text{Max})$ ,  $-5$  to  $30\mu\text{V}/^\circ\text{C}(\text{Max})$
- Ultralow gain error and drift:  $\pm 0.3\%(\text{Max})$ ,  $\pm 45\text{ppm}/^\circ\text{C}(\text{Max})$
- Ultralow non-linearity and drift:  $\pm 0.05\%(\text{Max})$  for  $0.02\text{V}\sim 0.1\text{V}$  VIN,  $\pm 0.04\%(\text{Max})$  for  $0.1\text{V}\sim 2\text{V}$  VIN,  $\pm 1\text{ppm}/^\circ\text{C}(\text{Max})$
- SNR: 82dB(Typ, BW=10kHz) or 70dB(Typ, BW=100kHz)
- Wide bandwidth: 400kHz(Typ)
- High CMTI: 150kV/us(Typ)
- System-level diagnostic capabilities: VDD1 monitoring
- Operating temperature:  $-40^\circ\text{C}$  to  $125^\circ\text{C}$
- RoHS compliant package: SOW-8(300mil)

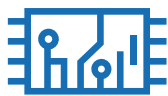
### ◆ Functional block diagram



### ◆ Application



BUS voltage monitoring



AC motor control



Power and solar inverters



UPS



Onboard charger

## NSI1312: Isolated Voltage Sampling Amplifier with High Reliability

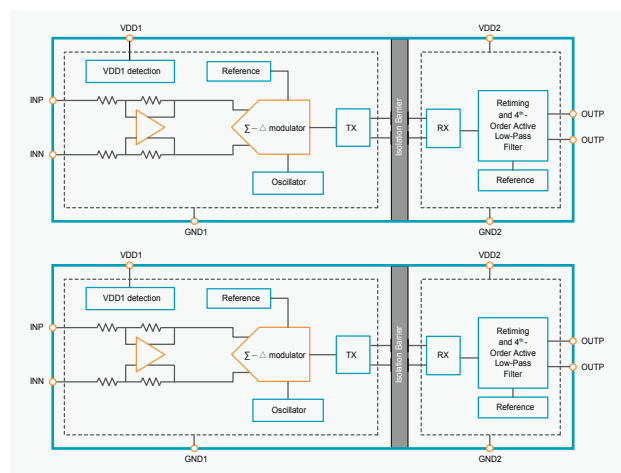
### ◆ Product introduction

NSI1312 is a cost-effective isolated amplifier with output separated from input based on the NOVOSENSE capacitive isolation technology. The linear differential input signal range of the device is 1.2V (full scale  $\pm 1.5V$ ). The high input impedance of the NSI1311 makes it ideal for connection to high voltage resistive dividers or other voltage signal sources with high output impedance. The fixed gain of the device is 1, and two versions are available: one is with differential analog output (NSI1312D), and the other is with single-ended analog output (NSI1312S). Low offset and gain drift ensure accuracy over the entire temperature range. High common-mode transient immunity ensures that the device is able to provide accurate and reliable measurements even in the presence of high-power switching such as in motor control applications. The fail-safe function (high-side supply voltage loss detection) simplifies the design and diagnostics of the system.

### ◆ Product feature

- Insulation voltage up to 5000Vrms
- Linear input range of  $\pm 1.2V$
- Fixed gain: 1
- Excellent DC performance:
  - Offset error and drift:  $\pm 2.5mV(Max)$ ,  $\pm 20\mu V/^{\circ}C (Max)$
  - Gain error and drift:  $\pm 0.3\%(Max)$ ,  $\pm 40ppm/^{\circ}C (Max)$
  - Non-linearity and drift:  $\pm 0.05\% (Max)$ ,  $\pm 1ppm/^{\circ}C (Typ)$
- SNR: 72dB(Typ)
- High CMTI: 150kV/us(Typ)
- System-level diagnostic capabilities:
  - VDD1 monitoring
- Operating temperature:  $-40^{\circ}C$  to  $125^{\circ}C$
- RoHS compliant package: SOW-8 (300mil), SOP-8 (150mil)

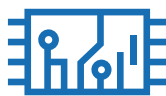
### ◆ Functional block diagram



### ◆ Application



BUS voltage monitoring



AC motor control



Power and solar inverters



UPS



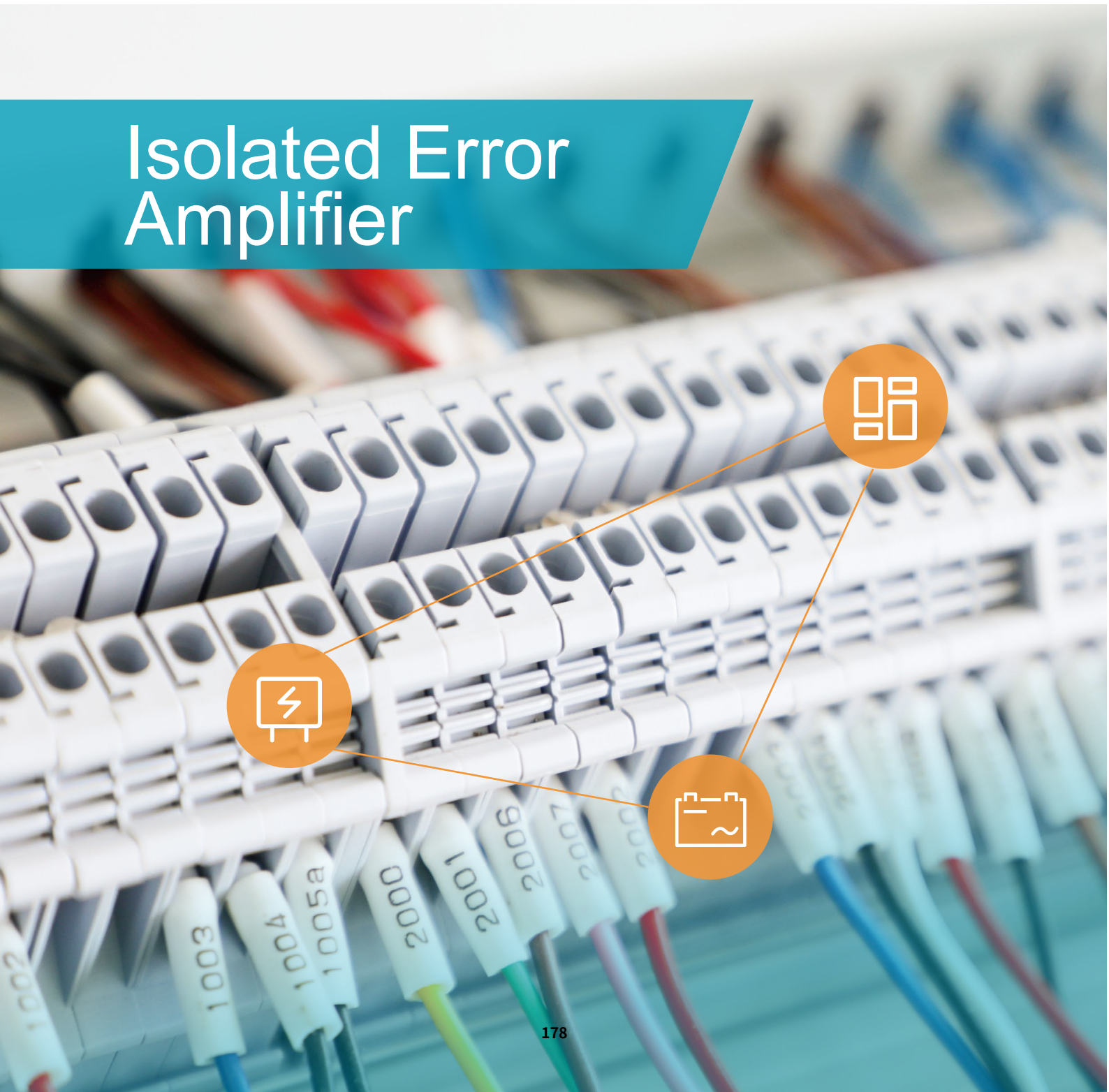
Onboard charger



# Isolated Error Amplifier

| NSI319x Isolated Error Amplifier |          |                    |                 |                      |                       |              |                                  |              |
|----------------------------------|----------|--------------------|-----------------|----------------------|-----------------------|--------------|----------------------------------|--------------|
|                                  | Part No. | ISO Rating (kVrms) | Bandwidth (kHz) | Initial Accuracy (%) | Reference Voltage (V) | CMTI (kV/μs) | Operating Temperature Range (°C) | Package Type |
| Isolated Error Amplifier         | NSI3190  | 3                  | 400             | 0.5                  | 1.225                 | 100          | -40~125                          | SSOP16       |

# Isolated Error Amplifier



## NSI3190: Isolated Error Amplifier with High Reliability

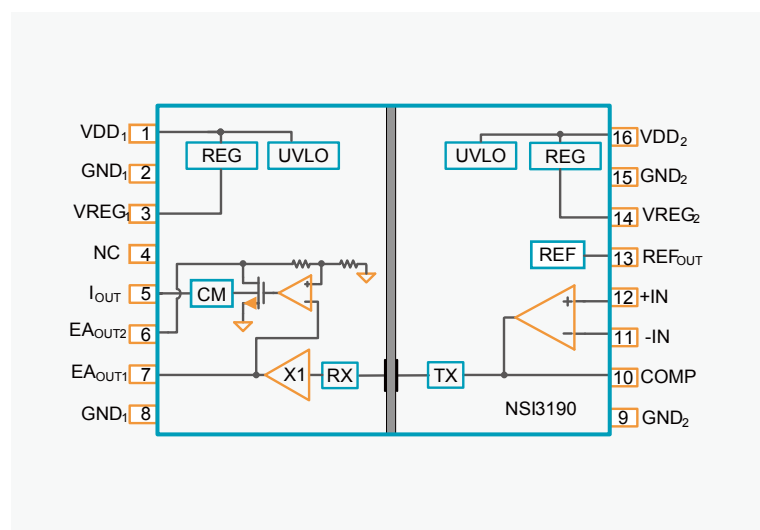
### ◆ Product introduction

The NSI3190 is a high reliability isolated error amplifier based on NOVOSENSE capacitive isolation technology. NSI3190 is ideal for linear feedback power supplies. The primary side controller of the NSI3190 improves transient response, power density and stability compared to schemes using optocouplers and shunt regulators. The output of NSI3190 can support voltage output and current output, which is compatible with optocouplers. The current transmission coefficient can be set by an external resistor between EAOUT2 and VDD1 or VREG1.

### ◆ Product feature

- 0.5% initial accuracy
- Insulation voltage up to 3000Vrms
- Wide bandwidth: 400kHz
- Power supply voltage:
  - VDD1: 4V to 20V
  - VDD2: 4V to 20V
- Reference voltage: 1.225V
- Compatible with voltage type output and current type output
- Ultra low power consumption
- Operating temperature: -40°C to 125°C

### ◆ Functional block diagram



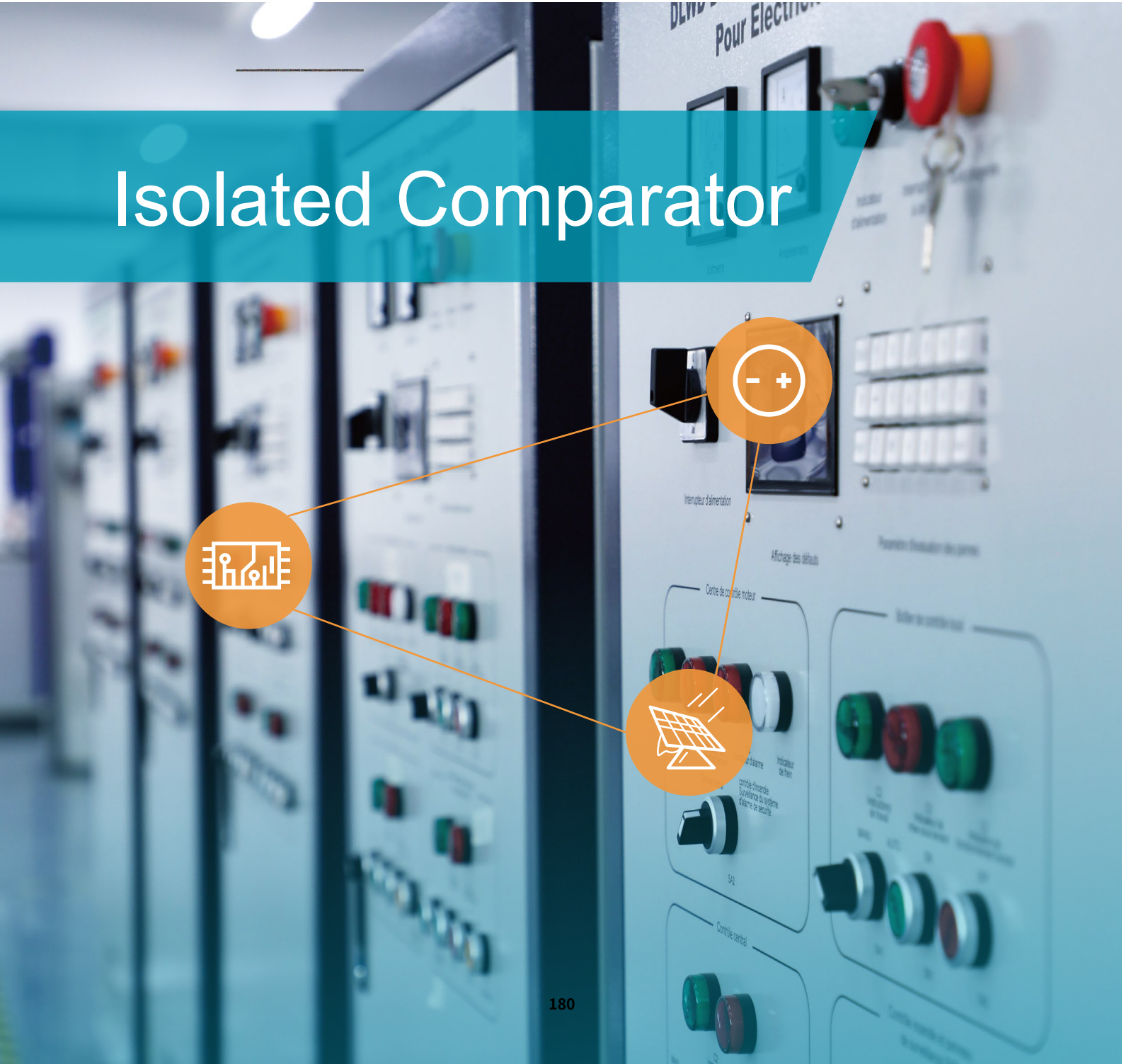
### ◆ Application



|                                           |                                           |                           |                            |                    |                            |                            |                          |                                               |
|-------------------------------------------|-------------------------------------------|---------------------------|----------------------------|--------------------|----------------------------|----------------------------|--------------------------|-----------------------------------------------|
| Isolated RS-485 Transceiver               | Isolated CAN Transceiver                  | Isolated I <sup>2</sup> C | I <sup>2</sup> C Interface | RS-485 Transceiver | CAN Transceiver            | LIN Transceiver            | Digital Isolator         | Digital Isolator with Integrated Power Supply |
| Isolated 485 with Integrated Power Supply | Isolated CAN with Integrated Power Supply | Solid-State Relay         | Transformer Driver         | Isolated ADC       | Isolated Current Amplifier | Isolated Voltage Amplifier | Isolated Error Amplifier | Isolated Comparator                           |

# Isolated Comparator

| NSI22C1x Isolated Comparator Series |          |          |                    |                 |                          |                         |              |          |                                  |         |
|-------------------------------------|----------|----------|--------------------|-----------------|--------------------------|-------------------------|--------------|----------|----------------------------------|---------|
|                                     | Product  | Part No. | ISO Rating (kVrms) | Input Power (V) | Reference Threshold (mV) | Output Type             | CMTI (kV/μs) | Latching | Operating Temperature Range (°C) | Package |
| Isolated Comparator                 | NSI22C1x | NSI22C11 | 5                  | 3.1-27          | 500~2000                 | Push-pull<br>Open-drain | 150          |          | -40~125                          | SOW-8   |
|                                     |          |          |                    |                 |                          |                         |              |          |                                  | SOP-8   |
|                                     |          | NSI22C12 | 5                  | 3.1-27          | 0~320                    | Open-drain              | 150          | ✓        | -40~125                          | SOW-8   |
|                                     |          |          |                    |                 |                          |                         |              |          |                                  | SOP-8   |





## NSI22C1x: High-speed isolated comparators

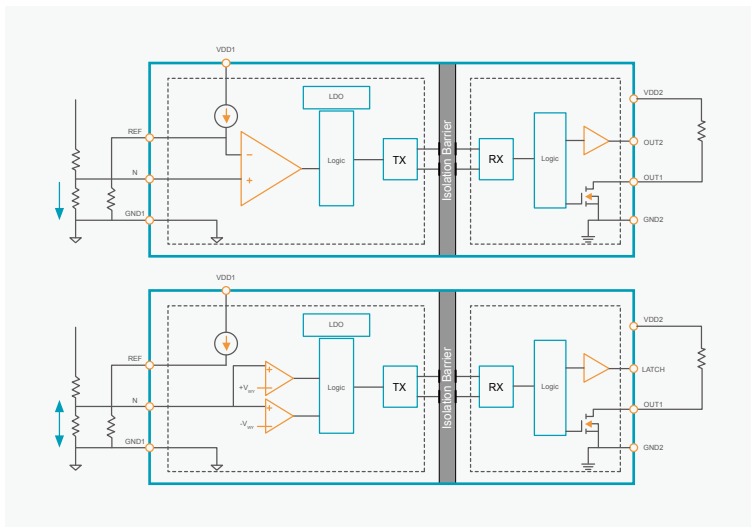
### Product introduction

NSI22C1x is a high speed isolated comparator with output separated from input based on the NOVOSENSE capacitive isolation technology. NSI22C11 is an isolated comparator with open-drain and push-pull outputs, and the NSI22C12 is a window comparator with open-drain output and latch function. The fast response characteristics of the NSI22C1x make it ideal for overvoltage and overcurrent protection applications. The protection threshold of the NSI22C1x can be adjusted by external resistors. NSI22C11 is designed with an adjustable threshold from 0.5V to 2V, and NSI22C12 is designed with a window threshold adjustment range from  $\pm 20\text{mV}$  to  $\pm 320\text{mV}$ . Two packages are available for NSI22C1x, one is SOP-8 narrow-body package with basic isolation and the other is SOW-8 wide-body package with reinforced isolation.

### Product feature

- Insulation voltage up to 5000Vrms
- Power supply at input side: 3.1V-27V
- Adjustable input reference range:  
NSI22C11: 0.5V to 2V  
NSI22C12:  $\pm 20$  to  $\pm 320\text{mV}$
- High-precision input threshold:  $\pm 1\%$  error (Max)
- Comparator threshold error:  
NSI22C11:  $\pm 0.25\%$  (Max)  
NSI22C12:  $\pm 1\%$  (Max)
- CMTI:  $\pm 150\text{kV}/\mu\text{s}$  (Typ)
- System-level diagnostic capabilities  
VDD1 monitoring
- Operating temperature:  $-40\sim 125^\circ\text{C}$
- RoHS compliant package: SOP-8(150mil), SOW-8(300mil)

### Functional block diagram



### Application



AC motor control



Power and  
solar inverters



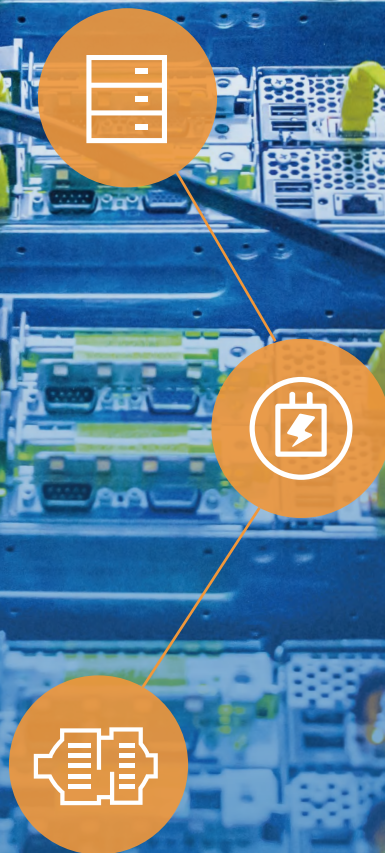
UPS



Onboard charger



# Isolated Half-bridge Driver





# Isolated Half-bridge Driver

| Part number     | Peak output current (a) | VCC UVLO threshold (V) | Input side VCC voltage (Max)(V) | Output side VCC voltage (Max)(V) | CMTI (kV/μs) | Feature                         | Isolation withstand voltage (kVrms) | Insulation grade      | Operating temperature (°C) | Qualification | Package |
|-----------------|-------------------------|------------------------|---------------------------------|----------------------------------|--------------|---------------------------------|-------------------------------------|-----------------------|----------------------------|---------------|---------|
| NSI6602A-DLAR   | 4/-6                    | 6                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602B-DLAR   | 4/-6                    | 8                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602C-DLAR   | 4/-6                    | 13                     | 6                               | 30                               | 150          | Programmable dead time, Disable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602A-DSPNR  | 4/-6                    | 6                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602B-DSPNR  | 4/-6                    | 8                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602C-DSPNR  | 4/-6                    | 13                     | 6                               | 30                               | 150          | Programmable dead time, Disable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602A-DSWR   | 4/-6                    | 6                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602B-DSWR   | 4/-6                    | 8                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602C-DSWR   | 4/-6                    | 13                     | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602A-DSWKR  | 4/-6                    | 6                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602B-DSWKR  | 4/-6                    | 8                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602C-DSWKR  | 4/-6                    | 13                     | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602A-Q1SWR  | 4/-6                    | 6                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602B-Q1SWR  | 4/-6                    | 8                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602C-Q1SWR  | 4/-6                    | 13                     | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602A-Q1SWKR | 4/-6                    | 6                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602B-Q1SWKR | 4/-6                    | 8                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602C-Q1SWKR | 4/-6                    | 13                     | 6                               | 30                               | 150          | Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602A-Q1SPNR | 4/-6                    | 6                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602B-Q1SPNR | 4/-6                    | 8                      | 6                               | 30                               | 150          | Programmable dead time, Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602C-Q1SPNR | 4/-6                    | 13                     | 6                               | 30                               | 150          | Programmable dead time, Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622A-DLAR   | 4/-6                    | 6                      | 6                               | 30                               | 150          | Disable                         | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622B-DLAR   | 4/-6                    | 8                      | 6                               | 30                               | 150          | Disable                         | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622C-DLAR   | 4/-6                    | 13                     | 6                               | 30                               | 150          | Disable                         | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622A-DSPNR  | 4/-6                    | 6                      | 6                               | 30                               | 150          | Disable                         | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6622B-DSPNR  | 4/-6                    | 8                      | 6                               | 30                               | 150          | Disable                         | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6622C-DSPNR  | 4/-6                    | 13                     | 6                               | 30                               | 150          | Disable                         | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6622A-DSWR   | 4/-6                    | 6                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6622B-DSWR   | 4/-6                    | 8                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6622C-DSWR   | 4/-6                    | 13                     | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6622A-DSWKR  | 4/-6                    | 6                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6622B-DSWKR  | 4/-6                    | 8                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6622C-DSWKR  | 4/-6                    | 13                     | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6622A-Q1SWR  | 4/-6                    | 6                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622B-Q1SWR  | 4/-6                    | 8                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622C-Q1SWR  | 4/-6                    | 13                     | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622A-Q1SWKR | 4/-6                    | 6                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622B-Q1SWKR | 4/-6                    | 8                      | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622C-Q1SWKR | 4/-6                    | 13                     | 6                               | 30                               | 150          | Disable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622A-Q1SPNR | 4/-6                    | 6                      | 6                               | 30                               | 150          | Disable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622B-Q1SPNR | 4/-6                    | 8                      | 6                               | 30                               | 150          | Disable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622C-Q1SPNR | 4/-6                    | 13                     | 6                               | 30                               | 150          | Disable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602VA-DLAR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |

# Isolated Half-bridge Driver

| Part number      | Peak output current (A) | VCC UVLO threshold (V) | Input side VCC voltage (Max)(V) | Output side VCC voltage (Max)(V) | CMTI (kV/μs) | Feature                                       | Isolation withstand voltage (kVrms) | Insulation grade      | Operating temperature (°C) | Qualification | Package |
|------------------|-------------------------|------------------------|---------------------------------|----------------------------------|--------------|-----------------------------------------------|-------------------------------------|-----------------------|----------------------------|---------------|---------|
| NSI6602VB-DLAR   | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602VC-DLAR   | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602VD-DLAR   | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602VA-DLAMR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602VB-DLAMR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602VC-DLAMR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602VD-DLAMR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602VA-DSWR   | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602VB-DSWR   | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602VC-DSWR   | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602VD-DSWR   | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602VA-DSWKR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602VB-DSWKR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602VC-DSWKR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602VD-DSWKR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602VA-DSPNR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602VB-DSPNR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602VC-DSPNR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602VD-DSPNR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602VA-Q1SWR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602VB-Q1SWR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602VC-Q1SWR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602VD-Q1SWR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602VA-Q1SWKR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602VB-Q1SWKR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602VC-Q1SWKR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602VD-Q1SWKR | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602VA-Q1SPNR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602VB-Q1SPNR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602VC-Q1SPNR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602VD-Q1SPNR | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Disable               | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602MC-DSWTR  | 5/-5                    | 9                      | 6                               | 35                               | 150          | Miller clamp, Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW18   |
| NSI6602MC-DSWTR  | 5/-5                    | 12                     | 6                               | 35                               | 150          | Miller clamp, Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW18   |
| NSI6602MF-DSWTR  | 5/-5                    | 15                     | 6                               | 35                               | 150          | Miller clamp, Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW18   |
| NSI6602MNB-DSWTR | 5/-5                    | 9                      | 6                               | 35                               | 150          | Miller clamp, Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW18   |
| NSI6602MNC-DSWTR | 5/-5                    | 12                     | 6                               | 35                               | 150          | Miller clamp, Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW18   |
| NSI6602MNF-DSWTR | 5/-5                    | 15                     | 6                               | 35                               | 150          | Miller clamp, Programmable dead time, Disable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW18   |
| NSI6602NA-DLAR   | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable                | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602NB-DLAR   | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable                | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602NC-DLAR   | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable                | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602ND-DLAR   | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable                | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |

| Part number     | Peak output current (A) | VCC UVLO threshold (V) | Input side VCC voltage (Max)(V) | Output side VCC voltage (Max)(V) | CMTI (kV/μs) | Feature                        | Isolation withstand voltage (kVrms) | Insulation grade      | Operating temperature (°C) | Qualification | Package |
|-----------------|-------------------------|------------------------|---------------------------------|----------------------------------|--------------|--------------------------------|-------------------------------------|-----------------------|----------------------------|---------------|---------|
| NSI6602NA-DLAMR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602NB-DLAMR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602NC-DLAMR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602ND-DLAMR | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6602NA-DSWR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602NB-DSWR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602NC-DSWR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602ND-DSWR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6602NA-DSWKR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602NB-DSWKR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602NC-DSWKR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602ND-DSWKR | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6602NA-DSPNR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602NB-DSPNR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602NC-DSPNR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602ND-DSPNR | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6642A-DLAR   | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642B-DLAR   | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642C-DLAR   | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642D-DLAR   | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642A-DLAMR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642B-DLAMR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642C-DLAMR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642D-DLAMR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6642A-DSWR   | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6642B-DSWR   | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6642C-DSWR   | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6642D-DSWR   | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6642A-DSWKR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6642B-DSWKR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6642C-DSWKR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6642D-DSWKR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6642A-DSPNR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6642B-DSPNR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6642C-DSPNR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6642D-DSPNR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6622NA-DLAR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622NB-DLAR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622NC-DLAR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622ND-DLAR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Enable                         | 2.5                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622NA-DLAMR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622NB-DLAMR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |

# Isolated Half-bridge Driver

| Part number      | Peak output current (A) | VCC UVLO threshold (V) | Input side VCC voltage (Max)(V) | Output side VCC voltage (Max)(V) | CMTI (kV/μs) | Feature                        | Isolation withstand voltage (kVrms) | Insulation grade      | Operating temperature (°C) | Qualification | Package |
|------------------|-------------------------|------------------------|---------------------------------|----------------------------------|--------------|--------------------------------|-------------------------------------|-----------------------|----------------------------|---------------|---------|
| NSI6622NC-DLAMR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622ND-DLAMR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Enable                         | 1.6                                 | Basic insulation      | -40~125                    | Industrial    | LGA13   |
| NSI6622NA-DSWR   | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6622NB-DSWR   | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6622NC-DSWR   | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6622ND-DSWR   | 6/-8                    | 4                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6622NA-DSWKR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6622NB-DSWKR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6622NC-DSWKR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6622ND-DSWKR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW14   |
| NSI6622NA-DSPNR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6622NB-DSPNR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6622NC-DSPNR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6622ND-DSPNR  | 6/-8                    | 4                      | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP16   |
| NSI6602NA-Q1SWR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602NB-Q1SWR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602NC-Q1SWR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6602NA-Q1SWKR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602NB-Q1SWKR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602NC-Q1SWKR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6602NA-Q1SPNR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602NB-Q1SPNR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602NC-Q1SPNR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6602NA-Q1SPOR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6602NB-Q1SPOR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6602NC-Q1SPOR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Programmable dead time, Enable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6622NA-Q1SWR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622NB-Q1SWR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622NC-Q1SWR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622NA-Q1SWKR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622NB-Q1SWKR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622NC-Q1SWKR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622NA-Q1SPNR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622NB-Q1SPNR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622NC-Q1SPNR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622NA-Q1SPOR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6622NB-Q1SPOR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6622NC-Q1SPOR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Enable                         | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6622VA-Q1SWR  | 6/-8                    | 6                      | 24                              | 30                               | 150          | Disable                        | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622VB-Q1SWR  | 6/-8                    | 8                      | 24                              | 30                               | 150          | Disable                        | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6622VC-Q1SWR  | 6/-8                    | 12                     | 24                              | 30                               | 150          | Disable                        | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |

| Part number      | Peak output current (a) | VCC UVLO threshold (V) | Input side VCC voltage (Max)(V) | Output side VCC voltage (Max)(V) | CMTI (kV/μs) | Feature | Isolation withstand voltage (kVrms) | Insulation grade      | Operating temperature (°C) | Qualification | Package |
|------------------|-------------------------|------------------------|---------------------------------|----------------------------------|--------------|---------|-------------------------------------|-----------------------|----------------------------|---------------|---------|
| NSI6622VA-Q1SWKR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622VB-Q1SWKR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622VC-Q1SWKR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Disable | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW14   |
| NSI6622VA-Q1SPNR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622VB-Q1SPNR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622VC-Q1SPNR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP16   |
| NSI6622VA-Q1SPOR | 6/-8                    | 6                      | 24                              | 30                               | 150          | Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6622VB-Q1SPOR | 6/-8                    | 8                      | 24                              | 30                               | 150          | Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |
| NSI6622VC-Q1SPOR | 6/-8                    | 12                     | 24                              | 30                               | 150          | Disable | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP14   |



## NSI66x2: Isolated Dual-channel Gate Driver

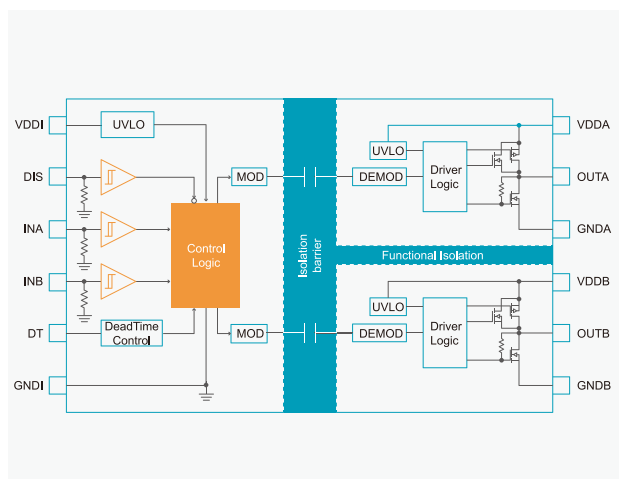
### ◆ Product introduction

NSI66x2 is a series of highly reliable isolated dual channel gate driver ICs, which can be designed to drive power transistors with switching frequency up to 2MHz. Each output can source and sink up to 4A/6A with fast propagation delay of 25ns and the maximum delay matching of 5ns. NSI66x2 provides 2500Vrms isolation in 5\*5mm LGA13 package according to UL1577, 3000Vrms isolation in SOP16 package, and 5700Vrms isolation in SOW16 and SOW14 packages. The common mode transient immunity (CMTI) of typical 150kV/μs improves system robustness. The absolute max rating of the driver side is 30V, and the input side accepts supply voltages from 3V to 5.5V. All supply voltage pins support undervoltage lockout (UVLO). With all these outstanding features, NSI66x2 is suitable for switching power supply systems which require high reliability, high power density and high efficiency.

### ◆ Product feature

- Isolated dual channel driver
- Input side power supply voltage: 3V~5.5V
- Driver side power supply voltage:  
Absolute max rating 30V, with UVLO
- Peak source and sink current 4A/6A
- High CMTI: typical 150kV/μs
- Typical propagation delay: 25ns
- Maximum delay matching: 5ns
- Maximum pulse width distortion: 6ns
- Programmable dead time (NSI6602)
- No dead time (NSI6622)
- Minimum receivable input pulse width: 15ns
- Operating temperature: -40°C~125°C
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Safety certification

- UL1577 certification:  
LGA13: 2.5kVrms  
SOW14: 5.7kVrms for 1 minute  
SOW16: 5.7kVrms for 1 minute  
SOP16: 3kVrms for 1 minute
- CQC certification: GB4943.1-2011
- CSA certification: 5A
- VDE certification: DIN V VDE V 0884-11:2017-1

### ◆ Package

- LGA13(4\*4mm), LGA13(5\*5mm), SOW14, SOW16, SOP16



### ◆ Application



Isolated DC-DC and AC-DC power supplies in servers, telecommunications and Industrial



DC-AC solar inverter



Motor drive and EV charging



UPS and battery charger

## NSI6602V/NSI6602N: Second - generation High-performance Isolated Dual-channel Gate Driver

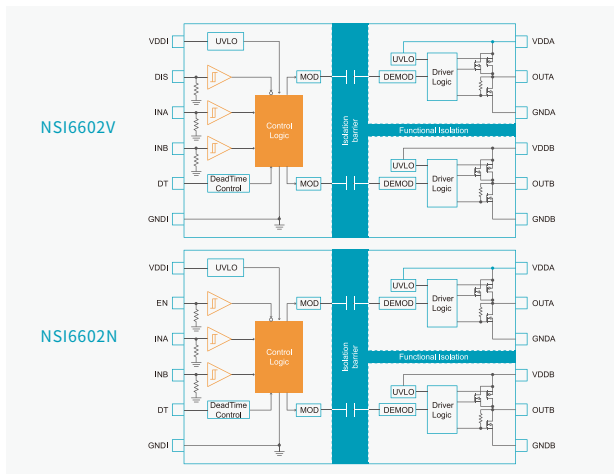
### ◆ Product introduction

NSI6602V/NSI6602N is the second-generation high-reliability isolated dual-channel gate driver IC, which enhances anti-interference capability and drive capability, reduces power consumption, and improves the withstand voltage of the input side. It can drive power transistors with switching frequencies up to 2MHz. Each channel output can provide a maximum source/sink current capability of 6A/8A with a fast 25ns propagation delay and a maximum delay match of 5ns. Common-mode transient immunity (CMTI) of 150kV/us improves system robustness. The absolute max rating of the driver side is 30V, and the input side accepts supply voltages from 3V to 18V. All supply voltage pins support undervoltage lockout (UVLO). In addition, multiple undervoltage points are available. The minimum undervoltage point supports 4V and can be used to drive GaN power devices. Multiple packages are available. The minimum package is the 4\*4mm LGA package, which can be used in applications with high power density requirements. According to UL1577, the NSI6602V provides 2500Vrms isolation with the 5\*5mm LGA13 package, 3000Vrms isolation with the SOP16 package, and 5700Vrms isolation with SOW16 and SOW14 packages. With all these outstanding features, NSI6602V is suitable for switching power supply systems which require high reliability, high power density and high efficiency.

### ◆ Product feature

- Isolated dual-channel driver
- Input side supply voltage: 3V-18V
- Driver side supply voltage:
  - Absolute max rating 30V, with UVLO
- Peak 6A/8A source/sink current capacity
- High CMTI: typical 150kV/μs
- 25ns typical propagation delay
- 5ns maximum delay matching
- 6ns maximum pulse width distortion
- Programmable dead time
- Enabling pins: NSI6602N Disable (high level off), NSI6602N Enable (high level on)
- Acceptable minimum input pulse width 15ns
- Operating temperature: -40°C~125°C
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Safety certification

- LGA13(4\*4mm): 1.6kVrms
- LGA13(5\*5mm): 2.5kVrms
- SOW14: 5.7kVrms for 1 minute
- SOW16: 5.7kVrms for 1 minute
- SOP16: 3kVrms for 1 minute
- CQC certification: GB4943.1 -2011
- CSA certification: components 5A qualified
- VDE certification: DIN V VDE V 0884-11: 2017-1

### ◆ Package

- LGA13(4\*4mm), LGA13(5\*5mm), SOW14, SOW16, SOP16



### ◆ Application



Isolated DC-DC and AC-DC power supplies in servers, telecommunications and Industrial



DC-AC solar inverter



Motor drive and EV charging



UPS and battery charger

## NSI6642: Second-generation High-performance Isolated Dual-channel Gate Driver Supporting PWM Input

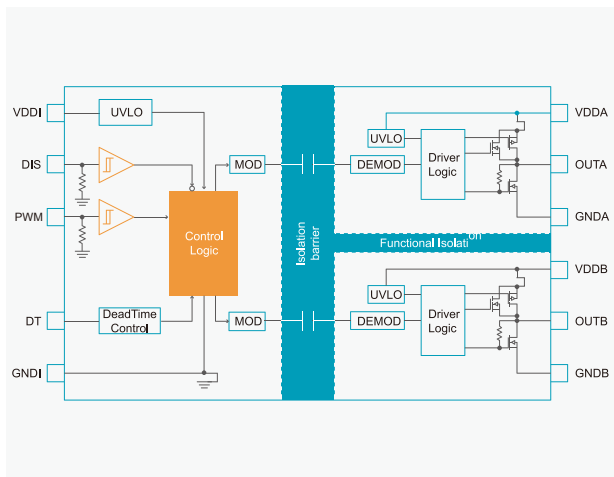
### ◆ Product introduction

NSI6642 is the second-generation, highly reliable, isolated dual-channel gate driver IC which provides enhanced anti-interference and drive capabilities with lower power consumption and improved withstand voltage of the input side. It uses a single PWM input mode to achieve complementary dual output and is capable of driving power transistors with switching frequencies up to 2MHz. Each channel output can provide a peak source/sink current capability of 6A/8A with a fast 25ns propagation delay and a maximum 5ns channel to channel delay match. It has a common-mode transient immunity (CMTI) of typical 150kV/μs, improving system robustness. The absolute max rating of the driver side is 30V, and the input side accepts supply voltages from 3V to 18V. All supply voltage pins support undervoltage lockout (UVLO). In addition, multiple UVLO options are available. The minimum UVLO supports 4V and can be used to drive GaN power devices. Multiple packages are also available. The minimum package is the 4\*4mm LGA package, which can be used in applications with high power density requirements. According to UL1577, the NSI6642 provides 2500Vrms isolation with the 5\*5mm LGA13 package, 3000Vrms isolation in the SOP16 package, and 5000Vrms isolation in the SOW16 and SOW14 packages. With all these outstanding features, the NSI6642 is suitable for switching power supply systems which require high reliability, high power density and high efficiency.

### ◆ Product feature

- Isolated dual-channel driver
- Single PWM input with complementary output OUTA and OUTB
- Input side supply voltage: 3V-18V
- Driver side supply voltage: Absolute max rating 30V, with UVLO
- Peak 6A/8A source/sink current capacity
- High CMTI: typical 150kV/μs
- 25ns typical transmission delay
- 5ns maximum channel to channel delay matching
- 6ns maximum pulse width distortion
- Programmable dead zone time
- Enable pins: NSI6642 Disable (high level off), NSI6642N Enable (high level on)
- Acceptable minimum input pulse width 15ns
- Operating temperature: -40°C ~ 125°C
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Application

  
Isolated DC-DC and AC-DC power supplies for servers, telecommunications and Industrial

  
DC-AC solar inverter

  
Motor drive and EV charging

  
UPS and battery charger

### ◆ Safety certification

- UL1577 certification:  
LGA13: 2.5kVrms for 1 minute  
SOW14: 5kVrms for 1 minute  
SOW16: 5kVrms for 1 minute  
SOP16: 3kVrms for 1 minute
- CQC certification: Conforms to GB4943.1 -2011
- CSA certification: Components conform to 5A
- VDE certification: DIN V VDE V 0884-11: 2017-1

### ◆ Package

- LGA13(4\*4mm), LGA13(5\*5mm), SOW14, SOW16, SOP16



# NSI6602M: Isolated Dual-channel Gate Driver with Integrated Miller Clamp

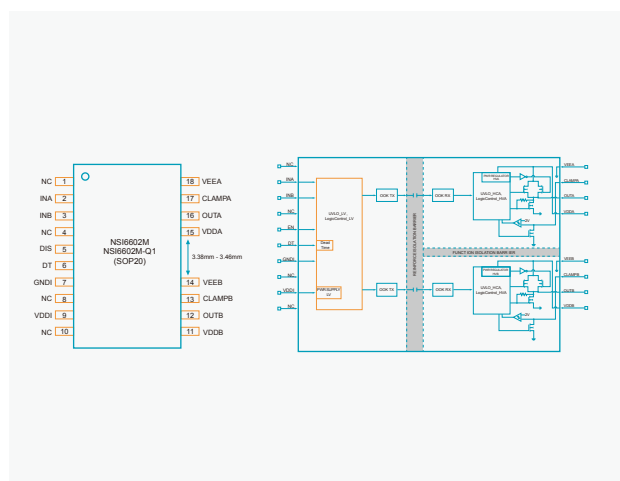
## Product introduction

NSI6602M is an isolated dual-channel gate driver IC integrated with Miller clamp. It is suitable for driving IGBT, power MOSFET and SiC MOSFET in many applications. It can provide peak source/sink current of 5A/5A, and is integrated with Miller clamp with current of up to 5A. The typical 150kV/μs common mode transient immunity (CMTI) ensures the robustness of the system. The absolute max rating of the driver side is 30V, and the input side is supplied with a power supply voltage of 3V to 5.5V. All power pins support undervoltage lockout (UVLO) protection. NSI6602M is designed with high drive current, dual-channel integrated Miller clamp function, excellent reliability, wide power supply voltage range and fast signal propagation, and is suitable for switching power supply systems which require high reliability, high power density and high efficiency.

## Product feature

- Isolated dual-channel driver
- Input side supply voltage: 3V - 5.5V
- Driver side supply voltage:  
Absolute max rating 35V, with UVLO
- Peak 5A/5A source/sink current capacity
- Support Miller Clamp, with current of up to 5A
- High CMTI: typical 150kV/μs
- 80ns typical propagation delay
- 5ns maximum delay matching
- 25ns maximum pulse width distortion
- Programmable dead zone time
- Acceptable minimum input pulse width 30ns
- Operating temperature: -40°C~125°C

## Functional block diagram

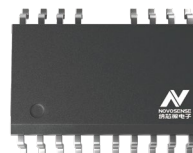


## Safety certification

- UL1577 certification:  
SOW18: 5kVrms for 1 minute
- CQC certification: GB4943.1 -2011
- CSA certification: components 5A qualified
- VDE certification: DIN V VDE V 0884-11: 2017-1

## Package

- SOW18



## Application



Isolated DC-DC and AC-DC power supplies in servers, telecommunications and Industrial



DC-AC solar inverter



Motor drive and EV charging



UPS and battery charger



# Isolated Single-channel Gate Driver





# Isolated Single-channel Gate Driver

| Part Number      | Peak drive current (A) | VCC UVLO threshold (V) | Input side VCC voltage (Max)(V) | Output side VCC voltage (Max)(V) | CMTI (Min) (kV/us) | Feature                             | Isolation Withstand Voltage (kVrms) | Insulation grade      | Operating temperature (°C) | Qualification | Package |
|------------------|------------------------|------------------------|---------------------------------|----------------------------------|--------------------|-------------------------------------|-------------------------------------|-----------------------|----------------------------|---------------|---------|
| NSI6801B-DSPR    | 5/-5                   | 9                      | N/A                             | 35                               | 150                | Opto-compatible input               | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP8    |
| NSI6801C-DSPR    | 5/-5                   | 13                     | N/A                             | 35                               | 150                | Opto-compatible input               | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP8    |
| NSI6801B-DSWFR   | 5/-5                   | 9                      | N/A                             | 35                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6801C-DSWFR   | 5/-5                   | 13                     | N/A                             | 35                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6801TB-DDBR   | 5/-5                   | 9                      | N/A                             | 35                               | 150                | Opto-compatible input               | 5                                   | Basic insulation      | -40~125                    | Industrial    | DUB8    |
| NSI6801TC-DDBR   | 5/-5                   | 13                     | N/A                             | 35                               | 150                | Opto-compatible input               | 5                                   | Basic insulation      | -40~125                    | Industrial    | DUB8    |
| NSI6801LC-DDBR   | 5/-5                   | 13                     | N/A                             | 35                               | 150                | Opto-compatible input               | 5                                   | Basic insulation      | -40~125                    | Industrial    | DUB8    |
| NSI68010B-DSWAR  | 0.7/-0.8               | 9                      | N/A                             | 35                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW6    |
| NSI68011C-DSWAR  | 1.5/-2                 | 13                     | N/A                             | 35                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW6    |
| NSI6601B-DSPR    | 5/-5                   | 9                      | 18                              | 35                               | 150                | Split output                        | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP8    |
| NSI6601C-DSPR    | 5/-5                   | 13                     | 18                              | 35                               | 150                | Split output                        | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP8    |
| NSI6601B-DSWVR   | 5/-5                   | 9                      | 18                              | 35                               | 150                | Split output                        | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6601C-DSWVR   | 5/-5                   | 13                     | 18                              | 35                               | 150                | Split output                        | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6601MB-DSPR   | 5/-5                   | 9                      | 18                              | 35                               | 150                | Miller clamp                        | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP8    |
| NSI6601MC-DSPR   | 5/-5                   | 13                     | 18                              | 35                               | 150                | Miller clamp                        | 3                                   | Basic insulation      | -40~125                    | Industrial    | SOP8    |
| NSI6601MB-DSWVR  | 5/-5                   | 9                      | 18                              | 35                               | 150                | Miller clamp                        | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6601MC-DSWVR  | 5/-5                   | 13                     | 18                              | 35                               | 150                | Miller clamp                        | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6601WC-DSWVR  | 5/-5                   | 13                     | 18                              | 35                               | 150                | Miller clamp                        | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6601MC-Q1SPR  | 5/-5                   | 13                     | 18                              | 35                               | 150                | Miller clamp                        | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP8    |
| NSI6601MC-Q1SWVR | 5/-5                   | 13                     | 18                              | 35                               | 150                | Miller clamp                        | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW8    |
| NSI6601MB-Q1SPR  | 5/-5                   | 9                      | 18                              | 35                               | 150                | Miller clamp                        | 3                                   | Basic insulation      | -40~125                    | Automotive    | SOP8    |
| NSI6601MB-Q1SWVR | 5/-5                   | 9                      | 18                              | 35                               | 150                | Miller clamp                        | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW8    |
| NSI6601WC-Q1SWVR | 5/-5                   | 13                     | 18                              | 35                               | 150                | Miller clamp                        | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW8    |
| NSI68010B-Q1SWAR | 0.7/-0.8               | 9                      | N/A                             | 35                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW6    |
| NSI68011C-Q1SWAR | 1.5/-2                 | 13                     | N/A                             | 35                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW6    |
| NSI6801MB-DSWVR  | 5/-5                   | 9                      | N/A                             | 35                               | 150                | Opto-compatible input, Miller clamp | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6801MC-DSWVR  | 5/-5                   | 13                     | N/A                             | 35                               | 150                | Opto-compatible input, Miller clamp | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW8    |
| NSI6801EB-DSWFR  | 5/-5                   | 8                      | N/A                             | 38                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW6    |
| NSI6801EC-DSWFR  | 5/-5                   | 12                     | N/A                             | 38                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW6    |
| NSI6801ETB-DDBR  | 5/-5                   | 8                      | N/A                             | 38                               | 150                | Opto-compatible input               | 5                                   | Basic insulation      | -40~125                    | Industrial    | DUB8    |
| NSI6801ETC-DDBR  | 5/-5                   | 12                     | N/A                             | 38                               | 150                | Opto-compatible input               | 5                                   | Basic insulation      | -40~125                    | Industrial    | DUB8    |
| NSI6801EB-DSWER  | 5/-5                   | 8                      | N/A                             | 38                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOL6    |
| NSI6801EC-DSWER  | 5/-5                   | 12                     | N/A                             | 38                               | 150                | Opto-compatible input               | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOL6    |

## NSI6801: Opto-compatible Isolated Single-channel Gate Driver

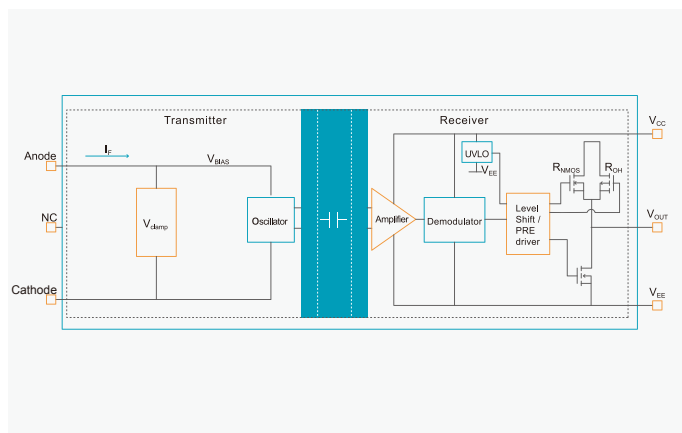
### ◆ Product introduction

NSI6801 is a single-channel isolated gate driver, which is pin-compatible with popular optically coupled gate drivers. It can provide a peak source/sink current of 5A. It supports the minimum common mode transient immunity (CMTI) of 150kV/μs, which ensures the robustness of the system. The absolute max rating of the driver side is 35V. When the input circuit is used in optocoupler compatible systems, it has performance advantages over optocoupler gate drivers, including better reliability and aging performance, higher operating temperature, shorter propagation delay and less pulse width distortion. Therefore, NSI6801 is more suitable than photoelectric isolation drivers for switching power supply systems which require high reliability, high power density and high efficiency.

### ◆ Product feature

- P2P compatible with optocoupler drivers, but upgraded performance
- Driver side power supply voltage: Absolute max rating NSI6801 35V, NSI6801E 38V
- UVLO: With UVLO protection, NSI6801 9V/13V, NSI6801E 8V/12V
- Peak source/sink current of 5A/5A
- High CMTI: 150kV/μs
- Typical propagation delay: 75ns
- Maximum pulse width distortion: 30ns

### ◆ Functional block diagram



### ◆ Application



Photovoltaic inverter



Motor driver



UPS power supply and battery charger



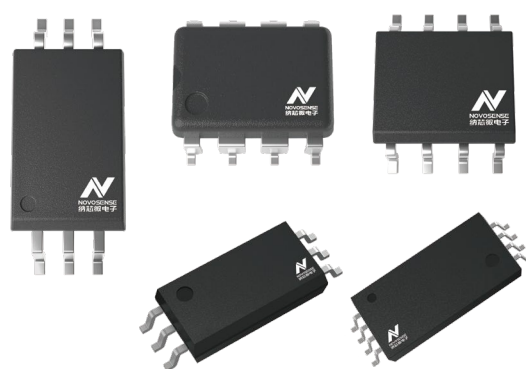
Isolation DC-DC and AC-DC power supplies

### ◆ Safety certification

- UL certification:
  - SOW6: 5700Vrms for 1 minute
  - SOL6: 5700Vrms for 1 minute
  - DUB8: 5000Vrms for 1 minute
  - SOP8: 3000Vrms for 1 minute
  - SOWW8: 5700Vrms for 1 minute
- VDE certification: DIN VDE V 0884-11:2017-01
- CSA certification: CSA components has passed 5A approval
- CQC certification: GB4943.1-2011

### ◆ Package

- SOW6, SOL6, DUB8, SOP8, SOWW8



## NSI68010/11: Cost-effective Opto-compatible Isolated Single-channel Gate Driver

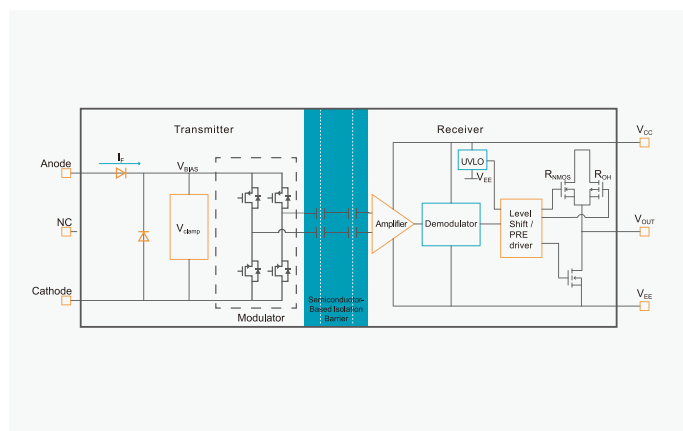
### ◆ Product introduction

The second-generation product series NSI68010/11 is based on the NSI6801 and includes NSI68010B and NSI68011C. NSI68010/11 is more cost-effective compared with the first generation in order to assist customers to reduce system costs and increase efficiency. NSI68010/11 single-channel isolated gate driver can be pin compatible with optically coupled gate drivers. It can provide up to 2A drive current. The minimum common mode transient immunity (CMTI) of 150kV/μs ensures system robustness. The absolute max rating of the driver side is 35V. When the input circuit is applied in an opto-compatible system, it offers better performance compared with optocoupler gate drivers, including better reliability, longer working life, higher operating temperature, shorter propagation delay and less pulse width distortion. Therefore, NSI6801x is suitable for replacing opto-isolated drivers in switching power supply systems which require high reliability, power density and efficiency.

### ◆ Product feature

- P2P compatible with optocoupler drivers, but upgraded performance
- Driver side power supply voltage: Absolute max rating 35V, with UVLO
- High CMTI: 150kV/μs
- NSI68010 drive current: +0.7A/-0.8A
- NSI68011 drive current: +1.5A/-2A
- Typical propagation delay: 63ns
- Maximum pulse width distortion: 30ns
- Operation ambient temperature: -40°C ~ 125°C
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Safety certification

- UL certification: 5700Vrms for 1 minute (SOW6)
- VDE certification: DIN VDE V 0884-11:2017-01
- CSA certification: CSA components has passed 5A approval
- CQC certification: GB4943.1-2011

### ◆ Package

- SOW6



### ◆ Application



Photovoltaic inverter



Motor driver



UPS power supply and battery charger



Isolation DC-DC and AC-DC power supplies

## NSI6601/NSI6601M: Isolated Single-channel Gate Driver

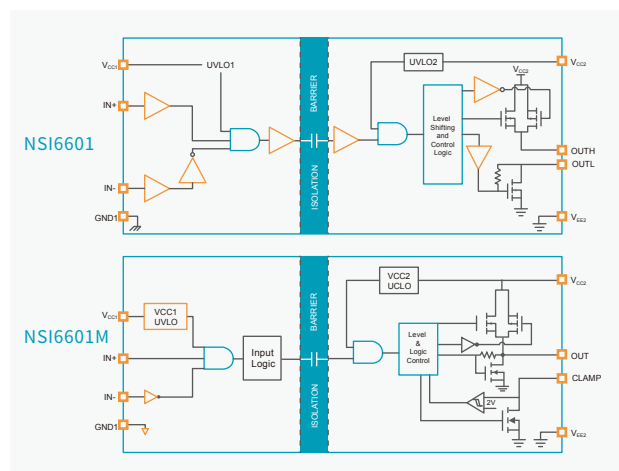
### ◆ Product introduction

NSI6601/6601M is a single-channel isolated gate driver suitable for driving IGBT, power MOSFET and SiC MOSFET in many applications. Separate outputs are provided to control the rising and falling duration respectively. It can provide peak source/sink current of 5A/5A. The 150kV/μs minimum common mode transient immunity (CMTI) ensures the robustness of the system. The absolute max rating of the driver side is 35V, and the input side is supplied with a power supply voltage of 3.1V to 17V. All power pins support undervoltage lockout (UVLO) protection. NSI6601 is designed with high drive current, excellent durability, wide power supply voltage range and fast signal propagation, and is suitable for switching power supply systems which require high reliability, high power density and high efficiency.

### ◆ Product feature

- Single-channel isolated driver
- Input side supply voltage: 3.1V to 17V
- Driver side voltage: Absolute max rating 35V, with UVLO
- Version M supports Miller Clamp function (NSI6601M) with current up to 5A
- Peak source/sink current of 5A/5A
- High CMTI: 150kV/μs
- Typical propagation delay: 78ns
- Operation ambient temperature: -40°C to 125°C
- AEC-Q100

### ◆ Functional block diagram

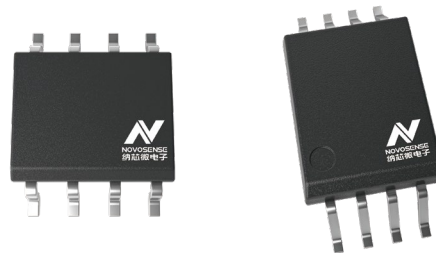


### ◆ Safety certification

- UL certification:
  - SOP8: 3000Vrms for 1 minute
  - SOW8: 5700Vrms for 1 minute
- VDE certification: DIN VDE V 0884-11:2017-01
- CSA certification: CSA components has passed 5A approval
- CQC certification: GB4943.1-2011

### ◆ Package

- SOP8, SOW8



### ◆ Application



Photovoltaic inverter



Motor driver



UPS power supply and battery charger



Isolation DC-DC and AC-DC power supplies

## NSI6801M: Opto-compatible Isolated Single-channel Gate Driver with Miller Clamp

### ◆ Product introduction

NSI6801M is a single-channel isolation gate driver suitable for driving IGBT, power MOSFET and SiC MOSFET in many applications. It can provide peak source/sink current of 5A/5A, and is integrated with Miller clamp with current of up to 5A. The 150kV/μs minimum common mode transient immunity (CMTI) ensures the robustness of the system. The absolute max rating of the driver side is 35V, and the input side is supplied with a power supply voltage of 3.1V to 17V. All power pins support undervoltage lockout (UVLO) protection. NSI6801M is designed with high drive current, excellent reliability, wide power supply voltage range and fast signal propagation, and is suitable for switching power supply systems which require high

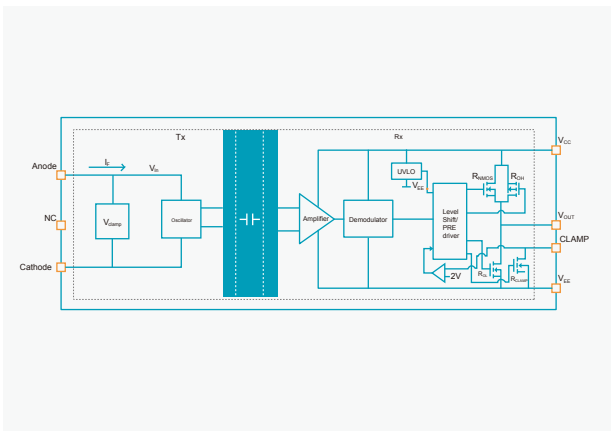
### ◆ Product feature

- Isolated single-channel driver
- Input side supply voltage: 3.1V - 17V
- Driver side supply voltage: Absolute max rating 35V, with UVLO
- Support Miller Clamp function, with current of up to 5A
- Peak 5A/5A source/sink current
- •High CMTI: 150kV/μs
- 75ns typical propagation delay
- Operating ambient temperature: -40°C~125°C
- AEC-Q100

### ◆ Safety certification

- UL certification:
  - SOP8: 3000Vrms for 1 minute
  - SOW8: 5700Vrms for 1 minute
- VDE certification: DIN VDE V 0884-11:2017-01
- CSA certification: components 5A qualified
- CQC certification: GB4943.1 -2011

### ◆ Functional block diagram



### ◆ Package

- SOW8



### ◆ Application



Solar inverter



Motor driver



UPS and battery charger



Isolated DC-DC and AC-DC power supplies



# Smart Isolated Gate Driver Integrated with DESAT Protection



# Smart Isolated Gate Driver Integrated with DESAT Protection

| Part Number      | Peak drive current (A) | VCC UVLO threshold (V) | Input side VCC voltage (Max)(V) | Output side VCC voltage (Max)(V) | CMTI(Min) (kV/us) | Feature                                                                                                                           | Isolation Withstand Voltage (kVrms) | Insulation grade      | Operating temperature (°C) | Qualification | Package |
|------------------|------------------------|------------------------|---------------------------------|----------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------|----------------------------|---------------|---------|
| NSI6611ASC-DSWR  | 10/-10                 | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, ASC function, Split output, and Fault alarm                          | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6651ASC-DSWR  | 10/-10                 | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, Split output, and Fault alarm                                        | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6651ALC-DSWR  | 10/-10                 | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, and Fault alarm                                                      | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6631ASC-DSWR  | 10/-10                 | 12                     | 6                               | 35                               | 150               | OCP short circuit protection, soft shutdown, Miller clamp, ASC function, Split output, and Fault alarm                            | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6611ASC-Q1SWR | 10/-10                 | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, ASC function, separate output, and Fault alarm                       | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6651ASC-Q1SWR | 10/-10                 | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, Split output, and Fault alarm                                        | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6651ALC-Q1SWR | 10/-10                 | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, and Fault alarm                                                      | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6631ASC-Q1SWR | 10/-10                 | 12                     | 6                               | 35                               | 150               | OCP short circuit protection, soft shutdown, Miller clamp, ASC function, Split output, and Fault alarm                            | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI68515LC-DSWR  | 5/-5                   | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, and Fault alarm                                                      | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI68515UC-DSWR  | 5/-5                   | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, soft shutdown, Miller clamp, and Fault alarm, UVLO alarm                                          | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI68515AC-DSWR  | 5/-5                   | 12                     | 6                               | 35                               | 150               | DESAT short circuit protection, Auto Reset, soft shutdown, Miller clamp, and Fault alarm                                          | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI68515RC-DSWR  | 5/-5                   | 12                     | 6                               | 35                               | 150               | Non-Rail-to-Rail output, DESAT short circuit protection, Auto Reset, soft shutdown, Miller clamp, and Fault alarm                 | 5.7                                 | Reinforced insulation | -40~125                    | Industrial    | SOW16   |
| NSI6770ASC-Q1SWR | 10/-10                 | 12                     | 6                               | 38                               | 150               | Isolated Analog Sensing, DESAT short circuit protection, soft shutdown, Miller clamp, ASC function, Split output, and Fault alarm | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6730ASC-Q1SWR | 10/-10                 | 12                     | 6                               | 38                               | 150               | Isolated Analog Sensing, DESAT short circuit protection, soft shutdown, Miller clamp, ASC function, Split output, and Fault alarm | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6730ASB-Q1SWR | 10/-10                 | 12                     | 6                               | 38                               | 150               | Isolated Analog Sensing, DESAT short circuit protection, soft shutdown, Miller clamp, ASC function, Split output, and Fault alarm | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |
| NSI6730ASA-Q1SWR | 10/-10                 | 12                     | 6                               | 38                               | 150               | Isolated Analog Sensing, DESAT short circuit protection, soft shutdown, Miller clamp, ASC function, Split output, and Fault alarm | 5.7                                 | Reinforced insulation | -40~125                    | Automotive    | SOW16   |

# NSI6611/NSI6651: Smart Isolated Gate Driver Integrated with DESAT Protection

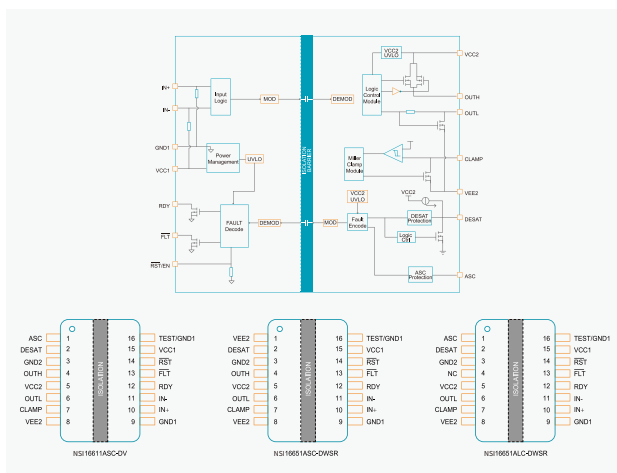
## Product introduction

NSI6611/NSI6651 is a single-channel smart isolated gate driver designed to drive IGBT, power MOSFET and SiC MOSFET and other power transistors in many applications and provide protection for their safe operation. It can provide separate output to control the rising and falling duration respectively, it supports rail-to-rail output, and can provide a maximum 10A/10A source and sink current capability. NSI6611/NSI6651 can provide protection functions, such as UVLO, Miller clamp, DESAT protection, soft turnoff, and when short circuit fault or undervoltage occurs, the fault can be indicated through a separate pin. NSI6611 supports ASC function and can be used to force the output to be high in emergency situations. It supports minimum common mode transient immunity (CMTI) of 150kV/μs to improve system robustness. The absolute max rating of the driver side is 35V, and the input side accepts supply voltages from 3V to 5.5V. NSI6611/NSI6651 features large drive current, wide power supply voltage range, and high CMTI, and is designed with excellent protection. It is suitable for switching power supply systems and inverters which require high reliability, high power density and high efficiency.

## Product feature

- Smart Single-channel isolated Driver
- Input side power supply voltage: 3V~5.5V
- Driver side power supply voltage:  
Absolute max rating 35V, with UVLO
- Peak source and sink current 10A/10A
- High CMTI: 150kV/μs
- Typical propagation delay: 80ns
- Maximum pulse width distortion: 30ns
- Minimum receivable input pulse width: 40ns
- Rail-to-rail output, with separate output as an option
- Protection mode:  
Miller Clamp 4.0A  
DESAT protection with a threshold of 9V  
Support soft turnoff at a current of 400mA  
Support fault reporting, reset or enable
- Operating temperature: -40°C~125°C

## Functional block diagram

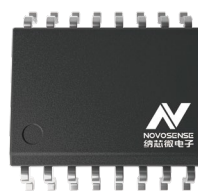


## Safety certification

- UL1577 certification: 5.7KVrms
- CQC certification: GB4943.1-2011
- CSA certification: components conform to 5A
- VDE certification: DIN V VDE V 0884-11:2017-1

## Package

- SOW16



## Application



EV electric  
drive system



Air conditioning  
compressor



DC-AC solar  
inverter



Motor driver



UPS and  
battery charger

## NSI67x0: Smart Isolated Gate Driver Integrated with Isolated Analog Sensing

### ◆ Product introduction

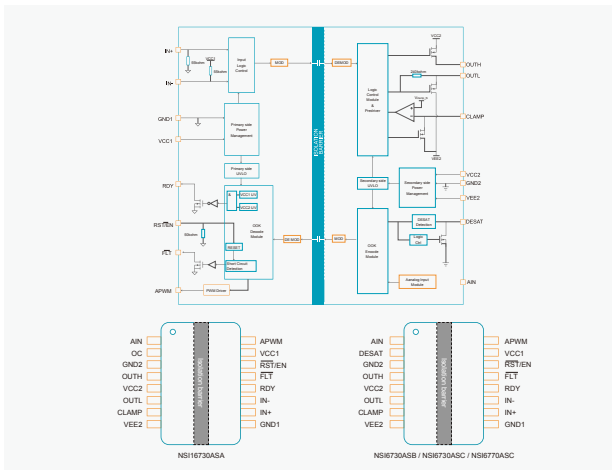
NSI67x0 is a single-channel smart isolated gate driver designed to drive IGBT, power MOSFET and SiC MOSFET and other power devices in many applications and provide protection for their safe operation. It offers separate output to control the rising and falling duration respectively, it supports rail-to-rail output, and can provide a maximum 10A/10A source and sink current capability. NSI67x0 can provide protection functions, such as UVLO, Miller Clamp, DESAT protection, soft turnoff and when short circuit fault or undervoltage occurs, the fault can be indicated through a separate pin.

NSI67x0 integrates Isolated Analog Sensing, which can be utilized for easier temperature or voltage sensing, further increasing the drivers' versatility and simplifying the system design effort, size and cost. It supports minimum common mode transient immunity (CMTI) of 150kV/μs to improve system robustness. The absolute max rating of the driver side is 35V, and the input side accepts supply voltages from 3V to 5.5V. NSI67x0 features large drive current, wide power supply voltage range, and high CMTI, and is designed with excellent protection. It is suitable for switching power supply systems and inverters which require high reliability, high power density and high efficiency.

### ◆ Product feature

- Smart Isolated Gate Driver Integrated with Isolated Analog Sensing
- Input side power supply voltage: 3V~5.5V
- Driver side power supply voltage: Absolute max rating 38V, with UVLO
- Peak source and sink current 10A/10A
- High CMTI: 150kV/μs
- Typical propagation delay: 90ns
- Maximum pulse width distortion: 30ns
- Minimum receivable input pulse width: 40ns
- Rail-to-rail output, with separate output as an option
- Isolated analog sensor with PWM output for Temperature sensing with NTC, PTC or thermal diode
- High voltage DC-Link or phase voltage
- Protection mode:
  - Miller Clamp 4.0A
  - DESAT protection with a threshold of 9V or 6.5V
  - OC protection with a threshold of 0.7V
  - Support soft turnoff at a current of 400mA
  - Support fault reporting, reset or enable
- Operating temperature: -40°C~125°C

### ◆ Functional block diagram



### ◆ Safety certification

- UL1577 certification: 5.7KVrms
- CQC certification: GB4943.1-2011
- CSA certification: components conform to 5A
- VDE certification: DIN V VDE V 0884-11:2017-1

### ◆ Package

- SOW16



### ◆ Application



EV electric drive system



A/C compressor



DC-AC solar inverter



Motor driver



UPS and battery charger

## NSI68515: Opto-compatible Smart Isolated Gate Driver Integrated with DESAT Protection

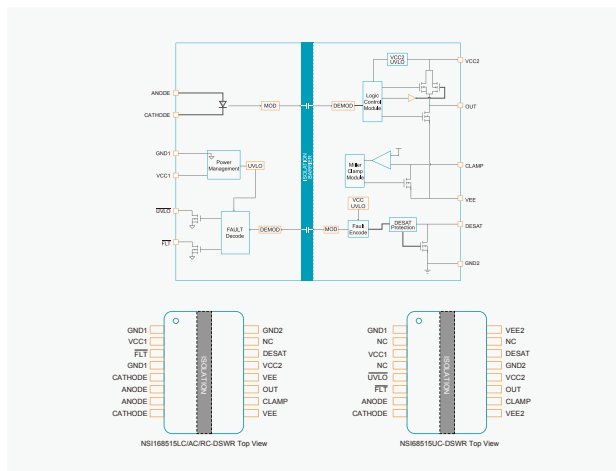
### ◆ Product introduction

NSI68515 is an opt-compatible single-channel smart isolated gate driver integrated with DESAT protection designed to drive and provide protection for safe operation of IGBTs, power MOSFETs and SiC MOSFETs in many applications. NSI68515 can provide up to +5A/-5A source/sink current capability. The absolute max rating of the driver side is 35V, and the input side accepts supply voltages from 3V to 5.5V. It can provide excellent protection function, such as UVLO, Miller clamp, DESAT protection, and soft turnoff, etc., and send alarm by a separate pin when detecting a short circuit fault or undervoltage. It is available in automatic alarm reset version, rail to rail output version and non-rail to rail output version. It supports a minimum common-mode transient immunity (CMTI) of 150kV/μs to improve system robustness. NSI68515 features high driver current, wide range of power supply voltage, high CMTI, and has excellent protection function, which is suitable for motor drive, inverter, switching power system and other systems with high reliability, high power density and high efficiency.

### ◆ Product feature

- Smart isolated single-channel driver integrated with DESAT protection
- Input side supply voltage: 3V - 5.5V
- Driver side supply voltage:  
Absolute max rating 35V, with UVLO
- Peak 5A/5A source/sink current capacity
- High CMTI: 150kV/μs
- 100ns typical propagation delay
- 100ns maximum pulse width distortion
- Acceptable minimum input pulse width 40ns
- NSI68515LC/UC/AC rail to rail output, NSI68515AC non- rail to rail output
- NSI68515AC/RC supports automatic resetting
- Protection mode
- Miller clamp 4.0A
- DESAT protection, with threshold of 6.5V
- Support soft shutdown function, with soft shutdown current of 140mA
- Support alarm feedback
- Operating temperature: -40°C~125°C

### ◆ Functional block diagram

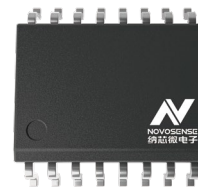


### ◆ Safety certification

- UL1577 certification: 5.7KVrms
- CQC certification: GB4943.1 -2011
- CSA certification: Components 5A qualified
- VDE certification: DIN V VDE V 0884-11:2017-1 (under qualification)

### ◆ Package

- SOW16



### ◆ Application



EV motor  
driving system



A/C compressor



DC-AC solar  
inverter



Motor driver



UPS and  
battery charger



# Non-isolated Low-side Gate Driver





## Non-isolated Low-side Gate Driver

| Part Number     | Drive object        | Peak drive current (A) | Output channel | VCC (V) | Propagation delay (Max) ton/off(ns) | Delay matching (ns) | Feature                                                           | Operating temperature (°C) | Qualification | Package  |
|-----------------|---------------------|------------------------|----------------|---------|-------------------------------------|---------------------|-------------------------------------------------------------------|----------------------------|---------------|----------|
| NSD1026V-DSPR   | GaN FET/MOSFET/IGBT | 5/-5                   | 2              | 30      | 27/27                               | 4                   | Enable, Negative Voltage Handling on Input(-10V)                  | -40~125                    | Industrial    | SOP8     |
| NSD1026V-DHMSR  | GaN FET/MOSFET/IGBT | 5/-5                   | 2              | 30      | 27/27                               | 4                   | Enable, Negative Voltage Handling on Input(-10V)                  | -40~125                    | Industrial    | EP-MSOP8 |
| NSD1026V-DDAER  | GaN FET/MOSFET/IGBT | 5/-5                   | 2              | 30      | 27/27                               | 4                   | Enable, Negative Voltage Handling on Input(-10V)                  | -40~125                    | Industrial    | DFN8     |
| NSD1026V-Q1SPR  | GaN FET/MOSFET/IGBT | 5/-5                   | 2              | 30      | 27/27                               | 4                   | Enable, Negative Voltage Handling on Input(-10V)                  | -40~125                    | Automotive    | SOP8     |
| NSD1026V-Q1HSPR | GaN FET/MOSFET/IGBT | 5/-5                   | 2              | 30      | 27/27                               | 4                   | Enable, Negative Voltage Handling on Input(-10V)                  | -40~125                    | Automotive    | EP-SOP8  |
| NSD1026V-Q1HMSR | GaN FET/MOSFET/IGBT | 5/-5                   | 2              | 30      | 27/27                               | 4                   | Enable, Negative Voltage Handling on Input(-10V)                  | -40~125                    | Automotive    | EP-MSOP8 |
| NSD1015T-DSPR   | MOSFET/IGBT/SiC     | 5/-5                   | 1              | 36      | 75/75                               | NA                  | DESAT protection, FAULT output, 5V supply output, bipolar voltage | -40~125                    | Industrial    | SOP8     |
| NSD1015MT-DSPR  | MOSFET/IGBT/SiC     | 5/-5                   | 1              | 36      | 75/75                               | NA                  | DESAT protection, FAULT output, 5V supply output, bipolar voltage | -40~125                    | Industrial    | SOP8     |

## NSD1026V: Dual-channel Low-side Gate Driver

### ◆ Product introduction

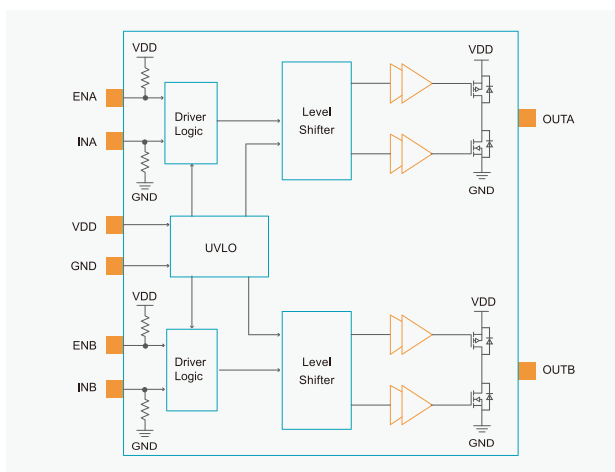
NSD1026V is an in-phase dual-channel high-speed gate driver suitable for driving MOSFET, IGBT, GaN and SiC power devices. It can provide 5A source current and sink current to drive capacitive loads, as well as rail-to-rail voltage swing in Miller platform area, which helps to reduce the Miller effect during MOSFET switching. In addition, the short rising and falling duration and the matching propagation delay of the two output channels make the NSD1026V series suitable for high frequency and dual-gate drive power applications, such as synchronous rectifiers.

Both the input pin and the enable pin support -10V input, thus increasing robustness, while the enable pin can help users realize control functions in different applications. Moreover, the internal circuit allows under-voltage lockout (UVLO), which keeps the output low until the power supply voltage returns to the operating range. The hysteresis function between high and low thresholds provides excellent immunity.

### ◆ Product feature

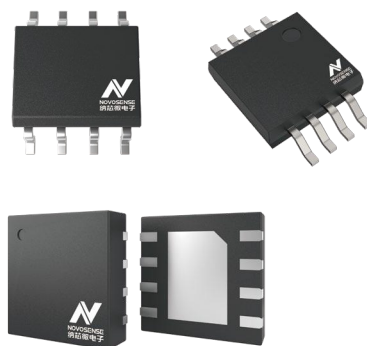
- Supply voltage range: 4.5V to 26V (Absolute max rating 30V)
- Source/sink drive current: 5A (peak)
- Each channel output is designed with two independent enable pins
- Supporting inputs as low as -10V
- CMOS/TTL compatible logic input
- The 5A reverse current function eliminates the need for output protection
- Operating temperature range: -40°C~125°C
- Propagation delay: 21 ns (typical)
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Package

- SOP8, HSOP8, HMSOP8, DFN8



### ◆ Application



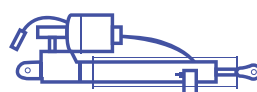
PFC, LLC, SR  
power supply  
topology



Power system  
(OBC/DCDC,  
industrial power, photovoltaic,  
communication, server)



Motor controller



Linear driver

## NSD1015T/MT: Smart Single-channel Low-side Gate Driver Integrated with DESAT Protection

### ◆ Product introduction

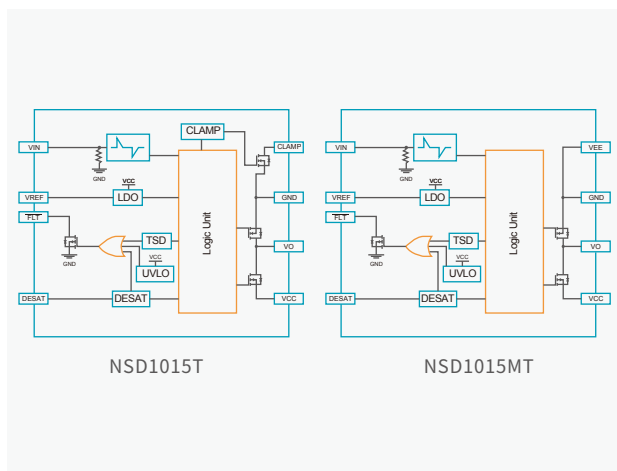
NSD1015T/MT is a smart single-channel non-isolated gate driver suitable for driving MOSFET, IGBT, and SiC power devices. It provides 5A source/sink current to drive capacitive loads.

In addition, fast rise and fall times and short propagation delays make the NSD1015T/MT series suitable for high-frequency switching applications. NSD1015T/MT's protection features include undervoltage protection (UVLO), desaturation protection (DESAT), and open-drain output fault reporting (FAULT). NSD1015T can also provide accurate 5V power output for external chips such as digital isolators. NSD1015T supports bipolar power supply, and NSD1015MT supports Miller clamp to ensure reliable shutdown.

### ◆ Product feature

- Supply voltage range: VCC-GND: 13V to 32V
- Source/sink drive current: 5A (peak)
- Rise time 16ns (typical), drop time 15ns (typical)
- Input to output propagation delay 75ns (maximum)
- UVLO undervoltage protection
- Desaturation (DESAT) protection
- FAULT reporting function
- NSD1015T supports bipolar power supply and NSD1015MT supports Miller clamp
- Operating temperature range: -40°C~125°C

### ◆ Functional block diagram



### ◆ Package

- SOP8



### ◆ Application



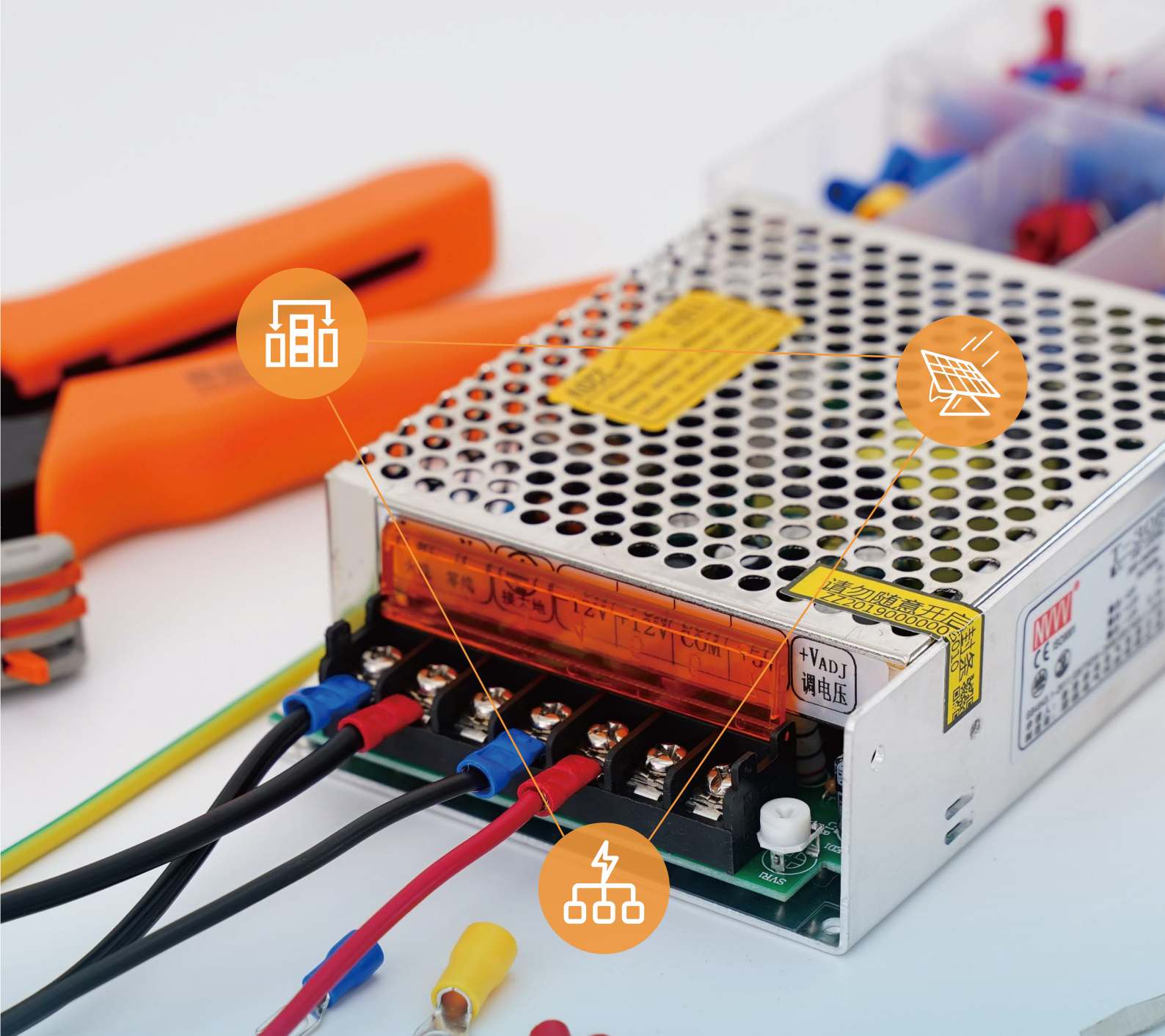
Industrial servo driver, inverter



HEV/EV compressor controller



HEV/EV PTC



# Non-isolated Half-bridge Gate Driver



## Non-isolated Half-bridge Gate Driver

| Part Number     | Drive object   | Peak drive current (A) | Output channel | BUS voltage (V) | VCC MAX(V) | Propagation delay (Max) ton/off(ns) | Delay matching (ns) | Feature                 | Operating temperature (°C) | Qualification | Package |
|-----------------|----------------|------------------------|----------------|-----------------|------------|-------------------------------------|---------------------|-------------------------|----------------------------|---------------|---------|
| NSD1624-DLAJR   | MOSFET/IGBT    | 4/-6                   | 2              | 700             | 24         | 35/35                               | 7                   | UVLO, Interlock         | -40~125                    | Industrial    | LGA10   |
| NSD1624-DSPR    | MOSFET/IGBT    | 4/-6                   | 2              | 700             | 24         | 35/35                               | 7                   | UVLO, Interlock         | -40~125                    | Industrial    | SOP8    |
| NSD1624-DSPKR   | MOSFET/IGBT    | 4/-6                   | 2              | 1200            | 24         | 35/35                               | 7                   | UVLO, Interlock         | -40~125                    | Industrial    | SOP14   |
| NSD16241-DSPR   | MOSFET/IGBT    | 4/-6                   | 2              | 700             | 24         | 35/35                               | 7                   | UVLO, Interlock         | -40~125                    | Industrial    | SOP8    |
| NSD16241-DSPKR  | MOSFET/IGBT    | 4/-6                   | 2              | 1200            | 24         | 35/35                               | 7                   | UVLO, Interlock         | -40~125                    | Industrial    | SOP14   |
| NSD16242-DSPR   | MOSFET/IGBT    | 4/-6                   | 2              | 700             | 24         | 35/35                               | 7                   | UVLO, Interlock         | -40~125                    | Industrial    | SOP8    |
| NSD1624-Q1SPR   | MOSFET/IGBT    | 4/-6                   | 2              | 700             | 24         | 55/55                               | 7                   | UVLO, Interlock         | -40~125                    | Automotive    | SOP8    |
| NSD1624-Q1SPKR  | MOSFET/IGBT    | 4/-6                   | 2              | 1200            | 24         | 55/55                               | 7                   | UVLO, Interlock         | -40~125                    | Automotive    | SOP14   |
| NSD16241-Q1SPR  | MOSFET/IGBT    | 4/-6                   | 2              | 700             | 24         | 55/55                               | 7                   | UVLO, Interlock         | -40~125                    | Automotive    | SOP8    |
| NSD16241-Q1SPKR | MOSFET/IGBT    | 4/-6                   | 2              | 1200            | 24         | 55/55                               | 7                   | UVLO, Interlock         | -40~125                    | Automotive    | SOP14   |
| NSD16242-Q1SPR  | MOSFET/IGBT    | 4/-6                   | 2              | 700             | 24         | 55/55                               | 7                   | UVLO, Interlock         | -40~125                    | Automotive    | SOP8    |
| NSD1224LA-DAFR  | MOSFET/GaN FET | 3/-4                   | 2              | 115             | 20         | 35/35                               | 5                   | UVLO, Interlock, Enable | -40~125                    | Industrial    | DFN10   |
| NSD1224LA-DSPR  | MOSFET/GaN FET | 3/-4                   | 2              | 115             | 20         | 35/35                               | 5                   | UVLO, Interlock         | -40~125                    | Industrial    | SOP8    |

## NSD1624x: High Voltage Half-bridge Gate Driver

### ◆ Product introduction

NSD1624/NSD16241/NSD16242 is a series of high-voltage half-bridge driver ICs. It is designed with 4/-6A drive current and can be used to drive various power devices such as MOSFET/IGBT.

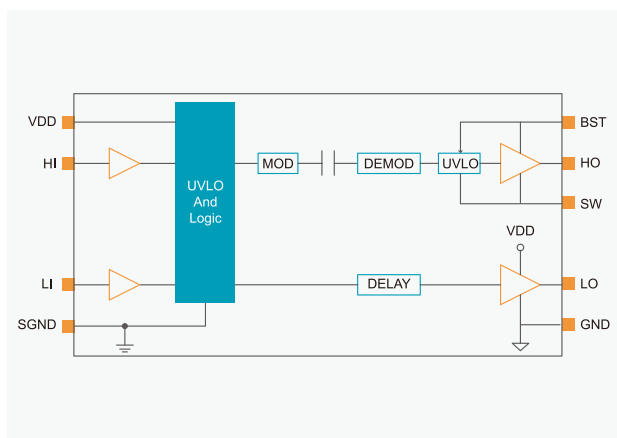
The isolation technology scheme is applied to high-voltage half-bridge driver by NOVOSENSE innovatively, so that the high-voltage output side can withstand up to 1200V DC voltage, while SW can meet the requirements of high dv/dt and can withstand negative spike. It can be applied to high-voltage half-bridges, full-bridges and LLC power supply topologies.

NSD1624x input is compatible with TTL/CMOS. Both the high-voltage side and the low-voltage side are designed with independent power supply undervoltage protections (UVLO), which operate in the voltage range of 10~20V.

### ◆ Product feature

- Voltage range on high voltage side: +/-1200V(SOP14 package); +/-700V(SOP8 & LGA package)
- Less than 35ns propagation delay, less than 7ns delay matching
- 4/-6A drive current capability
- High/low side independent UVLO protection
- Independent Logic Ground Pin (SOP14 package)
- Anti-interference of dV/dt on high voltage side up to 150kV/us
- Operating temperature range: -40°C~125°C
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Application



Half-bridge, full-bridge, and LLC power supply topology



Power supply for industrial, communication and server applications which requires high efficiency and high density



Solar energy, motor drivers and new energy fields

### ◆ Package

- SOP14, SOP8, LGA 4\*4mm



## NSD1224x: 120V Half-bridge Gate Driver

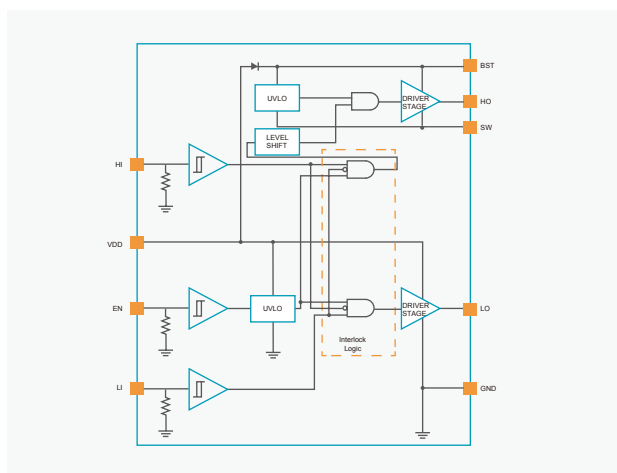
### ◆ Product introduction

NSD1224x is a powerful 120V half-bridge gate driver. With peak source/sink current of 3A/-4A and low  $R_{ds(on)}$  of inside ON/OFF MOSFET, it can drive high-power MOSFETs with very low switching losses. The NSD1224x input pin and SW pin can withstand large negative voltage to improve system reliability. The input interlock function prevents the short-through from high-side and low-side MOSFETs in bridge topologies. The undervoltage locking (UVLO) is available in both the high-side and low-side drivers. The small communication delay and channel to channel delay matching provide more dead time design margin, further improve efficiency. NSD1224x integrates a built-in bootstrap diode, requiring no external separate diode to save layout space and reduce system costs.

### ◆ Product feature

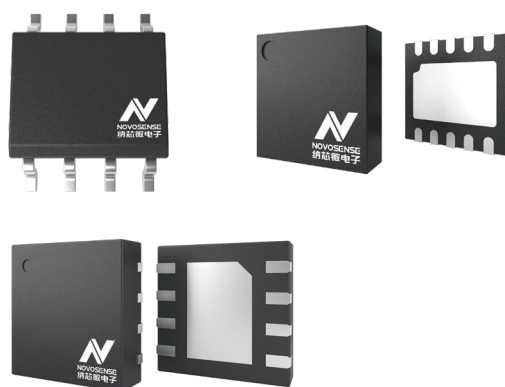
- Withstand voltage of VDD power of 20V
- Withstand voltage at SW bridge arm midpoint of -10V to 115V
- Negative withstand voltage of input pin of -10V
- The HS voltage ramp up rate of 50V/ns
- Peak source/sink current 3A/-4A
- Compatible with CMOS/TTL level input
- Input interlock
- Independent UVLO protection for high-side and low-side output
- Integrated high-voltage bootstrap diode
- Typical input/output delay of 16ns
- Typical transmission delay matching between high and low sides of 1ns
- DFN10 package has enable pin, and the static power consumption is 7μA in standby mode
- Junction temperature range of -40°C to 150°C

### ◆ Functional block diagram



### ◆ Package

- SOP8, HSOP8, DFN10, DFN8



### ◆ Application



Micro inverter and power optimizer



Power module



New energy vehicles



# GaN Integrated Power Stage & Gate Driver



## GaN Integrated Power Stage

| Part Number     | Product type | Bus voltage (V) | Rds(on)(mΩ) | I <sub>ds</sub> (A) | Feature                                                  | Operating temperature (°C) | Qualification | Package |
|-----------------|--------------|-----------------|-------------|---------------------|----------------------------------------------------------|----------------------------|---------------|---------|
| NSG65N15K-DQAFR | Half bridge  | 700             | 150         | 20                  | UVLO, Dead-time programmable, Integrated bootstrap diode | -40~125                    | Industrial    | QFN32   |

## GaN Half-bridge Driver

| Part Number    | Drive Object | Peak Drive Current (A) | Output Channel | Bus Voltage (V) | VCC(Max)(V) | Propagation Delay (Max) ton/off(ns) | Delay matching (ns) | Features                                             | Operating Temperature (°C) | Qualification | Package |
|----------------|--------------|------------------------|----------------|-----------------|-------------|-------------------------------------|---------------------|------------------------------------------------------|----------------------------|---------------|---------|
| NSD2621A-DQAGR | GaN FET      | 2/-4                   | 2              | 700             | 24          | 700                                 | 700                 | UVLO, Programmable dead time, Enable, Integrated LDO | -40~125                    | Industrial    | QFN15   |
| NSD2621C-DQAGR | GaN FET      | 2/-4                   | 2              | 700             | 24          | 700                                 | 700                 | UVLO, Programmable dead time, Enable, Integrated LDO | -40~125                    | Industrial    | QFN15   |



## NSG65N15K: GaN Integrated Power Stage IC

### ◆ Product introduction

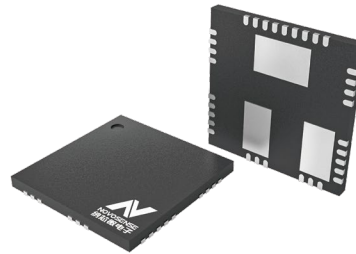
NSG65N15K is the GaN power stage device launched by NOVOSENSE. It is integrated with half-bridge driver NSD2621 and two pcs 650V GaN HEMT with 150mΩ conduction resistance, and the working current can reach 20A. Besides, NSG65N15K is integrated with the bootstrap diode, and built-in adjustable dead time, undervoltage protection, overtemperature protection, which make GaN applications more safe and reliable, and give full play to its advantages of high frequency and high speed.

### ◆ Product feature

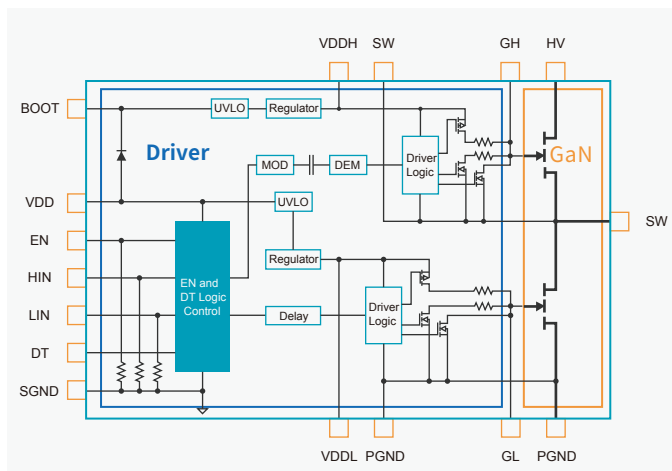
- Integrated 650V GaN HEMT and half-bridge driver
- GaN conduction resistance 150mΩ
- Non-reverse recovery loss
- Built-in LDO makes the driver voltage more stable and reliable
- High/low side independent UVLO protection
- Internal adjustable dead time
- Built-in bootstrap diode
- Operation ambient temperature: -40°C ~125°C

### ◆ Package

- QFN (9\*9mm)



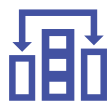
### ◆ Functional block diagram



### ◆ Application



Half-bridge or full-bridge topologies such as totem poles PFC, ACF and LLC



Adapter high density power supply



PV, motor driver and ESS

## NSD2621x: High Voltage Half-bridge GaN Driver IC

### ◆ Product introduction

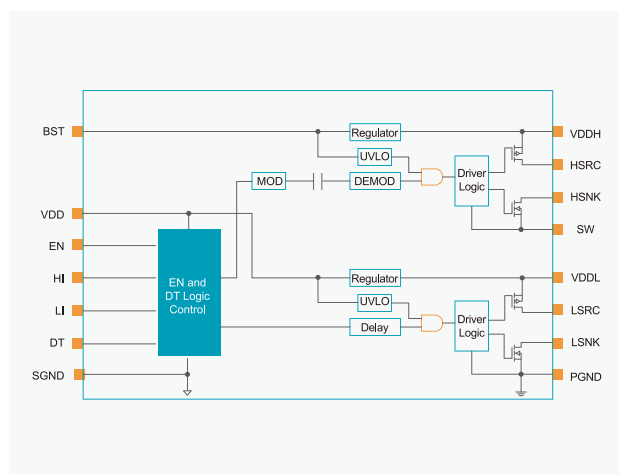
NSD2621 is a high-voltage half-bridge driver IC launched by NOVOSENSE, which is specially designed for GaN. The IC adopts the mature capacitance isolation technology of NOVOSENSE. The high-side driver can support common-mode voltage of -700V to 700V, SW voltage change slope of 150V/ns, and is designed with the Feature of low transmission delay and low delay between channels. Both channels can provide 2A~4A driving capability.

Both high-side drive stage and low-side drive stage are equipped with special voltage regulators to ensure that the driving voltage is in a stable range acceptable to GaN gate, so that GaN can work properly under any conditions. At the same time, it is designed with UVLO protection to protect the operation safety of the power supply system.

### ◆ Product feature

- Voltage range on high voltage side: +/-700V
- Independent UVLO protection for high and low sides
- 2/-4A drive current capability
- Built-in LDO makes the driving voltage more stable and reliable
- Less than 60ns propagation delay, less than 10ns delay matching between high and low side
- +5/-5V logic ground bias;
- Anti-interference of dV/dt on high voltage side: 150V/ns
- Operation ambient temperature: -40 °C ~125 °C
- Package: LGA (4\*4mm)
- Driver voltage NSD2621A: 6V; NSD2621B: 5.5V; NSD2621C: 5V

### ◆ Functional block diagram



### ◆ Package

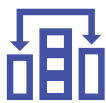
- LGA (4\*4mm)



### ◆ Application



Half-bridge, full-bridge, and LLC power supply topology



Adapter high density power supply



Solar energy, motor drivers and new energy fields

# Brushed DC Motor Integrated Driver



# Brushed DC Motor Integrated Driver

| Part Number          | Load type                            | Rds (on)<br>(HS+LS)<br>mΩ | Peak<br>current (A) | Number of<br>half-bridge<br>channels | VPower<br>(Max)(V) | Integrated<br>current<br>detector | Interface | Load<br>diagnosis | Feature                                                                                               | Operating<br>temperature<br>(°C) | Qualification | Package  |
|----------------------|--------------------------------------|---------------------------|---------------------|--------------------------------------|--------------------|-----------------------------------|-----------|-------------------|-------------------------------------------------------------------------------------------------------|----------------------------------|---------------|----------|
| NSD7310<br>-DHSPR    | Brushed DC<br>motor                  | 520                       | 3.6                 | 2                                    | 5-40               | No                                | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection               | -40~150                          | Industrial    | HSOP8    |
| NSD7310A<br>-DHSPR   | Brushed DC<br>motor                  | 520                       | 3.6                 | 2                                    | 5-40               | Yes                               | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection               | -40~150                          | Industrial    | HSOP8    |
| NSD7312<br>-DHSPR    | Brushed DC<br>motor                  | 520                       | 3.6                 | 2                                    | 5-40               | No                                | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Industrial    | HSOP8    |
| NSD7312A<br>-DHSPR   | Brushed DC<br>motor                  | 520                       | 3.6                 | 2                                    | 5-40               | Yes                               | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Industrial    | HSOP8    |
| NSD7310<br>-Q1DHSPR  | Brushed DC<br>motor                  | 520                       | 3.6                 | 2                                    | 5-40               | No                                | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection               | -40~150                          | Automotive    | HSOP8    |
| NSD7312<br>-Q1HSPR   | Brushed DC<br>motor                  | 520                       | 3.6                 | 2                                    | 5-40               | No                                | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Automotive    | HSOP8    |
| NSD7312A<br>-Q1HSPR  | Brushed DC<br>motor                  | 520                       | 3.6                 | 2                                    | 5-40               | Yes                               | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Automotive    | HSOP8    |
| NSD7314-<br>DHTSPR   | Brushed DC<br>motor                  | 220                       | 6                   | 2                                    | 4.5-40             | Yes                               | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection               | -40~150                          | Industrial    | HSSOP16  |
| NSD7314-<br>Q1HTSPR  | Brushed DC<br>motor                  | 220                       | 6                   | 2                                    | 4.5-40             | Yes                               | Parallel  | No                | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection               | -40~150                          | Automotive    | HSSOP16  |
| NSD8308<br>-Q1HTSXR  | Brushed DC<br>motor/Stepping<br>/LED | 1700                      | 1.3                 | 8                                    | 4.5-40             | -                                 | SPI       | Yes               | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Automotive    | HTSSOP24 |
| NSD8306<br>-Q1HTSXR  | Brushed DC<br>motor/Stepping<br>/LED | 1700                      | 1.3                 | 6                                    | 4.5-40             | -                                 | SPI       | Yes               | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Automotive    | HTSSOP24 |
| NSD8306A<br>-Q1HTSXR | Brushed DC<br>motor/Stepping<br>/LED | 1700                      | 1.3                 | 6                                    | 4.5-40             | -                                 | SPI       | Yes               | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Automotive    | HTSOP24  |
| NSD8310<br>-Q1HTSXR  | Brushed DC<br>motor/Stepping<br>/LED | 1700                      | 1.3                 | 10                                   | 4.5-40             | -                                 | SPI       | Yes               | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Automotive    | HTSSOP24 |
| NSD8312<br>-Q1HTSXR  | Brushed DC<br>motor/Stepping<br>/LED | 1700                      | 1.3                 | 12                                   | 4.5-40             | -                                 | SPI       | Yes               | Over-current protection,<br>over-temperature<br>protection, under-voltage<br>protection, fault report | -40~150                          | Automotive    | HTSSOP24 |

## NSD731x/NSD731x-Q1 40V Peak Current 3.6A Brushed DC Motor Driver IC

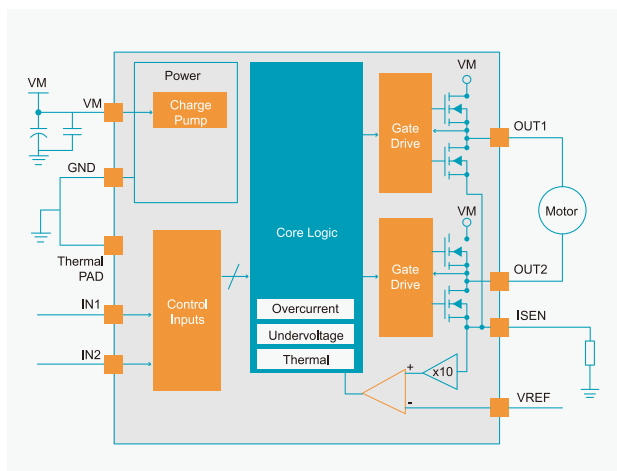
### ◆ Product introduction

NSD7310/NSD7312/NSD7310A/NSD7312A/NSD7312-Q1 is a brushed DC motor driver IC. The IC has built-in N-MOSFET and provides full protection for the power level, including power supply undervoltage protection, overcurrent protection and overtemperature protection. This product can provide 3.6A peak current and supports PWM current regulation. In version A product, the internal power path current mirror function is added, and the external ADC/MCU can directly obtain the current value from the pin of the product, saving power sampling resistor and optimizing the layout. The Automotive version has passed the AEC-Q100 qualification to meet the requirements in terms of quality and reliability of vehicles.

### ◆ Product feature

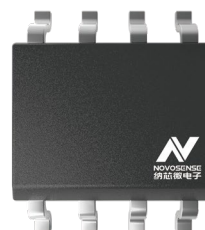
- Wide operating voltage range: 5V-36V (Absolute max rating 40V)
- On-resistance (HS + LS) 520mΩ
- Peak current 3.6A
- AEC-Q100 qualified
- Supporting current modulation
- Undervoltage protection
- Overcurrent protection
- Over-temperature protection
- Operating temperature:  $T_j = -40^{\circ}\text{C} \sim 150^{\circ}\text{C}$

### ◆ Functional block diagram



### ◆ Package

- HSOP8



### ◆ Application



Home appliances



New energy vehicles



Brushed DC motor module



Automotive thermal management system



## NSD7314/NSD7314-Q1: 40V Peak Current 6A Brushed DC Motor Driver IC

### ◆ Product introduction

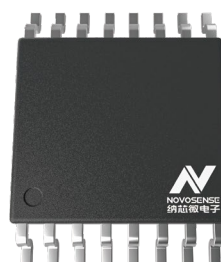
NSD7314/NSD7314-Q1 is a brushed DC motor driver IC. The IC has built-in N-MOSFET and provides full protection for the power level, including power supply undervoltage protection, overcurrent protection and overtemperature protection. This product can provide 6A peak current and supports PWM current regulation. The internal power path current mirror function is added, and the external ADC/MCU can directly obtain the current value from the pin of the product, saving power sampling resistor and optimizing the layout. The Automotive version has passed the AEC-Q100 qualification to meet the requirements in terms of quality and reliability of vehicles.

### ◆ Product feature

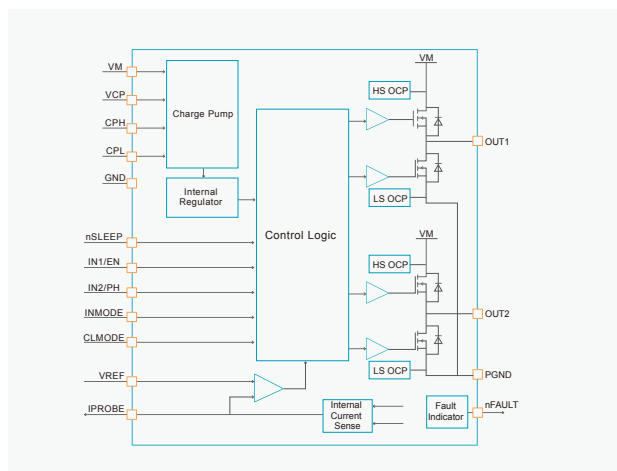
- Wide operating voltage range: 4.5V-36V (Absolute max rating 40V)
- On-resistance (HS + LS) 220mΩ
- Peak current 6A
- AEC-Q100 qualified
- Supporting current modulation
- Undervoltage protection
- Overcurrent protection
- Over-temperature protection
- Operating temperature:  $T_j = -40^{\circ}\text{C} \sim 150^{\circ}\text{C}$

### ◆ Package

- HTSSOP16



### ◆ Functional Block Diagram



### ◆ Application



Home appliances



New energy vehicles



Brushed DC motor module



Automotive thermal management system

## NSD8312/NSD8310/NSD8308/NSD8306/-Q1: 40V 12/10/8/6-channel Half-bridge Driver IC

### ◆ Product introduction

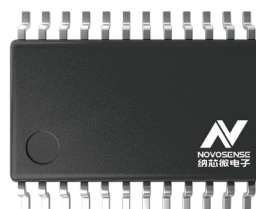
NSD8312/NSD8310/NSD8308/NSD8306 - Q1 is a multi-channel half-bridge driver chip ,which integrates 12/10/8/6 channels of half-bridges. Through flexible configuration, It can support various types of loads, including DC brushed motors, stepper motors, relays, and LEDs, etc... The chip features an internal PWM generator which could control the loads by configuring PWM frequency and duty cycle via SPI, applicable for soft start of DC brushed motors and LED dimming. Additionally, it offers smart diagnostic functions to assist vehicle systems in detecting the load status. In the event of wire breakage or short-circuits, the external MCU could get error information from internal registers for individual channels.

### ◆ Product feature

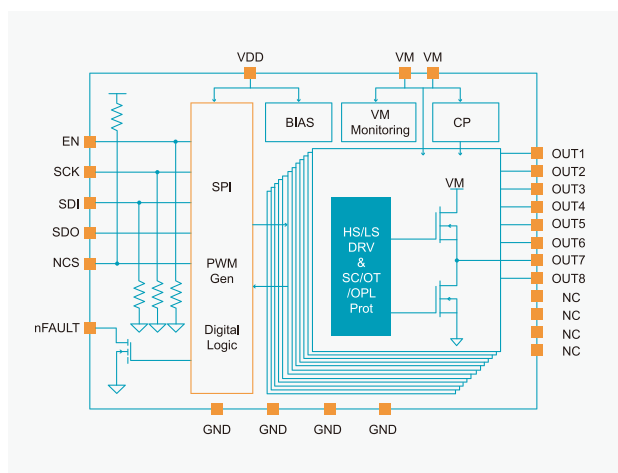
- Wide operating voltage range 4.5V –36V (Absolute max rating 40V)
- On-resistance (HS + LS) 1.7  $\Omega$
- Peak current 1A
- The PWM generator supports configurable frequency and duty cycle
- Open load diagnostics
- Undervoltage protection and overvoltage protection
- Operating temperature:  $T_j = -40^{\circ}\text{C} \sim 150^{\circ}\text{C}$
- AEC-Q100 qualified

### ◆ Package

- HTSSOP24



### ◆ Functional Block Diagram



### ◆ Application



Automotive  
body controller



Automotive  
area controller



Automotive  
HVAC controller



Automotive thermal  
management system

# Brushed DC Motor Pre-Driver

| Part Number     | Load type                 | Number of low-side channels | VPower(Max)(V) | Interface     | Operating temperature (°C) | Qualification | Package |
|-----------------|---------------------------|-----------------------------|----------------|---------------|----------------------------|---------------|---------|
| NSD3604-Q1QAIR  | Brushed DC motor/solenoid | 4                           | 40             | SPI & 4xInput | -40~150                    | Automotive    | VQFN40  |
| NSD3604-Q1QAJR  | Brushed DC motor/solenoid | 4                           | 40             | SPI & 4xInput | -40~150                    | Automotive    | VQFN56  |
| NSD3608-Q1QAJR  | Brushed DC motor/solenoid | 8                           | 40             | SPI & 4xInput | -40~150                    | Automotive    | VQFN56  |
| NSD3602S-Q1QDAR | Brushed DC motor/solenoid | 2                           | 40             | SPI & 2xInput | -40~150                    | Automotive    | VQFN32  |
| NSD3602H-Q1QDAR | Brushed DC motor/solenoid | 2                           | 40             | SPI & 2xInput | -40~150                    | Automotive    | VQFN32  |



# Brushed DC Motor Pre-Driver

## NSD3604/NSD3608-Q1: 40V Multi-channel Half-bridge Pre-driver

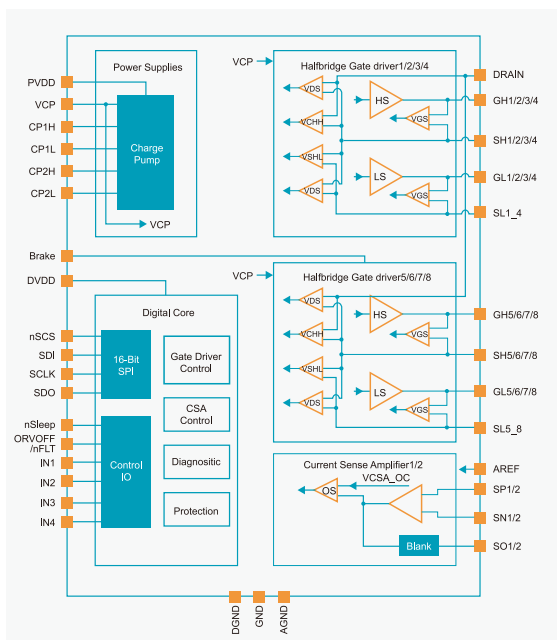
### ◆ Product introduction

NSD3604/8-Q1 is a series of multi-channel half-bridge gate driver IC tailored for 12V automotive battery systems and can withstand a load dump voltage up to 40V. Featuring either 4- or 8-channel half-bridge gate drivers, it empowers independent control up to 16 external MOSFETs, and enables precise charging or discharging current management to achieve the best trade-off between EMI and efficiency for brushed DC motor control. This series can also be used as a multi-channel high-side or low side switch driver, offering flexibility for various applications including door modules, seat controllers, electric tailgates, zonal controllers, and other automotive systems requiring multi-motor or multi-load functionalities.

### ◆ Product feature

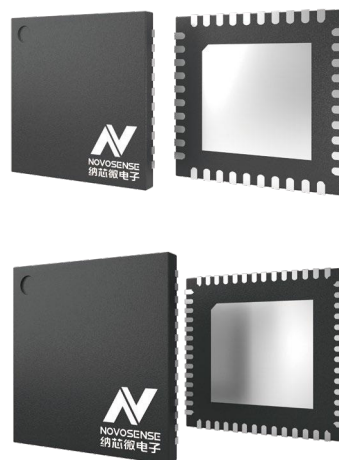
- AEC-Q100 qualified
- Wide operating voltage: 4.9V - 37V (Max. 40V)
- 4/8-channel half-bridge gate driver
- Configurable Charge/Discharge Current Profile Driver (CCPD) for optimized EMC performance
- Integrated 2-stage charge pump for 100% PWM duty cycle
- Integrated 2-channel programmable current sensing amplifier supporting high common mode input voltage
- 16-bit 10MHZ SPI communication
- Load diagnostic and protection functions
- Operating temperature:  $T_j = -40^{\circ}\text{C} - 150^{\circ}\text{C}$

### ◆ Functional block diagram



### ◆ Package

- VQFN40/VQFN56



### ◆ Application



Automotive body domain controller



Automotive zonal controller



Seat controller/tailgate controller/electric pedal



Solenoid valves

## NSD3602-Q1 40V 2 Channel Half-Bridge Pre-driver for BDC Motor

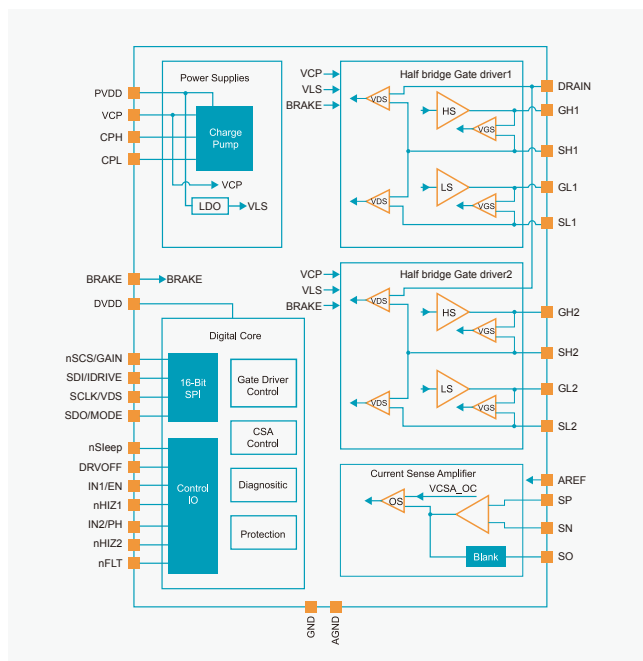
### ◆ Product introduction

NSD3602 -Q1 is 2 channel half-bridge gate driver IC for 12V automotive battery systems and can withstand a load dump voltage up to 40V. Featuring 2 channel half-bridge gate drivers, it empowers independent control up to 4 external MOSFETs, and enables precise charging or discharging current management to achieve the best trade-off between EMI and efficiency for brushed DC motor control. NSD3602- Q1 offers flexibility for various applications including door modules, seat controllers, electric tailgates, zonal controllers, and other automotive systems requiring multi-motor or multi-load functionalities.

### ◆ Product feature

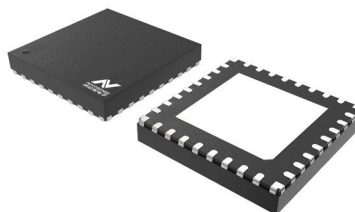
- AEC-Q100 qualified
- Wide operating voltage: 4.9V - 37V (Max. 40V)
- 2 channel half-bridge gate driver
- Configurable Charge/Discharge Current Profile Driver (CCPD) for optimized EMC performance
- Integrated 1-channel programmable current sensing amplifier supporting high common mode input voltage
- 16-bit 10MHZ SPI communication
- Load diagnostic and protection functions
- Operating temperature:  $T_j = -40^{\circ}\text{C} - 150^{\circ}\text{C}$

### ◆ Functional block diagram



### ◆ Package

- VQFN32



### ◆ Application



Automotive body domain controller



Automotive zonal controller



Seat controller/tailgate controller/electric pedal



Solenoid valves



## Micro-stepping Stepper Motor

| Part Number      | Load type     | Rds (on)<br>(LS) mΩ | MAX current (A) | Micro-Stepping | VPower<br>(Max)(V) | Interface | Feature                                                                        | Operating temperature (°C) | Qualification | Package  |
|------------------|---------------|---------------------|-----------------|----------------|--------------------|-----------|--------------------------------------------------------------------------------|----------------------------|---------------|----------|
| NSD8381-Q1QAIR   | stepper motor | 1.4                 | 1.35            | 32             | 4.5-36             | SPI       | Over-current protection, over-temperature protection, under-voltage protection | -40~125                    | Automotive    | VQFN40   |
| NSD8381-Q1QANR   | stepper motor | 1.2                 | 1.35            | 32             | 4.5-36             | SPI       | Over-current protection, over-temperature protection, under-voltage protection | -40~125                    | Automotive    | VQFN32   |
| NSD8389A-Q1QBRR  | stepper motor | 0.9                 | 1.5             | 256            | 4.5-36             | SPI       | Over-current protection, over-temperature protection, under-voltage protection | -40~125                    | Automotive    | QFN24    |
| NSD8389A-Q1HTSXR | stepper motor | 0.9                 | 1.5             | 256            | 4.5-36             | SPI       | Over-current protection, over-temperature protection, under-voltage protection | -40~125                    | Automotive    | HTSSOP24 |
| NSD8389-Q1QBRR   | stepper motor | 0.9                 | 1.5             | 256            | 4.5-36             | SPI       | Over-current protection, over-temperature protection, under-voltage protection | -40~125                    | Automotive    | QFN24    |
| NSD8389-Q1HTSXR  | stepper motor | 0.9                 | 1.5             | 256            | 4.5-36             | SPI       | Over-current protection, over-temperature protection, under-voltage protection | -40~125                    | Automotive    | HTSSOP24 |

## Micro-stepping Stepper Motor



## NSD8381-Q1: 40V 32 Micro-step Stepper Motor Driver

### ◆ Product introduction

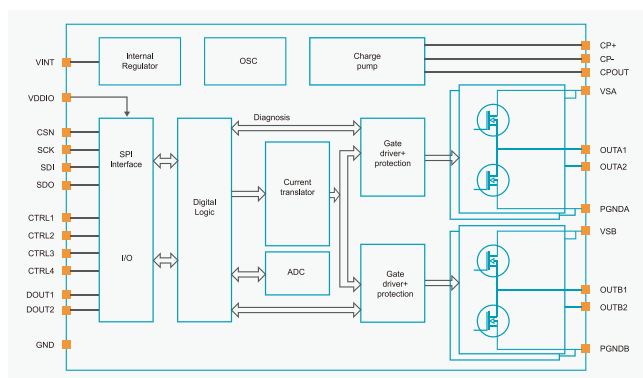
NSD8381-Q1 is an automotive grade integrated driver for stepper motors capable of current controlled micro-stepping with programmable amplitude. It features SPI ,PWM frequency spread spectrum, sensorless stall detection ,and temperature alarm and shutdown to support for flexible and reliable stepper motor control.

NSD8381 is specially designed for stepper motor drivers of headlight step control, HUD position adjustment motors, HVAC EXV(Electronic Expansion Valve) and flap motors , with excellent performance and stability.

### ◆ Product feature

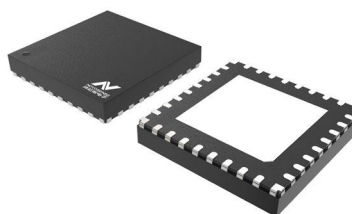
- Wide operating voltage: 4.5V-36V (Absolute max rating 40V)
- Current up to 1.35A,  $R_{DS(on)}$  (HS+LS): 1.2 $\Omega$
- Programmable micro-stepping, up to 1/32 micro-stepping mode.
- Four programmable decay modes: Slow Decay, Mixed Decay, Auto Decay 1, Auto Decay 2;
- IO direct control of clock/direction/hold, or direct half-bridge control;
- Integrated current sensor and controller. Support 16-level (4-bit) current configuration for motor running and holding;
- Support PWM frequency spread spectrum for EMC performance optimization
- Support slew rate and dead time configuration
- 24-bit, 4Mhz SPI communication
- Ultra-low power sleep mode
- Integrated BEMF detection for sensorless stall detection
- Support VBat undervoltage lockout (VSUV), overcurrent protection (OCP), temperature warn(OTW/UTW) and overtemperature protection (OTSD)
- Support open-circuit diagnosis and protection of load
- Operating temperature:  $T_J = -40^{\circ}\text{C} \sim 150^{\circ}\text{C}$
- AEC-Q100 qualified

### ◆ Functional block diagram



### ◆ Package

- VQFN40, VQFN32



### ◆ Application



Headlight step control  
(ADB/AFS)



HUD position  
adjustment motor



HVAC Climate  
Flap motor



Electronic expansion  
valves and multi-port valves

## NSD8389-Q1: 40V 256 Micro-step Stepper Motor Driver

### ◆ Product introduction

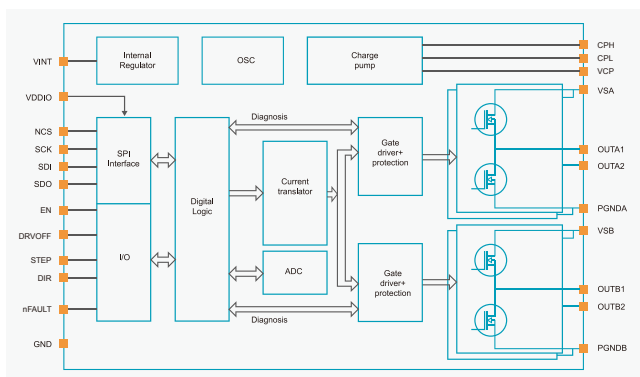
NSD8389-Q1 is an automotive-grade high-integration bipolar stepper motor driver. It features 1/256 programmable microstepping mode, 8 programmable decay mode, integrated PWM frequency spread spectrum, slew rate, dead time, sensorless stall detection, SPI, temperature alarm and shutdown to support for flexible and reliable stepper motor control.

NSD8389 is specially designed for stepper motor drivers of headlight step control, HUD position adjustment motors, HVAC EXV (Electronic Expansion Valve) and flap motors, with excellent performance and stability.

### ◆ Product feature

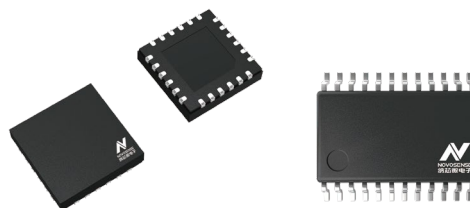
- Supply: 4.5V ~ 36V; AMR 40V
- $R_{ds(on)}$  & Current: 900mΩ; 1.5-A full-scale;
- Programmable micro-stepping up to 1/256 usteps
- 8 Decay Modes: smart tune, slow, and mixed decay options
- STEP/DIR input & SPI controllable Hold Mode
- Phase Counter for high precision position control
- Configurable OPL\_FILT&TBLANK, default DRV\_DIS for A version
- Sensorless Stall detection (bemf, zero crossing)
- Slew rate & dead time & spread spectrum configurable
- 16-bit SPI Interface with daisy chain mode
- Sleep mode with ultra low consumption
- Operating temperature:  $T_j = -40^{\circ}\text{C} - 150^{\circ}\text{C}$
- AEC-Q100 Grade1

### ◆ Functional block diagram



### ◆ Package

- VQFN24, HTSSOP24



### ◆ Application



Headlight step control  
(ADB/AFS)



HUD position  
adjustment motor



HVAC Climate  
Flap motor



Electronic expansion  
valves and multi-port valves



# Low-side Driver/Switch



## Low-side Driver/Switch

| Part Number      | Load type      | Rds (on)<br>(LS) mΩ | Peak<br>current (A) | Number of<br>low side<br>channels | VPower<br>(Max)(V) | Interface        | LDO | Feature                                                                                                                                   | Operating<br>temperature<br>(°C) | Qualification | Package  |
|------------------|----------------|---------------------|---------------------|-----------------------------------|--------------------|------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------|----------|
| NSD5604E-DHTSTR  | Relay/solenoid | 260                 | 3                   | 4                                 | 8-55               | Parallel         | Yes | Over-current protection,<br>over-temperature protection,<br>under-voltage protection,<br>clamp and configurable<br>current limiting point | -40~150                          | Industrial    | HTSSOP20 |
| NSD5604-DHTSPR   | Relay/solenoid | 260                 | 3                   | 4                                 | 8-55               | Parallel         | Yes | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Industrial    | HTSSOP16 |
| NSD5604NE-DHTSTR | Relay/solenoid | 260                 | 3                   | 4                                 | 8-55               | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection,<br>clamp and configurable<br>current limiting point | -40~150                          | Industrial    | HTSSOP20 |
| NSD5604N-DHTSPR  | Relay/solenoid | 260                 | 3                   | 4                                 | 8-55               | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Industrial    | HTSSOP16 |
| NSD5604N-Q1HTSPR | Relay/solenoid | 260                 | 3                   | 4                                 | 8-55               | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | HTSSOP16 |
| NSD12416-Q1SPR   | Relay/solenoid | 160                 | 2.5                 | 2                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOP8     |
| NSD12416A-Q1SPR  | Relay/solenoid | 160                 | 2.5                 | 2                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOP8     |
| NSE11409-QSPR    | Relay/solenoid | 90                  | 8.5                 | 1                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~125                          | Automotive    | SOP8     |
| NSE11409-QSTBR   | Relay/solenoid | 90                  | 8.5                 | 1                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~125                          | Automotive    | SOT223   |
| NSD12409-Q1SPR   | Relay/solenoid | 90                  | 8                   | 2                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOP8     |
| NSD11416-Q1STBR  | Relay/solenoid | 160                 | 2.5                 | 1                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOT223   |
| NSD11416-Q1SPR   | Relay/solenoid | 160                 | 2.5                 | 1                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp, open load diagnosis                    | -40~150                          | Automotive    | SOP8     |
| NSD56008-Q1HTSPR | Relay/solenoid | 1000                | 1                   | 8                                 | 40                 | SPI &<br>2xInput | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp, open load diagnosis                    | -40~150                          | Automotive    | HTSOP24  |
| NSD12430-Q1SPR   | Relay/solenoid | 300                 | 4.2                 | 2                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOP8     |
| NSD12430A-Q1SPR  | Relay/solenoid | 300                 | 4.2                 | 2                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOP8     |
| NSD11430-Q1STBR  | Relay/solenoid | 300                 | 4.2                 | 1                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOT223   |
| NSD11430-Q1SPR   | Relay/solenoid | 300                 | 4.2                 | 1                                 | 40                 | Parallel         | No  | Over-current protection,<br>over-temperature protection,<br>under-voltage protection and<br>clamp                                         | -40~150                          | Automotive    | SOP8     |



## NSD5604E/NSD5604/NSD5604NE/NSD5604N 55V Four-channel Low-side Relay and Solenoid Driver IC

### ◆ Product introduction

NSD5604E/NSD5604 is a 4-channel low-side driver IC. The product integrates 4-channel low-side NMOSFET to drive resistive, capacitive or inductive loads. The 4 channels can be turned on at the same time and each channel can support a load current of greater than 500mA. Each channel of the product supports independent overcurrent protection and the overcurrent points can be configured through external resistors. The IC also integrates active clamp and freewheeling diodes, by working with external TVS, different current attenuation modes including slow attenuation and fast shutdown can be realized for inductive load.

### ◆ Product feature

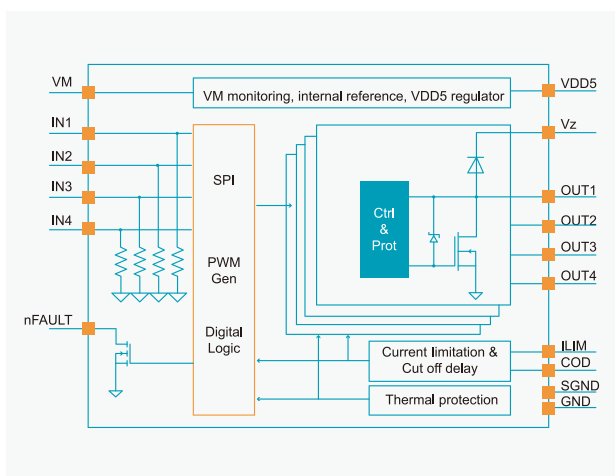
- Wide operating voltage range: 8V – 50V (Absolute max rating 55V)
- On-resistance of 260mΩ
- Peak current 3.0A
- LDO supports transmission voltage of 5V-20mA
- Integrated active clamp and freewheeling diode
- Configurable current limit point and overcurrent protection
- Undervoltage protection
- Operating temperature: Tj=-40°C~150°C

### ◆ Package:

- HTSSOP16
- HTSSOP20



### ◆ Functional Block Diagram



### ◆ Application



Industrial automation



Industrial machinery



Digital machine tools



General resistive /capacitive/inductive loads

## NSD56008-Q1: 8-channel Low-side Relay and Solenoid Driver

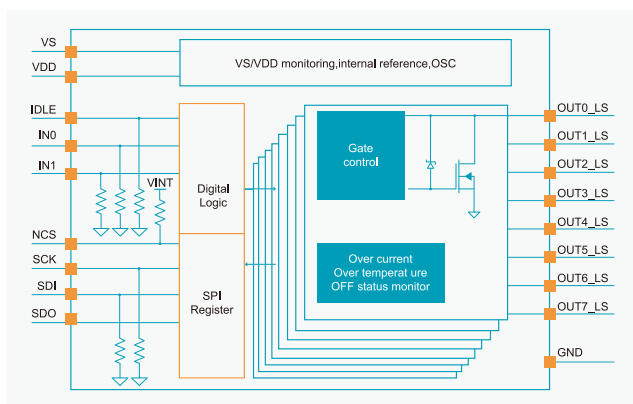
### ◆ Product introduction

NSD56008-Q1 is an automotive 8-channel low-side driver IC integrated with 8-channel 1Ω NMOSFET. It supports 2-channel IO control inputs, allowing flexible mapping to any output pin. NSD56008-Q1 also supports parallel mode, limp-home mode, and provides full load protection including output status monitor, overload & overtemperature protection.

### ◆ Product feature

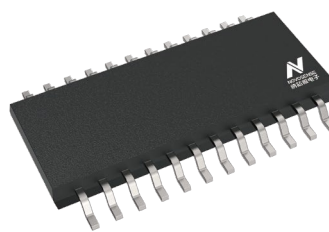
- AEC-Q100 qualified
- Operating voltage: 4.5V - 28V
- 8-channel 1Ω low-side drivers/typical load current of 330mA per channel
- 16-bit SPI communication, supporting parallel and daisy chain modes and compatible with 8-bit SPI communication
- 2 CMOS-compatible input pins IN0 and IN1 that can be mapped to output pins
- Supporting limp-home mode
- Supporting output parallel mode
- Supporting load diagnostics and protection: Overload/overtemperature protection/under-voltage protection/open-circuit diagnostics
- Operating temperature: Tj=-40°C - 150°C

### ◆ Functional Block Diagram



### ◆ Package:

- HTSOP24



### ◆ Application



Automotive Body Domain Controller



Automotive Zonal controller



Automotive Control Unit



General resistive/capacitive/inductive loads

## Automotive 40V Single Channel 90mΩ Intelligent Low Side Switch NSE11409 series

### ◆ Product introduction

NSE11409 is a single-channel smart low-side switch developed for automotive and industrial applications, featuring a withstand voltage of > 40V, and an internal resistance of about 90mΩ, it allows various diagnostic functions and different protections, and has passed AEC Q100 certification.

The IC is designed with a built-in VDD clamp of > 45V, which is especially suitable for driving inductive loads such as relays and valves to help them realize rapid demagnetization/deenergization.

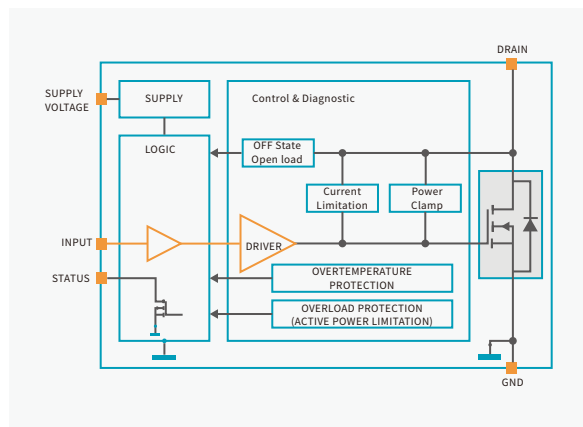
The IC is designed with an internal output current limiting function for overload protection and short circuit protection. Built-in absolute over-temperature protection and relative over-temperature protection to prevent the IC from overheating in multiple ways, slow down power accumulation, and improve IC reliability. At the same time, the IC supports open circuit detection, over-temperature detection and other diagnostic outputs.

The IC can operate at ambient temperatures from -40°C to 125°C. SOT223 and SOP8 packages are made available to meet different design requirements.

### ◆ Product feature

- AEC-Q100 automotive qualified
- Operation ambient temperature: -40°C to 125°C
- The operating voltage is up to 40V,
- VDD clamp to support the connection to inductive load
- Overcurrent protection: current limit value > 8A
- Over-temperature protection: absolute over-temperature protection, relative over-temperature protection
- Error status diagnostic output (SOP8 Package): open circuit detection, over temperature detection
- Ultra-low static power consumption  $I_q < 5\mu A$

### ◆ Functional Block Diagram



### ◆ Package:

- SOT223, SOP8



### ◆ Application



BMS



Body electronic controller



Vehicle controller



Air conditioning panel controller

## NSD12409 – Q1 Automotive 40V Dual-channel 90mΩ Intelligent Low-Side Switch

### ◆ Product introduction

NSD12409 is a dual-channel intelligent low-side switch developed for automotive and industrial applications, featuring a withstand voltage of > 40V, and an internal resistance of about 90mΩ, it allows various diagnostic functions and different protections, and has passed AEC Q100 qualification. The IC is designed with an integrated overvoltage clamp of > 45V, which is especially suitable for driving inductive loads such as relays and valves to help them realize rapid demagnetization. The chip has internal output current limiting function to realize overload and short circuit protection. Built-in absolute overtemperature protection and relative overtemperature protection prevent chip overheating in multiple ways, so that to improve chip reliability. In addition, the chip supports open circuit detection, overtemperature detection and other diagnostic output. The chip can be operated at ambient temperature from -40°C to 125°C, with SOP8 package to meet different design requirements.

### ◆ Product feature

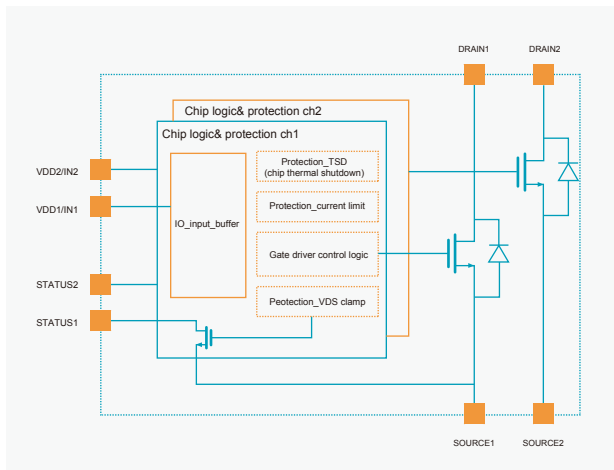
- Operating voltage range of up to 40V
- On-resistance: 90mΩ
- Overvoltage clamp to support inductive load
- Overcurrent protection: Current limit >8A
- Overcurrent protection; Absolute overtemperature protection, relative overtemperature protection
- Operating temperature: Tj=-40°C~150°C
- AEC-Q100 qualified

### ◆ Package:

- SOP8



### ◆ Functional Block Diagram



### ◆ Application



Automotive  
BMS system



Automotive  
body controller



Automotive  
controller



HVAC control panel



PLC

# NSD11416/12416/12416A – Q1 Automotive 40V Single/ Dual-channel 160mΩ Intelligent Low-side Switch

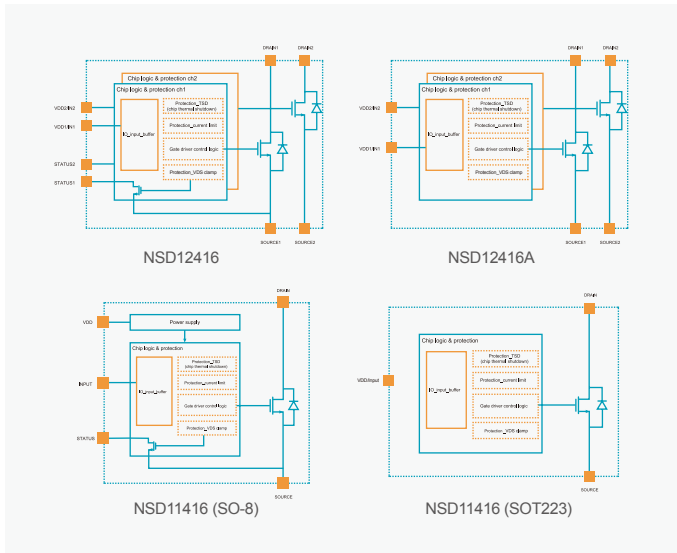
## ◆ Product introduction

NSD11416/12416/12416A-Q1 is a single-channel intelligent low-side switch developed for automotive and industrial applications, featuring a withstand voltage of > 40V, and an internal resistance of about 160mΩ, it allows various diagnostic functions and different protections, and has passed AEC Q100 qualification. The IC is designed with an integrated overvoltage clamp of > 45V, which is especially suitable for driving inductive loads such as relays and valves to help them realize rapid demagnetization. The chip has internal output current limiting function to realize overload and short circuit protection. Built-in absolute overtemperature protection and relative overtemperature protection prevent chip overheating in multiple ways, so that to improve chip reliability. In addition, the chip supports open circuit detection, overtemperature detection and other diagnostic output. The chip can be operated at ambient temperature from -40°C to 125°C, and support SOT223, with SOP8 package to meet different design requirements.

## ◆ Product feature

- Operating voltage range of up to 40V
- On-resistance: 160mΩ
- Overvoltage clamp to support inductive load
- Overcurrent protection: Current limit >2.5A
- Overcurrent protection; Absolute overtemperature protection, relative overtemperature protection
- Operating temperature: Tj=-40°C~150°C
- AEC-Q100 qualified

## ◆ Functional Block Diagram



## ◆ Package:

- SOP8
- SOT223



## ◆ Application



Automotive  
BMS system



Automotive body  
controller



Automotive  
controller



HVAC control panel



PLC



# NSD11430/12430/12430A-Q1: Automotive 40V Single/ Dual-channel 300mΩ Intelligent Low-side Switch

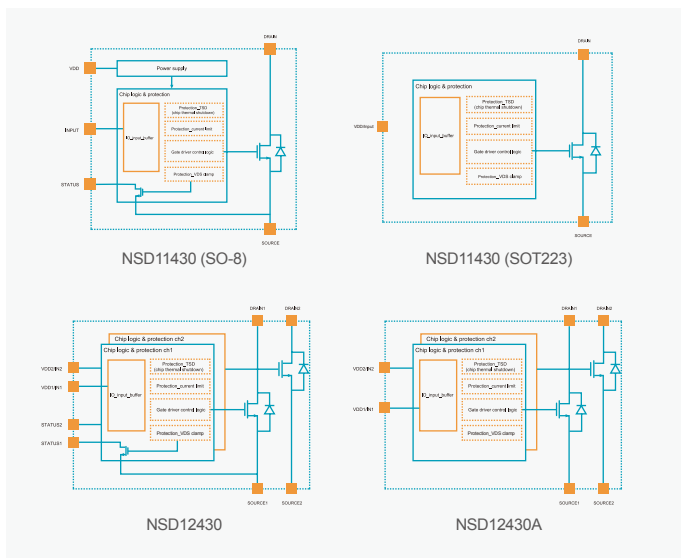
## ◆ Product introduction

NSD11430/12430/12430A is a single-channel intelligent low-side switch developed for automotive and industrial applications, featuring a withstand voltage of > 40V, and an internal resistance of about 300mΩ, it allows various diagnostic functions and different protections, and has passed AEC Q100 qualification. The IC is designed with an integrated overvoltage clamp of > 45V, which is especially suitable for driving inductive loads such as relays and valves to help them realize rapid demagnetization. The chip has internal output current limiting function to realize overload and short circuit protection. Built-in absolute overtemperature protection and relative overtemperature protection prevent chip overheating in multiple ways, so that improves chip reliability. The chip can be operated at ambient temperature from -40°C to 125°C, and support SOT223, with SOP8 package to meet different design requirements.

## ◆ Product feature

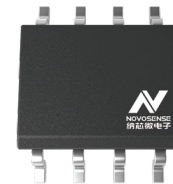
- Operating voltage range of up to 40V
- On-resistance: 300mΩ
- Overvoltage clamp to support inductive load
- Overcurrent protection: Current limit >2.5A
- Overcurrent protection; Absolute overtemperature protection, relative overtemperature protection
- Operating temperature: Tj=-40°C~150°C
- AEC-Q100 qualified

## ◆ Functional Block Diagram



## ◆ Package:

- SOP8
- SOT223



## ◆ Application



Vehicle body controller



Vehicle controller



HVAC control panel

# SiC Diode



## SiC Diode

| Part Number       | Power Supply VRRM | Current IF(TC=150°C) | Operating temperature (°C) | Qualification | Package |
|-------------------|-------------------|----------------------|----------------------------|---------------|---------|
| NPD010N120A-DTOGT | 1200V             | 10A                  | -55~175                    | Industrial    | TO247-2 |
| NPD020N120A-DTOGT | 1200V             | 20A                  | -55~175                    | Industrial    | TO247-2 |
| NPD030N120A-DTOGT | 1200V             | 30A                  | -55~175                    | Industrial    | TO247-2 |
| NPD040N120A-DTOGT | 1200V             | 40A                  | -55~175                    | Industrial    | TO247-2 |

## NPD0x0N120A: 1200V SiC Diode Series

### ◆ Product introduction

NPD0x0N120A is a 1200V series SiC Schottky diode product, with four current specifications, namely, 10A, 20A, 30A and 40A, which is designed for PV, energy storage, charging and other industrial applications. It offers excellent efficiency characteristics in single- or three-phase PFC, and isolation or non-isolation DC-DC circuits to meet the needs of medium- and high-voltage systems.

Compared with conventional silicon-based diodes, SiC diodes deliver significant benefits:

- The reverse recovery current of SiC diodes is almost zero, and the size of reverse recovery current is not affected by the forward on-state current, turn-off speed ( $di/dt$ ), and junction temperature;
- Excellent reverse recovery characteristics can be used with high-frequency switching devices to increase the switching frequency, and reduce the overall footprint and cost of the system;
- Compared with 1200V silicon-based diodes, SiC diodes have a Schottky structure with a lower forward on-state voltage;
- Smaller reverse recovery current leads to a better EMI result;
- SiC material has a better thermal conductivity, helping reduce the junction temperature.

### ◆ Product feature

- Ultra low reverse leakage current,  $\sim 5\mu A @ 175^\circ C$  (typ.)
- Lower losses with Low  $V_F$
- Great surge capability ( $>10$  times)
- Outstanding figure of merit  $Q_c \times V_F$
- No reverse recovery charge
- Up to 50A rated diode

### ◆ Functional Block Diagram



### ◆ Application



xEV battery charging infrastructure



Photovoltaic and energy storage converters

### ◆ Package

- TO247-2





# SiC MOSFET

| Part Number       | Power Supply VRRM | Current IF(TC=25°C) | Operating temperature (°C) | Qualification | Package |
|-------------------|-------------------|---------------------|----------------------------|---------------|---------|
| NPC060N120A-DTOIT | 1200V             | 49A                 | -55~175                    | Industrial    | TO247-4 |
| NPC060N120A-QTOIT | 1200V             | 49A                 | -55~175                    | Automotive    | TO247-4 |
| NPC060N120A-QTOOT | 1200V             | 49A                 | -55~175                    | Automotive    | TO263-7 |
| NPC040N120A-DTOIT | 1200V             | 86A                 | -55~175                    | Industrial    | TO247-4 |

# SiC MOSFET





## NPC0x0N120A: 1200V SiC MOSFET Series

### ◆ Product introduction

Silicon Carbide MOSFETs from NOVOSENSE provide excellent  $R_{DS(on)}$  temperature stability, high efficiency and optimal reliability. Our products cover 650 V, 1200 V and 1700 V voltage classes. And also provide devices with a variety of  $R_{DS(on)}$  values, from below 4mΩ to above 1Ω. Our products include TO247-4L, TO263-7L, and other packages, commonly used in industrial and automotive applications. It's noted that the NOVOSENSE SiC MOSFETs in through-hole package and surface mount package are designed with Kelvin source pins for optimized switching performance.

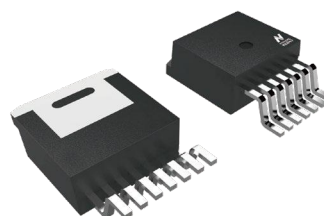
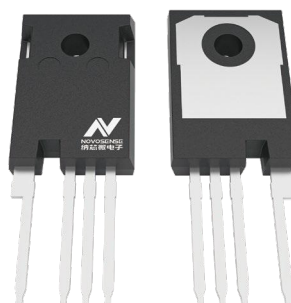
NPC0x0N120A is a 1200V SiC MOSFET product series, covering specifications such as 80mΩ, 60mΩ, 40mΩ, 22mΩ, etc. This series of products address the requirement of high-voltage, high-performance, and high-reliability SiC MOSFET in automotive and industrial applications, such as OBC/DC-DC, EV chargers, and photovoltaic and energy storage inverters.

### ◆ Product feature

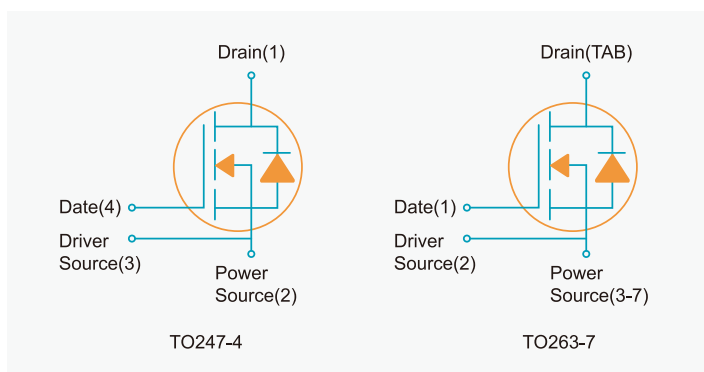
- Excellent  $R_{DS(on)}$  temperature stability
- Wider gate drive voltage range (-8 - 22V)  
Supporting +15V/+18V mode (compatible with IGBT +15 V)  
20% lower  $R_{DS(on)}$  under +18V mode
- Outstanding threshold voltage consistency
- Very low forward voltage drop of the body diode and high robustness

### ◆ Package:

- TO247-4
- TO263-7



### ◆ Functional Block Diagram



### ◆ Application



Photovoltaic and energy storage converters



xEV battery charging infrastructure



OBC/DCDC converter for xEVs

# LDO Linear Regulator



# LDO Linear Regulator

| Part Number | Ambient temperature | Number of Channels | Minimum input voltage | Maximum input voltage | Output Current | Output voltage                                                  | Static Power Consumption | Feature                                                                                                                                                                                                                                    | Application                                                                                                               | Package                                |
|-------------|---------------------|--------------------|-----------------------|-----------------------|----------------|-----------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| NSR31xxx    | -40°C~125°C         | 1CH                | 3V                    | 40V                   | 150mA          | Fixed output: 2.5V, 3.3V and 5V                                 | 5μA                      | Current limiting protection<br>Over-temperature protection                                                                                                                                                                                 | In-vehicle entertainment and autopilot, Body electronics and lighting, Inverter and motor control, OBC/DCDC and BMS       | SOT-223<br>SOT-23-5L<br>DFN-8          |
| NSR33xxx    | -40°C~125°C         | 1CH                | 3V                    | 40V                   | 300mA          | Fixed output: 2.5V, 3.3V and 5V<br>Adjustable output: 0.65V~18V | 5μA                      | Enable<br>Power normal state indication PG<br>Current limiting protection<br>Over-temperature protection                                                                                                                                   | In-vehicle entertainment and autopilot, Body electronics and lighting, Inverter and motor control, OBC/DCDC and BMS       | HMSOP8<br>HSOP8                        |
| NSR35xxx    | -40°C~125°C         | 1CH                | 3V                    | 40V                   | 500mA          | Fixed output: 2.5V, 3.3V and 5V<br>Adjustable output: 0.65V~18V | 5μA                      | Enable<br>Current limiting protection<br>Over-temperature protection                                                                                                                                                                       | In-vehicle entertainment and autopilot<br>Body electronics and lighting<br>Inverter and motor control<br>OBC/DCDC and BMS | TO252-4<br>TO263-5<br>TO252-2<br>HSOP8 |
| NSE5701     | -40°C~125°C         | 1CH                | 4.5V                  | 28V                   | 300mA/CH       | Adjustable output 1.5V~20V                                      | 1.6mA                    | High Accuracy<br>Current-Sense<br>Adjustable Current-Limit With External Resistor<br>Reverse Current protection<br>Reverse polarity protection<br>Output Inductive Load Clamp<br>Short to Battery<br>Protection operation: Latch mode      | In-vehicle entertainment and autopilot, Antenna, GPS load supply, ADAS camera load supply                                 | HTSSOP-16                              |
| NSE5701R    | -40°C~125°C         | 1CH                | 4.5V                  | 28V                   | 300mA/CH       | Adjustable output 1.5V~20V                                      | 1.6mA                    | High Accuracy<br>Current-Sense<br>Adjustable Current-Limit With External Resistor<br>Reverse Current protection<br>Reverse polarity protection<br>Output Inductive Load Clamp<br>Short to Battery<br>Protection operation: Auto-Retry mode | In-vehicle entertainment and autopilot, Antenna, GPS load supply, ADAS camera load supply                                 | HTSSOP-16                              |
| NSE5702     | -40°C~125°C         | 2CH                | 4.5V                  | 28V                   | 300mA/CH       | Adjustable output 1.5V~20V                                      | 2.3mA                    | High Accuracy<br>Current-Sense<br>Adjustable Current-Limit With External Resistor<br>Reverse Current protection<br>Reverse polarity protection<br>Output Inductive Load Clamp<br>Short to Battery<br>Protection operation: Auto-Retry mode | In-vehicle entertainment and autopilot, Antenna, GPS load supply, ADAS camera load supply                                 | HTSSOP-16                              |
| NSE5702R    | -40°C~125°C         | 2CH                | 4.5V                  | 28V                   | 300mA/CH       | Adjustable output 1.5V~20V                                      | 2.3mA                    | High Accuracy<br>Current-Sense<br>Adjustable Current-Limit With External Resistor<br>Reverse Current protection<br>Reverse polarity protection<br>Output Inductive Load Clamp<br>Short to Battery<br>Protection operation: Auto-Retry mode | In-vehicle entertainment and autopilot, Antenna, GPS load supply, ADAS camera load supply                                 | HTSSOP-16                              |
| NSE4250     | -40°C~125°C         | 1CH                | 4V                    | 40V                   | 50mA           | Adjustable output 2V~36V                                        | 100μA                    | High precision voltage following (+/-10mV)<br>Short circuit protection<br>Reverse battery polarity protection<br>Reverse current protection<br>Overheat protection                                                                         | Various automotive ECUs: Power supply and load protection for off-board sensors                                           | NSOT23-5<br>SOT23-5                    |

| Part Number | Ambient temperature | Number of Channels | Minimum input voltage | Maximum input voltage | Output Current | Output voltage           | Static Power Consumption | Feature                                                                                                                                                           | Application                                                                                                                               | Package            |
|-------------|---------------------|--------------------|-----------------------|-----------------------|----------------|--------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| NSE4251     | -40°C~125°C         | 1CH                | 4V                    | 40V                   | 400mA          | Adjustable output 2V~36V | 330μA                    | High precision voltage following(+/-10mV)<br>Short circuit protection<br>Reverse battery polarity protection<br>Reverse current protection<br>Overheat protection | Various automotive ECUs: Power supply and load protection for off-board sensors                                                           | TO252-4<br>TO263-5 |
| NSE4253     | -40°C~125°C         | 1CH                | 4V                    | 40V                   | 300mA          | Adjustable output 2V~36V | 330μA                    | High precision voltage following(+/-10mV)<br>Short circuit protection<br>Reverse battery polarity protection<br>Reverse current protection<br>Overheat protection | Various automotive ECUs: Power supply and load protection for off-board sensors                                                           | SOP-8<br>HSOP-8    |
| NSE4254     | -40°C~125°C         | 1CH                | 4V                    | 40V                   | 100mA          | Adjustable output 2V~36V | 116μA                    | High precision voltage following(+/-10mV)<br>Short circuit protection<br>Reverse battery polarity protection<br>Reverse current protection<br>Overheat protection | Various automotive ECUs: Power supply and load protection for off-board sensors                                                           | SOP-8<br>HSOP-8    |
| NSR30001    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 1A             | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>Soft start                                                                           | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-8              |
| NSR30101    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 1A             | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>With PG<br>Soft start                                                                | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-6              |
| NSR30102    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 0.5A           | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>With PG<br>Soft start                                                                | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-6              |
| NSR30201    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 1A             | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>With PG<br>Soft start                                                                | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-6              |
| NSR30202    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 0.5A           | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>With PG<br>Soft start                                                                | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-6              |
| NSR30301    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 1A             | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>With PG<br>Soft start                                                                | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-8              |
| NSR30302    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 0.5A           | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>With PG<br>Soft start                                                                | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-8              |
| NSR30401    | -40°C~125°C         | 1CH                | 2.5V                  | 5.5V                  | 1A             | Adjustable output        | 110μA                    | Short circuit protection<br>Overheat protection<br>Current Limit Foldback<br>With PG<br>Soft start                                                                | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-8              |

| Part Number | Ambient temperature | Number of Channels | Minimum input voltage | Maximum input voltage | Output Current | Output voltage     | Static Power Consumption | Feature                                                                                                                         | Application                                                                                                                               | Package  |
|-------------|---------------------|--------------------|-----------------------|-----------------------|----------------|--------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------|
| NSR30501    | -40 °C ~125 °C      | 1CH                | 2.5V                  | 5.5V                  | 1A             | Adjustable output  | 110μA                    | Short circuit protection<br>Overheat protection<br>Noise Reduction<br>Current Limit Foldback                                    | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-8    |
| NSR30601    | -40 °C ~125 °C      | 1CH                | 2.5V                  | 5.5V                  | 1A             | Adjustable output  | 110μA                    | Short circuit protection<br>Overheat protection<br>Noise Reduction<br>Current Limit Foldback                                    | Advanced Driving Assistance System<br>Automotive Infotainment<br>Telematics control units<br>High-Speed I/F<br>Automotive Cluster Display | DFN-8    |
| NSR37033    | -40 °C ~125 °C      | 1CH                | 4V                    | 40V                   | 300mA          | Fixed output: 3.3V | 19μA                     | Enable<br>Power normal state indication PG<br>Current limiting protection<br>Over-temperature protection<br>Integrated watchdog | Automotive MCU Power Supply<br>Body Control Modules (BCM)<br>Electronic Gear Shifter<br>Transmission Control Unit (TCU)                   | HTSSOP16 |
| NSR37050    | -40 °C ~125 °C      | 1CH                | 4V                    | 40V                   | 300mA          | Fixed output: 5V   | 19μA                     | Enable<br>Power normal state indication PG<br>Current limiting protection<br>Over-temperature protection<br>Integrated watchdog | Automotive MCU Power Supply<br>Body Control Modules (BCM)<br>Electronic Gear Shifter<br>Transmission Control Unit (TCU)                   | HTSSOP16 |
| NSR37133    | -40 °C ~125 °C      | 1CH                | 4V                    | 40V                   | 500mA          | Fixed output: 3.3V | 19μA                     | Enable<br>Power normal state indication PG<br>Current limiting protection<br>Over-temperature protection<br>Integrated watchdog | Automotive MCU Power Supply<br>Body Control Modules (BCM)<br>Electronic Gear Shifter<br>Transmission Control Unit (TCU)                   | HTSSOP28 |
| NSR37150    | -40 °C ~125 °C      | 1CH                | 4V                    | 40V                   | 500mA          | Fixed output: 5V   | 19μA                     | Enable<br>Power normal state indication PG<br>Current limiting protection<br>Over-temperature protection<br>Integrated watchdog | Automotive MCU Power Supply<br>Body Control Modules (BCM)<br>Electronic Gear Shifter<br>Transmission Control Unit (TCU)                   | HTSSOP28 |



## Automotive 40V 150/300/500mA LDO NSR31/33/35 Series with Ultra Low Quiescent Current

### ◆ Product introduction

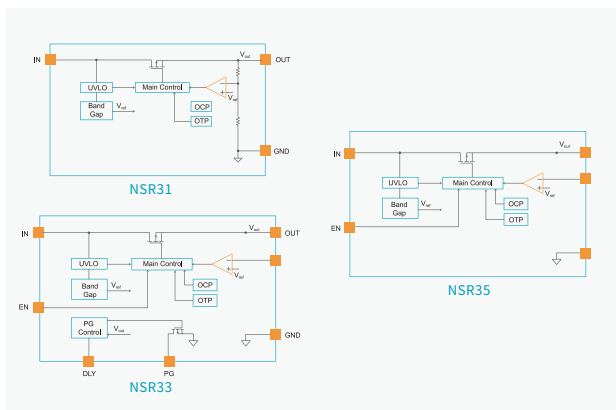
The NSR31/33/35 series LDO chips launched by NOVOSENSE are designed for the applications where the automobile battery supplies power to the system. With a wide input voltage of 3V to 40V, it supports transient voltage up to 42V, which can meet the normal operating requirements of automobile under cold crank and start-stop conditions. Its ultra-low quiescent current of 5μA and low dropout voltage is very suitable for automotive applications with low standby power consumption required. It supplies power to MCU and CAN/LIN transceivers in standby systems to save power and extend battery life.

The NSR31/33/35 series provides sufficient solutions for hardware designers, with various fixed voltage versions: 2.5V, 3.3V and 5.0V, and also provides adjustable output options (0.65V to 18V). In addition, different series are designed with output currents of 150mA, 300mA and 500mA respectively. This low-power linear regulator also integrates short-circuit protection and over-temperature protection. These devices can operate at ambient temperatures from -40°C to 125°C. SOT223, SOT23, DFN-8, HMSOP8, HSOP8, TO252, TO263 and other packages are made available to meet different design requirements.

### ◆ Product feature

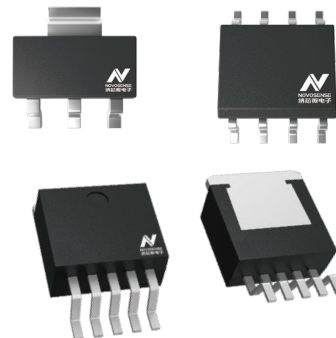
- Operating voltage range: 3V-40V, supporting transient voltage up to 42V
- Output current range:  
NSR31 series: 150mA; NSR33 series: 300mA; NSR35 series: 500mA
- Output voltage range:  
Fixed output: 2.5V, 3.3V, and 5V, Adjustable output: 0.65V to 18V
- Ultra low quiescent current  $I_q$   
 $I_q$ : 200nA in shutdown mode  
Typical value under light load is: 5μA
- Maximum voltage drop:  
NSR31 Series: 620mV@150mA, 5Vout  
NSR33 Series: 320mV@300mA, 5Vout  
NSR35 Series: 560mV@500mA, 5Vout
- Excellent output transient response  
NSR31 Series: supporting 1mΩ ~3Ω, 2.2μF~100μF capacitor  
NSR33 Series: supporting 1mΩ ~3Ω, 1μF~100μF capacitor  
NSR35 Series: supporting 1mΩ ~3Ω, 1μF~200μF capacitor
- Enable signal, PG signal, PG delay function: NSR331 series
- Integrated output short circuit protection, over-temperature protection

### ◆ Functional Block Diagram



### ◆ Package:

- NSR31 series: SOT-223, SOT-23-5L, DFN-8
- NSR33 series: HMSOP8, HSOP8
- NSR35 series: TO252-4, TO252-2, TO263-5, HSOP8



### ◆ Application



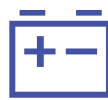
In-vehicle entertainment and autopilot



Body electronics and lighting



Inverter and motor control



OBC/DCDC and BMS

## Automotive 5.5V 500mA/1A LDO NSR30x0x-Q1 Series with Low Noise and High PSRR

### ◆ Product introduction

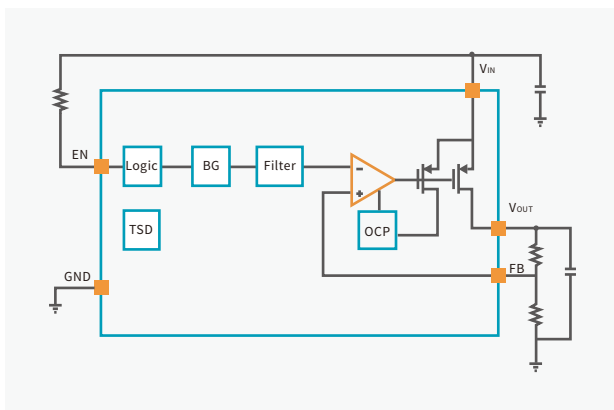
NSR30x0x-Q1 series is a low-voltage linear regulator that delivers up to 1A or 500mA current. Supply voltage ranges from 2.5V to 5.5V. It is available to set the output voltage from Vref to 5V. With 60nA shutdown current, NSR30x0x-Q1 series offers low noise, optional noise reduction, and excellent PSRR performance.

NSR30x01-Q1 series dropout voltage is only 180 mV at full load and NSR30x02-Q1 series dropout voltage is only 85 mV at full load, with superior transient response and line regulation. The device features integrated short-circuit-to-GND and thermal shutdown protections. This device operates in ambient temperatures from -40°C to 125°C, and is available in multiple packages such as DFN-8 and DFN-6, meeting different design.

### ◆ Product feature

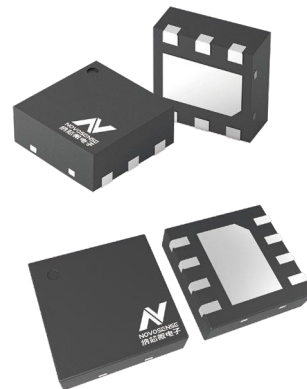
- AEC-Q100 qualified
- Operating temperature range: -40°C - 125°C
- Operating voltage range: 2.5V to 5.5V
- Output voltage range: Vref to 5V
- Output Current Range:
  - NSR30x01-Q1 up to 1 A
  - NSR30x02-Q1 up to 0.5 A
- Low Quiescent Current: 80 nA (Typ.) Shutdown Current when EN low
- High PSRR: Less than -30 dB@1 MHz
- Dropout Voltage:
  - NSR30xx1-Q1: 180mV at 1 A Load
  - NSR30xx2-Q1: 85 mV at 0.5 A Load
- Low noise: 7.6μVRMS Typ. (10Hz to 100kHz, CNR=470nF)
- Optional Noise Reduction
- Current Limit Foldback
- Integrated Fault Protection:
  - Short-Circuit-to-GND protection
  - Thermal Shutdown

### ◆ Functional Block Diagram



### ◆ Package:

- DNF-6, DFN-8



### ◆ Application



Advanced Driving Assistance System



Automotive Infotainment



Telematics control units



High-Speed I/F



Automotive Cluster Display

## Automotive 300mA Single-channel and Dual-channel Antenna Load Protection LDO NSE5701/2 Series

### ◆ Product introduction

NSE5701/2 series devices are designed to provide single-channel and dual-channel path protection for automotive loads with a low current of less than 300mA. With a wide input voltage range from 4.5V to 28V, the NSE5701/2 series can provide adjustable output voltage ranging from 1.5V to 20V per channel.

NSE5701/2 series provides high-precision current sensing capabilities, and can differentiate and diagnose various error states through different analog level outputs. The highly precise current sensing function allows the detection of open-circuit, normal, and short-circuit conditions without further calibration.

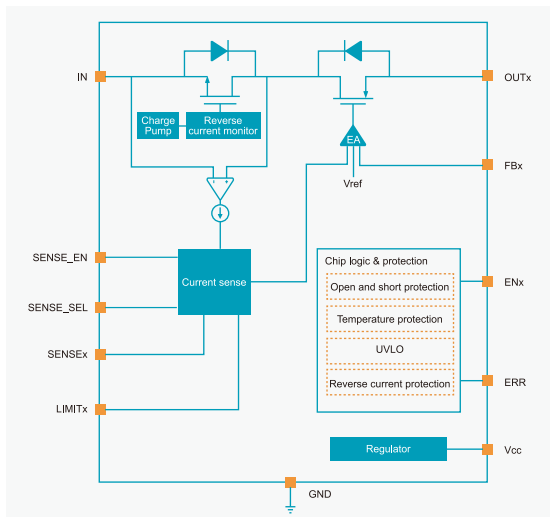
With an external resistor in place, each channel of NSE5701/2 can provide adjustable current limiting capability. This product series also features overheat protection, output battery short-circuit protection, battery reverse polarity protection, reverse current protection and internal inductive clamping protection.

NSE5701/2 series can operate at a temperature ranging from -40°C to +125°C, and is available in the HTSSOP-16 package.

### ◆ Product feature

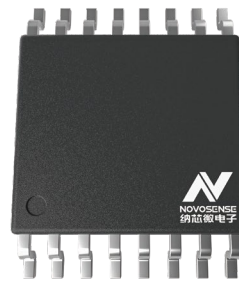
- AEC-Q100 qualified
- Operating temperature range: -40°C - 125°C
- Operating voltage range:  
4.5V-28V, with transient voltage up to 45V
- Output current range: 300mA/CH
- Output voltage range: Adjustable output from 1.5V to 20V
- Accurate current sensing
- Adjustable overcurrent output
- Integrated protection and diagnostic functions:
  - Short circuit protection
  - Reverse battery polarity protection
  - Reverse current protection
  - Overheat protection
  - Output battery short circuit protection
  - Output inductive load clamping
  - Ability to distinguish all faults through the current sensing functionality

### ◆ Functional Block Diagram



### ◆ Package:

- HTSSOP-16



### ◆ Application



Automotive infotainment systems: Load protection for antenna/GPS/camera, etc.

## Automotive 50mA/100mA/300mA/400mA Tracking LDO NSE4250/4/3/1 Series

### ◆ Product introduction

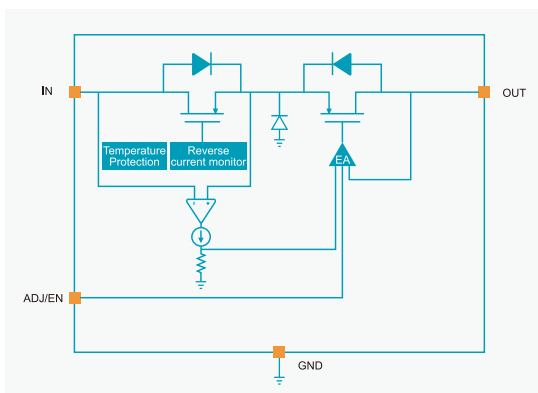
NSE425x is a tracking LDO with low dropout and high tracking accuracy, primarily designed to power off-board automotive sensors. NSE425x integrates protections against overload, overheat, reverse polarity, and short circuit between battery and ground output. By adjusting the reference voltage applied to the input pin ADJ, it can regulate power supply voltage up to  $V_{IN} = 45V$ , with load current up to a level ranging from 50mA to 400mA.

By setting the ADJ/EN input pin at a low level, the NSE425x device can switch to standby mode, thereby minimizing the static current. NSE425x can operate at a temperature ranging from  $-40^{\circ}C$  to  $+125^{\circ}C$ , and is available in multiple packages such as NSOT-23-5, SOT23-5, SOP-8, HSOP-8, TO252-4, TO263-5, meeting different design requirements.

### ◆ Product feature

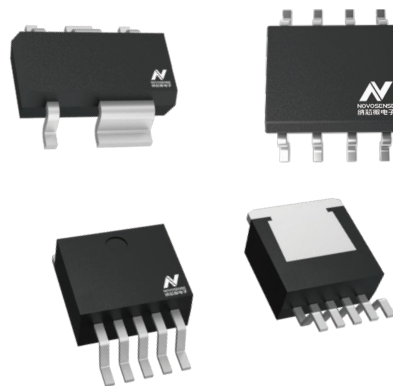
- AEC-Q100 qualified
- Operating temperature range:  $-40^{\circ}C$  -  $125^{\circ}C$
- Operating voltage range: 4V - 40V, with transient voltage up to 45V
- Output current range: 50mA/100mA/300mA/400mA
- High precision voltage following:  $\pm 10mV$
- Integrated protection and diagnostic functions:
  - Short circuit protection
  - Reverse battery polarity protection
  - Reverse current protection
  - Overheat protection

### ◆ Functional Block Diagram



### ◆ Package:

- NSOT23-5, SOT23-5, SOP-8, HSOP-8, TO252-4, TO263-5



### ◆ Application



Various automotive ECUs: Power supply and load protection for off-board sensors

## Automotive 40V 500mA/300mA LDO NSR37xxx Series Integrated with Selectable Watchdog

### ◆ Product introduction

In automotive microcontroller applications, watchdogs are used to monitor the working status of microcontrollers, to avoid software runaway. NSR37xxx-Q1 is a watchdog LDO series, designed for working voltages up to 40V, with a typical quiescent current of only 19  $\mu$ A under light load. And it has a low dropout voltage, only 400 mV at 200 mA output. This series has two package sizes, corresponding to two output current versions: 300mA and 500mA.

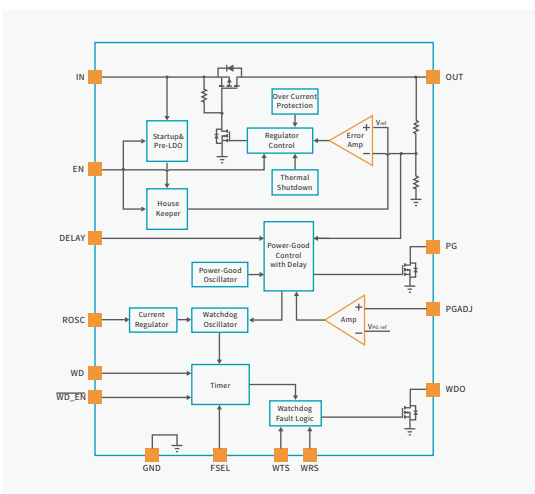
The device integrates a programmable function, which can be used to select window or standard watchdog, and the watchdog time can be set between 10ms and 500ms by external resistors. NSR37xxx-Q1 also has a PG pin, which is used to indicate when the output voltage is stable. The PG delay time and trigger threshold can be adjusted by external components. The device also has integrated short circuit and overcurrent protection functions.

NSR37xxx-Q1 can operate at a temperature ranging from -40°C to +125°C, and is available in multiple packages such as HTSSOP16 HTSSOP28, meeting different design requirements.

### ◆ Product feature

- AEC-Q100 qualified
- Operating temperature range: -40°C - 125°C
- Operating voltage range: 4V-40V, with transient voltage up to 45V
- Output current range:  
300mA for NSR370xx  
500mA for NSR371xx
- Low Quiescent Current ( $I_q$ ):  
< 4  $\mu$ A When EN = Low (Shutdown Mode)  
19  $\mu$ A (Typ) at Light Loads (Watchdog Disabled)
- Dropout Voltage: 400 mV at 200 mA
- Integrated, Adjustable Window Watchdog Timer with Independent Flag
- Selectable Window or Standard Watchdog, with Adjustable Period: 10 ms to 500 ms
- Programmable Threshold & Reset Pulse Delay
- Integrated Fault Protection  
Thermal Shutdown  
Short-Circuit Protection

### ◆ Functional Block Diagram



### ◆ Application



Automotive MCU Power Supply



Body Control Modules (BCM)



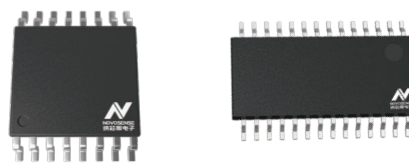
Electronic Gear Shifter



Transmission Control Unit (TCU)

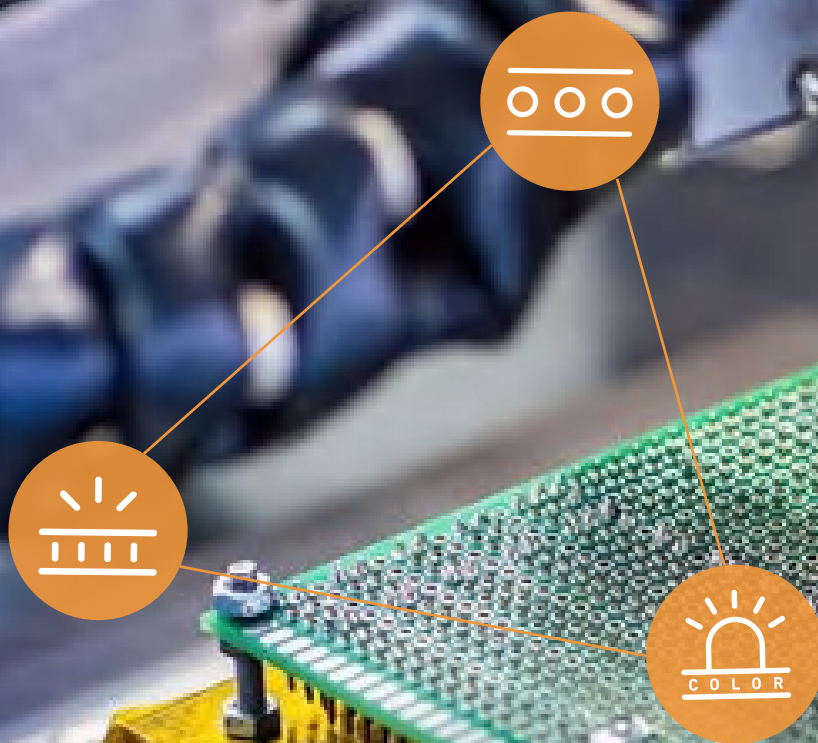
### ◆ Package:

- HTSSOP16, HTSSOP28





# DC-DC Switching Converter



## DC-DC Switching Converter

| Part Number | Ambient Temperature | Minimum Input Voltage | Maximum Input Voltage | Output current | Output Voltage    | Static Power Consumption | Control Mode | Feature                                                                                                                                                                                                     | Application                                                                                                        | Package |
|-------------|---------------------|-----------------------|-----------------------|----------------|-------------------|--------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------|
| NSR10A01    | -40°C~125°C         | 9V                    | 100V                  | 500mA          | Adjustable output | 120μA                    | COT          | No Control Loop Compensation Required<br>Integrated 500 mΩ High-Side Power MOSFETs<br>Cycle-by-Cycle Current Limit<br>Over-Voltage Protection<br>Over-Temperature Protection                                | Ebike GPS trackers/dashboards<br>Photovoltaic energy storage systems<br>Stepper motors<br>Electric tools<br>Drones | MSOP8   |
| NSR10A11    | -40°C~125°C         | 9V                    | 100V                  | 1A             | Adjustable output | 120μA                    | COT          | Integrated 500 mΩ High-Side Power MOSFET<br>Soft start<br>Cycle-by-Cycle Current Limit<br>Short circuit protection<br>Over Voltage Protection<br>Over Temperature Protection                                | Ebike GPS trackers/dashboards<br>Photovoltaic energy storage systems<br>Stepper motors<br>Electric tools<br>Drones | HSOP8   |
| NSR10A21    | -40°C~125°C         | 9V                    | 100V                  | 2A             | Adjustable output | 120μA                    | COT          | Integrated 500 mΩ High-Side Power MOSFET<br>Soft start<br>Cycle-by-Cycle Current Limit<br>Short circuit protection<br>Over Voltage Protection<br>Over Temperature Protection                                | Ebike GPS trackers/dashboards<br>Photovoltaic energy storage systems<br>Stepper motors<br>Electric tools<br>Drones | HSOP8   |
| NSR10A12    | -40°C~125°C         | 9V                    | 100V                  | 1A             | Adjustable output | 120μA                    | COT          | Integrated 500 mΩ High-Side Power MOSFET<br>Integrated 100mA LDO output<br>Soft start<br>Cycle-by-Cycle Current Limit<br>Short circuit protection<br>Over Voltage Protection<br>Over Temperature Protection | Ebike GPS trackers/dashboards<br>Photovoltaic energy storage systems<br>Stepper motors<br>Electric tools<br>Drones | HSOP8   |
| NSR10A22    | -40°C~125°C         | 9V                    | 100V                  | 2A             | Adjustable output | 120μA                    | COT          | Integrated 500 mΩ High-Side Power MOSFET<br>Integrated 100mA LDO output<br>Soft start<br>Cycle-by-Cycle Current Limit<br>Short circuit protection<br>Over Voltage Protection<br>Over Temperature Protection | Ebike GPS trackers/dashboards<br>Photovoltaic energy storage systems<br>Stepper motors<br>Electric tools<br>Drones | HSOP8   |
| NSR10430    | -40°C~125°C         | 4V                    | 40V                   | 3.5A           | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Internal Loop Compensation                                            | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters     | HSOP8   |
| NSR10431    | -40°C~125°C         | 4V                    | 40V                   | 3.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>External Optional Loop Compensation                                   | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters     | HSOP8   |
| NSR10421    | -40°C~125°C         | 4V                    | 40V                   | 2.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>External Optional Loop Compensation                                   | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters     | HMSOP10 |

| Part Number | Ambient Temperature | Minimum Input Voltage | Maximum Input Voltage | Output current | Output Voltage    | Static Power Consumption | Control Mode | Feature                                                                                                                                                                    | Application                                                                                                    | Package        |
|-------------|---------------------|-----------------------|-----------------------|----------------|-------------------|--------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------|
| NSR10430-Q1 | -40°C~125°C         | 4V                    | 40V                   | 3.5A           | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Internal Loop Compensation           | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8<br>DFN10 |
| NSR10420-Q1 | -40°C~125°C         | 4V                    | 40V                   | 2A             | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Internal Loop Compensation           | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | DFN10          |
| NSR10431-Q1 | -40°C~125°C         | 4V                    | 40V                   | 3.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>External Optional Loop Compensation  | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10421-Q1 | -40°C~125°C         | 4V                    | 40V                   | 2.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>External Optional Loop Compensation  | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HMSOP10        |
| NSR10630    | -40°C~125°C         | 4V                    | 60V                   | 3.5A           | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Internal Loop Compensation           | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10632    | -40°C~125°C         | 4V                    | 60V                   | 3.5A           | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Internal Loop Compensation           | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10631    | -40°C~125°C         | 4V                    | 60V                   | 3.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection                                         | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10621    | -40°C~125°C         | 4V                    | 60V                   | 2.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±12% Feedback Reference Voltage<br>Full-feature Protection<br>External Optional Loop Compensation | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HMSOP10        |
| NSR10631-Q1 | -40°C~125°C         | 4V                    | 60V                   | 3.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>External Optional Loop Compensation  | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |

| Part Number  | Ambient Temperature | Minimum Input Voltage | Maximum Input Voltage | Output current | Output Voltage    | Static Power Consumption | Control Mode | Feature                                                                                                                                                                                                      | Application                                                                                                    | Package        |
|--------------|---------------------|-----------------------|-----------------------|----------------|-------------------|--------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------|
| NSR10630-Q1  | -40°C~125°C         | 4V                    | 60V                   | 3.5A           | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Internal Loop Compensation                                             | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10632-Q1  | -40°C~125°C         | 4V                    | 60V                   | 3.5A           | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Internal Loop Compensation                                             | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10621-Q1  | -40°C~125°C         | 4V                    | 60V                   | 2.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>External Optional Loop Compensation                                    | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HMSOP10        |
| NSR10430S-Q1 | -40°C~125°C         | 4V                    | 40V                   | 3.5A           | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection with Spread Spectrum<br>Internal Loop Compensation                        | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8<br>DFN10 |
| NSR10420S-Q1 | -40°C~125°C         | 4V                    | 40V                   | 2A             | Adjustable output | 65μA                     | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection with Spread Spectrum<br>Internal Loop Compensation                        | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | DFN10          |
| NSR10431S-Q1 | -40°C~125°C         | 4V                    | 40V                   | 3.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection<br>Spread Spectrum for Reduced EMI<br>External Optional Loop Compensation | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10421S-Q1 | -40°C~125°C         | 4V                    | 40V                   | 2.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection with Spread Spectrum<br>External Optional Loop Compensation               | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HMSOP10        |
| NSR10631S-Q1 | -40°C~125°C         | 4V                    | 60V                   | 3.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection with Spread Spectrum<br>External Optional Loop Compensation               | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HSOP8          |
| NSR10621S-Q1 | -40°C~125°C         | 4V                    | 60V                   | 2.5A           | Adjustable output | 100μA                    | PCM          | Integrated 150 mΩ High-Side Power MOSFET<br>Peak Current Mode Control<br>±2% Feedback Reference Voltage<br>Full-feature Protection with Spread Spectrum<br>External Optional Loop Compensation               | Industrial power supplies<br>Automotive power supplies<br>Communication power system<br>Moto Drives, Inverters | HMSOP10        |

## Industrial 100V High-voltage High-efficiency Asynchronous Buck Converter NSR10Axx Series

### ◆ Product introduction

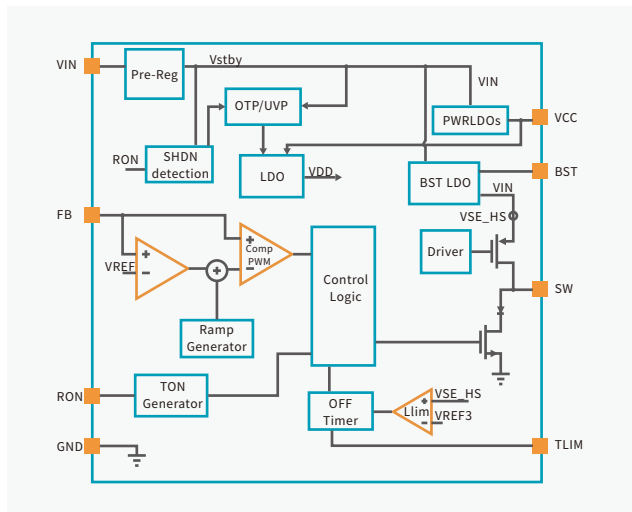
NSR10Axx series asynchronous buck converters have an input voltage range from 9V to 100V, and are suitable for 48V battery systems, such as Ebike GPS trackers/dashboards, photovoltaic energy storage systems, and stepper motors/electric tools, especially Ebike system applications.

In addition, the NSR10A12 and NSR10A22 variants integrate an additional LDO that has a voltage rating of 30V, an output voltage of 3.3V and an output current capacity of 100mA. This effectively eliminates the LDO requirement of customer's MCU/CAN for power supply, thereby reducing PCB footprint.

### ◆ Product feature

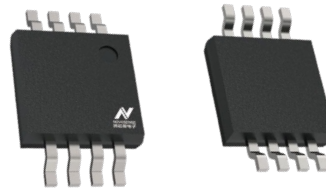
- Wide 9V to 100V Input Range
- NSR10A01: 500mA output current, 725mA peak current  
NSR10A1x: 1A output current, 2A peak current  
NSR10A2x: 2A output current, 4A peak current
- Integrated 500mΩ High-Side Power MOSFETs
- Adaptive Constant-on-time Control
- 2.5V Feedback Reference Voltage
- Adjustable Current Limit Off-time
- No Control Loop Compensation Required
- VCC Bias Function for High Light-load Efficiency
- Cycle-by-Cycle Current Limit
- Over-Voltage Protection
- Over-Temperature Protection

### ◆ Functional Block Diagram



### ◆ Package

- MSOP8



### ◆ Application



Ebike GPS trackers/dashboards



Photovoltaic energy storage systems



Stepper motors



Electric tools



Drones



## Automotive and Industrial 40V 2A/2.5A/3.5A High-efficiency Asynchronous Buck Converter NSR104xx Series

### ◆ Product introduction

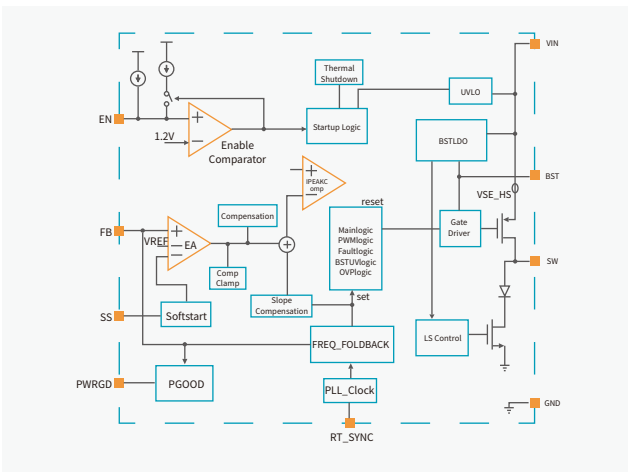
The NSR104xx is an asynchronous buck converter with a wide input voltage range of 4V to 40V and continuous output currents of 2A/2.5A/3.5A, designed for various buck applications. The series of high-voltage converters integrates a 150mΩ high-side power MOSFET. The NSR104xx adopts peak current mode (PCM) control. For the NSR1042/30, the converter features built-in compensation, eliminating the need for additional compensation configurations. For the NSR104x1, the converter offers externally selectable loop compensation. To reduce EMI, the NSR104xxS converters integrate spread spectrum functionality, which allows for smaller external component sizes. The non-S versions do not have spread spectrum functionality.

The NSR104xx operates in ambient temperatures ranging from -40°C to 125°C and is available in HSOP8, HMSOP10, and DFN10 packages to meet different design requirements.

### ◆ Product feature

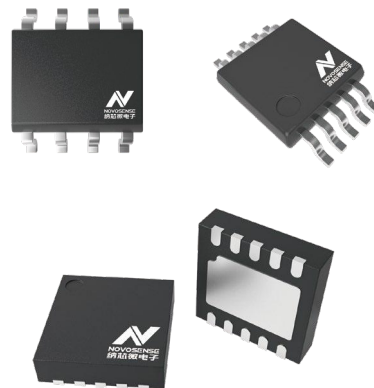
- Qualification Levels (Optional Based on Version):  
AEC-Q100 Automotive Grade Qualified  
Industrial Grade Qualified
- Operating temperature range: -40°C - 125°C
- Operating voltage range: 4V-40V
- Output current range:  
NSR10420: 2A Continuous Output Current  
NSR10421: 2.5A Continuous Output Current  
NSR10430/1: 3.5A Continuous Output Current
- Integrated 150 mΩ High-Side Power MOSFET
- Peak Current Mode Control
- ±2% Feedback Reference Voltage
- 1μA Shutdown supply current
- Loop Compensation  
NSR104x1: External Optional Loop Compensation  
NSR104xx: Internal Loop Compensation
- Full-feature Protection
- Spread Spectrum function:  
With Spread Spectrum: NSR104xxS  
Without Spread Spectrum: NSR104xx

### ◆ Functional Block Diagram



### ◆ Package

- HSOP8, HMSOP10, DFN10



### ◆ Application



Industrial power supplies



Automotive power supplies



Communication power system



Moto Drives, Inverters

## Automotive and Industrial 60V 2.5A/3.5A High-voltage High-efficiency Asynchronous Buck Converter NSR106xx Series

### ◆ Product introduction

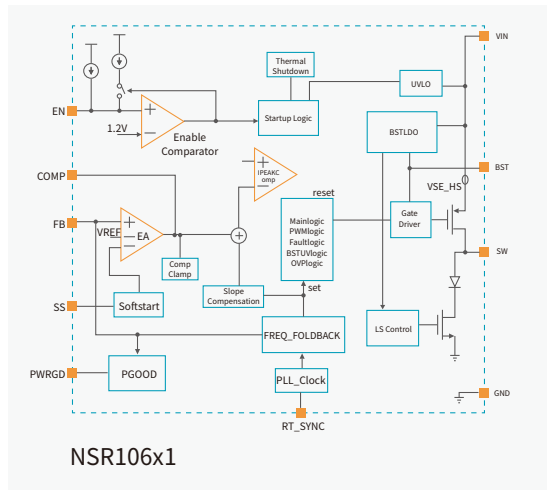
The NSR106xx series is an asynchronous buck converter with a wide input voltage range of 4V to 60V and continuous output currents of 2.5A/3.5A, designed for various buck applications. These high-voltage converters integrate a 150mΩ high-side power MOSFET. The NSR106xx adopts peak current mode (PCM) control with a wide switching frequency range. The NSR106x converter features built-in compensation, eliminating the need for additional compensation configurations, while the NSR106x1 converter offers externally optional loop compensation. To reduce EMI, the NSR106xxS converters integrate a spread spectrum function, allowing for smaller external component sizes. The non-S versions do not have the spread spectrum function.

The NSR106XX series operates in ambient temperatures ranging from -40°C to 125°C and is available in various packages, including HSOP8 and HMSOP10, to meet different design requirements.

### ◆ Product feature

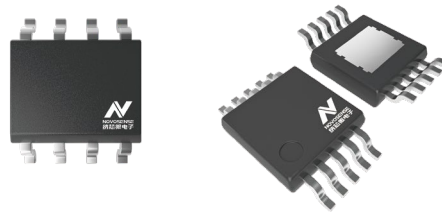
- Qualification Levels (Optional Based on Version):
  - AEC-Q100 Automotive Grade Qualified
  - Industrial Grade Qualified
- Operating temperature range: -40°C - 125°C
- Operating voltage range: 4V-60V
- Output current range:
  - NSR1062x: 2.5A Continuous Output Current
  - NSR1063x: 3.5A Continuous Output Current
- Integrated 150 mΩ High-Side Power MOSFETs
- Peak Current Mode Control
- ±2% Feedback Reference Voltage
- Quiescent Current
  - NSR106x1: 100 μA Non-switching Quiescent Current
  - NSR106xx: 65 μA Non-switching Quiescent Current
- Loop Compensation
  - NSR106x1: External Optional Loop Compensation
  - NSR1063x: Internal Loop Compensation
- Full-feature Protection
- Spread Spectrum function:
  - With Spread Spectrum: NSR106xxS
  - Without Spread Spectrum: NSR106xx

### ◆ Functional Block Diagram



### ◆ Package

- HSOP8, HMSOP10



### ◆ Application



Industrial power supplies



Automotive power supplies



Communication power system



Moto Drives, Inverters

# Voltage Monitoring Reset IC Series



# Voltage Monitoring Reset IC Series

| Part Number | Threshold Voltage | Negative-going input threshold accuracy(VIT) | Supply Voltage (V) | Iq-Quiescent Current | Other Features             | Reset Delay Time | Output Type           | Package  | Application                                                                                      |
|-------------|-------------------|----------------------------------------------|--------------------|----------------------|----------------------------|------------------|-----------------------|----------|--------------------------------------------------------------------------------------------------|
| NSR7808G01  | Adjustable        | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G09  | 0.84V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G12  | 1.12V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G125 | 1.16V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G15  | 1.4 V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G18  | 1.67V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G19  | 1.77V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G25  | 2.33V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G30  | 2.79V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G33  | 3.07V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G50  | 4.65V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | SOT23-6L | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G01  | Adjustable        | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G09  | 0.84V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G12  | 1.12V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G125 | 1.16V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G15  | 1.4V              | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G18  | 1.67V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G19  | 1.77V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G25  | 2.33V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6    | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |

| Part Number | Threshold Voltage | Negative-going input threshold accuracy(VIT) | Supply Voltage (V) | Iq-Quiescent Current | Other Features             | Reset Delay Time | Output Type           | Package | Application                                                                                      |
|-------------|-------------------|----------------------------------------------|--------------------|----------------------|----------------------------|------------------|-----------------------|---------|--------------------------------------------------------------------------------------------------|
| NSR7808G30  | 2.79V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6   | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G33  | 3.07V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6   | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |
| NSR7808G50  | 4.65V             | 2.0%                                         | 1.8V-6V            | 4.1μA                | With Manual Reset function | Programmable     | Low active Open Drain | DFN-6   | ASIC/FPGA/Microcontroller Applications<br>Battery Charge Control Unit<br>Telematics Control Unit |



## Industrial Grade low-Iq Programmable-delay Voltage Monitoring Reset IC Series NSR7808

### ◆ Product introduction

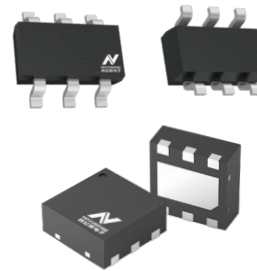
The NSR7808 series voltage monitoring reset chips are designed for industrial applications that monitor microprocessor circuits. They can monitor system voltages as low as 0.4V and provide a reset function with programmable reset delay. When the SENSE voltage drops to the threshold VIT or the manual reset MR voltage is triggered to a low level, the RESET signal is activated. The RESET output remains low until the user-set delay time elapses, at which point it is released and pulled up to a logic high level. The reset voltage can be set to typical voltage rails from 0.4V to 5V, and the reset voltage of the NSR7808G01 version can be adjusted and configured through an external resistor divider. The NSR7808 series features an ultra-low quiescent current of 4.1μA (typical value), which is ideal for industrial battery-powered applications. It provides a precise reference voltage, achieving ±2% detection accuracy (at room temperature). The reset delay time can be configured by connecting a capacitor between the CD and GND pins, allowing for a selection of any value between 1.25ms and 1s. If the CD pin is left floating, the default delay time is 20ms, and if the CD pin is connected to VDD, the delay time is 300ms. The NSR7808 series offers hardware designers a comprehensive solution with various fixed voltage versions, as well as adjustable voltage options. It is available in SOT23-6 and DFN-6 packages, meeting different design

### ◆ Product feature

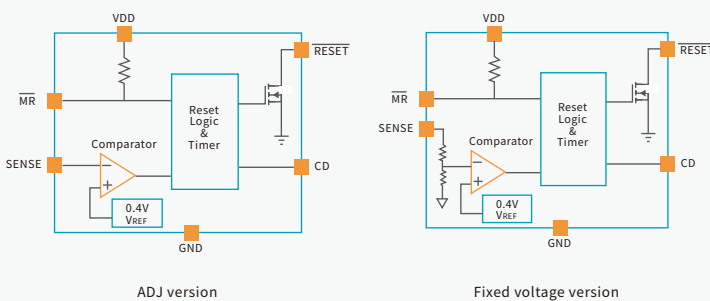
- Wide temperature range: -40°C to 125°C
- Supply voltage range: 1.8V-6V
- Monitoring threshold voltage:
  - Fixed version: 0.84V, 1.12V, 1.16V, 1.4V, 1.67V, 1.77V, 2.33V, 2.79V, 3.07V, 4.65V
  - Adjustable version: Adjustable
- Ultra-low static power consumption Iq: Typical 4.1μA
- Threshold voltage accuracy: 0.5%
- With Manual Reset function
- Output: Open-Drain
- Package: SOT23-6, DFN-6

### ◆ Package:

- SOT23-6L, DFN-6



### ◆ Functional Block Diagram



### ◆ Application



ASIC/FPGA/Microcontroller Applications



Battery Charge Control Unit



Telematics Control Unit

# Smart High Side Switch



# Smart High Side Switch

| Part Number | Ambient Temperature | Type             | Number of Channels | MOS Impedance | Overcurrent value | Protection                                                                                                                                                                                    | Feature                                           | Package  | Application |
|-------------|---------------------|------------------|--------------------|---------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------|-------------|
| NSE34025Q   | -40°C~125°C         | High side switch | 4CH                | 25mΩ          | 30A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34050Q   | -40°C~125°C         | High side switch | 4CH                | 50mΩ          | 27A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34140Q   | -40°C~125°C         | High side switch | 4CH                | 140mΩ         | 11A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34050D   | -40°C~125°C         | High side switch | 2CH                | 50mΩ          | 32A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34050S   | -40°C~125°C         | High side switch | 1CH                | 50mΩ          | 32A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34140D   | -40°C~125°C         | High side switch | 2CH                | 140mΩ         | 11A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34140S   | -40°C~125°C         | High side switch | 1CH                | 140mΩ         | 11A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34025D   | -40°C~125°C         | High side switch | 2CH                | 25mΩ          | 43A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34025S   | -40°C~125°C         | High side switch | 1CH                | 25mΩ          | 43A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34012D   | -40°C~125°C         | High side switch | 2CH                | 12mΩ          | 58A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34012S   | -40°C~125°C         | High side switch | 1CH                | 12mΩ          | 58A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |

| Part Number | Ambient Temperature | Type             | Number of Channels | MOS Impedance | Overcurrent value | Protection                                                                                                                                                                                    | Feature                                           | Package  | Application |
|-------------|---------------------|------------------|--------------------|---------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------|-------------|
| NSE34008D   | -40°C~125°C         | High side switch | 2CH                | 8mΩ           | 67A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE34008S   | -40°C~125°C         | High side switch | 1CH                | 8mΩ           | 67A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-16 | BCM ZCU     |
| NSE35120DA  | -40°C~125°C         | High side switch | 2CH                | 60mΩ          | 18A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35200DA  | -40°C~125°C         | High side switch | 2CH                | 60mΩ          | 11A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35040DA  | -40°C~125°C         | High side switch | 2CH                | 20mΩ          | 48A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35040SA  | -40°C~125°C         | High side switch | 1CH                | 20mΩ          | 48A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35080DA  | -40°C~125°C         | High side switch | 2CH                | 20mΩ          | 40A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35012DA  | -40°C~125°C         | High side switch | 2CH                | 12mΩ          | 65A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35012SA  | -40°C~125°C         | High side switch | 1CH                | 12mΩ          | 65A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35020DA  | -40°C~125°C         | High side switch | 2CH                | 12mΩ          | 65A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35030DA  | -40°C~125°C         | High side switch | 2CH                | 12mΩ          | 65A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |

| Part Number | Ambient Temperature | Type             | Number of Channels | MOS Impedance | Overcurrent value | Protection                                                                                                                                                                                    | Feature                                           | Package  | Application |
|-------------|---------------------|------------------|--------------------|---------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------|-------------|
| NSE35010DA  | -40 °C ~125 °C      | High side switch | 2CH                | 10mΩ          | 75A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35010SA  | -40 °C ~125 °C      | High side switch | 1CH                | 10mΩ          | 75A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35008DA  | -40 °C ~125 °C      | High side switch | 2CH                | 8mΩ           | 75A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35008SA  | -40 °C ~125 °C      | High side switch | 1CH                | 8mΩ           | 75A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |
| NSE35008SP  | -40 °C ~125 °C      | High side switch | 1CH                | 8mΩ           | 75A               | Overcurrent protection<br>Short-circuit protection<br>Overvoltage protection<br>Over-temperature protection<br>Lost ground protection<br>Lost power protection<br>Reverse polarity protection | Open circuit diagnosis<br>Support inductive loads | HSSOP-14 | BCM ZCU     |



## Automotive 40V Single/Dual/Quad Channel Intelligent High-side Switch NSE34xxx/NSE35xxx Series

### ◆ Product introduction

The NSE34xxx/NSE35xxx series high-side switches are designed for driving various traditional resistive, inductive, and halogen lamp loads in systems like automotive BCUs, while also being well-suited for handling large capacitive loads commonly found in first and second-level distribution in Zonal Control Units (ZCUs). These series offer options for 1, 2, or 4 channels and are available in HSSOP-16/HSSOP-14 packages, with an  $R_{ds(on)}$  range from 8mΩ to 140mΩ. The chips feature precise current sensing, ideal for fault diagnosis, protection, and real-time monitoring of load currents. Additionally, the NSE34xxx/NSE35xxx series incorporate comprehensive protection mechanisms, including overcurrent/short-circuit protection, overtemperature protection, overvoltage protection, ground and power loss protection, reverse polarity protection, and open-load detection.

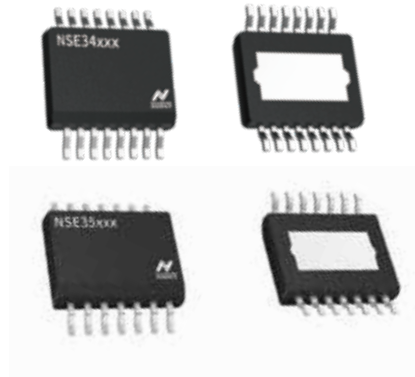
The NSE34xxx and NSE35xxx series products are AEC-Q100 qualified and certified to AEC-Q100-012 level A, ensuring over a million cycles of short-circuit and overcurrent protection.

### ◆ Product feature

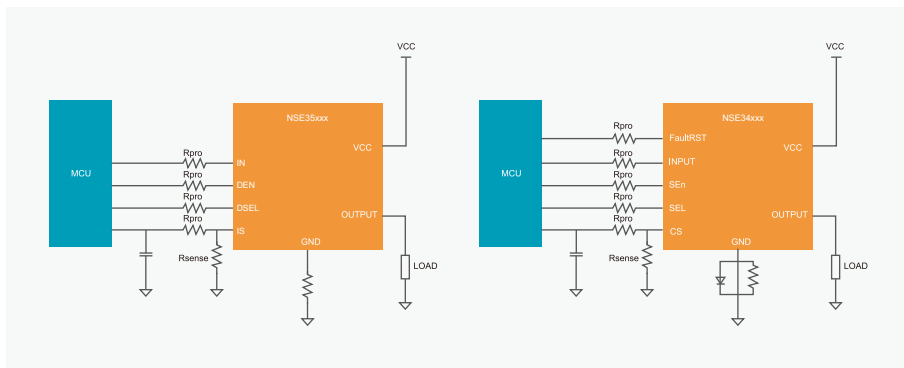
- AEC-Q100 qualified
- Operating temperature range: -40°C - 125°C
- The operating voltage range is up to 40V
- 1/2/4 channel options
- $R_{ds(on)}$  Range: 8mΩ ~ 140mΩ
- Accurate current sensing:  $\pm 25\%$  at 200mA load
- Overvoltage clamping, and supporting inductive loads
- Overcurrent protection
- Overtemperature protection: Absolute overtemperature protection, relative overtemperature protection
- Diagnostic output: Open circuit detection, short circuit detection, and overtemperature detection
- AEC-Q100-012 Level A certification

### ◆ Package:

- HSSOP-16, HSSOP-14



### ◆ Functional Block Diagram



### ◆ Application



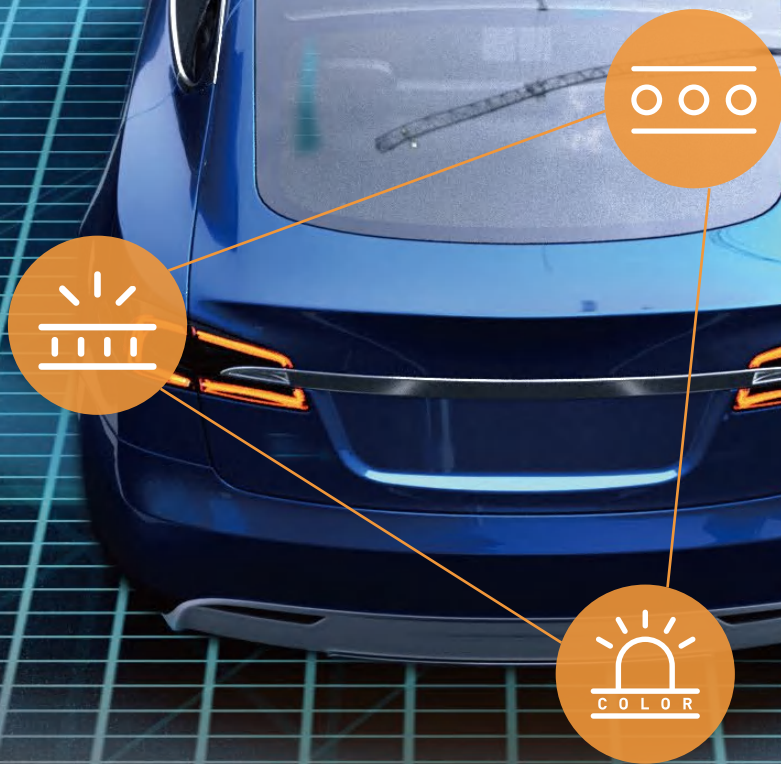
Body Control Modules(BCM)



ZCU

|                              |                                     |                                                             |                                   |                                      |                                          |                                    |                             |            |
|------------------------------|-------------------------------------|-------------------------------------------------------------|-----------------------------------|--------------------------------------|------------------------------------------|------------------------------------|-----------------------------|------------|
| Micro-stepping Stepper Motor | Low-side Driver/Switch              | SIC Diode                                                   | SIC MOSFET                        | LDO Linear Regulator                 | DC-DC Switching Converter                | Voltage Monitoring Reset IC Series | Smart High Side Switch      | LED Driver |
| Isolated Half-bridge Driver  | Isolated Single-channel Gate Driver | Smart Isolated Gate Driver Integrated with DESAT Protection | Non-isolated Low-side Gate Driver | Non-isolated Half-bridge Gate Driver | GaN Integrated Power Stage & Gate Driver | Brushed DC Motor Driver            | Brushed DC Motor Pre-Driver |            |

# LED Driver





## LED Driver

| Part Number | Ambient temperature | Number of channels | Input voltage | Output current | Diagnosis and protection                                                                                                                                                                                                                                  | Heat dissipation enhancement                 | Feature                                                           | Application                                                                                               | Package                |
|-------------|---------------------|--------------------|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------|
| NSL21610    | -40°C~125°C         | 1CH                | 5-40V         | 450mA          | Open circuit diagnosis<br>Short circuit diagnosis<br>Over-temperature protection                                                                                                                                                                          | Automatic current sharing via shunt resistor | PWM dimming<br>Multiple diagnostic cascades<br>Independent EN pin | Rear lighting<br>Interior lighting<br>Other body lighting                                                 | HMSOP-8                |
| NSL21611    | -40°C~125°C         | 1CH                | 5-40V         | 300mA          | Open circuit diagnosis<br>Short circuit diagnosis<br>Over-temperature protection                                                                                                                                                                          | /                                            | PWM dimming<br>Multiple diagnostic cascades<br>Independent EN pin | Rear lighting<br>Interior lighting<br>Other body lighting                                                 | HMSOP-8                |
| NSL21630    | -40°C~125°C         | 3CH                | 5-40V         | 200mA          | Open circuit diagnosis<br>Short circuit diagnosis<br>Over-temperature protection                                                                                                                                                                          | Automatic current sharing via shunt resistor | PWM dimming<br>Multiple diagnostic cascades                       | Rear lighting<br>Interior lighting<br>Other body lighting                                                 | HTSSOP-16              |
| NSL21631    | -40°C~125°C         | 3CH                | 5-40V         | 200mA          | Open circuit diagnosis<br>Short circuit diagnosis<br>Over-temperature protection                                                                                                                                                                          | Automatic current sharing via shunt resistor | PWM dimming<br>Multiple diagnostic cascades<br>Independent EN pin | Rear lighting<br>Interior lighting<br>Other body lighting                                                 | HTSSOP-16              |
| NSL21912    | -40°C~125°C         | 12CH               | 3.8 – 20V     | 100mA          | Programmable fail-safe state<br>LED Open circuit diagnosis<br>LED Short circuit diagnosis<br>Configurable LED open& short detect threshold<br>Single-LED short-circuit diagnostic<br>8-Bit ADC for pin voltage measurement<br>Over-temperature protection | Automatic current sharing via shunt resistor | UART Interface<br>PWM dimming<br>Analog current dimming           | Automotive rear lighting<br>Automotive exterior lighting<br>General automotive body lighting applications | HTSSOP-24              |
| NSL23716x   | -40°C~125°C         | 16CH               | 3.6 – 20V     | 100mA          | Programmable fail-safe state<br>LED Open circuit diagnosis<br>LED Short circuit diagnosis<br>Configurable LED open& short detect threshold<br>Single-LED short-circuit diagnostic<br>8-Bit ADC for pin voltage measurement<br>Over-temperature protection | Configurable thermal derating                | CAN differential Interface<br>PWM/Analog dimming                  | Automotive rear lighting<br>Automotive exterior lighting<br>General automotive body lighting applications | QFN32-5x6<br>QFN32-4x4 |
| NSL21916    | -40°C~125°C         | 16CH               | 3-22V         | 100mA          | Programmable fail-safe state<br>LED Open circuit diagnosis<br>LED Short circuit diagnosis<br>Configurable LED open& short detect threshold<br>Single-LED short-circuit diagnostic<br>8-Bit ADC for pin voltage measurement<br>Over-temperature protection | Automatic current sharing via shunt resistor | UART Interface<br>PWM dimming<br>Analog current dimming           | Automotive rear lighting<br>Automotive exterior lighting<br>General automotive body lighting applications | HTSSOP-38              |
| NSL21924    | -40°C~125°C         | 24CH               | 3-22V         | 100mA          | Programmable fail-safe state<br>LED Open circuit diagnosis<br>LED Short circuit diagnosis<br>Configurable LED open& short detect threshold<br>Single-LED short-circuit diagnostic<br>8-Bit ADC for pin voltage measurement<br>Over-temperature protection | Automatic current sharing via shunt resistor | UART Interface<br>PWM dimming<br>Analog current dimming           | Automotive rear lighting<br>Automotive exterior lighting<br>General automotive body lighting applications | HTSSOP-38              |

## Automotive 40V/450mA Single-channel Linear LED Driver NSL2161x

## Automotive 40V Three-channel Linear LED Driver with Thermal Sharing Function NSL2163x

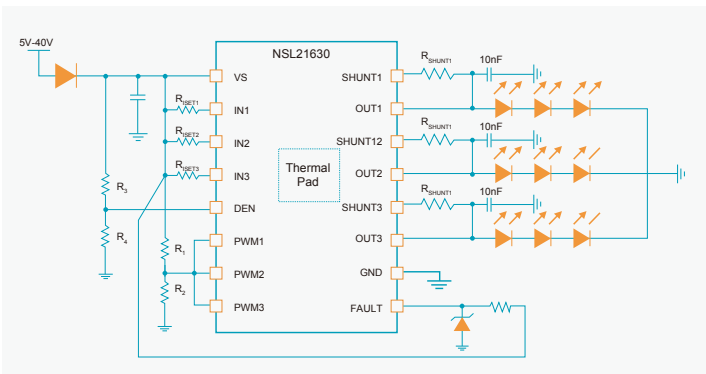
### ◆ Product introduction

The NSL2163x is an automotive-qualified three-channel linear LED driver with a wide input voltage range of 5V~40V. Each channel can be configured with an output current capacity of up to 200mA. External shunt resistors can be used to share the output current, reducing device temperature rise. The device has a full range of diagnostic functions, including LED open circuit protection, LED GND short circuit protection, and device overheat protection for “all off if one fails” or “others remain on if one fails” protection with the flexible configuration of the FAULT bus. The device offers an EN pin version for low power consumption.

### ◆ Product feature

- Qualified for Automotive Grade 1: T<sub>j</sub> from -40 °C -150 °C
- Wide input voltage range of 5V~40V
- Three high accuracy constant current channels
- Output current capacity of 200mA per channel
- Individual current setting and PWM dimming control per channel
- Automatic thermal balancing between device and external shunt resistors
- Low dropout voltage: 450mV maximum at 100mA
- Full protections and diagnostics
- EN pin version available for low power consumption (NSL21631)

### ◆ Functional Block Diagram



### ◆ Package:

- HTSSOP-16



### ◆ Application



Automotive rear lighting



Automotive exterior lighting



General automotive body lighting applications



## Automotive 20V 12-channel Linear LED Driver NSL21912

### ◆ Product introduction

NSL21912 is an automotive high-side LED driver with a supply voltage range of 3.8V to 20V and a current output capability of 100mA per channel. The device supports 2-bit global and 6-bit individual current settings, and flexible 12-bit PWM dimming.

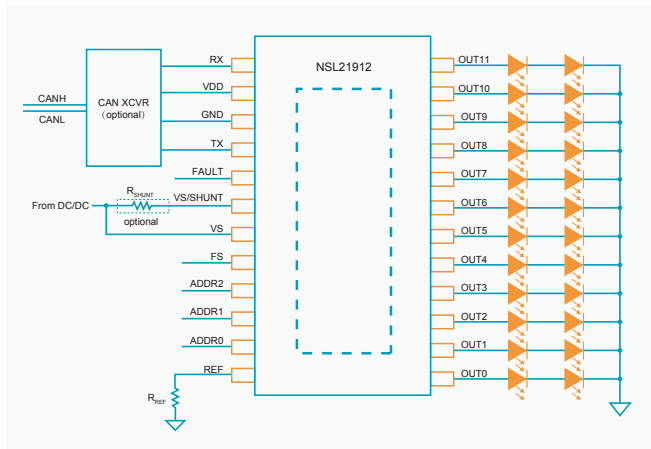
NSL21912 features a low dropout voltage requirement (700mV Max.@50mA) and supports automatic thermal sharing via VS shunt resistors, providing excellent thermal performance. NSL21912 supports multiple regulations along with LED open-circuit, short-to-ground, and single LED short-circuit diagnostics. It integrates a configurable watchdog and programmable EEPROM, allowing NSL21912 to flexibly configure fail-safe mode for different applications when the MCU connection is lost.

NSL21912 supports the UART-based digital interface for a wide range of control and diagnostic features, with a maximum of 16 NSL21912 devices on a single bus.

### ◆ Product feature

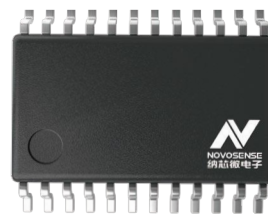
- Qualified for Automotive Grade 1: Tj from -40 °C to 150 °C
- 3.8V~20V supply voltage range
- 12-channel high side current sources
- 100mA output current capacity per channel
- 12-bit independent PWM dimming
- Low dropout voltage 700mV max. at 50mA
- Automatic thermal sharing via VS shunt resistor (NOVOSENSE patent)
- UART-based communication interface(up to 2Mbps)
- Configurable LED open and LED short detect threshold
- Full protections and diagnostics

### ◆ Functional Block Diagram



### ◆ Package:

- HTSSOP24



### ◆ Application



Automotive rear lighting



Automotive exterior lighting



General automotive body lighting applications

## Automotive 16-channel Linear LED Driver NSL23716x

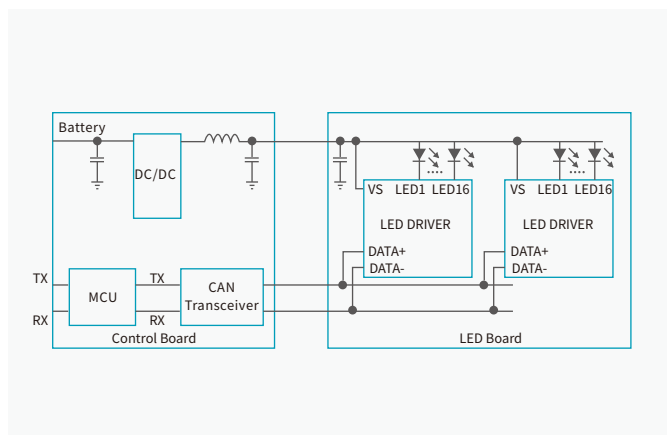
### ◆ Product introduction

The NSL23716 is a 16-channel low-side LED driver that provides a maximum output current of 100mA per channel and is available in both CAN differential and UART versions, where the CAN differential interface can maximize the simplification of the BOM and provide customers with a lower system cost solution.

### ◆ Product feature

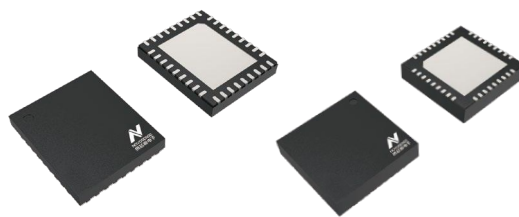
- Qualified for Automotive Grade 1: Tj from -40 °C to 150 °C
- 3.6 V to 20 V wide supply voltage range
- 16-channel low side current sink
- Cascade up to 16 ICs to support up to 256 channels
- 100mA output current capacity per channel
- 12-bit independent PWM dimming per channel
- Low dropout voltage 1000mV max. at 100mA
- UART interface (NSL23716D)
- CAN compatible differential interface (NSL23716A/C)
- Up to 2 Mbps data rate
- 3.3V VCC(NSL23716A) and 5.0V VCC(NSL23716C/D)
- Internal OTP and supports programmable Fail Safe mode.
- Full protections and diagnostics

### ◆ Functional Block Diagram



### ◆ Package:

- QFN32-5x6, OFN32-4x4



### ◆ Application



Automotive rear lighting



Automotive exterior lighting



General automotive body lighting applications

## Automotive 16/24-channel Linear LED Driver NSL21916/24

### ◆ Product introduction

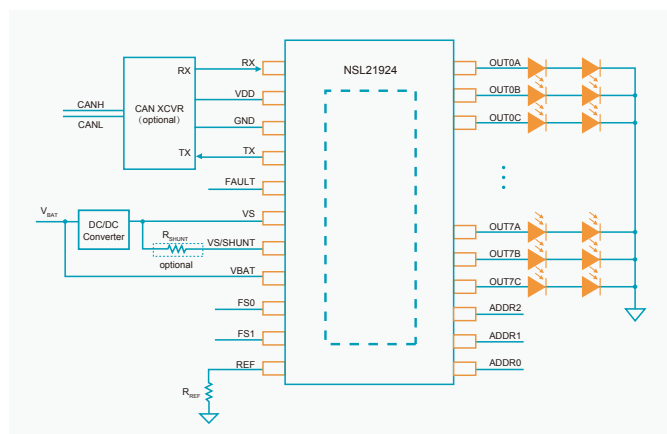
NSL21916/24 is a 16/24-channel high-side LED driver that controls the output channels individually with up to 100 mA current capability for each channel. 2-bit global, 6-bit individual current setting and 12-bit PWM dimming can be used to adjust the LED brightness flexibly. NSL21916/24 supports multiple regulation with LED open-circuit, short-to-ground, and single LED short-circuit diagnostics. The device also integrates a configurable watchdog which automatically sets failsafe states when the MCU connection is lost. With programmable EEPROM, NSL21916/24 can flexibly be set for different applications.

NSL21916/24 features a UART protocol-based communication interface, supporting up to 2 Mbps data rate.

### ◆ Product feature

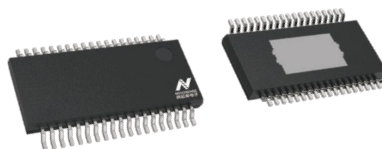
- Qualified for Automotive Grade 1: T<sub>J</sub> from -40 °C to 150 °C
- 16/24-channel high side current sources
- 100mA output current capacity per channel
- 12-bit independent PWM dimming
- Phase shift PWM dimming
- Low dropout voltage 600mV max. at 50mA
- Innovative thermal sharing characteristic based on a single shunt resistor
- UART protocol-based communication interface, supporting up to 2 Mbps data rate
- Configurable LED open and LED short detect threshold
- Full protections and diagnostics

### ◆ Functional Block Diagram



### ◆ Package:

- HTSSOP38



### ◆ Application



Automotive rear lighting



Automotive exterior lighting



Automotive ISD/ISC application



General automotive body lighting applications

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# NOVOSENSE



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Product Selection Guide



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Automotive Solution



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Renewable Energy &  
Power Supply Application  
Solution



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Control Solution

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