

# NPA

## Surface-Mount Pressure Sensor Series



The NPA product series is provided in a miniature size as a cost effective solution for applications that require calibrated performance. Packaged in a SOIC14 pin surface mount, the NPA Series is available in Gauge, Absolute or Differential pressure ranges with either mV, amplified analog or digital outputs. The sensor is intended for printed circuit board mounting and delivered in tape and reel form to simplify manufacturing handling.

### Features

- Surface Mountable
- Differential, Gauge, Absolute & Low Pressure
- 10" H<sub>2</sub>O to 30 PSI Full Scale
- Output Options: Amplified Analog, Digital Serial (14bit), Digital I<sup>2</sup>C, Uncalibrated mV
- On chip temperature sensor in digital mode
- Operating temperature range of -40 to 125°C
- Total Error Band < ±1.5% FSO
- Up to 60 psi proof pressure

# General NPA Specifications

| Parameter                             | Value                             | Units | Notes         |
|---------------------------------------|-----------------------------------|-------|---------------|
| <b>Environmental</b>                  |                                   |       |               |
| <b>Temperature Range</b>              |                                   |       |               |
| Operating                             | -40 to +125                       | °C    | -40 to +257°F |
| Compensated                           | 0 to 60                           | °C    | +32 to +157°F |
| Storage                               | -40 to +125                       | °C    | -40 to +257°F |
| <b>Mechanical</b>                     |                                   |       |               |
| <b>Weight</b>                         | ~1                                | grams |               |
| <b>Media Compatibility</b>            |                                   |       |               |
| Positive differential and gauge ports | Compatible with exposed materials |       | 1             |
| Negative differential ports           | Dry gases only                    |       |               |

Notes: 1. Exposed materials are thermoset plastic, silicon, epoxy, RTV, pyrex and silicone

| Parameter                         | Units | Min    | Typ | Max   | Notes |
|-----------------------------------|-------|--------|-----|-------|-------|
| <b>Common Parameters</b>          |       |        |     |       |       |
| Accuracy (Total Error Band)       | %FSO  | -1.5   |     | 1.5   |       |
| Proof Pressure (10"H2O to 1 psi)  | psi   |        | 35  |       |       |
| Proof Pressure (>1 psi to 30 psi) | psi   |        | 60  |       |       |
| Maximum Package Pressure          |       |        | 60  |       |       |
| Pressure ranges                   |       | 10"H2O |     | 30psi |       |

| Series  | Excitation Voltage | Min/Max            | Notes                                       |
|---------|--------------------|--------------------|---------------------------------------------|
| NPA-100 | 1.5mA              |                    | NPA Uncompensated, mV                       |
| NPA-300 | 3.3V               | 3.135 V to 3.465 V | NPA Compensated, low power amplified analog |
| NPA-500 | 5.0V               | 4.75 V to 5.25 V   | NPA Compensated, amplified analog           |
| NPA-600 | 5.0V *             | 4.75 V to 5.25 V   | NPA Compensated, digital serial             |
| NPA-700 | 5.0V *             | 4.75 V to 5.25 V   | NPA Compensated, digital I <sup>2</sup> C   |

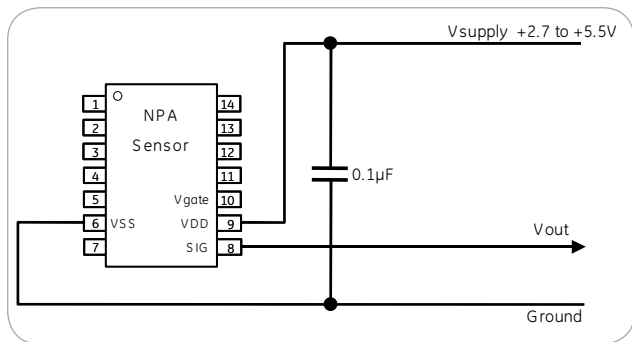
\* 3.3V optional, contact factory for more details

# Output Option: Amplified Analog

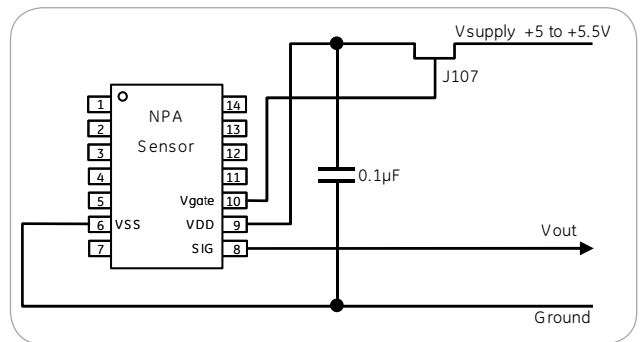
| Parameter                                                | Units | Min  | Max  |
|----------------------------------------------------------|-------|------|------|
| <b>Analog Performance Parameters 5 volt Excitation</b>   |       |      |      |
| Offset                                                   | Volts | 0.44 | 0.56 |
| Span (Absolute/Gauge)                                    | Volts | 4    |      |
| <b>Analog Performance Parameters 3.3 volt Excitation</b> |       |      |      |
| Offset                                                   | Volts | 0.46 | 0.54 |
| Span (Absolute/Gauge)                                    | Volts | 2.5  |      |

## Typical Analog Circuits

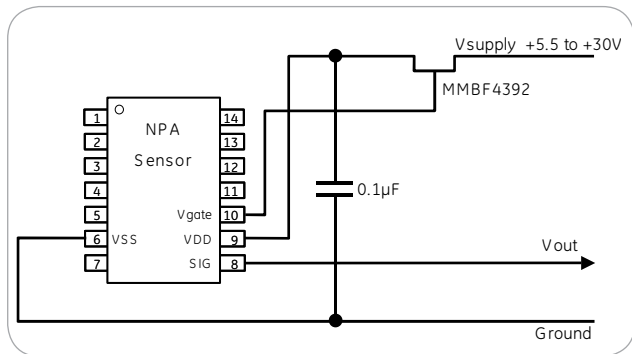
Circuit layout same as “Ratiometric Voltage Output”



Ratiometric Voltage Output - Standard NPA



Ratiometric Voltage Output with Over-Voltage Protection - Request Required



Absolute Voltage Output - Request Required

## NPA Pinout

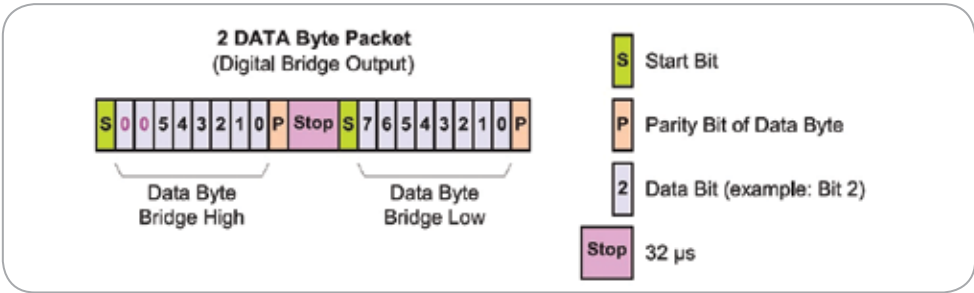
| Pin # | Amplified Analog | Function Notes                    |
|-------|------------------|-----------------------------------|
| 1     | --               |                                   |
| 2     | --               |                                   |
| 3     | NC               | Do Not Connect                    |
| 4     | NC               | Do Not Connect                    |
| 5     | --               |                                   |
| 6     | VSS              | Ground Supply                     |
| 7     | --               |                                   |
| 8     | SIG              | Analog Out, Calibration Interface |
| 9     | VDD              | Supply Voltage                    |
| 10    | --               |                                   |
| 11    | NC               | Do Not Connect                    |
| 12    | NC               | Do Not Connect                    |
| 13    | --               |                                   |
| 14    | --               |                                   |

# Output Option: Digital Serial (14 bit)

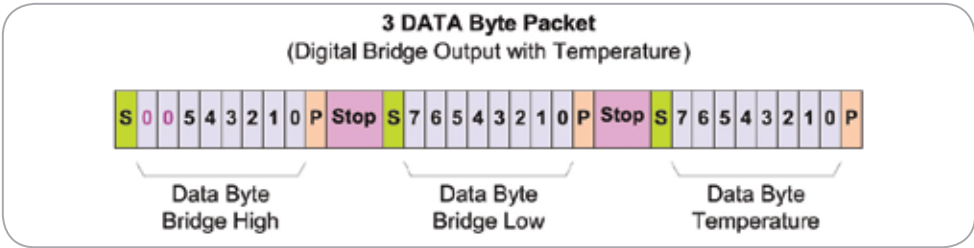
| Parameter           | Units | Min | Typ   | Max | Notes       |
|---------------------|-------|-----|-------|-----|-------------|
| Digital Performance |       |     |       |     |             |
| Resolution          | ADC   |     | 14bit |     | 16383 steps |
| Sampling Rate       | kHz   |     | 1     |     |             |

## Digital Output Options

Streaming serial output is a 14 bit number proportional to the full scale.



Zacwire—Digital Output (NOM) Bridge Readings



Zacwire—Digital Output (NOM) Bridge Readings with Temperature Option

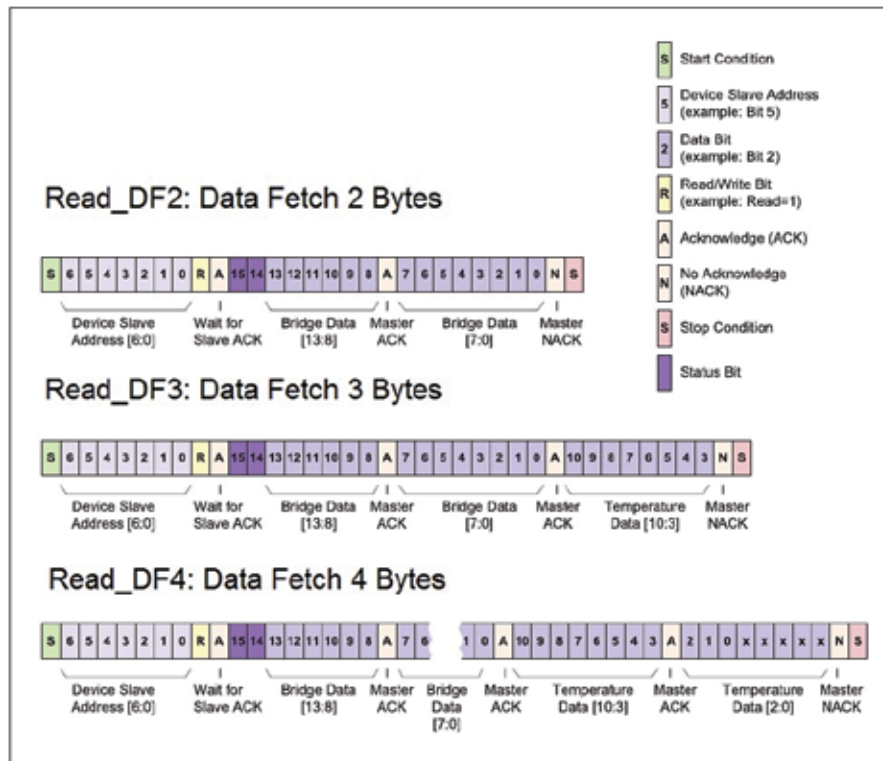
## NPA Pinout

| Pin # | Amplified Digital Serial | Function Notes                     |
|-------|--------------------------|------------------------------------|
| 1     | --                       |                                    |
| 2     | --                       |                                    |
| 3     | NC                       | Do Not Connect                     |
| 4     | NC                       | Do Not Connect                     |
| 5     | --                       |                                    |
| 6     | VSS                      | Ground Supply                      |
| 7     | --                       |                                    |
| 8     | SIG                      | Digital Out, Calibration Interface |
| 9     | VDD                      | Supply Voltage                     |
| 10    | --                       |                                    |
| 11    | NC                       | Do Not Connect                     |
| 12    | NC                       | Do Not Connect                     |
| 13    | --                       |                                    |
| 14    | --                       |                                    |

# Output Option: Digital I<sup>2</sup>C

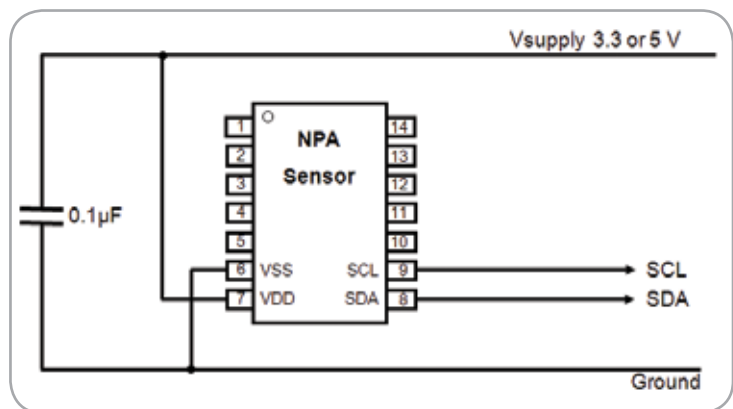
| Parameter                      | Units   | Min | Typ    | Max | Notes       |
|--------------------------------|---------|-----|--------|-----|-------------|
| <b>Digital Performance</b>     |         |     |        |     |             |
| Resolution (ADC)               | bit     |     | 14     |     | 16383 steps |
| I <sup>2</sup> C Slave Address |         |     | 0x28   |     |             |
| Sampling Rate                  | kHz     |     | 2      |     |             |
| I <sup>2</sup> C Bit Rate      | kbits/s | 100 |        | 400 |             |
| I <sup>2</sup> C Mode          |         |     | Update |     |             |

## Digital I<sup>2</sup>C Update Mode Output Options



## I2C Circuit NPA Pinout

| Pin # | Digital I <sup>2</sup> C | Function Notes                      |
|-------|--------------------------|-------------------------------------|
| 1     | --                       |                                     |
| 2     | --                       |                                     |
| 3     | NC                       | Do Not Connect                      |
| 4     | NC                       | Do Not Connect                      |
| 5     | --                       |                                     |
| 6     | VSS                      | Ground Supply                       |
| 7     | VDD                      | Supply Voltage                      |
| 8     | SDA                      | Serial Data, Calibration Interface  |
| 9     | SCL                      | Serial Clock, Calibration Interface |
| 10    | --                       |                                     |
| 11    | NC                       | Do Not Connect                      |
| 12    | NC                       | Do Not Connect                      |
| 13    | --                       |                                     |
| 14    | --                       |                                     |



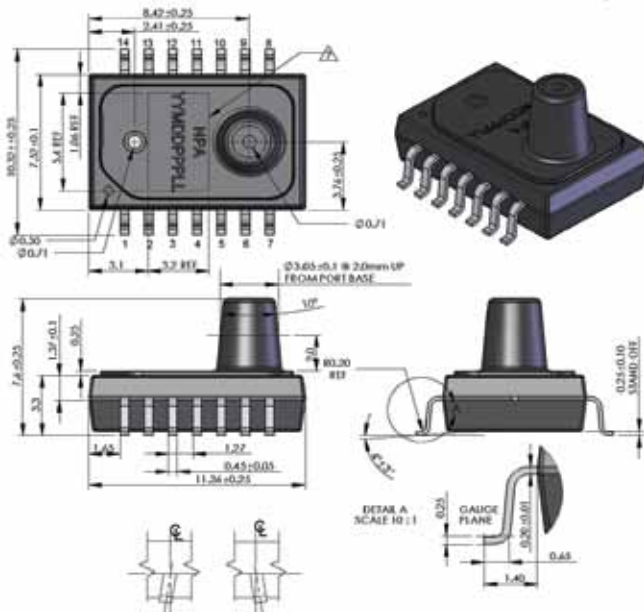
# Output Option: Uncalibrated mV

| NPA Uncalibrated Performance           |                           |                  |                |     |                 |                 |                   |     |                 |
|----------------------------------------|---------------------------|------------------|----------------|-----|-----------------|-----------------|-------------------|-----|-----------------|
|                                        |                           | 10 "H2O to 1 psi |                |     |                 | 5 psi to 30 psi |                   |     |                 |
| Parameter                              | Units                     | Min              | Typ            | Max | Notes           | Min             | Typ               | Max | Notes           |
| Pressure Range                         | psi                       |                  | 0.36 to 1      |     | 10"H2O = 2.5KPa |                 | 5 to 30           |     |                 |
| Excitation                             | mA                        |                  | 1.5            |     | 10 VDC Maximum  |                 | 1.0               |     | 10 VDC Maximum  |
| Input Impedance                        | $\Omega$                  |                  | 5000 $\pm$ 20% |     |                 |                 | 5000<br>$\pm$ 20% |     |                 |
| Output Impedance                       | $\Omega$                  |                  | 5000 $\pm$ 20% |     |                 |                 | 5000<br>$\pm$ 20% |     |                 |
| Zero Offset                            | mV                        |                  | $\pm$ 75       |     |                 |                 | $\pm$ 10          |     |                 |
| Full Scale Output                      | mV                        |                  | 40 to 120      |     | 10 "H2O         |                 | 100 to 166        |     | 5 psi to 30 psi |
|                                        |                           |                  | 75 to 135      |     | 1 psi           |                 |                   |     |                 |
| Linearity                              | %FSO                      |                  | $\pm$ 0.25     |     | BFSL            |                 | $\pm$ 0.25        |     |                 |
| Pressure Hysteresis                    | %FSO                      |                  | $\pm$ 0.20     |     |                 |                 | $\pm$ 0.15        |     |                 |
| Temperature Coefficient of Zero        | $\mu$ V/ V / $^{\circ}$ C |                  | $\pm$ 30       |     |                 |                 | $\pm$ 20          |     |                 |
| Temperature Coefficient of Resistance  | % / $^{\circ}$ C          |                  | 0.29           |     |                 |                 | 0.38              |     |                 |
| Temperature Coefficient of Sensitivity | %FSO/ $^{\circ}$ C        |                  | -0.2           |     |                 |                 | -0.19             |     |                 |
| Thermal Hysteresis of Zero             | %FSO                      |                  | $\pm$ 0.15     |     |                 |                 | $\pm$ 0.2         |     |                 |
| Position Sensitivity                   | %FSO                      |                  | 0.2            |     |                 |                 | N/A               |     |                 |

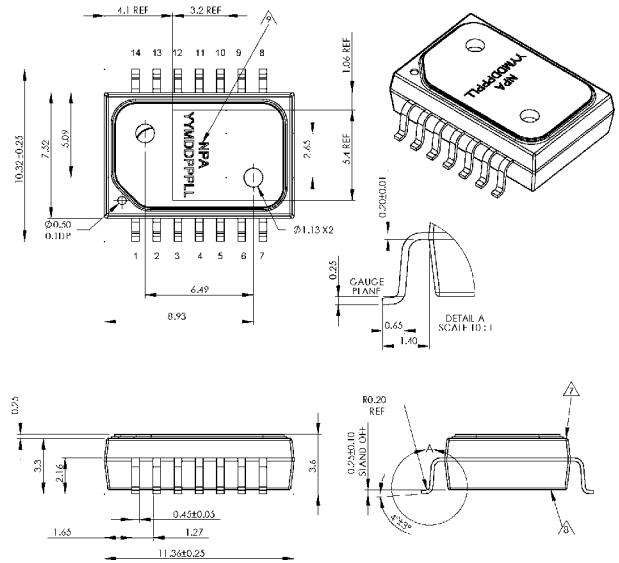
## NPA Pinout

| Pin # | Uncalibrated mV | Function Notes                       |
|-------|-----------------|--------------------------------------|
| 1     | --              |                                      |
| 2     | --              |                                      |
| 3     | VN              | Sensor Interface Negative Output     |
| 4     | VSSP            | Sensor Interface Ground              |
| 5     | --              |                                      |
| 6     | NC              | Do Not Connect                       |
| 7     | --              |                                      |
| 8     | NC              | Do Not Connect                       |
| 9     | NC              | Do Not Connect                       |
| 10    | --              |                                      |
| 11    | VP              | Sensor Interface Positive Output     |
| 12    | VDDP            | Sensor Interface Positive Excitation |
| 13    | --              |                                      |
| 14    | --              |                                      |

## Manifold Design (All measurements given in mm)

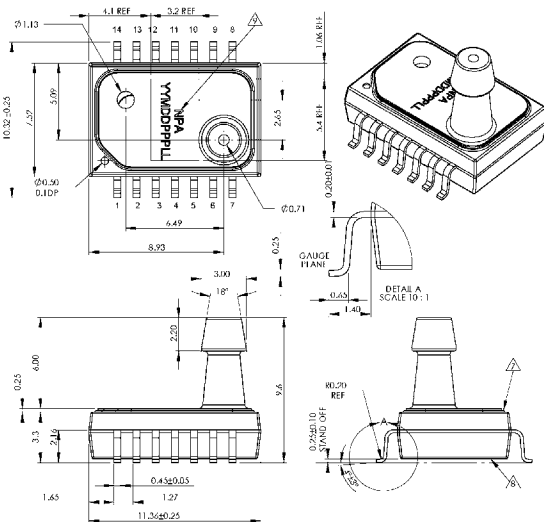


## No Port Design (All measurements given in mm)

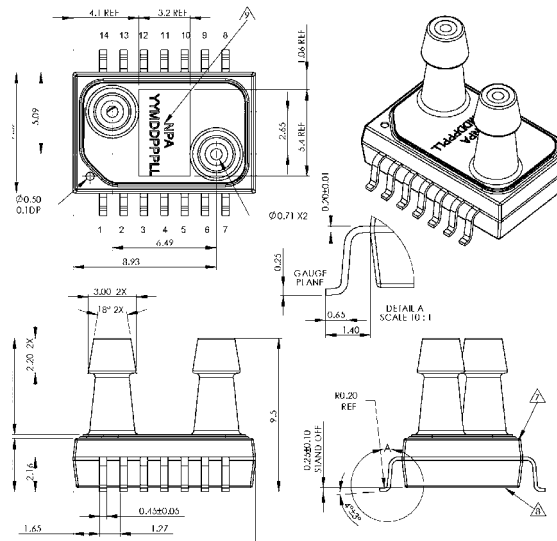


## Barbed Design

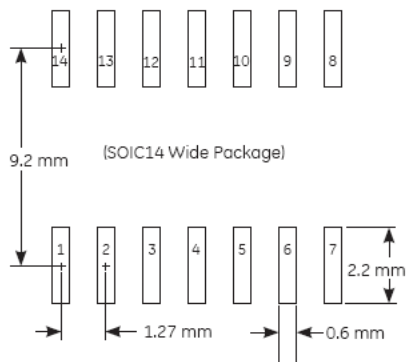
Recommended tubing size of 3/32" ID, 7/32" OD, 1/16" wall thickness (All measurements given in mm)



1 Barb Port — Request Required



## Suggested PCB Land Pattern



Package Leadframe Material: Alloy 194, NiPdAu Plated

## Ordering Information

### Model

NPA

#### Code Description

|     |                                                               |
|-----|---------------------------------------------------------------|
| 100 | mV Output, Ratiometric Uncalibrated sensor***                 |
| 300 | Analog Amplified Output, 3.3Vdc Excitation, Calibrated sensor |
| 500 | Analog Amplified Output, 5Vdc Excitation, Calibrated sensor   |
| 600 | Zacwire — Digital Serial Output, Calibrated Sensor, 2 byte    |
| 601 | Zacwire — Digital Serial Output, Calibrated Sensor, 3 byte    |
| 700 | I <sup>2</sup> C - Digital output, Calibrated Sensor, 2 byte  |

#### Code Port Type

|   |                                                                      |
|---|----------------------------------------------------------------------|
| M | 1 manifold port for Gauge and Absolute pressure types                |
| B | 2 barbed ports for Gauge, Absolute and Differential pressure types** |
| N | Non ported ***                                                       |

#### Code Pressure Range

|     |                  |
|-----|------------------|
| 10W | 10"H2O (2.5 KPa) |
| 001 | 1 PSI (7 KPa)    |
| 005 | 5 PSI (35 KPa)   |
| 015 | 15 PSI (100 KPa) |
| 030 | 30 PSI (200 KPa) |

#### Code Pressure Type

|     |              |
|-----|--------------|
| G   | Gauge        |
| D   | Differential |
| A * | Absolute     |

NPA - [ ] [ ] - [ ] [ ]

Note: \* Absolute pressure ranges are available in 15 PSIA and 30 PSIA only.

\*\* 1 barbed port available upon request.

\*\*\* Order NPA-100N-XXXG in place of NPA-100N-XXXD.

- Contact NovaSensor for custom pressure ranges.
- Refer to application guide 910-289 for more information.
- Product is RoHS:2010 compliant.

| NPA Product     | Dual/Single Barb | Manifold   | No Port    |
|-----------------|------------------|------------|------------|
| Qty/Tube        | 42 Units         | 42 Units   | 42 Units   |
| Qty/Reel        | 300 Units        | 448 Units  | 896 Units  |
| Qty/Reel/Carton | 6 Reels          | 6 Reels    | 6 Reels    |
| Qty/Carton      | 1800 Units       | 2688 Units | 5376 Units |

## Warranty

NovaSensor warrants its products against defects in material and workmanship for 12 months from the date of shipment. Products not subjected to misuse will be repaired or replaced. NovaSensor reserves the right to make changes without further notice to any products herein. NovaSensor makes no warranty, representation or guarantee regarding the suitability of its products for any particular application. NovaSensor does not assume any liability arising out of the application or use of any product or circuit and specifically disclaims, and all liability, without limitation consequential or incidental damages. The foregoing warranties are exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. No implied statutory warranty or merchantability or fitness for particular purpose shall apply.

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