

# NPX1

## NovaSensor Sensors



The NPX1 sensor represents the next generation of Remote Tire Pressure Monitoring (RTPM).

NPX1 sensor adds a silicon pressure sensor, a 8-bit RISC processor, and an LF-input stage to meet market demands for flexible, customer specific behavior/solutions and overall system cost reduction.

A programmable version of the sensor is available, allowing the customer to download the application code in an electrically programmable ROM version. This sensor is intended for developing the application specific program. In order to ensure high reliability, the NPX1 sensor has the measurement routines (pressure, temperature, and supply voltage) implemented in ROM. Routines for LF reception and UHF transmission are also implemented in ROM.

### Features

- 12 bit ADC
- 4k byte flash (E-ROM) for user application
- 4K ROM for library routines
- 128 byte RAM
- 128 byte EEPROM
- Battery management—minimizing power consumption
- Measure and compensate pressure,
- Media compatibility with tire pressure media
- 450, 700, and 1400 kPa absolute pressure ranges  
Custom ranges are available
- On chip temperature sensor
- On chip temperature shut down

# NPX1 Specifications

## General

### Operating Temperature

-40°F to 257°F (-40°C to 125°C)

### Storage Temperature

-67°F to 257°F (-55°C to 125°C)

### Battery Supply Voltage

2.1 to 3.6 V (3.0 V typical)

### Supply Current

600 nA typical power down current at 3.6 V

## Pressure Ranges

100 to 450, 100 to 700, 0 to 1400 is typical

### 450 kPa Resolution

- 1.37 kPa/LSB (450 kPa to 100 kPa/255)
- -40°F to 257°F (-40°C to 125°C)

### 700 kPa Resolution

- 2.35 kPa/LSB (700 kPa to 100 kPa/255)
- -40°F to 257°F (-40°C to 125°C)

### 1400 kPa Resolution

- 5.49 kPa/LSB (1400 kPa to 0 kPa/255)
- -40°F to 257°F (-40°C to 125°C)

### Over Pressure

10x

## Pressure Measurement

### Measurement Accuracy (2.1 to 3.6 V)

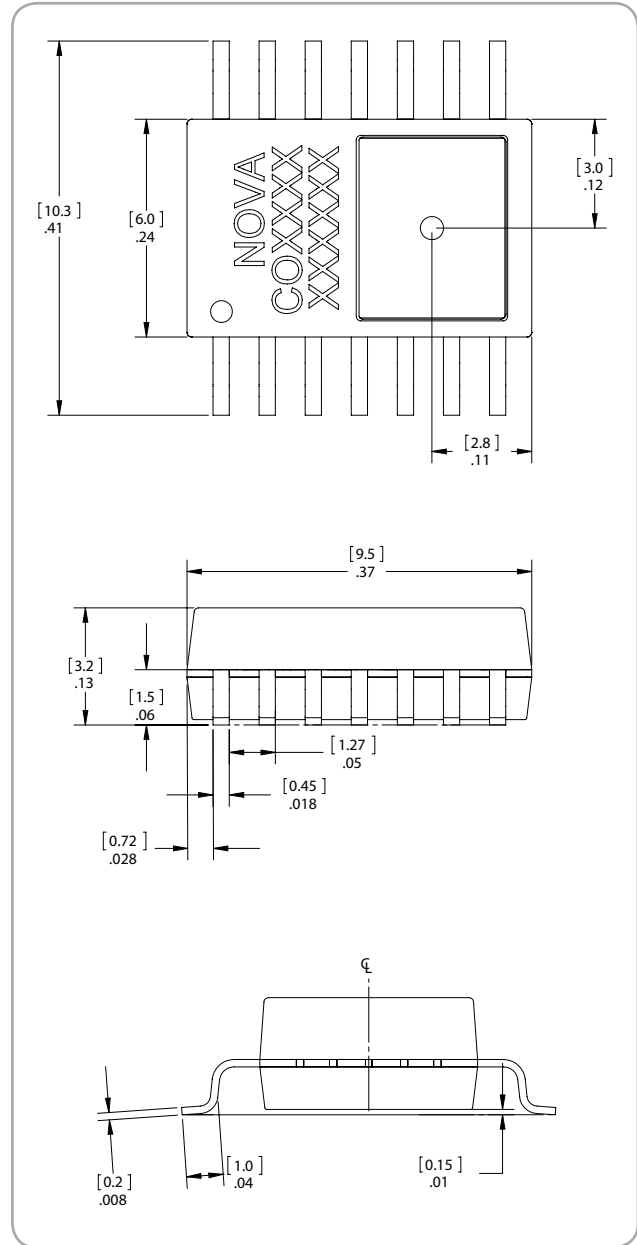
- -6 to 6 LSB (6 $\sigma$  capability), 32°F to 122°F (0°C to 50°C)
- -8 to 8 LSB, -40°F to 257°F (-40°C to 125 °C)

### Charge Consumption (All Pressure Ranges)

3.2 micro-coulombs; 77°F (25°C), 3V

### Battery Voltage Measurement

- $\pm 6$  LSB, -40°F to 257°F (-40°C to 125°C)
- 1 LSB = 10.8 mV/LSB
- 0.4 micro-coulombs charge consumption



NPX1 dimensions in [mm]

## Pressure Measurement

### Measurement Accuracy (2.1 to 3.6 V)

- -6 to 6 LSB (6  $\sigma$  capability), 32°F to 122°F (0°C to 50°C)
- -8 to 8 LSB, -40°F to 257°F (-40°C to 125 °C)

### Charge Consumption (All Pressure Ranges)

3.2 micro-coulombs; 77°F (25°C), 3V

### Battery Voltage Measurement

- $\pm 6$  LSB, -40°F to 257°F (-40°C to 125°C)
- 1 LSB = 10.8 mV/LSB
- 0.4 micro-coulombs charge consumption

# NPX1 Specifications

## Temperature Measurement

### Temperature Range

-40°F to 257°F (-40°C to 125°C)

### Resolution

1.0 °C/LSB; 401°F (-58°F)/255  
(205°C -(-50°C)/255)

### Measurement Accuracy (6FFcapability)

- ±10.8°F (±6°C), -4°F to 158°F (-20°C to 70°C)
- ±14.4°F (±8°C), -40°F to 257°F (-40°C to 125°C)

### Measurement Charge Consumption (77°F (25°C), 3.0 V)

- 0.8 micro-coulombs

## Temperature Maximum

SHTD represents the temperature at which the thermal shut-down function can be enabled and REL represents the temperature at which the master reset state is released.

### SHTD

- 239°F (115°C) maximum
- 2.1 to 3.6 V
- Thermal shut-down enabled

### REL

- 212°F (100°C) minimum
- 2.1 to 3.6 V
- Master reset release

## Voltage Minimum

The voltage at which the Vmin-circuit will return a low battery voltage status is specified in Vmin:

### Vmin

- 2.0 to 2.2 V (2.1 V typical)
- -40°F to 257°F (-40°C to 125°C)

## Transfer Functions

### 450 kPa Pressure

$$P = 1.3725 \times Po + 100$$

P = Pressure in kPa

Po = 8 bit scaled output pressure

### 700 kPa Pressure

$$P = 2.3529 \times Po + 100$$

P = Pressure in kPa

Po = 8 bit scaled output pressure

### 1400 kPa Pressure

$$P = 5.490 \times Po$$

P = Pressure in kPa

Po = 8 bit scaled output pressure

### Temperature

$$T = To - 50$$

T = Temperature in °F (°C)

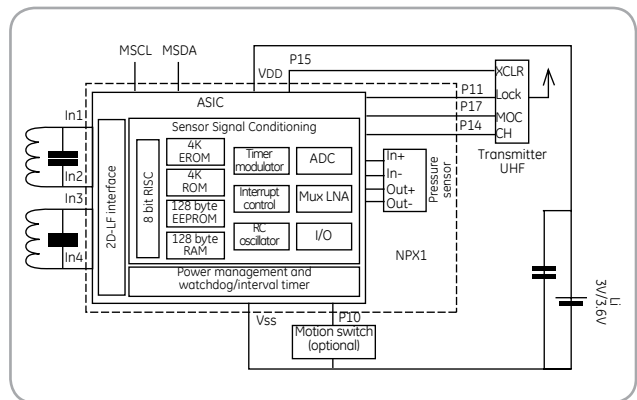
To = 8 bit scaled output temperature

### V Battery

$$V = 0.0108 \times Vo + 4$$

V = V Battery in V

Vo = 8 bit scaled output Vbattery



NPX1 block diagram

# NPX1 Specifications

## Detailed Performance

Pin	Name	Function	Note
1	IN4	LF receiver channel 2, negative input	
2	P10	General purpose I/O with external wakeup feature, internal pull-up/pull-down	1
3	P11	General purpose I/O with external wakeup feature, internal pull-up/pull-down	
4	MSDA	Monitor Serial Data I/O with internal pull-up	3
5	MSCL	Monitor Serial Clock output	3
6	VDD	Battery supply voltage (positive terminal)	
7	NC		
8	VSS	Common ground (negative terminal)	
9	P17	General purpose I/O or Modulator for UHF transmitter	2
10	P15	General purpose I/O or external system clock reference input	
11	P14	General purpose I/O or Modulator for UHF transmitter	2
12	IN1	LF receiver channel 1, positive input	
13	IN2	LF receiver channel 2, negative input	
14	IN3	LF receiver channel 2, positive input	

- 1) P10/P11 inputs have internal pull-up and must be left unconnected if not in use.
- 2) The functions of P14 and P17 may be interchanged by software.
- 3) Actual pad function determined by boot sequence. MSCL is an output and must be unconnected in the application. MSDA feature an on-chip pull-up to VBAT may be left open or terminated to VBAT in the application.

## Ordering Information

### Use this code when ordering

NPX-C017		
Code	Description	Shipping
67	450 kPa	Tape and reel
68	700 kPa	Tape and reel
69	1400 kPa	Tape and reel

NPX-C017 \_\_\_ - \_T\_\_      Typical model number

### Notice

The customer has sole responsibility for designing and implementing a solution, which will ensure safe operation including review of appropriate reliability, required redundancy, mitigation of failure modes and meeting appropriate standards. The customer is responsible for review of any conditions for use including, but not limited to: environmental conditions, electrical supply and residual risk.