

# 2SMPP-03

MEMS Gauge Pressure Sensor

## MEMS Gauge Pressure Sensor Featuring Small Size and Low Power Consumption

- Superior electrical characteristics  
at -50 kPa to 50 kPa pressure range.  
Offset voltage of  $-2.5 \pm 4.0$  mV  
Span voltage of  $42.0 \pm 5.5$  mV  
(At rated pressure 50 kPa, 100  $\mu$ ADC Current supply)
- Small package  $6.1 \times 4.7 \times 8.2$  mm (L x W x H).
- Good temperature dependency  
at 0 to 85°C, at rated pressure 0 to 50 kPa  
Temp. influence of span of  $\pm 3.0\%$ FS  
Temp. influence of offset of  $\pm 5.0\%$ FS  
(100  $\mu$ ADC Current supply)
- Rated power consumption of 0.2 mW



RoHS Compliant



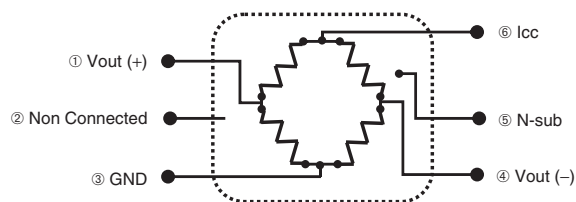
Refer to the *Safety Precautions* on page 7.

## Ordering Information

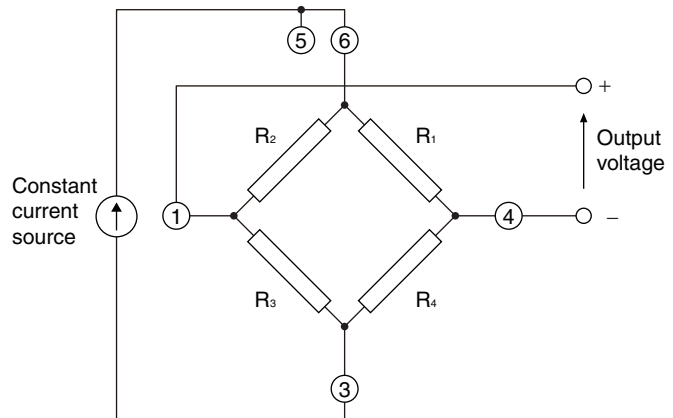
Standard Models with Surface mount package

Model	Classification	Structure	Packaging	MOQ (Minimum Order Quantity)
2SMPP-03	Bottom Port Type	SOP	Plastic sleeve	112 pcs/ 1 sleeve

## Terminal Arrangement



## Connection Diagram



Note: If necessary, add a variable resistor below the GND pin (3).  
The NC pin (2) must be secured to the circuit board.

## Application Examples

- Home appliance
- Air movement control
- Level indicators
- Leak detection
- Pressure controller

## Specifications

### ■ Ratings

Item	2SMPP-03
Type of pressure	Gauge pressure
Sensing method	Piezoresistance
Pressure medium	Air
Driving method	Constant current drive
Drive current	100 $\mu$ ADC
Pressure range	-50 to 50 kPa
Withstand pressure	-80 to 120 kPa
Absolute maximum current	200 $\mu$ ADC max.
Ambient operating temperature	-10 to 100°C (with no icing and condensation)
Ambient operating humidity	10 to 95%RH (with no icing and condensation)
Ambient storage temperature	-40 to 120°C (with no icing and condensation)
Ambient storage humidity	10 to 95%RH (with no icing and condensation)
Weight	0.17 g

Note: 1. The above values are initial values measured at ambient temperature condition of 23°C.

Note: 2. Please avoid caustic gases.

## Characteristics

### ■ Operating characteristics

#### Positive pressure (at rated pressure 0 to 50 kPa)

Item	Min.	Typ.	Max.	Unit
Supply current	-	100	-	μADC
Bridge resistance	18.0	20.0	22.0	kohm
Operating pressure range	0	-	50	kPa
Offset voltage	-6.5	-2.5	1.5	mV
Span voltage	36.5	42.0	47.5	mV
Non-linearity	0.3	0.8	1.3	%FS
Pressure hysteresis	-0.2	0.0	0.2	%FS
Temperature influence of span voltage at 0°C	-1.0	1.0	3.0	%FS
Temperature influence of span voltage at 50°C	-2.1	-0.1	1.9	%FS
Temperature influence of span voltage at 85°C	-2.0	1.0	4.0	%FS
Temperature influence of offset voltage at 0°C	-4.0	-1.0	2.0	%FS
Temperature influence of offset voltage at 50°C	-2.0	1.0	4.0	%FS
Temperature influence of offset voltage at 85°C	-3.0	2.0	7.0	%FS

#### Negative pressure (at rated pressure 0 to -50 kPa)

Item	Min.	Typ.	Max.	Unit
Supply current	-	100	-	μADC
Bridge resistance	18.0	20.0	22.0	kohm
Operating pressure range	-50	-	0	kPa
Offset voltage	-6.5	-2.5	1.5	mV
Span voltage	-48.5	-43.0	-37.5	mV
Non-linearity	-0.3	0.2	0.7	%FS
Pressure hysteresis	-0.2	0.0	0.2	%FS
Temperature influence of span voltage at 0°C	-1.2	0.8	2.8	%FS
Temperature influence of span voltage at 50°C	-1.9	0.1	2.1	%FS
Temperature influence of span voltage at 85°C	-1.8	1.2	4.2	%FS
Temperature influence of offset voltage at 0°C	-4.0	-1.0	2.0	%FS
Temperature influence of offset voltage at 50°C	-2.0	1.0	4.0	%FS
Temperature influence of offset voltage at 85°C	-3.0	2.0	7.0	%FS

Note: 1. The above values are initial values.

Note: 2. Ambient temperature condition: 23°C without Temperature property.

Note: 3. The above values are operated at 100 μADC

Note: 4. The above values are operated at 0 to 50 kPa, and 0 to -50 kPa.

Note: 5. Offset voltage is defined as the output voltage at 0 kPa rated pressure.

Note: 6. Positive span voltage is defined as the algebraic difference between the output voltage at 50 kPa rated pressure and the output voltage at 0 kPa rated pressure.

Note: 7. Negative span voltage is defined as the algebraic difference between the output voltage at -50 kPa rated pressure and the output voltage at 0 kPa rated pressure.

Note: 8. Hysteresis is defined as follows,

In case of positive pressure:

{The output voltage difference at 0 kPa before and after a pressure cycle (0 to 50 to 0 kPa)} / (span voltage) × 100 [%FS].

In case of negative pressure:

{The output voltage difference at 0 kPa before and after a pressure cycle (0 to -50 to 0 kPa)} / (span voltage) × 100 [%FS].

Note: 9. Temperature influence of span voltage is defined as follows,

{Span voltage at 0°C. - span voltage at 25°C.} / span voltage at 25°C. × 100 [%FS]

{Span voltage at 50°C. - span voltage at 25°C.} / span voltage at 25°C. × 100 [%FS]

{Span voltage at 85°C. - span voltage at 25°C.} / span voltage at 25°C. × 100 [%FS]

Note: 10. Temperature influence of offset voltage is defined as follows,

{Offset voltage at 0°C. - offset voltage at 25°C.} / span voltage at 25°C. × 100 [%FS]

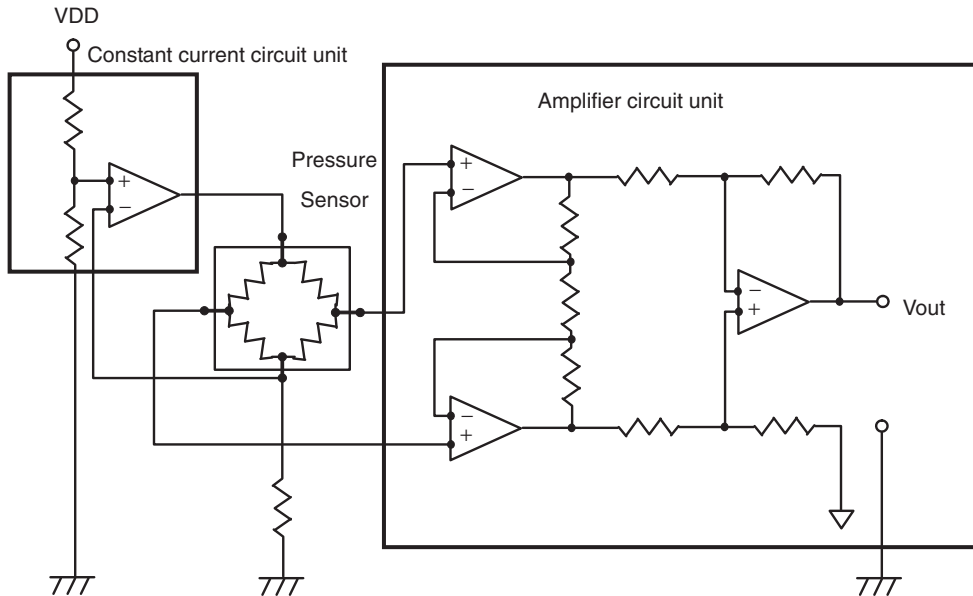
{Offset voltage at 50°C. - offset voltage at 25°C.} / span voltage at 25°C. × 100 [%FS]

{Offset voltage at 85°C. - offset voltage at 25°C.} / span voltage at 25°C. × 100 [%FS]

### Environment characteristics

Item	2SMPP-03	
Vibration Resistance	Destruction	10 to 500 Hz 10 G
	Malfunction	10 to 500 Hz 10 G
Shock Resistance	Destruction	15 G
	Malfunction	15 G
Life Expectancy	100,000 Operations min. (0 to 75 kPa)	
ESD	1,000 V (Human body model)	
Package Material	PPS (Polyphenylenesulfide)	

## Example of Application Circuit for MEMS Pressure Sensor

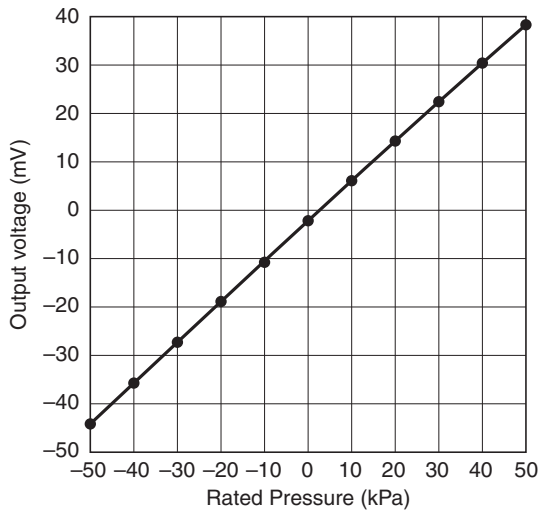


- (1) The pressure sensor is designed to convert a voltage by means of constant current drive.
- (2) Please amplifier the output voltage of the pressure sensor by using the amplifying circuit if necessary.

## Engineering Data (for Reference)

### Output Characteristics

#### Rated Pressure vs. Output Voltage



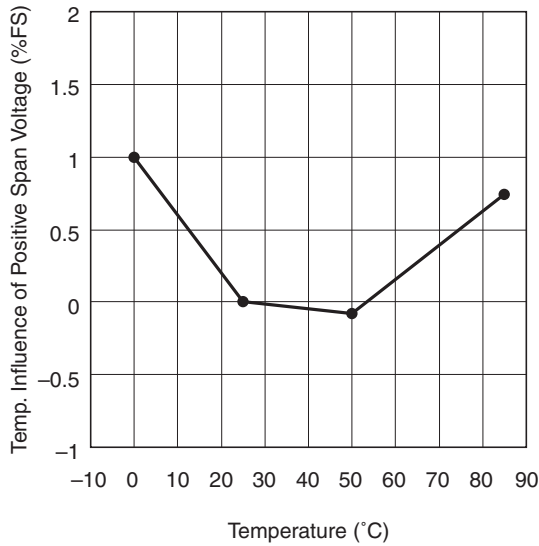
Note: 1. Ambient temperature condition: 23°C.

Note: 2. Drive current: 100  $\mu$ A

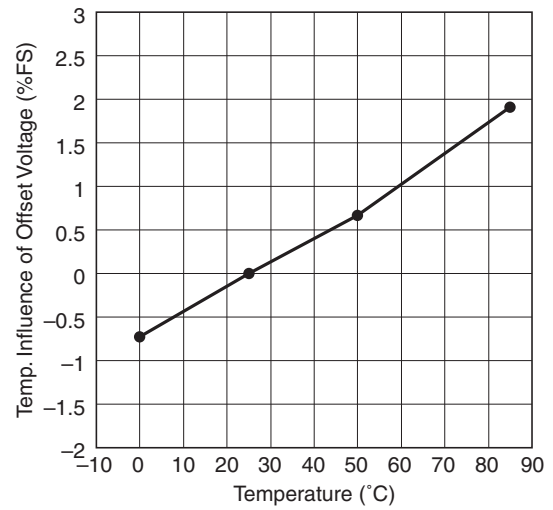
Note: 3. These output voltage characteristics are measured with tester without a mounting board.

Note: 4. The output voltage characteristics may be influenced by the mounting board. Be sure to check operation including durability in actual equipment before use.

**Temperature influence of Span voltage (at 0 to 50 kPa)**



**Temperature influence of Offset voltage (at 0 kPa)**



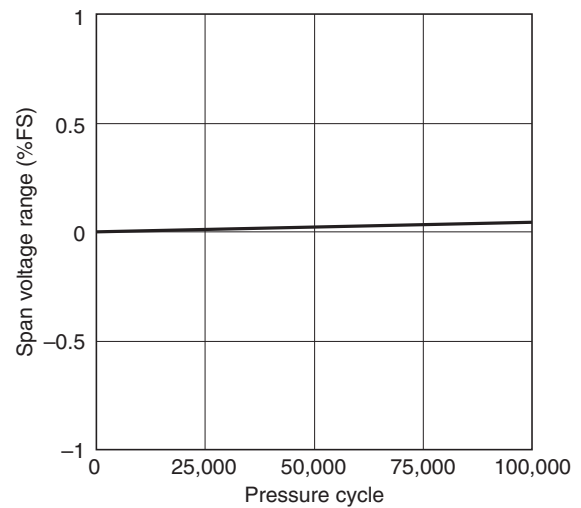
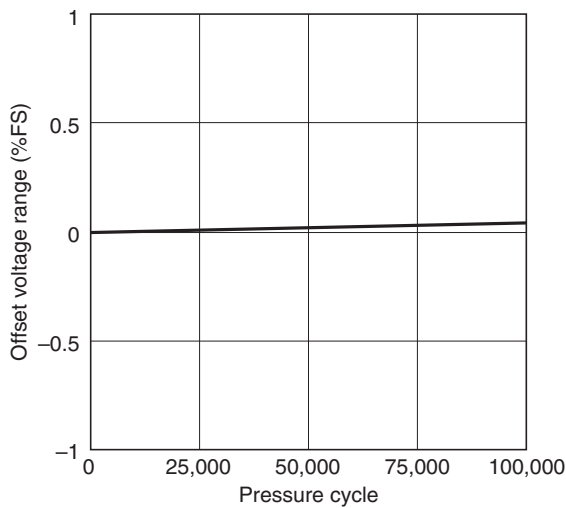
Note: 1. Measured points are 0°C, 25°C, 50°C and 85°C at 0 to 50 kPa.

Note: 2. Drive current: 100 μA

Note: 3. These output voltage characteristics are measured with tester without a mounting board.

Note: 4. The output voltage characteristics may be influenced by the mounting board. Be sure to check operation including durability in actual equipment before use.

**Pressure Cycle Range (0 to 75 kPa)**



Note: 1. Tested temperature condition: 25°C

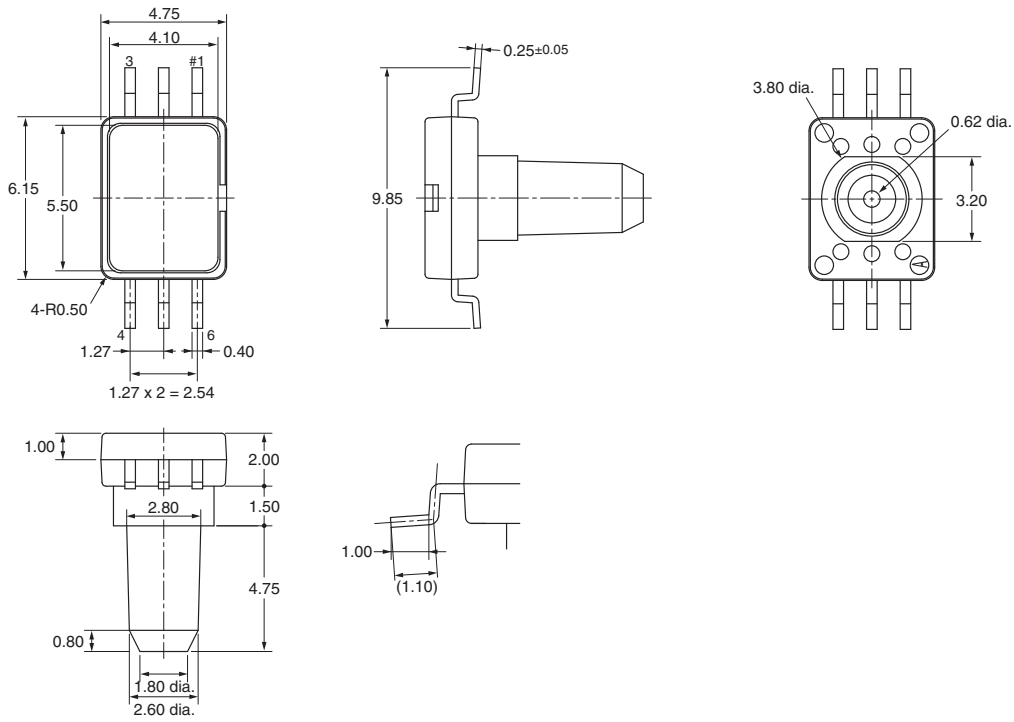
Note: 2. Number of pressure cycle time:  $1 \times 10^5$

Note: 3. Rated cycle pressure: 0 to 75 kPa

Note: 4. These output voltage characteristics are measured with tester without a mounting board.

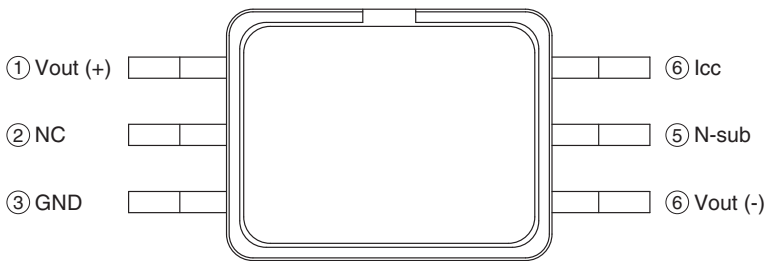
## Dimensions

Note: All units are in millimeters unless otherwise indicated.

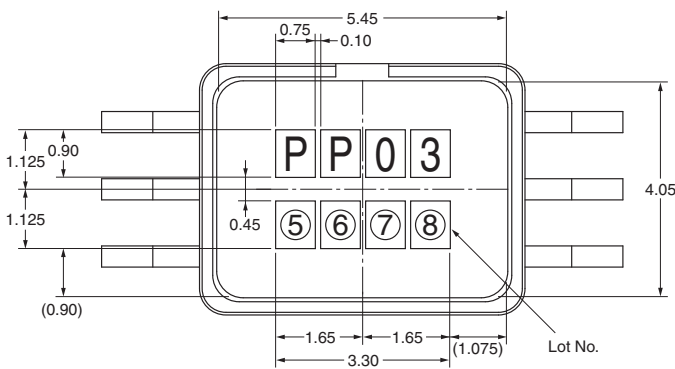


### Pin Diagram (Top Surface of Sensor)

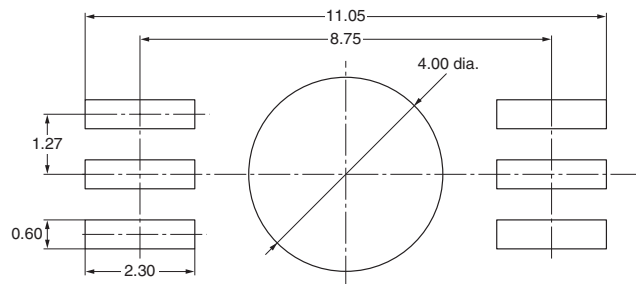
Atmospheric pressure hole



### Markings



### Recommended Pad Dimensions



Note: Unless otherwise specified, the tolerance for all of the above drawings is ±0.3 mm.

## Safety Precautions

### Precautions for Correct Use

#### Handling the Sensor

- (1) Only air can be used as pressure media on the products directly. It is prohibited to use pressure media including corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases), fluid and any other foreign materials.
- (2) The products are not water proof. Please keep dry in use.
- (3) Don't use the products under dew-condensing conditions. Frozen fluid on sensor chips may also cause fluctuation of sensor output and any other troubles.
- (4) Don't put foreign materials (e.g. a wire and a pin) into a connecting tube. It may cause breakage of pressure sensor chips or fluctuation of sensor output caused by clogging the tube.
- (5) Use the products within rated pressure. Usage at pressure out of the range may cause breakage.
- (6) Don't use under high-frequency vibration including ultrasonic wave.
- (7) The products may be broken by static electricity. Charged materials (e.g. a workbench and a floor) and workers must provide measures against static electricity, including ground connection.
- (8) Overpowering terminals may deform them and detract their solder abilities. Don't drop and handle the products roughly.
- (9) Don't use the products under humid or dusty condition.
- (10) Terminals connection of pressure sensors must be handled as directed by a connection diagram.

#### Environmental Condition for Transportation and Storage

- (1) It is prohibited to keep the products with corrosive gases (e.g. organic solvents gases, sulfur dioxide and hydrogen sulfide gases).
- (2) The products are not water proof. Please keep dry during storage.
- (3) An anti-static treatment has been applied to the sleeves. Please note the following points.
  1. Getting wet may remove an anti-static treatment and eliminate its effect.
  2. The sleeve may feel sticky under hot and humid condition due to the nature of the anti-static treatment.
  3. Anti-static has aging degradation. It is prohibited to keep the sleeves for more than six months. The sleeves are also non-reusable.

- (4) Keep in an appropriate temperature and humidity condition specified as  
Temperature : 5 to 30°C , Humidity : 40 to 60%.
- (5) As the lead is plated with silver, there is a possibility of being tarnished depending on storage condition.  
Not guarantee the tarnishing after shipping. Be careful the method of storage.
- (6) Don't keep the products under humid or dusty condition.

#### Mounting Method

- Use lands on the printed-circuit boards to which the sensor can be securely fixed.
- Fix pin No.2 on the printed-circuit boards, not fixed causes fluctuation of sensor output signals.

#### Soldering Method

- Due to its small size, the thermal capacity of the pressure sensor is low. Therefore, take steps to minimize the effects of external heat.
- Dip soldering bath: Max. 260°C, within 10 sec.
- Soldering iron: Max. 260°C, within 10 sec.
- Do not heat the case of sensor package, heat only terminal.
- Use a non-corrosive resin type of flux. Since the pressure sensor chip is exposed to the atmosphere, do not allow flux to enter inside.

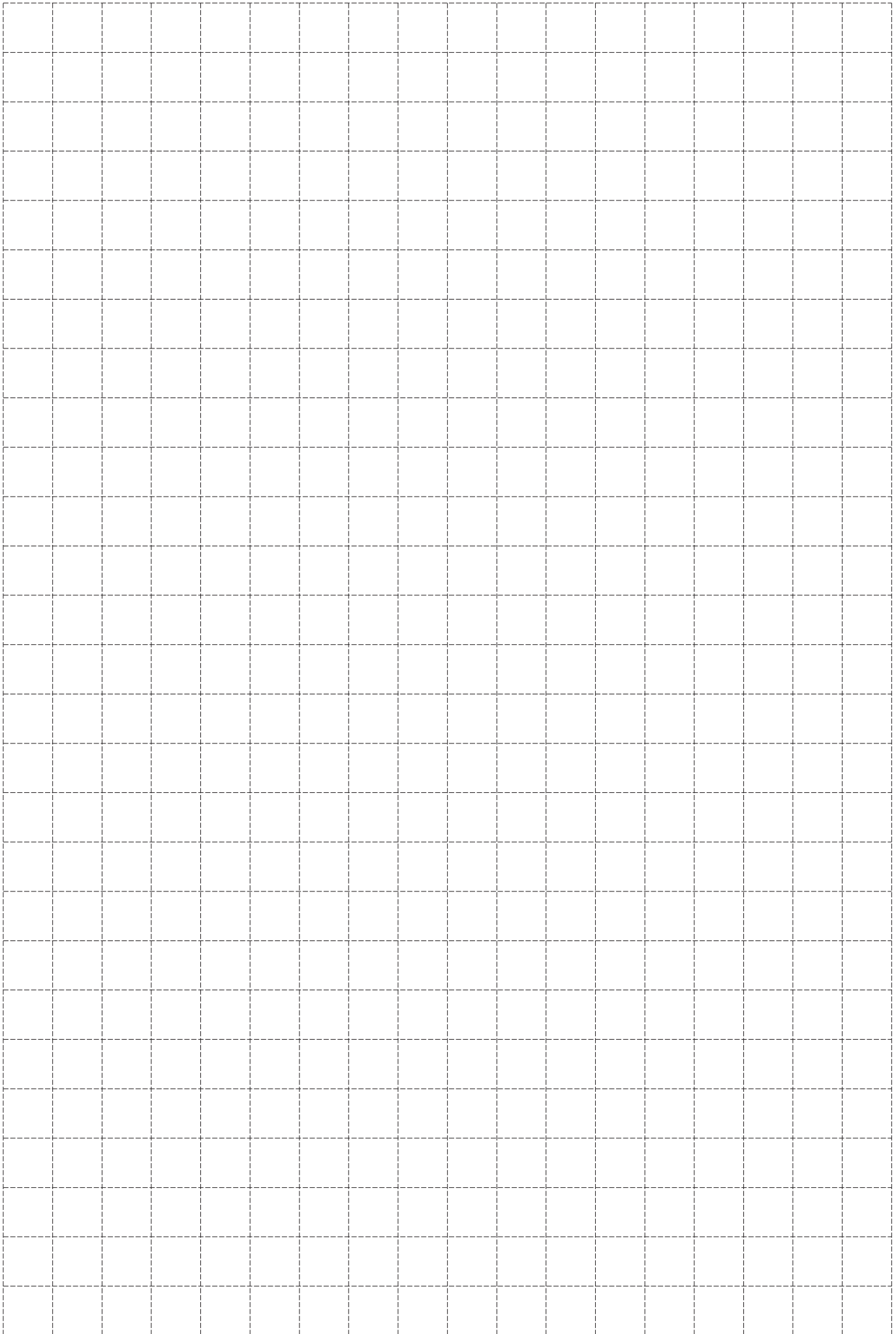
#### Cleaning

- Since the pressure sensor chip is exposed to atmosphere, do not allow cleaning fluid to enter inside.
- Avoid ultrasonic cleaning since this may cause breaks or disconnections in the wiring.
- Do not wash the print circuit board after the pressure sensor is mounted using detergent containing silicone. Otherwise, the detergent may remain on the surface of the pressure sensor.

#### Coating

- Do not coat the pressure sensor when it is mounted to the print circuit board.

MEMO





# Terms and Conditions Agreement

## Read and understand this catalog.

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

## Warranties.

- (a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.
- (b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See <http://www.omron.com/global/> or contact your Omron representative for published information.

## Limitation on Liability; Etc.

OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

## Suitability of Use.

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

## Programmable Products.

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

## Performance Data.

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

## Change in Specifications.

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

## Errors and Omissions.

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Please check each region's Terms & Conditions by region website.

---

## **OMRON Corporation**

**Electronic and Mechanical Components Company**

### **Regional Contact**

**Americas**

<https://www.components.omron.com/>

**Asia-Pacific**

<https://ecb.omron.com.sg/>

**Korea**

<https://www.omron-ecb.co.kr/>

**Europe**

<http://components.omron.eu/>

**China**

<https://www.ecb.omron.com.cn/>

**Japan**

<https://www.omron.co.jp/ecb/>