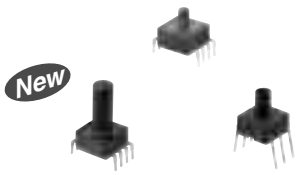
Panasonic
ideas for life

Pressure sensor with built-in amplification and temperature compensation circuit. Low pressure type ideal for water level detection applications added to lineup.

PS-A PRESSURE SENSOR
(built-in amplification and temperature compensating circuit)



<Low pressure type>

RoHS Directive compatibility information
http://www.mew.co.jp/ac/e/environment/

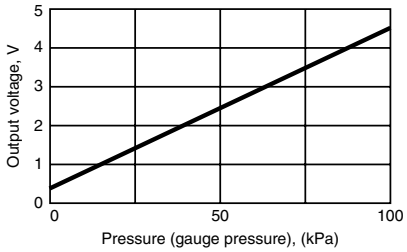
FEATURES

1. Contains built-in amplification and temperature compensation circuit. Circuit design and adjustment of characteristics are not required by users.

2. High-level precision and high reliability realized.
- Overall accuracy is ±1.25% FS (Standard type)
- Overall accuracy is ±4% FS (Economy type)
- Overall accuracy is ±2.5% FS (Low pressure type)

3. Compact pressure sensor unit that saves space.
Same size and as previous PS pressure sensor.
- Footprint 7.0 mm (W) x 7.2 mm (D)
- 10.4 mm (W) x 10.4 mm (D) (Low pressure type)

Example of pressure characteristics
(ADP5140)
Drive voltage: 5V DC rated voltage; ambient temperature: 25°C 77°F



TYPICAL APPLICATIONS

(Please evaluate under actual conditions before using.)
- **Industrial use (pressure switches and pneumatic devices, etc.)**
- **Medical use (blood pressure monitors, oxygen concentrators, air beds, etc.)**
- **Other pneumatically operated pressure devices**

Low pressure type

1. Water level detection for household appliances
Washing machines and dishwashers.
2. Air pressure control
Clean rooms and separate rooms for smokers.
3. Medical applications
Respiratory equipment monitoring, etc.

ORDERING INFORMATION

ADP5 □ □ □ □

<Product name>
PS-A pressure sensor

<Terminal profile>
1: DIP terminal

<Rated pressure>
0: ±100 kPa
1: −100 kPa
2: 25 kPa
3: 50 kPa
4: 100 kPa
5: 200 kPa
6: 500 kPa
7: 1,000 kPa
A: 40 kPa
B6: 6 kPa (Low pressure type)

<Pressure inlet hole>
0: length 3 mm, diameter 3 mm
1: length 5 mm, diameter 3 mm
2: length 13.5 mm, diameter 5.45 mm

<Type>
None: Standard type (with glass base)
1: Economy type (without glass base)

Note: Some part numbers may not be available depending on the combination. Please refer to the Table of Product Types on the next page.

PRODUCT TYPES

Pressure \ Pressure inlet hole length		Part No.			
		3mm	5mm	Low pressure type	
				5mm	14.5mm
Pressure \ Terminal		DIP terminal	DIP terminal	DIP terminal	DIP terminal
Standard type (with glass base)	±100kPa	ADP5100	ADP5101	—	—
	–100kPa	ADP5110	ADP5111	—	—
	25kPa	ADP5120	ADP5121	—	—
	50kPa	ADP5130	ADP5131	—	—
	100kPa	ADP5140	ADP5141	—	—
	200kPa	ADP5150	ADP5151	—	—
	500kPa	ADP5160	ADP5161	—	—
	1,000kPa	ADP5170	ADP5171	—	—
Economy type (without glass base)	40kPa	—	ADP51A11	—	—
Low pressure type	6kPa	—	—	ADP51B61	ADP51B62

SPECIFICATIONS

1. Standard type

Item		Standard type (with glass base)								Remarks
Type of pressure		Gauge pressure								
Pressure medium		Air								Note*1
Rated pressure	Unit: kPa	±100	–100	25	50	100	200	500	1,000	
Max. applied pressure		Twice the rated pressure							1.5 times the rated pressure	
Drive voltage		5±0.25V DC								
Temperature compensation range		0 to 50°C 32 to 122°F								
Offset voltage		2.5±0.05	0.5±0.05V							Note*2
Rated output voltage		4.5±0.05 (when +100kPa)	4.5±0.05V							Note*2
Overall accuracy		±1.25%FS								Note*2 Note*3
Current consumption		Max. 10mA								
Output impedance		Approx. 50Ω								
Source current		Max. 0.2mA								
Sink current		Max. 2mA								

Notes) 1. Please consult us for pressure media other than air.
2. Indicates output when drive voltage is 5 V. Although output fluctuates due to fluctuations in the drive voltage, this is not included.
3. Overall accuracy indicates the accuracy of the offset voltage and rated output voltage at temperatures between 0 to 50°C 32 to 122°F (Low pressure type: 0 to 70°C 32 to 158°F). (FS=4V)
4. Overall accuracy indicates accuracy after adjusting auto offset to zero.

2. Economy type

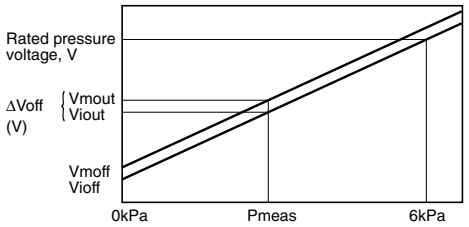
Item		Economy type (without glass base)	Remarks
Type of pressure		Gauge pressure	
Pressure medium		Air	Note*1
Rated pressure	Unit: kPa	40	
Max. applied pressure		Twice the rated pressure	
Drive voltage		3±0.15V DC	
Temperature compensation range		5 to 45°C 41 to 113°F	
Offset voltage		0.3±0.09V	Note*2
Span voltage		2.4±0.03V	Note*2
Overall accuracy		±4%FS	Note*2 Note*3
Current consumption		Max. 3mA	
Output impedance		20Ω (typ.)	
Source current		Max. 0.15mA	
Sink current		Max. 1.5mA	

Notes) 1. Please consult us for pressure media other than air.
2. Indicates output when drive voltage is 3 V. Although output fluctuates due to fluctuations in the drive voltage, this is not included.
3. Overall accuracy indicates the accuracy of the offset voltage and rated output voltage at temperatures between 5 to 45°C 41 to 113°F (Low pressure type: 0 to 70°C 32 to 158°F). (FS=4V)

3. Low pressure type

Item		Low pressure type	Remarks
Type of pressure		Gauge pressure	
Pressure medium		Air	Note*1
Rated pressure	Unit: kPa	6	
Max. applied pressure		Twice the rated pressure	
Drive voltage		5±0.25V DC	
Temperature compensation range		0 to 70°C 32 to 158°F	
Offset voltage		0.5V	Note*2
Span voltage		4.0V	Note*2
Overall accuracy		±2.5%FS	Notes*2, *3 and *4
Current consumption		Max. 10mA	
Output impedance		Approx. 50Ω	
Source current		Max. 0.2mA	
Sink current		Max. 2.0mA	

Notes) 1. Please consult us for pressure media other than air.
2. Indicates output when drive voltage is 5 V. Although output fluctuates due to fluctuations in the drive voltage, this is not included.
3. Overall accuracy indicates the accuracy of the offset voltage and span voltage at temperatures between 0 to 70°C 32 to 158°F (FS=4V)
4. Overall accuracy indicates accuracy after adjusting auto offset to zero.

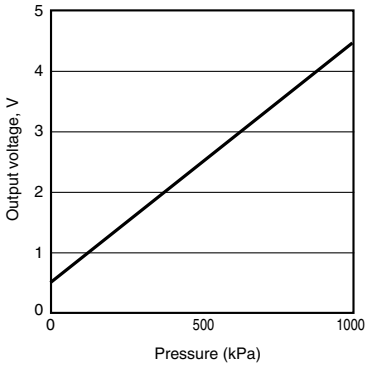


5. Where no particular temperature is indicated, the specification is for use at 25°C 77°F.

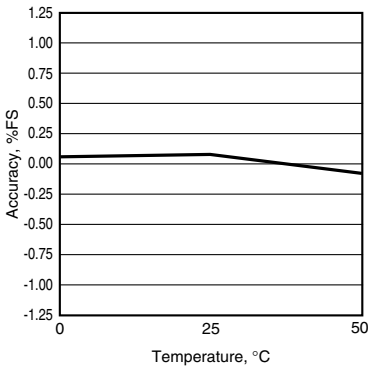
DATA

1. Standard and Economy types

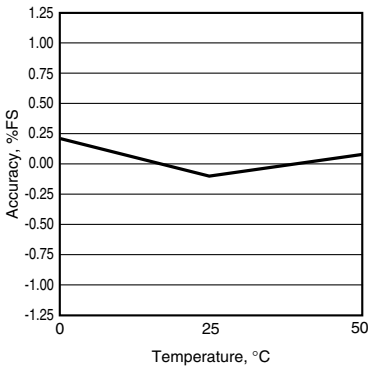
1.-(1) Output voltage
ADP5170
Drive voltage: 5V DC
Temperature: 25°C 77°F
Applied pressure: 0 to +1,000kPa



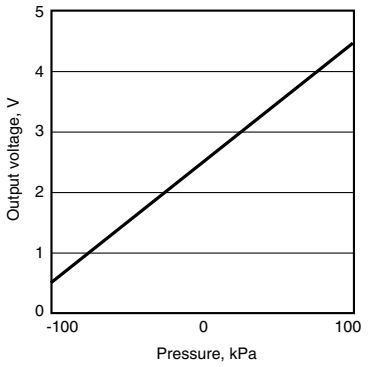
1.-(2) Overall accuracy (Offset voltage)
ADP5170
Drive voltage: 5V DC
Temperature: 0 to 50°C 32 to 122°F
Applied pressure: 0kPa



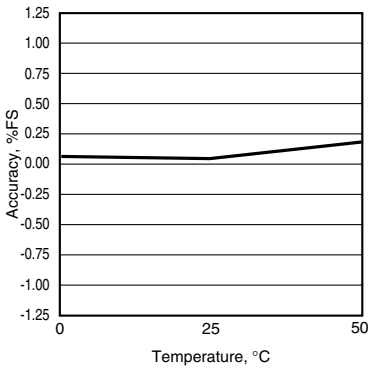
1.-(3) Overall accuracy (Rated output voltage)
ADP5170
Drive voltage: 5V DC
Temperature: 0 to 50°C 32 to 122°F
Applied pressure: +1,000kPa



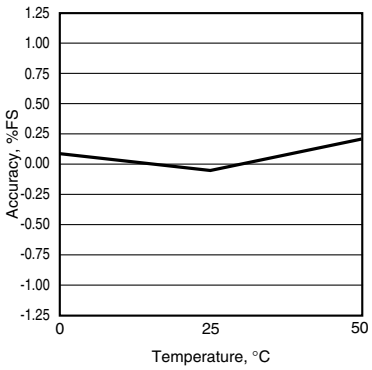
2.-(1) Output voltage
ADP5100
Drive voltage: 5V DC
Temperature: 25°C 77°F
Applied pressure: –100 to +100kPa



2.-(2) Overall accuracy (Offset voltage)
ADP5100
Drive voltage: 5V DC
Temperature: 0 to 50°C 32 to 122°F
Applied pressure: 0kPa

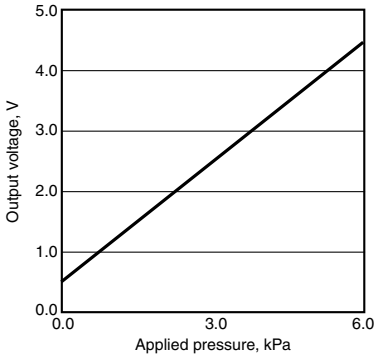


2.-(3) Overall accuracy (Rated output voltage)
ADP5100
Drive voltage: 5V DC
Temperature: 0 to 50°C 32 to 122°F
Applied pressure: +100kPa

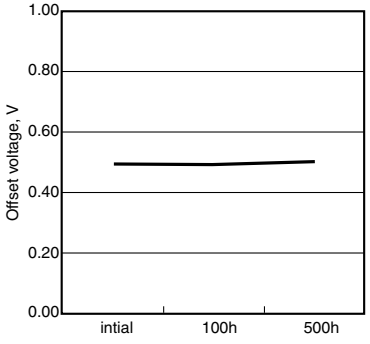


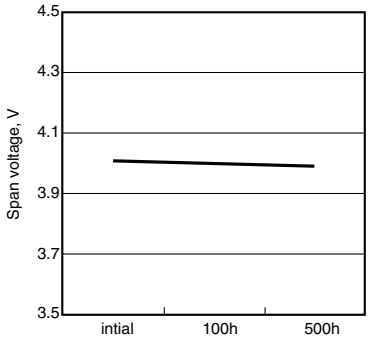
2. Low pressure type

1. Output voltage
ADP51B61
Drive voltage: 5V
Temperature: 25°C 77°F
Applied pressure: 0 to 6kPa

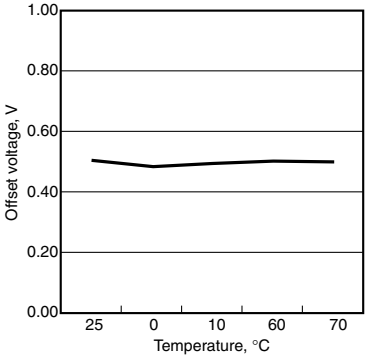


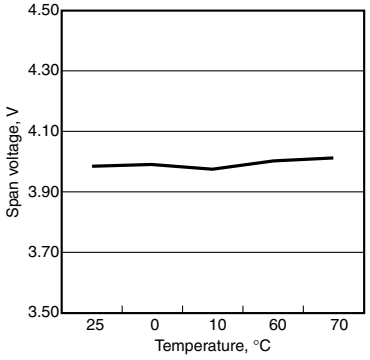
2. THB (high temperature high humidity bias test)
ADP51B61
Within 85°C and 85% RH
5 V applied between No. 2 (Vdd) and No. 3 (GND)
Applied pressure: 0kPa



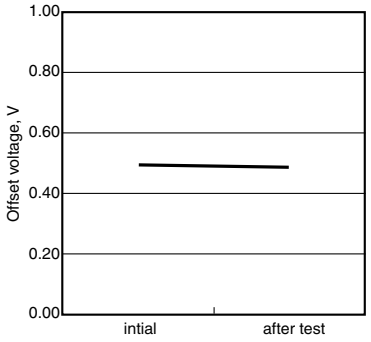


3. Ambient temperature characteristics
Ambient temperature: 25°C → 0°C → 10°C → 60°C → 70°C

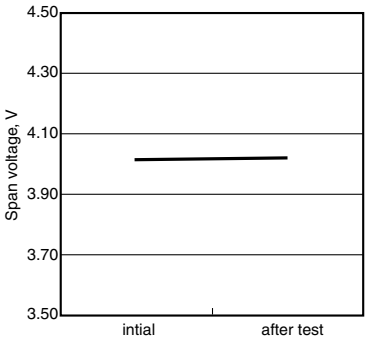


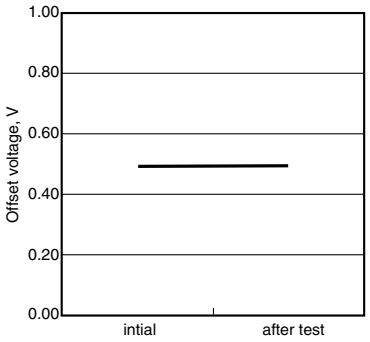


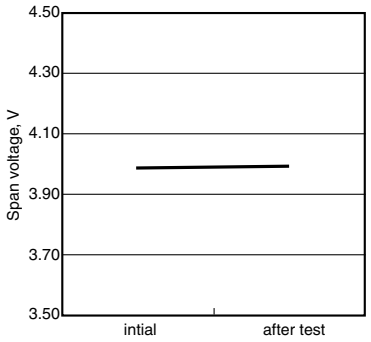
4. Shock test
ADP51B61
Shock applied:
981 m/s² 3 times in x, y and z directions
Applied pressure: 0kPa



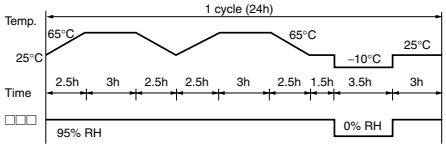
5. Vibration test
ADP51B61
Vibration applied: 10 to 55 Hz, amplitude: 1.5mm, x, y and z directions, 2 hrs each
Applied pressure: 0kPa

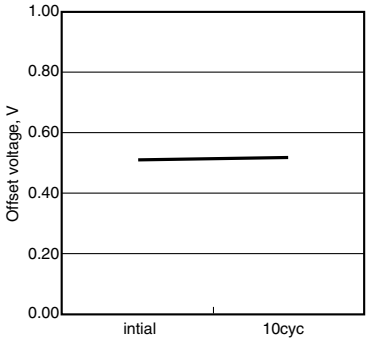


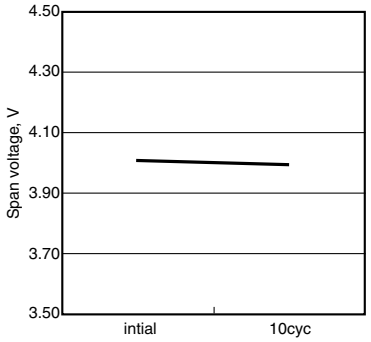




6. Temperature/humidity cycle test
ADP51B61
Exposed to 10 cycles in the temperature and humidity conditions given below.
Applied pressure: 0kPa







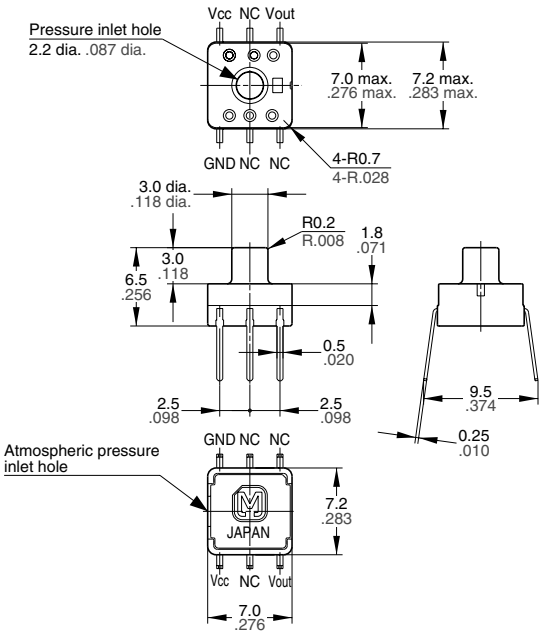
3. Evaluation test

Classification	Tested item	Tested condition	Result
Environmental characteristics	Storage at high temperature	Temperature: Left in a 85°C 185°F constant temperature bath; Time: 100 hrs.	Passed
	Storage at low temperature	Temperature: Left in a –20°C –4°F constant temperature bath; Time: 100 hrs.	Passed
	Humidity	Temperature/humidity: Left at 40°C 104°F, 90% RH; Time: 100 hrs.	Passed
	Temperature cycle	Temperature: –20°C to 85°C –4°F to 185°F; 1 cycle: 30 min.; Times of cycle: 100	Passed
Endurance characteristics	High temperature/high humidity operation	Temperature/humidity: 40°C 104°F, 90% RH; Operation times: 10^6, rated voltage applied	Passed
Mechanical characteristics	Vibration resistance	Double amplitude: 1.5 mm .059 inch; Vibration: 10 to 55 Hz; Applied vibration direction: X, Y, Z 3 directions; Times: 2 hrs each	Passed
	Dropping resistance	Dropping height: 75 cm 29.528 inch; Times: 2 times	Passed
	Terminal strength	Pulling strength: 9.8 N {1 kgf}, 10 sec.; Bending strength: 4.9 N {0.5 kgf}, left and right 90° 1 time	Passed
Soldering Resistance	Soldered in DIP soldering bath	Temperature: 230°C 446°F; Time: 5 sec.	Passed
	Temperature (DIP)	Temperature: 260°C 500°F; Time: 10 sec.	Passed

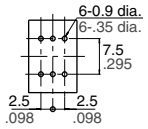
DIMENSIONS

mm inch General tolerance: ±0.3 ±.012

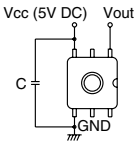
1. DIP terminal (Pressure inlet hole: 3mm) ADP51∗0



Recommended PC board pattern
(TOP VIEW 2:1)

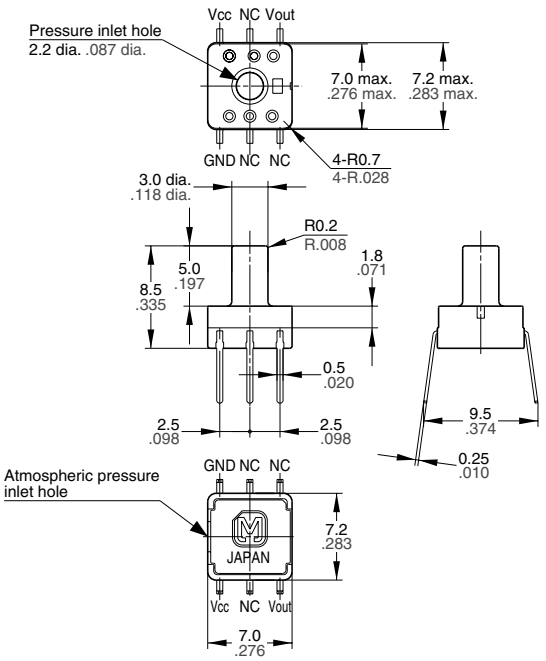


Terminal connection diagram

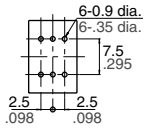


Terminal No.	Name
1	Vcc (Power supply [+])
2	NC (No connection)
3	Vout (Output)
4	NC (No connection)
5	NC (No connection)
6	GND (Ground)

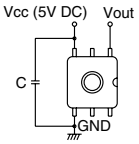
2. DIP terminal (Pressure inlet hole: 5mm) ADP51∗1/ADP51A11



Recommended PC board pattern
(TOP VIEW 2:1)



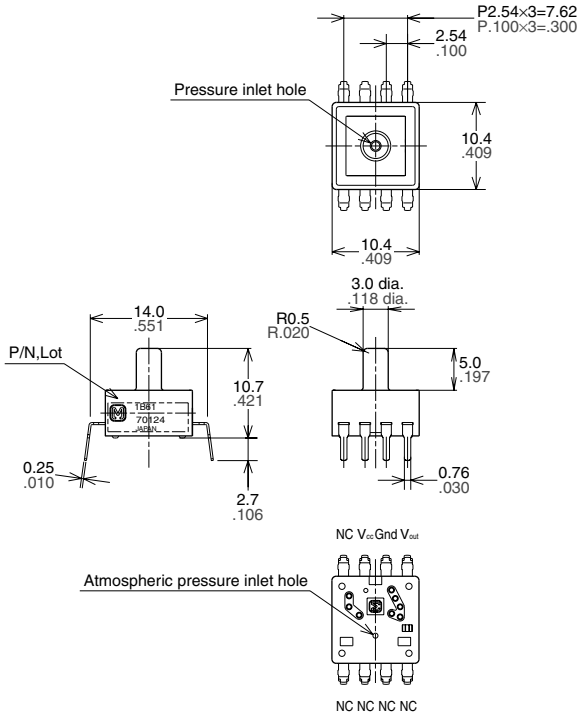
Terminal connection diagram



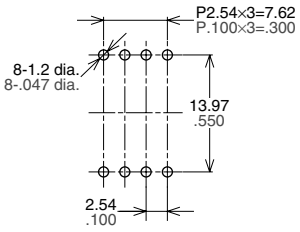
Terminal No.	Name
1	Vcc (Power supply [+])
2	NC (No connection)
3	Vout (Output)
4	NC (No connection)
5	NC (No connection)
6	GND (Ground)

3. Low pressure type (Pressure inlet hole length: 3mm) ADP51B61

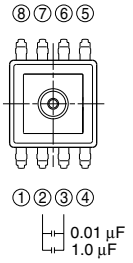
mm inch General tolerance: ±0.3 ±.012



Recommended PC board pattern

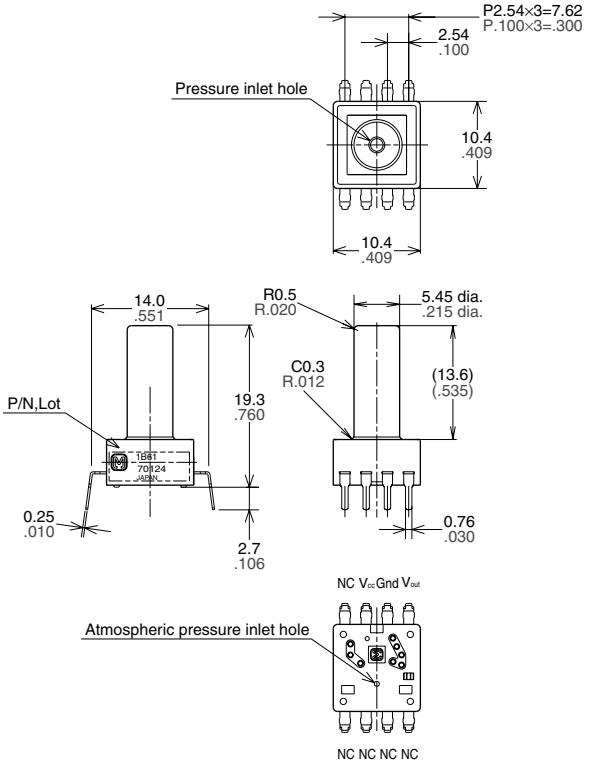


Terminal connection diagram

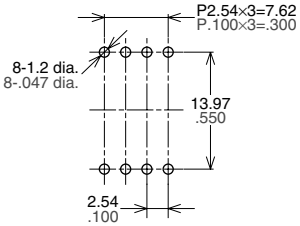


Terminal No.	Name
1	NC
2	Vcc (Power supply [+])
3	GND (Ground)
4	Vout (Output)
5	NC
6	NC
7	NC
8	NC

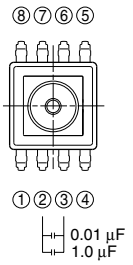
4. Low pressure type (Pressure inlet hole length: 5.45mm) ADP51B62



Recommended PC board pattern



Terminal connection diagram



Terminal No.	Name
1	NC
2	Vcc (Power supply [+])
3	GND (Ground)
4	Vout (Output)
5	NC
6	NC
7	NC
8	NC

NOTES

1. Mounting

Use lands on the printed-circuit boards to which the sensor can be securely fixed.

2. Soldering

Due to its small size, the thermal capacity of the pressure sensor DIP type is low. Therefore, take steps to minimize the effects of external heat.
Damage and changes to characteristics may occur due to heat deformation.
Use a non-corrosive resin type of flux.
Since the pressure sensor DIP type is exposed to the atmosphere, do not allow flux to enter inside.

1) Manual soldering

• Set the soldering tip from 260 to 300°C 500 to 572°F (30W), and solder for no more than 5 seconds.
• Please note that output may change if the pressure is applied on the terminals when the soldering.
• Thoroughly clean the soldering iron.

2) DIP soldering (DIP terminal type)

• Please keep the DIP solder bath temperature no higher than 260°C 500°F. When soldering, heat should be applied no longer than five seconds.
• When mounting onto a PCB of low thermal capacity, please avoid DIP soldering as this may cause heat deformity.

3) Solder reworking

• Finish reworking in one operation.
• For reworking of the solder bridge, use a soldering iron with a flat tip. Please do not add more flux when reworking.
• Please use a soldering iron that is below the temperature given in the specifications in order to maintain the correct temperature at the tip of the soldering iron.

4) Too much force on the terminals will cause deformation and loss in effectiveness of the solder. Therefore, please avoid dropping and careless handling of the product.

5) Please control warping of the PCB within 0.05 mm of the sensor width.

6) When cut folding the PCB after mounting the sensor, take measures to prevent stress to the soldered parts.

7) The sensor terminals are designed to be exposed, so contact of the terminals with metal shards and the like will cause output errors. Therefore, please be careful and prevent things such as metal shards and hands from contacting the terminals.

8) To prevent degradation of the PCB insulation after soldering, please be careful not to get chemicals on the sensor when coating.

9) Please consult us regarding the use of lead-free solder.

3. Connections

1) Please perform connections correctly in accordance with the terminal connection diagram. In particular, be careful not to reverse wire the power supply as this will cause damage or degrade to the product.

2) Do not connect terminals that are not used. This can cause malfunction of the sensor.

4. Cleaning

1) Since the pressure sensor chip is exposed to the atmosphere, do not allow cleaning fluid to enter inside.

2) Avoid ultrasonic cleaning since this may cause breaks or disconnections in the wiring.

5. Environment

1) Please avoid using or storing the pressure sensor chip in a place exposed to corrosive gases (such as the gases given off by organic solvents, sulfurous acid gas, hydrogen sulfides, etc.) which will adversely affect the performance of the pressure sensor chip.

2) To ensure resistance to power supply superimposed noise, you must provide a capacitor at the power supply input terminal of the sensor in order to stabilize the power supply voltage. We recommend to provide 0.1 µF and 1,000 pF capacitor in parallel. Please confirm the noise resistance with the actual equipment and choose adequate capacitor.

3) Since the internal circuitry may be destroyed if an external surge voltages is supplied, provide an element which will absorb the surges.

4) Malfunctioning may occur if the product is in the vicinity of electrical noise such as that from static electricity, lightning, a broadcasting station, an amateur radio, or a mobile phone.

5) Since this pressure sensor chip does not have a water-proof construction, please do not use the sensor in a location where it may be sprayed with water, etc.

6) Avoid using the pressure sensors chip in an environment where condensation may form.
Furthermore, its output may fluctuate if any moisture adhering to it freezes.

7) The pressure sensor chip is constructed in such a way that its output will fluctuate when it is exposed to light. Especially when pressure is to be applied by means of a transparent tube, take steps to prevent the pressure sensor chip from being exposed to light.

8) Avoid using the pressure sensor chip where it will be susceptible to ultrasonic or other high-frequency vibration.

6. Quality check under actual loading conditions

To assure reliability, check the sensor under actual loading conditions. Avoid any situation that may adversely affect its performance.

7. Other handling precautions

1) That using the wrong pressure range or mounting method may result in accidents.

2) The only direct pressure medium you can use is dry air. The use of other media, in particular, corrosive gases (organic solvent based gases, sulfurous acid based gases, and hydrogen sulfide based gases, etc.) and media that contains moisture or foreign substances will cause malfunction and damage. Please do not use them.

3) The pressure sensor chip is positioned inside the pressure inlet. Never poke wires or other foreign matter through the pressure inlet since they may damage the chip or block the inlet. Avoid use when the atmospheric pressure inlet is blocked.

4) Use an operating pressure which is within the rated pressure range. Using a pressure beyond this range may cause damage.

5) Since static charge can damage the pressure sensor chip, bear in mind the following handling precautions.
• When storing the pressure sensor chips, use a conductive material to short the pins or wrap the entire chip in aluminum foil. Plastic containers should not be used to store or transport the chips since they readily become charged.
• When using the pressure sensor chips, all the charged articles on the bench surface and the work personnel should be grounded so that any ambient static will be safely discharged.

6) Based on the pressure involved, give due consideration to the securing of the pressure sensor DIP type and to the securing and selection of the inlet tube. Consult us if you have any queries.

Panasonic
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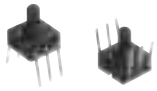
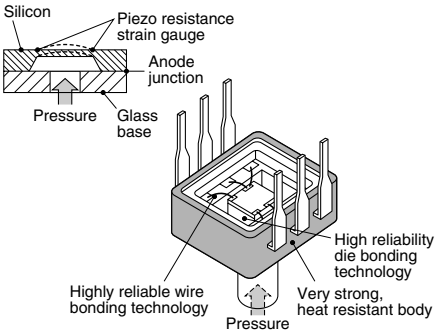
ULTRA SMALL HIGHLY SEMICONDUCTOR PRESSURE SENSOR

PS PRESSURE SENSOR



<Cross-section of Sensor Chip>

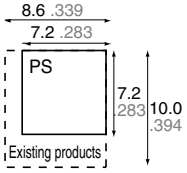


RoHS Directive compatibility information
http://www.mew.co.jp/ac/e/environment/

FEATURES

1. Ultra-miniature size: much more compact than the PF pressure sensors offered in the past

- Base area: 7.2(W) x 7.2(D) mm .283(W) x .283(D) inch
- Only 60% in mounting area and 91% in overall height of previous models (PF)



2. High-level precision and linearity

A high degree of precision and linear detector response have been achieved by applying the semiconductor strain gauge system. Highly reproducible based on repeated pressure.

3. Impressive line-up of models

- Taking their place alongside the standard 5kΩ bridge resistance models are those with a 3.3kΩ resistance which is optimally suited to 5V drive circuits.
- Economy model (no glass base) gives outstanding value for consumer appliances

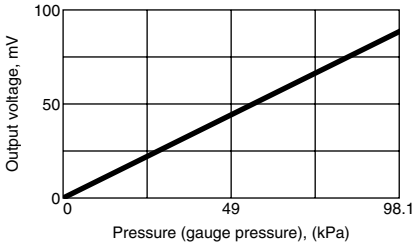
40 kPa (0.4 kgf/cm²) and 49 kPa (0.5 kgf/cm²) units are also available.

4. Improved ease of DIP pin insertion into printed circuit boards

The ends of the DIP pins are chamfered to ensure easy insertion into printed circuit boards.

Example of pressure characteristics (ADP41410)

Drive current: 1.5 mA rated current; ambient temperature: 25°C 77°F



TYPICAL APPLICATIONS

- Medical equipment: Electronic hemodynamometer
- Home appliance: Vacuum cleaner
- Gas equipment: Microprocessor gas meter, gas leakage detector
- Industrial equipment: Absorption device, etc.

ORDERING INFORMATION

Ex. ADP 4 ☐ ☐ ☐ ☐

Part No.	Terminal profile and direction	Rated pressure	Type	Bridge resistance
ADP4: PS pressure sensor	1: DIP terminal: Direction opposite the pressure inlet direction 2: DIP terminal: Pressure inlet direction	0: 4.9 kPa 1: 14.7 kPa 2: 34.3 kPa 3: 49.0 kPa 4: 98.1 kPa 5: 196.1 kPa 6: 343.2 kPa 7: 490.3 kPa 8: 833.6 kPa 9: 980.7 kPa A: 40.0 kPa	1: Standard type (With glass base) 2: Economy type (Without glass base)	0: 5.0kΩ 3: 3.3kΩ

Note: Some part numbers may not be available depending on the combination. Please refer to the Table of Product Types, below.

PRODUCT TYPES

1. DIP terminal

Pressure \ Terminal		5.0kΩ		3.3kΩ	
		DIP terminal: Direction opposite the pressure inlet direction 	DIP terminal: Pressure inlet direction 	DIP terminal: Direction opposite the pressure inlet direction 	DIP terminal: Pressure inlet direction 
Standard type (with glass base)	4.9kPa	ADP41010	ADP42010	—	—
	14.7kPa	ADP41110	ADP42110	—	—
	34.3kPa	ADP41210	ADP42210	—	—
	49.0kPa	ADP41310	ADP42310	—	—
	98.1kPa	ADP41410	ADP42410	ADP41413	ADP42413
	196.1kPa	ADP41510	ADP42510	—	—
	343.2kPa	ADP41610	ADP42610	—	—
	490.3kPa	ADP41710	ADP42710	—	—
	833.6kPa	ADP41810	ADP42810	—	—
	980.7kPa	ADP41910	ADP42910	ADP41913	ADP42913
Economy type (without glass base)	40.0kPa	—	—	ADP41A23	ADP42A23
	49.0kPa	ADP41320	ADP42320	—	—

SPECIFICATIONS

Type		Standard type (With glass base)												Economy type (Without glass base)	
Type of pressure		Gauge pressure													
Pressure medium		Air (For other medium, please consult us.)													
Rated pressure	Unit: kPa	4.9	14.7	34.3	49.0	98.1	196.1	343.2	490.3	833.6	980.7	98.1	980.7	40.0	49.0
Max. applied pressure		Twice the rated pressure								1.5 times the rated pressure		Twice the rated pressure	1.5 times the rated pressure	Twice the rated pressure	
Bridge resistance		5000±1000 Ω										3300±700 Ω		3300 ±600 Ω	5000 ±1000 Ω
Ambient temperature		–20 to 100°C –4 to 212°F (no freezing or condensation)												–5 to +50°C +23 to +122°F	–20 to +100°C –4 to +212°F
Storage temperature		–40 to 120°C –40 to 248°F (no freezing or condensation)												–20 to +70°C –4 to +158°F	–40 to +120°C –40 to +248°F
Standard temperature		25°C 77°F										30°C 86°F		25°C 77°F	
Temperature compensation range		0 to 50°C 32 to 122°F										0 to 60°C 32 to 140°F		5 to 45°C 41 to 113°F	0 to 50°C 32 to 122°F
Drive current (constant current)		1.5 mA DC										1.0 mA DC		1.5 mA DC	
Output span voltage		40±20 mV	100±40 mV									65±25 mV		43.5±22.5 mV	85±45 mV
Offset voltage		±20 mV												±15 mV	±25 mV
Linearity		±0.7%FS	±0.5%FS	±0.3%FS					±0.5%FS	±0.6%FS		±1.0%FS		±0.3%FS	
Pressure hysteresis		±0.6%FS	±0.4%FS	±0.2%FS					±0.4%FS			±1.0%FS		±0.7%FS	
Offset voltage-temperature characteristics (0 to 50°C 32 to 122°F)		±15%FS	±5.0%FS									±3.5%FS		±10%FS	±8%FS
Sensitivity-temperature characteristics (0 to 50°C 32 to 122°F)		±10%FS	±2.5%FS											±1.3%FS	±2.5%FS

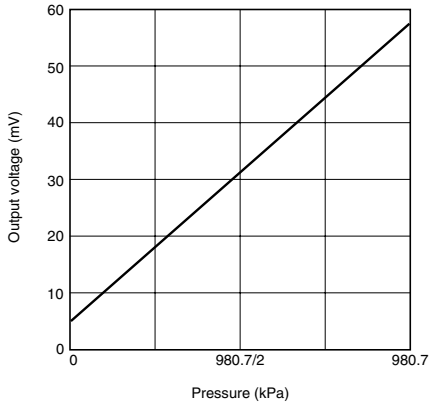
Notes) 1. Unless otherwise specified, measurements were taken with a drive current of ±0.01 mA and humidity ranging from 25% to 85%.
2. Please consult us if a pressure medium other than air is to be used.
3. This is the regulation which applies within the compensation temperature range.
4. Please consult us if the intended use involves a negative pressure.

DATA

1. Characteristics data

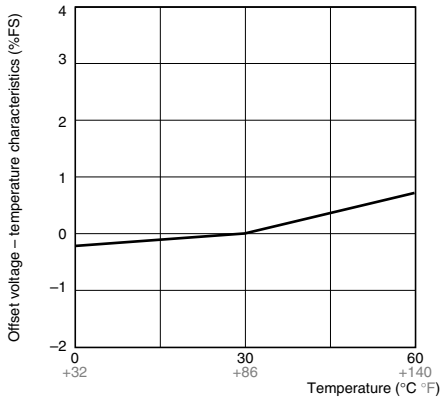
1-(1) Output characteristics

ADP41913
Drive current: 1.0 mA; temperature: 30°C 86°F



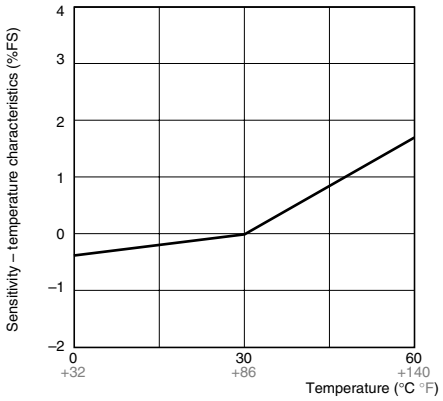
1-(2) Offset voltage – temperature characteristics

ADP41913
Drive current: 1.0 mA; rating ±3.5%FS



1-(3) Sensitivity – temperature characteristics (%FS)

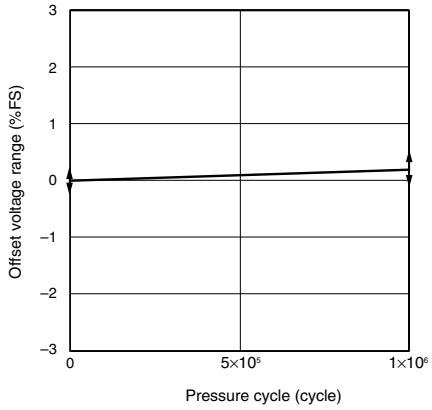
ADP41913
Drive current: 1.0 mA; rating ±2.5%FS



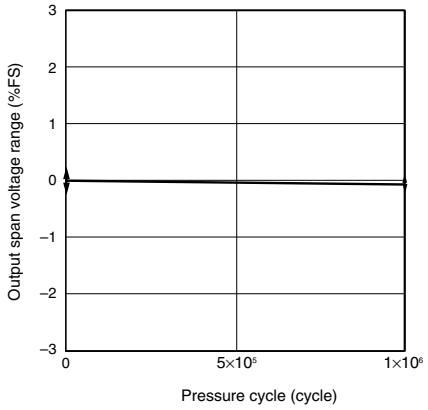
2. Pressure cycle range (0 to rated pressure)

Tested sample: ADP41913, temperature: 100°C 212°F, No. of cycle: 1×10^6

2-(1) Offset voltage range



2-(2) Output span voltage range



Even after testing for 1 million times, the variations in the offset voltage and output span voltage are minimal.

3. Evaluation test

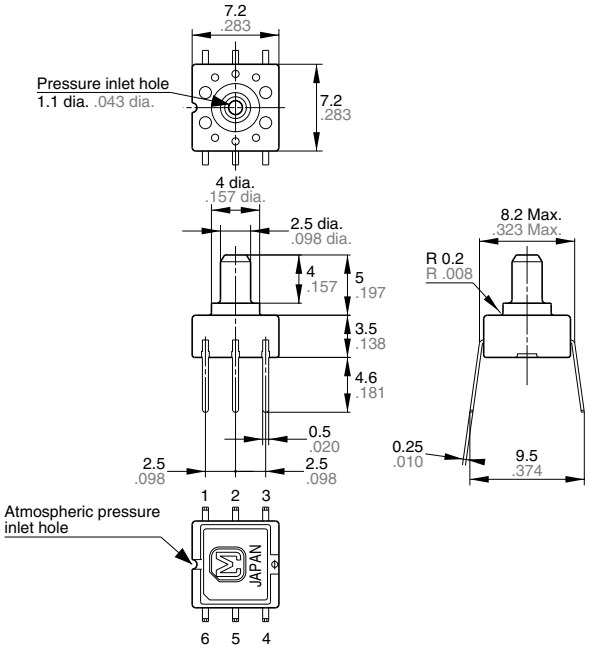
Tested item		Tested condition	Result
Environmental characteristics	Storage at high temperature	Temperature: Left in a 120°C 248°F constant temperature bath Time: 1,000 hrs.	Passed
	Storage at low temperature	Temperature: Left in a –40°C –40°F constant temperature bath Time: 1,000 hrs.	Passed
	Humidity	Temperature/humidity: Left at 40°C 104°F, 90% RH Time: 1,000 hrs.	Passed
	Temperature cycle	Temperature: –40°C to 120°C –40°F to 248°F 1 cycle: 30 min. Times of cycle: 100	Passed
Endurance characteristics	High temperature/high humidity operation	Temperature/humidity: 40°C 104°F, 90% RH Operation times: 10^6, rated voltage applied	Passed
Mechanical characteristics	Vibration resistance	Double amplitude: 1.5 mm .059 inch Vibration: 10 to 55 Hz Applied vibration direction: X, Y, Z 3 directions Times: 2 hrs each	Passed
	Dropping resistance	Dropping height: 75 cm 29.528 inch Times: 2 times	Passed
	Terminal strength	Pulling strength: 9.8 N {1 kgf}, 10 sec. Bending strength: 4.9 N {0.5 kgf}, left and right 90° 1 time	Passed
Soldering Resistance	Soldered in DIP soldering bath	Temperature: 230°C 446°F Time: 5 sec.	Passed
	Temperature	Temperature: 260°C 500°F Time: 10 sec.	Passed

Note: For details other than listed above, please consult us.

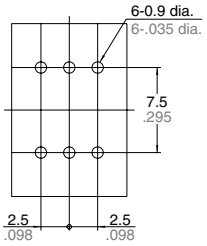
DIMENSIONS

mm inch General tolerance: ±0.3 ±.012

1. Terminal direction: DIP terminal Direction opposite the pressure inlet direction ADP41□□□

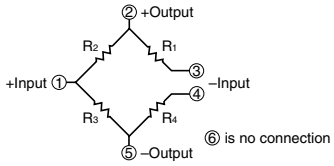


Recommended PC board pattern
(BOTTOM VIEW)



Tolerance: ±0.1 ±.004

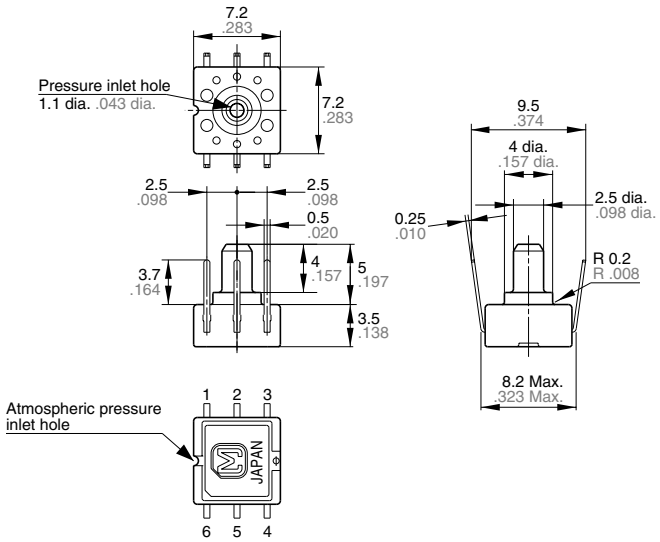
Terminal connection diagram



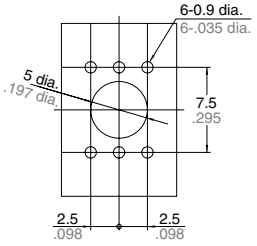
Terminal No.	Name
1	Power supply (+)
2	Output (+)
3	Power supply (–)
4	Power supply (–)
5	Output (–)
6	No connection

Note: Leave terminal 6 unconnected.

2. Terminal direction: DIP terminal Pressure inlet direction ADP42□□□

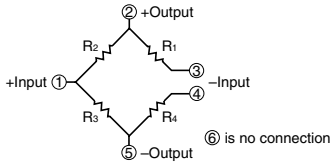


Recommended PC board pattern
(BOTTOM VIEW)



Tolerance: ±0.1 ±.004

Terminal connection diagram



Terminal No.	Name
1	Power supply (+)
2	Output (+)
3	Power supply (–)
4	Power supply (–)
5	Output (–)
6	No connection

Note: Leave terminal 6 unconnected.

NOTES

1. Mounting

Use lands on the printed-circuit boards to which the sensor can be securely fixed.

2. Soldering

Due to its small size, the thermal capacity of the pressure sensor DIP type is low. Therefore, take steps to minimize the effects of external heat.

Damage and changes to characteristics may occur due to heat deformation.

Use a non-corrosive resin type of flux.

Since the pressure sensor DIP type is exposed to the atmosphere, do not allow flux to enter inside.

1) Manual soldering

• Set the soldering tip from 260 to 300°C 500 to 572°F (30W), and solder for no more than 5 seconds.

• Please note that output may change if the pressure is applied on the terminals when the soldering.

• Thoroughly clean the soldering iron.

2) DIP soldering (DIP terminal type)

• Please keep the DIP solder bath temperature no higher than 260°C 500°F. When soldering, heat should be applied no longer than five seconds.

• When mounting onto a PCB of low thermal capacity, please avoid DIP soldering as this may cause heat deformity.

3) Solder reworking

• Finish reworking in one operation.

• For reworking of the solder bridge, use a soldering iron with a flat tip. Please do not add more flux when reworking.

• Please use a soldering iron that is below the temperature given in the specifications in order to maintain the correct temperature at the tip of the soldering iron.

4) Too much force on the terminals will cause deformation and loss in effectiveness of the solder. Therefore, please avoid dropping and careless handling of the product.

5) Please control warping of the PCB within 0.05 mm of the sensor width.

6) When cut folding the PCB after mounting the sensor, take measures to prevent stress to the soldered parts.

7) The sensor terminals are designed to be exposed, so contact of the terminals with metal shards and the like will cause output errors. Therefore, please be careful and prevent things such as metal shards and hands from contacting the terminals.

8) To prevent degradation of the PCB insulation after soldering, please be careful not to get chemicals on the sensor when coating.

9) Please consult us regarding the use of lead-free solder.

3. Cleaning

1) Since the pressure sensor chip is exposed to the atmosphere, do not allow cleaning fluid to enter inside.

2) Avoid ultrasonic cleaning since this may cause breaks or disconnections in the wiring.

4. Environment

1) Please avoid using or storing the pressure sensor chip in a place exposed to corrosive gases (such as the gases given off by organic solvents, sulfurous acid gas, hydrogen sulfides, etc.) which will adversely affect the performance of the pressure sensor chip.

2) Since this pressure sensor chip does not have a water-proof construction, please do not use the sensor in a location where it may be sprayed with water, etc.

3) Avoid using the pressure sensors chip in an environment where condensation may form.

Furthermore, its output may fluctuate if any moisture adhering to it freezes.

4) The pressure sensor chip is constructed in such a way that its output will fluctuate when it is exposed to light. Especially when pressure is to be applied by means of a transparent tube, take steps to prevent the pressure sensor chip from being exposed to light.

5) Avoid using the pressure sensor chip where it will be susceptible to ultrasonic or other high-frequency vibration.

5. Quality check under actual loading conditions

To assure reliability, check the sensor under actual loading conditions. Avoid any situation that may adversely affect its performance.

6. Other handling precautions

1) That using the wrong pressure range or mounting method may result in accidents.

2) The only direct pressure medium you can use is dry air. The use of other media, in particular, corrosive gases (organic solvent based gases, sulfurous acid based gases, and hydrogen sulfide based gases, etc.) and media that contains moisture or foreign substances will cause malfunction and damage. Please do not use them.

3) The pressure sensor chip is positioned inside the pressure inlet. Never poke wires or other foreign matter through the pressure inlet since they may damage the chip or block the inlet. Avoid use when the atmospheric pressure inlet is blocked.

4) Use an operating pressure which is within the rated pressure range. Using a pressure beyond this range may cause damage.

5) Since static charge can damage the pressure sensor chip, bear in mind the following handling precautions.

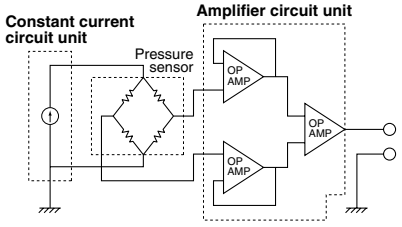
• When storing the pressure sensor chips, use a conductive material to short the pins or wrap the entire chip in aluminum foil. Plastic containers should not be used to store or transport the chips since they readily become charged.

• When using the pressure sensor chips, all the charged articles on the bench surface and the work personnel should be grounded so that any ambient static will be safely discharged.

6) Based on the pressure involved, give due consideration to the securing of the pressure sensor DIP type and to the securing and selection of the inlet tube. Consult us if you have any queries.

APPLICATION CIRCUIT DIAGRAM (EXAMPLE)

The pressure sensor is designed to convert a voltage by means of constant current drive and then, if necessary, it amplifies the voltage for use. The circuit shown below is a typical example of a circuit in which the pressure sensor is used.



MOUNTING METHOD

The general method for transmitting air pressures differs depending on whether the pressure is low or high.

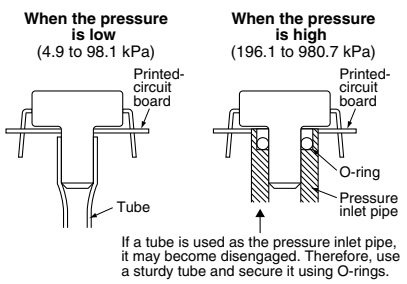
• Checkpoints for use

<1> Select a pressure inlet pipe which is sturdy enough to prevent pressure leaks.

<2> Fix the pressure inlet pipe securely so as to prevent pressure leaks.

<3> Do not block the pressure inlet pipe.

Methods of transmitting air pressures



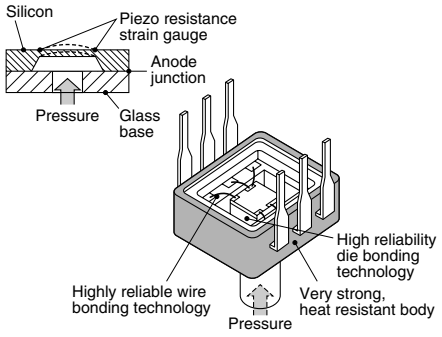
Panasonic
ideas for life

PRECISION SEMICONDUCTOR PRESSURE SENSOR

PF PRESSURE SENSOR

<Actual size>

<Cross-section of Sensor Chip>



RoHS Directive compatibility information
http://www.nais-e.com/

FEATURES

1. A wide range of rated pressure, including a minute pressure

There are 10 types of sensors covering a wide range of rated pressure from a minute pressure between 4.9 kPa {0.05 kgf/cm²}, to a maximum pressure of 980.7 kPa {10 kgf/cm²}.

2. Realization of highly accurate, linear characteristics

This sensor employs a semiconductor strain gauge method, ensuring accurate and linear detection characteristics. It also has excellent repeatability of pressure characteristics.

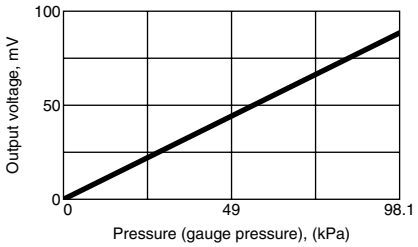
3. Impressive line-up of models

• Taking their place alongside the standard 5kΩ bridge resistance models are those with a 3.3kΩ resistance which is optimally suited to 5V drive circuits.

• Economy model (no glass base) gives outstanding value for consumer appliances

40 kPa (0.4 kgf/cm²) and 49 kPa (0.5 kgf/cm²) units are also available.

Example of pressure characteristics
(ADP1141)
Drive current: 1.5 mA rated current;
ambient temperature: 25°C 77°F



TYPICAL APPLICATIONS

• Medical equipment: Electronic hemodynamometer
• Home appliance: Vacuum cleaner
• Gas equipment: Microprocessor gas meter, gas leakage detector
• Industrial equipment: Absorption device, etc.

ORDERING INFORMATION

Ex. ADP 1 □ □ □ □

Part No.	Terminal profile and direction	Rated pressure	Type	Bridge resistance
ADP1: PF pressure sensor	1: DIP terminal: Direction opposite the pressure inlet direction 2: DIP terminal: Pressure inlet direction	0: 4.9 kPa 1: 14.7 kPa 2: 34.3 kPa 3: 49.0 kPa 4: 98.1 kPa 5: 196.1 kPa 6: 343.2 kPa 7: 490.3 kPa 8: 833.6 kPa 9: 980.7 kPa A: 40.0 kPa	1: Standard type (With glass base) 2: Economy type (Without glass base)	Nill: 5.0kΩ 3: 3.3kΩ

Note: Some part numbers may not be available depending on the combination. Please refer to the Table of Product Types, below.

PRODUCT TYPES

1. DIP terminal

Pressure \ Terminal		5.0kΩ		3.3kΩ	
		DIP terminal: Direction opposite the pressure inlet direction 	DIP terminal: Pressure inlet direction 	DIP terminal: Direction opposite the pressure inlet direction 	DIP terminal: Pressure inlet direction 
Standard type (with glass base)	4.9kPa	ADP1101	ADP1201	—	—
	14.7kPa	ADP1111	ADP1211	—	—
	34.3kPa	ADP1121	ADP1221	—	—
	49.0kPa	ADP1131	ADP1231	—	—
	98.1kPa	ADP1141	ADP1241	—	—
	196.1kPa	ADP1151	ADP1251	—	—
	343.2kPa	ADP1161	ADP1261	—	—
	490.3kPa	ADP1171	ADP1271	—	—
	833.6kPa	ADP1181	ADP1281	—	—
	980.7kPa	ADP11910	ADP1291	—	—
Economy type (without glass base)	40.0kPa	—	—	ADP11A23	ADP12A23
	49.0kPa	ADP1132	ADP1232	—	—

SPECIFICATIONS

Type		Standard type (With glass base)										Economy type (Without glass base)	
Type of pressure		Gauge pressure											
Pressure medium		Air (For other medium, please consult us.)											
Rated pressure	Unit: kPa	4.9	14.7	34.3	49.0	98.1	196.1	343.2	490.3	833.6	980.7	40.0	49.0
Max. applied pressure		Twice the rated pressure								1.5 times the rated pressure		Twice the rated pressure	
Bridge resistance		5000±1000 Ω										3300 ±600 Ω	5000 ±1000 Ω
Ambient temperature		–20 to 100°C –4 to 212°F (no freezing or condensation)										–5 to +50°C +23 to +122°F	–20 to +100°C –4 to +212°F
Storage temperature		–40 to 120°C –40 to 248°F (no freezing or condensation)										–20 to +70°C –4 to +158°F	–40 to +120°C –40 to +248°F
Temperature compensation range		0 to 50°C 32 to 122°F										5 to 45°C 41 to 113°F	0 to 50°C 32 to 122°F
Drive current (constant current)		1.5 mA DC										1.5 mA DC	
Output span voltage		40±20 mV	100±40 mV									43.5±22.5 mV	85±45 mV
Offset voltage		±20 mV										±15 mV	±25 mV
Linearity		±0.7%FS	±0.5%FS	±0.3%FS					±0.5%FS	±0.6%FS		±0.3%FS	
Pressure hysteresis		±0.6%FS	±0.4%FS	±0.2%FS					±0.4%FS			±0.7%FS	
Offset voltage-temperature characteristics (0 to 50°C 32 to 122°F)		±15%FS	±5.0%FS									±10%FS	±8%FS
Sensitivity-temperature characteristics (0 to 50°C 32 to 122°F)		±10%FS	±2.5%FS									±1.3%FS	±2.5%FS

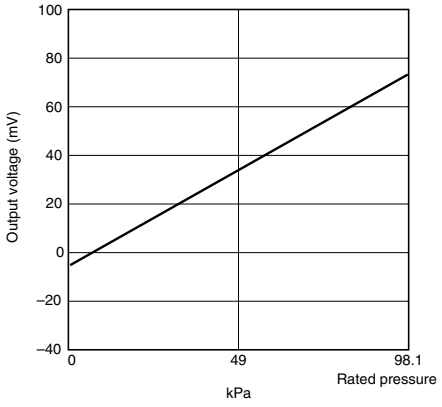
Notes) 1 Unless otherwise specified, measurements were taken with a drive current of1.5 mA ±0.01 mA at a temperature of 25°C 77°F and humidity ranging from 25% to 85%.
2. Please consult us if a pressure medium other than air is to be used.
3. This is the regulation which applies within the compensation temperature range.
4. Please consult us if the intended use involves a negative pressure.

DATA

1. Characteristics data

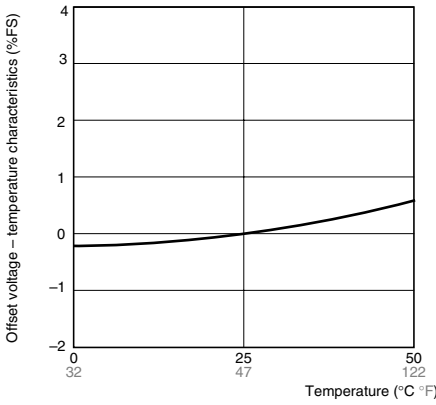
1-(1) Output characteristics

ADP1141
Drive current: 1.5 mA; temperature: 25°C 77°F



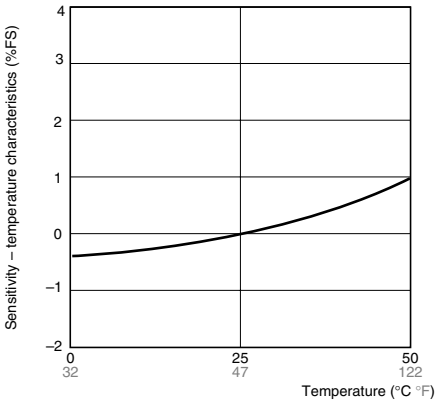
1-(2) Offset voltage – temperature characteristics

ADP1141
Drive current: 1.5 mA; rating ±5%FS



1-(3) Sensitivity – temperature characteristics (%FS)

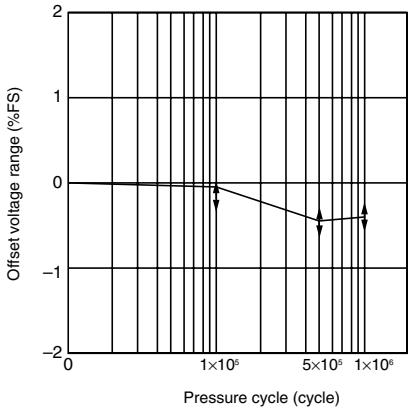
ADP1141
Drive current: 1.5 mA; rating ±2.5%FS



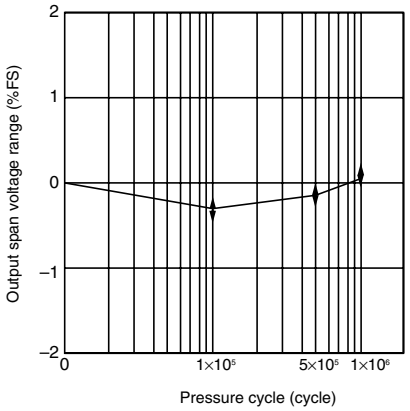
2. Pressure cycle range (0 to rated pressure)

Tested sample: ADP1131, temperature: 25°C 77°F

2-(1) Offset voltage range



2-(2) Output span voltage range



Even after testing for 1 million times, the variations in the offset voltage and output span voltage are minimal.

3. Evaluation test

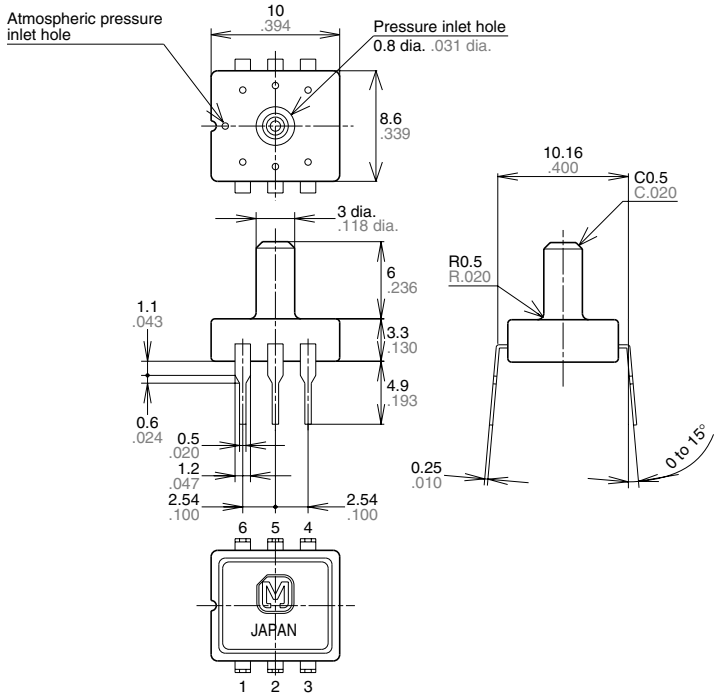
Tested item		Tested condition	Result
Environmental characteristics	Storage at high temperature	Temperature: Left in a 120°C 248°F constant temperature bath Time: 1,000 hrs.	Passed
	Storage at low temperature	Temperature: Left in a –40°C –40°F constant temperature bath Time: 1,000 hrs.	Passed
	Humidity	Temperature/humidity: Left at 40°C 104°F, 90% RH Time: 1,000 hrs.	Passed
	Temperature cycle	Temperature: –40°C to 120°C –40°F to 248°F 1 cycle: 30 min. Times of cycle: 100	Passed
Endurance characteristics	High temperature/high humidity operation	Temperature/humidity: 40°C 104°F, 90% RH Operation times: 10^6, rated voltage applied	Passed
Mechanical characteristics	Vibration resistance	Double amplitude: 1.5 mm .059 inch Vibration: 10 to 55 Hz Applied vibration direction: X, Y, Z 3 directions Times: 2 hrs each	Passed
	Dropping resistance	Dropping height: 75 cm 29.528 inch Times: 2 times	Passed
	Terminal strength	Pulling strength: 9.8 N {1 kgf}, 10 sec. Bending strength: 4.9 N {0.5 kgf}, left and right 90° 1 time	Passed
Soldering Resistance	Soldered in DIP soldering bath	Temperature: 230°C 446°F Time: 5 sec.	Passed
	Temperature	Temperature: 260°C 500°F Time: 10 sec.	Passed

Note: For details other than listed above, please consult us.

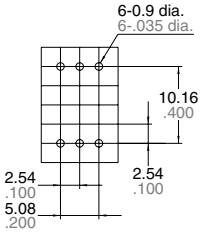
DIMENSIONS

mm inch General tolerance: ±0.3 ±.012

1. Terminal direction: Direction opposite the pressure inlet derection ADP11□□ (□)

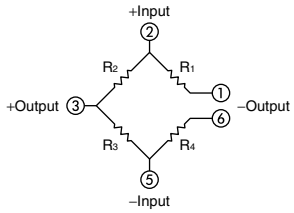


Recommended PC board pattern
(BOTTOM VIEW)



Tolerance: ±0.1 ±.004

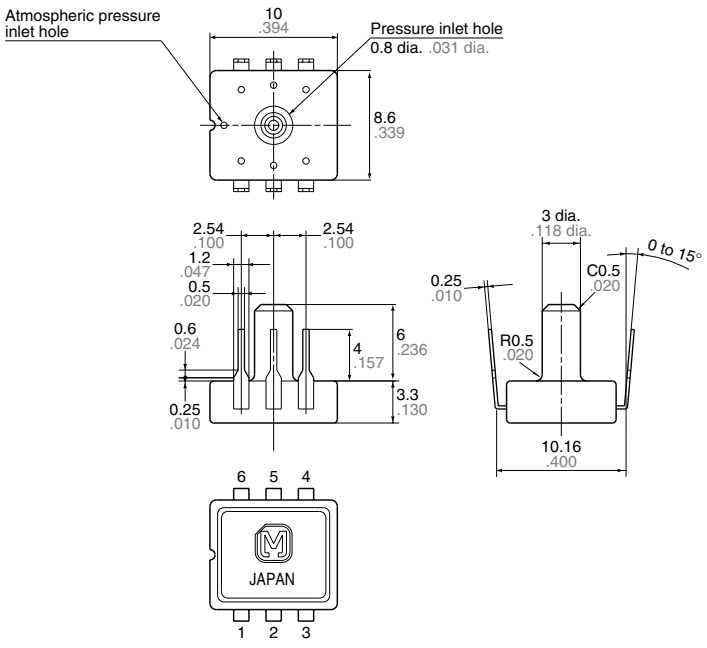
Terminal connection diagram



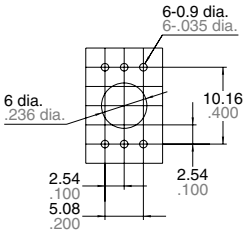
Terminal No.	Name
1	Output (–)
2	Power supply (+)
3	Output (+)
4	No connection
5	Power supply (–)
6	Output (–)

Note: Leave terminal 6 unconnected.

2. Terminal direction: Pressure inlet direction ADP12□□ (□)

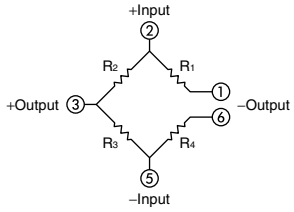


Recommended PC board pattern
(BOTTOM VIEW)



Tolerance: ±0.1 ±.004

Terminal connection diagram



Terminal No.	Name
1	Output (–)
2	Power supply (+)
3	Output (+)
4	No connection
5	Power supply (–)
6	Output (–)

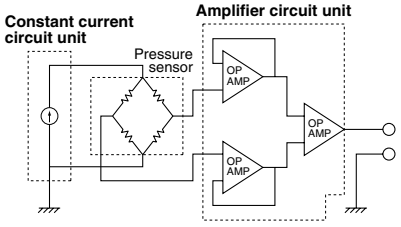
Note: Leave terminal 6 unconnected.

NOTES

1. Mounting
Use lands on the printed-circuit boards to which the sensor can be securely fixed.
2. Soldering
Due to its small size, the thermal capacity of the pressure sensor DIP type is low. Therefore, take steps to minimize the effects of external heat.
Damage and changes to characteristics may occur due to heat deformation.
Use a non-corrosive resin type of flux.
Since the pressure sensor DIP type is exposed to the atmosphere, do not allow flux to enter inside.
1) Manual soldering
• Set the soldering tip from 260 to 300°C 500 to 572°F (30W), and solder for no more than 5 seconds.
• Please note that output may change if the pressure is applied on the terminals when the soldering.
• Thoroughly clean the soldering iron.
2) DIP soldering (DIP terminal type)
• Please keep the DIP solder bath temperature no higher than 260°C 500°F. When soldering, heat should be applied no longer than five seconds.
• When mounting onto a PCB of low thermal capacity, please avoid DIP soldering as this may cause heat deformity.
3) Solder reworking
• Finish reworking in one operation.
• For reworking of the solder bridge, use a soldering iron with a flat tip. Please do not add more flux when reworking.
• Please use a soldering iron that is below the temperature given in the specifications in order to maintain the correct temperature at the tip of the soldering iron.
4) Too much force on the terminals will cause deformation and loss in effectiveness of the solder. Therefore, please avoid dropping and careless handling of the product.
5) Please control warping of the PCB within 0.05 mm of the sensor width.
6) When cut folding the PCB after mounting the sensor, take measures to prevent stress to the soldered parts.
7) The sensor terminals are designed to be exposed, so contact of the terminals with metal shards and the like will cause output errors. Therefore, please be careful and prevent things such as metal shards and hands from contacting the terminals.
8) To prevent degradation of the PCB insulation after soldering, please be careful not to get chemicals on the sensor when coating.
9) Please consult us regarding the use of lead-free solder.
3. Cleaning
1) Since the pressure sensor chip is exposed to the atmosphere, do not allow cleaning fluid to enter inside.
2) Avoid ultrasonic cleaning since this may cause breaks or disconnections in the wiring.
4. Environment
1) Please avoid using or storing the pressure sensor chip in a place exposed to corrosive gases (such as the gases given off by organic solvents, sulfurous acid gas, hydrogen sulfides, etc.) which will adversely affect the performance of the pressure sensor chip.
2) Since this pressure sensor chip does not have a water-proof construction, please do not use the sensor in a location where it may be sprayed with water, etc.
3) Avoid using the pressure sensors chip in an environment where condensation may form.
Furthermore, its output may fluctuate if any moisture adhering to it freezes.
4) The pressure sensor chip is constructed in such a way that its output will fluctuate when it is exposed to light. Especially when pressure is to be applied by means of a transparent tube, take steps to prevent the pressure sensor chip from being exposed to light.
5) Avoid using the pressure sensor chip where it will be susceptible to ultrasonic or other high-frequency vibration.
5. Quality check under actual loading conditions
To assure reliability, check the sensor under actual loading conditions. Avoid any situation that may adversely affect its performance.
6. Other handling precautions
1) That using the wrong pressure range or mounting method may result in accidents.
2) The only direct pressure medium you can use is dry air. The use of other media, in particular, corrosive gases (organic solvent based gases, sulfurous acid based gases, and hydrogen sulfide based gases, etc.) and media that contains moisture or foreign substances will cause malfunction and damage. Please do not use them.
3) The pressure sensor chip is positioned inside the pressure inlet. Never poke wires or other foreign matter through the pressure inlet since they may damage the chip or block the inlet. Avoid use when the atmospheric pressure inlet is blocked.
4) Use an operating pressure which is within the rated pressure range. Using a pressure beyond this range may cause damage.
5) Since static charge can damage the pressure sensor chip, bear in mind the following handling precautions.
• When storing the pressure sensor chips, use a conductive material to short the pins or wrap the entire chip in aluminum foil. Plastic containers should not be used to store or transport the chips since they readily become charged.
• When using the pressure sensor chips, all the charged articles on the bench surface and the work personnel should be grounded so that any ambient static will be safely discharged.
6) Based on the pressure involved, give due consideration to the securing of the pressure sensor DIP type and to the securing and selection of the inlet tube. Consult us if you have any queries.

APPLICATION CIRCUIT DIAGRAM (EXAMPLE)

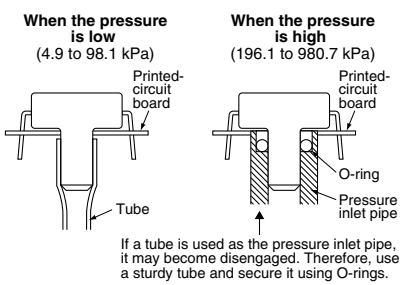
The pressure sensor is designed to convert a voltage by means of constant current drive and then, if necessary, it amplifies the voltage for use. The circuit shown below is a typical example of a circuit in which the pressure sensor is used.



MOUNTING METHOD

The general method for transmitting air pressures differs depending on whether the pressure is low or high.
• Checkpoints for use
<1> Select a pressure inlet pipe which is sturdy enough to prevent pressure leaks.
<2> Fix the pressure inlet pipe securely so as to prevent pressure leaks.

Methods of transmitting air pressures



If a tube is used as the pressure inlet pipe, it may become disengaged. Therefore, use a sturdy tube and secure it using O-rings.

Glossary of Common Terms for Pressure Sensors

SAFETY PRECAUTIONS

This product uses semiconductor components manufactured for use in general electronic devices (communication devices, measuring instruments and machine tools, etc.). Products that use these semiconductor components may malfunction or break down due to external noise or surges; therefore, please test sufficiently under actual conditions in order to verify performance and quality. To prevent infringement to life, body or property, please do all that is necessary to ensure safe design of the device (protection circuits such as fuses and breakers, and device redundancy, etc.), in order to be extra certain in the event of a malfunction. Be sure to obey the following in order to prevent injuries and accidents.

- Use with a drive current or voltage that does not exceed the rated values.
- Perform wiring only in accordance with the terminal connection diagram. Be particularly careful, since reverse power supply wiring can cause an accident due to circuit damage caused by such things as heat generation, smoke emission, and ignition.
- For safety, in particular if the application is of an important nature, be sure to take necessary precautions such as the implementation of a redundant safety circuit.
- Do not apply pressure that exceeds the maximum allowable amount. Also, be careful that foreign objects do not intermix with the pressure medium. Product damage or accidents due to blowout of the medium may occur.
- Take utmost care when securing the product and connecting the pressure inlet. The product may blow apart or accidents due to blowout of the medium may occur.
- Be careful when handling in order to avoid cuts caused by the sharp-edged terminals.

EXPLANATION OF TERMS

1. Pressure object
This is what can be used to activate the pressure sensor.
(The Matsushita Electric Works pressure sensor can be used with gas.)

2. Rated pressure
The pressure value up to which the specifications of the pressure sensor are guaranteed.

3. Maximum applied pressure
The maximum pressure that can be applied to the pressure sensor, after which, when the pressure is returned to below the rated pressure range, the specifications of the pressure sensor are guaranteed.

4. Temperature compensation range
The temperature range across which the specification values of the pressure sensor are guaranteed.

5. Drive current
The supply current required to drive a pressure sensor.

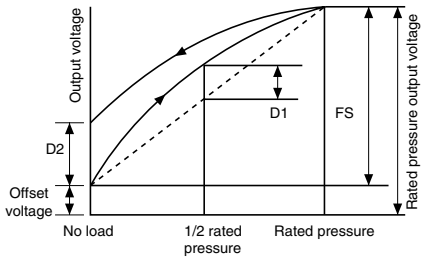
6. Output span voltage
The difference between the rated output voltage and the offset voltage. The output span voltage is also called the full-scale voltage (FS).

7. Offset voltage
The output voltage of a pressure sensor when no pressure is applied.

8. Rated pressure output voltage
Output voltage when rated pressure is applied.

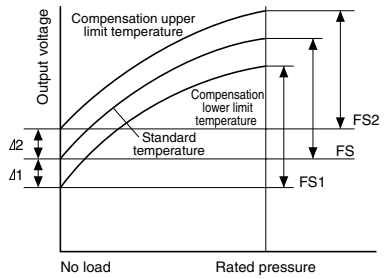
9. Linearity
When the pressure is varied from no load to the rated pressure, the linearity is the amount of shift between the straight line that joins the no-load voltage value and the rated pressure voltage value (expressed as the ratio of the amount of shift (D1) at half of the rated pressure value with respect to the full scale voltage (FS)).

10. Output hysteresis
The ratio of the difference (D2) in the no-load output voltages when the pressure is varied from no load to the rated pressure then reduced back to no load, with respect to the full scale voltage (FS).

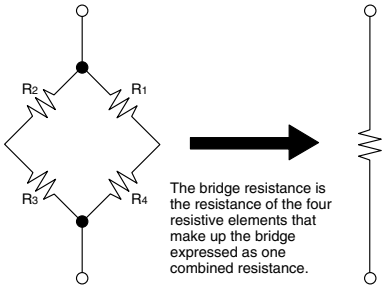


11. Offset voltage temperature characteristic
The variation of the offset voltage with changes in ambient temperature. The difference between the offset voltage at the standard temperature and the offset values at the compensation lower limit temperature (low temperature) (D1) and compensation upper limit temperature (high temperature) (D2) are obtained, and the offset voltage temperature characteristic is expressed as the ratio of the larger of these two differences (absolute) with respect to the full scale voltage (FS).

12. Temperature sensitivity characteristic
The variation of the sensitivity with changes in ambient temperature (variation in full scale (FS)). The difference between the full scale voltage at the standard temperature (FS) and the full scale values at the compensation lower limit temperature (low temperature) (FS1) and compensation upper limit temperature (high temperature) (FS2) are obtained, and the offset voltage temperature characteristic is expressed as the ratio of the larger of these two differences (FS1 - FS and FS2 - FS (absolute)) with respect to the full scale voltage (FS).



13. Bridge resistance
Refers to the resistance value of a piezoresistance formed on a monolithic silicon substrate.
For example, the values of the resistances R1 to R4 in the bridge are typically 5kΩ each.
When the resistances of the resistive elements R1 to R4 that comprise the bridge are 5kΩ each, the equivalent composite resistance of the bridge is 5kΩ (3kΩ bridges are also available).



14. Overall accuracy
Accuracy of offset voltage and rated pressure output voltage within the temperature compensation range.