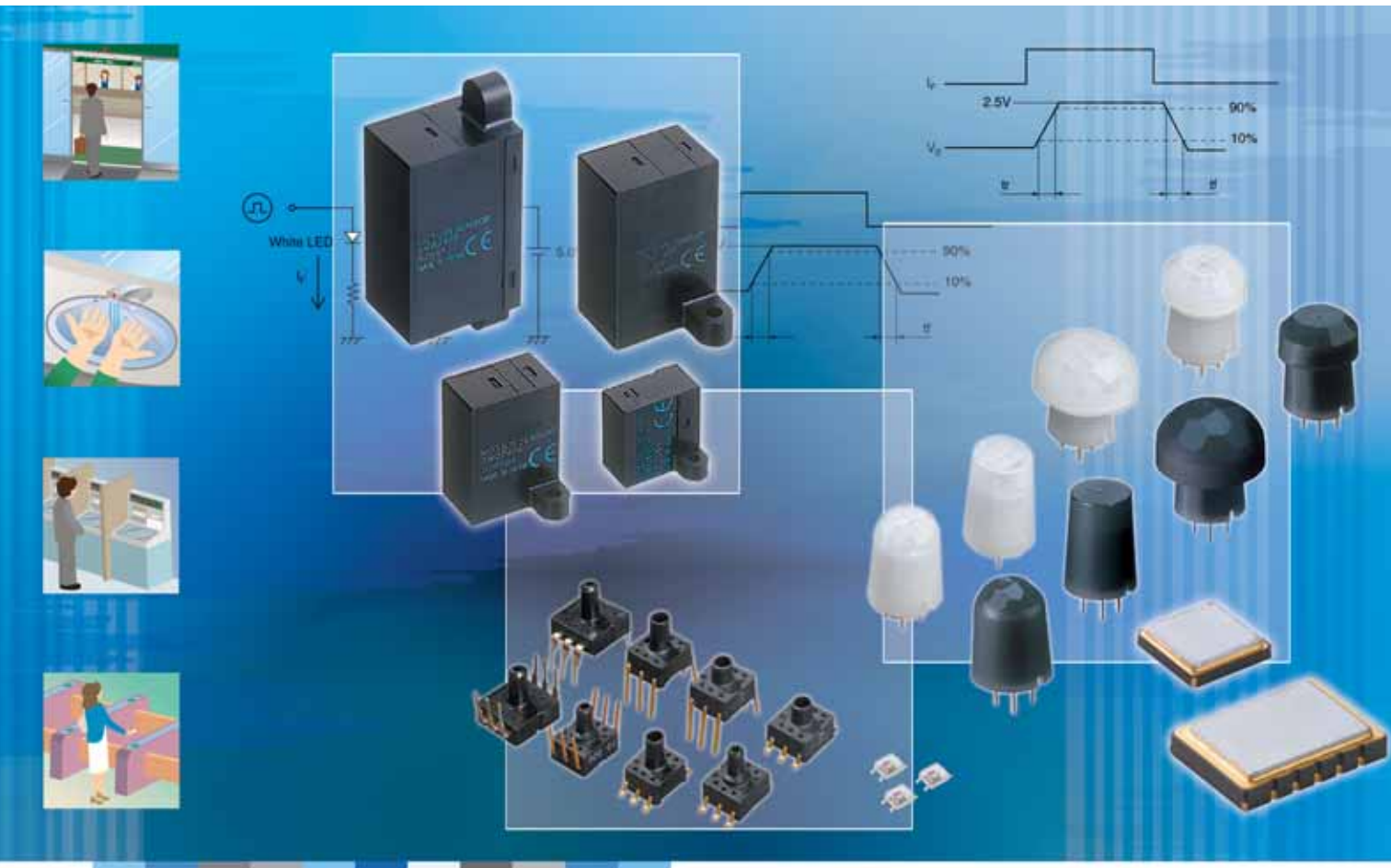
Panasonic

ideas for life



General Catalogue 2006 / 2007

Built-in Sensors

07/2007

Built-in Sensor Selector Chart

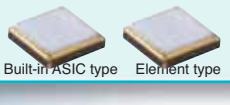
Equipment sensors for improved comfort and convenience, safety and energy conservation

Acceleration

Acceleration Sensors

Acceleration Sensor

Made possible by leading-edge MEMS technology, this acceleration sensor is ideal for automotive and mobile devices.

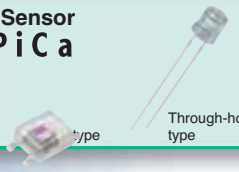
Product name	Acceleration detection range	Characteristics
PIMITES 1-axis GS1 	±2g	● High precision and high sensitivity ● High reliability: Detection errors due to temperature fluctuation reduced to a minimum. ● Compact size: 6.2 × 8.5 × 1.6 mm (H) .244 × .335 × .063 inch (H) Page 6
PIMITES 3-axis GS3  Built-in ASIC type Element type	±2g ±3g (Element type is ±3g only)	● Ultra-compact size: 4.6 × 4.6 × 1.3 mm (H) .181 × .181 × .051 inch (H) [Built-in ASIC type] ● Excellent ability to withstand dropping due to high anti-shock properties (5,000 g) ● Independent detection possible of acceleration and inclination on X, Y, and Z axes. Page 10

Brightness

Light Sensors

Light Sensor

Making us more comfortable with energy efficient devices...Environmentally friendly, cadmium-free

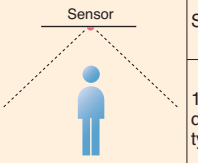
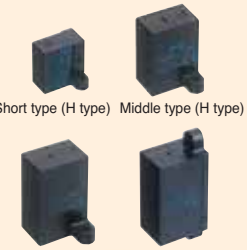
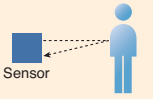
Product name	Peak sensitivity wave length	Characteristics
Light Sensor NaPiCa  Through-hole type	580nm	● Cadmium-free ● Built-in optical filter for spectral response similar to that of the human eye. ● Photocurrent is proportional to illumination. (linear output) Page 16

Motion

Motion Sensors

Motion Sensor

Motion sensors that always detect your slightest movement

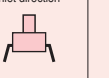
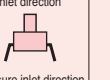
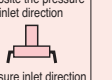
	Product name	Detection method	Type		Characteristics
Passive infrared type	**MP Motion Sensor NaPiOn**  Standard type, Slight motion detection type, Spot type, 10m detection type	Detecting the heat (infrared rays) of the human body and other objects.  Sensor	Standard type	Black lens	● The world s smallest with a built-in amplifier ● Detects even slight motion of a person ● Digital output and analog output (with adjustable sensitivity) are available. ● Ideal for battery driven devices, a low current consumption type (46 μA typ.) has also been added to the lineup. *Digital output type only. Page 22
				White lens	
			Slight motion detection type	Black lens	
			Spot type	White lens	
				Black lens	
			10m detection type	White lens	
				Black lens	
				White lens	
Area reflective type	**MA Motion Sensor**  Short type (H type), Middle type (H type), Long type (H type), Long type (V type)	Detecting the presence of the human body (or another object) by the reflected beam of LED light from the sensor itself.  Sensor	Built-in oscillation circuit type	Detection distance 5 to 200cm 1.969 to 78.74inch	● The sensors are ready for immediate use by simply connecting to a DC power supply. The built-in oscillation circuit removes the need to input a start signal. ● Can be used with a number of different supply voltages. 1) 5V DC type 2) Free-ranging type (6.5 to 27V DC) Page 30
			External trigger type	Detection distance 5 to 200cm 1.969 to 78.74inch	● These sensors can be used in adjacent positions and can save energy. ● Can be used with a number of different supply voltages. 1) 5V DC type 2) Free-ranging type (6.5 to 27V DC) Page 30

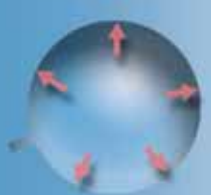
Pressure

Pressure Sensors

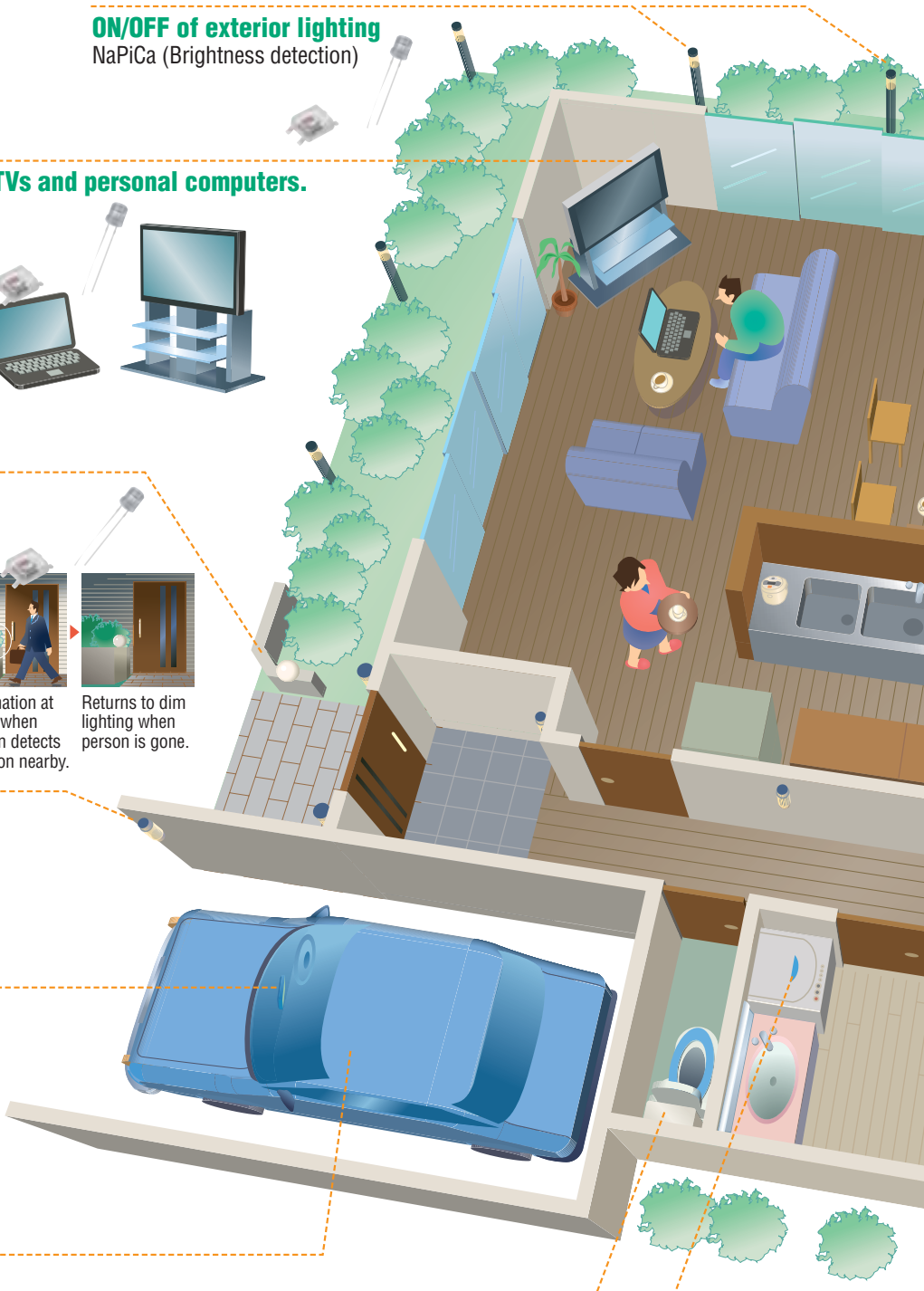
Pressure Sensor

A wide range of rated pressure, including minute pressures

Product name	Pressure medium	Type (*Without glass base type)		Terminal direction	Pressure inlet hole length	Characteristics
PS-A Pressure Sensor 	Air	Rated pressure: ±100°–100, 25, 50, 100, 200, 500, 1,000 *40 kPa		Opposite the pressure inlet direction 	3mm  5mm 	● Compact pressure sensor with built-in amplification and temperature compensation circuit Page 39
PS Pressure Sensor 	Air	Rated pressure: 4.9, 14.7, 34.3, 49.0, *49.0, 98.1, 196.1, 343.2, 490.3, 833.6, 980.7 kPa	Bridge resistance: 5k	Opposite the pressure inlet direction  Pressure inlet direction	—	● Ultra-miniature Base area 7.2 (W) × 7.2 (D) mm .283 (W) × .283 (D) inch Only 60% in mounting area and 91% in overall height of previous models Page 44
		*40, 98.1, 980.7 kPa	3.3k			
PF Pressure Sensor 	Air	Rated pressure: 4.9, 14.7, 34.3, 49.0, *49.0, 98.1, 196.1, 343.2, 490.3, 833.6, 980.7 kPa	Bridge resistance: 5k	Opposite the pressure inlet direction  Pressure inlet direction	—	● A wide range of rated pressure, including 4.9 kPa type Page 49
		*40 kPa	3.3k			

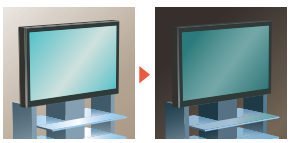


Providing sensors for various aspects



ON/OFF of exterior lighting
NaPiCa (Brightness detection)

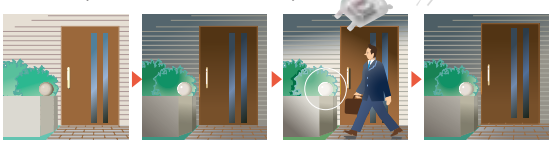
Increased visibility of LCD TVs and personal computers.
NaPiCa (Brightness detection)



Regular screen

Backlight dims when the room gets dark.

ON/OFF of door light
NaPiOn (Motion detection)
NaPiCa (Brightness detection)



Light turns off when surroundings are bright.

Dim lighting when it gets dark.

Illumination at 100% when NaPiOn detects a person nearby.

Returns to dim lighting when person is gone.

ON/OFF of garage light
NaPiOn (Motion detection)
NaPiCa (Brightness detection)

Car navigation
NaPiCa (Brightness detection)
1-axis Acceleration Sensor
(Inclination detection)

Automotive control
1-axis Acceleration Sensor (Inclination and acceleration detection)

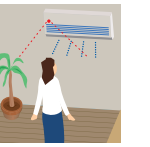
Occupancy detection
MA Motion Sensor (Position detection)
NaPiOn (Motion detection)

Vibration detection for washing machine
3-axis Acceleration Sensor
(Vibration detection)

# of our lives.

ON/OFF of bicycles light
NaPiCa (Brightness detection)

Air conditioner
NaPiOn (Motion detection)



Pressure detection of sphygmomanometer
Pressure Sensor

Brightness detection of an electric wave clock
NaPiCa (Brightness detection)

Stops when it gets dark.

When it gets light, the clock will set the correct time by reception of radio waves.

ON/OFF of blinds
NaPiCa (Brightness detection)

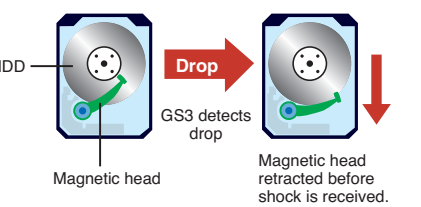
Security camera
NaPiOn (Motion detection)

PDA (LCD backlight)
Mobile phones (Keypad backlight)
NaPiCa (Brightness detection)

Normally, the keypad backlight is not needed.

When it gets dark, the keypad backlight turns on.

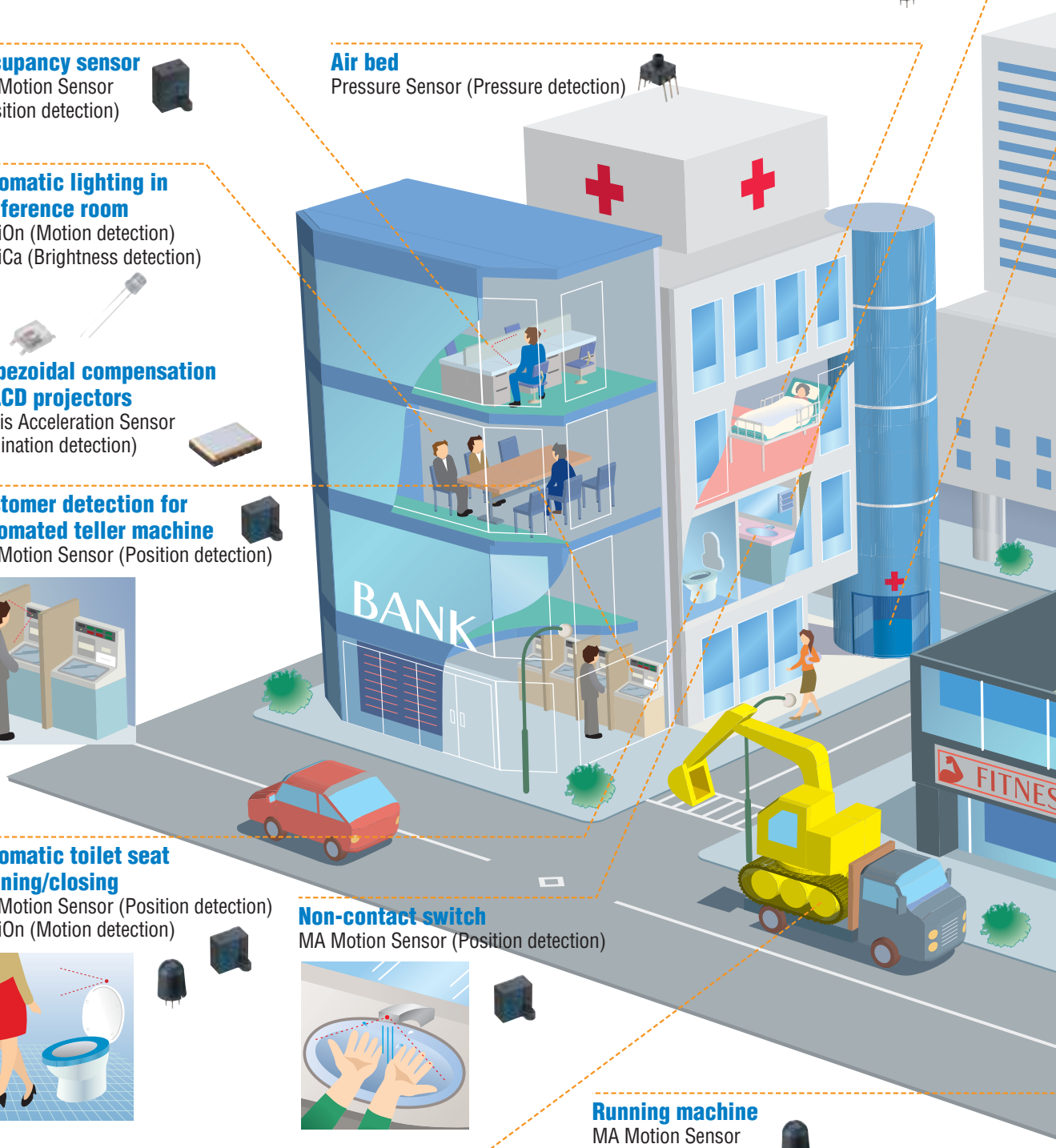
Protection of HDD parts against drops, free drop detection (Mobile phone, Personal computer, and Music player)
3-axis Acceleration Sensor (Free drop detection)



Gaming devices and controller
3-axis Acceleration Sensor (Inclination detection)

ON/OFF of corridor light
NaPiCa (Brightness detection)
NaPiOn (Motion detection)

Built-in sensor contributes to energy



Automatic ventilation fan
NaPiOn (Motion detection)

Occupancy sensor
MA Motion Sensor
(Position detection)

Air bed
Pressure Sensor (Pressure detection)

Automatic lighting in conference room
NaPiOn (Motion detection)
NaPiCa (Brightness detection)

Trapezoidal compensation of LCD projectors
1-axis Acceleration Sensor
(Inclination detection)

Customer detection for automated teller machine
MA Motion Sensor (Position detection)

Automatic toilet seat opening/closing
MA Motion Sensor (Position detection)
NaPiOn (Motion detection)

Non-contact switch
MA Motion Sensor (Position detection)

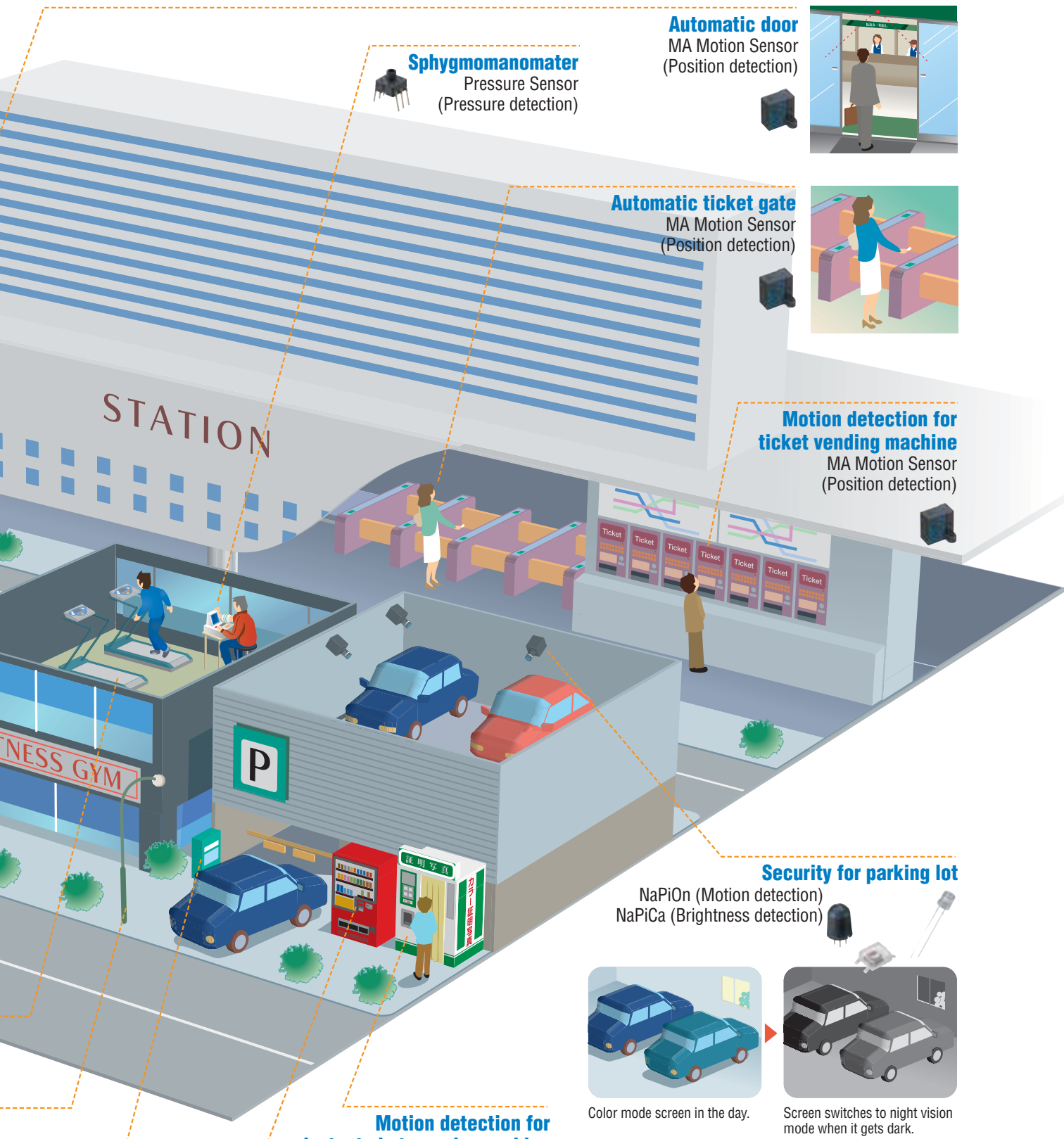
Running machine
MA Motion Sensor
(Position detection)

ON/OFF of street light
NaPiCa (Brightness detection)

Permit dispenser for parking lot
MA Motion Sensor (Position detection)

Posture detection of construction machine
3-axis Acceleration Sensor (Inclination detection)

savings, safety, and comfort.



Automatic door
MA Motion Sensor
(Position detection)

Sphygmomanometer
Pressure Sensor
(Pressure detection)

Automatic ticket gate
MA Motion Sensor
(Position detection)

Motion detection for ticket vending machine
MA Motion Sensor
(Position detection)

Security for parking lot
NaPiOn (Motion detection)
NaPiCa (Brightness detection)

Color mode screen in the day.

Screen switches to night vision mode when it gets dark.

Motion detection for instant photography machine
NaPiOn (Motion detection)

Automatic lighting for vending machine
NaPiCa (Brightness detection)

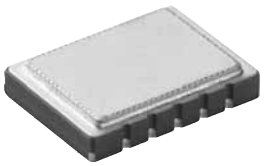
07/2007

Panasonic
ideas for life

1-AXIS ACCELERATION SENSOR

GS1 SENSOR

Ultra-small devices
PIMITES
[pi:mi:teIs]



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

FEATURES

1. High precision and high sensitivity
±5% FS overall accuracy and 1 V/g detection sensitivity.
2. High reliability
Detection errors due to temperature fluctuation reduced to a minimum.
3. Compact size
6.2 (L) mm × 8.5 (W) mm × 1.6 mm (H) (typ.)

APPLICATIONS

1. Car navigation system
Distinguish between regular roads and highways (inclination sensor)

2. Automotive control
Skid prevention system, 4 WD-ABS, Rollover prevention system (inclination and acceleration detection)
3. Other applications
Projectors (trapezoidal compensation), Elevators, Medical caregiving devices (inclination detection)

ORDERING INFORMATION

AGS 1 1 1 5 1

Number of detectable axis (Method)
1: 1-axis Acceleration Sensor (Electrostatic capacitance method)

Package type/Size
1: Ceramic package/6.2 x 8.5 mm

Detection sensitivity
1: 1 V/g

Operation power supply voltage/Output type
5: 5 V DC/Analog output

Type
1: Built-in ASIC

PRODUCT TYPES

Product name	Operation power supply voltage	Acceleration detection range	Detection sensitivity	Part number
1-axis Acceleration sensor GS1	5 V DC	±2g	1 V/g	AGS11151

Note: Packaging format: Tape and reel (Outer carton: 5,000 pcs. Inner carton: 1,000 pcs.)

MAXIMUM RATING

Item	Unit	Standard value			Remarks
		min.	typ.	max.	
Maximum allowable voltage	V	–0.3	—	7	Ta=25°C
Storage temperature range	°C	–40	—	85	
Operation temperature range	°C	–40	—	85	
Anti-shock characteristic	g	5,000	—		

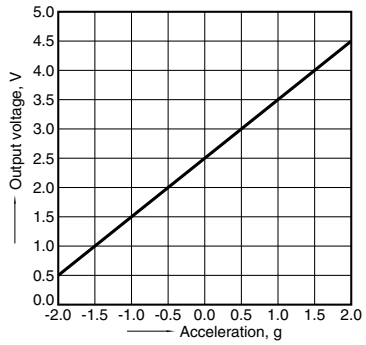
ELECTRICAL CHARACTERISTICS

Item	Unit	Standard value			Remarks
		min.	typ.	max.	
Acceleration detection range	g	–2	—	2	
Operation power supply voltage	V	4.75	5	5.25	–40 to 85°C
Current consumption	mA	—	5	7	0g, Ta=25°C
Sensitivity	V/g	0.97	1	1.03	Ta=25°C
Temperature sensitivity characteristic	V/g	–0.05	—	0.05	–40 to 85°C
Offset voltage (0 g)	V	2.4	2.5	2.6	Ta=25°C
Offset voltage temperature characteristic	V	–0.125	—	0.125	–40 to 85°C
Other axis sensitivity	%	–5	—	5	Ta=25°C
Non-linearity Note 3)	%FS	–1	—	1	Ta=25°C
Turn-on time Note 4)	ms	—	10	—	0g, Ta=25°C C1=220nF, C2=27nF
Frequency response Note 5)	Hz	DC	60	—	–3dB point, C2=27nF

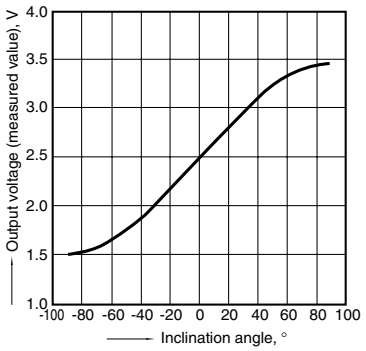
Notes: 1. The acceleration unit "g" means 9.8 m/s².
2. VDD=5 V when there is no indication.
3. Maximum error from linear output that connects +2 g and –2 g output.
4. "C1" is a ceramic capacitor installed between the VDD and GND terminals. "C2" is a ceramic capacitor installed between the Vout and Ext-Cap terminals.
5. The frequency characteristics can by changed depending on the C2 capacitance value. Please refer to "Recommended circuit diagram" on the following page. Note that the maximum frequency response is 200 Hz.

REFERENCE DATA

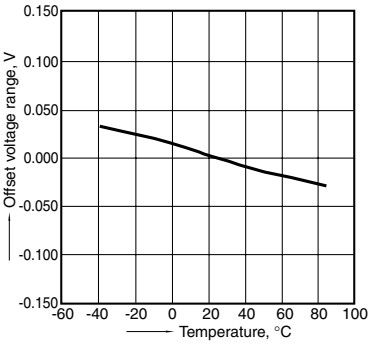
1. Output characteristics



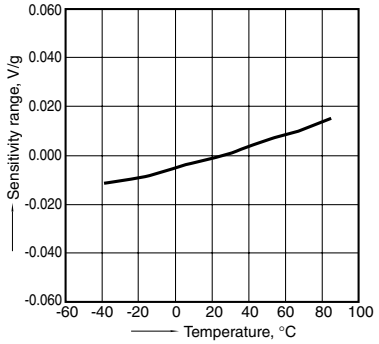
2. Inclination angle - Output voltage characteristics



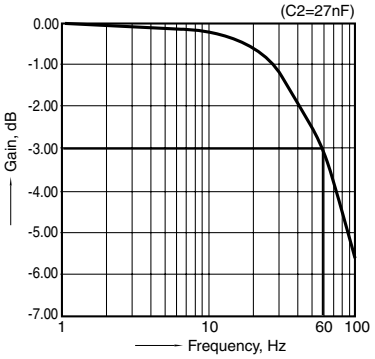
3. Offset voltage temperature characteristics (Typical value)



4. Sensitivity temperature characteristics (Typical value)



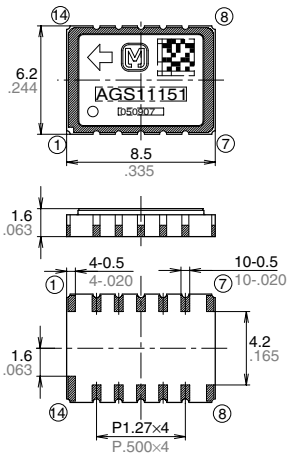
5. Frequency characteristics (Typical value)



Note: The frequency characteristics can by changed depending on the C2 capacitance value. Please refer to "Recommended circuit diagram" on the following page.

DIMENSIONS

mm inch

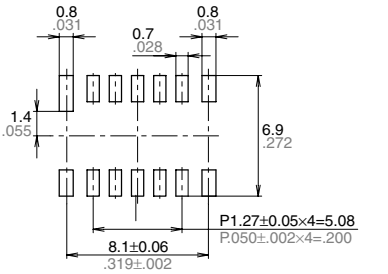


Tolerance: ±0.2 ±.008

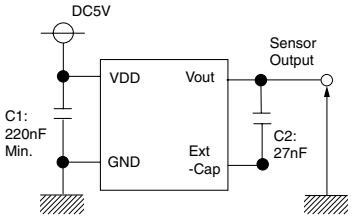
Terminal No.	Abbreviation	Terminal No.	Abbreviation
①	NC	⑧	NC
②	GND	⑨	VDD
③	NC	⑩	NC
④	Vout	⑪	NC
⑤	Ext-Cap	⑫	NC
⑥	GND	⑬	NC
⑦	NC	⑭	NC

Leave terminal "NC (No. 1, 3, 7, 8 and 10 to 14)" unconnected.
The No. 2 and No. 6 terminals are connected internally.

Recommended PC board pad



RECOMMENDED CIRCUIT DIAGRAM

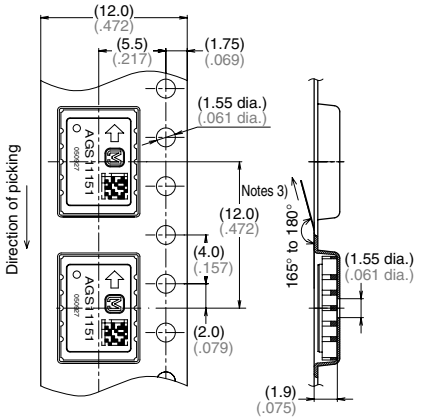


The frequency characteristics value can by changed depending on the C2 capacitance value.
-3dB bandwidth is expressed in the formula below.

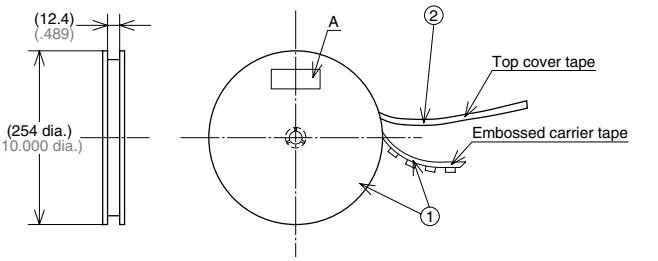
$$f_{-3dB} = \frac{1}{2\pi \times (100k\Omega) \times C2}$$

PACKAGING FORMAT (Tape and reel)

Tape dimensions



Dimensions of tape reel



NOTES

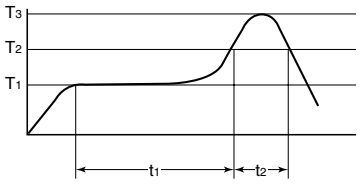
To ensure reliability, please verify quality under conditions of actual use.

1. Mounting

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

2. Soldering

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.
1) Manual soldering
• Set the soldering tip from 260 to 300°C (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) Reflow soldering
• The recommended reflow temperature profile conditions are given below.
• We recommend the screen solder printing method as the method for cream solder printing.
• Please refer to the recommended PC board pad for the PC board foot pattern.
• Self alignment may not always work as expected; therefore, please carefully adjust the position of the terminals and pattern.
• The profile temperature is the value measured on the PCB near the terminals.
• When doing reflow soldering on the back of the PC board after performing sensor reflow, please fix the sensor with adhesive and so on.
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 temperature on the terminals will cause deformation and loss in effectiveness of the solder. Therefore, please avoid dropping and careless handling of the product.
5) When cut folding the PC board after mounting the sensor, take measures to prevent stress to the soldered parts.
6) 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.
7) To prevent degradation of the PC board insulation after soldering, please be careful not to get chemicals on the sensor when coating.



T_1 = 150 to 180°C 302 to 356°F
T_2 = 230°C 446°F
T_3 = Max. 240°C 464°F
t_1 = 60 to 120 sec.
t_2 = With in 30 sec.

3. Connections

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

4. Cleaning

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

5. Environment

• Please avoid using or storing the sensor 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 sensor.
• When installing the sensor, you must provide a capacitor as shown in the recommended circuit diagram.
• Since the internal circuitry may be destroyed if an external surge voltages is supplied, provide an element which will absorb the surges.
• 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.
• Please do not use the sensor in a location where it may be sprayed with water, etc.
• Avoid using the sensor in an environment where condensation may form.
Furthermore, its output may fluctuate if any moisture adhering to it freezes.
• Avoid using the sensor where it will be susceptible to ultrasonic or other high-frequency vibration.

6. Other handling precautions

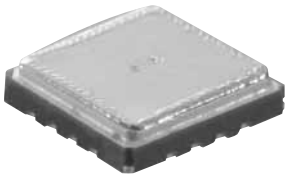
To assure reliability, check the sensor under actual loading conditions. Avoid any situation that may adversely affect its performance.
• Caution is required because differences in the acceleration detection range and the method of connection can lead to accidents.
• The actual acceleration should be within the rated acceleration range. Damage may occur if it is outside of this range.
• Static electricity can damage the sensor. Be very careful when handling.

Panasonic
ideas for life

3-AXIS ACCELERATION SENSOR BUILT-IN ASIC AND ELEMENT TYPES

GS3 SENSOR

Ultra-small devices
PIMITES
[pi:mi:tels]



FEATURES

• Built-in ASIC Type

1. Ultra-compact size
4.6 (L) × 4.6 (W) × 1.3 mm (H) (typ.)

2. Excellent ability to withstand dropping due to high anti-shock properties
5,000 g

3. Independent detection possible of acceleration and inclination on X, Y, and Z axes.

• Element Type

1. Ultra-compact size
4.6 (L) × 4.6 (W) × 1.0 mm (H) (typ.)

2. High anti-shock characteristic
5000g

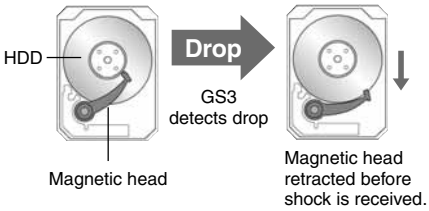
3. Functioning 6-axis motion sensor in connection with "AK8971N" 3-axis electronic compass of Asahi Kasei Microsystems Corporation.

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

APPLICATIONS

• Built-in ASIC Type

1. Protection of HDD parts against drops, free drop detection



2. Inclination detection in gaming devices

3. Other applications
• Posture detection of mobile terminals, operation simplification, and vertical/
• Vibration and inclination detection for security devices
• Robot posture detection
• Vibration detection for household appliances

• Element Type

1. Mobile phone GPS navigation (Posture detection)

2. Other mobile phone applications
• Games
• Simplification of key operation
• HDD drop protection
• LCD horizontal/vertical switching
• Pedometers, etc.

ORDERING INFORMATION

AGS [6] [1] [ ] [3] [ ]

Number of detectable axis (Method)
6: 3-axis Acceleration Sensor (Piezo resistance method)

Package type/Size
1: Ceramic package/4.6 x 4.6 mm

Acceleration detection range
2: ±2 g
3: ±3 g

Operation power supply voltage/Output type
3: 3 V DC/Analog output

Type
1: Built-in ASIC type
3: Element type

07/2007

PRODUCT TYPES

Product name	Operation power supply voltage	Type	Acceleration detection range	Part number
3-axis Acceleration sensor GS3	3 V DC	Built-in ASIC type 1	±2g	AGS61231
		Built-in ASIC type 2	±3g	AGS61331
		Element type	±3g	AGS61333

Note: Packaging format: Tape and reel (Outer carton: 2,000 pcs.)

MAXIMUM RATING

1. Built-in ASIC type (AGS61231/AGS61331)

Item	Unit	Standard value			Remarks
		min.	typ.	max.	
Maximum allowable voltage	V	–0.3	—	6.5	Ta=25°C
Storage temperature range	°C	–40	—	85	
Operation temperature range	°C	–20	—	70	
Anti-shock characteristic	g	5,000	—	—	

2. Element type (AGS61333)

Item	Unit	Standard value			Remarks
		min.	typ.	max.	
Maximum allowable voltage	V	–0.3	—	6.5	Ta=25°C
Storage temperature range	°C	–40	—	85	
Operation temperature range	°C	–30	—	85	
Anti-shock characteristic	g	5,000	—	—	

ELECTRICAL CHARACTERISTICS

1. Built-in ASIC type (AGS61231/AGS61331)

Part number / Item	Axis	Unit	AGS61231 Standard value			AGS61331 Standard value			Remarks
			min.	typ.	max.	min.	typ.	max.	
Acceleration detection range	X, Y, Z	g	–2	—	2	–3	—	3	
Operation power supply voltage	—	V	2.7	3.0	3.6	2.7	3.0	3.6	–20 to 70°C
Current consumption	—	mA	—	1.7	2.5	—	1.7	2.5	Ta=25°C
Sensitivity	X, Y, Z	V/g	0.47	0.5	0.53	0.313	0.333	0.353	Ta=25°C
Temperature sensitivity characteristic	X, Y, Z	%	–9	—	9	–9	—	9	–20 to 70°C
Offset voltage (0 g)	X, Y, Z	V	1.41	1.5	1.59	1.44	1.5	1.56	Ta=25°C
Offset voltage temperature characteristic	X, Y, Z	%FS	–12	—	12	–8	—	8	–20 to 70°C
Other axis sensitivity	X, Y, Z	%	–6	—	6	–6	—	6	Ta=25°C
Non-linearity Note 3)	X, Y, Z	%FS	–2	—	2	–2	—	2	Ta=25°C
Turn-on time Note 4)	X, Y, Z	ms	—	20	—	—	20	—	0g, Ta=25°C, C1=C2=0.1µF, Cx,Cy, Cz=33nF
Frequency response Note 5)	X, Y, Z	Hz	DC	50	—	DC	50	—	–3dB point, Cx, Cy, Cz=33nF

Notes: 1. The acceleration unit “g” means 9.8 m/s^2.
2. VDD=3 V when there is no indication.
3. Maximum error from linear output that connects +2 g and –2 g output (Built-in ASIC type 1) or +3 g and –3 g output (Built-in ASIC type 2).
4. “C1” is a capacitor installed between the VDD and GND terminals. “C2” is a capacitor installed between the AGND and GND terminals.
5. The frequency characteristics can by changed depending on the Cx, Cy and Cz capacitance value. Please refer to “Recommended circuit diagram” on the following page. Note that the maximum frequency response is 200 Hz.
6. The specifications above are subject to change without notice.

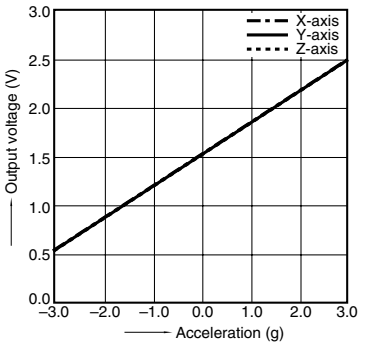
2. Element type (AGS61333)

Item	Unit	Standard value			Remarks
		min.	typ.	max.	
Acceleration detection range	g	–3	—	3	
Operation power supply voltage	V	2.0	3.0	5.0	–30 to 85°C
Sensor resistance Note 3)	kΩ	8	9.5	11	0g, Ta=25°C
Sensitivity	mV/g	0.6	—	2.3	Ta=25°C
Temperature sensitivity characteristic	%/°C	–0.8	—	0.8	–30 to 85°C
Offset voltage (0 g)	mV	–20	—	20	Ta=25°C
Offset voltage temperature characteristic	%FS/°C	–1.5	—	1.5	–30 to 85°C
Other axis sensitivity	%	–6	—	6	Ta=25°C
Non-linearity Note 4)	%FS	–2	—	2	Ta=25°C
Frequency response	Hz	DC	200	—	±1dB point

Notes: 1. The acceleration unit "g" means 9.8 m/s².
2. VDD=3 V when there is no indication.
3. Resistance value between VDD and GND terminals.
4. Maximum error from linear output that connects +3 g and –3 g output.
5. The specifications above are subject to change without notice.

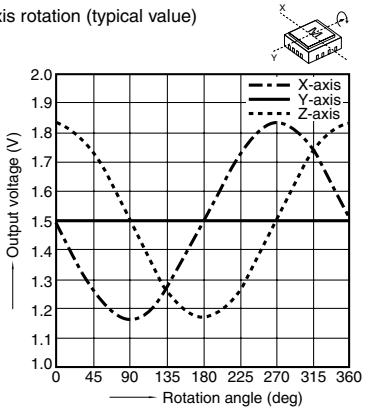
REFERENCE DATA (Typical value for AGS61331)

1. Output characteristics

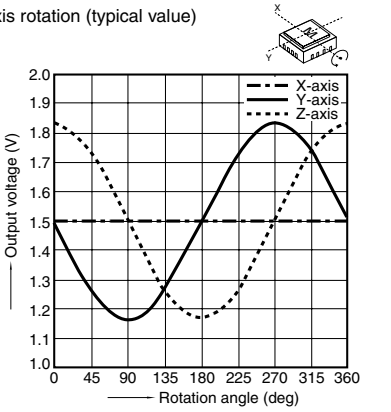


2. Inclination angle - Output voltage characteristics

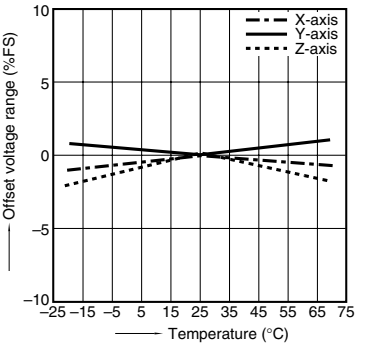
Y-axis rotation (typical value)



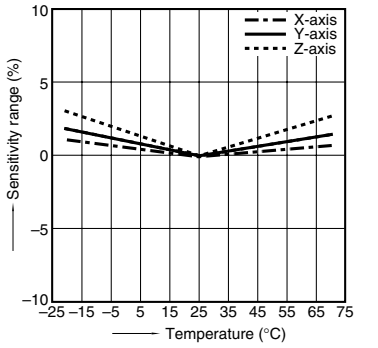
X-axis rotation (typical value)



3. Offset voltage temperature characteristics (Typical value)

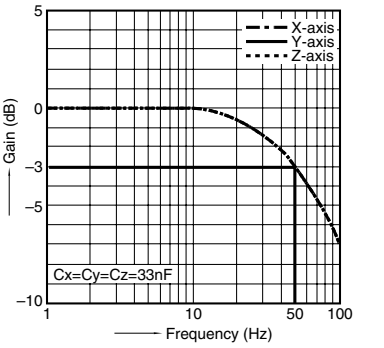


4. Sensitivity temperature characteristics



5. Frequency characteristics

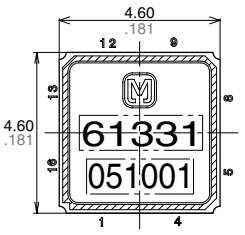
–3dB bandwidth: 50 Hz

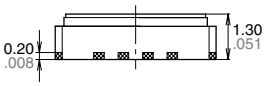


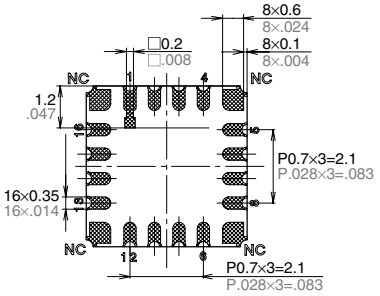
Note: The frequency characteristics can by changed depending on the Cx, Cy and Cz capacitance value. Please refer to "Recommended circuit diagram" on the following page.

DIMENSIONS FOR BUILT-IN ASIC TYPE

mm inch



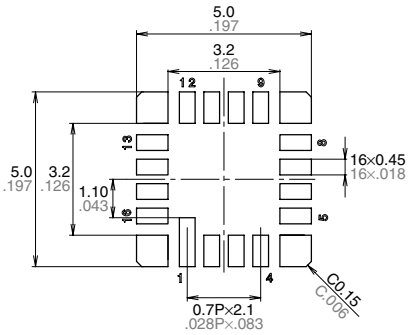




Terminal No.	Abbreviation	Terminal No.	Abbreviation
1	ZO	9	NC
2	AGND	10	NC
3	VDD	11	GND
4	NC	12	XC
5	NC	13	XO
6	NC	14	YC
7	GND	15	YO
8	NC	16	ZC

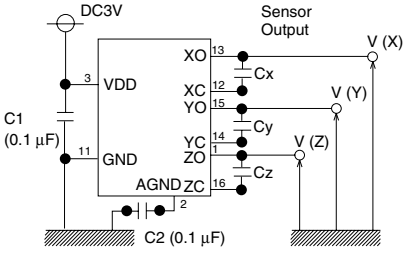
Leave terminal “NC (No. 4 to 6 and 8 to 10)” unconnected.
The No. 7 and No. 11 terminals are connected internally.

Recommended PC board pad



Tolerance: ±0.15 ±.006

RECOMMENDED CIRCUIT DIAGRAM FOR BUILT-IN ASIC TYPE



The frequency characteristics value can by changed depending on the Cx, Cy and Cz capacitance value. –3dB bandwidth is expressed in the formula below.

$$f_{-3dB} = \frac{1}{2\pi \times (100k\Omega) \times C(x,y,z)}$$

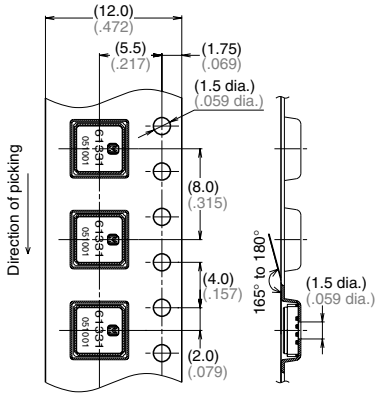
Selection example of Cx, Cy and Cz

Cx, Cy, Cz	Bandwidth
33nF	50Hz
8.2nF	200Hz

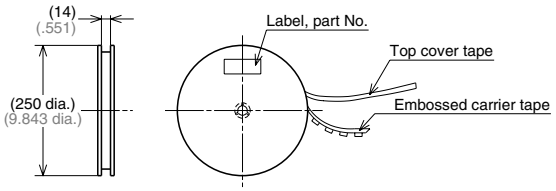
PACKAGING FORMAT (Tape and reel)

AGS61231, AGS61331

Tape dimensions

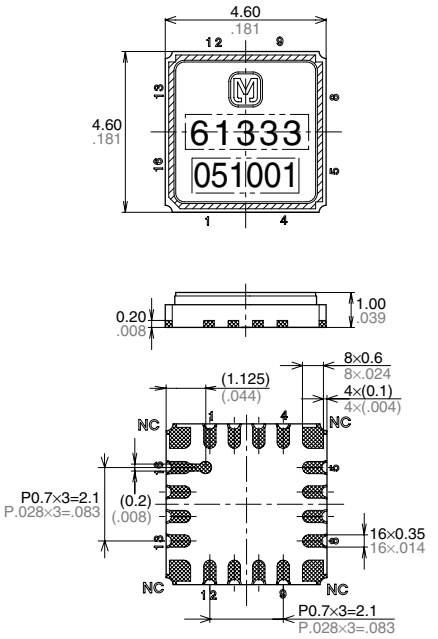


Dimensions of tape reel



DIMENSIONS FOR ELEMENT TYPE

mm inch

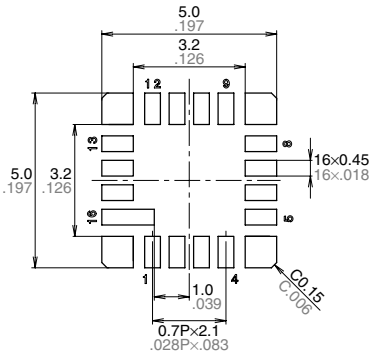


Terminal No.	Abbreviation	Terminal No.	Abbreviation
1	NC	9	NC
2	NC	10	NC
3	NC	11	NC
4	NC	12	NC
5	XP	13	XN
6	YN	14	YP
7	VDD	15	ZP
8	ZN	16	GND

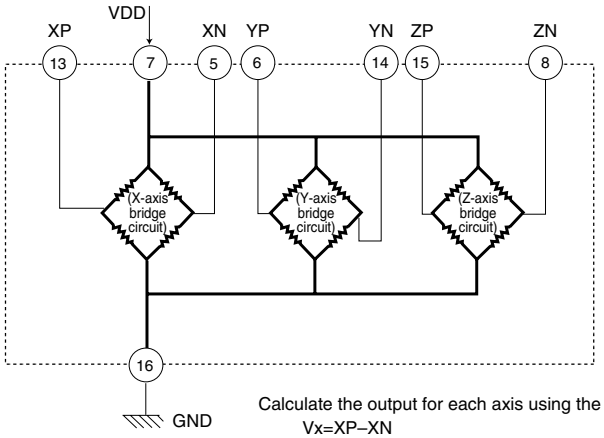
Note: Leave terminal "NC (No. 1 to 4 and 9 to 12)" unconnected.

Tolerance: ±0.15 ±.006

Recommended PC board pad



BLOCK DIAGRAM FOR ELEMENT TYPE



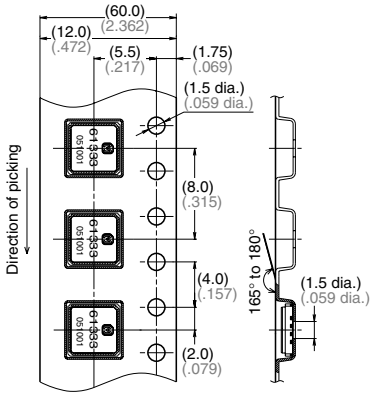
Calculate the output for each axis using the formulas below.

Vx=XP–XN
Vy=YP–YN
Vz=ZP–ZN

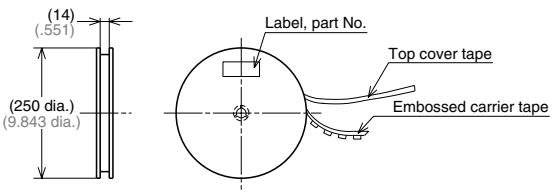
PACKAGING FORMAT (Tape and reel)

AGS61333

Tape dimensions



Dimensions of tape reel



NOTES

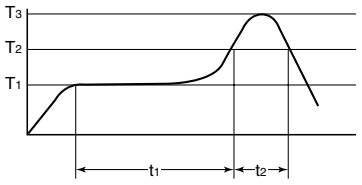
To ensure reliability, please verify quality under conditions of actual use.

1. Mounting

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

2. Soldering

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.
1) Manual soldering
• Set the soldering tip from 260 to 300°C (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) Reflow soldering
• The recommended reflow temperature profile conditions are given below.
• We recommend the screen solder printing method as the method for cream solder printing.
• Please refer to the recommended PC board pad for the PC board foot pattern.
• Self alignment may not always work as expected; therefore, please carefully adjust the position of the terminals and pattern.
• The profile temperature is the value measured on the PCB near the terminals.
• When doing reflow soldering on the back of the PC board after performing sensor reflow, please fix the sensor with adhesive and so on.
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 temperature on the terminals will cause deformation and loss in effectiveness of the solder. Therefore, please avoid dropping and careless handling of the product.
5) When cut folding the PC board after mounting the sensor, take measures to prevent stress to the soldered parts.
6) 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.
7) To prevent degradation of the PC board insulation after soldering, please be careful not to get chemicals on the sensor when coating.



T_1 = 150 to 180°C 302 to 356°F
T_2 = 230°C 446°F
T_3 = Max. 240°C 464°F
t_1 = 60 to 120 sec.
t_2 = With in 30 sec.

3. Connections

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

4. Cleaning

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

5. Environment

• Please avoid using or storing the sensor 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 sensor.
• When installing the sensor, you must provide a capacitor as shown in the recommended circuit diagram.
• Since the internal circuitry may be destroyed if an external surge voltages is supplied, provide an element which will absorb the surges.
• 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.
• Please do not use the sensor in a location where it may be sprayed with water, etc.
• Avoid using the sensor in an environment where condensation may form.
Furthermore, its output may fluctuate if any moisture adhering to it freezes.
• Avoid using the sensor where it will be susceptible to ultrasonic or other high-frequency vibration.

6. Other handling precautions

To assure reliability, check the sensor under actual loading conditions. Avoid any situation that may adversely affect its performance.
• Caution is required because differences in the acceleration detection range and the method of connection can lead to accidents.
• The actual acceleration should be within the rated acceleration range. Damage may occur if it is outside of this range.
• Static electricity can damage the sensor. Be very careful when handling.

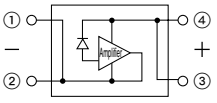
Panasonic
ideas for life

Cadmium-free sensor with spectral response The Through-hole Type for easy implementation as a CdS cell replacement

LIGHT SENSOR NaPiCa

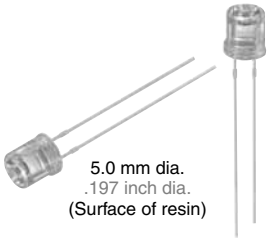
• SMD type

L 2.0mm .079inch
W 3.2mm .126inch
H 1.0mm .039inch

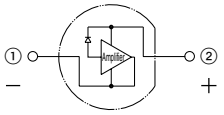


①② Anode
③④ Cathode

• Through-hole type



5.0 mm dia.
.197 inch dia.
(Surface of resin)

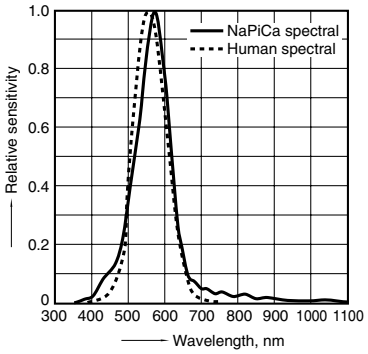


① Anode
② Cathode

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

FEATURES

1. Built-in optical filter for spectral response similar to that of the human eye.
Peak sensitivity wavelength is 580 nm



2. Photocurrent is proportional to illumination. (linear output)
High photocurrent is achieved by built-in photocurrent amp.
I_L = 260 µA (typical)
Ev = 100 lx (florescent light)
3. Uses environmentally friendly silicon chips.
4. Lead-free.
5. Operates on 1.5 to 6 V DC, which is suitable for battery operation.
6. Compact, SMD package
Same through-hole shape as CdS cell.

TYPICAL APPLICATIONS

1. Brightness detection for LCD backlight control for LCD devices (mobile phones, LCD TVs, car navigation systems, mobile PCs, and PDAs).
2. Brightness detection for controlling the keypad backlight in mobile phones.
3. Brightness detection for circuits in household lighting, crime prevention lighting, and automatic lighting for bicycle.
4. Brightness detection for wall clocks (radio clocks).

TYPES

Packing quantity: Tape and reel package SMD type: Inner 3,000 pcs., Outer 3,000 pcs.
Tape and reel pckage Through-hole type: Inner 2,000 pcs., Outer 2,000 pcs.
Baggage package Through-hole type: Inner 500 pcs., Outer 1,000 pcs.

Photo current	Part No.		
	Tape and reel package	Tape and reel package	Baggage package
	SMD type (Picked from the 1/4-pin side)	Through-hole type	
260 µA*	AMS104Y	AMS302T	AMS302

Note*: Ev = 100 lx (Fluorescent lamp is used as light source)
Tape package is the standard packing style.
Please inquire if you need tape and reel packaging that allows the SMD type to be picked from the 2/3-pin side.

RATINGS

1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item	Symbol	AMS104/AMS302	Remarks
Reverse voltage	V_R	–0.5 to 8 V	
Photocurrent	I_L	5 mA	
Power dissipation	P	40 mW	
Operating temperature	T_{opr}	–30 to +85°C –22 to +185°F	Non-condensing at low temperatures
Storage temperature	T_{stg}	–40 to +100°C –40 to +176°F	Non-condensing at low temperatures

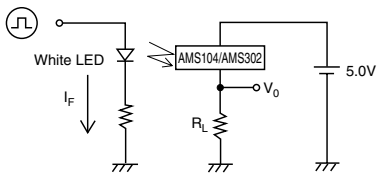
2. Recommended operating condition

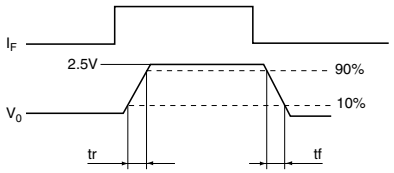
Item		Symbol	AMS104/AMS302	Remarks
Reverse voltage	Minimum	V_R	1.5 V	—
	Maximum		6 V	

3. Electrical and optical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	AMS104/AMS302	Condition
Peak sensitivity wavelength		—	λp	580 nm	—
Photocurrent 1		Minimum	I_{L1}	9.1 µA	V_R = 5 V E_V = 5 lx*1
		Typical		13 µA	
		Maximum		16.9 µA	
Photocurrent 2		Minimum	I_{L2}	182 µA	V_R = 5 V E_V = 100 lx*1
		Typical		260 µA	
		Maximum		338 µA	
Photocurrent 3		Typical	I_{L3}	500 µA	V_R = 5 V E_V = 100 lx*2
Dark current		Maximum	I_D	0.3 µA	V_R = 5 V
Switching time	Rise time	Typical	t_r	8.5 ms	V_R = 2.5 V, V_O = 2.5 V R_L = 5 kΩ
	Fall time	Typical	t_f	8.5 ms	

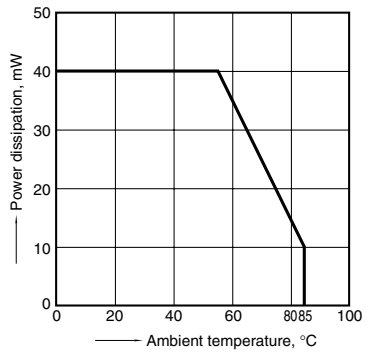
*1 Fluorescent lamp is used as light source. Ev = Brightness
*2 CIE standard illuminant 'A' is used as light source.
*3 Measuring method for switching time.



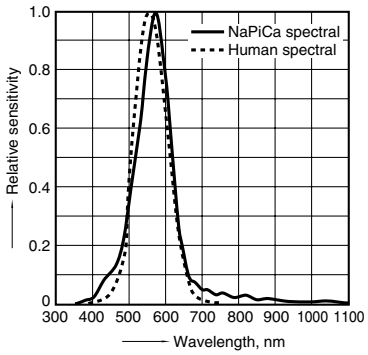


REFERENCE DATA

1. Power dissipation vs. ambient temperature characteristics

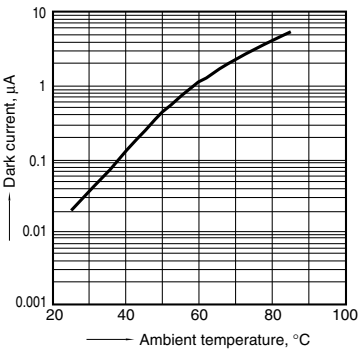


2. Relative sensitivity vs. wavelength characteristics
Ambient temperature: 25°C 77°F
Reverse voltage: 5V

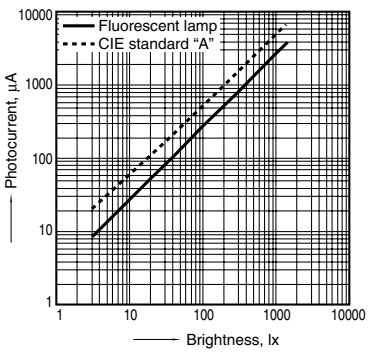


3. Dark current vs. ambient temperature characteristics

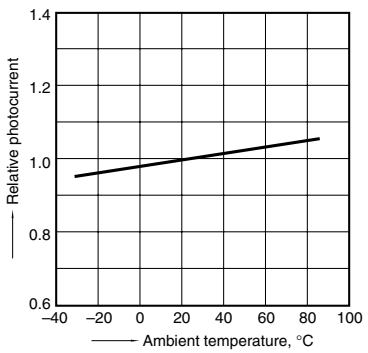
Reverse voltage: 5V



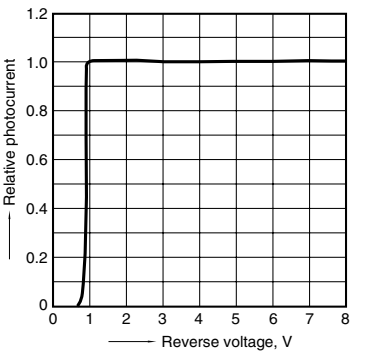
4. Photocurrent vs. brightness characteristics
Light source: Fluorescent lamp, CIE standard "A"
Reverse voltage: 5V, Ambient temperature: 25°C 77°F



5. Relative photocurrent vs. ambient temperature characteristics
Light source: Fluorescent lamp, Brightness: 100 lx
Reverse voltage: 5V

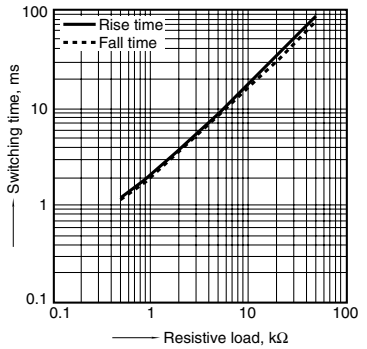


6. Relative photocurrent vs. reverse voltage characteristics
Light source: Fluorescent lamp, Brightness: 100 lx
Ambient temperature: 25°C 77°F



7. Switching time vs. resistive load characteristics

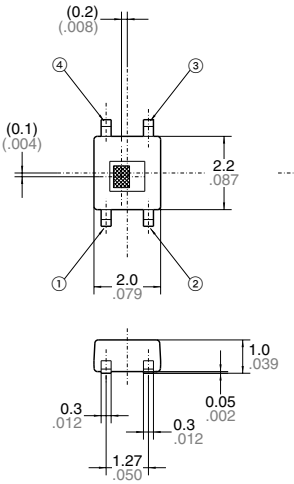
Light source: White LED, Reverse voltage: 2.5V
Resistive load voltage: 2.5V
Ambient temperature: 25°C 77°F



DIMENSIONS

mm inch

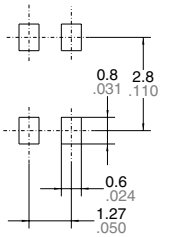
1. SMD type



① Anode: –
② Anode: –
③ Cathode: +
④ Cathode: +
▩ DETECTION AREA

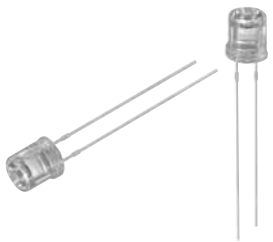
Terminal thickness: t=0.125
General Tolerance: ±0.1 ±.004

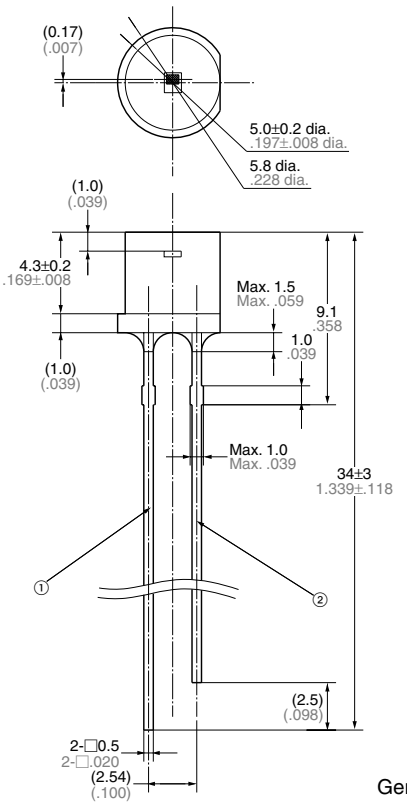
Recommended mounting pad
(Top view)



Tolerance: ±0.1 ±.004

2. Through-hole type





① Anode: –
② Cathode: +
▩ DETECTION AREA

General Tolerance: ±0.5 ±.020

SAFETY PRECAUTIONS

Be sure to obey the following in order to prevent injuries and accidents.

- Do not use the sensors under conditions that exceed the range of its specifications. It may cause overheating, smoke, or fire.
- Connect terminals correctly by verifying the pin layout with the specifications diagram or other instructions. Erroneous connections may lead to unexpected operating errors, overheating, smoke, or fire.
- For an impotant and serious application in terms of safety, add protection circuit or any other protection method.

CAUTIONS FOR USE

1. Applying stress that exceeds the absolute maximum rating

If the voltage or current value for any of the terminals exceeds the absolute maximum rating, internal elements will deteriorate because of the excessive voltage or current. In extreme cases, wiring may melt, or silicon P/N junctions may be destroyed.

As a result, the design should ensure that the absolute maximum ratings will never be exceeded, even momentarily.

2. Deterioration and destruction caused by discharge of static electricity

This phenomenon is generally called static electricity destruction. Static electricity generated by various factors flows through the terminal and occurs to destroy internal elements. To prevent problems from static electricity, the following precautions and measures should be taken when using your device.

1) Employees handling sensor should wear anti-static clothing and should be grounded through protective resistance of 500 kΩ to 1 MΩ.

2) A conductive metal sheet should be placed over the work table. Measuring instruments and jigs should be grounded.

3) When using soldering irons, either use irons with low leakage current, or ground the tip of the soldering iron. (Use of low-voltage soldering irons is also recommended.)

4) Devices and equipment used in assembly should also be grounded.

5) When packing printed circuit boards and equipment, avoid using high-polymer materials such as foam styrene, plastic, and other materials which carry an electrostatic charge.

6) When storing or transporting sensor, the environment should not be generated static electricity (for instance, the humidity should be between 45 and 60%), and sensor should be protected using conductive packing materials.

3. Just after supplying voltage, please note that current in the sensor will be not constant until internal circuit stability.

4. Storage

The sensors are transparent plastic packages. They are sensitive to moisture and come in moisture-proof packages. Observe the following cautions when storing.

1) After the moisture-proof package is unsealed, take the sensors out of storage as soon as possible (within 1 week at the most).

2) If the devices are to be left in storage for a considerable period after the moisture-proof package has been unsealed, it is recommended to keep them in another moisture-proof bag containing silica gel (within 3 months at the most).

3) Storage under extreme conditions will cause soldering degradation, external appearance defects, and deterioration of the characteristics. The following storage conditions are recommended:

- Temperature: 0 to 30°C 32 to 86°F
- Humidity: Less than 60% R.H. (Avoid freezing and condensing)
- Atomosphere: No harmful gasses such as sulfurous acid gas, minimal dust.

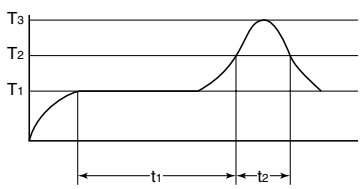
*When mounting with solder, if thermal stress is applied to sensors that have absorbed moisture, the moisture will vaporize, swelling will occur, and the inside of the package will become stressed. This may cause the package surface to blister or crack. Therefore, please take caution and observe the soldering conditions in the following section.

5. Recommended soldering conditions

<SMD type>

1) Recommended condition

(1) IR (Infrared reflow) soldering method



T_1 = 155 to 180°C 311 to 356°F
T_2 = 230°C 446°F
T_3 = 250°C 482°F or less
t_1 = 60 to 120 s or less
t_2 = 30 s or less

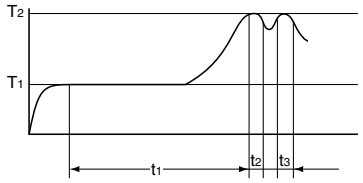
(2) Soldering iron method
Tip temperature: 350 to 400°C 662 to 752°F
Wattage: 30 to 60 W
Soldering time: within 3 s

2) Do not do flow soldering.

<Through-hole type>

1) Recommended condition

(1) Double wave soldering method



T_1 = 120°C 248°F
T_2 = 260°C 500°F or less
t_1 = 120 s or less
t_2+t_3= 6 s or less

(2) Soldering iron method
Tip temperature: 350 to 400°C 662 to 752°F
Wattage: 30 to 60 W
Soldering time: within 3 s

2) The soldered position on leads should not be closer than 3mm .118inch to the molding resin of this sensor.

6. Notes for mounting

1) Temperature rise in the lead portion is highly dependent on package size. If multiple different packages are mounted on the same board, please check your board beforehand in an actual product, ensuring that the temperature of the solder area of the sensor terminals falls within the temperature conditions of item 5.

2) If the mounting conditions exceed the recommended solder conditions in item 5, resin strength will fall and the mismatching of the heat expansion coefficient of each constituent material will increase markedly, possibly causing cracks in the package, disconnections of bonding wires, and the like. For this reason, please inquire with us about whether this use is possible.

Light Sensor (AMS1, 3)

7. Cleaning solvents compatibility

We recommend dip cleaning with an organic solvent for removal of solder flux etc. If you cannot avoid using ultrasonic cleansing, please ensure that the following conditions are met, and check beforehand for defects.

- Frequency: 27 to 29 kHz
- Ultrasonic power:
  No greater than 0.25W/cm^2
- Cleaning time:
  No longer than 30 s
- Cleanser used: Asahiklin AK-225
- Other:
  Submerge in solvent in order to prevent the PCB and sensors from being contacted directly by the ultrasonic vibrations.

Note: Applies to unit area ultrasonic power for ultrasonic baths.

8. Transportation

Extreme vibration during transport will warp the lead or damage the sensor. Handle the outer and inner boxes with care.

9. Avoid using the sensor in environments containing excessive amounts of steam, dust, corrosive gas, or where organic solvents are present.

10. Lead forming and cutting

1) Lead forming must be done at normal temperature before soldering

2) The bent and cut position on leads should not be closer than 3mm .118inch to the base of leads.

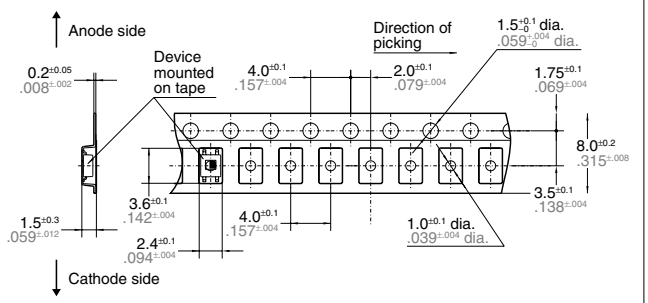
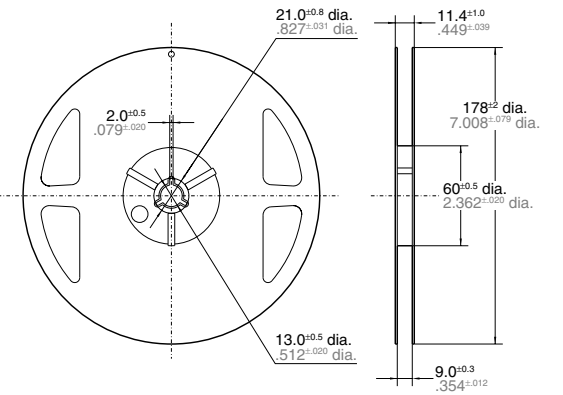
3) Lead forming and cutting must be done while fixing the base of leads.

4) Avoid mounting with stress at the base of leads.

11. The following shows the packaging format

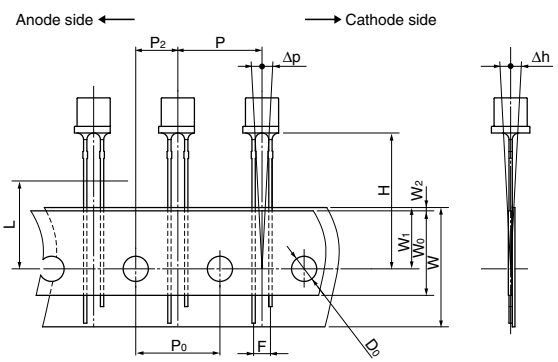
1) SMD type tape and reel

mm inch

Type	Tape dimensions	Dimensions of tape reel
Light sensor NaPiCa SMD type AMS104Y	 Note) When picked from 1 and 4-pin side: Part No. AMS104Y (Shown above)	

2) Through-hole type tape and reel

mm inch

	Tape dimensions
Light sensor NaPiCa Through-hole type AMS302T	 Note) Zigzag tape style is used.

Symbol	Symbol	Dimensions	Remarks
Feed hole pitch	P_0	12.7±0.3 .500±.012	
Product interval pitch	P	12.7±1.0 .500±.039	
Product distance	P_2	6.35±1.3 .250±.051	
Product bottom distance	H	20.5±1.0 .807±.039	
Lead interval	F	2.54±0.5 .100±.020	
Product slant	Δh	0±1.0 0±.039	
Product tilt	Δp	0±1.0 0±.039	
Tape width	W	$18.0^{+1.0}_{-0.5}$ $.709^{+.039}_{-.020}$	
Holding tape width	W_0	13.0±0.3 .512±.012	
Feed hole position	W_1	$9.0^{+0.75}_{-0.5}$ $.354^{+.030}_{-.020}$	
Holding tape distance	W_2	0 to 0.5 0 to .020	
Feed hole diameter	D_0	3.8±0.2 .150±.008	
Tape thickness	t	0.5±0.2 .020±.008	Included holding tape thickness
	L	Max.: 11.0 .433	

Light Sensor NaPiCa terminology

Term	Symbol	Explanation
Reverse voltage	V_R	The applied voltage between the cathode and anode.
Photocurrent	I_L	The current that flows between the cathode and anode when light is applied.
Power dissipation	P	The electric power loss that occurs between the cathode and anode.
Operating temperature	T_{opr}	The workable ambient temperature range at which normal operation is possible under the condition of a prescribed allowable loss.
Storage temperature	T_{stg}	The ambient temperature range at which the sensor can be left or stored without applying voltage.
Peak sensitivity wavelength	λ_p	The wavelength of light at which sensitivity is at its maximum.
Dark current	I_D	The current between the cathode and anode when reverse voltage is applied during darkness.
Rise time	t_r	Time required for the output waveform to rise from 10% to 90% when light is applied.
Fall time	t_f	Time required for the output waveform to fall from 90% to 10% when light is cut.

Panasonic
ideas for life

MOTION SENSOR (PASSIVE INFRARED TYPE)

MP MOTION SENSOR 'NaPiOn'


Standard type


Slight motion detection type


Spot type

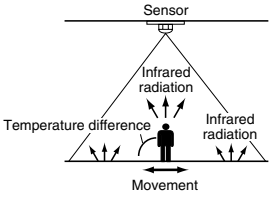

10 m detection type

What is passive infrared type?

This sensor detects changes in infrared radiation which occur when there is movement by a person (or object) which is different in temperature from the surroundings.

① As this sensor detects temperature differences, it is well suited to detecting the motion of people by their body temperature.

② Wide sensing area.



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

FEATURES

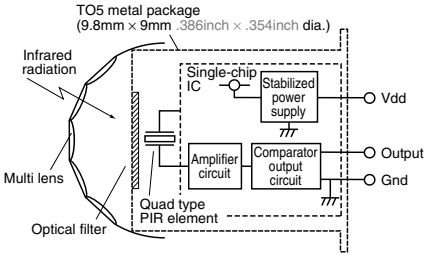
1. The world s smallest with a built-in amplifier
Extremely compact. Ideal for use in miniaturized devices.

2. Dual lens colors (white and black) are provided
With an ultrasmall design and dual lens colors (white and black), it is inconspicuous, allowing the user to select either white or black to match the equipment color. This provides greater flexibility in equipment design.

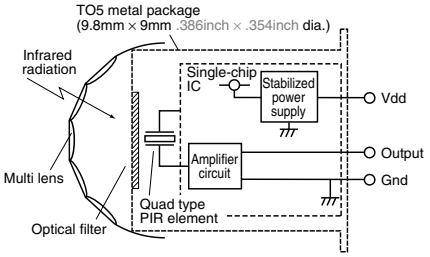
3. Both digital output and analog output (with adjustable sensitivity) are available.

4. Built-in amplifier for easy use
Has a built-in amplifier, and can be connected directly to a microcomputer.

• Block diagram of the digital output circuit



• Block diagram of the analog output circuit



5. Detects even slight motion of a person
With our sensor, even slight motions made by people will be detected easily.

• Fine motion detection capability within approximately 2 meters of sensor.

Standard type:
Detects movement of approximately 30cm 11.811inch.
Slight motion detection type:
Detects movement of approximately 20cm 7.874inch.

6. Noise withstanding capability
Circuitry is contained in a TO5 metal package, providing at least twice the noise withstanding capability as conventional type.

• Comparison example of noise withstanding capability

	Distance at which motion sensor is not affected by cellular phone noise
Conventional type	Min. 1 to 2m 3.281 to 6.562ft
MP Motion Sensor	Min. 1 to 2cm .394 to .787inch

7. A low current consumption type (46 µA) has also been added to the lineup.
A type that keeps current consumption to 46 µA (less than 30% compared to predecessor) is now available.
Ideal for battery driven devices.
*Digital output type only.

APPLICATIONS

1. Home appliances
Useful for saving energy in air conditioner, television, personal computer, or ventilator and air purifier

2. Amusement machine market
Useful for saving energy and for automated guidance in theme parks and large video games

3. Equipment in service market
Useful for automated guidance, automated announcements and energy saving in vending machines, ATMs, etc.

4. Lighting market
Automated on/off controls, etc. for lamps, desk lamps, indoor lights, halls, stairway lights, etc.

ORDERING INFORMATION

AMN □ □ 1 □ □

Output
1: Digital output
2: Analog output
4: Low current consumption (digital output)

Detection performance
1: Standard detection type
2: Slight motion detection type
3: Spot detection type
4: 10m detection type

Feature
1: PC board mounting type

Operating voltage
1: 5V DC
2: 3V DC

Lens color
1: Black
2: White

07/2007

PRODUCT TYPES

1. Digital output

Rated operating voltage	Detection performance		Ambient temperature	Lens color	Part No.	Packing quantity	
						Inner	Outer
3 to 6 V DC 2.2 to 3 V DC (Low current consumption type)	Standard detection type	Standard	–20 to +60°C –4 to +140°F	Black	AMN11111	50 pcs.	1,000 pcs.
				White	AMN11112		
		Low current consumption		Black	AMN41121		
				White	AMN41122		
	Slight motion detection type	Standard		Black	AMN12111		
				White	AMN12112		
		Low current consumption		Black	AMN42121		
				White	AMN42122		
	Spot detection type	Standard		Black	AMN13111		
				White	AMN13112		
		Low current consumption		Black	AMN43121		
				White	AMN43122		
	10m detection type	Standard		Black	AMN14111		
				White	AMN14112		
		Low current consumption		Black	AMN44121		
				White	AMN44122		

2. Analog output

Rated operating voltage	Detection performance	Ambient temperature	Lens color	Part No.	Packing quantity	
					Inner	Outer
4.5 to 5.5 V DC	Standard detection type	–20 to +60°C –4 to +140°F	Black	AMN21111	50 pcs.	1,000 pcs.
			White	AMN21112		
	Slight motion detection type		Black	AMN22111		
			White	AMN22112		
	Spot detection type		Black	AMN23111		
			White	AMN23112		
	10m detection type		Black	AMN24111		
			White	AMN24112		

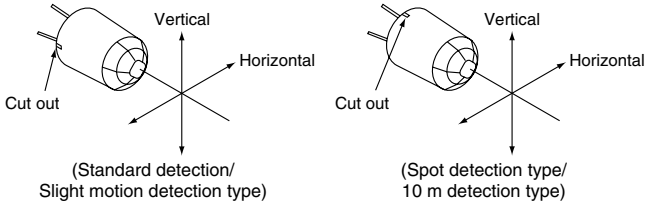
PERFORMANCE

1. Detection performance

Items		Standard detection type	Slight motion detection type	Spot detection type	10m detection type	Conditions of objects to be detected
Rated detection distance *Remark 1		5m 16.404ft (Max.)	2m 6.562ft (Max.)	5m 16.404ft (Max.)	10m 32.808ft (Max.)	1. Detectable difference in temperature between the target and background for the spot type is more than 4°C 39.2°F. 2. Movement speed • Standard detection type/Spot detection type/ 10m detection type: 0.5 to 1.5 m/s • Slight motion detection type: 0.3 to 1.0 m/s 3. Detection object = human body (size is 700mm × 250mm 27.559inch × 9.843inch, but for the slight motion detection type the size is 200mm × 200mm 7.874inch × 7.874inch)
Detection range	Horizontal *Remark 2	100°	91°	38°	110°	
	Vertical *Remark 2	82°	91°	22°	93°	
	Detection zone *Remark 3	64 zones	104 zones	24 zones	80 zones	

*Remarks 1. Depending on the difference in temperature between the background and detection target and the speed at which the target moves, these sensors may be capable of detection beyond the detection distances stated above. Nevertheless, they should be used within the prescribed detection distances. For further details, refer to the detection range diagram on page 14.

*Remarks 2.



(Standard detection/ Slight motion detection type)

(Spot detection type/ 10 m detection type)

*Remarks 3. Regarding of detection zone, please refer to "DETECTION PERFORMANCE" on page 14.

2. Rating (Measuring condition: ambient temp. = 25°C 77°F) (Common to All types)

Items	Specified value	Remarks
Power supply voltage	–0.3 to 7 V DC	
Usable ambient temperature	–20 to 60°C –4 to +140°F	No freezing and condensing at low temperature.
Storage temperature	–20 to 70°C –4 to +158°F	

3. Electrical characteristics (Measuring condition: ambient temp. = 25°C 77°F; operating voltage = 5V) (Common to All types)

1) Digital output

Items			Symbol	Specified value		Measured conditions
				Standard type	Low current consumption type	
Reted operating voltage		Minimum Typical Maximum	Vdd	3.0 V DC — 6.0 V DC	2.2 V DC — 3.0 V DC	
Reted consumption current (Standby)*Remark		Typical Maximum	Iw	170 µA 300 µA	46 µA 60 µA	Iout = 0
Output (when detecting)	Current	Maximum	Iout	100 µA	100 µA	Vout ≧ Vdd–0.5
	Voltage	Minimum Maximum	Vout	Vdd –0.5 —	Vdd –0.5 —	Open when not detecting
Circuit stability time		Typical Maximum	Twu	7 s 30 s	7 s 30 s	

Remark: The current which is consumed during detection consists of the standby consumed current plus the output current.

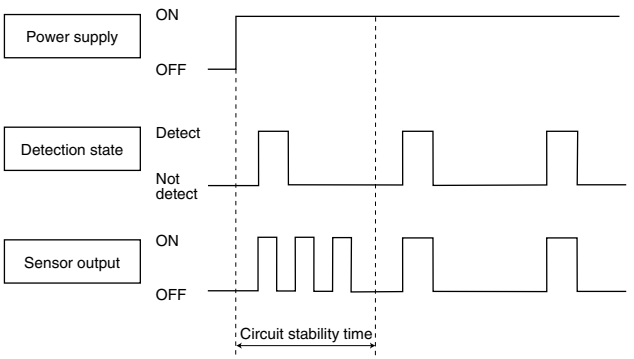
2) Analog output

Items		Symbol	Specified value	Measured conditions
Reted operating voltage	Minimum Maximum	Vdd	4.5 V DC 5.5 V DC	
Reted consumption current	Typical Maximum	Iw	0.17 mA 0.3 mA	Iout = 0
Output current	Maximum	Iout	50 µA	
Output voltage	Minimum Typical Maximum	Vout	0 V 2.5 V Vdd	
Output offset average voltage	Minimum Typical Maximum	Voff	2.3 V 2.5 V 2.7 V	Steady-state output voltage when not detecting
Steady-state noise	Typical Maximum	Vn	155 m Vp-p 300 m Vp-p	
Circuit stability time	Maximum	Twu	45 s	

Note: To set to the same detection performance as the digital type, set the output voltage to the offset voltage (2.5V) ±0.45V (i.e. 2.95V or more and 2.05V or less).

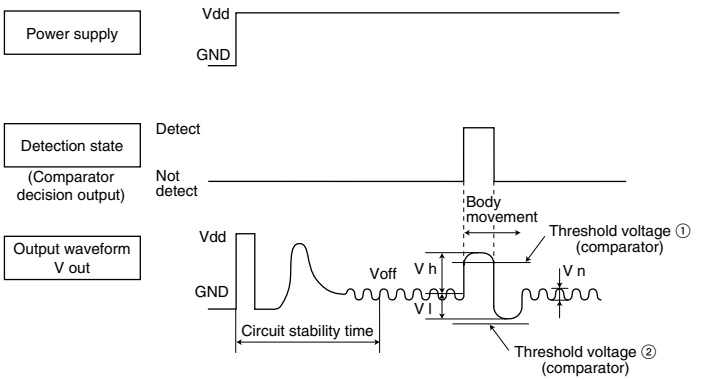
[Timing chart]

1) Digital output



Remark:
Circuit stability time: 30s max.
While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the “on” state or “off” state. This is true regardless of whether or not the sensor has detected anything.

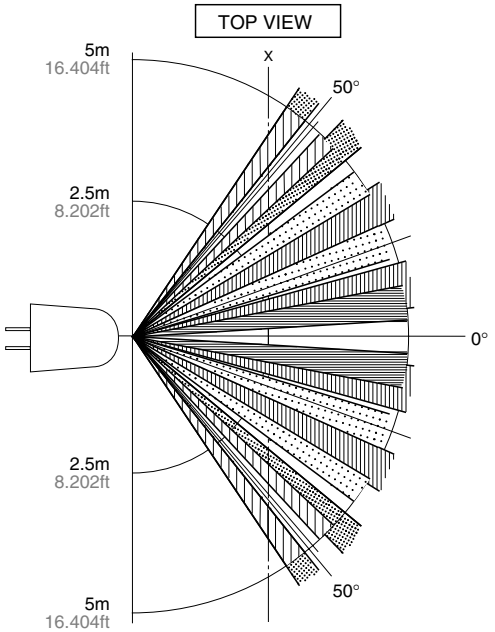
2) Analog output

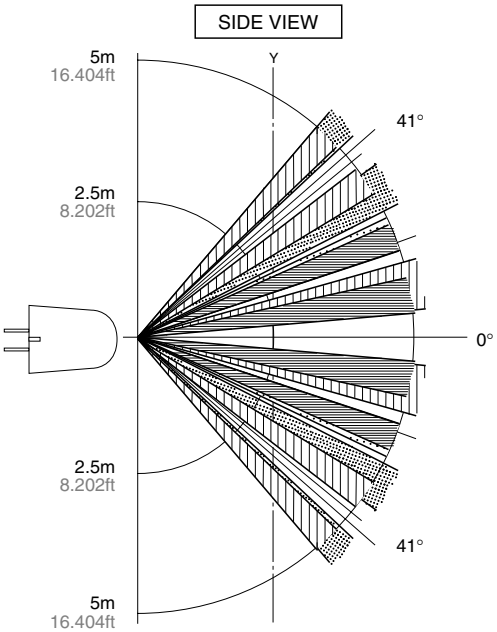


Remark:
Circuit stability time: 45s max.
While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the “on” state or “off” state. This is true regardless of whether or not the sensor has detected anything.

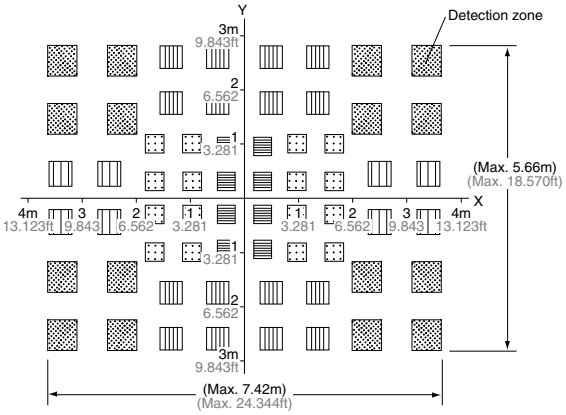
DETECTION PERFORMANCE

1. Standard detection type



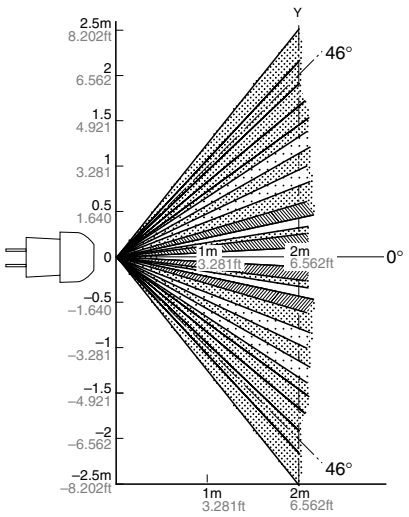


X-Y cross section

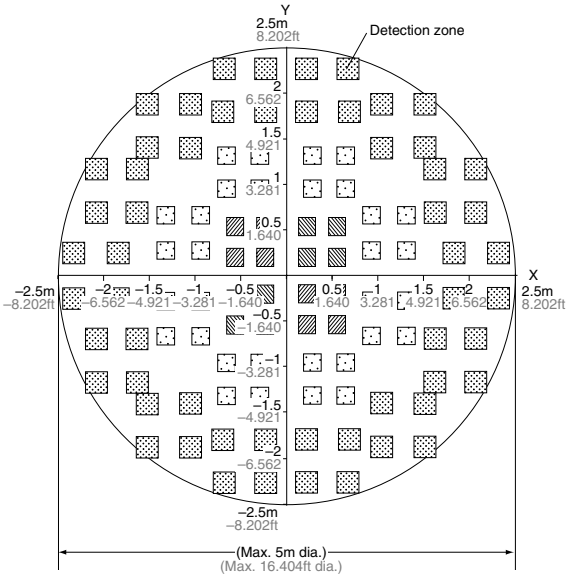


Remarks:
1. The X-Y cross-sectional diagram shows the detection area.
2. The differences in the detection zone patterns are indicative of the projections of the 16 lenses with single focal point and with five optical axes. An object whose temperature differs from the background temperature and which crosses inside the detection zone will be detected.

2. Slight motion detection type

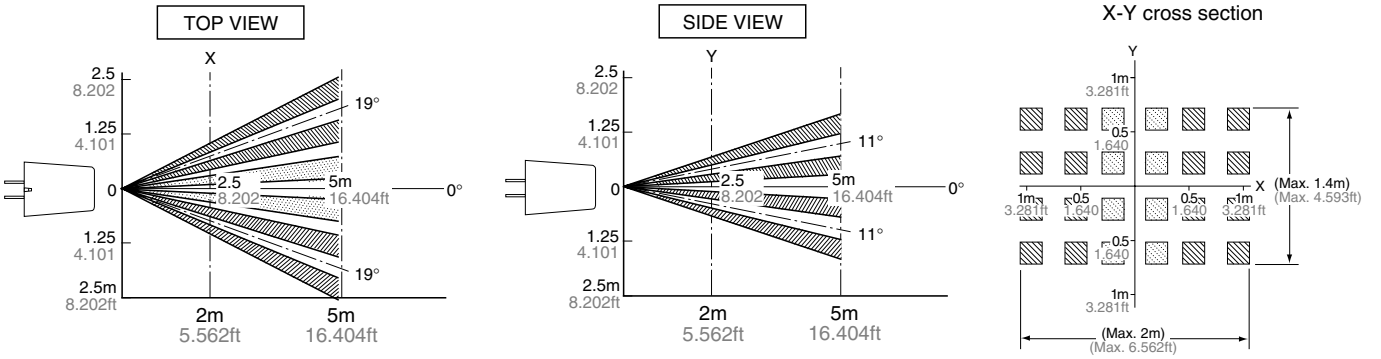


X-Y cross section



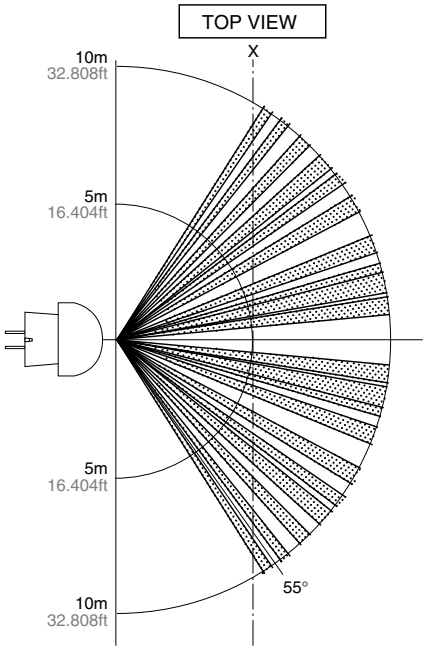
Remarks:
1. The X-Y cross-sectional diagram shows the detection area.
2. The differences in the detection zone patterns are indicative of the projections of the 26 lenses with single focal point and with three optical axes. An object whose temperature differs from the background temperature and which crosses inside the detection zone will be detected.

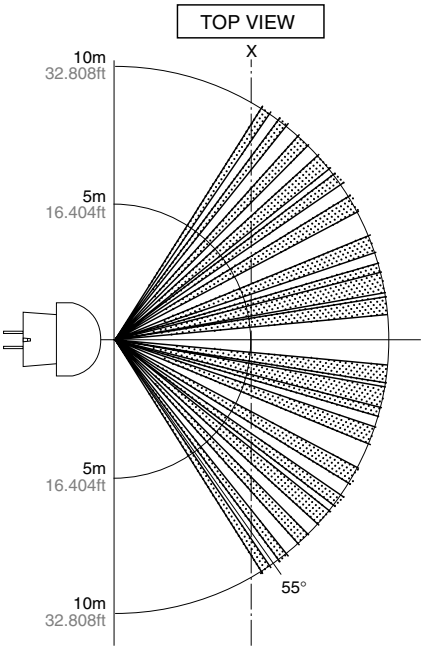
3. Spot detection type

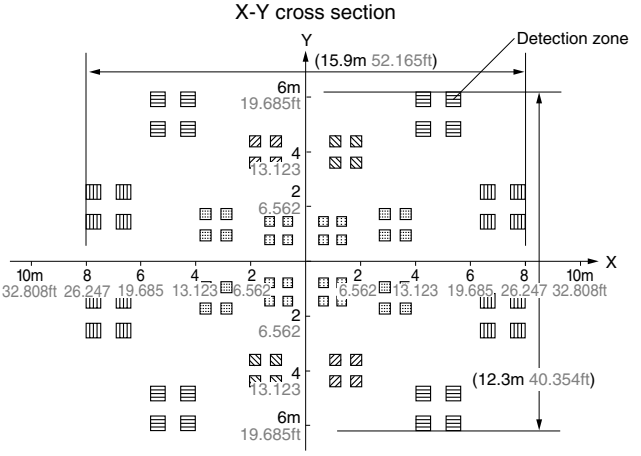


Remarks: 1. The X-Y cross-sectional diagram shows the detection area.
2. The differences in the detection zone patterns are indicative of the projections of the 6 lenses with single focal point and with two optical axes. An object whose temperature differs from the background temperature and which crosses inside the detection zone will be detected.

4. 10m detection type



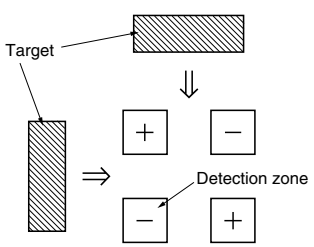




Remarks:
1. The X-Y cross-sectional diagram shows the detection area.
2. The differences in the detection zone patterns are indicative of the projections of the 20 lenses with single focal point and with five optical axes. An object whose temperature differs from the background temperature and which crosses inside the detection zone will be detected.

5. Notes regarding the detection zone

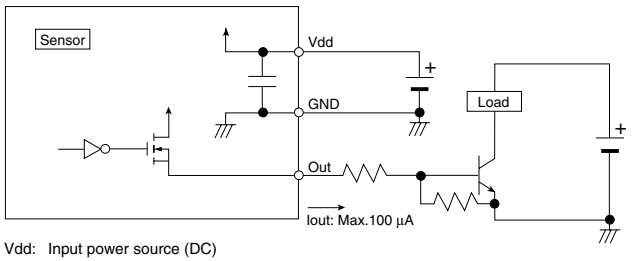
The detection zone has the polarity shown in the diagram on the right. When targets enter both the + and – zones with the same timing, the signals are cancelled each other, thus in this case there is a possibility that the object cannot be detected at the maximum specified detection distance.



HOW TO USE

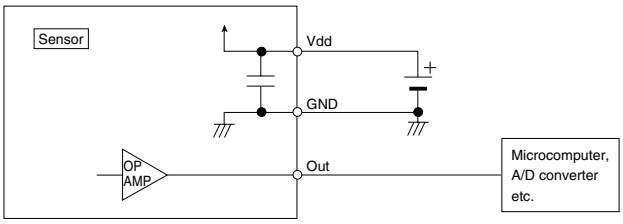
1. Wiring diagram

1) Digital output



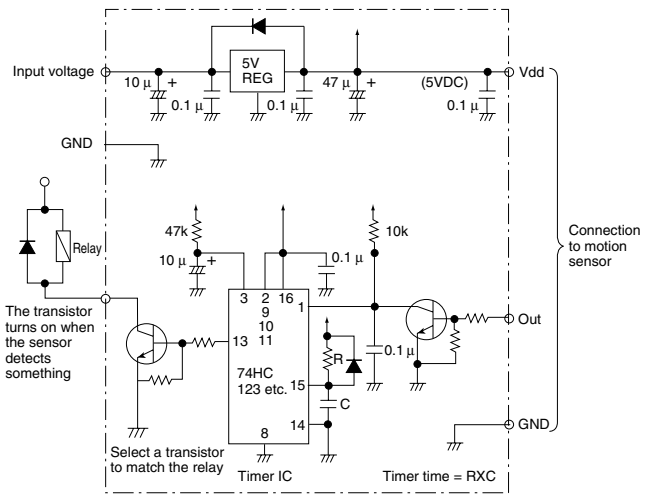
Vdd: Input power source (DC)
GND: GND
Out: Output (Comparator)

2) Analog output

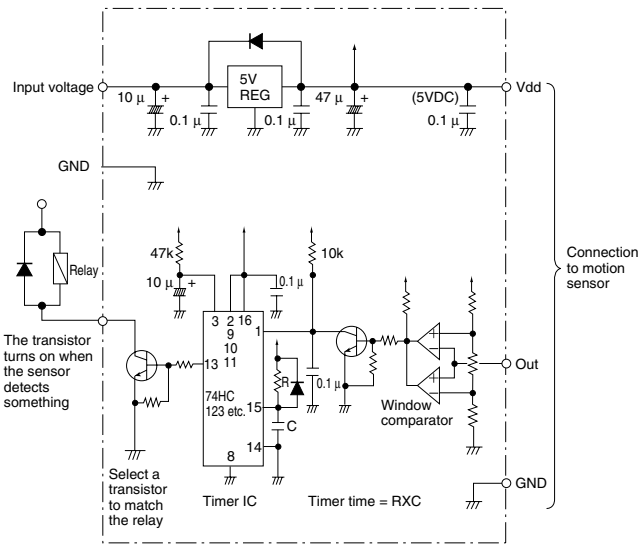


2. Timer circuit example

1) Digital output



2) Analog output

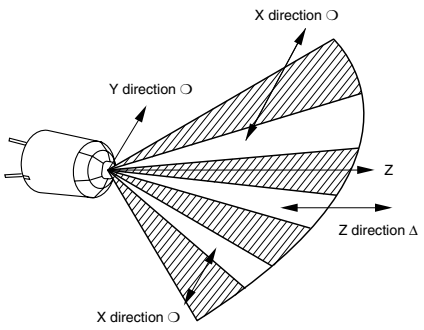


Note: This is the reference circuit which drives the MP motion sensor. Install a noise filter for applications requiring enhanced detection reliability and noise withstanding capability.
Differences in the specifications of electronic components to which the units are connected sometimes affect their correct operation; please check the units' performance and reliability for each application.

Note: This circuit is a sample of a drive circuit for the MP Motion Sensor. Its noise resistance and long-term reliability are not considered or investigated.
To improve the detection reliability and noise resistance of the circuit, consider adding a noise filter.
Matsushita Electric Works, Ltd. accepts no responsibility for damages resulting from the use of this circuit.

3. Installation

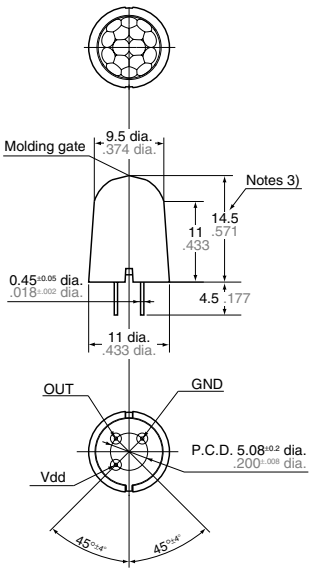
Install the sensor so that people will be entering from the X or Y direction shown below. If persons approch the sensor from the Z direction, detection distance will be shortened.



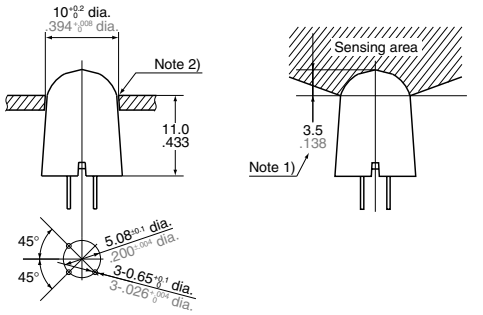
DIMENSIONS

mm inch General tolerance ±0.5 ±.020

1. Standard detection type

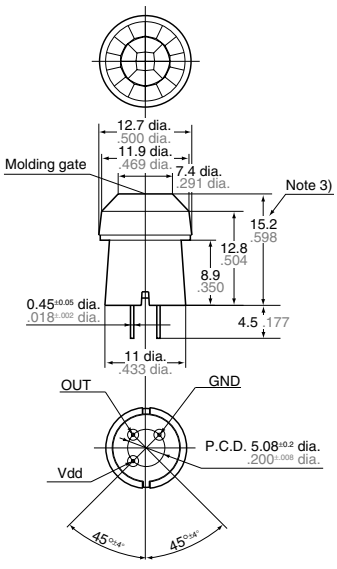


Recommended PC board pattern

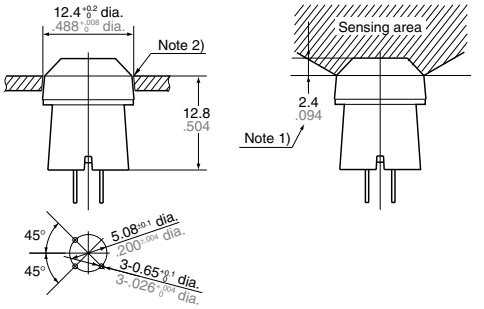


Notes: 1. In order to ensure proper detection, install it with the lens exposed at least 3.5mm .138inch.
2. As for panel mounting hole, tapering or making a large size hole should be done.
3. The height dimension does not include the remaining molding gate.

2. Slight motion detection type

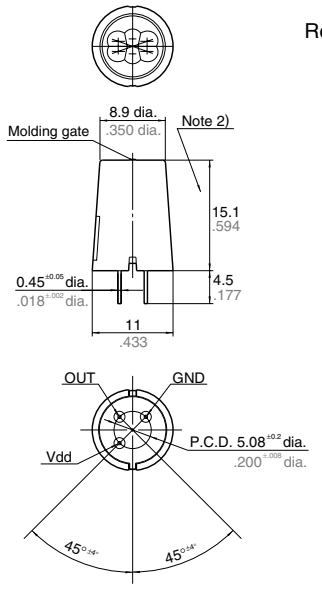


Recommended PC board pattern



Notes: 1. In order to ensure proper detection, install it with the lens exposed at least 2.4mm .094inch.
2. As for panel mounting hole, tapering or making a large size hole should be done.
3. The height dimension does not include the remaining molding gate.

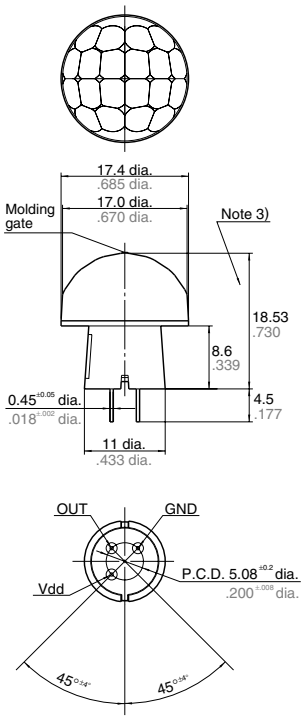
3. Spot detection type



Recommended PC board pattern

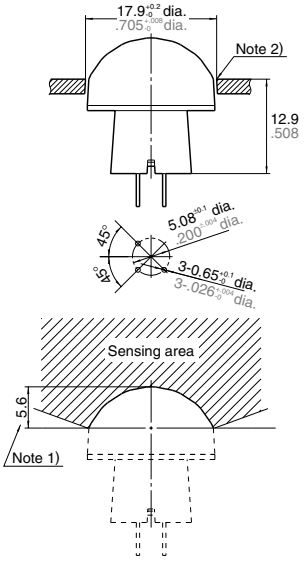
Notes: 1. As for panel mounting hole, tapering or making a large size hole should be done.
2. The height dimension does not include the remaining molding gate.

4. 10m detection type



mm inch General tolerance ±0.5 ±.020

Recommended PC board pattern



Notes:
1. In order to ensure proper detection, install it with the lens exposed at least 5.6mm .220inch.
2. As for panel mounting hole, tapering or making a large size hole should be done.
3. The height dimension does not include the remaining molding gate.

NOTES

1. Checkpoints relating to principle of operation

MP motion sensors are passive infrared sensors which detect changes in the infrared rays. They may fail to detect successfully if a heat source other than a human being is detected or if there are no temperature changes in or movement of a heat source. Care must generally be taken in the following cases. The performance and reliability of the sensors must be checked out under conditions of actual use.

<1> Cases where a heat source other than a human being is detected.

1) When a small animal enters the detection range.

2) When the sensor is directly exposed to sunlight, a vehicle's headlights, an incandescent light or some other source of far infrared rays.

3) When the temperature inside the detection range has changed suddenly due to the entry of cold or warm air from an air-conditioning or heating unit, water vapor from a humidifier, etc.

<2> Cases where it is difficult to detect the heat source

1) When an object made of glass, acrylic or other subject which far infrared rays have difficulty passing through is located between the sensor and what is to be detected.

2) When the heat source inside the detection range hardly moves or when it moves at high speed; for details on the movement speed, refer to the section on the performance ratings.

2. When the detection area becomes larger

When the difference between the ambient temperature and body temperature is large (more than 20°C 68°F), detection may occur in isolated areas outside the specified detection range.

3. Other handling cautions

1) Be careful not to allow dust or dirt to accumulate on the lens as this will adversely affect the detection sensitivity.

2) The lens is made of a soft material (polyethylene).
Avoid applying a load or impact since this will deform or scratch the lens, making proper operation impossible and causing a deterioration in its performance.

3) The sensor may be damaged if it is exposed to static with a voltage exceeding ±200V. Therefore, do not touch its terminals directly, and exercise adequate care in the handling of the sensor.

4) When the leads are to be soldered, solder them by hand for less than 3 seconds at a temperature of less than 350°C 662°F at the tip of the soldering iron. Avoid using a solder bath since this will causing a deterioration in the sensor's performance.

5) Do not attempt to clean the sensor. Cleaning fluid may enter inside the lens area causing a deterioration in performance.

6) When using the sensors with cables, it is recommended that cables which are shielded and as short as possible be used in order to safeguard against the effects of noise.

For the general precautions, refer to the Notes for Motion Sensors on page 27.

Panasonic
ideas for life

MOTION SENSOR (AREA REFLECTIVE TYPE)

MA MOTION SENSOR Series

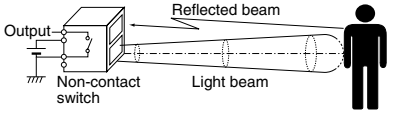
Short type
(Mounting direction: H type)

Middle type
(Mounting direction: H type)

Long type
(Mounting direction: H type)

Long type
(Mounting direction: V type)

What is area reflective type?
The sensor emits a ray of light toward the human body and detects the distance and determine whether there is a person within a given distance of the sensor. If the sensor detects a person, it sets an output non-contact switch to ON.



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

FEATURES

1. Certain detection unaffected by the reflectance of the object
The sensor can provide stable detection that is not affected by the condition (color or material of the clothing) or parts (skin, hair, etc.) of the object being monitored. (Reflectance 18% to 90%). Excellent performance even when the detection surface is dirty.

2. Only connecting DC power supply for operating
Built-in oscillation circuit type obviates the hitherto existing need for start signal input.

3. Use in adjacent positions is possible
These sensors can be located in adjacent positions, because the timing of the external trigger signals can be adjusted so that the beam frequency of each adjacent sensor will not interfere with the other.

4. Battery drive possible
By applying longer interval for the trigger signal, you can reduce the total power consumption.

5. Ultra compact size
Suitable for building in equipment as the size is ultra compact.

6. Can be used with a number of different supply voltages.
1) The 5V DC type (4.5 to 6.5V DC)
2) The free-ranging power type (6.5 to 27V DC)
They support the DC power supplies of electronic products and equipment in general.

7. The open collector output system makes for easy load drive.
These sensors provide a continuous output during detection because the output system makes it easy to drive the load.
They achieve an output performance of 30V, Built-in oscillation circuit type: 100 mA, External triggering type: 10 mA.

8. All models with Built-in oscillation circuit type meet CE mark standards.
Conforms with EMC directive for CE certification vital for use in Europe.

APPLICATIONS

1. Water-based product market
- Automatic lighting of wash basin units
- Toilets
- Automatic water flow from faucets

2. Stores and financial instructions
- Automatic doors
- Automatic lighting
- Cash dispensing machines
- Automatic teller machines
- Visitor detecting sensors

3. Amusement market
- Automatic lighting for game display

4. Medical field
- Non-contact switch

5. Others
- Automatic ticket gates
- Seat-taking sensors
- Detection of passengers getting on and off a bus

ORDERING INFORMATION

AMB □ □ □ □ □

AMB; MA Motion Sensor

Detection distance type (shape)
1: Short type 2: Middle type 3: Long type

Triggering function
1: External triggering type 4: Built-in oscillation circuit type (Internal trigger)

Classification by output method & mounting direction
0: Transistor/H type 5: Transistor/V type

Operating voltage
2: Free-ranging power type (6.5 to 27V DC) 9: The DC 5V type (4.5 to 6.5V DC)

Detection distance \ Part No.		02	03	04	05	06	07	08 (Middle type does not need 08.)	09	10 (Short type does not need 10.)	11	12	13	14	15	16	17	18	19	20 (Long type does not need 20.)
Short type	cm	—	—	—	5	6	7	8	9	10	—	—	—	—	—	—	—	—	—	—
	inch				1.969	2.362	2.756	3.150	3.543	3.937										
Middle type	cm	20	30	40	50	60	70	80	—	—	—	—	—	—	—	—	—	—	—	—
	inch	7.874	11.811	15.748	19.685	23.622	27.559	31.496												
Long type	cm	—	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
	inch		11.811	15.748	19.685	23.622	27.559	31.496	35.433	39.37	43.307	47.244	51.181	55.118	59.055	62.992	66.929	70.866	74.803	78.74

07/2007

DETECTION DISTANCE TYPE (distance limited)

Mounting direction	Type (shape)	Rated operating voltage	Rated detection distance	Part No.		Packing quantity	
				Built-in oscillation circuit type	External triggering type	Inner	Outer
H type	Short type	4.5 to 6.5 V DC	5 cm 1.969 inch	AMB140905	AMB110905	20 pcs.	200 pcs.
			6 cm 2.362 inch	AMB140906	AMB110906		
			7 cm 2.756 inch	AMB140907	AMB110907		
			8 cm 3.150 inch	AMB140908	AMB110908		
			9 cm 3.543 inch	AMB140909	AMB110909		
			10 cm 3.937 inch	AMB1409	AMB1109		
		6.5 to 27 V DC	5 cm 1.969 inch	AMB140205	AMB110205		
			6 cm 2.362 inch	AMB140206	AMB110206		
			7 cm 2.756 inch	AMB140207	AMB110207		
			8 cm 3.150 inch	AMB140208	AMB110208		
			9 cm 3.543 inch	AMB140209	AMB110209		
			10 cm 3.937 inch	AMB1402	AMB1102		
H type	Middle type	4.5 to 6.5 V DC	20 cm 7.874 inch	AMB240902	AMB210902	20 pcs.	200 pcs.
			30 cm 11.811 inch	AMB240903	AMB210903		
			40 cm 15.748 inch	AMB240904	AMB210904		
			50 cm 19.685 inch	AMB240905	AMB210905		
			60 cm 23.622 inch	AMB240906	AMB210906		
			70 cm 27.559 inch	AMB240907	AMB210907		
			80 cm 31.496 inch	AMB2409	AMB2109		
		6.5 to 27 V DC	20 cm 7.874 inch	AMB240202	AMB210202		
			30 cm 11.811 inch	AMB240203	AMB210203		
			40 cm 15.748 inch	AMB240204	AMB210204		
			50 cm 19.685 inch	AMB240205	AMB210205		
			60 cm 23.622 inch	AMB240206	AMB210206		
			70 cm 27.559 inch	AMB240207	AMB210207		
			80 cm 31.496 inch	AMB2402	AMB2102		
H type	Long type	4.5 to 6.5 V DC	30 cm 11.811 inch	AMB340903	AMB310903	20 pcs.	200 pcs.
			40 cm 15.748 inch	AMB340904	AMB310904		
			50 cm 19.685 inch	AMB340905	AMB310905		
			60 cm 23.622 inch	AMB340906	AMB310906		
			70 cm 27.559 inch	AMB340907	AMB310907		
			80 cm 31.496 inch	AMB340908	AMB310908		
			90 cm 35.433 inch	AMB340909	AMB310909		
			100 cm 39.370 inch	AMB340910	AMB310910		
			110 cm 43.307 inch	AMB340911	AMB310911		
			120 cm 47.244 inch	AMB340912	AMB310912		
			130 cm 51.181 inch	AMB340913	AMB310913		
			140 cm 55.118 inch	AMB340914	AMB310914		
			150 cm 59.055 inch	AMB340915	AMB310915		
			160 cm 62.992 inch	AMB340916	AMB310916		
			170 cm 66.929 inch	AMB340917	AMB310917		
			180 cm 70.866 inch	AMB340918	AMB310918		
			190 cm 74.803 inch	AMB340919	AMB310919		
			200 cm 78.740 inch	AMB3409	AMB3109		
H type	Long type	6.5 to 27 V DC	30 cm 11.811 inch	AMB340203	AMB310203	20 pcs.	200 pcs.
			40 cm 15.748 inch	AMB340204	AMB310204		
			50 cm 19.685 inch	AMB340205	AMB310205		
			60 cm 23.622 inch	AMB340206	AMB310206		
			70 cm 27.559 inch	AMB340207	AMB310207		
			80 cm 31.496 inch	AMB340208	AMB310208		
			90 cm 35.433 inch	AMB340209	AMB310209		
			100 cm 39.370 inch	AMB340210	AMB310210		
			110 cm 43.307 inch	AMB340211	AMB310211		
			120 cm 47.244 inch	AMB340212	AMB310212		
			130 cm 51.181 inch	AMB340213	AMB310213		
			140 cm 55.118 inch	AMB340214	AMB310214		
			150 cm 59.055 inch	AMB340215	AMB310215		
			160 cm 62.992 inch	AMB340216	AMB310216		
			170 cm 66.929 inch	AMB340217	AMB310217		
			180 cm 70.866 inch	AMB340218	AMB310218		

Note: If you plan to use multiple sensors side-by-side, or you wish to keep the current consumption small, inquire for details about external trigger type, which is suitable for such applications.

DETECTION DISTANCE TYPE (distance limited) (cont.)

Mounting direction	Type (shape)	Rated operating voltage	Rated detection distance	Part No.		Packing quantity	
				Built-in oscillation circuit type	External triggering type	Inner	Outer
H type	200 cm type	6.5 to 27 V DC	190 cm 74.803 inch	AMB340219	AMB310219	20 pcs.	200 pcs.
			200 cm 78.740 inch	AMB3402	AMB3102		
V type	Long type	4.5 to 6.5 V DC	30 cm 11.811 inch	AMB345903	AMB315903	20 pcs.	200 pcs.
			40 cm 15.748 inch	AMB345904	AMB315904		
			50 cm 19.685 inch	AMB345905	AMB315905		
			60 cm 23.622 inch	AMB345906	AMB315906		
			70 cm 27.559 inch	AMB345907	AMB315907		
			80 cm 31.496 inch	AMB345908	AMB315908		
			90 cm 35.433 inch	AMB345909	AMB315909		
			100 cm 39.370 inch	AMB345910	AMB315910		
			110 cm 43.307 inch	AMB345911	AMB315911		
			120 cm 47.244 inch	AMB345912	AMB315912		
			130 cm 51.181 inch	AMB345913	AMB315913		
			140 cm 55.118 inch	AMB345914	AMB315914		
			150 cm 59.055 inch	AMB345915	AMB315915		
			160 cm 62.992 inch	AMB345916	AMB315916		
			170 cm 66.929 inch	AMB345917	AMB315917		
			180 cm 70.866 inch	AMB345918	AMB315918		
			190 cm 74.803 inch	AMB345919	AMB315919		
			200 cm 78.740 inch	AMB3459	AMB3159		
V type	Long type	6.5 to 27 V DC	30 cm 11.811 inch	AMB345203	AMB315203	20 pcs.	200 pcs.
			40 cm 15.748 inch	AMB345204	AMB315204		
			50 cm 19.685 inch	AMB345205	AMB315205		
			60 cm 23.622 inch	AMB345206	AMB315206		
			70 cm 27.559 inch	AMB345207	AMB315207		
			80 cm 31.496 inch	AMB345208	AMB315208		
			90 cm 35.433 inch	AMB345209	AMB315209		
			100 cm 39.370 inch	AMB345210	AMB315210		
			110 cm 43.307 inch	AMB345211	AMB315211		
			120 cm 47.244 inch	AMB345212	AMB315212		
			130 cm 51.181 inch	AMB345213	AMB315213		
			140 cm 55.118 inch	AMB345214	AMB315214		
			150 cm 59.055 inch	AMB345215	AMB315215		
			160 cm 62.992 inch	AMB345216	AMB315216		
			170 cm 66.929 inch	AMB345217	AMB315217		
			180 cm 70.866 inch	AMB345218	AMB315218		
			190 cm 74.803 inch	AMB345219	AMB315219		
			200 cm 78.740 inch	AMB3452	AMB3152		

Note: If you plan to use multiple sensors side-by-side, or you wish to keep the current consumption small, inquire for details about external trigger type, which is suitable for such applications.

PERFORMANCE

1. Detection performance (Measuring conditions: ambient temp.: 25°C 77°F; operating voltage: 5 V DC)

Items \ Detection distance			Short type*Remark 1						Measured conditions
			5 cm 1.969 inch	6 cm 2.362 inch	7 cm 2.756 inch	8 cm 3.150 inch	9 cm 3.543 inch	10 cm 3.937 inch	
Rated detection distance		Minimum	45 mm 1.772 inch	54 mm 2.126 inch	63 mm 2.480 inch	72 mm 2.835 inch	81 mm 3.189 inch	90 mm 3.543 inch	with a standard reflection board
		Typical	50 mm 1.969 inch	60 mm 3.362 inch	70 mm 2.756 inch	80 mm 3.150 inch	90 mm 3.543 inch	100 mm 3.937 inch	
		Maximum	55 mm 2.165 inch	66 mm 2.598 inch	77 mm 3.031 inch	88 mm 3.465 inch	99 mm 3.898 inch	110 mm 4.331 inch	
Measuring tolerance		Typical	10%		15%	20%		25%	Reflection rate: 90 to 18%
Usable ambient brightness (Resistance to ambient light)*Remark	Brightness of sensor surface	Maximum	30,000 lx						See the drawing on the next page.
	Brightness of reflection surface	Maximum	30,000 lx						

Remarks:1. After receipt of order, average rated detection distance to 15 cm 5.906 inch is possible. Please inquire.
2. Install so that light from direct light sources does not enter the sensor (within 30° of the sensor light beam).

Items \ Detection distance			Middle type*Remark 1							Measured conditions
			20 cm 7.874 inch	30 cm 11.811 inch	40 cm 15.748 inch	50 cm 19.685 inch	60 cm 23.622 inch	70 cm 27.559 inch	80 cm 31.496 inch	
Rated detection distance		Minimum	190 mm 7.480 inch	285 mm 11.220 inch	380 mm 14.961 inch	475 mm 18.701 inch	570 mm 22.441 inch	665 mm 26.181 inch	760 mm 29.921 inch	with a standard reflection board
		Typical	200 mm 7.874 inch	300 mm 11.811 inch	400 mm 15.748 inch	500 mm 19.685 inch	600 mm 23.622 inch	700 mm 27.559 inch	800 mm 31.496 inch	
		Maximum	210 mm 8.268 inch	315 mm 12.402 inch	420 mm 16.535 inch	525 mm 20.669 inch	630 mm 24.803 inch	735 mm 28.937 inch	840 mm 33.071 inch	
Measuring tolerance		Typical	3%			5%		10%		Reflection rate: 90 to 18%
Usable ambient brightness (Resistance to ambient light)*Remark	Brightness of sensor surface	Maximum	30,000 lx							See the drawing on the next page.
	Brightness of reflection surface	Maximum	30,000 lx							

Remarks:1. After receipt of order, average rated detection distance to 110 cm 43.307 inch is possible. Please inquire.
2. Install so that light from direct light sources does not enter the sensor (within 30° of the sensor light beam).

Items \ Detection distance			Long type									Measured conditions
			30 cm 11.811 inch	40 cm 15.748 inch	50 cm 19.685 inch	60 cm 23.622 inch	70 cm 27.559 inch	80 cm 31.496 inch	90 cm 35.433 inch	100 cm 39.37 inch	110 cm 43.307 inch	
Rated detection distance		Minimum	285 mm 11.220 inch	380 mm 14.961 inch	475 mm 18.701 inch	570 mm 22.441 inch	665 mm 26.181 inch	760 mm 29.921 inch	855 mm 33.661 inch	950 mm 37.402 inch	1045 mm 41.142 inch	with a standard reflection board
		Typical	300 mm 11.811 inch	400 mm 15.748 inch	500 mm 19.685 inch	600 mm 23.622 inch	700 mm 27.559 inch	800 mm 31.496 inch	900 mm 34.433 inch	1000 mm 39.37 inch	1100 mm 43.307 inch	
		Maximum	315 mm 12.402 inch	420 mm 16.535 inch	525 mm 20.669 inch	630 mm 24.803 inch	735 mm 28.937 inch	840 mm 33.071 inch	945 mm 37.205 inch	1050 mm 41.339 inch	1155 mm 45.472 inch	
Measuring tolerance		Typical	3%						5%			Reflection rate: 90 to 18%
Usable ambient brightness (Resistance to ambient light)*Remark	Brightness of sensor surface	Maximum	30,000 lx									See the drawing on the next page.
	Brightness of reflection surface	Maximum	30,000 lx									

Remark: Install so that light from direct light sources does not enter the sensor (within 30° of the sensor light beam).

Items \ Detection distance			Long type									Measured conditions
			120 cm 47.244 inch	130 cm 51.181 inch	140 cm 55.118 inch	150 cm 49.055 inch	160 cm 62.992 inch	170 cm 66.929 inch	180 cm 70.866 inch	190 cm 74.803 inch	200 cm 78.74 inch	
Rated detection distance		Minimum	1140 mm 44.882 inch	1235 mm 48.622 inch	1330 mm 52.362 inch	1425 mm 56.102 inch	1520 mm 59.842 inch	1615 mm 63.583 inch	1710 mm 67.323 inch	1805 mm 71.063 inch	1900 mm 74.803 inch	with a standard reflection board
		Typical	1200 mm 47.244 inch	1300 mm 51.181 inch	1400 mm 55.118 inch	1500 mm 59.055 inch	1600 mm 62.992 inch	1700 mm 66.929 inch	1800 mm 70.866 inch	1900 mm 74.803 inch	2000 mm 78.74 inch	
		Maximum	1260 mm 49.606 inch	1365 mm 53.740 inch	1470 mm 57.874 inch	1575 mm 62.008 inch	1680 mm 66.142 inch	1785 mm 70.275 inch	1890 mm 74.409 inch	1995 mm 78.543 inch	2100 mm 82.677 inch	
Measuring tolerance		Typical	5%	10%				15%				Reflection rate: 90 to 18%
Usable ambient brightness (Resistance to ambient light)*Remark	Brightness of sensor surface	Maximum	30,000 lx									See the drawing on the next page.
	Brightness of reflection surface	Maximum	30,000 lx									

Remark: Install so that light from direct light sources does not enter the sensor (within 30° of the sensor light beam).

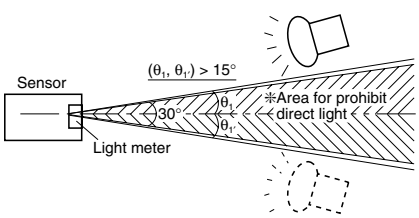
- For short type:
  100 mm 3.937 inch square area, 90% reflection rate.
- For middle type:
  200 mm 7.874 inch square area, 90% reflection rate.
- For long type:
  500 mm 19.685 inch square area, 90% reflection rate.

Notes: 1. Detecting an object within the maximum preset detection distance.

2. Distance deviation = $\frac{a-b}{a} \times 100$ (%)

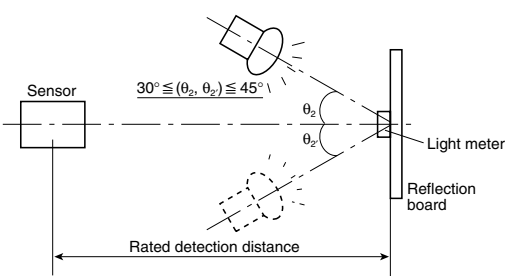
a: detection distance of standard detection target with reflectance of 90%.
b: detection distance of standard detection target with reflectance of 18%.

[Brightness of sensor surface]



Note: Light from direct light sources (sunlight, strobe light, inverter illumination, reflected light from glass or mirrors etc.) that enters the sensor from within the prohibited range can cause the sensor to operate erroneously.

[Brightness of reflection surface]



2. Absolute maximum rating (Measuring condition: ambient temp.: 25°C 77°F)

Items \ Type	Built-in oscillation circuit type		External triggering type	
	5 V DC type	Free-ranging power type	5 V DC type	Free-ranging power type
Power supply voltage	–0.3 to 8 V DC	–0.3 to 30 V DC	–0.3 to 8 V DC	–0.3 to 30 V DC
Output dielectric strength	30 V		30 V	
Output flow current	100 mA		10 mA	
Usable ambient temperature	–25 to +75°C +5 to +131°F (No freezing)		–25 to +75°C +5 to +131°F (No freezing)	
Storage temperature	–30 to +85°C –4 to +176°F		–30 to +85°C –4 to +176°F	

3. Electrical characteristics

(Measuring conditions: ambient temp.: 25°C 77°F; operating voltage: 5 V DC type =5V DC, free-ranging power type =24V DC)

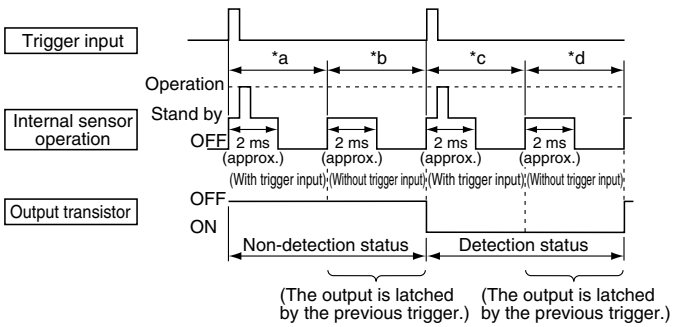
1) Built-in oscillation circuit type

Items			Symbol	Short type	Middle type	Long type	Measured conditions
Rated operating voltage		Minimum Typical Maximum	Vdd	5V DC type: 4.5V Free-ranging power type: 6.5V — 5V DC type: 6.5V Free-ranging power type: 27V			
Average current consumption (Iout = 0 mA)	No detection	Minimum Typical Maximum	It	— 5V DC type: 4.5mA Free-ranging power type: 5.6mA 5V DC type: 6.2mA Free-ranging power type: 7.8mA			
	Detection	Minimum Typical Maximum	It	— 5V DC type: 7.0mA Free-ranging power type: 9.1mA 5V DC type: 11.2mA Free-ranging power type: 14.2mA			
Measuring cycle		Minimum	T	8ms/cycle			
Output characteristics	Remain voltage	Maximum	Vr	1 V DC			It = 100 mA
	Leakage current	Maximum	Il	3µA			V = 30V

2) External triggering type (trigger conditions: trigger pulse width = 20µs and trigger synchronization = 5ms)

Items				Symbol	Short type	Middle type	Long type	Measured conditions
Rated operating voltage			Minimum Typical Maximum	Vdd	5V DC type: 4.5V Free-ranging type: 6.5V — 5V DC type: 6.5V Free-ranging type: 27V			
Average current consumption	Without trigger input	Output OFF	Minimum Typical Maximum	Ib	— 5V DC type: 0.1mA Free-ranging type: 1.0mA 5V DC type: 0.3mA Free-ranging type: 1.8mA			Notes: 1.*b
		Output ON	Minimum Typical Maximum	Id	— 5V DC type: 0.5mA Free-ranging type: 1.4mA 5V DC type: 3.4mA Free-ranging type: 4.5mA			Notes: 1.*d
	With trigger input	Output OFF	Minimum Typical Maximum	Ia	— 5V DC type: 2.2mA Free-ranging type: 3.1mA 5V DC type: 6.2mA Free-ranging type: 7.2mA			Notes: 1.*a
		Output ON	Minimum Typical Maximum	Ic	— 5V DC type: 2.4mA Free-ranging type: 3.3mA 5V DC type: 8.2mA Free-ranging type: 9.3mA			Notes: 1.*c
Measuring cycle (Trigger interval)			Minimum	Tt	5ms/cycle			
External trigger	Pulse width		Minimum Maximum	Tw	20µs 1/2Tt			Half off the distance period
	Level		Maximum Minimum	V_{TL} V_{TH}	0.8V 3V			Notes: 2
Response performance: time from trigger pulse fall to detection output			Maximum	Tr	5ms			
Output characteristics	Remain voltage		Maximum	Vr	1 V			I = 10 mA
	Leakage current		Maximum	Il	3µA			V = 30 mA

Notes: 1. The ratio between the 4 operating modes (*a to *d) depends on the external trigger period and detector time, and the current consumption corresponds with this varying ratio.

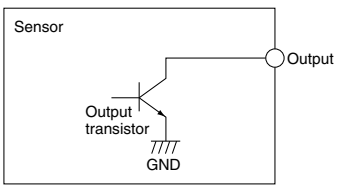


Notes: 2. A high level is established in the open state due to pull-up by the internal circuit. (Refer to the connector wiring diagram.)

Notes: 3. The output transistor is open collector.
The output transistor is turned ON by the sensor detection status and turned OFF by its non-detection status.

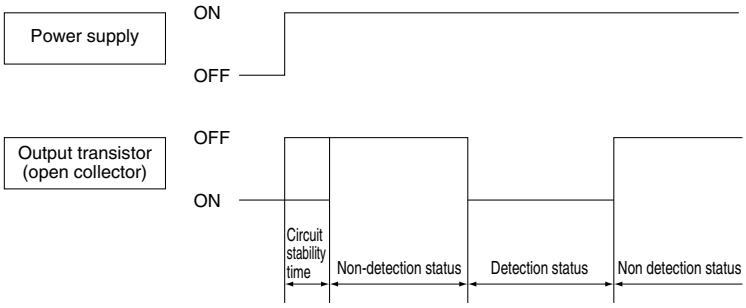
Detection status:
output transistor ON

Non-detection status:
output transistor OFF



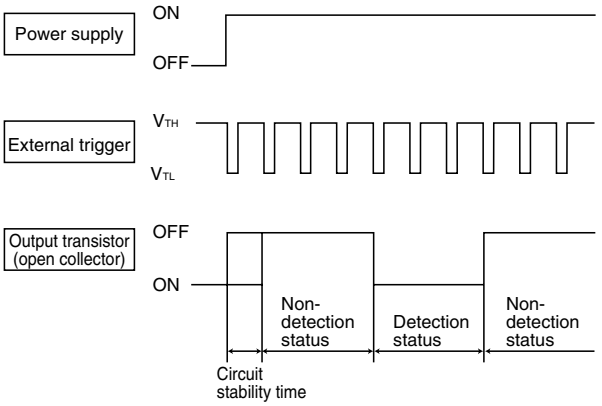
TIMING CHART

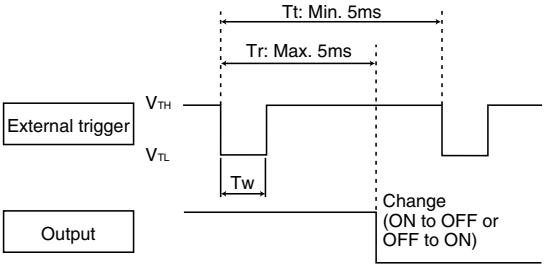
1) Built-in oscillation circuit type



Notes: 1. Circuit stability time : Max. 12 ms
2. During the time taken for the circuit to stabilize after the power is turned on, the ON/OFF status of the output transistor is not determined by whether the sensor is in the detection status or non-detection status.

2) External triggering type





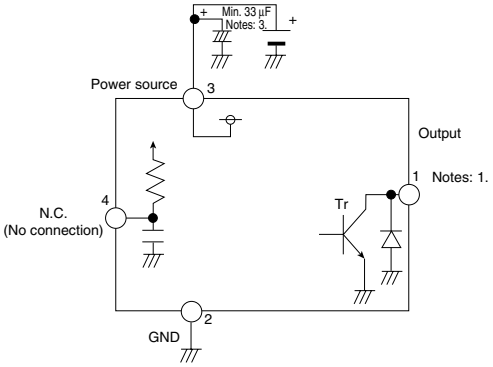
Notes: 1. Circuit stability time : Max. 12 ms
2. During the time taken for the circuit to stabilize after the power is turned on, the ON/OFF status of the output transistor is not determined by whether the sensor is in the detection status or non-detection status.

Note: The sensor recognizes at the $V_{TH} \rightarrow V_{TL}$ edge of an external trigger that the external trigger has been input.

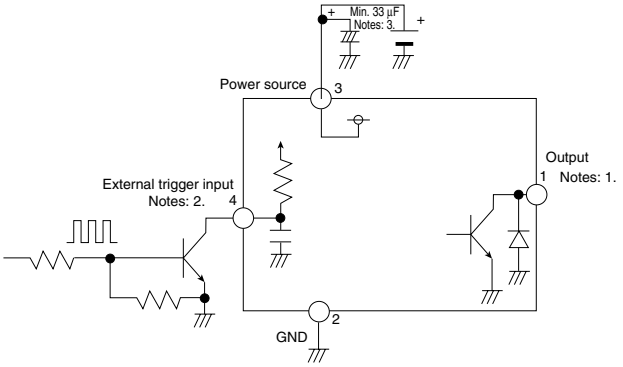
HOW TO USE

1. Wiring diagram of connector

Built-in oscillation circuit type



External triggering type



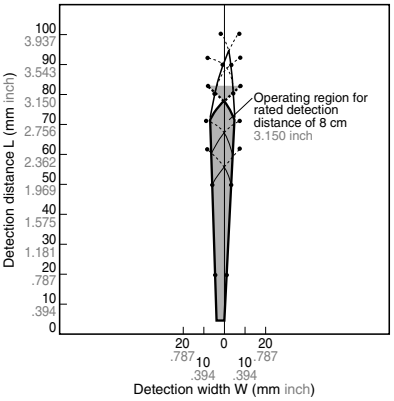
Notes: 1. The output transistor has an open collector structure.
Detection status: Output transistor ON (connected to GND)
Non-detection status: Output transistor OFF (open state)
2. The status of the external trigger input is as follows:
Open at the high level
GND (less than 0.8V) at the low level
Under no circumstances must a high-level voltage be applied.
3. In the case of the external trigger type, to maintain the power supply noise performance, be certain to connect a capacitor (33µF or more) to the sensor power supply input terminal in order to stabilize the power supply voltage.

REFERENCE DATA

Operating region characteristics

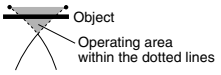
• How to interpret the graph

Example: Operating area of the Short Type with rated detection distance of 8 cm 3.150 inch.



Operating area within the dotted lines

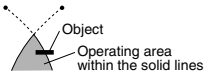
Objects that enter the entire area are detected.



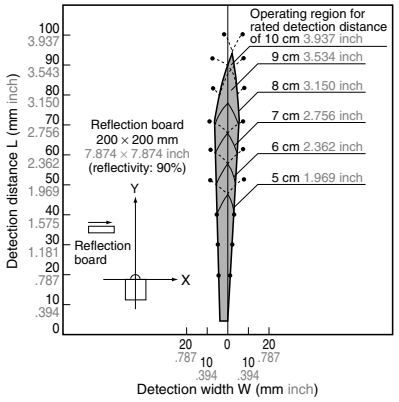
Note: If only part of the object is in the detection area, it is not detected.

Operating area within the solid lines

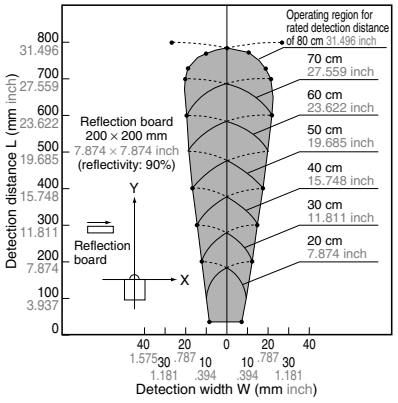
Objects that even partially enter the area are detected.



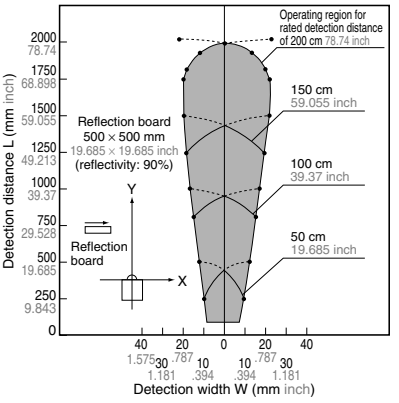
(1) Short type (AMB14□□□□□)



(2) Middle type (AMB24□□□□□)



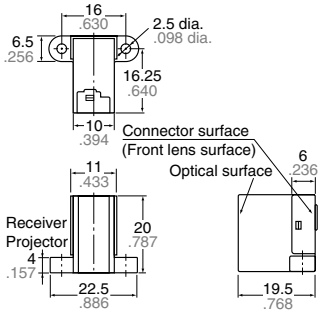
(3) Long type (AMB34□□□□□)



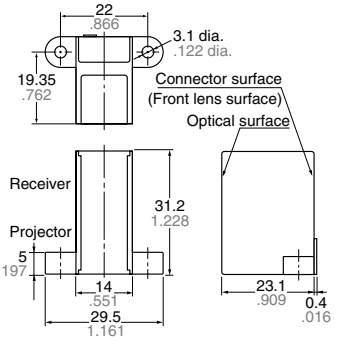
DIMENSIONS (Common to the Built-in oscillation circuit type and External triggering type)

mm inch

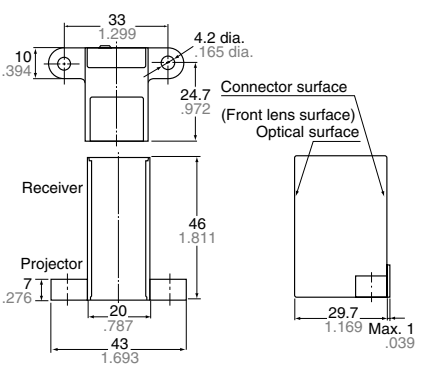
1) Short type (H) (10 cm 3.937 inch)



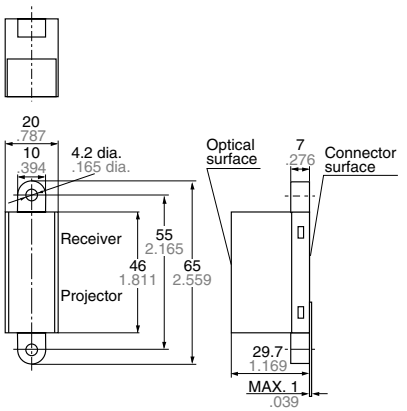
2) Middle type (H) (80 cm 31.496 inch)



3) Long type (H) (200 cm 78.74 inch)

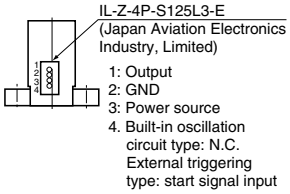


Long type (V) (200 cm 78.74 inch)

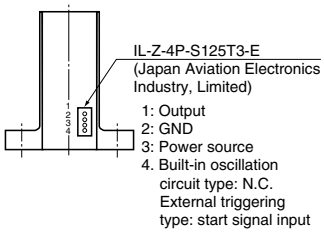


WIRING DIAGRAM (Connector surface view)

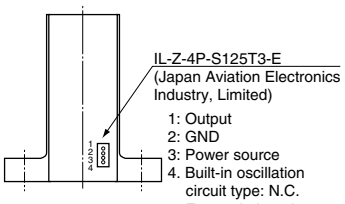
1) Short type (H) (10 cm 3.937 inch)



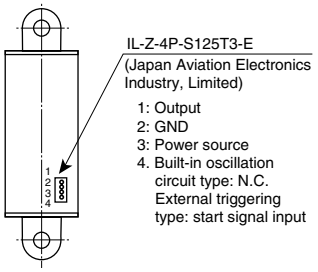
2) Middle type (H) (80 cm 31.496 inch)



3) Long type (H) (200 cm 78.740 inch)



4) Long type (V) (200 cm 78.740 inch)

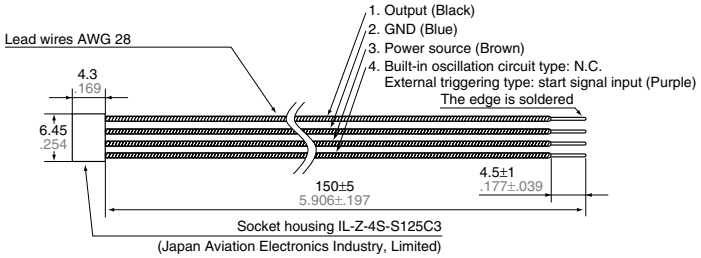


Notes: Purchase the follwing connections:
1. Socket housing IL-Z-4S-S125C3 (Japan Aviation Electronic Industry, Ltd.)
2. Lead wire (with metal connector at one end)

OPTIONAL

mm inch

1. Connector with cable AMV9001



Note: Mistaken cable assembly can cause damage to the internal circuits, so please check the power cord before switching ON. (Particular care must be taken as to avoid reverse connection of the power.)

NOTES

1. Environment

1) Avoid using the sensor in environments containing excessive amounts of steam, dust, corrosive gas, or where organic solvents are present.

2) When the sensor is used in noisy environments, connect a capacitor (minimum 33 µF) across its power input terminals.

2. Wiring

1) Check all wiring before applying power. Incorrect wiring may damage the internal circuit (in particular, check that the connection to the power supply is not reversed.)

2) Avoid excessive removing and replacing of the connector.

3. Detector surface (Optical surface)

1) Keep the detector surface clean. Excessive dust or dirt on the detector surface will deteriorate the sensing performance.

2) Do not allow condensation or freezing to occur on the surface of the sensor. If condensation or freezing does occur at low temperatures, the sensor may not detect objects correctly.

3) This product is designed to detect the existence of human body. The sensor will not detect objects consisting of a low reflective material (e.g., an object coated with black rubber, etc.) or of a highly reflective material (e.g., mirror, glass, coated paper, etc.)

4) The front surface of the lens and case are made of polycarbonate resin and can withstand water, alcohol, oils, salts and weak acids. Other fluids such as alkalines, aromatic hydrocarbons and halogenated hydrocarbons may melt or swell the lens and case, please do not have such fluids touch the lens and case.

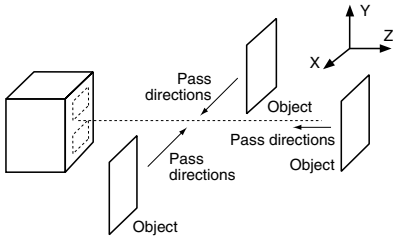
5) If you use the sensor with a cover or filter connected to the front of the sensor, the sensor may detect the cover itself, the detection distance can change, and unstable operation can result.

6) When using multiple sensors in parallel, leave a space of at least 5 cm 1.969 inch between adjacent sensors, and confirm that they do not interfere with each other before use.

7) To protect the inner circuit, wiring should be max. 3 m 9.843 ft..

4. Recommended installation procedure

Install the photoelectric sensor so that it is orientated correctly in relation to the pass directions of the target objects as shown in the figure below.



❉ → stands for pass direction of the target object.

For the general precautions, refer to the Notes for Motion Sensors on next page.

NOTES FOR MOTION SENSOR

1. Ambient operating conditions

1) Temperature: Refer to the absolute maximum ratings for the temperature of each individual sensor.

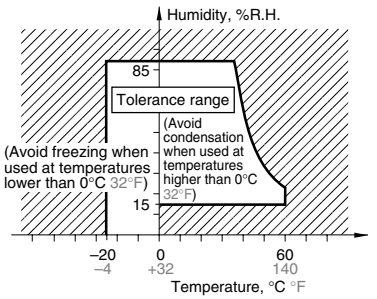
2) Humidity: 15% to 85% RH (No freezing nor condensation at low temperature)

3) Atmospheric pressure: 86 to 106 kPa

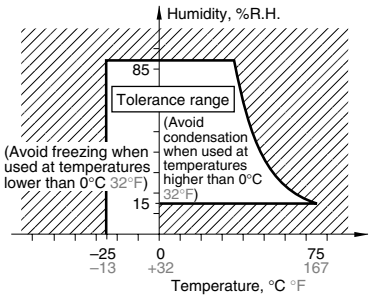
4) Because the humidity range differs depending on the ambient temperature, the humidity range indicated below should be used. Continuous operation of the switch is possible within this range, but continuous use near the limit of the range should be avoided.

• This humidity range does not guarantee permanent performance.

<MP Motion Sensor>



<MA Motion Sensor>



5) The operating temperature and humidity ranges are the ranges in which the sensor can be continuously operated. They are not the guaranteed environmental withstanding values. In general, degradation of electronic devices accelerates when they are operated under conditions of high temperature or high humidity. Before use, confirm the reliability of the sensors under the expected operating conditions.

6) The sensors do not have a water-proof or dust-proof construction. Depending on the ambient operating conditions, some means of providing protection from water and dust and preventing the formation of ice and condensation must be provided prior to using the sensors. If a sensor is used with a cover installed, the initial detection performance specifications may not be able to be met. Confirm the operation under the actual operating conditions.

7) Take care to avoid exposing the sensors to heat, vibration or impact since malfunctioning may result.

2. Concerning external surge voltages

Since the internal circuitry may be destroyed if an external surge voltages is supplied, provide an element which will absorb the surges. The levels of the voltage surges which the sensor can withstand is given below.

MA motion sensors: 500 V (±1.2 x 50µs unipolar full-wave voltage)

MP motion sensors: Within the supply voltage given in the absolute maximum ratings.

3. Concerning power supply-superimposed noise

1) Use a regulated power supply as the power supply. Otherwise, power supply-superimposed noise may cause the sensors to malfunction. The levels of noise which the sensor can withstand is given below.

MA motion sensors: ±200 V (50ns, 1µs wide square waves)

MP motion sensors: ±20 V (50ns, 1µs wide square waves)

2) To maintain the power supply noise performance, be certain to connect a capacitor (33µF or more) to the sensor power supply input terminal in order to stabilize the power supply voltage.

4. Drop damage

If the sensor is dropped, damage can occur resulting in incorrect operation. If dropped, be sure to do a visual check of the exterior for noticeable damage and check the operation characteristics for faulty operation.

5. Concerning the circuit sides

Since the circuit sides given in this catalog are not protected in terms of circuit design, check out the performance and reliability of the circuits prior to using the sensors.

SAFETY PRECAUTIONS

Head the following precautions to prevent injury or accidents.

• Do not use these sensors under any circumstances in which the range of their ratings, environment conditions or other specifications are exceeded. Using the sensors in any way which causes their specifications to be exceeded may generate abnormally high levels of heat, emit smoke, etc., resulting in damage to the circuitry and possibly causing an accident.

• Before connecting a connector, check the pin layout by referring to the connector wiring diagram, specifications diagram, etc., and make sure that the connector is connected properly. Take note that mistakes made in connection may cause unforeseen problems in operation, generate abnormally high levels of heat, emit smoke, etc., resulting in damage to the circuitry.

• Do not use any motion sensor which has been disassembled or remodeled.

• Protection circuit recommended

The possible failure mode is either open or short of the output transistor. An excess heat is the cause for short mode failure. For any important and serious application in terms of safety, add protection circuit or any other protection method.

Panasonic
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Pressure sensor with built-in amplification and temperature compensation circuit

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

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.

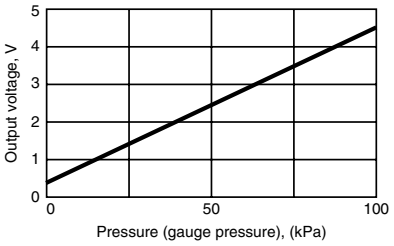
- Overall accuracy is ±1.25% FS (Standard type)
- Overall accuracy is ±4% FS (Economy type)

3. Compact pressure sensor unit that saves space.

Same size and footprint (7.0 mm (W) x 7.2 mm (D)) as previous PS pressure sensor.

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.)**
- **Healthcare (blood pressure monitors, oxygen concentrators, air beds, etc.)**
- **Other pneumatically operated pressure devices**

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

ORDERING INFORMATION

Ex. ADP 5 ☐ ☐ ☐ ☐

Part No.	Terminal profile	Rated pressure	Pressure inlet hole length	Type
ADP5: PS-A pressure sensor	1: DIP terminal	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	0: 3 mm .118 inch 1: 5 mm .197 inch	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, below.

PRODUCT TYPES

1. DIP terminal

Pressure \ Pressure inlet hole length		Part No. 3mm	Part No. 5mm
Pressure \ 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

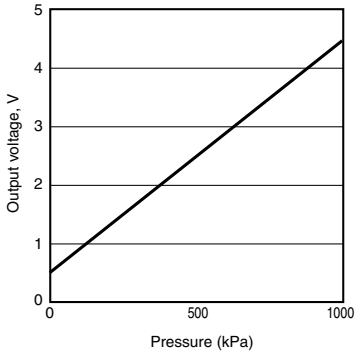
SPECIFICATIONS

Type		Standard type (with glass base)								Economy type (without glass base)	Remarks
Type of pressure		Gauge pressure								Gauge pressure	
Pressure medium		Air								Air	Note*1
Rated pressure	Unit: kPa	±100	–100	25	50	100	200	500	1,000	40	
Drive voltage		5±0.25V DC								3±0.15V DC	
Temperature compensation range		0 to 50°C 32 to 122°F								5 to 45°C 41 to 113°F	
Offset voltage		2.5±0.05	0.5±0.05V							0.3±0.09V	Note*2
Rated output voltage		4.5±0.05 (when +100kPa)	4.5±0.05V							2.4±0.03V	Note*2
Overall accuracy		±1.25%FS								±4%FS	Note*2 Note*3
Current consumption		Max. 10mA								Max. 3mA	
Output impedance		Approx. 50Ω								20Ω (typ.)	
Source current		Max. 0.2mA								Max. 0.15mA	
Sink current		Max. 2mA								Max. 1.5mA	

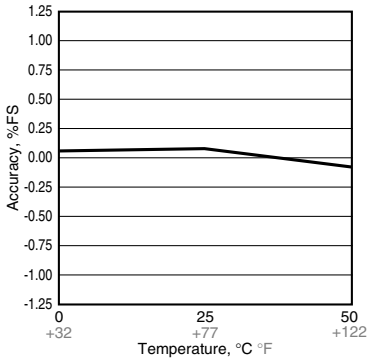
Notes) 1. Please consult us for pressure media other than air.
2. Indicates output when drive voltage is 5 V. Although output fluctuates due to fluctuations in the drive voltage, this is not included.
3. Overall accuracy indicates the accuracy of the offset voltage and rated output voltage at temperatures between 0 to 50°C 32 to 122°F. (FS=4V)
4. Where no particular temperature is indicated, the specification is for use at 25°C 77°F.

DATA

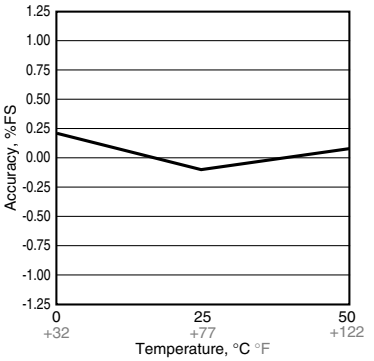
1-(1) Output voltage
ADP5170
Drive voltage: 5V DC;
temperature: 25°C 77°F
Applied pressure: 0 to +1,000kPa



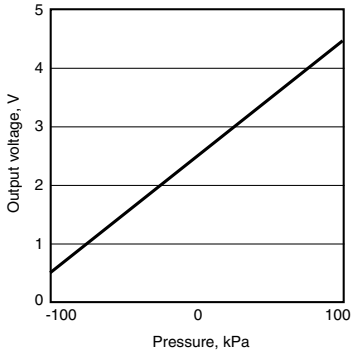
1-(2) Overall accuracy (Offset voltage)
ADP5170
Drive voltage: 5V DC;
temperature: 0 to 50°C 32 to 122°F
Applied pressure: 0kPa



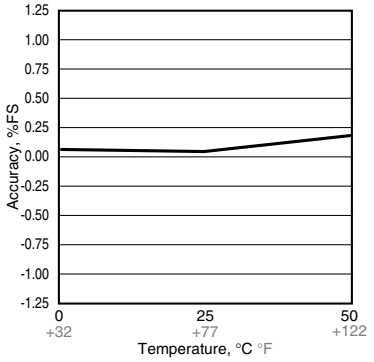
1-(3) Overall accuracy (Rated output voltage)
ADP5170
Drive voltage: 5V DC;
temperature: 0 to 50°C 32 to 122°F
Applied pressure: +1,000kPa



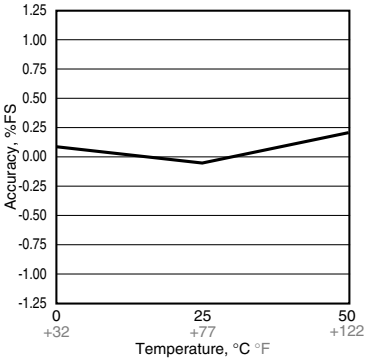
2-(1) Output voltage
ADP5100
Drive voltage: 5V DC;
temperature: 25°C 77°F
Applied pressure: –100 to +100kPa



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



3. Evaluation test

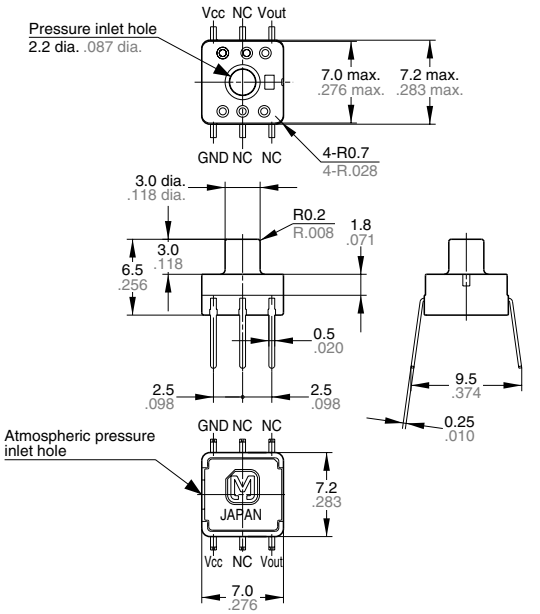
Tested item		Tested condition	Result
Environmental characteristics	Storage at high temperature	Temperature: Left in a 85°C 185°F constant temperature bath Time: 100 hrs.	Passed
	Storage at low temperature	Temperature: Left in a –20°C –4°F constant temperature bath Time: 100 hrs.	Passed
	Humidity	Temperature/humidity: 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

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

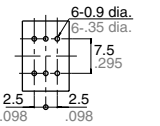
DIMENSIONS

mm inch General tolerance: ±0.3 ±.012

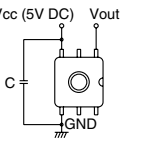
1. DIP terminal (Pressure inlet hole: 3mm) ADP51∗0



Recommended PC board pattern
(TOP VIEW 2:1)

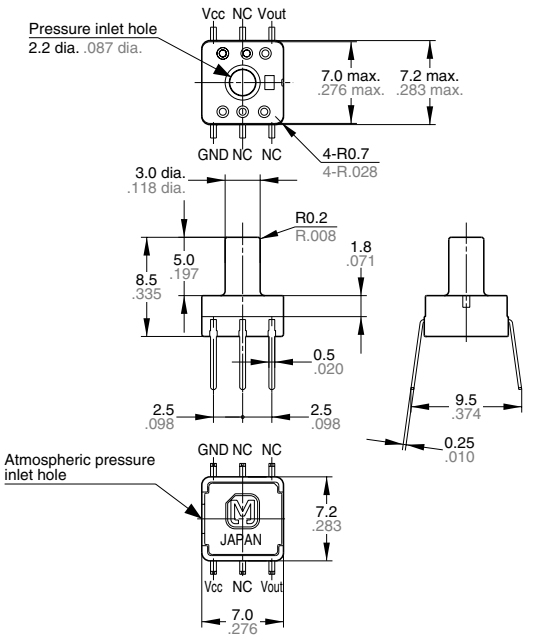


Terminal connection diagram

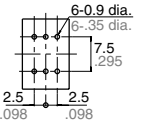


Terminal No.	Name
1	Vcc (Power supply [+])
2	NC (No connection)
3	Vout (Output)
4	NC (No connection)
5	NC (No connection)
6	GND (Ground)

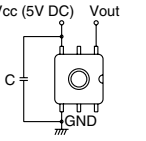
2. DIP terminal (Pressure inlet hole: 5mm) ADP51∗1/ADP51A11



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)

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.

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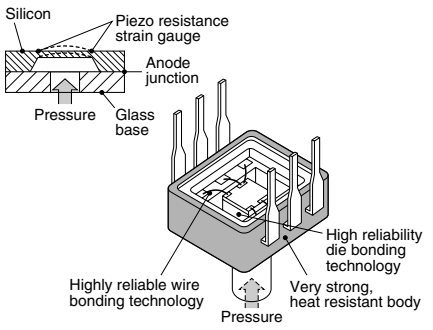
ULTRA SMALL HIGHLY SEMICONDUCTOR PRESSURE SENSOR

PS PRESSURE SENSOR

Ultra-small miniature

<Actual size>

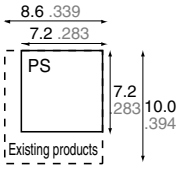
<Cross-section of Sensor Chip>



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

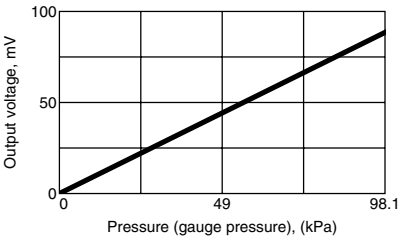
40 kPa (0.4 kgf/cm²) and 49 kPa (0.5 kgf/cm²) units are also available.

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.

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

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

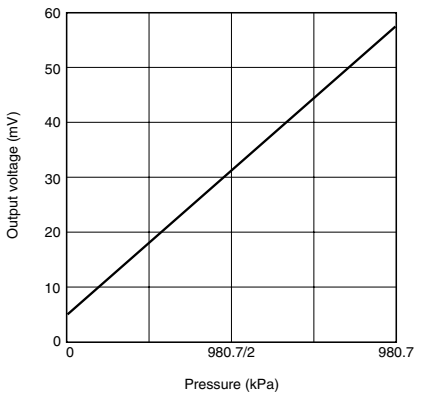
Notes) 1. Unless otherwise specified, measurements were taken with a drive current of ±0.01 mA and humidity ranging from 25% to 85%.
2. Please consult us if a pressure medium other than air is to be used.
3. This is the regulation which applies within the compensation temperature range.
4. Please consult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

DATA

1. Characteristics data

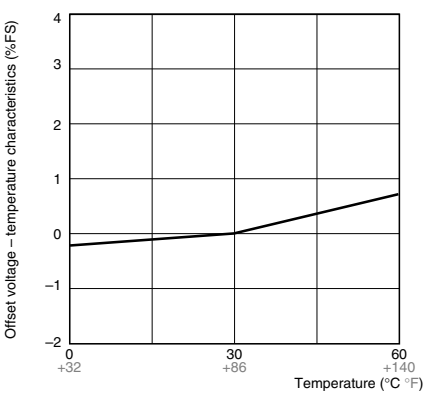
1-(1) Output characteristics

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



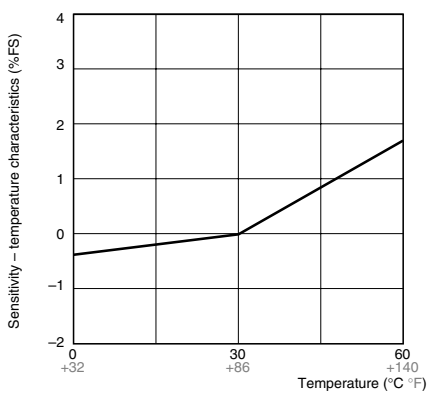
1-(2) Offset voltage – temperature characteristics

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



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

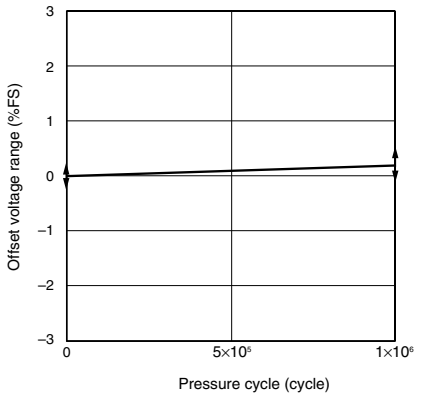
ADP41913
Drive current: 1.0 mA; rating ±2.5%FS



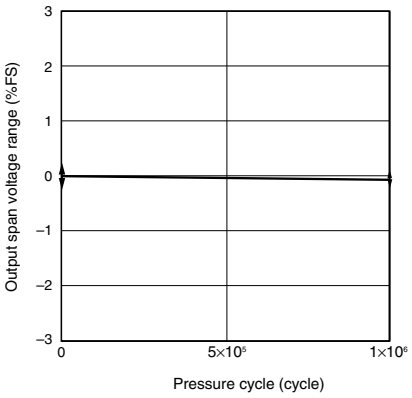
2. Pressure cycle range (0 to rated pressure)

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

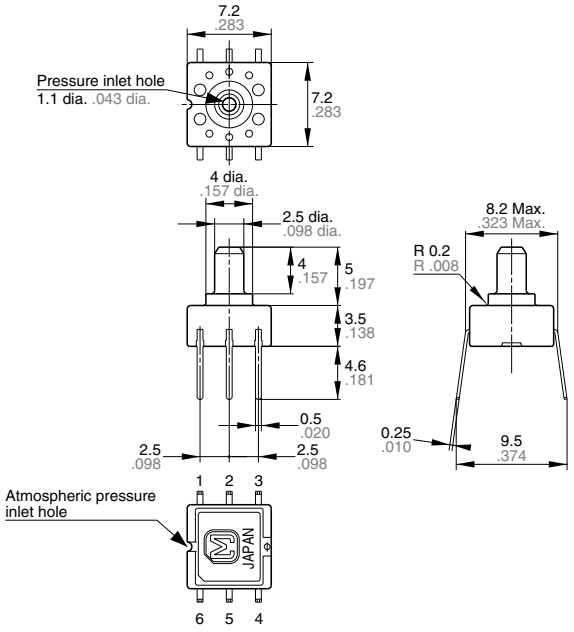
Tested item		Tested condition	Result
Environmental characteristics	Storage at high temperature	Temperature: Left in a 120°C 248°F constant temperature bath Time: 1,000 hrs.	Passed
	Storage at low temperature	Temperature: Left in a –40°C –40°F constant temperature bath Time: 1,000 hrs.	Passed
	Humidity	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.

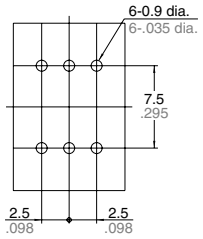
DIMENSIONS

mm inch General tolerance: ±0.3 ±.012

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

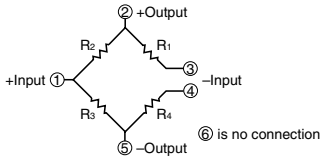


Recommended PC board pattern
(BOTTOM VIEW)



Tolerance: ±0.1 ±.004

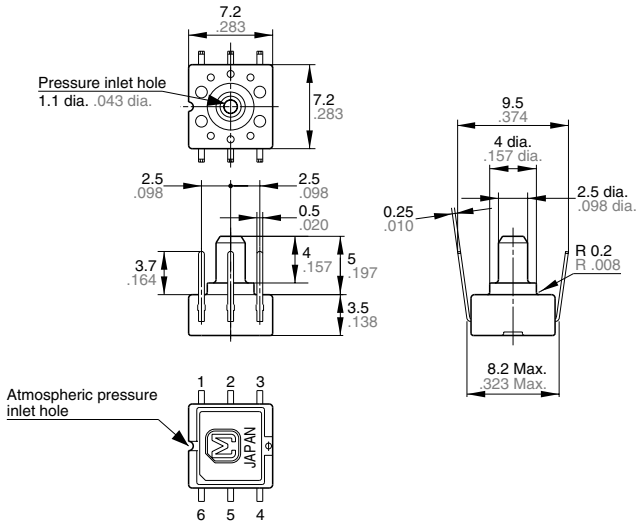
Terminal connection diagram



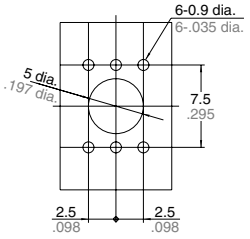
Terminal No.	Name
1	Power supply (+)
2	Output (+)
3	Power supply (–)
4	Power supply (–)
5	Output (–)
6	No connection

Note: Leave terminal 6 unconnected.

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

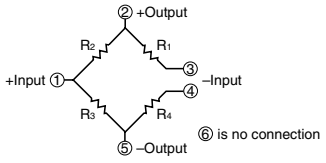


Recommended PC board pattern
(BOTTOM VIEW)



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

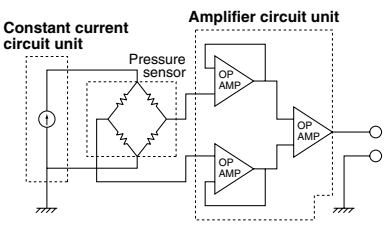
Note: Leave terminal 6 unconnected.

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)

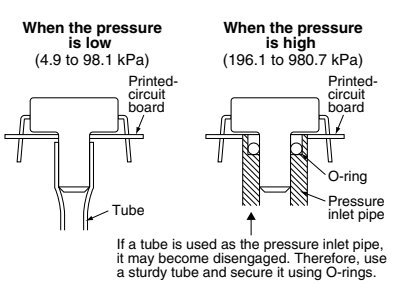
The pressure sensor is designed to convert a voltage by means of constant current drive and then, if necessary, it amplifies the voltage for use. The circuit shown below is a typical example of a circuit in which the pressure sensor is used.



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.

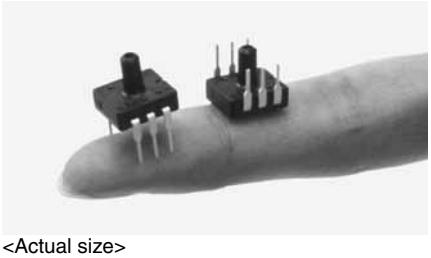
Methods of transmitting air pressures



Panasonic
ideas for life

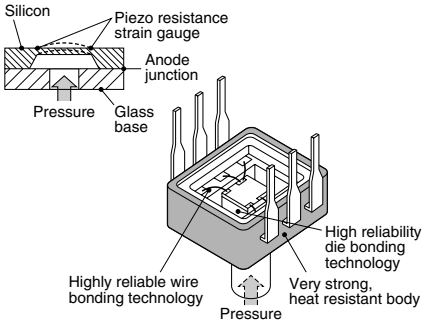
PRECISION SEMICONDUCTOR PRESSURE SENSOR

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.

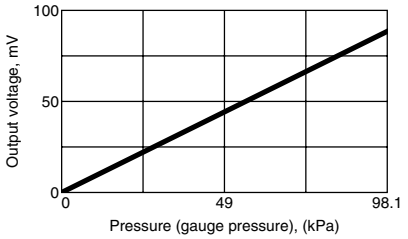
3. Impressive line-up of models

• Taking their place alongside the standard 5kW bridge resistance models are those with a 3.3kW 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.

07/2007

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

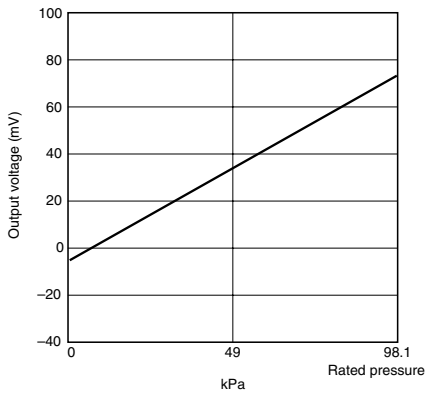
Notes) 1 Unless otherwise specified, measurements were taken with a drive current of1.5 mA ±0.01 mA at a temperature of 25°C 77°F and humidity ranging from 25% to 85%.
2. Please consult us if a pressure medium other than air is to be used.
3. This is the regulation which applies within the compensation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

DATA

1. Characteristics data

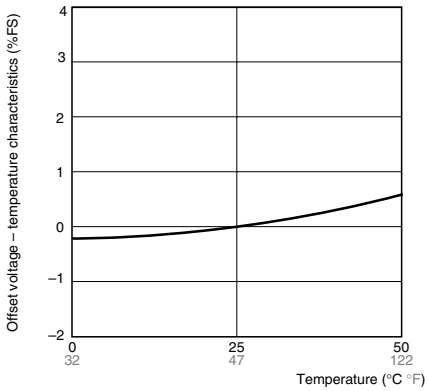
1-(1) Output characteristics

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



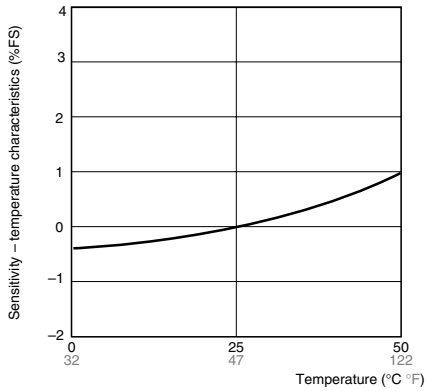
1-(2) Offset voltage – temperature characteristics

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



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

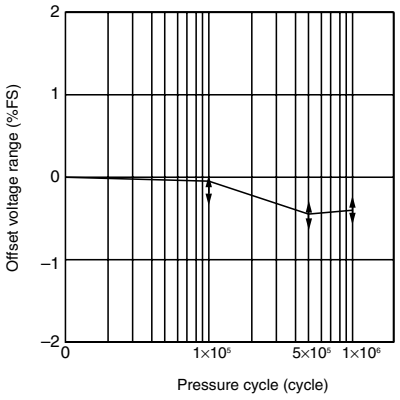
ADP1141
Drive current: 1.5 mA; rating ±2.5%FS



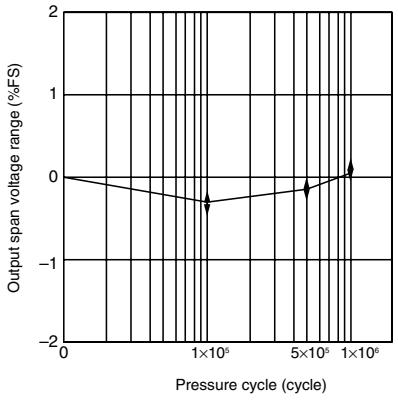
2. Pressure cycle range (0 to rated pressure)

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

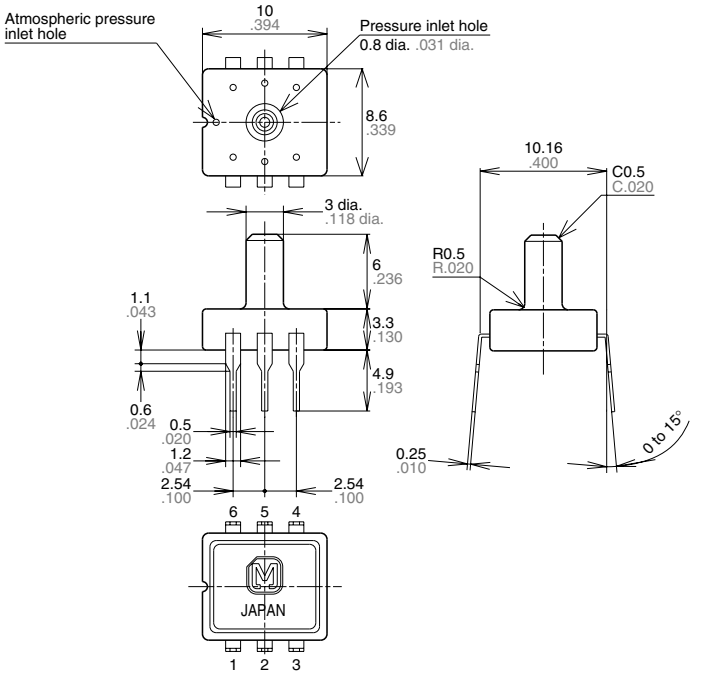
Tested item		Tested condition	Result
Environmental characteristics	Storage at high temperature	Temperature: Left in a 120°C 248°F constant temperature bath Time: 1,000 hrs.	Passed
	Storage at low temperature	Temperature: Left in a –40°C –40°F constant temperature bath Time: 1,000 hrs.	Passed
	Humidity	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.

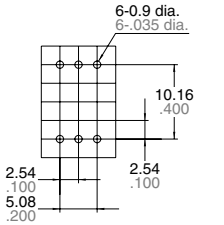
DIMENSIONS

mm inch General tolerance: ±0.3 ±.012

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

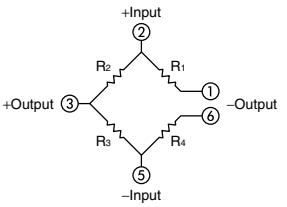


Recommended PC board pattern
(BOTTOM VIEW)



Tolerance: ±0.1 ±.004

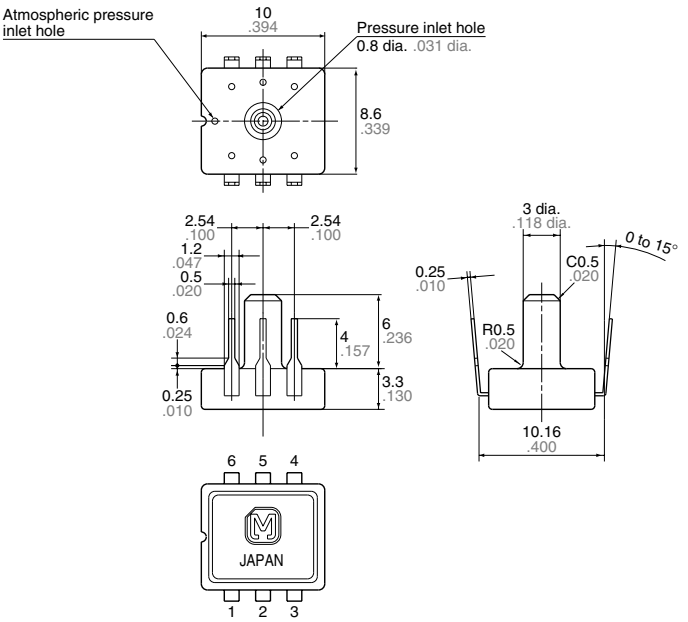
Terminal connection diagram



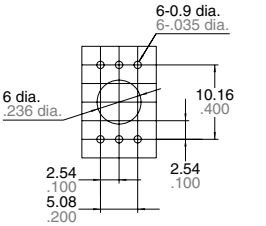
Terminal No.	Name
1	Output (–)
2	Power supply (+)
3	Output (+)
4	No connection
5	Power supply (–)
6	Output (–)

Note: Leave terminal 6 unconnected.

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

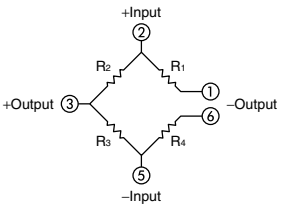


Recommended PC board pattern
(BOTTOM VIEW)



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.

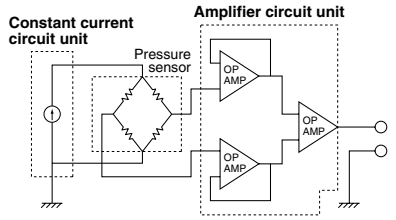
• When storing the pressure sensor chips, use a conductive material to short the pins or wrap the entire chip in aluminum foil. Plastic containers should not be used to store or transport the chips since they readily become charged.

• 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

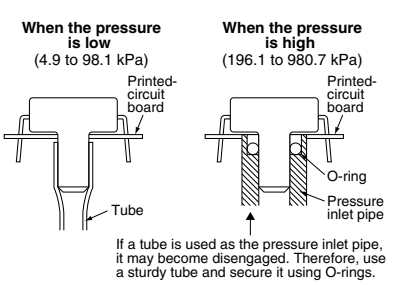
The general method for transmitting air pressures differs depending on whether the pressure is low or high.

• 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



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

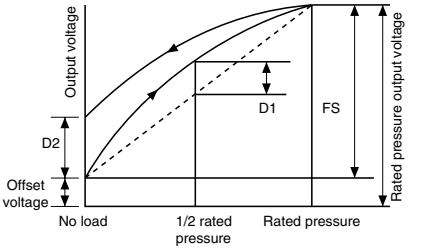
Output voltage when rated pressure is applied.

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).

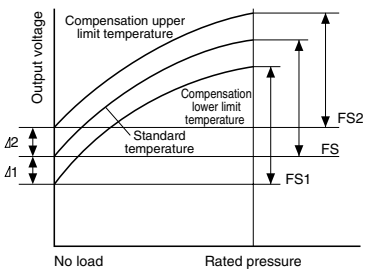


11. Offset voltage temperature characteristic

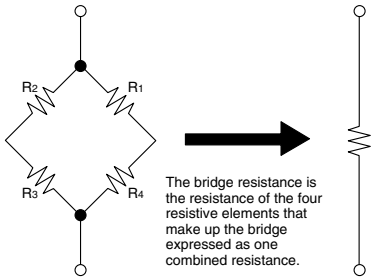
The variation of the offset voltage with changes in ambient temperature. The difference between the offset voltage at the standard temperature and the offset values at the compensation lower limit temperature (low temperature) (D1) and compensation upper limit temperature (high temperature) (D2) are 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.

ISO14001
Certificate of approval

Since the establishment of the "Matsushita Electric Works Global Environmental Charter" in 1992, we are set to unite in a concerted effort toward making Matsushita Electric Works a company capable of sustainable development by striking the right balance between our commitments to the environment, the economy, and society.
Regarding environmental conservation, we are fully committed to the complete elimination of freon and trichloroethylene. In energy-related efforts, we are developing technology to create energy-saving products, and for natural resources, we are working to eliminate industrial waste and to develop recycling technology. Our goal is peaceful co-existence with our global society.

Matsushita Electric Works Global Environmental Charter


Lloyd's Register Quality Assurance

CERTIFICATE OF APPROVAL

■ **Responsibilities of industry**
- To provide products and services useful to society
- To fulfill social responsibilities
- To pursue corporate logic

■ **Harmonization with the global environment**
- Conservation of the global environment
- Protection of resources

■ **Harmonization with society**
- Contributing to local communities
- Contributing to the global community

ISO9001
Certificate of approval

Our Electro-Mechanical Device Division, which handles from development to production and marketing, has been approved for certification of the ISO9001 quality assurance standards established by the International Standards Organization (ISO).
On October, 1993, this achievement was officially registered by the certification organizations UKAS of the United Kingdom and RVA of the Netherlands.


CERTIFICATE OF APPROVAL

Matsushita Electric Works Ltd.
Automation Components Division
Watarai-gun, Mie ken
Kadoma-shi, Osaka, Japan

ISO 9001 :1994
EN ISO 9001 :1994
BS EN ISO 9001 :1994
DIN EN ISO 9001: 1994
NF EN ISO 9001: 1994
NEN EN ISO 9001: 1994
JIS Z 9901 :1994

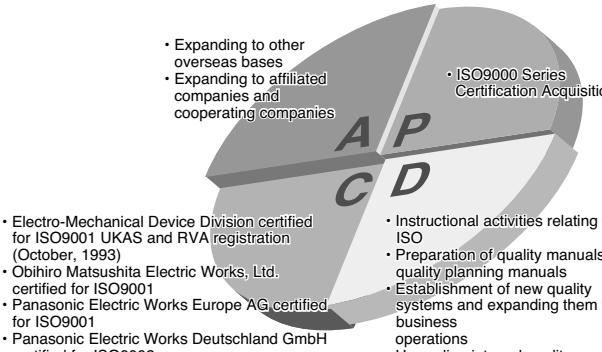
The design and manufacture of electro-magnetic and solid-state relays.

QS-9000
Certificate of approval

Our Electro-Mechanical Device Division has been accredited for QS-9000, covering our quality management system for an entire spectrum of automotive products ranging from mechanical to semiconductor relays.
QS-9000 is a required component of quality systems and includes independent requirements by the Big 3 of the U.S. automotive world, GM, Ford, and Chrysler. It calls for a comprehensive quality management system that includes CS, cost performance, ongoing improvement, and many other aspects of quality management.

■ **Certification Status**
- Electro-Mechanical Device Division approved
- Obihiro Matsushita Electric Works, Ltd. approved
- Panasonic Electric Works, (Thailand) Ltd. approved
- Panasonic Electric Works, Mexicana S.A. de C.V. approved

The Necessity and Pursuit of ISO Certification



- Electro-Mechanical Device Division certified for ISO9001 UKAS and RVA registration (October, 1993)
- Obihiro Matsushita Electric Works, Ltd. certified for ISO9001
- Panasonic Electric Works Europe AG certified for ISO9001
- Panasonic Electric Works Deutschland GmbH certified for ISO9002
- Panasonic Electric Works Automation Controls (Beijing) Co., Ltd. certified for ISO9002
- Panasonic Electric Works (Thailand), Ltd. certified for ISO9002
- Panasonic Electric Works, Mexicana S.A. de C.V. certified for ISO9002

- Instructional activities relating to ISO
- Preparation of quality manuals and quality planning manuals
- Establishment of new quality systems and expanding them to business operations
- Upgrading internal quality monitoring

▼

Advantages

- **Strengthening and upgrading quality assurance organizational structures applicable on an international basis**
- **Technology can be accumulated and disseminated through documentation and records**
- **Leads to improved reliability of the manufacturer's quality and improved CS (customer satisfaction)**

North America | Europe | Asia Pacific | China | Japan

Panasonic Electric Works

Please contact our Global Sales Companies in:

Europe

▸ Headquarters	**Panasonic Electric Works Europe AG**	Rudolf-Diesel-Ring 2, 83607 Holzkirchen, Tel. (08024) 648-0, Fax (08024) 648-111, www.panasonic-electric-works.com
▸ Austria	**Panasonic Electric Works Austria GmbH**	Josef Madersperger Str. 2, 2362 Biedermannsdorf, Tel. (0 22 36) 2 68 46, Fax (0 22 36) 4 61 33, www.panasonic-electric-works.at
	PEW Electronic Materials Europe GmbH	Ennshafenstraße 9, 4470 Enns, Tel. (0 72 23) 8 83, Fax (0 72 23) 8 83 33, www.panasonic-electronic-materials.com
▸ Benelux	**Panasonic Electric Works Sales Western Europe B.V.**	De Rijn 4, (Postbus 211), 5684 PJ Best, (5680 AE Best), Netherlands, Tel. (0499) 37 27 27, Fax (0499) 372185, www.panasonic-electric-works.nl
▸ Czech Republic	**Panasonic Electric Works Czech s.r.o.**	Průmtyslová 1, 34815 Planá, Tel. 374 799 990, Fax 374 799 999, www.panasonic-electric-works.cz
▸ France	**Panasonic Electric Works Sales Western Europe B.V.**	French Branch Office, B.P. 44, 91371 Verrières le Buisson CEDEX, Tél. 01 60135757, Fax 01 60135758, www.panasonic-electric-works.fr
▸ Germany	**Panasonic Electric Works Deutschland GmbH**	Rudolf-Diesel-Ring 2, 83607 Holzkirchen, Tel. (08024) 648-0, Fax (08024) 648-555, www.panasonic-electric-works.de
▸ Ireland	**Panasonic Electric Works UK Ltd.**	Dublin, Tel. (01) 4600969, Fax (01) 4601131, www.panasonic-electric-works.co.uk
▸ Italy	**Panasonic Electric Works Italia s.r.l.**	Via del Commercio 3-5 (Z.I. Ferlina), 37012 Bussolengo (VR), Tel. (045) 6752711, Fax (045) 6700444, www.panasonic-electric-works.it
	PEW Building Materials Europe s.r.l.	Piazza della Repubblica 24, 20154 Milano (MI), Tel. (02) 29005391, Fax (02) 29003466, www.panasonic-building-materials.com
▸ Nordic Countries	**Panasonic Electric Works Nordic AB**	Sjöängsvägen 10, 19272 Sollentuna, Sweden, Tel. (08) 59476680, Fax (08) 59476690, www.panasonic-electric-works.se
	PEW Fire & Security Technology Europe AB	Citadellsvägen 23, 21118 Malmö, Tel. (040) 6977000, Fax (040) 6977099, www.panasonic-fire-security.com
▸ Portugal	**Panasonic Electric Works España S.A.**	Portuguese Branch Office, Avda Adelino Amaro da Costa 728 R/C J, 2750-277 Cascais, Tel. (21) 4812520, Fax (21) 4812529
▸ Spain	**Panasonic Electric Works España S.A.**	Barajas Park, San Severo 20, 28042 Madrid, Tel. (91) 3293875, Fax (91) 3292976, www.panasonic-electric-works.es
▸ Switzerland	**Panasonic Electric Works Schweiz AG**	Grundstrasse 8, 6343 Rotkreuz, Tel. (041) 7997050, Fax (041) 7997055, www.panasonic-electric-works.ch
▸ United Kingdom	**Panasonic Electric Works UK Ltd.**	Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6LF, Tel. (01908) 231555, Fax (01908) 231599, www.panasonic-electric-works.co.uk

North & South America

▸ USA	**PEW Corporation of America**	629 Central Avenue, New Providence, N.J. 07974, Tel. 1-908-464-3550, Fax 1-908-464-8513, www.pewa.panasonic.com

Asia Pacific / China / Japan

▸ China	**Panasonic Electric Works (China) Co., Ltd.**	Level 2, Tower W3, The Towers Oriental Plaza, No. 2, East Chang An Ave., Dong Cheng District, Beijing 100738, Tel. (010) 8518-5988, Fax (010) 8518-1297
▸ Hong Kong	**Panasonic Electric Works (Hong Kong) Co., Ltd.**	RM1205-9, 12/F, Tower 2, The Gateway, 25 Canton Road, Tsimshatsui, Kowloon, Hong Kong, Tel. (0852) 2956-3118, Fax (0852) 2956-0398
▸ Japan	**Matsushita Electric Works, Ltd.**	1048 Kadoma, Kadoma-shi, Osaka 571-8686, Japan, Tel. (06) 6908-1050, Fax (06) 6908-5781, www.mew.co.jp/e-acg/
▸ Singapore	**Panasonic Electric Works Asia Pacific Pte. Ltd.**	101 Thomson Road, #25-03/05, United Square, Singapore 307591, Tel. (06255) 5473, Fax (06253) 5689

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