

Panasonic
ideas for life

**MOTION SENSOR
(PASSIVE INFRARED TYPE)**

**MP MOTION
SENSOR
'NaPiOn'**



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 11.81inch.

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 line-up.

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.

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.



FEATURES

1. The world's smallest with a built-in amplifier

Extremely compact. Ideal for use in miniaturized devices.

ORDERING INFORMATION

| | AMN | | | | |
|-----------------------|----------------------------|---------------------------------|---|---|--|
| Output | 1: Digital output | 2: Analog output | 4: Low current consumption (digital output) | 1 | |
| Detection performance | 1: Standard detection type | 2: Slight motion detection type | 3: Spot detection type | | |
| Feature | 1: PC board mounting type | | | | |
| Operating voltage | 1: 5V DC | 2: 3V DC | | | |
| Lens color | 1: Black | 2: White | | | |

MP Motion Sensor (AMN1,2,4)

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 | Standard detection type | Standard | -20 to +60°C -4 to +140°F | Black | AMN11111 | 50 pcs. | 1,000 pcs. |
| | | Low current consumption | | White | AMN11112 | | |
| | Slight motion detection type | Standard | | Black | AMN41121 | | |
| | | Low current consumption | | White | AMN41122 | | |
| | Spot detection type | Standard | | Black | AMN12111 | | |
| | | | | White | AMN12112 | | |
| | | Low current consumption | | Black | AMN42121 | | |
| | | | | White | AMN42122 | | |
| | 10m detection type | Standard | | Black | AMN13111 | | |
| | | | | White | AMN13112 | | |
| | | Low current consumption | | Black | AMN43121 | | |
| | | | | White | AMN43122 | | |
| | 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 27.55inch × 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 | |

2.



*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.
 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 | |

MP Motion Sensor (AMN1,2,4)

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 | Vdd | 3.0 V DC | 2.2 V DC | |
| | Typical | | — | — | |
| Maximum | 6.0 V DC | 3.0 V DC | | | |
| Reted consumption current (Standby) <small>*Remark</small> | Typical | Iw | 170 μA | 46 μA | Iout = 0 |
| | Maximum | | 300 μA | 60 μA | |
| Output (when detecting) | Current | Maximum | Iout | 100 μA | Vout ≥ Vdd-0.5 |
| | Voltage | Minimum | Vout | Vdd -0.5 | Open when not detecting |
| | Maximum | | | — | |
| Circuit stability time | Typical | Twu | 7 s | 7 s | |
| | Maximum | | 30 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 | Vdd | 4.5 V DC | |
| | Maximum | | 5.5 V DC | |
| Reted consumption current | Typical | Iw | 0.17 mA | |
| | Maximum | | 0.3 mA | |
| Output current | Maximum | Iout | 50 μA | |
| Output voltage | Minimum | Vout | 0 V | |
| | Typical | | 2.5 V | |
| | Maximum | | Vdd | |
| Output offset average voltage | Minimum | Voff | 2.3 V | Steady-state output voltage when not detecting |
| | Typical | | 2.5 V | |
| | Maximum | | 2.7 V | |
| Steady-state noise | Typical | Vn | 130 m Vp-p | |
| | Maximum | | 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.

MP Motion Sensor (AMN1,2,4)

DETECTION PERFORMANCE

1. Standard 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 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



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.

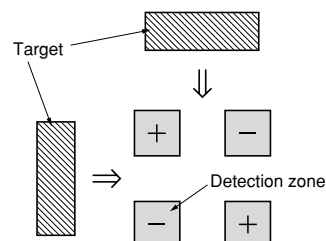
4. 10m detection type



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.



MP Motion Sensor (AMN1,2,4)

HOW TO USE

1. Wiring diagram

1) Digital output



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

2) Analog output



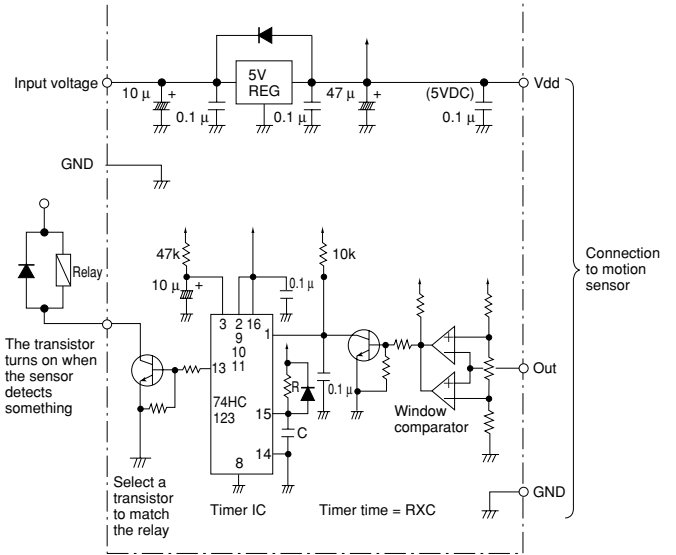
2. Timer circuit example

1) Digital output



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.

2) Analog output



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 approach the sensor from the Z direction, detection distance will be shortened.



DIMENSIONS

1. Standard detection type



Recommended PC board pattern (BOTTOM VIEW)



- 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 (BOTTOM VIEW)



- 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.

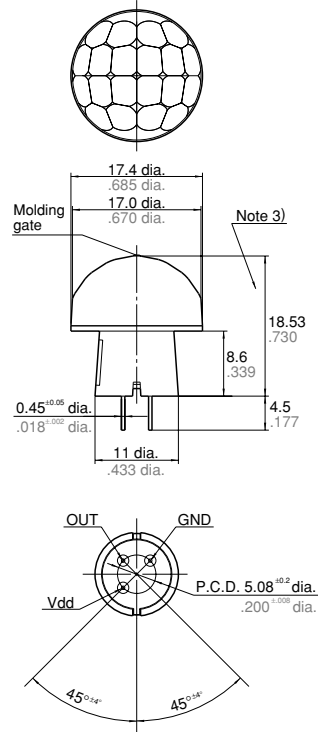
MP Motion Sensor (AMN1,2,4)

3. Spot detection type



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.

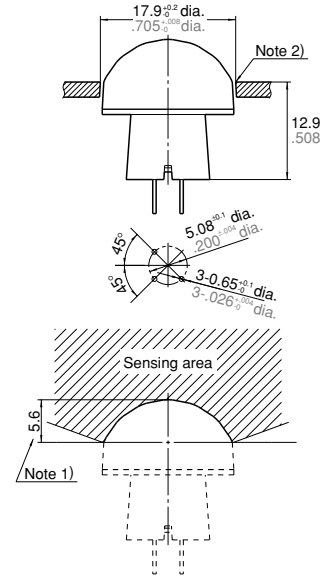
4. 10m detection type



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.

mm inch General tolerance $\pm 0.5 \pm 0.020$

Recommended PC board pattern (BOTTOM VIEW)



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 $\pm 200V$. 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 cause 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.

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