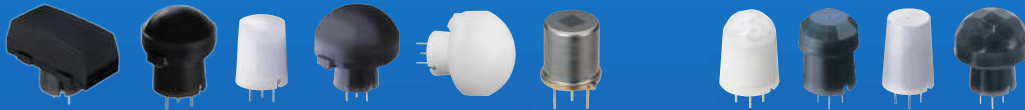


**Panasonic**

PIR Motion Sensor

(((PaPIRs)))

Special Designs from Panasonic that Provide High Sensitivity and Reliability



**Motion Sensor**



# Pyroelectric infrared motion sensors from Panasonic for optimal usability and reliability

Panasonic develops and produces PIR motion sensors, which combine easy integration, high reliability and environment-friendly materials.

The Panasonic PIR motion sensors abbreviated as PaPIRs, have different series of products, including

## EKM

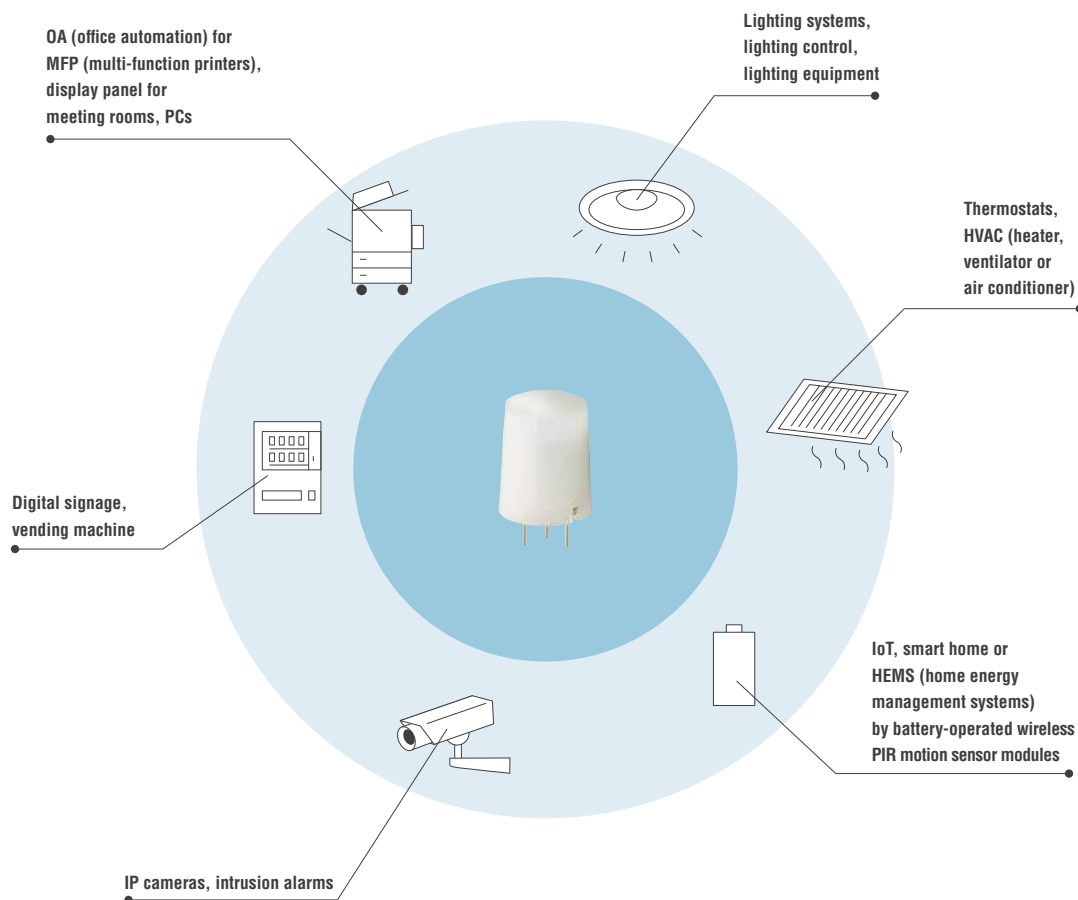
**EKMB (WL)** digital output for battery-operated devices (1, 2, 6 $\mu$ A)

**EKMC (VZ)** digital output for battery-free devices (170 $\mu$ A)

## AMN

**AMN2** analog output for battery-free devices (170 $\mu$ A)

**AMN3** digital output for battery-free devices (170 $\mu$ A)

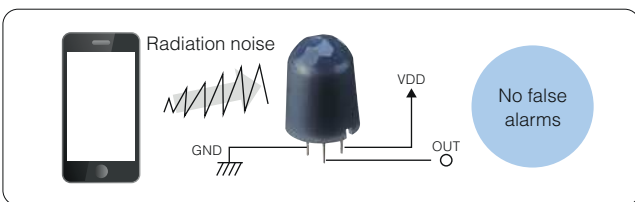
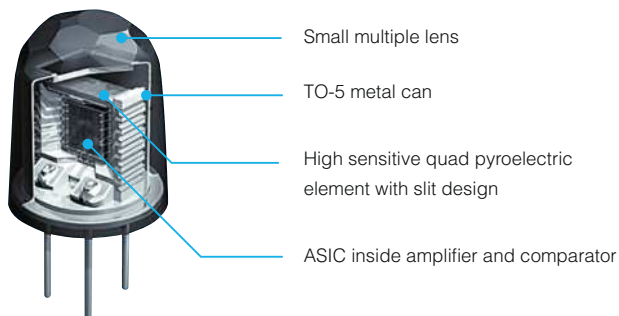


# Unique design

The PIR motion sensors from Panasonic offer crucial advantages over conventional PIR motion sensors. The unique design concept (explained below) ranges from the production of the pyroelectric sensing devices to the internal signal processing, thus guaranteeing an optimal detection capability and high reliability.

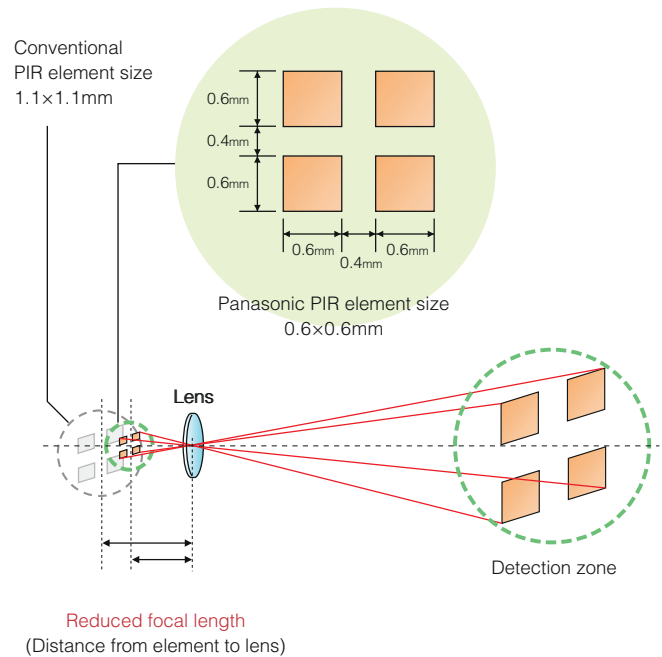
## Easy design-in

The integrated amplifier / comparator circuit inside a TO-5 metal can (digital type) prevent interferences caused by electromagnetic fields, such as those generated by cell phones and wireless devices. A special differential circuit design is introduced for the EKMB 6 $\mu$ A type for applications where a high noise resistance is required (up to GHz range).



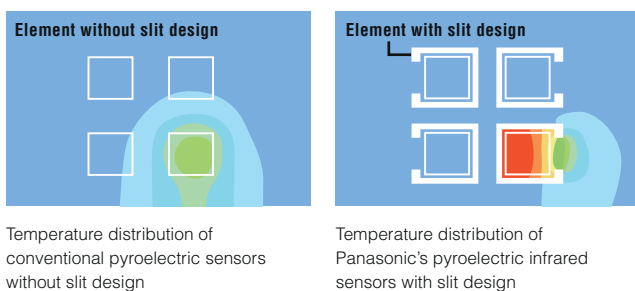
## Small and fancy lens design

Thanks to the special design of the small pyroelectric elements and a reduced focal length, it is possible to use a smaller lens size while keeping the same detection area compared to conventional sensors.



## 2 times better sensitivity

The sensitivity has been significantly improved thanks to a unique slit design of the pyroelectric elements. The separated sensing areas prevent thermal crosstalk between the single sensing elements. Therefore, reliable detection is possible even if the temperature difference between the background (e.g. floor /wall) and the target object (human) is small. (e.g.  $\Delta T=4\text{degC}$ )



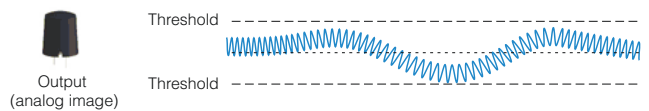
## Lead-free pyroelectric element

A ferroelectric LiTaO<sub>3</sub> single lead-free crystal is used as the pyroelectric element for Panasonic PIR motion sensors. Conventional PIR motion sensors normally use a ceramic base material (e.g. PZT) for the pyroelectric element, which contains lead in many cases.

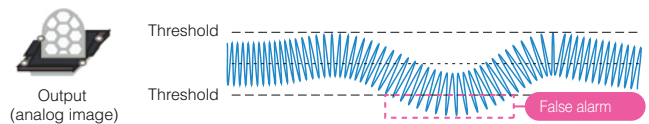
## 4 times better signal-to-noise ratio

Improved signal-to-noise ratio thanks to a special I/V circuit which is used for converting a current signal from the pyroelectric element to voltage. Panasonic PIR motion sensors perform by the feedback capacitor and the operational amplifier, different from the conventional FET-type, thereby decreasing the probability of false alarms due to temperature fluctuation.

[PaPIRs] High S/N = smaller steady noise



[Conventional Type] Low S/N = bigger steady noise



## Low current consumption EKMB (WL)

Reduction of current consumption (1, 2 or 6 $\mu$ A) thanks to the special circuit design technology allows battery life to be extended for battery-operated products.

# Horizontally wide detection type

Current consumption **1/2/6/170µA**

Digital output

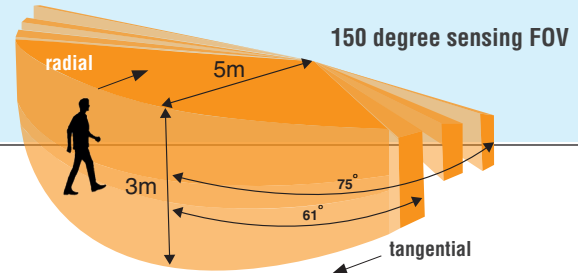
## > World's first PIR with "Approach Sensing" technology

Panasonic presents the world's first PIR sensor in the shape of a hammerhead with a special optic, which is more sensitive to radial motion.



### Recommended applications

Wall switches, thermostats, IP cameras, wake-up switch for displays, intrusion alarm sensors (e.g. for windows and doors), door intercom systems, entrance and garden lamps, automatic door systems, vending machines



Horizontally wide detection type

<b>Current consumption in standby mode</b> (1µA type: in sleep mode)	1µA	2µA	6µA	170µA	
	Digital (open collector)				
<b>Lens color</b>	White	EKMB1105111	EKMB1205111	EKMB1305111K	EKMC1605111
	Black	EKMB1105112	EKMB1205112	EKMB1305112K	EKMC1605112
	Pearl white	EKMB1105113	EKMB1205113	EKMB1305113K	EKMC1605113

Dimension (mm)	Detection zone	Detection characteristics																		
<p><b>CAD data by request</b></p>		<table border="1"> <tr> <td>Detection distance</td> <td colspan="2">Max. 5m*</td> </tr> <tr> <td rowspan="2">Field of view</td> <td>Area A</td> <td>122° x 35°</td> </tr> <tr> <td>Area B</td> <td>150° x 20°</td> </tr> <tr> <td rowspan="2">Detection zone</td> <td>Area A</td> <td>88</td> </tr> <tr> <td>Area B</td> <td>16</td> </tr> <tr> <td rowspan="2">Detection condition ▲</td> <td>Area A</td> <td> <ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 1m/s</li> <li>Target concept: human head with an approx. size of 700x250mm</li> <li>Target moving direction: crossing 2 detection zones</li> </ul> </td> </tr> <tr> <td>Area B</td> <td> <ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 8°C.</li> <li>Movement speed: 1m/s</li> <li>Target concept: human body with an approx. size of 700x250mm</li> <li>Target moving direction: crossing 2 detection zones</li> </ul> </td> </tr> </table>	Detection distance	Max. 5m*		Field of view	Area A	122° x 35°	Area B	150° x 20°	Detection zone	Area A	88	Area B	16	Detection condition ▲	Area A	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 1m/s</li> <li>Target concept: human head with an approx. size of 700x250mm</li> <li>Target moving direction: crossing 2 detection zones</li> </ul>	Area B	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 8°C.</li> <li>Movement speed: 1m/s</li> <li>Target concept: human body with an approx. size of 700x250mm</li> <li>Target moving direction: crossing 2 detection zones</li> </ul>
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\* Under specified detection conditions  
 ▲ Please refer to "Cautions for use" (page 18) and "Basic principles" (page 18, point 5), for more details

Please contact your local sales representative for detailed specifications.

# Standard and slight motion detection type

Current consumption **1/2/6/170µA**

Digital output



### > 2 functions in 1 lens

High Sensitivity Centre ZONE: Optimized for detecting small movements and small objects  
 Normal Sensitivity Outer ZONE: Optimized for detecting larger movements of larger objects

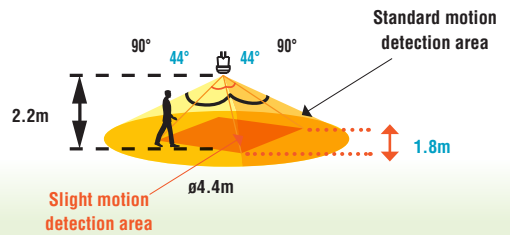


### Recommended applications

Lighting control, heaters, ventilators or air conditioners, IP cameras, intrusion alarms, digital signage, vending machines, multi-function printers, display panels for meeting rooms, PCs



Standard and slight motion detection type



<b>Current consumption in standby mode</b> (1µA type: in sleep mode)	1µA	2µA	6µA	170µA	
	Digital (open collector)				
<b>Output</b>	Digital (open collector)				
	White	EKMB1193111	EKMB1293111	EKMB1393111K	EKMC1693111
	Black	EKMB1193112	EKMB1293112	EKMB1393112K	EKMC1693112
<b>Lens color</b>	Pearl white	EKMB1193113	EKMB1293113	EKMB1393113K	EKMC1693113

Dimension (mm)	Detection zone	Detection characteristics																		
<p><b>CAD data by request</b></p>		<table border="1"> <tr> <td>Detection distance</td> <td colspan="2">Max. 2.2m*</td> </tr> <tr> <td rowspan="2">Field of view</td> <td>Slight motion</td> <td>44° x 44°</td> </tr> <tr> <td>Standard motion</td> <td>90° x 90°</td> </tr> <tr> <td rowspan="2">Detection zone</td> <td>Slight motion</td> <td>36</td> </tr> <tr> <td>Standard motion</td> <td>48</td> </tr> <tr> <td rowspan="2">Detection condition ▲</td> <td>Slight motion</td> <td> <ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 0.5m/s</li> <li>Target concept: human head with an approx. size of 200x200mm</li> <li>Target moving direction: crossing 1 detection zone</li> </ul> </td> </tr> <tr> <td>Standard motion</td> <td> <ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 1.0m/s</li> <li>Target concept: human body with an approx. size of 400x200mm</li> <li>Target moving direction: crossing 2 detection zones</li> </ul> </td> </tr> </table>	Detection distance	Max. 2.2m*		Field of view	Slight motion	44° x 44°	Standard motion	90° x 90°	Detection zone	Slight motion	36	Standard motion	48	Detection condition ▲	Slight motion	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 0.5m/s</li> <li>Target concept: human head with an approx. size of 200x200mm</li> <li>Target moving direction: crossing 1 detection zone</li> </ul>	Standard motion	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 1.0m/s</li> <li>Target concept: human body with an approx. size of 400x200mm</li> <li>Target moving direction: crossing 2 detection zones</li> </ul>
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<p>* Under specified detection conditions                  ▲ Please refer to "Cautions for use" (page 18) and "Basic principles"(page 18, point 5), for more details</p>																				

Please contact your local sales representative for detailed specifications.

# Line up

((PaPIR<sub>S</sub>)) motion sensor

## EKM series

### EKMB<sub>(WL)</sub> / EKMC<sub>(VZ)</sub>

> EKMB for battery-operated devices

> EKMC for battery-free devices

#### ► Lens

#### Lenses for EKMB/ EKMC



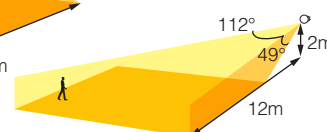
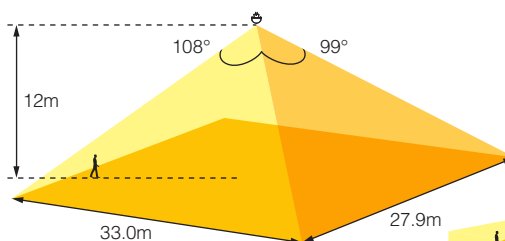
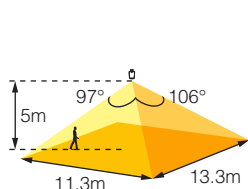
Standard detection type



Long distance detection type



Wall installation type



Standard detection type



Long distance detection type

► **Current consumption in standby mode**  
(1μA type: in sleep mode)

1μA

2μA

6μA

170μA

1μA

2μA

6μA

170μA

► **Output**

Digital (open collector)

► **Lens color**

White

EKMB1101111

EKMB1201111

EKMB1301111K

EKMC1601111

EKMB1103111

EKMB1203111

EKMB1303111K

EKMC1603111

Black

EKMB1101112

EKMB1201112

EKMB1301112K

EKMC1601112

EKMB1103112

EKMB1203112

EKMB1303112K

EKMC1603112

Pearl white

EKMB1101113

EKMB1201113

EKMB1301113K

EKMC1601113

EKMB1103113

EKMB1203113

EKMB1303113K

EKMC1603113

► **Reference page**

P. 10, 11, 12, 13



# AMN (NaPiOn)

> For battery-free devices

## Lenses for AMN



Standard detection type



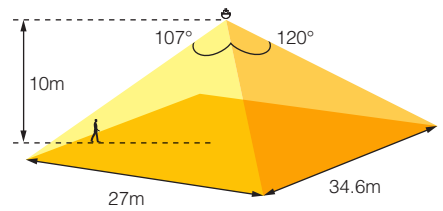
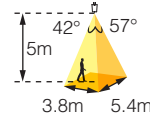
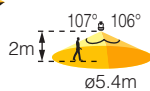
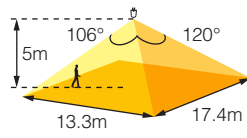
Slight motion detection type



Spot detection type



10m detection type



Standard detection type



Slight motion detection type



Spot detection type



10m detection type

### Lensless type available

The EKMB/EKMC also offers a lensless type for those customers who design their own lens.

#### EKMB

- 1µA type: EKMB1100100
- 2µA type: EKMB1200100
- 6µA type: EKMB1300100K



#### EKMC

- 170µA type: EKMC1600100



Wall installation type

1µA

2µA

6µA

170µA

170µA

Digital (open collector)

Digital (open collector)

Analog (op amp)

Digital (open collector)

Analog (op amp)

Digital (open collector)

Analog (op amp)

Digital (open collector)

Analog (op amp)

EKMB1104111	EKMB1204111	EKMB1304111K	EKMC1604111
EKMB1104112	EKMB1204112	EKMB1304112K	EKMC1604112
EKMB1104113	EKMB1204113	EKMB1304113K	EKMC1604113

AMN31112	AMN21112	AMN32112	AMN22112	AMN33112	AMN23112	AMN34112	AMN24112
AMN31111	AMN21111	AMN32111	AMN22111	AMN33111	AMN23111	AMN34111	AMN24111

P. 10, 11, 12, 13

P. 14, 15, 16

# EKMB(WL)

Current consumption **1/2/6μA**

Digital output



Standard detection type



Long distance detection type



Wall installation type



Horizontally wide detection type



Standard and slight motion detection type

see page 6

see page 7

- > Low-current consumption for battery-operated applications
- > A special differential input circuit design (EKMB 6μA type only) for applications where a high-noise resistance is required (up to GHz range)

**Recommended applications**

IoT, occupancy sensor module for smart home, battery-operated applications, wireless devices

**Lensless type available**

1μA type: EKMB1100100  
2μA type: EKMB1200100

6μA type: EKMB1300100K



EKMB

EKMC

AMN

## Specifications

Detection performance	Model no.	Current consumption	Lens color	Detection distance	Detection area		Detection zones	Output type
					Horizontal	Vertical		
Standard detection type 	EKMB1101111	1μA	White	5m	94° (106°)	82° (97°)	64	Digital (open collector)
	EKMB1101112		Black					
	EKMB1101113		Pearl white					
	EKMB1201111	2μA	White					
	EKMB1201112		Black					
	EKMB1201113		Pearl white					
	EKMB1301111K	6μA	White					
	EKMB1301112K		Black					
	EKMB1301113K		Pearl white					
Long distance detection type 	EKMB1103111	1μA	White	12m	102° (108°)	92° (99°)	92	Digital (open collector)
	EKMB1103112		Black					
	EKMB1103113		Pearl white					
	EKMB1203111	2μA	White					
	EKMB1203112		Black					
	EKMB1203113		Pearl white					
	EKMB1303111K	6μA	White					
	EKMB1303112K		Black					
	EKMB1303113K		Pearl white					
Wall installation type 	EKMB1104111	1μA	White	12m (1st step lens) 6m (2nd step lens) 3m (3rd step lens)	40° (55.6)	105° (112°)	68	Digital (open collector)
	EKMB1104112		Black					
	EKMB1104113		Pearl white					
	EKMB1204111	2μA	White					
	EKMB1204112		Black					
	EKMB1204113		Pearl white					
	EKMB1304111K	6μA	White					
	EKMB1304112K		Black					
	EKMB1304113K		Pearl white					

## Characteristics

### > Maximum rated values

Items	Value
Power supply voltage	-0.3 to 4.5V
Ambient temperature	-20 to +60°C (no frost, no condensation)
Storage temperature	-20 to +70°C

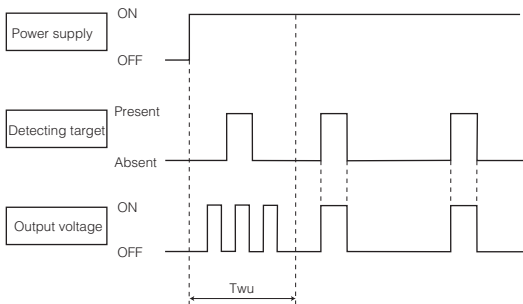
### > Electrical characteristics

Items	Symbol	1μA type	2μA type	6μA type	Conditions	
Operating voltage	Max	4.0V			-	
	Min	2.3V				
Current consumption (in standby/sleep mode) Note 1)	Ave	Iw	1μA	2μA	6μA	Ambient temperature: 25°C Iout=0A Vdd=3V
Output current (during detection period) Note 2)	Max	Iout	100μA			Ambient temperature: 25°C Vout≥Vdd-0.5V
Output voltage (during detection period)	Min	Vout	Vdd-0.5V			Ambient temperature: 25°C Open at no detection
Circuit stability time (when voltage is applied) Note 3)	Ave	T <sub>wu</sub>	25 seconds		-	Ambient temperature: 25°C Iout=0A Vdd=3V
	Max		210 seconds		10 seconds	

Note 1) The total current consumption is equal to the current consumption in standby mode (Iw) plus the output current during detection (Iout). For the 1μA type please note that the average current consumption is 1μA in sleep mode and 1.9μA in standby mode. Please also refer to the timing chart.  
 Note 2) Please select an output resistor (pull-down concept) in accordance with Vout so that the output current is lower than or equal to 100μA. If the output current is more than 100μA, this may cause false alarms.  
 Note 3) The sensor temperature is constant.

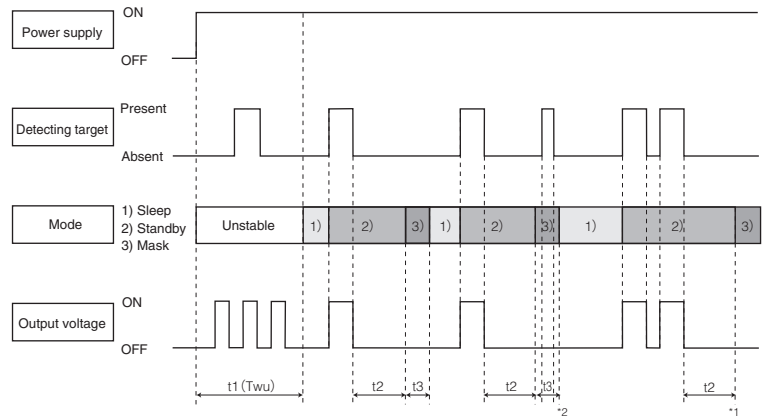
## Timing chart

### > 2μA / 6μA type



[Explanation of the timing]  
 T<sub>wu</sub>: Circuit stability time: about 25 seconds (typ.) for 2μA type, max. 10 seconds for 6μA type.  
 While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the ON or OFF state. This is true regardless of whether or not the sensor has detected anything.

### > 1μA type



[Explanation of modes]  
 1) Sleep mode: When the output is OFF, the electrical current consumption is around 1μA.  
 2) Standby mode: After the sensor's output has reached ON status, the sensor switches to standby mode. The electrical current consumption gets close to 1.9μA. When the sensor's output returns to its OFF value after the "hold time" has expired, the sensor switches again to sleep mode.  
 3) Mask mode: Time during which the output is forced to OFF status after the end of the standby mode. (No detection is possible during this period.)

[Explanation of the timing]  
 t1 (T<sub>wu</sub>): Circuit stability time: about 25 seconds (typ.)  
 While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the ON or OFF state. This is true regardless of whether or not the sensor has detected anything.  
 t2: Standby hold time: about 2.6 seconds (typ.) after the last detection of a signal. (#1)  
 t3: Mask time: about 1.3 seconds (typ.) During this stage, even if the sensor detects something, the output will not switch to ON. (#2)

# EKMC (VZ)

Current consumption **170μA**

Digital output



Standard detection type



Long distance detection type



Wall installation type



Horizontally wide detection type



Standard and slight motion detection type

see page 6

see page 7

> Economy type suitable for a wide range of applications

**Recommended applications**

Lighting control, lighting equipment, heaters, ventilators or air conditioners, IP cameras, intrusion alarms, digital signage, vending machines, multi-function printers, display panels for meeting rooms, PCs

**Lensless type available**

170μA type: EKMC1600100



EKMB

EKMC

## Specifications

Detection performance	Model no.	Current consumption	Lens color	Detection distance	Detection area		Detection zones	Output type	
					Horizontal	Vertical			
Standard detection type 	EKMC1601111	170μA	White	5m	94° (106°)	82° (97°)	64	Digital (open collector)	
	EKMC1601112		Black						
	EKMC1601113		Pearl white						
Long distance detection type 	EKMC1603111		White	12m	102° (108°)	92° (99°)			
	EKMC1603112		Black						
	EKMC1603113		Pearl white						
Wall installation type 	EKMC1604111		White	12m (1st step lens) 6m (2nd step lens) 3m (3rd step lens)	40° (55.6°)	105° (112°)			68
	EKMC1604112		Black						
	EKMC1604113		Pearl white						

## Characteristics

### > Maximum rated values

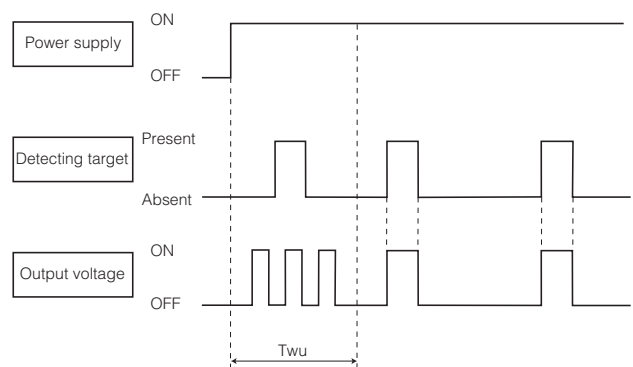
Items	Value
Power supply voltage	-0.3 to 7V
Ambient temperature	-20 to +60°C (no frost, no condensation)
Storage temperature	-20 to +70°C

### > Electrical characteristics

Items	Symbol	EKMC(VZ) type	Conditions
Operating voltage	Max	Vdd	6.0V
	Min		3.0V
Current consumption (in standby mode) Note 1)	Ave	Iw	170μA Ambient temperature = 25°C Iout=0A Vdd=5V
Output current (during detection) Note 2)	Max	Iout	100μA Ambient temperature = 25°C Vout>Vdd-0.5V
Output voltage (during detection period)	Min	Vout	Vdd - 0.5V Ambient temperature: 25°C Open at no detection
Circuit stability time (when voltage is applied) Note 3)	Max	Twu	30 seconds Ambient temperature: 25°C Iout=0A Vdd=5V

Note 1) Current consumption during detection period is the total value of current consumption in standby mode added to the output current.  
 Note 2) Please select an output resistor (pull-down concept) in accordance with Vout so that the output current is lower than or equal to 100μA. If the output current is more than 100μA, this may cause false alarms.  
 Note 3) The sensor temperature is constant.

## Timing chart



[Explanation of the timing]

Twu: Circuit stability time: max. 30 seconds

During this stage, the output's status is undefined (ON/OFF) and detection is therefore not guaranteed. This is true regardless of whether or not the sensor has detected anything.

AMN

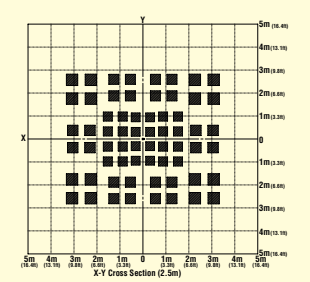
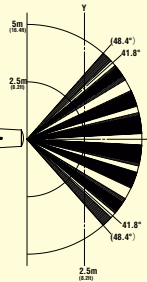
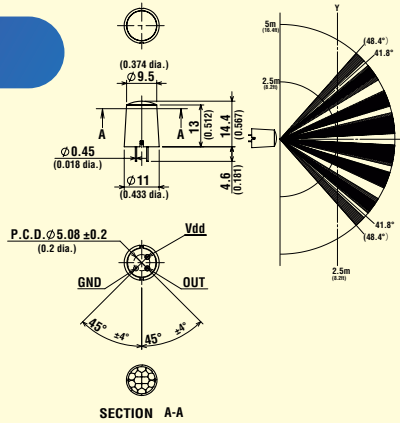
Dimension (mm)

Detection zone

Detection characteristics

Standard detection type

CAD data



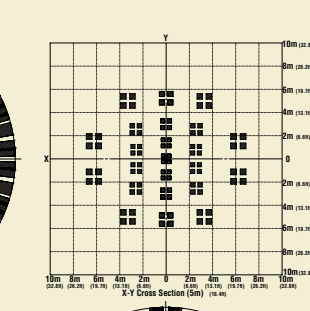
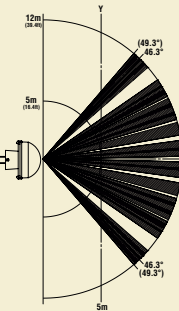
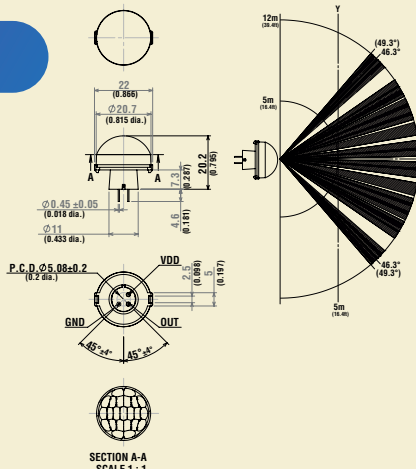
Detection distance	Max. 5m*
Field of view	94°×82° (106°×97°)
Detection zone	64
Detection condition ▲	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 1.0m/s</li> <li>Target concept: human body with an approx. size of 700×250mm</li> <li>Target moving direction: crossing 2 detection zones.</li> </ul>

\* Under specified detection conditions  
▲ Please refer to "Cautions for use" (page 18) and "Basic principles" (page 18, point 5) for more details

Please note that the horizontal and vertical field of view depends on the position of the metal tab on which the lens is mounted.

Long distance detection type

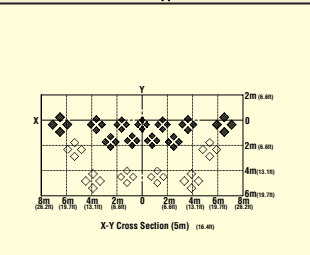
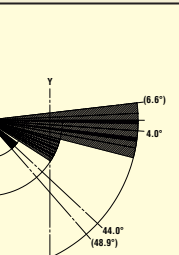
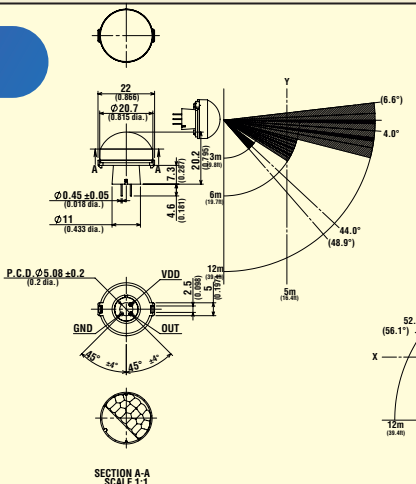
CAD data



Detection distance	Max. 12m*
Field of view	102°×92° (108°×99°)
Detection zone	92
Detection condition ▲	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 1.0m/s</li> <li>Target concept: human body with an approx. size of 700×250mm</li> <li>Target moving direction: crossing 2 detection zones.</li> </ul>

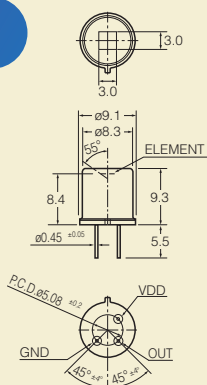
Wall installation type

CAD data

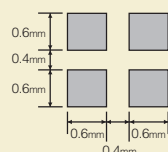


Detection distance	1st step lens	Max. 12m*
	2nd step lens	Max. 6m*
	3rd step lens	Max. 3m*
Field of view	40°×105° (55.6°×112°)	
Detection zone	68	
Detection condition	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: 1.0m/s</li> <li>Target concept: human body with an approx. size of 700×250mm</li> <li>Target moving direction: crossing 2 detection zones.</li> </ul>	

Lensless type



> PIR element

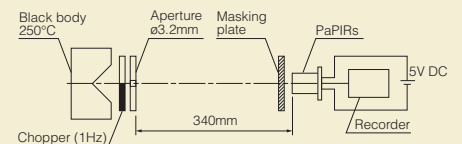


Please contact your local sales representative for detailed specifications.

Detection sensitivity	<p>Average: 5.6μW/cm<sup>2</sup></p> <p>Maximum: 7.6μW/cm<sup>2</sup></p>
-----------------------	---

Detection sensitivity is measured by following system

> Test setup



# AMN (NaPiOn)

Current consumption **170 $\mu$ A**

**Digital/Analog output**



Standard detection type



Slight motion detection type



Spot detection type



10m detection type

> Line-up with special detection lenses for slight motion or very small objects

> Digital and analog output types available

**Recommended applications**

Lighting control, lighting equipment, heaters, ventilators or air conditioners, IP cameras, intrusion alarms, digital signage, vending machines, multi-function printers, display panels for meeting rooms, PCs

EKMB

EKMC

AMN

## Specifications

Detection performance	Model no.	Current consumption	Lens color	Detection distance	Detection area		Detection zones	Output type
					Horizontal	Vertical		
Standard detection type 	AMN31112	170 $\mu$ A	White	5m	108° (120°)	90° (106°)	64	Digital (open collector)
	AMN31111		Black					Analog (op amp)
	AMN21112		White					
	AMN21111		Black					
Slight motion detection type 	AMN32112		White	2m	98° (107°)	97° (106°)	104	Digital (open collector)
	AMN32111		Black					Analog (op amp)
	AMN22112		White					
	AMN22111		Black					
Spot detection type 	AMN33112		White	5m	24° (42°)	40° (57°)	24	Digital (open collector)
	AMN33111		Black					Analog (op amp)
	AMN23112		White					
	AMN23111		Black					
10m detection type 	AMN34112		White	10m	114° (120°)	98° (107°)	80	Digital (open collector)
	AMN34111		Black					Analog (op amp)
	AMN24112		White					
	AMN24111		Black					

## Characteristics

### > Maximum rated values

Items	Value
Power supply voltage	-0.3 to 7V
Ambient temperature	-20 to +60°C (no frost, no condensation)
Storage temperature	-20 to +70°C

### > Electrical characteristics (digital output)

Items	Symbol	Digital output	Conditions
Operating voltage	Max	6.0V	-
	Min	3.0V	
Current consumption (in standby mode) Note 1)	Ave	170μA	Ambient temperature: 25°C I <sub>out</sub> =0A V <sub>dd</sub> =5V
Output current (during detection) Note 2)	Max	100μA	Ambient temperature: 25°C V <sub>out</sub> ≥V <sub>dd</sub> -0.5V
Output voltage (during detection)	Min	V <sub>dd</sub> - 0.5V	Ambient temperature: 25°C Open at no detection
Circuit stability time (when voltage is applied) Note 3)	Max	30 seconds	Ambient temperature: 25°C I <sub>out</sub> =0A V <sub>dd</sub> =5V

Note 1) The total current consumption is equal to the current consumption in standby mode (I<sub>w</sub>) plus the output current during detection (I<sub>out</sub>).

Note 2) Please select an output resistor (pull-down concept) in accordance with V<sub>out</sub> so that the output current is lower than or equal to 100μA. If the output current is more than 100μA, this may cause false alarms.

Note 3) The sensor temperature is constant.

### > Electrical characteristics (analog output)

Items	Symbol	Analog output	Conditions
Operating voltage	Max	5.5V	-
	Min	4.5V	
Current consumption (in standby mode) Note 1)	Ave	I <sub>w</sub>	Ambient temperature = 25°C I <sub>out</sub> =0A V <sub>dd</sub> =5V
Output current (during detection period) Note 2)	Max	I <sub>out</sub>	Ambient temperature: 25°C V <sub>dd</sub> =5V
Output voltage range (during detection period)	Max	V <sub>dd</sub>	Ambient temperature: 25°C V <sub>dd</sub> =5V
	Min	0V	
Output offset voltage (at non detection)	Max	2.7V	Ambient temperature: 25°C V <sub>dd</sub> =5V Steady output voltage at non detection
	Ave	2.5V	
	Min	2.3V	
Steady noise	Max	300mV <sub>pp</sub>	Ambient temperature: 25°C V <sub>dd</sub> =5V
	Ave	155mV <sub>pp</sub>	
Detection sensitivity	Min	V <sub>h</sub> or V <sub>l</sub>	Ambient temperature: 25°C V <sub>dd</sub> =5V
Circuit stability time (when voltage is applied) Note 3)	Max	T <sub>wu</sub>	Ambient temperature: 25°C V <sub>dd</sub> =5V

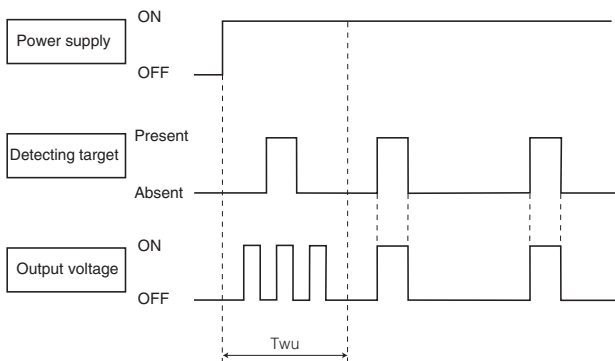
Note 1) The total current consumption is equal to the current consumption in standby mode (I<sub>w</sub>) plus the output current during detection (I<sub>out</sub>).

Note 2) To set the same detection sensitive as for the digital output type, set the output voltage to 2.5V ±0.45V

Note 3) The sensor temperature is constant.

## Timing chart

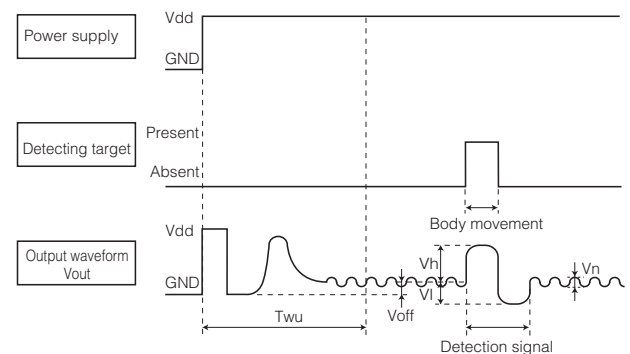
### > Digital output



[Explanation of the timing]

T<sub>wu</sub>: Circuit stability time: max. 30 seconds  
While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the ON or OFF state. This is true regardless of whether or not the sensor has detected anything.

### > Analog output

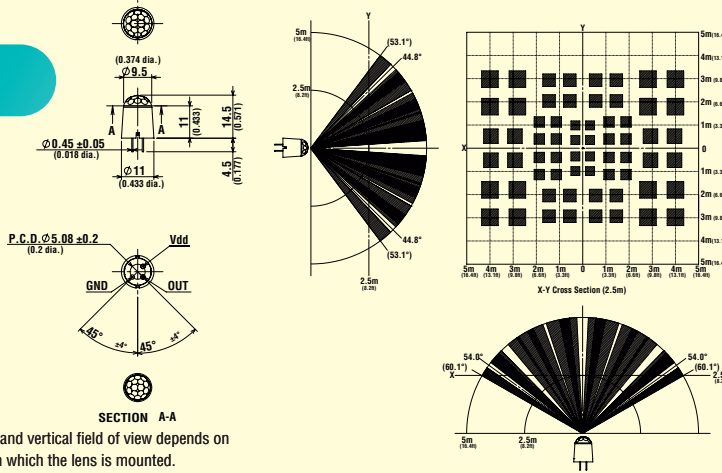


[Explanation of the timing]

T<sub>wu</sub>: Circuit stability time: max. 45 seconds  
While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the ON or OFF state. This is true regardless of whether or not the sensor has detected anything.

## Standard detection type

CAD data



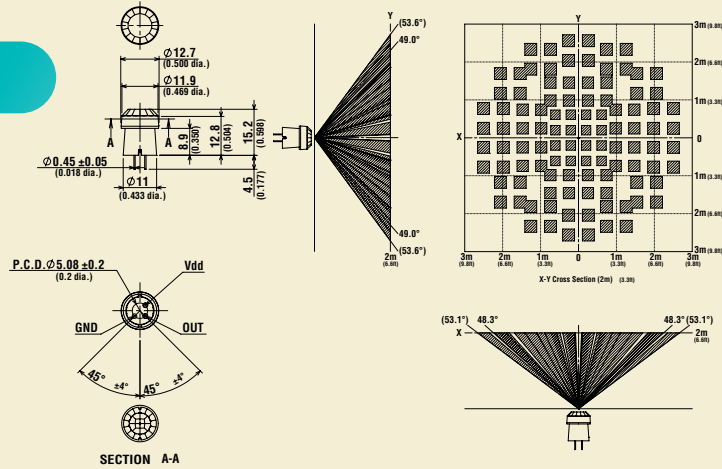
Please note that the horizontal and vertical field of view depends on the position of the metal tab on which the lens is mounted.

Detection distance	5m*
Field of view	108°x90° (120°x106°)
Detection zone	64
Detection condition ▲	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: digital output 0.8 to 1.2m/s analog output 0.5 to 1.5m/s</li> <li>Target concept: size of 700x250mm</li> <li>Target moving direction: crossing 2 detection zones.</li> </ul>

\* Under specified detection conditions  
▲ Please refer to "Caution for use" (page 18) and "Basic principles" (page 18, point 5), for more details

## Slight motion detection type

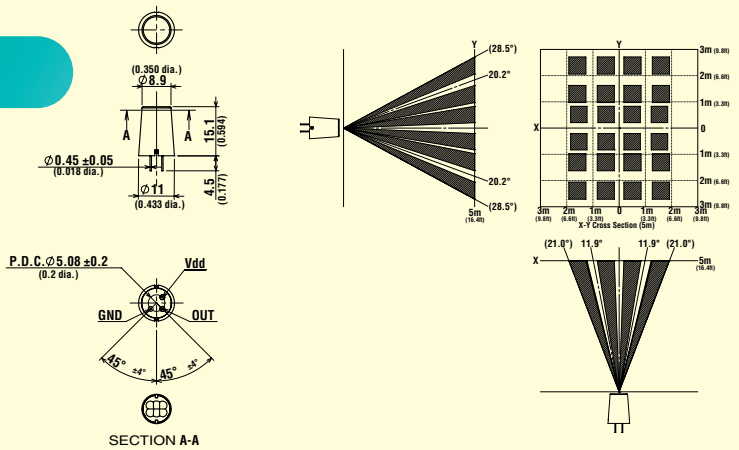
CAD data



Detection distance	2m*
Field of view	98°x97° (107°x106°)
Detection zone	104
Detection condition ▲	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: digital output 0.5m/s analog output 0.3 to 1.0m/s</li> <li>Target concept: size of 200x200mm</li> <li>Target moving direction: crossing 1 detection zone.</li> </ul>

## Spot detection type

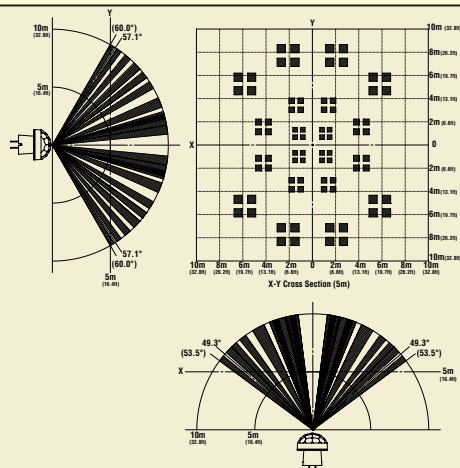
CAD data



Detection distance	5m*
Field of view	24°x40° (42°x57°)
Detection zone	24
Detection condition ▲	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: digital output 0.8 to 1.2m/s analog output 0.5 to 1.5m/s</li> <li>Target concept: size of 700x250mm</li> <li>Target moving direction: crossing 2 detection zones.</li> </ul>

## 10m detection type

CAD data

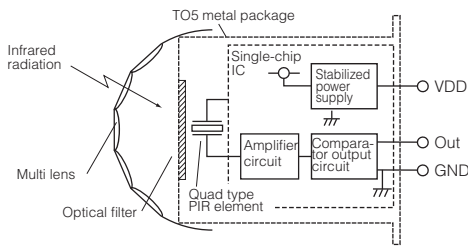


Detection distance	10m*
Field of view	114°x98° (120°x107°)
Detection zone	80
Detection condition ▲	<ul style="list-style-type: none"> <li>The temperature difference between the target and the surroundings must be higher than 4°C.</li> <li>Movement speed: digital output 0.8 to 1.2m/s analog output 0.5 to 1.5m/s</li> <li>Target concept: size of 700x250mm</li> <li>Target moving direction: crossing 2 detection zones.</li> </ul>

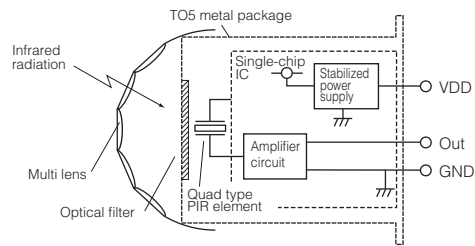


### > Block diagram output circuit

1) Digital output with integrated amplifier and comparator

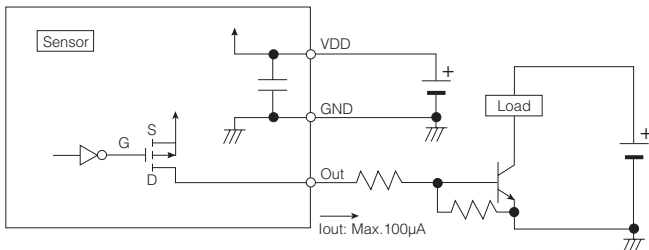


2) Analog output with integrated amplifier

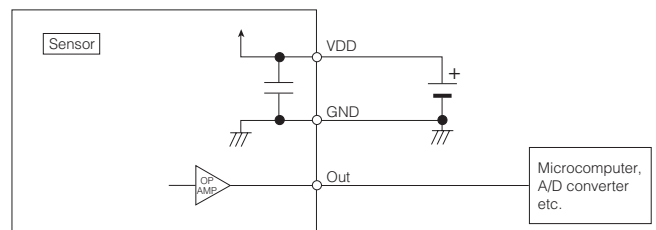


### > Wiring diagram

1) Digital output



2) Analog output

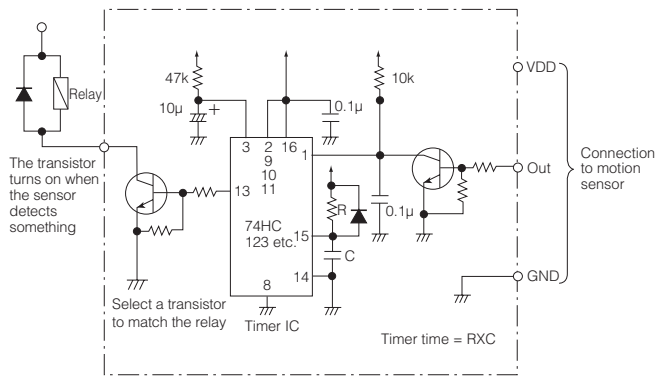


Vdd: Input power source (DC), GND: GND, Out: Output (Comparator)

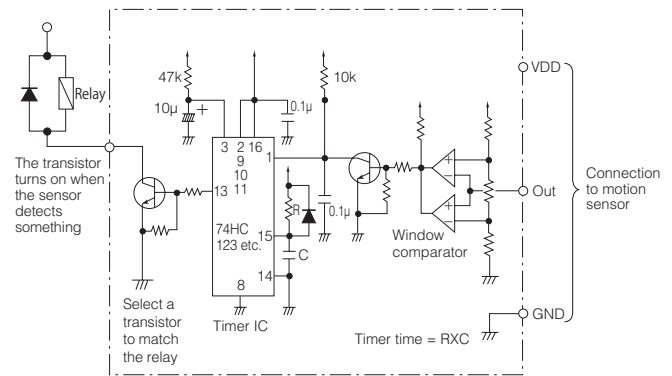
Note) The output signal for the digital output type is from inside FET drain, therefore pull-down resistors are necessary. Please select an output resistor (pull-down concept) in accordance with  $V_{out}$  so that the output current is lower than or equal to  $100\mu A$ . Use  $50K\Omega$  or more as a guideline. If the output current is more than  $100\mu A$ , this may cause false alarms.

### > Timer circuit example

1) Digital output



2) Analog output

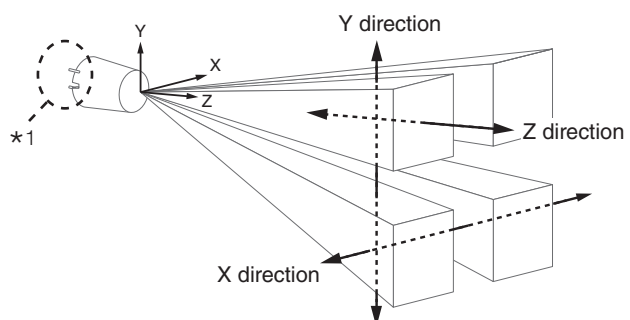


Note) This is the reference circuit which drives the PIR motion sensor. Install a noise filter for applications requiring enhanced detection reliability and noise withstanding capability. Differences in the specifications of electronic components to which the units are connected sometimes affect their correct operation; please check the units' performance and reliability for each application. Panasonic Corporation, Ltd. accepts no responsibility for damages resulting from the use of this circuit.

### > Mounting direction

1) As shown in the diagram on the right, please install the sensor so that the expected trespassing direction corresponds to the X or Y direction. In some cases, moving towards or away from the sensor (parallel movement to the Z direction) may not be detected as expected sensitivity or distance.

2) Please note that the horizontal and vertical field of view depends on the position of the metal tab (\*1) on which the lens is mounted.



## › Basic principles

PaPIRs are pyroelectric infrared sensors that detect variations in infrared rays. However, detection may not be successful in the following cases: lack of movement or no temperature change in the heat source. They could also detect the presence of heat sources other than a human body. Efficiency and reliability of the system may vary depending on the actual operating conditions:

- 1) Detecting heat sources other than the human body, such as:
  - a) small animals entering the detection area
  - b) When a heat source, for example sun light, incandescent lamp, car headlights etc., or strong light beam hit the sensor regardless whether the detection area is inside or outside.
  - c) Sudden temperature change inside or around the detection area caused by hot or cold wind from HVAC, or vapor from a humidifier, etc.
- 2) Difficulty in sensing the heat source
  - a) Glass, acrylic or similar materials standing between the target and the sensor may not allow a correct transmission of infrared rays.
  - b) Non-movement or quick movements of the heat source inside the detection area. (Please refer to the table on page 8 or 11 for details about movement speed.)
- 3) Expansion of the detection area  
In case of a considerable difference in the ambient temperature and the human body temperature, the detection area may be larger than the configured detection area.
- 4) Malfunction / Detection error  
On rare occasions, an erroneous detection signal may be output due to the nature of pyroelectric element. When the application cannot tolerate erroneous detection signals, take countermeasures by introducing a pulse-count circuit, etc.
- 5) Detection distance  
Panasonic's PIR Motion sensors state the detection distance in the specifications because they are usually provided with the lens (please refer to item 6 for lensless types). The PIR Motion sensor could detect variations in infrared rays however such variations are decided by following three factors.
  - The temperature difference between the target and the surroundings:  
The larger the temperature difference, the easier it is to detect targets.
  - Movement speed: If the target is moving at a slower or faster speed than specified in the tables, the detection ability may be lower.
  - Target size: The human body is the standard. If the target is smaller or larger than specified in the table, the detection ability may be lower.

The detection distance explained in our data sheet is defined by the three factors mentioned above. Panasonic's standard for the temperature difference between the target and the surrounding is defined as 4°C. The larger the temperature difference, the longer the detection distance. If the temperature difference is 8°C, which is twice as much as the standard, the detection distance will be approx. 1.4 times longer than the distance at 4°C. For example, if targets at a distance of 5m can be detected at 4°C, then the sensor can detect targets at a distance of 7m at 8°C. (This is based on the theory that the detection sensitivity will vary inversely with the square of the distance.)
- 6) Lensless type  
The lensless type cannot detect any targets because it is not possible to focus infrared variations into the sensor chip. It is not possible to determine the detection distance and the field of view without a lens. Please provide your own lens based on your lens design concept.
- 7) Lens material and the plate setting in front of the lens  
Typically, the only material that can be passed by infrared rays is Polyethylene. (The lens material of Panasonic's PIR Motion sensors is "High density polyethylene, HDPE".) When you need to set a plate in front of the lens, please choose one made from the Polyethylene. Please note the thickness or color of the plate will affect the detection ability, e.g. it may make the detection distance shorter. Therefore, please confirm by testing the sensor with the plate under realistic conditions.

## › Cautions

- 1) Refer to the newest specification regarding optimal operating environment conditions.
- 2) Do not solder with a soldering iron above 350°C (662°F) or for more than 3 seconds. This sensor should be hand-soldered.
- 3) To maintain stability of the product, always mount it on a printed circuit board.
- 4) Do not use liquids to wash the sensor. If washing fluid gets into the lens, it can reduce the performance.
- 5) Do not use a sensor after it has fallen on the ground.
- 6) The sensor may be damaged by ±200 volts of static electricity. Avoid direct hand contact with the pins and be very careful when operating the product.
- 7) When wiring the product, always use shielded cables and minimize the wiring length to prevent noise disturbances.
- 8) The inner circuit board can be destroyed by a voltage surge. The use of surge absorption elements is highly recommended. Surge resistance: below the power supply voltage value indicated in the section on maximum rated values.
- 9) Please use a stabilized power supply. Noise from the power supply can cause operating errors. Noise resistance: max. ±20V (square waves with a width of 50ns or 1µs) To reduce the effect of noise from the power supply, install a capacitor on the sensor's power supply pin.
- 10) Operation errors can be caused by noise from static electricity, lightnings, cell phones, amateur radio, broadcasting offices, etc
- 11) The detection performance can be reduced by dirt on the lens, please be careful.
- 12) The lens is made of soft materials (Polyethylene). Please avoid adding weight or impacts that may change its shape, causing operation errors or reduced performance.
- 13) The specified temperature and humidity levels are suggested to prolong usage. However, they do not guarantee durability or environmental resistance. Generally, high temperatures or high humidity levels will accelerate the deterioration of electrical components. Please consider both the planned usage and environment to determine the expected reliability and length of life of the product.
- 14) Do not attempt to clean this product with detergents or solvents such as benzene or alcohol, as these can cause shape or color alterations.
- 15) Avoid storage in high, low temperature or liquid environments. Also, avoid storage in environments containing corrosive gas, dust, salty air etc. Adverse conditions may cause performance deterioration and the sensor's main part or the metallic connectors could be damaged.
- 16) Storage conditions  
Temperature: +5 to +40°C, humidity: 30 to 75%  
Please use within 1 year after delivery.

## › Safety precautions

Obey the following precautions to prevent injury or accidents.

- 1) Do not use these sensors under any circumstance 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.
- 2) Our company is committed to making products of the highest quality and reliability. Nevertheless, all electrical components are subject to natural deterioration, and durability of a product will depend on the operating environment and conditions of use. Continued use after such deterioration could lead to overheating, smoke or fire. Always use the product in conjunction with proper fire-prevention, safety and maintenance measures to avoid accidents, reduction in product life expectancy or break-down.
- 3) Before connecting, check the pin layout by referring to the connector wiring diagram, specifications diagram, etc., to verify that the connector is connected properly. 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.
- 4) Do not use any motion sensor which has been disassembled or remodeled.
- 5) Failure modes of sensors include short-circuiting, open-circuiting and temperature rises. If this sensor is to be used in equipment where safety is a prime consideration, examine the possible effects of these failures on the equipment concerned, and ensure safety by providing protection circuits or protection devices.  
Example : Safety equipment and devices, traffic signals, burglar and disaster prevention devices, controlling and safety device for trains and motor vehicles





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Europe

Asia Pacific

China

Japan

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▶ <b>Germany</b>	<b>Panasonic Electric Works Europe AG</b>	Robert-Koch-Straße 100, 85521 Ottobrunn, Tel. +49 89 45354-1000, Fax +49 89 45354-2111, <a href="http://www.panasonic-electric-works.de">www.panasonic-electric-works.de</a>
▶ <b>Hungary</b>	<b>Panasonic Electric Works Europe AG</b>	Magyarországi Közvetlen Kereskedelmi Képviselet, 1117 Budapest, Neumann János u. 1., Tel. +43 2236 26846-25, Mobile: +36 20 264 9896, Fax +43 2236 46133, <a href="http://www.panasonic-electric-works.hu">www.panasonic-electric-works.hu</a>
▶ <b>Ireland</b>	<b>Panasonic Electric Works UK Ltd.</b>	Irish Branch Office, Dublin, Tel. +353 (0) 14600969, Fax +353 (0) 14601131, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>
▶ <b>Italy</b>	<b>Panasonic Electric Works Italia srl</b>	Via del Commercio 3-5 (Z.I. Ferlina), 37012 Bussolengo (VR), Tel. +39 0456752711, Fax +39 0456700444, <a href="http://www.panasonic-electric-works.it">www.panasonic-electric-works.it</a>
▶ <b>Nordic Countries</b>	<b>Panasonic Electric Works Europe AG Panasonic Eco Solutions Nordic AB</b>	Filial Nordic, Knarrarnäsgatan 15, 164 40 Kista, Sweden, Tel. +46 859476680, Fax +46 859476690, <a href="http://www.panasonic-electric-works.se">www.panasonic-electric-works.se</a>
▶ <b>Poland</b>	<b>Panasonic Electric Works Polska sp. z o.o.</b>	Jungmansgatan 12, 21119 Malmö, Tel. +46 40 697 7000, Fax +46 40 697 7099, <a href="http://www.panasonic-fire-security.com">www.panasonic-fire-security.com</a>
▶ <b>Spain</b>	<b>Panasonic Electric Works España S.A.</b>	ul. Wołoska 9A, 02-583 Warszawa, Tel. +48 22 338-11-33, Fax +48 22 338-12-00, <a href="http://www.panasonic-electric-works.pl">www.panasonic-electric-works.pl</a>
▶ <b>Switzerland</b>	<b>Panasonic Electric Works Schweiz AG</b>	Barajas Park, San Severo 20, 28042 Madrid, Tel. +34 913293875, Fax +34 913292976, <a href="http://www.panasonic-electric-works.es">www.panasonic-electric-works.es</a>
▶ <b>United Kingdom</b>	<b>Panasonic Electric Works UK Ltd.</b>	Grundstrasse 8, 6343 Rotkreuz, Tel. +41 (0) 41 7997050, Fax +41 (0) 41 7997055, <a href="http://www.panasonic-electric-works.ch">www.panasonic-electric-works.ch</a>
		Sunrise Parkway, Linford Wood, Milton Keynes, MK14 6LF, Tel. +44 (0) 1908 231555, Fax +44 (0) 1908 231599, <a href="http://www.panasonic-electric-works.co.uk">www.panasonic-electric-works.co.uk</a>
North & South America		
▶ <b>USA</b>	<b>Panasonic Industrial Devices Sales Company of America</b>	Two Riverfront Plaza, 7th Floor, Newark, NJ 07102-5490, Tel. 1-8003-442-112, <a href="http://www.pewa.panasonic.com">www.pewa.panasonic.com</a>
Asia Pacific / China / Japan		
▶ <b>China</b>	<b>Panasonic Electric Works Sales (China) Co. Ltd.</b>	Tower C 3rd Floor, Office Park, NO.5 Jinghua South Street, Chaoyang District, Beijing 100020, Tel. +86-10-5925-5988, Fax +86-10-5925-5980
▶ <b>Hong Kong</b>	<b>Panasonic Industrial Devices Sales (HK) Co., Ltd.</b>	Suite 301, 3/F, Chinachem Golden Plaza, 77 Mody Road, TST East, Kowloon, Hong Kong, Tel. +852-2529-3956, Fax +852-2528-6991
▶ <b>Japan</b>	<b>Panasonic Corporation</b>	1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8501, Japan, Tel. +81-6-6908-1121, <a href="http://www.panasonic.net">www.panasonic.net</a>
▶ <b>Singapore</b>	<b>Panasonic Industrial Devices Automation Controls Sales Asia Pacific</b>	No.3 Bedok South Road, Singapore 469269, Tel. +65-6299-9181, Fax +65-6390-3953