PIR Motion Sensor

Special Designs from Panasonic that Provide High Sensitivity and Reliability
PIR Motion sensors (Passive Infrared or Pyroelectric) 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, has three series of products, including:

- EKMB (WL) with low current consumption
- EKMC (VZ) for general use
- AMN (NaPiOn), the traditional type. Various lenses, digital and analog types are available:

- OA (office automation) for MFP (multi-function printers), Display panel for meeting rooms, PCs
- Lighting systems, lighting control, lighting equipment
- Home appliance such as air conditioners, air purifiers, or automatic toilets
- Thermostats, HVAC (heater, ventilator or air conditioner)
- Digital signage, vending machine
- IoT, smart home or HEMS (home energy management systems) by battery-operated wireless PIR Motion sensor modules
- Security equipment for IP cameras, intrusion alarms
Unique design to satisfy market demand

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, save design costs by excellent radiation noise resistance

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 6µA type for applications where a high noise resistance is required (up to GHz range).

Better sensitivity (approx. 2 times better)

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. ΔT=4degC)

Better signal-to-noise ratio (min. 4 times better)

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.

Small and fancy lens design

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

Conventional PIR element size 1.1x1.1mm

Panasonic PIR element size 0.6x0.6mm

Better sensitivity

Element with slit design

Temperature distribution of conventional pyroelectric sensors without slit

Temperature distribution of Panasonic’s pyroelectric infrared sensor for detection of humans

Lead-free pyroelectric element

A ferroelectric LiTaO3 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.

Low current consumption

[EKMB(WL) series only]

Reduction of current consumption (1, 2 or 6µA) thanks to the special circuit design technology allows battery life to be extended for battery-driven products including wireless devices etc.
Extensive line-up to satisfy a variety of applications

Please choose based on your application and/or environmental requirement

Choose by the lens

Choose by output

Choose by lens color

Reference page

Lenses for the EKMB/ EKMC series

Standard detection type

Long distance detection type

Wall installation type

Low current consumption for battery-driven applications

A special differential input circuit design is introduced for the EKMB 6μA type for applications where a high noise resistance is required (up to GHz range)

Choose by the lens color

White

Black

Pearl white

Choose by output

Digital

Choose by the current consumption in standby mode

(1μA type: in sleep mode)

1μA  2μA  6μA  1μA  2μA  6μA  1μA  2μA  6μA

EKMB1101111 EKMB1201111 EKMB1301111 EKMB1103111 EKMB1203111 EKMB1303111 EKMB1104111 EKMB1204111 EKMB1304111

EKMB1101112 EKMB1201112 EKMB1301112 EKMB1103112 EKMB1203112 EKMB1303112 EKMB1104112 EKMB1204112 EKMB1304112

EKMB1101113 EKMB1201113 EKMB1301113 EKMB1103113 EKMB1203113 EKMB1303113 EKMB1104113 EKMB1204113 EKMB1304113

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

Saturn lens

NEW

P.14

P.5
Please choose based on your application and/or environmental requirement.

**Choose by the lens color**
- White
- Black
- Pearl white

**Choose by output type**
- Standard detection type
- Long distance detection type
- Wall installation type
- Slight motion detection type
- Spot detection type
- 10m detection type

**Choose by current consumption in standby mode**
- (1/μA type: in sleep mode)

**Digital and analog output types available**

**Economy type suitable for a wide range of applications**

**Lensless type available**

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

**EKMB series**
- 1μA type: EKMB1100100
- 2μA type: EKMB1200100
- 6μA type: EKMB1300100

**EKMC series**
- 170μA type: EKMC1600100

**EKMC(VZ) series**

**AMN(NaPiOn) series**

**Line-up with special detection lenses for slight motion or narrow spot detection**

**AMN series**

**References page**

**New lenses are under development, please contact the sales department when you have special lens requirements.**
## Specifications

<table>
<thead>
<tr>
<th>Detection performance</th>
<th>Model no.</th>
<th>Current consumption</th>
<th>Lens color</th>
<th>Output type</th>
<th>Detection distance</th>
<th>Detection area</th>
<th>Detection zones</th>
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<tbody>
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<td>White</td>
<td>Output type</td>
<td>Detection distance</td>
<td>Detection area</td>
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</table>

### Ordering information

- **PaPIRs motion sensor**
- **Current consumption in standby mode**
  - 1μA / 2μA / 3μA
- **Detection (Lens)**
  - 00: Lensless / 01: Short distance standard / 02: Long distance / 03: Wall installation type

- **Recommended applications**
  - IoT, occupancy sensor module for smart home, battery-driven applications, wireless devices

- **Lensless type available**
  - 1μA type: EKMB1100100
  - 2μA type: EKMB1200100
  - 6μA type: EKMB1300100K

- **Low current consumption for battery-driven 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-driven applications, wireless devices

- **Specifications**
  - **Ordering information**
    - **PaPIRs motion sensor**
    - **Current consumption in standby mode**
      - 1μA / 2μA / 3μA
    - **Detection (Lens)**
      - 00: Lensless / 01: Short distance standard / 02: Long distance / 03: Wall installation type

- **Current consumption**
  - 1/2/6μA

- **Digital output**

- **Recommended applications**
  - IoT, occupancy sensor module for smart home, battery-driven applications, wireless devices
### Characteristics

#### Maximum rated values

<table>
<thead>
<tr>
<th>Items</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>-0.3 to 4.5V</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 to +60°C (No frost, no condensation)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20 to +70°C</td>
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</table>

#### Electrical Characteristics

<table>
<thead>
<tr>
<th>Items</th>
<th>Symbol</th>
<th>1μA type</th>
<th>2μA type</th>
<th>6μA type</th>
<th>Conditions</th>
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<tbody>
<tr>
<td>Operating voltage</td>
<td>Max</td>
<td>Vdd</td>
<td>4.0V</td>
<td>4.0V</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Min</td>
<td></td>
<td>2.3V</td>
<td>2.3V</td>
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<tr>
<td>Current consumption (in standby mode)</td>
<td>Ave</td>
<td>Iw</td>
<td>1μA</td>
<td>2μA</td>
<td>6μA</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Ambient temperature: 25°C lout=0 Vdd: 3V</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>Iout</td>
<td></td>
<td>100μA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ambient temperature: 25°C VoutVdd=0.5</td>
</tr>
<tr>
<td>Output current (during detection period)</td>
<td>Min</td>
<td>Vout</td>
<td></td>
<td></td>
<td>Vdd 0.5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ambient temperature: 25°C Open at no detection</td>
</tr>
<tr>
<td>Circuit stability time</td>
<td>Ave</td>
<td>Twu</td>
<td>25 sec</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td></td>
<td>210 sec</td>
<td>10 sec</td>
<td>Ambient temperature: 25°C Vdd: 3V</td>
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</tbody>
</table>

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 resistors (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 has to be constant for the time specified.

### Timing chart

#### 2μA / 6μA type

### 1μA type

[Explanation of modes]
1) Sleep mode: When the output is OFF. The electrical current consumption is around 1μA. When the sensor’s output returns to its OFF value after the “hold time” has expired, the sensor switches again to sleep mode.
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]
1) (Twu): Circuit stability time: about 25 sec (typ.) for 2μA type. max. 10 sec 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.

2) (t1): Standby hold time: about 2.6 sec (typ.) after the last detection of a signal. (t1)
3) (t2): Mask time: about 1.3 sec (typ.) During this stage, even if the sensor detects something, the output will not switch to ON. (t2)
EKMC (VZ) series

Economy type suitable for a wide range of applications

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

Specifications

<table>
<thead>
<tr>
<th>Detection performance</th>
<th>Model no.</th>
<th>Current consumption</th>
<th>Lens color</th>
<th>Output type</th>
<th>Detection distance</th>
<th>Detection area (°)</th>
<th>Detection zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard detection type</td>
<td>EKMC1601111</td>
<td>170μA</td>
<td>White</td>
<td>Digital</td>
<td>5m</td>
<td>94° (106°)</td>
<td>64</td>
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<tr>
<td></td>
<td>EKMC1601112</td>
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<td>Black</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>EKMC1601113</td>
<td></td>
<td>Pearl white</td>
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<td></td>
</tr>
<tr>
<td>Long distance detection type</td>
<td>EKMC1603111</td>
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<td>White</td>
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<td>102° (108°)</td>
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<td>Pearl white</td>
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<td></td>
</tr>
<tr>
<td>Wall installation type</td>
<td>EKMC1604111</td>
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<td>White</td>
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<td>12m (1st step lens)</td>
<td>40° (55.6°)</td>
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<tr>
<td></td>
<td>EKMC1604112</td>
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<td>Black</td>
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<td>6m (2nd step lens)</td>
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<tr>
<td></td>
<td>EKMC1604113</td>
<td></td>
<td>Pearl white</td>
<td></td>
<td>3m (3rd step lens)</td>
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<td></td>
</tr>
</tbody>
</table>

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Ordering information

- PaPIRs motion sensor
- Detection (Lens)
  - 00: Lensless / 01: 5m distance standard / 03: 12m long distance / 04: Wall installation type
  - Lens color
    - 0: Lensless / 1: White / 2: Black / 3: Pearl white
  - Lens
    - 0: Lensless / 1: with lens

Characteristics

- Maximum rated values
  - 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
  - Operating voltage: Max 6.0V, Min 3.0V
  - Current consumption (in standby mode) Note 1: Ave Iw = 170μA
  - Current consumption (during detection) Note 2: Max Iout = 100μA
  - Output voltage (during detection period): Min Vout = Vdd - 0.5V
  - Circuit stability time (when voltage is applied): Max Twu = 30 sec

Timing chart

- Power supply
  - ON
  - OFF

- Detecting target
  - Present
  - Absent

- Output voltage
  - ON
  - OFF

[Explanation of the timing]
- Twu: Circuit stability time: max. 30 sec
- During this stage, the output’s status is undefined (ON/OFF) and detection is therefore not guaranteed.

Note 1: Current consumption during detection period is the total value of current consumption in standby mode add to output current.

Note 2: Please select an output resistors (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.

Lensless type available
170μA type: EKMC1600100
### Standard detection type

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Detection zone</th>
<th>Detection characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5m*</td>
<td>94°×82° (106°x97°)</td>
</tr>
<tr>
<td></td>
<td>92 beams</td>
<td></td>
</tr>
</tbody>
</table>

- The temperature difference between the target and the surroundings must be higher than 4°C.
- Movement speed: 1.0m/s
- Target concept: Human body with an approx. size of 700×250mm
- Target moving direction: Crossing the detection beam.

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

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Detection zone</th>
<th>Detection characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>12m*</td>
<td>102°×92° (108°x99°)</td>
<td></td>
</tr>
<tr>
<td>92 beams</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The temperature difference between the target and the surroundings must be higher than 4°C.
- Movement speed: 1.0m/s
- Target concept: Human body with an approx. size of 700×250mm
- Target moving direction: Crossing the detection beam.

### Wall installation type

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Detection zone</th>
<th>Detection characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>5m*</td>
<td>40°×105° (55.6°x112°)</td>
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<tr>
<td>68 beams</td>
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</table>

- The temperature difference between the target and the surroundings must be higher than 4°C.
- Movement speed: 1.0m/s
- Target concept: Human body with an approx. size of 700×250mm
- Target moving direction: Crossing the detection beam.

### Lensless type

- PIR element

Detection sensitivity:
- Average: 5.6μW/cm²
- Maximum: 7.6μW/cm²

Detection sensitivity is measured by following system

CAD data can be downloaded from the Panasonic PaPIRs WEB site.

Please refer to the formal specification for the dimension, and the tolerance.
## Specifications

<table>
<thead>
<tr>
<th>Detection performance</th>
<th>Model no.</th>
<th>Current consumption</th>
<th>Lens color</th>
<th>Output type</th>
<th>Detection distance</th>
<th>Detection area</th>
<th>Detection zones</th>
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<td>Standard detection type</td>
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<td>White</td>
<td>Digital</td>
<td>5m</td>
<td>100° (112°)</td>
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<td></td>
<td>AMN31111</td>
<td></td>
<td>Black</td>
<td>Digital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMN21112</td>
<td></td>
<td>White</td>
<td>Analog</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>AMN21111</td>
<td></td>
<td>Black</td>
<td>Analog</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Slight motion detection type</td>
<td>AMN32112</td>
<td>170μA</td>
<td>White</td>
<td>Digital</td>
<td>2m</td>
<td>92° (102°)</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>AMN32111</td>
<td></td>
<td>Black</td>
<td>Digital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMN22112</td>
<td></td>
<td>White</td>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMN22111</td>
<td></td>
<td>Black</td>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spot detection type</td>
<td>AMN33112</td>
<td></td>
<td>White</td>
<td>Digital</td>
<td>5m</td>
<td>22° (40°)</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>AMN33111</td>
<td></td>
<td>Black</td>
<td>Digital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMN23112</td>
<td></td>
<td>White</td>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMN23111</td>
<td></td>
<td>Black</td>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10m detection type</td>
<td>AMN34112</td>
<td></td>
<td>White</td>
<td>Digital</td>
<td>10m</td>
<td>110° (116°)</td>
<td>80</td>
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<tr>
<td></td>
<td>AMN34111</td>
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<td>Black</td>
<td>Digital</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>AMN24112</td>
<td></td>
<td>White</td>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMN24111</td>
<td></td>
<td>Black</td>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Ordering information
- **AMN**
- **1**: NaPiOn sensor
- **2**: Output type
  - 2: Analog output
  - 3: Digital output (170μA)
- **11**: Lens color
  - 1: Black
  - 2: White
- **Detection (Lens)**
  - 1: Standard type
  - 2: Slight motion type
  - 3: Spot type
  - 4: 10m type

### Recommended applications
- Line-up with special detection lenses for slight motion or narrow spot detection
- Digital and analog output types
- Lighting control, lighting equipment, heaters, ventilators or air conditioners, security equipment for IP cameras, intrusion alarms, digital signage, vending machines, multi-function printers, display panels for meeting rooms, PCs
### Characteristics

#### Maximum rated values

<table>
<thead>
<tr>
<th>Items</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply voltage</td>
<td>-0.3 to 7V</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 to +60°C (No frost, no condensation)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20 to +70°C</td>
</tr>
</tbody>
</table>

#### Electrical characteristics (digital output)

<table>
<thead>
<tr>
<th>Items</th>
<th>Symbol</th>
<th>Digital output</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>Max</td>
<td>Vdd</td>
<td>6.0V</td>
</tr>
<tr>
<td>Min</td>
<td>3.0V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption (in standby mode)</td>
<td>Ave</td>
<td>Iw</td>
<td>170μA</td>
</tr>
<tr>
<td>Note1</td>
<td>Ambient temperature: 25°C lout=0 Vdd: 5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output current (during detection period)</td>
<td>Max</td>
<td>Iout</td>
<td>100μA</td>
</tr>
<tr>
<td>Note2</td>
<td>Ambient temperature: 25°C Vout=Vdd-0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output voltage (during detection period)</td>
<td>Min</td>
<td>Vout</td>
<td>Vdd-0.5V</td>
</tr>
<tr>
<td>Note1</td>
<td>Ambient temperature: 25°C Open at no detection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit stability time (when voltage is applied)</td>
<td>Max</td>
<td>Twu</td>
<td>30 sec</td>
</tr>
<tr>
<td>Note1</td>
<td>Ambient temperature: 25°C lout=0 Vdd: 5V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Electrical characteristics (analog output)

<table>
<thead>
<tr>
<th>Items</th>
<th>Symbol</th>
<th>Analog output</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>Max</td>
<td>Vdd</td>
<td>5.5V</td>
</tr>
<tr>
<td>Min</td>
<td>4.5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption (in standby mode)</td>
<td>Ave</td>
<td>Iw</td>
<td>170μA</td>
</tr>
<tr>
<td>Note1</td>
<td>Ambient temperature: 25°C lout=0 Vdd: 5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output current (during detection period)</td>
<td>Max</td>
<td>Iout</td>
<td>50μA</td>
</tr>
<tr>
<td>Note2</td>
<td>Ambient temperature: 25°C Vdd: 5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output voltage range (during detection period)</td>
<td>Max</td>
<td>Vout</td>
<td>2.7V</td>
</tr>
<tr>
<td>Note2</td>
<td>Ambient temperature: 25°C Vdd: 5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output offset voltage (at non detection)</td>
<td>Min</td>
<td>Voff</td>
<td>2.5V</td>
</tr>
<tr>
<td>Note2</td>
<td>Steady output voltage at non detection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steady noise</td>
<td>Max</td>
<td>Vn</td>
<td>300mVpp</td>
</tr>
<tr>
<td>Note2</td>
<td>Ambient temperature: 25°C Vdd: 5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detection sensitivity</td>
<td>Min</td>
<td>Vh or Vl</td>
<td>0.45V</td>
</tr>
<tr>
<td>Note2</td>
<td>Ambient temperature: 25°C Vdd: 5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit stability time (when voltage is applied)</td>
<td>Max</td>
<td>Twu</td>
<td>45 sec</td>
</tr>
<tr>
<td>Note2</td>
<td>Ambient temperature: 25°C Vdd: 5V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1) The total current consumption is equal to the current consumption in standby mode (Iw) plus the output current during detection (Iout).

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.

### Timing chart

#### Digital output

- **Power supply**
  - **ON**
  - **OFF**
- **Detecting target**
  - Present
  - Absent
- **Output voltage**
  - **ON**
  - **OFF**

(Time axis explanation)

Twu: Circuit stability time: max. 30 sec
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

- **Power supply**
  - Vdd
  - GND
- **Detecting target**
  - Present
  - Absent
- **Output waveform**
  - **Vout**

(Time axis explanation)

Twu: Circuit stability time: max. 45 sec
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.
**Lenses for the AMN series**

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Detection zone</th>
<th>Detection characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5m*</td>
<td>64 beams</td>
</tr>
<tr>
<td></td>
<td>100°×82° (112°×98°)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22°×38° (40°×54°)</td>
<td>24 beams</td>
</tr>
<tr>
<td></td>
<td>5m*</td>
<td>64 beams</td>
</tr>
<tr>
<td></td>
<td>100°×82° (112°×98°)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22°×38° (40°×54°)</td>
<td>24 beams</td>
</tr>
</tbody>
</table>

**Standard detection type**

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

**Slight motion detection type**

- *Please refer to "Caution for use" (page 13) and "Basic principles"(page 13, point 5), for more details.*

**Spot detection type**

**10m detection type**

- *Under specified detection conditions ▲ Please refer to "Caution for use" (page 13) and "Basic principles"(page 13, point 5), for more details.*

Please refer to the formal specification for the dimension, and the tolerance.

CAD data: CAD data can be downloaded from the Panasonic PaPIRs WEB site.
### Technical information concerning all sensors

#### Block diagram output circuit

1) Digital output with integrated amplifier and comparator

![Block diagram of digital output with integrated amplifier and comparator](image1)

2) Analog output with integrated amplifier

![Block diagram of analog output with integrated amplifier](image2)

#### Wiring diagram

1) Digital output

![Wiring diagram for digital output](image3)

2) Analog output

![Wiring diagram for analog output](image4)

- **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 Vout so that the output current is lower than or equal to 100μA. Use 50KΩ or more as a guideline. If the output current is more than 100μA, this may cause false alarms.

#### Timer circuit example

1) Digital output

![Timer circuit diagram for digital output](image5)

2) Analog output

![Timer circuit diagram for analog output](image6)

**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) *1 Please note that the horizontal and vertical field of view depends on the position of the metal tab on which the lens is mounted.
Cautions for use

Basic principles

PyPIRs 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 the 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 surroundings 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 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.
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 falls 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 operational 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 those 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 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 protective devices.

Example: Safety equipment and devices Traffic signals Burglar and disaster prevention devices Controlling and safety device for trains and motor vehicles
Please contact your local sales representative for detailed specification.

SATURN LENS –
2 functions in 1 lens

**Standard- and slight-motion detection type**

<table>
<thead>
<tr>
<th>Choose by output</th>
<th>Digital</th>
<th>Digital</th>
<th>Analog</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>EKMB1193111</td>
<td>EKMB1293112</td>
<td>EKMC1693111</td>
</tr>
<tr>
<td>Black</td>
<td>EKMB1193112</td>
<td>EKMB1293112</td>
<td>EKMC1693112</td>
</tr>
<tr>
<td>Pearl white</td>
<td>EKMB1193113</td>
<td>EKMB1293113</td>
<td>EKMC1693113</td>
</tr>
</tbody>
</table>

**Choose by current consumption in standby mode**

- **1µA**: EKMB1193111
- **2µA**: EKMB1293112
- **6µA**: EKMB1393112K
- **170µA**: By request

**Choose by lens color**

- **White**: EKMB1193111
- **Black**: EKMB1193112
- **Pearl white**: EKMB1193113

**Saturn lens**

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Detection zone</th>
<th>Detection characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard motion</td>
<td>Slight motion</td>
</tr>
<tr>
<td></td>
<td>detection area</td>
<td>detection area</td>
</tr>
</tbody>
</table>

**Standard motion detection area**

- **Max. 2.2m**: The temperature difference between the target and the surroundings must be higher than 4°C.
- **Movement speed**: 0.5m/s
- **Target concept**: Human head with an approx. size of 200×200mm
- **Target moving direction**: Crossing the detection beam, 1 zone

**Slight motion detection area**

- **Max. 1.8m**: The temperature difference between the target and the surroundings must be higher than 4°C.
- **Movement speed**: 1.0m/s
- **Target concept**: Human body with an approx. size of 400×200mm
- **Target moving direction**: Crossing the detection beam, 2 zones

**Field of view**

- **44° x 44°**: Standard motion
- **90° x 90°**: Slight motion

**Detection zone**

- **Vertical**: 44° ±4°
- **Horizontal**: 44° ±4°

**Detection distance**

- **Max. 2.2m**: Under specified detection conditions

**Please refer to “Caution for use” (page 13) and “Basic principles” (page 13, point 5), for more details**