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:

**EKMB (WL)** digital output for battery-operated devices (1, 2, 6μA)
**EKMC (VZ)** digital and analog output for battery-free devices (170μA)
Available lens colors: white, black and pearl white

**AMN3** digital output for battery-free devices (170μA)
Available lens colors: white and black

**Applications**
- Multi-function printers, video-conference systems
- Digital signage, vending machine
- Wake-up switch for LCD displays and panels
- IP cameras, intrusion alarms
- Lighting controls in general, smart luminaires, smart LED bulbs
- Thermostats, HVAC (heater, ventilator or air conditioner)
- Smart home and IoT applications

Further information at [www3.panasonic.biz/ac/e/control/sensor/human/index.jsp](http://www3.panasonic.biz/ac/e/control/sensor/human/index.jsp)
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Ordering Information

- PaPIRs motion sensor
- Current consumption in standby mode
  1: 1µA / 2: 2µA / 3: 6µA [all digital]
- Lens type
  00: Lensless / 01: Standard Detection Type / 03: Long Distance Detection Type / 04: Wall Installation Type / 05: Horizontally Wide Detection Type / 06: High Density Long Distance Detection Type / 07: Low Profile Type / 08: Wide Area Detection Type / 09: Ultra Slight Motion Detection Type / 10: Flat Square Type / 91: Slight Motion Detection Type / 93: Standard and Slight Motion Detection Type

- K: 6µA / Blank: Other than 6µA
- Lens color
  0: Lensless / 1: White / 2: Black / 3: Pearl white
- Others
  K: 6µA / Blank: Other than 6µA
  Lens
  0: Lensless / 1: with lens

AMN - Standard Detection Type

- NaPiOn sensor [digital 170µA]
- Detection
  1: Standard Detection Type
  2: Slight Motion Detection Type
  3: Spot Detection Type
  4: 10m Detection Type
- Lens color
  1: Black / 2: White

Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
PaPIRs design features

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) prevents 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).

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 and distance compared to conventional sensors.

Conventional PIR element size 1.1x1.1mm

PaPIRs

- High sensitive quad pyroelectric element with slit design
- ASIC inside (amplifier and comparator)
- “Plug and Play”
**Two 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. $\Delta T = 4^\circ C$)

**Four 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.

**Lead-free pyroelectric element**

A ferroelectric Lithiumtantalate ($LiTaO_3$) 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)**

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.

Further information at [www3.panasonic.biz/ac/e/control/sensor/human/index.jsp](http://www3.panasonic.biz/ac/e/control/sensor/human/index.jsp)
Technical information for all sensors (EKM and AMN)

Block diagram output circuit

Digital output with integrated amplifier and comparator

Analog output with integrated amplifier

Further information at www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
Wiring diagram

Digital output

Sensor

\[ V_{\text{dd}} \]

\[ \text{GND} \]

Out

\[ I_{\text{OUT}} \text{ max. 100}\mu\text{A} \]

Microcomputer, A/D converter, etc.

Sensor

\[ V_{\text{dd}} \]

\[ \text{GND} \]

Out

\[ I_{\text{OUT}} \text{ max. 100}\mu\text{A} \]

Notes:

**Digital output types:**
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 \( V_{\text{OUT}} \) so that the output current is maximum 100μA. If the output current is more than 100μA, this may cause false alarms.

If the microcomputer has a pull-down function, there is no need for a resistor as long as the output current does not exceed 100µA.

**Analog output types (EKMC26 series):**
In either case, a microcomputer or a resistor needs to be chosen in accordance to \( V_{\text{OUT}} \) so that the output current is maximum 200µA.

**IMPORTANT:**
The analog types are not temperature compensated. Please contact us for further information and design-in support.

Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
EKM-Flat Square Type

Detection area: 9m x 9m (@3m installation height)
Flat & square lens design: 10.6 x 10.6mm
Low profile: 10.9mm

Specified detection distance (Note 1) | Up to 5.0m
Typical ceiling installation height (Note 2) | 3.0m
Field of view | 115° x 115°
Detection zones | 40

Note 1:
- ∆T ≥ 4°C
- Object speed: 1.0m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2:
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended

Typical applications
- IoT, Smart homes
- Wake-up switch for displays
- Well-designed Lighting
- Well-designed Appliance

Dimension (in mm, inches in brackets)

Detection area

Notes | Standby current consumption | Output type | Sensitivity | White | Black | Pearl White
--- | --- | --- | --- | --- | --- | ---
High-end | 1μA | Digital | Standard | EKMB1110111 | EKMB1110112 | EKMB1110113
| 2μA | Digital | Standard | EKMB1210111 | EKMB1210112 | EKMB1210113

Economy | 6μA | Digital | Standard | EKMB1310111K | EKMB1310112K | EKMB1310113K
| 170μA | Digital | Standard | EKMC1610111 | EKMC1610112 | EKMC1610113
| 170μA | Analog | Adjustable | EKMC2610111K | EKMC2610112K | EKMC2610113K

Special | 6μA | Digital | High | Please contact us if a higher or a lower sensitivity is required.
| 170μA | Digital | High
| 170μA | Digital | Low

Note: The specification shows the X-Y cross section at 2.5m.
EKM - Low Profile Type

- Low height sensor (10.9mm)
- Flat lens
- Lip for mechanical stop or for an o-ring

Specified detection distance (Note 1) up to 5m
Typical ceiling installation height (Note 2) 3m
Field of view 110° x 110°
Detection zones 32

Note 1:
- ΔT ≥ 4°C
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2:
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended.

Further information on electrical characteristics please see page 20

Typical applications
- LED screen for TV, PC
- Wake-up switch for displays
- Digital signage
- Lighting controls for offices and smart home
- Smart luminaires
- Ventilation systems and air conditioners
- IP cameras

Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
EKM - Wide Area Detection Type

Specified detection distance (Note 1) 2.5m ~ 5.9m
Typical ceiling installation height (Note 2) 3.0m
Field of view 130° × 130°
Detection zones 208

Note 1:
- ΔT ≥ 4°C
- Object speed: 1.0m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2: The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended.

Typical applications
- Lighting controls for offices, schools and smart homes
- Entrance lighting
- Ventilation systems and air conditioners
- Security cameras

Dimension (in mm, inches in brackets)

Detection area

<table>
<thead>
<tr>
<th>Notes</th>
<th>Standby current consumption</th>
<th>Output type</th>
<th>Sensitivity</th>
<th>White</th>
<th>Black</th>
<th>Pearl White</th>
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</table>

Note: The specification shows the X-Y cross section at 2.5m.
EKM - Ultra Slight Motion Detection Type

Optimized for the detection of smallest movements and objects
Extremely small lens: 14mm diameter
Same mechanical dimensions like the Wide Area Detection Type
Additional lip (14.9 mm) ready for an o-ring

Specified detection distance (Note 1) 2.5m ~ 4.1m
Typical ceiling installation height(Note 2) 3.0m
Field of view 107° x 107°
Detection zones 200

Note 1:
- ΔT ≥ 4°C
- Object speed: 0.5m/s
- Object size: 200 x 200mm
- Crossing 1 detection zones

Note 2:
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended

Typical applications
- Lighting controls for offices, schools and smart homes
- Ventilation systems and air conditioners
- Security cameras
- Hot desking
- Digital signage

Dimension (in mm, inches in brackets)

Detection area

Notes
- Standby current consumption
- Output type
- Sensitivity
- White
- Black
- Pearl White

High-end
- 1μA
- Digital (open drain)
- Standard
- EKMB1109111
- EKMB1109112
- EKMB1109113

Economy
- 6μA
- Digital (open drain)
- Standard
- EKMB1309111K
- EKMB1309112K
- EKMB1309113K

- 170μA
- Digital (open drain)
- Standard
- EKMC1609111
- EKMC1609112
- EKMC1609113

Special
- 6μA
- Digital (open drain)
- High
- EKMC2609111K
- EKMC2609112K
- EKMC2609113K

- 170μA
- Digital (open drain)
- High
- Please contact us if a higher or a lower sensitivity is required.

Note: The specification shows the X-Y cross section at 2.5m.

Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
EKM - Standard Detection Type

Preference type
Flat lens for an unobtrusive integration
Lens diameter 9.5mm

Specified detection distance (Note 1) up to 5m
Typical ceiling installation height (Note 2) 3m
Field of view 106° x 97°
Detection zones 64

Note 1:
- ΔT ≥ 4°C
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2:
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended

Notes
- Further information on electrical characteristics please see page 20
- Please contact us if a higher or a lower sensitivity is required.

Typical applications
- Lighting controls for offices and smart homes
- Smart luminaires
- Smart LED bulbs
- Ventilation systems and air conditioners
- IP cameras
- Digital signage
- Wake-up switch for displays

Further information at www3.panasonic.biz/ac/e/control/sensor/human/index.jsp

Note: The specification shows the X-Y cross section at 2.5m.
**PIR MOTION SENSORS**

### EKM - High Density Long Distance Detection Type

Smallest long range sensor  
Maximum installation height of 17m (high sensitivity type)  
Lens diameter 19.3mm  
Lip for mechanical stop or for an O-ring

#### Specified detection distance (Note 1)
- up to 12m - 14.5m

#### Typical ceiling installation height (Note 2)
- 12m

#### Field of view
- 69° x 69°

#### Detection zones
- 128

**Note 1:**
- \( \Delta T \geq 4°C \)
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

**Note 2:**
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended

Further information on electrical characteristics please see page 20

### Dimension (in mm, inches in brackets)

<table>
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Please contact us if a higher or a lower sensitivity is required.

### Detection area

**Typical applications**
- Lighting controls for warehouses, industrial buildings, entrance halls and retail shops
- Street lighting
- Security cameras
- Smart high-bay luminaires

**Further information** at [www3.panasonic.biz/ac/e/control/sensor/human/index.jsp](http://www3.panasonic.biz/ac/e/control/sensor/human/index.jsp)
EKM - Horizontally Wide Detection Type

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.

Specified detection distance (Note 1 & 2)  up to 5m
Field of view area A  122° x 35°
Field of view area B  150° x 20°
Detection zones area A  88
Detection zones area B  16

Note 1:
- $\Delta T \geq 4°C$ (Area A)
- $\Delta T \geq 8°C$ (Area B)
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2: The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended.

Typical applications
- Corridor sensors
- Wall switches
- Thermostats
- Intrusion alarm sensors for windows and doors
- Door intercom systems
- Entrance and garden lamps
- Wake-up switch for displays

Further information on electrical characteristics please see page 20

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Please contact us if a higher or a lower sensitivity is required.

Further information at [www3.panasonic.biz/ac/e/control/sensor/human/index.jsp](http://www3.panasonic.biz/ac/e/control/sensor/human/index.jsp)
EKM - Wall Installation Detection Type (corner)

Lens diameter 20.7mm
Similar dimensions like the Long Distance Detection Type

Specified detection distance (Note 1 & 2)
- up to 12m (1st step lens)
- up to 6m (2nd step lens)
- up to 3m (3rd step lens)

Field of view
56° x 112°

Detection zones
68

Note 1:
- ∆T ≥ 4°C
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2:
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended

Typical applications
- Intrusion alarm sensors
- Thermostats
- Door intercom systems
- Entrance and garden lamps

Further information on electrical characteristics please see page 20

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Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
## EKM - Long Distance Detection Type

Lens diameter 20.7mm  
Similar dimensions like the Wall Installation Type

### Specified detection distance (Note 1)
- up to 12m

### Typical ceiling installation height (Note 2)
- 7m

### Field of view
- 108° x 99°

### Detection zones
- 92

**Note 1:**
- \( \Delta T \geq 4°C \)
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

**Note 2:**
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended.

Further information on electrical characteristics please see page 20

### Typical applications
- Lighting control for sport halls and public areas
- Intrusion alarm sensors
- Street lighting
- Security cameras

### Dimension (in mm, inches in brackets)

### Detection area

### Notes
- The specification shows the X-Y cross section at 5m.

Further information at www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
**PIR MOTION SENSORS**

**EKM - Standard and Slight Motion Detection Type**

The rectangular center zone is optimized detecting smallest movements.

Lens diameter 14.9mm

Almost the same mechanical dimensions like the Slight Motion Detection Type (lens diameter 0.3mm bigger)

**Typical applications**

- Lighting controls for restrooms, changing rooms, smoking cabins and hotel rooms
- Smart luminaires
- Smart LED bulbs
- Ventilation systems and air conditioners
- Hot deskings
- Digital signage
- Vending machines
- Wake-up switch for displays

Further information on electrical characteristics please see page 20

**Dimension (in mm, inches in brackets)**

**Detection area**

- X-Y cross section at 3m (9.8ft)

Note: The specification shows the X-Y cross section at 2.2m.

Further information at www.panasonic.com/ac/e/control/sensor/human/index.jsp
EKM - Slight Motion Detection Type

- Optimized for small movements
- Lens diameter 14.6mm
- Almost the same mechanical dimensions like the Standard and Slight Motion Detection Type (lens diameter 0.3mm smaller)

**Specified detection distance (Note 1)**
- up to 2.5m - 4m

**Typical ceiling installation height (Note 2)**
- 3m

**Field of view**
- $104\,^\circ \times 104\,^\circ$

**Detection zones**
- 112

**Note 1:**
- $\Delta T \geq 4^\circ C$
- Object speed: 0.5m/s
- Object size: 200 x 200mm
- Crossing 1 detection zone

**Notes**

- Standby current consumption
- Output type
- Sensitivity
- White
- Black
- Pearl White

<table>
<thead>
<tr>
<th>Notes</th>
<th>Standby current consumption</th>
<th>Output type</th>
<th>Sensitivity</th>
<th>White</th>
<th>Black</th>
<th>Pearl White</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-end</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1µA</td>
<td>Digital (open drain)</td>
<td>Standard</td>
<td>EKMB1191111</td>
<td>EKMB1191112</td>
<td>EKMB1191113</td>
<td></td>
</tr>
<tr>
<td>2µA</td>
<td>Digital (open drain)</td>
<td>Standard</td>
<td>EKMB1291111</td>
<td>EKMB1291112</td>
<td>EKMB1291113</td>
<td></td>
</tr>
<tr>
<td>Economy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6µA</td>
<td>Digital (open drain)</td>
<td>Standard</td>
<td>EKMB1391111K</td>
<td>EKMB1391112K</td>
<td>EKMB1391113K</td>
<td></td>
</tr>
<tr>
<td>170µA</td>
<td>Digital (open drain)</td>
<td>Standard</td>
<td>EKMC1691111</td>
<td>EKMC1691112</td>
<td>EKMC1691113</td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6µA</td>
<td>Digital (open drain)</td>
<td>High</td>
<td>EKMC2691111K</td>
<td>EKMC2691112K</td>
<td>EKMC2691113K</td>
<td></td>
</tr>
<tr>
<td>170µA</td>
<td>Digital (open drain)</td>
<td>High</td>
<td>EKMC2691111K</td>
<td>EKMC2691112K</td>
<td>EKMC2691113K</td>
<td></td>
</tr>
<tr>
<td>170µA</td>
<td>Digital (open drain)</td>
<td>Low</td>
<td>EKMC2691111K</td>
<td>EKMC2691112K</td>
<td>EKMC2691113K</td>
<td></td>
</tr>
</tbody>
</table>

Please contact us if a higher or a lower sensitivity is required.

**Typical applications**
- Lighting controls for offices and smart homes
- Smart luminaires
- Smart LED bulbs
- Ventilation systems and air conditioners

**Detection area**

Further information on electrical characteristics please see page 20

Note: The specification shows the X-Y cross section at 2.5m.

Further information at www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
EKM - Lensless Type

Small sensor elements with a very high sensitivity (D, NEP)
High electromagnetic noise withstand capability
Superior signal-to-noise ratio

Please contact us whenever a customized lens is required, the sensor shall be used with an external lens or for the design data of the pin-hole lens

Typical applications
 › Pin-hole lens
 › Combination with lenses from external suppliers

Detection sensitivity

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

Detection sensitivity is measured by following system

Further information on electrical characteristics please see page 20

Dimension (in mm, inches in brackets)

Detection area

Pin-hole lens example

Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp

Notes | Standby current consumption | Output type | Sensitivity | Part numbers |
--- | --- | --- | --- | --- |
High-end | 1μA | Digital (open drain) | Standard | EKMB1100100 |
| 2μA | Digital (open drain) | Standard | EKMB1200100 |
Economy | 6μA | Digital (open drain) | Standard | EKMB1300100K |
| 170μA | Digital (open drain) | Standard | EKMC1600100 |
| 170μA | Analog (op amp) | Adjustable | EKMC2600100K |
Special | 6μA | Digital (open drain) | High | |
| 170μA | Digital (open drain) | High | Please contact us if a higher or a lower sensitivity is required. |
| 170μA | Digital (open drain) | Low | |

Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
**EKM - Characteristics**

**EKM - Maximum rated values**

<table>
<thead>
<tr>
<th>Items</th>
<th>EKMB series</th>
<th>EKMC series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>-0.3 to 4.5V DC</td>
<td>-0.3 to 7V DC</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 to 60°C</td>
<td>-20 to 55°C (high sensitivity type) (no frost, no condensation)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td></td>
<td>-20 to 70°C</td>
</tr>
</tbody>
</table>

**EKM - Electrical characteristics (digital output types)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>EKMB11 series (1μA)</th>
<th>EKMB12 series (2μA)</th>
<th>EKMB13 series (6μA)</th>
<th>EKMC16 series (170μA)</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>V_{DD}</td>
<td>Max</td>
<td>4.0V DC</td>
<td>6.0V DC</td>
<td></td>
<td>Ambient temperature: 25°C I_{out} = 0A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>2.3V DC</td>
<td>3.0V DC</td>
<td></td>
<td>EKMB series: V_{DD} = 3V DC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EKMC series: V_{DD} = 5V DC</td>
</tr>
<tr>
<td>Current consumption (in standby/sleep mode) Note 1</td>
<td>I_{W}</td>
<td>Ave</td>
<td>1μA</td>
<td>2μA</td>
<td>6μA</td>
<td>170μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ambient temperature: 25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>V_{out} ≥ V_{DD} – 0.5V DC</td>
</tr>
<tr>
<td>Output current (during detection period) Note 2</td>
<td>I_{OUT}</td>
<td>Max</td>
<td>100μA</td>
<td></td>
<td></td>
<td>Ambient temperature: 25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>V_{out} ≥ V_{DD} – 0.5V DC</td>
</tr>
<tr>
<td>Output voltage (during detection period)</td>
<td>V_{OUT}</td>
<td>Min</td>
<td>V_{DD} – 0.5V</td>
<td></td>
<td></td>
<td>Ambient temperature: 25°C</td>
</tr>
<tr>
<td>Circuit stability time (when voltage is applied)</td>
<td>t_{WU}</td>
<td>Ave</td>
<td>25 seconds</td>
<td>–</td>
<td>–</td>
<td>Ambient temperature: 25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max</td>
<td>210 seconds</td>
<td>10 seconds</td>
<td>30 seconds</td>
<td>EKMB series: V_{DD} = 3V DC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EKMC series: V_{DD} = 5V DC</td>
</tr>
</tbody>
</table>

**Note 1:** The total current consumption during detection is the current consumption in standby mode (I_{W}) plus the output current (I_{OUT}). For the 1μA type the average current consumption (I_{W}) is 1μA in sleep mode and 1.9μA in standby mode. Please also refer to the timing charts on the next page.

**Note 2:** Please select an output resistor (pull-down concept) in accordance with V_{OUT} so that the output current is maximum 100μA.

**EKM - Electrical characteristics (analog output)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>EKMC26/K series</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>V_{DD}</td>
<td>Max</td>
<td>5.5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>3.0V</td>
</tr>
<tr>
<td>Current consumption (in standby mode) Note 1</td>
<td>I_{W}</td>
<td>Ave</td>
<td>170μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max</td>
<td>350μA</td>
</tr>
<tr>
<td>Output current (during detection period) Note 2</td>
<td>I_{OUT}</td>
<td>Max</td>
<td>200μA</td>
</tr>
<tr>
<td>Analog output saturated voltage</td>
<td>V_{H}</td>
<td>High</td>
<td>Min. 1.9V</td>
</tr>
<tr>
<td></td>
<td>V_{L}</td>
<td>Low</td>
<td>Max. 0.2V</td>
</tr>
<tr>
<td>Output offset voltage (at non detection)</td>
<td>V_{OFF}</td>
<td>Max</td>
<td>1.2V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ave</td>
<td>1.1V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>1.0V</td>
</tr>
<tr>
<td>Steady noise</td>
<td>V_{IN}</td>
<td>Max</td>
<td>150mV_{IN}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ave</td>
<td>80mV_{IN}</td>
</tr>
<tr>
<td>Circuit stability time (after applying voltage)</td>
<td>t_{WU}</td>
<td>Max</td>
<td>30 seconds</td>
</tr>
</tbody>
</table>

**Note 1:** The total current consumption during detection is the current consumption in standby mode (I_{W}) plus the output current (I_{OUT}).

**Note 2:** The output offset voltage has a certain tolerance. Please assure to measure the offset voltage before setting the upper and lower threshold values. Otherwise the threshold window could be unsymmetrical relative to the offset voltage.

Further information at www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
Timing chart

**2μA / 6μA / 170μA type (digital output)**

1μA type (digital output)

Explanation of modes
1) Sleep mode: When the output is Low. The electrical current consumption is around 1μA.
2) Standby mode: After the sensor’s output has reached High status, the sensor switches to standby mode. The electrical current consumption gets close to 1.9μA. When the sensor’s output returns to its Low 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 Low status after the end of the standby mode. (No detection is possible during this period.)

Explanation of the timing
- t\textsubscript{WU} Circuit stability time: about 25 seconds (typ.) for 2μA type, max. 10 seconds for 6μA type, max. 30 seconds for 170μA type.
- While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the High or Low state. This is true regardless of whether or not the sensor has detected anything.

**170μA type (analog output)**

Explanation of the timing
- t\textsubscript{WU} Circuit stability time: max. 30 seconds
- While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed. This is true regardless of whether or not the sensor has detected anything.

**IMPORTANT:**

The analog types are not temperature compensated.
Please contact us for further information and design-in support.

Further information at [www3.panasonic.biz/ac/e/control/sensor/human/index.jsp](http://www3.panasonic.biz/ac/e/control/sensor/human/index.jsp)
AMN - Standard Detection Type

Specified detection distance (Note 1) | up to 5m
Typical ceiling installation height (Note 2) | 3m
Field of view | 120° x 106°
Detection zones | 64

Note 1:
- $\Delta T \geq 4°C$
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2:
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended

Small lens diameter of only 9.5mm

Typical applications
- Lighting controls
- Heaters
- Ventilators and air conditioners
- Multi-functional printers

Further information on electrical characteristics please see page 26

Dimension (in mm, inches in brackets)

Detection area

<table>
<thead>
<tr>
<th>Notes</th>
<th>Standby current consumption</th>
<th>Output type</th>
<th>Sensitivity</th>
<th>White</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaPiOn 2nd generation</td>
<td>170μA</td>
<td>Digital (open drain)</td>
<td>Standard</td>
<td>AMN31112</td>
<td>AMN31111</td>
</tr>
</tbody>
</table>

Note: The specification shows the X-Y cross section at 2.5m.
AMN - Slight Motion Detection Type

Optimized for small movements

- Specified detection distance (Note 1): up to 2m - 3.3m
- Typical ceiling installation height (Note 2): 3m
- Field of view: 107° x 106°
- Detection zones: 104

**Note 1:**
- ∆T ≥ 4°C
- Object speed: 0.5m/s
- Object size: 200mm x 200mm
- Crossing 1 detection zone

**Note 2:**
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended

**Typical applications**
- Lighting controls
- Heaters
- Ventilators and air conditioners
- Multi-functional printers

Further information on electrical characteristics please see page 26

**Dimension (in mm, inches in brackets)**

**Detection area**

**X-Y cross section at 3m (9.8ft)**

<table>
<thead>
<tr>
<th>Notes</th>
<th>Standby current consumption</th>
<th>Output type</th>
<th>Sensitivity</th>
<th>White</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaPiOn 2nd generation</td>
<td>170μA</td>
<td>Digital (open drain)</td>
<td>Standard</td>
<td>AMN32112</td>
<td>AMN32111</td>
</tr>
</tbody>
</table>

*Note:* The specification shows the X-Y cross section at 2m.
AMN - Spot Detection Type

Flat lens
Laser diameter 8.9mm

Specified detection distance (Note 1) | up to 5m - 5.6m
Typical ceiling installation height (Note 2) | 5m
Field of view | 57° x 42°
Detection zones | 24

Note 1:
- ΔT ≥ 4°C
- Object speed: 1m/s
- Object size: 700 x 250mm
- Crossing 2 detection zones

Note 2:
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended.

Further information on electrical characteristics please see page 26

Typical applications
- Vending machines
- Multi-functional printers
- Intrusion alarm sensors for windows and doors
- Digital signage

Further information at www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
**AMN - 10m Detection Type (long distance)**

Specified detection distance (Note 1) | up to 5 - 10m  
Typical ceiling installation height (Note 2) | 5m  
Field of view | 120° x 107°  
Detection zones | 80  

**Note 1:**  
- ΔT ≥ 4°C  
- Object speed: 1m/s  
- Object size: 700 x 250mm  
- Crossing 2 detection zones

**Note 2:**  
The sensitivity of passive infrared sensors is influenced by environmental conditions, so a performance evaluation test under representative conditions is recommended.

Further information on electrical characteristics please see page 26

### Dimension (in mm, inches in brackets)

**Detection area**

**Typical applications**
- Lighting controls  
- Heaters  
- Ventilators and air-conditioners

<table>
<thead>
<tr>
<th>Notes</th>
<th>Standby current consumption</th>
<th>Output type</th>
<th>Sensitivity</th>
<th>White</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaPiOn 2nd generation</td>
<td>170μA</td>
<td>Digital (open drain)</td>
<td>Standard</td>
<td>AMN34112</td>
<td>AMN34111</td>
</tr>
</tbody>
</table>

Further information at /www3.panasonic.biz/ac/e/control/sensor/human/index.jsp
**AMN - Characteristics**

**AMN - Maximum rated values (digital output)**

<table>
<thead>
<tr>
<th>Items</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage</td>
<td>-0.3 to 7V DC</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>

**AMN - Electrical characteristics (digital output)**

<table>
<thead>
<tr>
<th>Items</th>
<th>Symbol</th>
<th>AMN3* series</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>( V_{DD} )</td>
<td>Max</td>
<td>6.0VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>3.0VDC</td>
</tr>
<tr>
<td>Current consumption (in standby mode) Note 1</td>
<td>( I_W )</td>
<td>Ave</td>
<td>170( \mu )A</td>
</tr>
<tr>
<td>Output current (during detection) Note 2</td>
<td>( I_{OUT} )</td>
<td>Max</td>
<td>100( \mu )A</td>
</tr>
<tr>
<td>Output voltage (during detection) (when voltage is applied) Note 3</td>
<td>( V_{OUT} )</td>
<td>Min</td>
<td>( V_{DD} - 0.5V )</td>
</tr>
<tr>
<td>Circuit stability time</td>
<td>( t_{WU} )</td>
<td>Max</td>
<td>30 seconds</td>
</tr>
</tbody>
</table>

**Note 1:** The total current consumption is equal to the current consumption in standby mode \( I_W \) plus the output current \( I_{OUT} \).

**Note 2:** Please select an output resistor (pull-down concept) in accordance with \( V_{OUT} \) so that the output current is maximum 100\( \mu \)A. If the output current is more than 100\( \mu \)A, this may cause false alarms.

**Note 3:** The sensor temperature has to be constant for the time specified.

---

**Digital output**

- **Power supply:**
  - ON
  - OFF

- **Movement:**
  - Yes
  - No

- **Output:**
  - High
  - Low

---

**Explanation of the timing**

\( t_{WU} \) 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 High or Low state. This is true regardless of whether or not the sensor has detected anything.

---

Further information at [www3.panasonic.biz/ac/e/control/sensor/human/index.jsp](http://www3.panasonic.biz/ac/e/control/sensor/human/index.jsp)
Cautions

Basic principles

Panasonic’s PIR Motion sensors detect the distance in the specifications because they are usually provided with the lens. The PIR Motion sensor could detect variations in infrared rays however such variations are decided by following three factors:

1) 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 lens. 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 real conditions.

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.