Proximity Sensors

PL Pyroelectric Infrared Sensors

Overview

KEMET’s Pyroelectric Infrared Sensors use the pyroelectric effect of ceramic by absorbing infrared rays emitted from the human body. This detects the natural infrared signature produced by humans. Also, it can detect infrared rays without using lenses.

Due to the absence of a lens, KEMET’s Pyro Sensor is low profile, as it does not protrude, which makes it ideal for gathering visual requirements. With KEMET’s proprietary piezoelectric ceramic material and element structure of the Pyroelectric Infrared Sensor, humans can be detected through glass or resin. This allows more freedom in the design of the outer appearance of the end product.

Benefits

- Reflow capable SMD configuration
- Lens not required
- A lens can be attached to the sensor
- Wide view angle up to ±60 degrees (lensless)
- View angle up to ±37/±28 degrees (with lens)
- Detection possible through glass or resin
- Low power consumption, down in the μA range
- Excellent radio wave performance in high-frequency band
- Compact and low profile (5.0 x 4.8 x 1.7 mm)

Applications

Typical applications include human presence detection sensing for energy saving functions in:
- Contact less switching
- Office automation equipment
- Home appliances
- Lighting
- Display products
- Air-conditioners
- TV
- PC monitors
- Rice cookers
- Smart toilets

Benefits

Sensor - Front

Sensor - Back

Natural Lens

White Lens

Black Lens
Proximity Sensors – PL Pyroelectric Infrared Sensors

Ordering Information

<table>
<thead>
<tr>
<th>PL-</th>
<th>N</th>
<th>823-</th>
<th>01</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Series</td>
<td>Lens Type(^1)</td>
<td>Sensor Type</td>
</tr>
<tr>
<td>PL</td>
<td>N = No lens</td>
<td>823</td>
<td>01</td>
</tr>
<tr>
<td>Q</td>
<td>Q = With lens</td>
<td>873</td>
<td>02</td>
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</table>

\(^1\) With lens type is not including the lens itself, to be selected separately, see below.

<table>
<thead>
<tr>
<th>PL-</th>
<th>001L-</th>
<th>N</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Series</td>
<td>Lens Type</td>
</tr>
<tr>
<td>PL</td>
<td>001L</td>
<td>BK = Black</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W = White</td>
</tr>
</tbody>
</table>

Performance Characteristics

Measuring Method

Detected Distance (m)

\[ \Delta T \, (^\circ C) = \text{Difference between room temperature and heat source temperature} \]
**Performance Characteristics cont.**

**PL-001L-N - Field of View (Unit: m)**

- **Horizontal View**
  - $\pm 37^\circ$

- **Vertical View**
  - $\pm 28^\circ$

**PL-001L-N - Projection View**

**Detecting Performance with Different Materials**

<table>
<thead>
<tr>
<th>Material</th>
<th>Output Voltage [V]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can detect</td>
<td>Threshold</td>
</tr>
<tr>
<td>Glass</td>
<td>1.8</td>
</tr>
<tr>
<td>Glass (Gorilla®)</td>
<td>1.6</td>
</tr>
<tr>
<td>ASB</td>
<td>1.4</td>
</tr>
<tr>
<td>Acrylic</td>
<td>1.2</td>
</tr>
<tr>
<td>Polycarbonate</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Measuring conditions:**
- Transfer velocity - 1 m/s
- Heat source size - 170×70 mm (relative to hand)
- Temperature difference - $\Delta 10^\circ C$
- Each material thickness - 1 mm (clear color)
Dimensions in mm

Sensor - Dimensions in mm

Sensor - Land Pattern in mm

Sensor - Pin Assignment

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
</tr>
<tr>
<td>2</td>
<td>$V_{\text{out}}$ (Source)</td>
</tr>
<tr>
<td>3</td>
<td>$V_{\text{in}}$ (Drain)</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
</tbody>
</table>
Dimensions in mm cont.

Lens - Dimensions in mm

Lens Area with Crack

Sensor and Lens Mounting Direction

Standard Position of Sensor

PCB Hole Dimension
Environmental Compliance

All KEMET Pyroelectric Infrared Sensors are RoHS and REACH Compliant.

Article 33(1) of the REACH Regulation states that manufacturers and importers of articles (products) are required to notify their customers of the presence of any Substances of Very High Concern (SVHC) in their products exceeding 0.1% by weight and provide instructions on safe use of the product.

KEMET Corporation reports regarding the Article 33(1) of REACH Regulation as follows:

1. Applicable Product: Pyroelectric Infrared Sensors (PL series)

2. Report for the content of REACH SVHC list:
The product(s) above contains a substance by more than 0.1wt% per product weight that was published in the 8th update of the REACH SVHC substances (December 19, 2012).

3. Regarding the safety of the pyroelectric infrared sensors (Piezoceramic products):
The Piezoceramic that is used in this product becomes ceramic by sintering powder containing PZT as the main ingredient. It is chemically stable, with minimum risks toward the human body or environment within the intended use of the product. Please note that risks could occur in the case of inhalation or accidental oral uptake of powder ceramics.

4. Technical product information on the multilayer piezoelectric actuators (Piezoceramic products):
The manufacturing technique of the “piezoceramic products” whose main ingredient is LeadTitanium Zirconium Oxide (PZT) has been established, and there is no alternative material that can exhibit superior performance than PZT at this moment. Please note that the piezoceramic is listed as an exempt on RoHS (2011/65/EU) AnnexIII (7c.1).

5. The responsibility of piezoceramic manufacturers:
Piezoceramic manufacturers report information regarding PZT containment in their products to the customers to obey the article 33 of the REACH regulation
## Table 1 – Ratings & Part Number Reference

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Part Number</th>
<th>Supply Voltage (VDC)</th>
<th>Output Voltage(^1) (mVp-p) Minimum</th>
<th>Source Voltage(^2) (V)</th>
<th>Noise(^3) (mVp-p) Maximum</th>
<th>Warm up Time(^4) (seconds) Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL-N823-01</td>
<td>2.0 ~ 15.0</td>
<td>550</td>
<td>0.3 ~ 0.9</td>
<td>140</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>PL-Q873-02</td>
<td>2.0 ~ 15.0</td>
<td>550</td>
<td>0.3 ~ 0.9</td>
<td>140</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lens</th>
<th>Part Number</th>
<th>Lens Color</th>
<th>Detection Distance(^1) (m)</th>
<th>Field of View (°)</th>
<th>Operating Temperature (°C)</th>
<th>Storage Temperature (°C)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL-001L-N</td>
<td>Natural</td>
<td>5.0</td>
<td>Horizontal: ±37° Vertical: ±28°</td>
<td>-20°C to +60°C</td>
<td>-25°C to +75°C</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>PL-001L-BK</td>
<td>Black</td>
<td>3.5</td>
<td>Horizontal: ±37° Vertical: ±28°</td>
<td>-20°C to +60°C</td>
<td>-25°C to +75°C</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>PL-001L-W</td>
<td>White</td>
<td>3.5</td>
<td>Horizontal: ±37° Vertical: ±28°</td>
<td>-20°C to +60°C</td>
<td>-25°C to +75°C</td>
<td>0.07</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Difference of temperature with ambient temperature and heat source: 70°C, aperture diameter: Φ10, 1 Hz and AMP: 26 dB
\(^2\) Vd = 5 V and Rs = 47 kΩ
\(^3\) AMP = 72 dB and Rs = 47 kΩ
\(^4\) The warm up time is defined by the time needed for the source voltage to reach a rated value after the sensor's power supply has been turned on.

**Reference data using SS-430L**
Applications

Non-contact Switch

Detecting distance will vary by the chassis material used.

Common Application

Detecting distance increased to a few meters by using a polyethylene plate.

Part Schematic
Tape & Reel Packaging Information

### Sensor

<table>
<thead>
<tr>
<th>Series</th>
<th>Packaging Type</th>
<th>Pieces per Reel</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL</td>
<td>Tape &amp; Reel</td>
<td>2,000</td>
</tr>
</tbody>
</table>

### Lens

<table>
<thead>
<tr>
<th>Series</th>
<th>Packaging Type</th>
<th>Pieces per Tray</th>
<th>Pieces per Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL</td>
<td>Tray</td>
<td>100</td>
<td>2,000</td>
</tr>
</tbody>
</table>

**Taping Specifications**

Dimensions of indented square hole plastic tape
Handling Precautions

Pyroelectric Infrared Sensors should be kept away from indirect and direct sunlight, the headlights of cars, wind, and exposure to strong vibration and strong shock. Do not use in water, alcohol ETA, corrosive gas or undersea breeze. Do not drop or apply any mechanical stress.

Pyroelectric Infrared Sensors should be stored in normal working environments. Do not expose to high temperatures, high humidity, corrosive atmospheres, and avoid long-term storage. KEMET recommends that maximum storage temperature not exceed 25°C and maximum storage humidity not exceed 50% relative humidity. Atmospheres should be free of chlorine and sulfur-bearing compounds.

Temperature fluctuations should be minimized to avoid condensation on the parts. The stock of sensors should be used promptly, preferably within six months of receipt.
KEMET Electronics Corporation Sales Offices

For a complete list of our global sales offices, please visit www.kemet.com/sales.

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