PbS, PbSe near-infrared detector
TE-cooled Single-Pixel double encapsulated TO8-package

Features
- Double encapsulation (thin-film + TO8 package)
- One or Two-Stage thermoelectric cooler (TEC)
- High durability for rugged operation
- Very high sensitivity
- Sapphire window
- Custom windows and filters available

Applications
- Flame monitoring
- Flame and spark detection
- Gas detection and analysis
- Spectroscopy
- Temperature measurement
- Moisture measurement

Overview PbS and PbSe detectors with TEC

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Dimensional outline</th>
<th>Cooling</th>
<th>Active area [mm x mm]</th>
<th>Replaces following Hamamatsu detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>PbS050040TO8-1TEC</td>
<td>Type 1</td>
<td>One-stage TEC-cooled</td>
<td>4x5</td>
<td>P2532-01</td>
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<tr>
<td>PbS050040TO8-2TEC</td>
<td>Type 2</td>
<td>Two-stage TEC-cooled</td>
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<td>P2682-01</td>
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<tr>
<td>PbS050050TO8-1TEC</td>
<td>Type 1</td>
<td>One-stage TEC-cooled</td>
<td>5x5</td>
<td></td>
</tr>
<tr>
<td>PbS050050TO8-2TEC</td>
<td>Type 2</td>
<td>Two-stage TEC-cooled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PbSe020020TO8-1TEC</td>
<td>Type 1</td>
<td>One-stage TEC-cooled</td>
<td>2x2</td>
<td>P9696-102</td>
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<tr>
<td>PbSe020020TO8-2TEC</td>
<td>Type 2</td>
<td>Two-stage TEC-cooled</td>
<td></td>
<td>P2038-02, P9696-202</td>
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<tr>
<td>PbSe030030TO8-1TEC</td>
<td>Type 1</td>
<td>One-stage TEC-cooled</td>
<td>3x3</td>
<td>P9696-103, P2038-03</td>
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<tr>
<td>PbSe030030TO8-2TEC</td>
<td>Type 2</td>
<td>Two-stage TEC-cooled</td>
<td></td>
<td>P9696-203, P2680-03</td>
</tr>
</tbody>
</table>

Storage
- Storage temperature: -55°C to +70°C
- Exposure to UV light results in permanent damage
- Prolonged exposure to visible light results in temporary low dark resistance

Handling
- Ensure dust-free environment for device handling
- Operating temperature: -30°C to +70°C
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Type 1 exemplary package outlines (mm)

PbS050040TO8-1TEC

Bottom view

1-Detector
2-Detector
3-TEC (-)
4-TEC (+)
5-Thermistor
6-Thermistor

Side view

Serial number
Detector number
Batch number
Detector dimensions

Sensor plane

Top view

Section A-A

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Type 2 exemplary package outlines (mm)

PbS050050TO8-2TEC
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Characteristics thermoelectric cooler (1TEC)

Single stage TEC U-I-curve

NTC resistance curve

TEC cooling performance (absolute)
Ambient temperature +24°C, heat sink <7 K/W

TEC cooling performance (relative)

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Characteristics thermoelectric cooler (2TEC)

**TEC cooling performance (absolute)**

**2-stage TEC U-I-curve**

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>NTC resistance (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>12.081k ±1%</td>
</tr>
<tr>
<td>0</td>
<td>27.219k ±1%</td>
</tr>
<tr>
<td>-10</td>
<td>42.506k ±1%</td>
</tr>
<tr>
<td>-15</td>
<td>53.65k ±1%</td>
</tr>
<tr>
<td>-20</td>
<td>68.237k ±1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resistance (25°C) (ohm)</th>
<th>B-Constant (25-50°C) (K)</th>
<th>B-Constant (25-80°C) (Reference Value) (K)</th>
<th>B-Constant (25-85°C) (Reference Value) (K)</th>
<th>B-Constant (25-100°C) (Reference Value) (K)</th>
<th>Maximum Operating Current (25°C) (mA)</th>
<th>Maximum Voltage (V)</th>
<th>Typical Dissipation Constant (25°C) (mW/°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10k ±1%</td>
<td>3380 ±1%</td>
<td>3428</td>
<td>3434</td>
<td>3455</td>
<td>0.100</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

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Exemplary readout circuit

\[ \begin{align*}
V_B &: \text{Bias voltage} \\
V_O &: \text{Output voltage} \\
R_D &: \text{Dark resistance of the detector} \\
R_L &: \text{Load resistor} \\
C_F &: \text{Filter capacitor} \\
R_F &: \text{Filter resistor} \\
R_f &: \text{Feedback resistor} \\
R_i &: \text{Gain resistor}
\end{align*} \]

Regulatory

For the use of Hertzstück™ PbS and PbSe infrared photodetectors in medical devices, monitoring and control instruments and consumer applications RoHS exemptions apply. For automotive applications Hertzstück™ PbS and PbSe infrared photodetectors fall under ELV exemption.