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>PbS</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PbS050040TO8-1TEC</td>
<td>Type 1</td>
<td>One-stage TE-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 TE-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 TE-cooled</td>
<td>5x5</td>
<td></td>
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<tr>
<td>PbS050050TO8-2TEC</td>
<td>Type 2</td>
<td>Two-stage TE-cooled</td>
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<tr>
<td>PbSe</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>PbSe020020TO8-1TEC</td>
<td>Type 1</td>
<td>One-stage TE-cooled</td>
<td>2x2</td>
<td>P9696-102</td>
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<td>PbSe020020TO8-2TEC</td>
<td>Type 2</td>
<td>Two-stage TE-cooled</td>
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<td>P2038-02</td>
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<td>PbSe030030TO8-1TEC</td>
<td>Type 1</td>
<td>One-stage TE-cooled</td>
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<td>P9696-103</td>
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<td>Type 2</td>
<td>Two-stage TE-cooled</td>
<td></td>
<td>P2038-03</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 (dimensions in mm)

PbS050040TO8-1TEC

Bottom view

Side view

Top view

Section A-A
PbS, PbSe near-infrared detector
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Type 2 exemplary package outlines (dimensions in mm)
PbS050050TO8-2TEC

Bottom view

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

Side view

Clear aperture

Top view

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

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)
**PbS, PbSe near-infrared detector**
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**Characteristics thermoelectric cooler (2TEC)**

**TEC cooling performance (absolute)**

![Graph showing TEC cooling performance](image)

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

*Ambient temperature +21°C*

![Graph showing 2-stage TEC U-I-curve](image)

**NTC resistance curve**

![Graph showing NTC resistance curve](image)

**NTC resistance at key temperatures**

<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

\[ \text{Chopper} \quad V_B \quad R_D \quad \text{PbS, PbSe} \quad R_I \quad R_F \quad \text{OP} \quad V_C \]

- \( V_B \): Bias voltage
- \( V_D \): Output voltage
- \( R_D \): Dark resistance of the detector
- \( R_I \): Load resistor
- \( C_F \): Filter capacitor
- \( R_F \): Filter resistor
- \( R_I \): Feedback resistor
- \( R_1 \): Gain resistor

Regulatory

For the use of trinamiX PbS and PbSe infrared photodetectors in medical devices, monitoring and control instruments and consumer applications RoHS exemptions apply.

For automotive applications trinamiX PbS and PbSe infrared photodetectors fall under ELV exemption.