TS-200

FEATURES

- High Responsivity
- Rugged Construction
- Low Cost
- Broad Spectral Response in the IR
- Self-Generating Voltage
  - No Bias Required
  - No 1/f Noise
- Ambient Temperature Operation
- High Reliability
- Hermetically Sealed
- Excellent Long-Term Stability

TECHNICAL DESCRIPTION

The model TS-200 sensor is a miniaturized multijunction thermopile made by thin-film and other microsystems technologies on Si wafers. It consists of 200 rectangularly arranged junction pairs formed from evaporated antimony and bismuth thin films. The centrally located active (hot) junctions comprise an area of 1.44 mm$^2$. The whole membrane (1.2 x 1.2 mm$^2$) supporting the active layer is coated with an interference absorption multilayer system.

The element is hermetically sealed in a small modified TO-18 package under an inert gas atmosphere. By means of special interference absorption layers the spectral range is restricted to 3.0 ... 5.0 µm or 5.5 ... 13 µm, respectively.

The output e.m.f. of the sensor is proportional to the temperature difference between the active and the reference junctions. The thermopile requires no cooling and no bias voltage or current for operation. It generates no 1/f noise but only the thermal resistance (Nyquist) noise. The sensor can be used for DC and low frequency AC measurements.
**TYPICAL SPECIFICATIONS TS-200**

This data sheet may be modified at any time

<table>
<thead>
<tr>
<th>Parameters</th>
<th>units</th>
<th>values</th>
<th>conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Area</td>
<td>mm² (mm x mm)</td>
<td>1.44 (1.2 x 1.2)</td>
<td>membrane area</td>
</tr>
<tr>
<td>Number of Junctions</td>
<td></td>
<td>200</td>
<td>thermocouples</td>
</tr>
<tr>
<td>Resistance</td>
<td>kΩ</td>
<td>50 ... 80</td>
<td></td>
</tr>
<tr>
<td>Resistance TC</td>
<td>% /K</td>
<td>- 0.02 ... - 0.04</td>
<td>room temperature (300 K)</td>
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<tr>
<td>Noise Voltage</td>
<td>nV/Hz¹²</td>
<td>≤ 33</td>
<td>room temperature (300 K)</td>
</tr>
<tr>
<td>Max. Irradiance</td>
<td>mW/mm²</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>DC Responsivity</td>
<td>V/W</td>
<td>86 ... 90</td>
<td>black body, 500 K, without window, absorbing layer 3.0...5.0 µm</td>
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<tr>
<td>DC Responsivity</td>
<td>V/W</td>
<td>100 ... 104</td>
<td>black body, 500K, without window, absorbing layer 5.5...13 µm</td>
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<tr>
<td>Responsivity TC</td>
<td>% /K</td>
<td>-0.35...-0.55</td>
<td>N₂</td>
</tr>
<tr>
<td>DC Output @ 38µW/mm²</td>
<td>mV</td>
<td>4.7 ... 4.9</td>
<td>black body, 500 K, without window, absorbing layer 3.0...5.0 µm</td>
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<tr>
<td>DC Output @ 38µW/mm²</td>
<td>mV</td>
<td>5.5 ... 5.7</td>
<td>black body, 500 K, without window, absorbing layer 5.5...13 µm</td>
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<tr>
<td>Time Constant</td>
<td>ms</td>
<td>≤ 30</td>
<td>rₜₐₘ , N₂</td>
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<tr>
<td>D⁺ (500K, DC)</td>
<td>cmHz¹²/W</td>
<td>3.2 x 10⁸</td>
<td>black body, 500 K, without window, absorbing layer 3.0...5.0 µm</td>
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<tr>
<td>D⁺ (500K, DC)</td>
<td>cmHz¹²/W</td>
<td>3.7 x 10⁸</td>
<td>black body, 500 K, without window, absorbing layer 5.5...13 µm</td>
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<tr>
<td>Filling Gases</td>
<td></td>
<td></td>
<td>Ne, Kr, Xe, Ar, N₂</td>
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<tr>
<td>Spectral Response</td>
<td>Flat from 3.0 ... 5.0 µm or 5.5 ... 13 µm, respectively</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window Materials</td>
<td>Standard: 8 ... 14 µm Filter (other materials on request)</td>
<td></td>
<td></td>
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<tr>
<td>Case</td>
<td>TO-18 Package (modified)</td>
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<tr>
<td>Operating Temperature</td>
<td>-20 ... +85 °C</td>
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<td></td>
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<tr>
<td>Weight</td>
<td></td>
<td>&lt; 1 g</td>
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</table>

Spectral absorptance of the multilayer system with an interference absorbing layer in the spectral range 3.0 ... 5.0 µm

APPLICAT IONS

- Non-Contact Temperature Measurements
- Radiometry
- Imaging System Requiring Small Spot Size
- Precise NDIR spectroscopic gas detection and control in medical applications

Spectral absorptance of the multilayer system with an interference absorbing layer in the spectral range 5.5 ... 13 µm

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[Graph showing spectral absorptance]