For CO₂ concentration measurement, High sensitivity

The T11722-01 is a dual-element type thermopile detector designed to detect CO₂ concentration with high accuracy. It consists of a high sensitivity dual-element thermopile detector and two band-pass filters for sensing two wavelengths (reference: 3.9 μm, CO₂: 4.3 μm) simultaneously.

**Features**
- 2 wavelengths detection (Reference: 3.9 μm, CO₂: 4.3 μm)
- Metal package (TO-5)
- High sensitivity

**Applications**
- CO₂ concentration measurement

**Absolute maximum ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>Topr</td>
<td></td>
<td>-30</td>
<td>1.2</td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg</td>
<td></td>
<td>-40</td>
<td>1.2</td>
<td>+125</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

**Electrical and optical characteristics (Ta=25 °C)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photosensitive area (per 1 element)</td>
<td></td>
<td></td>
<td>-</td>
<td>1.2</td>
<td>-</td>
<td>mm</td>
</tr>
<tr>
<td>Spectral response range</td>
<td></td>
<td>Band-pass filter, center wavelength (FWHM)</td>
<td>-</td>
<td>For reference: 3.9 (0.09) For CO₂: 4.3 (0.14)</td>
<td>-</td>
<td>μm</td>
</tr>
<tr>
<td>Photosensitivity</td>
<td>S</td>
<td>1 Hz, 500 K</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>V/W</td>
</tr>
<tr>
<td>Element resistance</td>
<td>Rd</td>
<td></td>
<td>100</td>
<td>125</td>
<td>150</td>
<td>kΩ</td>
</tr>
<tr>
<td>Noise voltage</td>
<td>Vn</td>
<td>Johnson noise</td>
<td>-</td>
<td>45</td>
<td>50</td>
<td>nV/Hz¹/²</td>
</tr>
<tr>
<td>Noise equivalent power</td>
<td>NEP</td>
<td>-</td>
<td>0.9</td>
<td>1.3</td>
<td></td>
<td>nW/Hz¹/²</td>
</tr>
<tr>
<td>Detectivity</td>
<td>D*</td>
<td></td>
<td>0.9 x 10⁸</td>
<td>1.3 x 10⁸</td>
<td>-</td>
<td>cm-Hz¹/²/W</td>
</tr>
<tr>
<td>Rise time</td>
<td>tr</td>
<td>0 to 63%</td>
<td>-</td>
<td>20</td>
<td>30</td>
<td>ms</td>
</tr>
<tr>
<td>Temperature coefficient of resistance</td>
<td>TCR</td>
<td></td>
<td>-</td>
<td>±0.1</td>
<td>-</td>
<td>%/°C</td>
</tr>
</tbody>
</table>

*1: Without filter
**Spectral transmittance characteristics of window material (typical example)**

![Graph showing transmittance percentage versus wavelength (μm) for two filters: Filter 1 and Filter 2.]

**Field of view**

![Diagram showing field of view with 98° angles for Filter 1 and Filter 2.]

**Operating circuits**

![Circuit diagram for single power supply type with labels for components: R1, R2, R3, R4, C1, Vout, +V, etc.]  

Gain = $1 + \frac{R2}{R1}$  

$f_{\text{high}} = \frac{1}{2\pi CR2}$  

$R3 = R4$

Since the thermopile output signal is very low in the order of microvolts, use an amplifier with a low offset voltage. (Example: LTC1050)
**Thermopile detector T1722-01**

**Dual power supply type**

![Diagram of the thermopile detector](image)

**Dimensional outline (unit: mm)**

- Window: 2.5 ± 0.1 mm
- Thermopile 1 (1.2 × 1.2): 3.4 ± 0.2 mm
- Thermopile 2 (1.2 × 1.2): 8.3 ± 0.2 mm
- Filter 1: 0.45 ± 0.05 mm
- Filter 2: 2.8 ± 0.2 mm
- Filter for reference (3.9 μm): 10.0 ± 0.2 mm
- Filter for CO\(_2\) (4.3 μm): 0.8 ± 0.1 mm
- Common: 5.08 ± 0.2 mm
- Case: 13.2 ± 0.5 mm

**Equations**

- Gain = \(1 + \frac{R_2}{R_1}\)
- \(f_{\text{high}} = \frac{1}{2\pi C_1 R_2}\)
**Precautions**

The band-pass filters used in this product have a secondary transmission at wavelengths longer than 10 μm. If the secondary transmission affects measurements, install a sapphire glass, etc. in front of the light input window to block long wavelength light.

**Related information**


- Precautions
  - Notice
  - Metal, Ceramic, Plastic package products/Precautions