The S15249 is a surface mount type 16-element Si APD array with high sensitivity in the short wavelength range and low bias operation. This offers uniform gain and small crosstalk between elements.

**Features**

- High sensitivity in the short wavelength range 
  QE=77% (λ=450 nm)
- Low bias operation: Breakdown voltage=160 V typ.
- Gain variation between elements is small.

**Applications**

- Particle counters
- Flow cytometry

**Structure**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photosensitive area (per element)</td>
<td>0.7 × 2.0</td>
<td>mm</td>
</tr>
<tr>
<td>Element pitch</td>
<td>0.76</td>
<td>mm</td>
</tr>
<tr>
<td>Number of elements</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Package</td>
<td>Glass epoxy</td>
<td>-</td>
</tr>
<tr>
<td>Window material</td>
<td>Epoxy resin</td>
<td>-</td>
</tr>
</tbody>
</table>

**Absolute maximum ratings (Ta=25 °C)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward current</td>
<td>I_F</td>
<td>max</td>
<td>10</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse current (DC)</td>
<td>I_R</td>
<td>max</td>
<td>200</td>
<td>µA</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>T_op</td>
<td>No dew condensation⁴¹</td>
<td>-20 to +60</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_stg</td>
<td>No dew condensation⁴¹</td>
<td>-20 to +80</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>T_sol</td>
<td>260 (once)⁴²</td>
<td>260 (once)⁴²</td>
<td>°C</td>
</tr>
</tbody>
</table>

*1: When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

*2: Reflow soldering, JEDEC J-STD-020 MSL 5a, see P4

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, per element)

<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>Spectral response range</td>
<td>λ</td>
<td></td>
<td>-</td>
<td>350</td>
<td>1000</td>
<td>nm</td>
</tr>
<tr>
<td>Peak sensitivity wavelength</td>
<td>λp</td>
<td>M=50</td>
<td>-</td>
<td>620</td>
<td>-</td>
<td>nm</td>
</tr>
<tr>
<td>Photosensitivity</td>
<td>S</td>
<td>M=1, λ=450 nm</td>
<td>-</td>
<td>0.28</td>
<td>-</td>
<td>A/W</td>
</tr>
<tr>
<td>Quantum efficiency</td>
<td>QE</td>
<td>M=1, λ=450 nm</td>
<td>-</td>
<td>77</td>
<td>-</td>
<td>%</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>Vbr</td>
<td>Id=100 μA</td>
<td>-</td>
<td>160</td>
<td>200</td>
<td>V</td>
</tr>
<tr>
<td>Temperature coefficient of Vbr</td>
<td>ΔTVbr</td>
<td></td>
<td>-</td>
<td>0.14</td>
<td>-</td>
<td>V/°C</td>
</tr>
<tr>
<td>Dark current</td>
<td>Id</td>
<td>M=50</td>
<td>-</td>
<td>0.3</td>
<td>5</td>
<td>nA</td>
</tr>
<tr>
<td>Cutoff frequency</td>
<td>fc</td>
<td>M=50, λ=450 nm</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>MHz</td>
</tr>
<tr>
<td>Terminal capacitance</td>
<td>Ct</td>
<td>M=50, f=100 kHz</td>
<td>-</td>
<td>25</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>Excess noise figure</td>
<td>x</td>
<td>M=50, λ=450 nm</td>
<td>-</td>
<td>0.28</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gain</td>
<td>M</td>
<td>λ=450 nm</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gain uniformity between elements</td>
<td>Mv</td>
<td>M=50, λ=450 nm</td>
<td>-</td>
<td>±5</td>
<td>±10</td>
<td>%</td>
</tr>
</tbody>
</table>

### Spectral response

(Typ. Ta=25 °C, M=50 at λ=450 nm, per element)

![Spectral response graph](image)

### Quantum efficiency vs. wavelangth

(Typ. Ta=25 °C, per element)

![Quantum efficiency vs. wavelength graph](image)
**Dark current vs. reverse voltage**

(Typ. Ta=25 °C, per element)

- Dark current
  - 100 µA
  - 10 µA
  - 1 µA
  - 100 nA
  - 10 nA
  - 1 nA
  - 100 pA
  - 10 pA

- Reverse voltage (V)
  - 90
  - 100
  - 110
  - 120
  - 130
  - 140
  - 150
  - 160
  - 170

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**Terminal capacitance vs. reverse voltage**

(Typ. Ta=25 °C, f=100 kHz, per element)

- Terminal capacitance (pF)
  - 0
  - 10
  - 20
  - 30
  - 40

- Reverse voltage (V)
  - 90
  - 100
  - 110
  - 120
  - 130
  - 140
  - 150
  - 160

---

**Gain vs. reverse voltage**

(Typ. Ta=25 °C, λ=450 nm, per element)

- Gain
  - 1
  - 10
  - 100
  - 1000

- Reverse voltage (V)
  - 90
  - 100
  - 110
  - 120
  - 130
  - 140
  - 150
  - 160

---

**Crosstalk (typical example)**

(Ta=25 °C, M=50 at λ=470 nm)

- Relative sensitivity (%)
  - 0
  - 1
  - 10
  - 100

- Position on photosensitive area (mm)
  - -0.6
  - -0.4
  - -0.2
  - 0
  - 0.2
  - 0.4
  - 0.6
**Dimensional outline (unit: mm)**

- Photosensitive area: 0.7 × 2.0 mm (× 16 elements)
- Epoxy resin
- Index mark

**Recommended land pattern (unit: mm)**

**Recommended reflow soldering conditions**

- After unpacking, store the device in an environment at a temperature range of 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 24 hours.
- The effect that the product receives during reflow soldering varies depending on the circuit board and reflow oven that are used. When you set reflow soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.
**Baking**

If more than 3 months have passed in the unopened state or storage conditions are exceeded after opening the package, baking is required to remove moisture before reflow soldering. For the baking method, refer to the precautions "Surface mount type products".

- **Recommended baking conditions**
  - Temperature: 120 °C, 3 hours, up to twice

  Note: Before setting the baking conditions, perform experiments to confirm that no problems occur with the products.

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**Related information**


- Precautions
- Disclaimer
- Surface mount type products
- Si APD / Technical note

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Information described in this material is current as of May 2022. Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use.

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