Si PIN photodiodes

S5106/S5107/S7509/S7510 series

Surface mountable, high-speed response Si PIN photodiodes

The S5106, S5107, S7509, and S7510 are Si PIN photodiodes sealed in surface mountable chip carrier packages. They can be mounted using solder reflow, which facilitates automation. Since the photosensitive area is large, they are suitable for FSO (free space optics) and other applications that require a wide field of view. In addition, they can be used in a wide variety of applications including POS, measurements, and analysis.

Features

- Surface mount type ceramic chip carrier package
- Compatible with lead-free solder reflow
- High sensitivity, high-speed response
- Packing
  - Tray: S5106, S5107, S7509, S7510
  - Reel: S5106-10, S5107-10, S7509-10, S7510-10

Applications

- FSO
- Laser radars
- Power meters
- Barcode readers

Structure

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Photosensitive area (mm)</th>
<th>Package</th>
<th>Window material</th>
</tr>
</thead>
<tbody>
<tr>
<td>S5106/-10</td>
<td>5 × 5</td>
<td>Ceramic</td>
<td>Silicone resin</td>
</tr>
<tr>
<td>S5107/-10</td>
<td>10 × 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S7509/-10</td>
<td>2 × 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S7510/-10</td>
<td>6 × 11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Absolute maximum ratings

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Reverse voltage $V_R$ (V)</th>
<th>Power dissipation $P$ (mW)</th>
<th>Operating temperature $T_{op}$*1 ($°C$)</th>
<th>Storage temperature $T_{stg}$*1 ($°C$)</th>
<th>Soldering conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>S5106/-10</td>
<td>30</td>
<td>50</td>
<td>-40 to +100</td>
<td>-40 to +125</td>
<td>Peak temperature: 240 °C max., once*2</td>
</tr>
<tr>
<td>S5107/-10</td>
<td>30</td>
<td>50</td>
<td>-40 to +100</td>
<td>-40 to +125</td>
<td></td>
</tr>
<tr>
<td>S7509/-10</td>
<td>30</td>
<td>50</td>
<td>-40 to +100</td>
<td>-40 to +125</td>
<td></td>
</tr>
<tr>
<td>S7510/-10</td>
<td>30</td>
<td>50</td>
<td>-40 to +100</td>
<td>-40 to +125</td>
<td></td>
</tr>
</tbody>
</table>

*1: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

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 (Typ. Ta=25 °C, unless otherwise noted)

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Spectral response range λ (nm)</th>
<th>Peak sensitivity wavelength λp (nm)</th>
<th>Photosensitivity S (A/W)</th>
<th>Short circuit current Isc 100 lx (µA)</th>
<th>Dark current ID Vr=10 V Typ. (nA) Max. (nA)</th>
<th>Dark current temperature coefficient TCD (times/°C)</th>
<th>Cutoff frequency fc RL=50 Ω VR=10 V (MHz)</th>
<th>Terminal capacitance Ct VR=10 V (pF)</th>
<th>NEP VR=10 V λ=λp (W/Hz(^{1/2}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>S5106/-10</td>
<td>320 to 1100</td>
<td>960</td>
<td>0.72</td>
<td>27</td>
<td>0.4</td>
<td>5</td>
<td>20</td>
<td>40</td>
<td>1.6 × 10^{-14}</td>
</tr>
<tr>
<td>S5107/-10</td>
<td></td>
<td></td>
<td>0.45</td>
<td>110</td>
<td>0.9</td>
<td>10</td>
<td>10</td>
<td>150</td>
<td>2.4 × 10^{-14}</td>
</tr>
<tr>
<td>S7509/-10</td>
<td></td>
<td></td>
<td>0.57</td>
<td>22</td>
<td>0.5</td>
<td>5</td>
<td>20</td>
<td>40</td>
<td>1.7 × 10^{-14}</td>
</tr>
<tr>
<td>S7510/-10</td>
<td></td>
<td></td>
<td>0.62</td>
<td>72</td>
<td>1.0</td>
<td>10</td>
<td>15</td>
<td>80</td>
<td>2.5 × 10^{-14}</td>
</tr>
</tbody>
</table>

Spectral response

Sensitivity temperature characteristics

Dark current vs. reverse voltage

Terminal capacitance vs. reverse voltage
Si PIN photodiodes  |  S5106/S5107/S7509/S7510 series

**Dimensional outlines (unit: mm)**

**S5106/-10**

- Photosensitive area: 8.80 ± 0.2
- Index mark: 10.6 ± 0.2
-硅酮树脂 Photosensitive surface: 0.46 ± 0.15
- NC (excluding pins ①②③④): 1.27

Burrs shall protrude no more than 0.3 mm on any side of package.

**S5107/-10**

- Photosensitive area: 14.5 ± 0.2
- Silicone resin Photosensitive surface: 0.46
- NC (excluding pins ①②③④): 1.27

Burrs shall protrude no more than 0.3 mm on any side of package.

**S7509/-10**

- Photosensitive area: 15.35 ± 0.15
- Silicone resin Photosensitive surface: 0.46 ± 0.15
- (18 ×) 0.6
- NC (excluding pins ①②③④): 1.27

Burrs shall protrude no more than 0.3 mm on any side of package.

**S7510/-10**

- Photosensitive area: 14.8 ± 0.2
- Silicone resin Photosensitive surface: 0.46 ± 0.15
- (16 ×) 0.6
- NC (excluding pins ①②③④): 1.27

Burrs shall protrude no more than 0.3 mm on any side of package.
Recommended land patterns (unit: mm)

**S5106/-10**

- x: 0.6 max.  
- y: 2.5 mm

**S5107/-10**

- x: 1.2 max.  
- y: 2.8 mm

**S7509/-10**

- x: 0.6 max.  
- y: 3.0 mm

**S7510/-10**

- x: 0.6 max.  
- y: 3.0 mm

1. Solder all terminals.
2. Do not make the land area larger than necessary.
3. It is preferable that the land sizes be about equal.
4. Make land width x about the same as the terminal width.
5. Make land height y at least 1 mm longer than the terminal height, protruding outside the package.
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**Standard packing specifications**

<table>
<thead>
<tr>
<th>Packing quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 pcs max./tray</td>
</tr>
</tbody>
</table>

Note: S5106, S7509: For mass production orders, please order in units of 100.
S5107, S7510: For mass production orders, please order in units of 50.

<table>
<thead>
<tr>
<th>Packing state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tray and desiccant in moisture-proof packaging (vacuum-sealed)</td>
</tr>
</tbody>
</table>

**S5106-10**

<table>
<thead>
<tr>
<th>Reel (conforms to JEITA ET-7200)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Reel outer diameter</th>
<th>Hub diameter</th>
<th>Tape width</th>
<th>Material</th>
<th>Electrostatic characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>330 mm</td>
<td>100 mm</td>
<td>24 mm</td>
<td>PS</td>
<td>Conductive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Embossed tape (unit: mm, material: PS, conductive)</th>
</tr>
</thead>
</table>

**Packing quantity**

1000 pcs/reel

**Packing state**

Reel and desiccant in moisture-proof packaging (vacuum-sealed)
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S5107-10

- Reel (conforms to JEITA ET-7200)

<table>
<thead>
<tr>
<th>Reel outer diameter</th>
<th>Hub diameter</th>
<th>Tape width</th>
<th>Material</th>
<th>Electrostatic characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>330 mm</td>
<td>80 mm</td>
<td>24 mm</td>
<td>PS</td>
<td>Conductive</td>
</tr>
</tbody>
</table>

- Embossed tape (unit: mm, material: PS, conductive)

- Packing quantity
  100 pcs/reel

- Packing state
  Reel and desiccant in moisture-proof packaging (vacuum-sealed)
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S7509-10

Reel (conforms to JEITA ET-7200)

<table>
<thead>
<tr>
<th>Reel outer diameter</th>
<th>Hub diameter</th>
<th>Tape width</th>
<th>Material</th>
<th>Electrostatic characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>254 mm</td>
<td>100 mm</td>
<td>24 mm</td>
<td>PS</td>
<td>Conductive</td>
</tr>
</tbody>
</table>

- Embossed tape (unit: mm, material: PS, conductive)

- Packing quantity
  1000 pcs/reel

- Packing state
  Reel and desiccant in moisture-proof packaging (vacuum-sealed)
Reel (conforms to JEITA ET-7200)

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<td>Conductive</td>
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</tbody>
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Embossed tape (unit: mm, material: PS, conductive)

Packing quantity
100 pcs/reel

Packing state
Reel and desiccant in moisture-proof packaging (vacuum-sealed)
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**Recommended reflow soldering conditions**

![Graph showing recommended reflow soldering conditions](image)

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>170 °C</td>
<td>70 to 90 s Preheat</td>
</tr>
<tr>
<td>190 °C</td>
<td>40 s max. Soldering</td>
</tr>
<tr>
<td>220 °C</td>
<td></td>
</tr>
<tr>
<td>300 °C</td>
<td></td>
</tr>
</tbody>
</table>

**Precautions**

- This product’s light input window uses soft silicone resin. Stain or scratch in the light input window degrades the sensitivity. Avoid contact with the light input window, as applying external force to the resin surface may cause the wire to deform and break.
- When soldering, use rosin-based flux to prevent terminal corrosion. Solder at 260 °C or less within 5 seconds without moisture absorption.
- 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.
- Silicone resin swells with organic solvents. So do not use anything other than alcohol.
- Avoid opening the bag until immediately before using the product so as to prevent oxidation or contamination of terminals or moisture absorption of resin filling.

In addition, if 3 months have passed in an unopened state or 24 hours have passed after opening, bake in nitrogen atmosphere for 3 to 5 hours at 150 °C, or for 12 to 15 hours at 120 °C before use.
Related information
www.hamamatsu.com/sp/ssd/doc_en.html

Precautions
- Disclaimer
- Surface mount type products

Technical information
- Si photodiode / Application circuit examples

Information described in this material is current as of January 2020.
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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