Si PIN photodiodes

High-speed photodiodes
(S5973 series: 1 GHz)

The S5971, S5972 and S5973 series are high-speed Si PIN photodiodes designed for visible to near infrared light detection. These photodiodes provide wideband characteristics at a low bias, making them suitable for optical communications and other high-speed photometry. The S5973 series includes a mini-lens type (S5973-01) that can be efficiently coupled to an optical fiber and a violet sensitivity enhanced type (S5973-02) ideal for violet laser detection.

### Features
- **High-speed response**
  - S5971: 100 MHz (V<sub>R</sub>=10 V)
  - S5972: 500 MHz (V<sub>R</sub>=10 V)
  - S5973 series: 1 GHz (V<sub>R</sub>=3.3 V)
- **Low price**
- **High sensitivity**
  - S5973-02: 0.3 A/W, QE=91 % (λ=410 nm)
- **High reliability**

### Applications
- **Optical fiber communications**
- **High-speed photometry**
- **Violet laser detection (S5973-02)**

### Structure / Absolute maximum ratings

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Dimensional outline/ Window material*1</th>
<th>Package</th>
<th>Photosensitive area size</th>
<th>Effective photosensitive area</th>
<th>Absolute maximum ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(mm)</td>
<td></td>
<td>(mm)</td>
<td>(mm)&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reverse voltage V&lt;sub&gt;R&lt;/sub&gt; Max. (V)</td>
</tr>
<tr>
<td>S5971</td>
<td>1/K</td>
<td>TO-18</td>
<td>φ1.2</td>
<td>1.1</td>
<td>20</td>
</tr>
<tr>
<td>S5972</td>
<td></td>
<td></td>
<td>φ0.8</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>S5973</td>
<td></td>
<td></td>
<td>φ0.4</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>S5973-01</td>
<td>2/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S5973-02</td>
<td>3/K</td>
<td></td>
<td></td>
<td></td>
<td></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

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Spectral response range λ&lt;sub&gt;p&lt;/sub&gt;</th>
<th>Peak sensitivity wavelength λ&lt;sub&gt;p&lt;/sub&gt;</th>
<th>Photosensitivity S (A/W)</th>
<th>Short circuit current Isc 100 lx</th>
<th>Dark current Ib</th>
<th>Temp. coefficient of Ib/IdT&lt;sub&gt;b&lt;/sub&gt;</th>
<th>Temp. coefficient of frequency fc</th>
<th>Terminal capacitance C&lt;sub&gt;f&lt;/sub&gt; f=1 MHz</th>
<th>Noise equivalent power NEP V&lt;sub&gt;R&lt;/sub&gt;=10 V λ=λ&lt;sub&gt;p&lt;/sub&gt; (W/Hz&lt;sup&gt;1/2&lt;/sup&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(nm)</td>
<td>(nm)</td>
<td></td>
<td></td>
<td></td>
<td>(times/°C)</td>
<td>(GHz)</td>
<td>(pF)</td>
<td>(times/°C)</td>
</tr>
<tr>
<td>S5971</td>
<td>320 to 1000</td>
<td>920</td>
<td>0.64</td>
<td>0.6</td>
<td>1.0</td>
<td>0.07&lt;sup&gt;×3&lt;/sup&gt;</td>
<td>1&lt;sup&gt;×3&lt;/sup&gt;</td>
<td>3&lt;sup&gt;×&lt;/sup&gt;</td>
<td>7.4 × 10&lt;sup&gt;-15&lt;/sup&gt;</td>
</tr>
<tr>
<td>S5972</td>
<td>320 to 1000</td>
<td>800</td>
<td>0.57</td>
<td>0.55</td>
<td>0.42</td>
<td>0.01&lt;sup&gt;×3&lt;/sup&gt;</td>
<td>0.5&lt;sup&gt;×3&lt;/sup&gt;</td>
<td>1&lt;sup&gt;×&lt;/sup&gt;</td>
<td>3.1 × 10&lt;sup&gt;-15&lt;/sup&gt;</td>
</tr>
<tr>
<td>S5973</td>
<td>320 to 1000</td>
<td>760</td>
<td>0.52</td>
<td>0.51</td>
<td>0.47</td>
<td>0.001&lt;sup&gt;×4&lt;/sup&gt;</td>
<td>1&lt;sup&gt;×6&lt;/sup&gt;</td>
<td>1.6&lt;sup&gt;×&lt;/sup&gt;</td>
<td>1.1 × 10&lt;sup&gt;-15&lt;/sup&gt; ×4</td>
</tr>
<tr>
<td>S5973-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.9 × 10&lt;sup&gt;-15&lt;/sup&gt; ×2&lt;sup&gt;×&lt;/sup&gt; v&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>S5973-02</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

*1: Window material K: borosilicate glass, L: lens type borosilicate glass
*2: λ=410 nm
*3: V<sub>R</sub>=10 V
*4: V<sub>R</sub>=3.3 V

www.hamamatsu.com
Si PIN photodiodes

- **S5971, S5972, S5973 series**

**Spectral response**

![Spectral response graph](image)

**Photosensitivity temperature characteristics**

![Photosensitivity temperature characteristics graph](image)

**Frequency response**

![Frequency response graph](image)

**Cutoff frequency vs. reverse voltage**

![Cutoff frequency vs. reverse voltage graph](image)
Si PIN photodiodes | S5971, S5972, S5973 series

**Dark current vs. reverse voltage**

![Graph showing dark current vs. reverse voltage for S5971, S5972, S5973 series.]

**Terminal capacitance vs. reverse voltage**

![Graph showing terminal capacitance vs. reverse voltage for S5971, S5972, S5973 series.]

**Fiber coupling characteristics (S5973-01)**

**X, Y direction**

![Graph showing fiber-coupled sensitivity for X, Y direction.]

**Z direction**

![Graph showing fiber-coupled sensitivity for Z direction.]

- Optical fiber (core diameter: 50 µm)
- Light source = 780 nm LD
- Distance between lens and fiber end Z (mm)
- Shift from lens center X, Y (mm)

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Si PIN photodiodes

S5971, S5972, S5973 series

Dimensional outlines (unit: mm)

1. S5971, S5972, S5973

2. S5973-01

3. S5973-02

Dimensional outline (S5971, etc. unit: mm)

- Window Ø3.0 ± 0.2
- Photosensitive surface Ø0.45
- Lead
- Case
- Window Ø5.4 ± 0.2
- Photonsensitive surface Ø4.7 ± 0.1
- Lead
- Case
- Window Ø5.4 ± 0.2
- Photonsensitive surface Ø4.6 ± 0.1
- Lead
- Case
- Window Ø5.4 ± 0.2
- Photonsensitive surface Ø4.7 ± 0.1
- Lead
- Case

Dimensional outline (S5973-02, unit: mm)

- Window Ø2.0 min.
- Photosensitive surface Ø0.45
- Lead
- Case
- Window Ø5.4 ± 0.2
- Photonsensitive surface Ø4.7 ± 0.1
- Lead
- Case

Dimensional outline (S5973-01, unit: mm)

- Window Ø2.0 min.
- Photosensitive surface Ø0.45
- Lead
- Case
- Window Ø5.4 ± 0.2
- Photonsensitive surface Ø4.7 ± 0.1
- Lead
- Case

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Si PIN photodiodes
S5971, S5972, S5973 series

Related information
www.hamamatsu.com/sp/ssd/doc_en.html

Precautions
- Disclaimer
- Metal, ceramic, plastic package products

Technical information
- Si photodiode / Application circuit example

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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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