The S6045 and S12060 series are near infrared Si APDs developed for use in the 800 nm wavelength band. These APDs are designed so that the temperature coefficient of the operating voltage is low enough to ensure stable operation over a wide temperature range. They are suitable for applications such as optical rangefinders and FSO (free space optics).

**Features**

- **Temperature coefficient of breakdown voltage:** 0.4 V/°C
- **High-speed response**
- **High sensitivity and low noise**

**Applications**

- **Optical rangefinders**
- **FSO**
- **Optical fiber communications**

### Structure / Absolute maximum ratings

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Dimensional outline/Window material*1</th>
<th>Package</th>
<th>Effective photosensitive area size (mm)</th>
<th>Absolute maximum ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Operating temperature Topr (°C)</td>
</tr>
<tr>
<td>S12060-02</td>
<td>(1)/K</td>
<td>TO-18</td>
<td>0.2</td>
<td>-40 to +85</td>
</tr>
<tr>
<td>S12060-05</td>
<td>(2)/K</td>
<td>TO-5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>S12060-10</td>
<td>(3)/K</td>
<td>TO-8</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>S6045-04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S6045-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S6045-06</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.

*1: K=borosilicate glass

*2: Area in which a typical gain can be obtained

### Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Spectral response range (nm)</th>
<th>Peak sensitivity wavelength (nm)</th>
<th>Photosensitivity S M=1, λ=800 nm (A/W)</th>
<th>Quantum efficiency QE M=1, λ=800 nm (%)</th>
<th>Breakdown voltage Vbr, Id=100 μA (V)</th>
<th>Temp. coefficient of Vbr (V/°C)</th>
<th>Dark current Id Typ. (nA)</th>
<th>Cutoff frequency fc, RL=50 Ω (MHz)</th>
<th>Terminal capacitance Ct (pF)</th>
<th>Excess noise figure, λ=800 nm (ppm)</th>
<th>Gain M, λ=800 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>S12060-02</td>
<td>400 to 1000</td>
<td>800</td>
<td>0.5</td>
<td>75</td>
<td>200</td>
<td>300</td>
<td>0.4</td>
<td>1000</td>
<td>1.5</td>
<td>100</td>
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<tr>
<td>S12060-05</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>0.1</td>
<td>900</td>
<td>2.5</td>
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</tr>
<tr>
<td>S12060-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.2</td>
<td>600</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>S6045-04</td>
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<td></td>
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<td>0.5</td>
<td>350</td>
<td>12</td>
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<tr>
<td>S6045-05</td>
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<td></td>
<td>1</td>
<td>80</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>S6045-06</td>
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<td></td>
<td></td>
<td></td>
<td>3</td>
<td>35</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

*3: Values measured at a gain listed in the characteristics table
**Terminal capacitance vs. reverse voltage**

![Graph showing terminal capacitance vs. reverse voltage for different models of Si APD S6045/S12060 series.](image)

**Dimensional outlines (unit: mm)**

(1) S12060-02/-05/-10

![S12060-02/-05/-10 dimensional outline](image)

- Photosensitive surface: 5.4 ± 0.1
- Window: 4.7 ± 0.1
- 2.8 ± 0.2
- 3.7 ± 0.2
- Lead: 0.45
- Distance from photosensitive area center to cap center:
  - -0.3 ≤ X ≤ +0.3
  - -0.3 ≤ Y ≤ +0.3
- The glass window may extend a maximum of 0.2 mm above the upper surface of the cap.

(2) S6045-04

![S6045-04 dimensional outline](image)

- Photosensitive surface: 9.1 ± 0.2
- Window: 8.2 ± 0.1
- 2.6 ± 0.2
- 4.7 ± 0.2
- Lead: 0.45
- Case: 5.08 ± 0.2
- 1.5 max.
- Distance from photosensitive area center to cap center:
  - -0.3 ≤ X ≤ +0.3
  - -0.3 ≤ Y ≤ +0.3

KAPDA0011EC
### Replacements for previous products

<table>
<thead>
<tr>
<th>Previous product (listed on the previous datasheet)</th>
<th>Replacement (listed on this datasheet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S6045-01</td>
<td>S12060-02</td>
</tr>
<tr>
<td>S6045-02</td>
<td>S12060-05</td>
</tr>
<tr>
<td>S6045-03</td>
<td>S12060-10</td>
</tr>
</tbody>
</table>

* Products that have been removed from this datasheet
Related information
www.hamamatsu.com/sp/ssd/doc_en.html

- Precautions
  - Notice
  - Metal, ceramic, plastic package products / Precautions
- Technical information
  - Si APD / Technical information

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