The G8931 series are InGaAs APDs used for distance measurement, optical communication, and low-light-level detection. The G8931-04 provides high-speed response at 2.5 Gbps, which is necessary for SONET, G/GE-PON, and other optical trunk lines. The G8931-20 features a large \( \Phi 0.2 \text{ mm} \) photosensitive area.

### Features
- **High-speed response: 2.5 Gbps (G8931-04)**
- **Low dark current**
- **Low capacitance**
- **High sensitivity**

### Applications
- **Distance measurement**
- **Optical communications**
- **Low-light-level detection**

### Structure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>G8931-04</th>
<th>G8931-10</th>
<th>G8931-20</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photosensitive area</td>
<td>-</td>
<td>( \Phi 0.4 )</td>
<td>( \Phi 0.1 )</td>
<td>( \Phi 0.2 )</td>
<td>mm</td>
</tr>
<tr>
<td>Package</td>
<td>-</td>
<td>TO-18</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Window material</td>
<td>-</td>
<td>Borosilicate glass (AR coated: 1.55 ( \mu \text{ m} ))</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>G8931-04</th>
<th>G8931-10</th>
<th>G8931-20</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward current</td>
<td>IF</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse current</td>
<td>IR</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>mA</td>
</tr>
<tr>
<td>Operating temperature*1</td>
<td>Topr</td>
<td>-40 to +85</td>
<td>-40 to +85</td>
<td>-40 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature*1</td>
<td>Tstg</td>
<td>-55 to +125</td>
<td>-55 to +125</td>
<td>-55 to +125</td>
<td>°C</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: Always be sure to use the product within the absolute maximum ratings. Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>G8931-04</th>
<th>G8931-10</th>
<th>G8931-20</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral response range</td>
<td>( \lambda )</td>
<td>0.95 to 1.7</td>
<td>0.95 to 1.7</td>
<td>0.95 to 1.7</td>
<td>( \mu \text{ m} )</td>
</tr>
<tr>
<td>Peak sensitivity wavelength</td>
<td>( \lambda_p )</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>( \mu \text{ m} )</td>
</tr>
<tr>
<td>Photosensitivity</td>
<td>S</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Dark current</td>
<td>ID</td>
<td>40</td>
<td>65</td>
<td>90</td>
<td>140</td>
</tr>
<tr>
<td>Temperature coefficient of dark current</td>
<td>( \Delta T ID )</td>
<td>1.07</td>
<td>-1.07</td>
<td>-1.07</td>
<td>-1.07</td>
</tr>
<tr>
<td>Cutoff frequency</td>
<td>fc</td>
<td>4</td>
<td>4</td>
<td>0.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Terminal capacitance</td>
<td>Ct</td>
<td>0.35</td>
<td>0.45</td>
<td>0.7</td>
<td>1</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>VBR</td>
<td>40</td>
<td>55</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Temperature coefficient of breakdown voltage</td>
<td>( \Gamma )</td>
<td>-40 to +85 °C</td>
<td>-0.11</td>
<td>-0.11</td>
<td>-0.11</td>
</tr>
<tr>
<td>Excess noise figure</td>
<td>( x )</td>
<td>0.7</td>
<td>0.85</td>
<td>0.7</td>
<td>0.85</td>
</tr>
<tr>
<td>Gain</td>
<td>M</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>30</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: Always be sure to use the product within the absolute maximum ratings. Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality.

www.hamamatsu.com
Spectral response

(Typ. Ta=25 °C, M=10)

Photosensitivity (A/W)

Wavelength (µm)

Spectral transmittance of window material

(Typ. Ta=25 °C)

Transmittance (%)

Wavelength (µm)

Photosensitivity temperature characteristics

(Typ.)

Temperature coefficient of photosensitivity (%/ °C)

Wavelength (µm)
InGaAs APD  |  G8931 series

- Dark current, photocurrent, gain vs. reverse voltage

<table>
<thead>
<tr>
<th>G8931-04</th>
<th>G8931-10</th>
</tr>
</thead>
</table>

(Typ. Ta=25 °C, λ=1.55 µm)

- Terminal capacitance vs. reverse voltage
InGaAs APD G8931 series

Dimensional outline (unit: mm)

- Window: 3.0 ± 0.1
- 4.7 ± 0.1
- 3.0 ± 0.1
- 2.6 ± 0.2
- 3.7 ± 0.2
- 13 mm

- Photosensitive surface
- Lead: 0.45
- 2.5 ± 0.2

APD peripheral circuit example

- Bias power supply (temperature compensation)
- Power supply limiting resistor
- 0.1 µF or more (as close to APD as possible)
- Overvoltage protection circuit
- High-speed op amp
- Output
- Readout circuit

Related information

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

- Precautions
- Disclaimer
- Safety precautions
- Metal, ceramic, plastic packages
- Compound semiconductor photosensors

- Technical information
- Infrared detectors

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