InGaAs PIN photodiodes

G12183 series

Long wavelength type (cutoff wavelength: 2.55 to 2.6 μm)

Features
- Cutoff wavelength: 2.55 to 2.6 μm
- Low cost
- Photosensitive area: φ0.3 to φ3 mm
- Low noise
- High sensitivity:
- High reliability
- High-speed response
- High short-wavelength sensitivity (G12183-210KA-03): 0.4 A/W (λ=900 nm)

Applications
- Optical power meters
- Gas analysis
- Moisture meters
- NIR (near infrared) photometry

Structure

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Dimensional outline/ window material*1</th>
<th>Package</th>
<th>Cooling</th>
<th>Photosensitive area (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G12183-003K</td>
<td>(1)/K</td>
<td>TO-18</td>
<td>Non-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-005K</td>
<td>(1)/K</td>
<td>TO-5</td>
<td></td>
<td>φ0.5</td>
</tr>
<tr>
<td>G12183-010K</td>
<td>(1)/K</td>
<td>TO-8</td>
<td>One-stage TE-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-020K</td>
<td>(2)/K</td>
<td></td>
<td>One-stage TE-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-030K</td>
<td>(2)/K</td>
<td></td>
<td>One-stage TE-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-103K</td>
<td>(3)/K</td>
<td></td>
<td>One-stage TE-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-105K</td>
<td>(3)/K</td>
<td></td>
<td>One-stage TE-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-110K</td>
<td>(3)/K</td>
<td></td>
<td>One-stage TE-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-120K</td>
<td>(3)/K</td>
<td></td>
<td>Two-stage TE-cooled</td>
<td>φ2</td>
</tr>
<tr>
<td>G12183-130K</td>
<td>(3)/K</td>
<td></td>
<td>Two-stage TE-cooled</td>
<td>φ3</td>
</tr>
<tr>
<td>G12183-203K</td>
<td>(4)/K</td>
<td></td>
<td>Two-stage TE-cooled</td>
<td>φ0.3</td>
</tr>
<tr>
<td>G12183-205K</td>
<td>(4)/K</td>
<td></td>
<td>Two-stage TE-cooled</td>
<td>φ0.5</td>
</tr>
<tr>
<td>G12183-210K</td>
<td>(4)/K</td>
<td></td>
<td>Two-stage TE-cooled</td>
<td>φ1</td>
</tr>
<tr>
<td>G12183-220K</td>
<td>(4)/K</td>
<td></td>
<td>Two-stage TE-cooled</td>
<td>φ2</td>
</tr>
<tr>
<td>G12183-230K</td>
<td>(4)/K</td>
<td></td>
<td>Two-stage TE-cooled</td>
<td>φ3</td>
</tr>
<tr>
<td>NEW G12183-210KA-03</td>
<td>(5)/K</td>
<td>TO-66</td>
<td>Two-stage TE-cooled</td>
<td>φ1</td>
</tr>
</tbody>
</table>

*1: K=borosilicate glass

NEW: Amplifier for InGaAs PIN photodiode C4159-03
NEW: Heatsink for two-stage TE-cooled type A3179
NEW: Heatsink for two-stage TE-cooled type (excluding G12183-210KA-03) A3179-01
NEW: Temperature controller for TE-cooled type C1103-04

Options
- Amplifier for InGaAs PIN photodiode C4159-03
- Heatsink for two-stage TE-cooled type A3179
- Heatsink for two-stage TE-cooled type (excluding G12183-210KA-03) A3179-01
- Temperature controller for TE-cooled type C1103-04

The G12183 series may be destroyed or deteriorated by static electricity. Use caution when handling.

www.hamamatsu.com
## Absolute maximum ratings

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Thermistor power dissipation ( P_{d\text{,th}} ) (mW)</th>
<th>Allowable TE-cooler current ( I_{\text{TE\max}} ) (A)</th>
<th>Allowable TE-cooler voltage ( V_{\text{TE\max}} ) (V)</th>
<th>Reverse voltage ( V_{\text{R\max}} ) (V)</th>
<th>Operating temperature ( T_{\text{opr}} ) (°C)</th>
<th>Storage temperature ( T_{\text{stg}} ) (°C)</th>
<th>Soldering conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>G12183-003K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-40 to +85°²</td>
<td>-55 to +125°²</td>
<td>260 °C or less, 10 s or less</td>
<td></td>
</tr>
<tr>
<td>G12183-005K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-010K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-020K</td>
<td>0.2</td>
<td>1.5</td>
<td>1.0</td>
<td>1</td>
<td>-40 to +70°²</td>
<td>-55 to +85°²</td>
<td></td>
</tr>
<tr>
<td>G12183-030K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-103K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-105K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-110K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-120K</td>
<td>-</td>
<td>-</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>G12183-130K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-203K</td>
<td>1.0</td>
<td>1.2</td>
<td>1.0</td>
<td>1</td>
<td>-40 to +70°²</td>
<td>-55 to +85°²</td>
<td></td>
</tr>
<tr>
<td>G12183-205K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-210K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-220K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G12183-230K</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEW</strong>G12183-210KA-03</td>
<td>-</td>
<td>-</td>
<td>-</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.

*²: 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.

## Electrical and optical characteristics (Typ. unless otherwise noted)

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Measurement conditions</th>
<th>Thermistor resistance ( R_{\text{th}} ) (kΩ)</th>
<th>Thermistor B constant ( B ) (K)</th>
<th>Spectral response range ( \lambda ) (μm)</th>
<th>Peak sensitivity wavelength ( \lambda_{p} ) (μm)</th>
<th>Photosensitivity ( S_{\lambda=\lambda_{p}} ) (W/A)</th>
<th>Dark current ( I_{\text{D}} ) ( V_{R}=0.5 ) V (μA)</th>
<th>Temperature coefficient of dark current ( V_{R}=0.5 ) V (times/°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G12183-003K</td>
<td>25</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.6</td>
<td>2.3</td>
<td>0.9 to 2.57</td>
<td>4.4</td>
<td>1.035</td>
</tr>
<tr>
<td>G12183-005K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-010K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
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<td>G12183-020K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
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<td>G12183-030K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-103K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-105K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-110K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-120K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-130K</td>
<td>-10</td>
<td>-</td>
<td>-</td>
<td>0.9 to 2.57</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-203K</td>
<td>-20</td>
<td>9.0</td>
<td>3.3</td>
<td>0.9 to 2.55</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-205K</td>
<td>-20</td>
<td>9.0</td>
<td>3.3</td>
<td>0.9 to 2.55</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-210K</td>
<td>-20</td>
<td>9.0</td>
<td>3.3</td>
<td>0.9 to 2.55</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-220K</td>
<td>-20</td>
<td>9.0</td>
<td>3.3</td>
<td>0.9 to 2.55</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td>G12183-230K</td>
<td>-20</td>
<td>9.0</td>
<td>3.3</td>
<td>0.9 to 2.55</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
<tr>
<td><strong>NEW</strong>G12183-210KA-03</td>
<td>-20</td>
<td>9.0</td>
<td>3.3</td>
<td>0.9 to 2.55</td>
<td>2.3</td>
<td>0.9 to 2.55</td>
<td>0.4</td>
<td>1.038</td>
</tr>
</tbody>
</table>

*³: \( V_{R}=10 \) mV

*4: \( V_{R}=10 \) mV
### InGaAs PIN photodiodes

#### G12183 series

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Spectral response</th>
<th>Spectral transmittance of window material</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New</strong> G12183-210KA-03</td>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

#### Spectral response

- **Type no.**: G12183-210KA-03
- **Wavelength (μm)**: 0.8 to 2.6
- **Element temperature (°C)**:
  - Tchip = 25 °C
  - Tchip = -10 °C
  - Tchip = -20 °C

#### Spectral transmittance of window material

- **Type no.**: G12183-210KA-03
- **Wavelength (μm)**: 0.8 to 2.6
- **Transmittance (%)**:
  - Tchip = 25 °C

---

*4: Excluding G12183-210KA-03

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#### G12183-003K
- **Element temperature (°C)**: 25
- **Cutoff frequency (fc)**: 20 MHz
- **Terminal capacitance (CT)**: 50 pF
- **Max. (pF)**: 100
- **Shunt resistance (Rsh)**: 50 kΩ
- **Typ. (kΩ)**: 5
- **Detectivity D**: $3 \times 10^{10}$
- **Noise equivalent power (NEP)**: $9 \times 10^{-13}$

#### G12183-005K
- **Element temperature (°C)**: -10
- **Cutoff frequency (fc)**: 5 MHz
- **Terminal capacitance (CT)**: 20 pF
- **Max. (pF)**: 100
- **Shunt resistance (Rsh)**: 50 kΩ
- **Typ. (kΩ)**: 10
- **Detectivity D**: $1 \times 10^{11}$
- **Noise equivalent power (NEP)**: $1 \times 10^{-13}$

#### G12183-010K
- **Element temperature (°C)**: -20
- **Cutoff frequency (fc)**: 2 MHz
- **Terminal capacitance (CT)**: 1 pF
- **Max. (pF)**: 100
- **Shunt resistance (Rsh)**: 50 kΩ
- **Typ. (kΩ)**: 0.65
- **Detectivity D**: $1 \times 10^{12}$
- **Noise equivalent power (NEP)**: $3 \times 10^{-13}$

---

*NEW* G12183-210KA-03
- **Element temperature (°C)**: 2
- **Cutoff frequency (fc)**: 4 MHz
- **Terminal capacitance (CT)**: 50 pF
- **Max. (pF)**: 100
- **Shunt resistance (Rsh)**: 20 kΩ
- **Typ. (kΩ)**: 2
- **Detectivity D**: $2 \times 10^{12}$
- **Noise equivalent power (NEP)**: $4 \times 10^{-13}$
**InGaAs PIN photodiodes**

**G12183 series**

### Photosensitivity temperature characteristics

(Typ. \( V_e = 0 \, \text{V} \))

- **Linearity**

(Typ. \( T_a = 25 \, ^\circ \text{C} \), \( \lambda = 1.55 \, \mu\text{m} \), \( R_L = 2 \, \Omega \), \( V_e = 0 \, \text{V} \))

### Dark current vs. reverse voltage

<table>
<thead>
<tr>
<th>Non-cooled type</th>
<th>TE-cooled type</th>
</tr>
</thead>
</table>

- **Incident light level (mW)**

- **Relative sensitivity (%)** (Typ. \( T_a = 25 \, ^\circ \text{C} \), \( \lambda = 1.55 \, \mu\text{m} \), \( R_L = 2 \, \Omega \), \( V_e = 0 \, \text{V} \))

### Linearity

- **Relative sensitivity (%)**

- **Incident light level (mW)**

### Photosensitivity temperature characteristics

- **Wavelength (μm)**

- **Photosensitivity temperature coefficient (%/°C)** (Typ. \( V_e = 0 \, \text{V} \))

### Dark current vs. reverse voltage

- **Non-cooled type**

- **TE-cooled type**

- **Reverse voltage (V)**

- **Dark current**

- **Values in parentheses indicate chip temperature.**
InGaAs PIN photodiodes

G12183 series

**Thermistor temperature characteristics**

![Thermistor temperature characteristics](image)

**Cooling characteristics of TE-cooler**

![Cooling characteristics of TE-cooler](image)

**Shunt resistance vs. chip temperature**

![Shunt resistance vs. chip temperature](image)

Note: The operating temperature for the one-stage TE-cooled type and two-stage TE-cooled type is up to 70 °C.

**Terminal capacitance vs. reverse voltage**

![Terminal capacitance vs. reverse voltage](image)

**Thermistor temperature characteristics**

![Thermistor temperature characteristics](image)

**Cooling characteristics of TE-cooler**

![Cooling characteristics of TE-cooler](image)
InGaAs PIN photodiodes  |  G12183 series

- **Current vs. voltage characteristics of TE-cooler**

![Graph showing current vs. voltage characteristics of TE-cooler](image-url)

(Typ. $T_a=25\, ^\circ C$, thermal resistance of heatsink=3 °C/W)

- **Dimensional outline (unit: mm)**

1. **G12183-003K/005K/010K**

   - Input window
     - $\phi 5.9 \pm 0.1$
     - $2.5 \pm 0.2$
     - $0.15 \text{ max.}
     - $0.4 \text{ max.}$

   - Photosensitive surface
     - $\phi 5.1 \pm 0.3$

   - Lead
     - $\phi 0.45$

   - Case
     - $\phi 2.54 \pm 0.2$

2. **G12183-020K/030K**

   - Input window
     - $\phi 8.1 \pm 0.1$
     - $\phi 9.2 \pm 0.2$

   - Photosensitive surface
     - $\phi 5.1 \pm 0.3$

   - Lead
     - $\phi 0.45$

   - Case
     - $\phi 5.1 \pm 0.3$

Distance from photosensitive area center to cap center

$-0.2 \leq X \leq +0.2$

$-0.2 \leq Y \leq +0.2$

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### InGaAs PIN photodiodes

#### G12183 series

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

#### Specifications

- **Input window**
  - \( \phi_{10} \pm 0.2 \)  
  - \( \phi_{14} \pm 0.2 \)  
  - \( \phi_{15.3} \pm 0.2 \)  

- **Photosensitive surface**
  - \( \phi_{0.45} \)

- **Lead**
  - 10.2 ± 0.2
  - 5.1 ± 0.2
  - 5.1 ± 0.2
  - 5.1 ± 0.2

- **Distance from photosensitive area center to cap center**
  - \(-0.3 \leq X \leq +0.3\)
  - \(-0.3 \leq Y \leq +0.3\)

<table>
<thead>
<tr>
<th>(5) G12183-210KA-03</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

#### Specifications

- **Input window**
  - \( \phi_{10} \pm 0.2 \)  
  - \( \phi_{14} \pm 0.1 \)  
  - \( \phi_{31.5} \pm 0.3 \)  

- **Photosensitive surface**
  - \( \phi_{10.8} \)

- **Distance from photosensitive area center to cap center**
  - \(-0.3 \leq X \leq +0.3\)
  - \(-0.3 \leq Y \leq +0.3\)
Related information
www.hamamatsu.com/sp/ssd/doc_en.html

- Precautions
- Disclaimer
- Safety consideration
- Metal, ceramic, plastic package products

Information described in this material is current as of July 2019.
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.
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