The C10439 series photodiode modules are high-precision photodetectors that integrate a photodiode and a current-to-voltage amplifier. The output from these photodiode modules is an analog voltage and can be easily checked with a voltmeter, etc. Since their sensitivity is switchable between two ranges (High/Low), highly accurate output can be obtained by selecting the proper sensitivity range that matches the light level to be detected.

- **Features**
  - Voltage output for easy handling
  - Two-range (High/Low) switching function
  - Compact: half size of a business card (C10439-01/-02/-03/-07/-08/-09/-10/-11/-14) business card size (C10439-15)
  - Can be mounted on optical bench rod (M4)

- **Applications**
  - Precision photometry, light source power monitors, fluorescence detection of printed matter, illuminometers, color difference meters, brix meter, flowmeters (C10439-01/-02/-03/-07/-08/-09/-10/-11)
  - Gas detection (CH₄, CO₂, CO, etc.), flame detection (C10439-14)
  - Spectrophotometers, radiation thermometers (C10439-15)

**Structure**

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Photodiode type</th>
<th>Photosensitive area (mm)</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C10439-01</td>
<td>Si</td>
<td>2.4 × 2.4</td>
<td>19 × 46 × 52</td>
</tr>
<tr>
<td>C10439-02</td>
<td></td>
<td>5.8 × 5.8</td>
<td></td>
</tr>
<tr>
<td>C10439-03</td>
<td></td>
<td>10 × 10</td>
<td></td>
</tr>
<tr>
<td>C10439-07</td>
<td></td>
<td>2.4 × 2.4</td>
<td></td>
</tr>
<tr>
<td>C10439-08</td>
<td></td>
<td>5.8 × 5.8</td>
<td></td>
</tr>
<tr>
<td>C10439-09</td>
<td></td>
<td>10 × 10</td>
<td></td>
</tr>
<tr>
<td>C10439-10</td>
<td>InGaAs</td>
<td>φ1</td>
<td>19 × 50 × 52</td>
</tr>
<tr>
<td>C10439-11</td>
<td></td>
<td>φ3</td>
<td></td>
</tr>
<tr>
<td>C10439-14</td>
<td>InAsSb</td>
<td>0.7 × 0.7</td>
<td>19 × 50 × 52</td>
</tr>
<tr>
<td>C10439-15</td>
<td>Si</td>
<td>2.4 × 2.4</td>
<td>19 × 50 × 75</td>
</tr>
<tr>
<td></td>
<td>InGaAs</td>
<td>φ1</td>
<td></td>
</tr>
</tbody>
</table>
## Photodiode modules

### C10439 series

#### Recommended conditions/Absolute maximum ratings (Ta=25 °C unless otherwise noted)

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Supply voltage $V_s$ (V)</th>
<th>Current consumption Is Max. Dark state (mA)</th>
<th>Capacitive load $C_l$ Max. (pF)</th>
<th>Output resistance $R_o$ (Ω)</th>
<th>Absolute maximum ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
<td></td>
<td></td>
<td>Supply voltage $V_s$ max (V)</td>
</tr>
<tr>
<td>C10439-01</td>
<td>±5</td>
<td>±12</td>
<td>±2</td>
<td>1000</td>
<td>100</td>
</tr>
<tr>
<td>C10439-02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-03</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C10439-07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>C10439-08</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C10439-09</td>
<td></td>
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<td></td>
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<tr>
<td>C10439-10</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>C10439-11</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>C10439-14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-15</td>
<td></td>
<td></td>
<td></td>
<td></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 (Ta=25 °C, $V_s$=±12 V, unless otherwise noted)

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Spectral response range $\lambda$ (nm)</th>
<th>Peak sensitivity wavelength $\lambda_p$ (nm)</th>
<th>Saturation incident light level $P_{sat}$ (nW)</th>
<th>Photosensitivity $S$ (mV/nW)</th>
<th>Conversion impedance $Z_t$ (V/A)</th>
<th>Cutoff frequency $f_c$ -3 dB (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-01</td>
<td>190 to 1100</td>
<td>960</td>
<td>23.6</td>
<td>2360</td>
<td>500</td>
<td>$1 \times 10^3$</td>
</tr>
<tr>
<td>C10439-02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-10</td>
<td>500 to 1700</td>
<td>1550</td>
<td>23600</td>
<td>2360000</td>
<td>0.5</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>C10439-11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-14</td>
<td>320 to 2600</td>
<td>940</td>
<td>23300</td>
<td>2330000</td>
<td>0.45</td>
<td>$1 \times 10^6$</td>
</tr>
<tr>
<td>C10439-15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*2: $\lambda=\lambda_p$

*3: Output amplitude 2 Vp-p

#### Cutoff frequency $f_c$ -3 dB (Hz)

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Cutoff wavelength $\lambda_c$ (μm)</th>
<th>Peak sensitivity wavelength $\lambda_p$ (μm)</th>
<th>Photosensitivity $S$ (mV/nW)</th>
<th>Conversion impedance $Z_t$ (V/A)</th>
<th>Cutoff frequency $f_c$ -3 dB (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-14</td>
<td>5.3</td>
<td>4.1</td>
<td>0.045</td>
<td>0.0045</td>
<td>$1 \times 10^7$</td>
</tr>
</tbody>
</table>

*4: $\lambda=\lambda_p$, uniform irradiation on the entire photosensitive area
### Photodiode modules | C10439 series

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Maximum output amplitude voltage $V_{fs}$</th>
<th>Output offset voltage $V_{os}$ Dark state (mV)</th>
<th>Output noise voltage*5 $V_{n}$ Dark state (mVp-p)</th>
<th>Output offset voltage drift*6 Dark state (mV/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output current $I_0=1$ mA</td>
<td>Min.</td>
<td>Max.</td>
<td>Typ.</td>
</tr>
<tr>
<td>C10439-01</td>
<td>+Vs - 0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-02</td>
<td>+Vs - 0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10439-15</td>
<td>+Vs - 3.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*5: Within frequency band

*6: Dark voltage variation per day, measured at 25 °C after a 10-minute (C10439-15: 60-minute) warm-up after power-on

#### Block diagram

![Block diagram for C10439-01/-02/-03/-07/-08/-09/-10/-11/-14](image1.png)

![Block diagram for C10439-15](image2.png)
Photodiode modules  |  C10439 series

C10439-01/-02/-03

**Output voltage vs. incident light level**

(Typ. Ta=25 °C, Vs=±12 V, λ=λp)

![Graph showing output voltage vs. incident light level](image1)

**Spectral response**

(Typ. Ta=25 °C)

![Graph showing spectral response](image2)

C10439-07/-08/-09

**Output voltage vs. incident light level**

(Typ. Ta=25 °C, Vs=±12 V, λ=λp)

![Graph showing output voltage vs. incident light level](image3)

**Spectral response**

(Typ. Ta=25 °C)

![Graph showing spectral response](image4)
**Photodiode modules**  |  **C10439 series**

---

**Output voltage vs. incident light level**

(Typ. Ta=25 °C, Vs=±12 V, λ=λp)

![Graph showing output voltage vs. incident light level](image1)

**Spectral response**

(Typ. Ta=25 °C)

![Graph showing spectral response](image2)

---

**Output voltage vs. incident light level**

(Typ. Ta=25°C, Vs=±12 V, λ=1.55 μm)

![Graph showing output voltage vs. incident light level](image3)

**Spectral response**

(Typ. Ta=25 °C)

![Graph showing spectral response](image4)
Photodiode modules | C10439 series

**Output voltage vs. incident light level**

(Typ. Ta=25 °C, Vs=±12 V, λ=λp)

![Output voltage vs. incident light level graph](image)

**Spectral response**

(Typ. Ta=25 °C)

![Spectral response graph](image)

**Dimensional outlines (unit: mm, tolerance unless otherwise noted: ±0.2)**

![Dimensional outlines](image)
Photodiode modules | C10439 series

C10439-02/-08

- Power connector HR10A-7R-4P (73) (Hirose Electric, 4-pin, male)
- Output connector BNC
- High/Low range selector switch
- Front edge of the case to photosensitive surface 2.35
- Photosensitive area 5.8 x 5.8
- M4 depth 5

C10439-03/-09

- Power connector HR10A-7R-4P (73) (Hirose Electric, 4-pin, male)
- Output connector BNC
- High/Low range selector switch
- Front edge of the case to photosensitive surface 2.35
- Photosensitive area 10 x 10
- M4 depth 5
Photodiode modules | C10439 series

C10439-10

- Power connector HR10A-7R-4P (73) (Hirose Electric, 4-pin, male)
- Output connector BNC
- High/Low range selector switch
- Front edge of the case to photosensitive surface: 2.6

C10439-11

- Power connector HR10A-7R-4P (73) (Hirose Electric, 4-pin, male)
- Output connector BNC
- High/Low range selector switch
- Front edge of the case to photosensitive surface: 3.3

Photosensitive area: 2.6

(2 ×) M3 depth 4

M4 depth 5

KACCA0328EA

KACCA0327EA
Photodiode modules | C10439 series

C10439-14

Power connector HR10A-7R-4P (73) (Hirose Electric, 4-pin, male)
Output connector BNC
High/Low range selector switch

C10439-15

Power connector HR10A-7R-4P (73) (Hirose Electric, 4-pin, male)
Output connector BNC
High/Low range selector switch

HAMAMATSU
PHOTON IS OUR BUSINESS
**Photodiode modules | C10439 series**

**Connection example**

![Connection example diagram]

- Power cable (accessory)
- Dual power supply (+5 to ±12 V)
  - Be sure to use a dual power supply.
- BNC cable E2573 (sold separately)
- DC voltmeter, oscilloscope, etc.

**Accessories (unit: mm)**

- Instruction manual
- Cable for power supply (no connector on one end)

![Accessories diagram]

**Connector HR10A-7P-4S**
(Hirose Electric, 4-pin, female)
Options (sold separately, unit: mm)

Optical fiber adapter A12781 series

This adapter is used to connect an optical fiber to the photodiode module. Three connector types are available: FC, SC, and SMA.

Note:
- The optical fiber is not included.
- It may not be possible to monitor the total light level depending on the combinations of the photodiode, optical fiber, and fiber adapter that you are using. Select the appropriate components by carefully designing the optical system.

- A12781-01 (for FC type optical fiber)
- A12781-02 (for SC type optical fiber)
- A12781-03 (for SMA type optical fiber)

<Assembly procedure>
Fix the optical fiber adapter in place using the M3 screw holes in the front of the case. (M3 screws are supplied with the adapter.)
Photodiode modules | C10439 series

Optical fiber (SMA type) A9511
This SMA type optical fiber can be used with the photodiode module. The combination of this optical fiber with the SMA type optical fiber adapter (A12781-03) makes it easy to connect an optical fiber to the photodiode module.
Note: The SMA type optical fiber adapter (A12781-03) is not included.

- Specifications
  Photosensitive diameter: φ2 (bundled fiber)
  Photosensitive numerical aperture: 0.56

![Optical fiber (SMA type) A9511 Diagram]

BNC cable E2573
This cable can be used to extract signals from the photodiode module.

- Specifications
  Cable specifications: 1.5D-QEV

![BNC cable E2573 Diagram]

Signal processing unit for photodiode module C10475
This unit converts the output from a photodiode module (C10439 series) into digital signals. High resolution digital output (16 bits) can be retrieved through a serial connection (RS-232C) from a PC. The supplied sample software can be used to easily load measurement data.
For the specifications, refer to the C10475 datasheet.

- Specifications
  Size: 110 × 100 × 30