Photon counting modules

C11202 series

Single pixel photon counting module for low-light-level detection

The C11202 series is a single-photon counting module capable of detecting low light levels. The C11202 series is made up of a thermoelectrically cooled single-pixel photon counter (SPPC), an amplifier, a comparator, a high-voltage power supply circuit, and a temperature controller. The photosensitive area is available in two sizes of \( \phi 50 \) \( \mu m \) and \( \phi 100 \) \( \mu m \), and such small photosensitive areas offer a low dark count. Modules operate just by connecting them to an external power supply (\( \pm 5 \) V).

**Features**

- High sensitivity in the short wavelength range
- Low dark count
- Low afterpulse

**Applications**

- Low-light-level measurement
- Particle diameter measurement
- Fluorescence measurement
- Analytical instrument

**Structure**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>C11202-050</th>
<th>C11202-100</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal photodetector</td>
<td>-</td>
<td>Single-pixel photon counter</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Photosensitive area size</td>
<td>-</td>
<td>( \phi 50 )</td>
<td>( \phi 100 )</td>
<td>( \mu m )</td>
</tr>
</tbody>
</table>

**Absolute maximum ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>C11202-050</th>
<th>C11202-100</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>Vs</td>
<td>( \pm 6 ) V</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>Topr</td>
<td>No condensation</td>
<td>-10 to +40</td>
<td>-10 to +40</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg</td>
<td>No condensation</td>
<td>-20 to +70</td>
<td>-20 to +70</td>
<td>°C</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 (Typ. Ta=25 °C, \( \lambda=\lambda_p \), Vs=\( \pm 5 \) V, unless otherwise noted)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>C11202-050</th>
<th>C11202-100</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral response range</td>
<td>( \lambda )</td>
<td>320 to 900</td>
<td>320 to 900</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Peak sensitivity wavelength</td>
<td>( \lambda_p )</td>
<td>- 450</td>
<td>- 450</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Element temperature</td>
<td>Td</td>
<td>- -20</td>
<td>- -20</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>(set temperature)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photon detection efficiency</td>
<td>PDE</td>
<td>60 70</td>
<td>60 70</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Dark count</td>
<td>-</td>
<td>7 25</td>
<td>30 100</td>
<td>cps</td>
<td></td>
</tr>
<tr>
<td>Afterpulse probability</td>
<td>-</td>
<td>100 ns to 500 ns</td>
<td>- 0.1</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Comparator output</td>
<td>-</td>
<td>TTL compatible</td>
<td>TTL compatible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum count rate</td>
<td>-</td>
<td>30</td>
<td>20</td>
<td>Mcps</td>
<td></td>
</tr>
</tbody>
</table>
### Electrical characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>+Vs</td>
<td>+4.75</td>
<td>+5</td>
<td>5.25</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Vs</td>
<td>-4.75</td>
<td>-5</td>
<td>-5.25</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>Ic</td>
<td>+Vs</td>
<td>-200</td>
<td>+1000</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Vs</td>
<td>-</td>
<td>-40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Block diagram

![Block diagram](image)

### Connection example

Using the supplied power cable, connect the photon counting module to a power supply. You can count output pulses by connecting the photon counting module to a frequency counter.
**Measurement example**

Comparator output

**Photon detection efficiency vs. wavelength**

![Graph showing photon detection efficiency vs. wavelength](graph1)

**Linearity (typical example)**

![Graph showing linearity vs. number of incident photons](graph2)

![Graph showing number of incident photons](graph3)
Photon counting modules | C11202 series

Dimensional outline (unit: mm)

- Light input window φ9.5
- Photosensitive area
- Photosensitive surface
- Digital output connector (SMB connector)
- Power connector SSB-PH-K-S (J.S.T.MFG.)

Tolerance unless otherwise noted: ±0.5
Weight: 230 g

Hamamatsu
Photon is our business
Photon counting modules

C11202 series

Accessories
- Power cable
- Instruction manual

Options (sold separately)

Coaxial converter adapter A10613 series

The A10613 series is a coaxial adapter that converts the SMB coaxial connector for signal-output on the photon counting module to a BNC or SMA coaxial connector. This adapter allows connecting a BNC or SMA cable to the photon counting module.

A10613-01 (SMB-BNC)  A10613-02 (SMB-SMA)

Precautions
- For cleaning the product, wipe using a clean, soft, dry cloth. Do not use organic solvents such as thinner and acetone.
- Do not cover the unit with a dark cloth or something similar while the product is running. Covering the product can cause the internal temperature to rise and prevent it from operating normally.

Accessories
- Power cable
- Instruction manual

Related information

Precautions
- Notice

Information described in this material is current as of March 2020. 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.

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. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.