

MPPC® (Multi-Pixel Photon Counter)



S14420 series

Visible/near infrared MPPC

MPPC is a type of device called SiPM (silicon photomultipliers). It is a new type of photon counting device that consists of multiple Geiger mode APD (avalanche photodiode) pixels. It is an opto-semiconductor with outstanding photon counting capability and low operating voltage and is immune to the effects of magnetic fields.

The S14420 series is an MPPC for the visible to near infrared region. It provides higher photon detection efficiency than the previous product (S13360 series) in the visible to near infrared region.

Features

- High photon detection efficiency: 40% ($\lambda=600$ nm, $V_{op}=V_{BR} + 5$)
- Low crosstalk, low afterpulses
- Low voltage ($V_{BR}=42$ V typ.) operation
- High gain: 10^5 to 10^6
- Operates with simple readout circuits
- MPPC module also available (sold separately)

Applications

- Flow cytometry
- Laser scan microscope
- Fluorescence measurement

Structure / Absolute maximum ratings

| Type no. | Pixel pitch (μm) | Photosensitive area (mm) | Number of pixels | Fill factor (%) | Package | Window material | Window refractive index | Absolute maximum ratings | | |
|---------------|----------------------------------|--------------------------------|---------------------|--------------------|-----------------|-----------------------|-------------------------------|--|--|---|
| | | | | | | | | Operating temperature* ¹ Topr (°C) | Storage temperature* ¹ Tstg (°C) | Soldering conditions* ² |
| S14420-1525MG | 25 | φ1.5 | 2876 | 63 | Metal (TO-5) | Borosilicate glass | 1.49 | -40 to +85 | -40 to +105 | Peak temperature: 350 °C, once, 3 s max. |
| S14420-1550MG | 50 | | 724 | 81 | | | | | | |
| S14420-3025MG | 25 | φ3.0 | 11344 | 63 | | | | | | |
| S14420-3050MG | 50 | | 2836 | 81 | | | | | | |

*1: No dew condensation

*2: At least 1 mm away from lead roots

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.

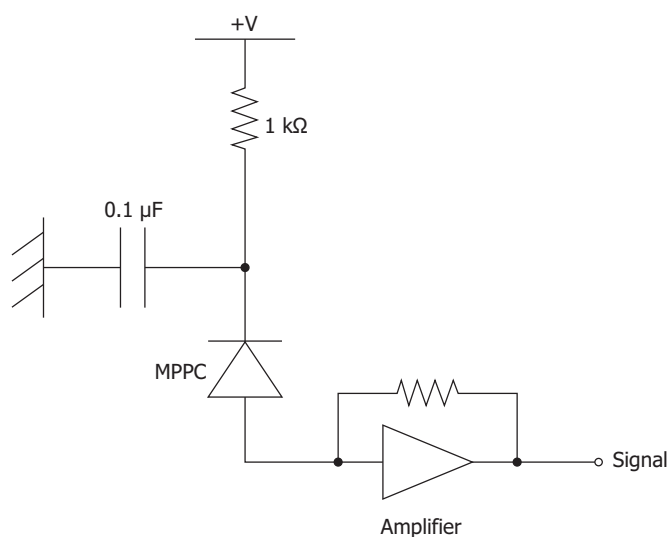
Electrical and optical characteristics

| Type no. | Spectral response range λ (nm) | Peak sensitivity wavelength λ_p (nm) | Photon detection efficiency ^{*3} PDE $\lambda = \lambda_p$ (%) | Dark count | | Terminal capacitance C_t (pF) | Gain M | Breakdown voltage V_{BR} (V) | Crosstalk probability (%) | Recommended operating voltage ^{*4} V_{op} (V) | Temperature coefficient of recommended operating voltage ΔT_{Vop} (mV/°C) |
|---------------|--|--|---|-------------|-------------|---------------------------------|-------------------|--------------------------------|---------------------------|--|---|
| | | | | Typ. (kcps) | Max. (kcps) | | | | | | |
| S14420-1525MG | 350 to 1000 | 600 | 30 | 380 | 1000 | 90 | 0.9×10^6 | 42 ± 5 | 1.5 | $V_{BR} + 5$ | 47 |
| S14420-1550MG | | | 40 | | | | | | 3.6×10^6 | | |
| S14420-3025MG | | | 30 | 1600 | 4000 | 350 | 0.9×10^6 | | 1.5 | | |
| S14420-3050MG | | | 40 | | | | | | 3.6×10^6 | | |

*3: Photon detection efficiency does not include crosstalk or afterpulses.

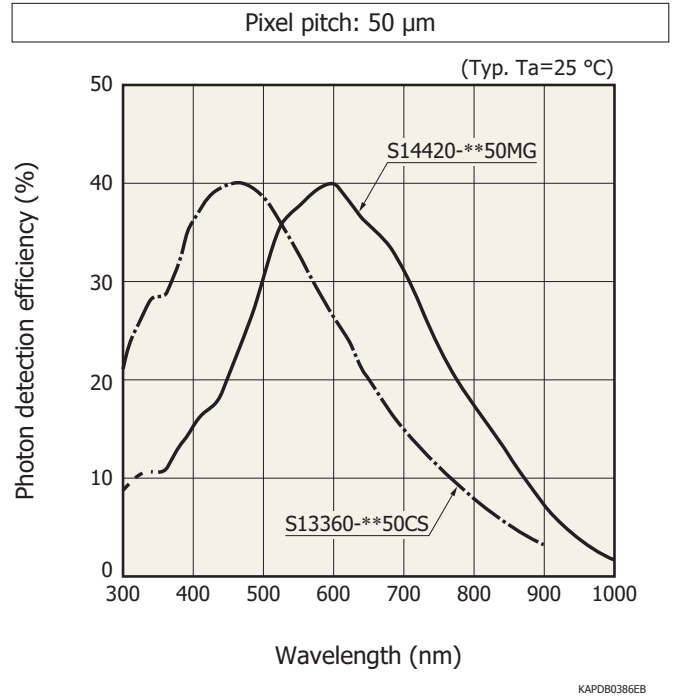
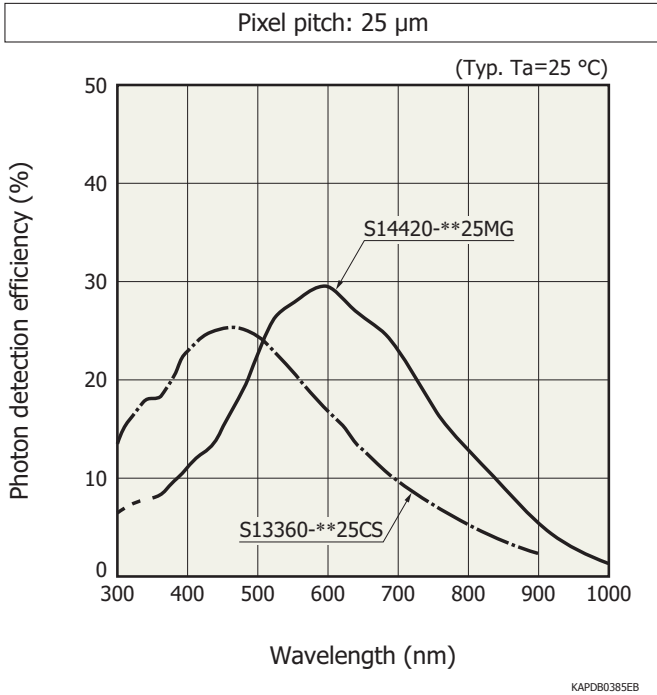
*4: Refer to the data provided with the product.

Connection example



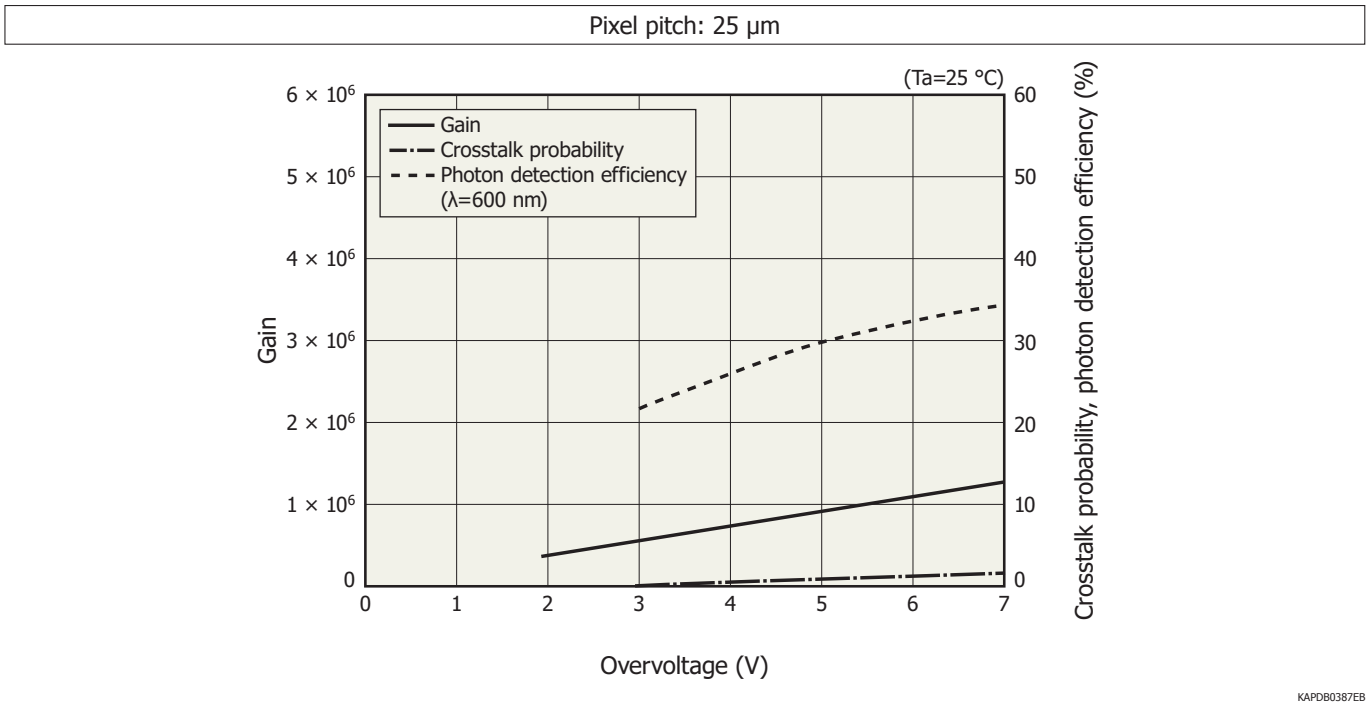
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Photon detection efficiency vs. wavelength (typical example)

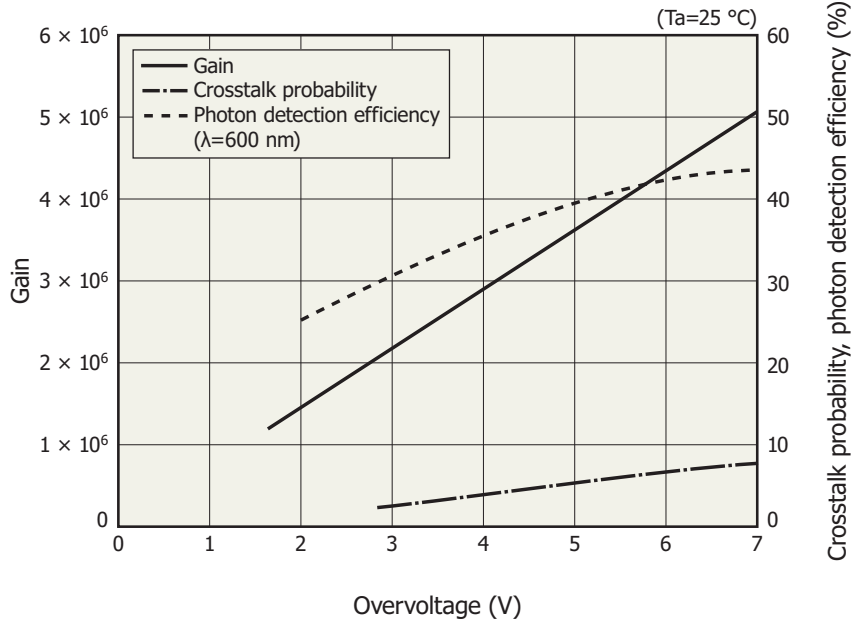


Photon detection efficiency does not include crosstalk or afterpulses.

Gain, crosstalk probability, photon detection efficiency-overvoltage characteristics (typical example)



Pixel pitch: 50 μm

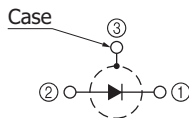
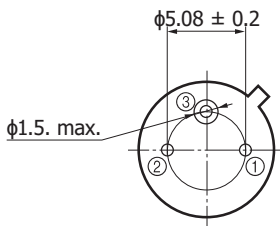
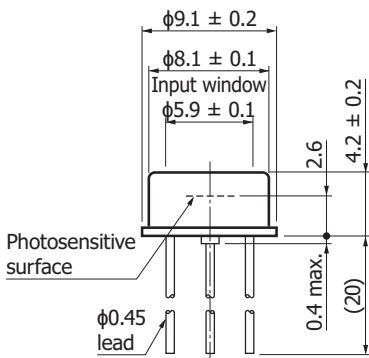
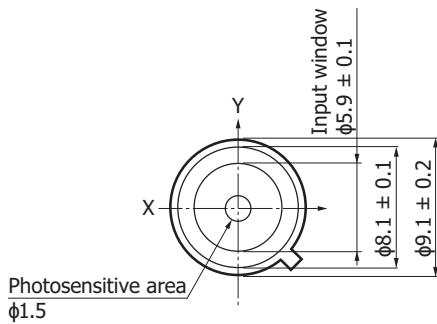


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MPPC characteristics vary with the operating voltage. Although increasing the operating voltage improves the photon detection efficiency and time resolution, it also increases the dark count and crosstalk at the same time, so an optimum operating voltage must be selected to match the application.

Dimensional outlines (unit: mm)

S14420-1525MG/-1550MG

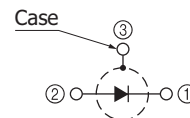
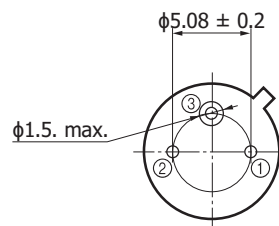
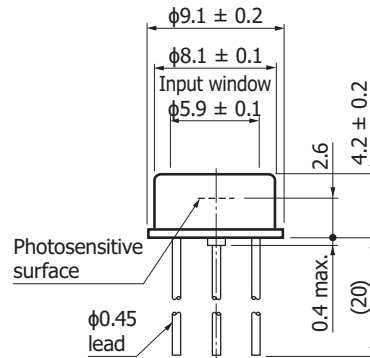
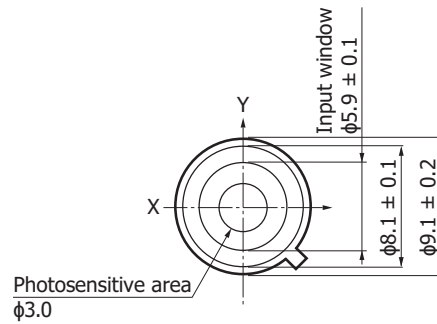


Distance from photosensitive area center to cap center
 $-0.3 \leq X \leq +0.3$
 $-0.3 \leq Y \leq +0.3$

The glass window may extend a maximum of 0.2 mm above the upper surface of the cap.

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S14420-3025MG/-3050MG



Distance from photosensitive area center to cap center
 $-0.3 \leq X \leq +0.3$
 $-0.3 \leq Y \leq +0.3$

The glass window may extend a maximum of 0.2 mm above the upper surface of the cap.

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Precautions

- If necessary, incorporate appropriate protective circuits in power supplies, devices, and measuring instruments to prevent overvoltage and overcurrent.

Related information

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

Precautions

- Disclaimer
- Metal, ceramic, plastic package products

Driver circuit for MPPC: C14450

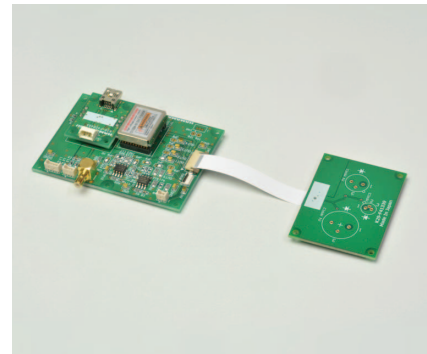
The C14450 is a simple evaluation starter kit for non-cooled visible/near infrared MPPC. MPPC evaluation is possible by mounting an MPPC in the socket of the sensor circuit board. Various types of MPPCs can be evaluated.

The power supply circuit board is equipped with the C11204-01, a high-accuracy, high-voltage power supply that provides the operating voltage for MPPCs. It operates just by connecting to an external power supply (± 5 V). It is also equipped with a USB interface that can be used to set the operating voltage and temperature compensation coefficient from a PC running the supplied sample software.

Features

- Enables the evaluation of non-cooled visible/near infrared MPPCs
- Sensor circuit board with a socket for mounting an MPPC with leads
- Equipped with a high-accuracy, high-voltage C11204-01 power supply
- Adjustable operating voltage and temperature compensation coefficient
- Selectable amplifier usage (the default condition is use)
- Built-in pole-zero cancellation (PZC) circuit (Initial condition: set to a PZC constant appropriate for the S14420-3050MG)
- Analog output

Note: MPPC is sold separately.



Applications

- Simple initial evaluation of MPPCs

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The content of this document is current as of March 2018.

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