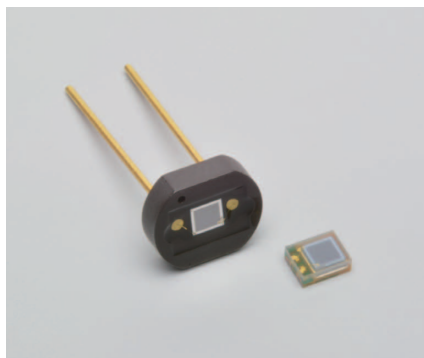


MPPC® (Multi-Pixel Photon Counter)



S13720 series

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 S13720 series near infrared MPPC provides high photon detection efficiency in the near infrared region.

Features

- High photon detection efficiency (twice that of Hamamatsu S13360 series): 7% ($\lambda=905$ nm)
- Low crosstalk
- Small package (S13720-1325PS)
- High gain: 10^5 to 10^6

Applications

- Distance measurement (e.g., LiDAR)

Structure

Parameter	S13720-1325CS	S13720-1325PS	Unit
Effective photosensitive area	1.3 × 1.3		mm
Pixel pitch	25		μm
Number of pixels/ch	2668		-
Fill factor	47		%
Package	Ceramic	Surface mount type	-
Window material	Silicone		-
Refractive index of window material	1.41	1.57	-

Absolute maximum ratings

Parameter	Symbol	S13720-1325CS	S13720-1325PS	Unit
Operating temperature*1	Topr	-40 to +85		°C
Storage temperature*1	Tstg	-40 to +105		°C
Soldering conditions	Tsol	350 °C max., once, 3 s max	Peak temperature: 260 °C , 3 times*2	-

*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.

*2: JEDEC level 2a

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.

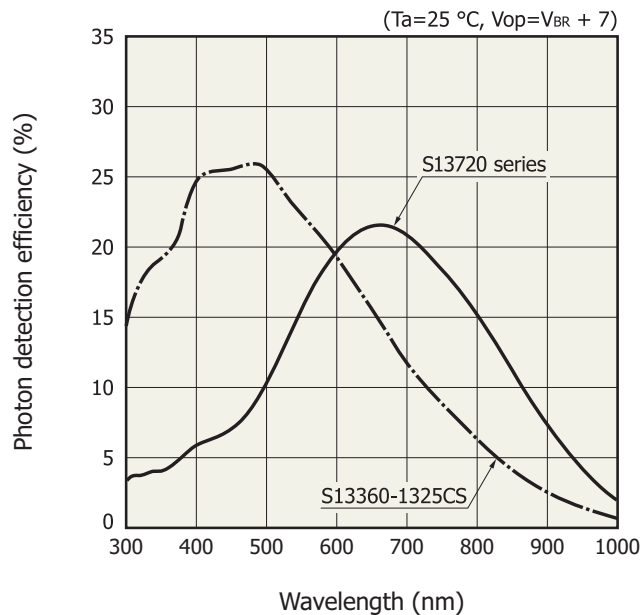
Electrical and optical characteristics (Typ. Ta=25 °C, overvoltage=7 V, unless otherwise noted)

Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit
Spectral response range		λ	-	350 to 1000	-	nm
Peak sensitivity wavelength		λ_p	-	660	-	nm
Photon detection efficiency*3	$\lambda=\lambda_p$	PDE	-	22	-	%
	$\lambda=905\text{ nm}$		-	7	-	
Breakdown voltage		V_{BR}	52	57	62	V
Recommended operating voltage*4		V_{op}	-	$V_{BR} + 7$	-	V
Dark count		-	-	500	1500	kcps
Crosstalk probability		-	-	6	-	%
Terminal capacitance		C_t	-	65	-	pF
Gain		M	-	1.1×10^6	-	-
Temperature coefficient of reverse voltage		ΔTV_{op}	-	54	-	mV/°C

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

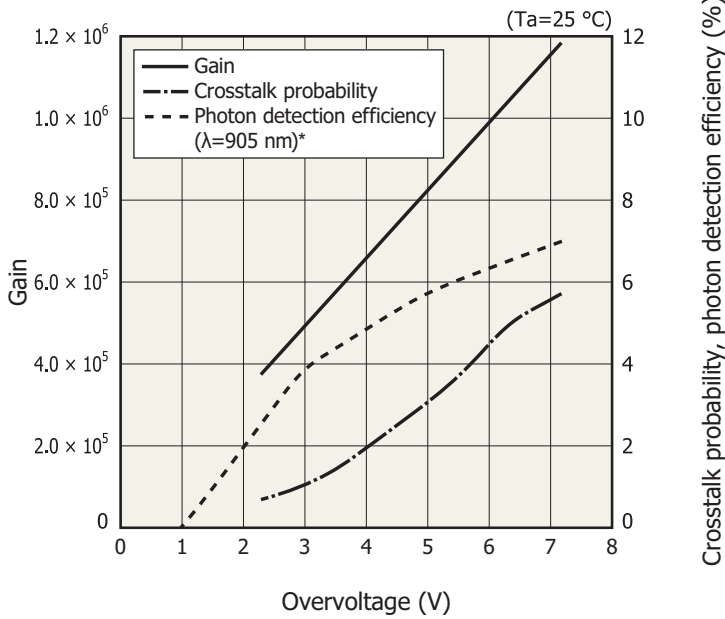
*4: Refer to the label affixed to the product package. Recommended operating voltage variation in-reel products: $\pm 0.25\text{ V/reel}$

Photon detection efficiency vs. wavelength (typical example)



KAPDB0377EB

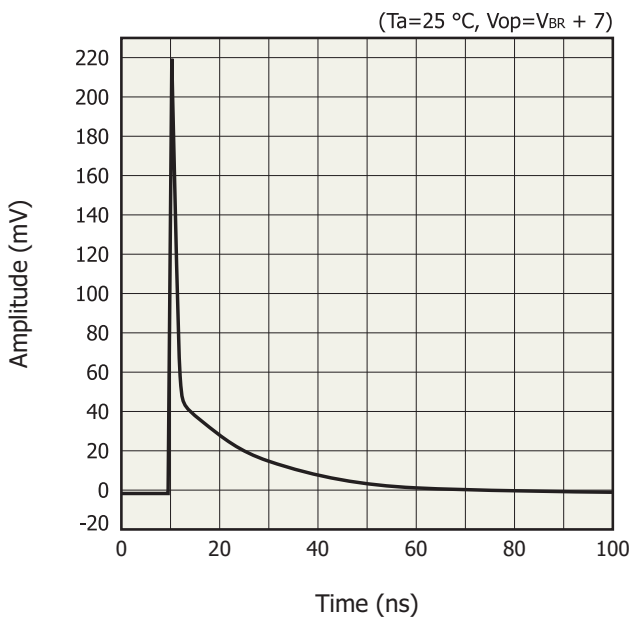
Gain, crosstalk probability, photon detection efficiency-overvoltage characteristics (typical example)



* Converted from photon detection efficiency ($\lambda=660$ nm)

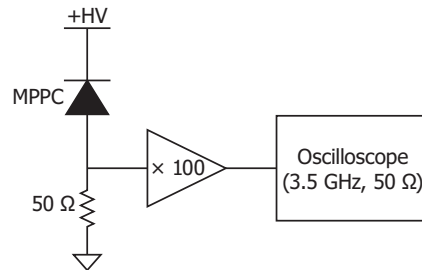
KAPDB0383EB

Pulse waveform



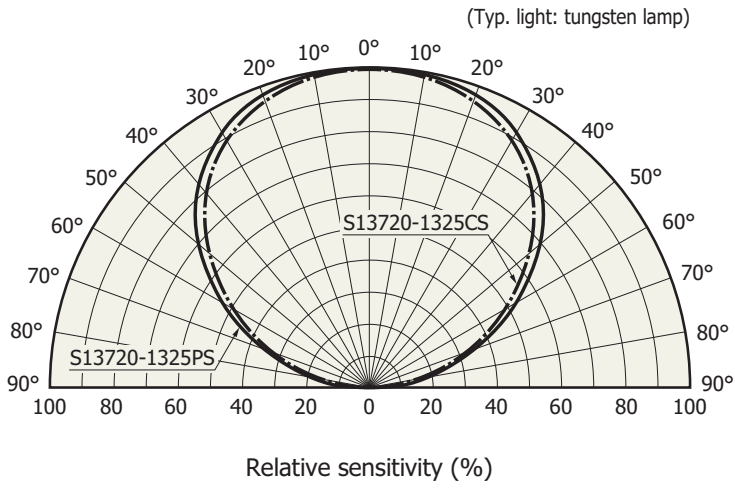
KAPDB0380EA

Measurement circuit

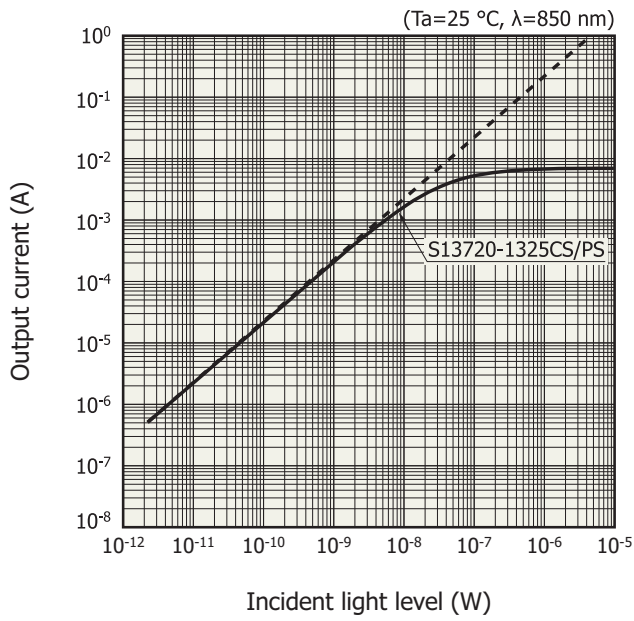


KAPDC0100EA

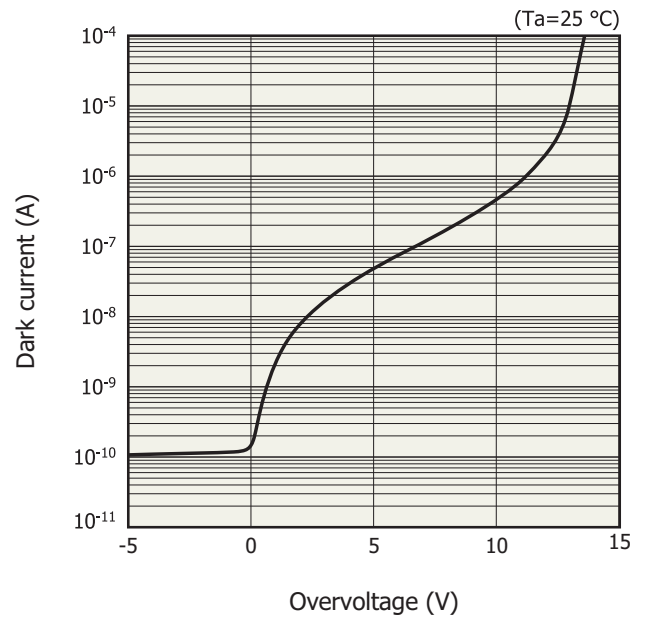
Directivity



Linearity

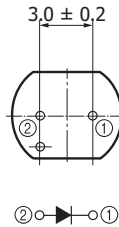
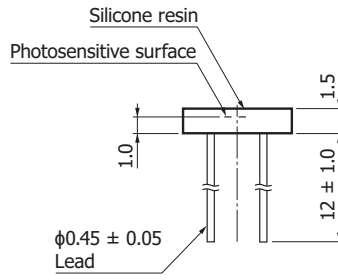
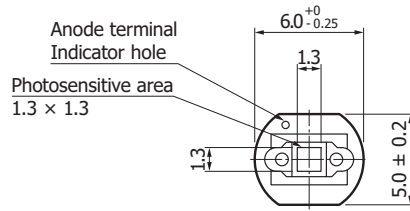


Dark current vs. overvoltage



Dimensional outlines (unit: mm)

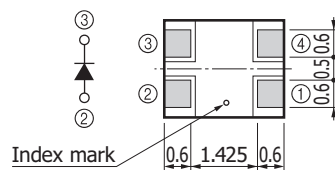
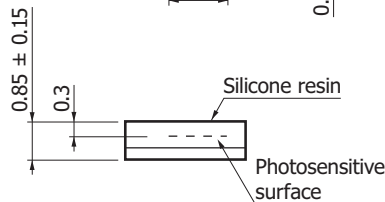
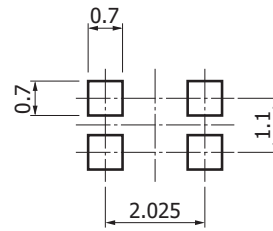
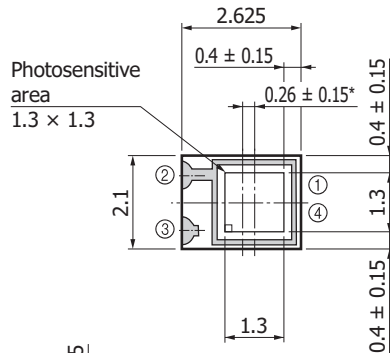
S13720-1325CS



Tolerance unless otherwise noted: ±0.2
Lead material: Fe-Ni-Co alloy
Lead processing: Au plating
Chip position accuracy:
X, Y ≤ ±0.25 with respect to package center
The coating resin may swell a maximum of 0.1 mm above the top of the package.

KAPDA0177EB

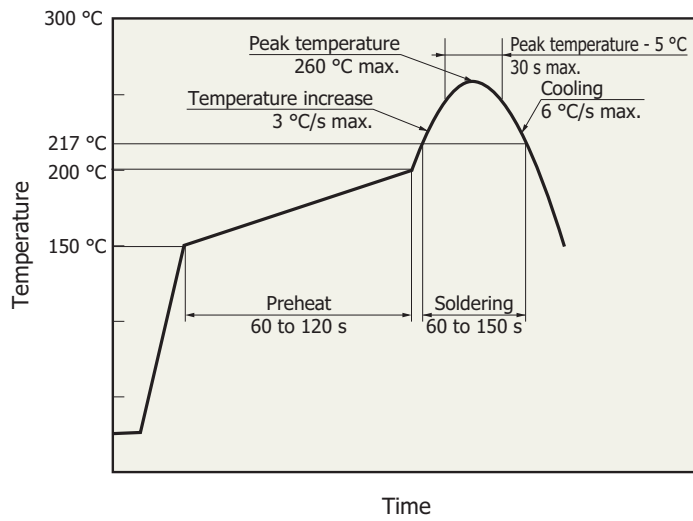
S13720-1325PS



- ① NC
- ② Anode
- ③ Cathode
- ④ NC

Tolerance unless otherwise noted: ±0.1
* Dimension from the center of the chip to the center of the package

KAPDA0178EA

Measured example of temperature profile with our hot-air reflow oven for product testing (S13720-1325PS)

KMPDB0405EB

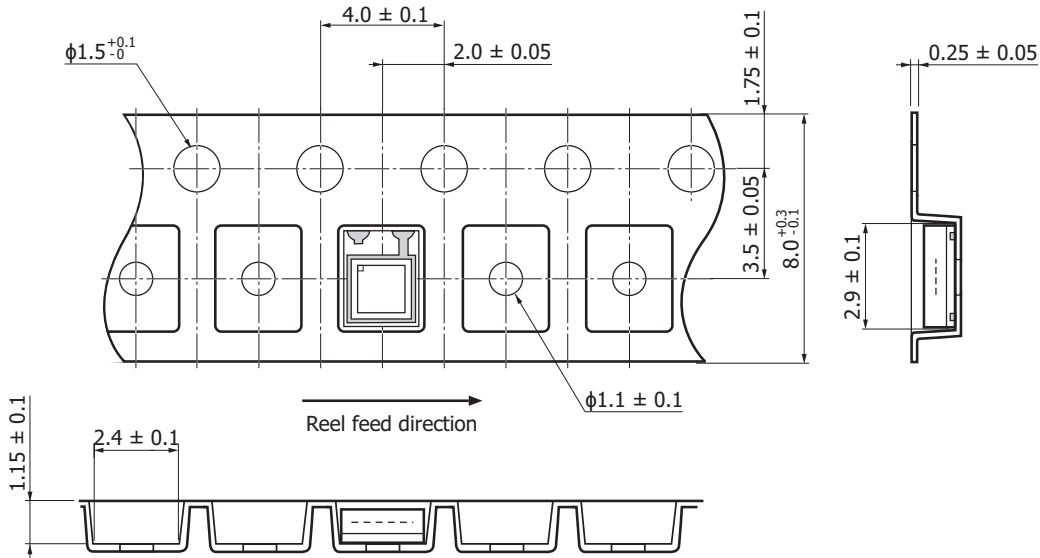
- This surface mount type package product supports lead-free soldering. After unpacking, store it in an environment at a temperature of 25 °C or less and a humidity of 60% or less, and perform soldering within 24 hours.
- The effect that the product is subject to during reflow soldering varies depending on the circuit board and reflow oven that are used. When you set reflow soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

■ Standard packing specifications (S13720-1325PS)

- Reel (conforms to JEITA ET-7200)

Dimensions	Hub diameter	Tape width	Material	Electrostatic characteristics
180 mm	60 mm	8 mm	PS	Conductive

- Embossed tape (unit: mm, material: PS, conductive)



KAPDC0101EA

- Packing quantity
1000 pcs/reel

- Packing type
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

Related information

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

■ Precautions

- Disclaimer
- Metal, ceramic, plastic packages
- Surface mount type products

MPPC module C14193-1325SA

The C14193-1325SA is an optical measurement module that can detect low light levels. It consists of an MPPC, a high-speed amplifier circuit, a high-voltage circuit, and a temperature compensation circuit. The built-in small pixel pitch (25 μm) MPPC S13720-1325CS allows high photon detection efficiency in the near infrared region as well as high-speed measurement and wide dynamic range. The C14193-1325SA runs simply by connecting a single power supply (+5 V).

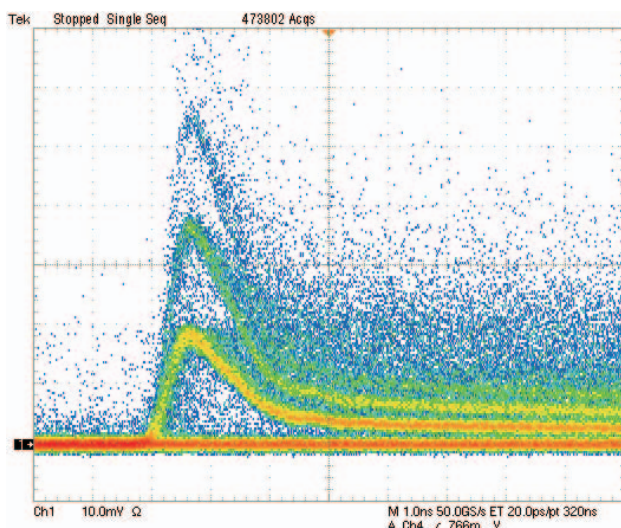
Features

- Internal MPPC: S13720-1325CS
- High-speed response
- Built-in temperature compensation circuit
- Compact and lightweight

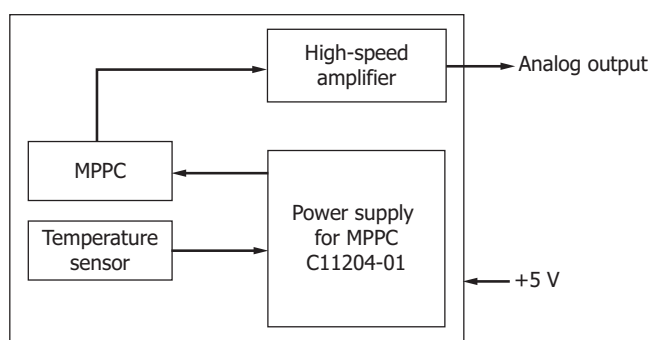
Applications

- Distance measurement (e.g., LiDAR)
- S13720-1325CS evaluation

Pulse waveform



Block diagram



KACCC0710EA

MPPC is a registered trademark of Hamamatsu Photonics K.K.

Information described in this material is current as of July 2017.

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.

HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81) 53-434-3311, Fax: (81) 53-434-5184

U.S.A.: Hamamatsu Corporation: 360 Foothill Road, Bridgewater, N.J. 08807, U.S.A., Telephone: (1) 908-231-0960, Fax: (1) 908-231-1218

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49) 8152-375-0, Fax: (49) 8152-265-8

France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: 33-(1) 69 53 71 00, Fax: 33-(1) 69 53 71 10

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44) 1707-294888, Fax: (44) 1707-325777

North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01

Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39) 02-93581733, Fax: (39) 02-93581741

China: Hamamatsu Photonics (China) Co., Ltd.: B1201, Jiaming Center, No.27 Dongsanhuan Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86) 10-6586-6006, Fax: (86) 10-6586-2866