

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.

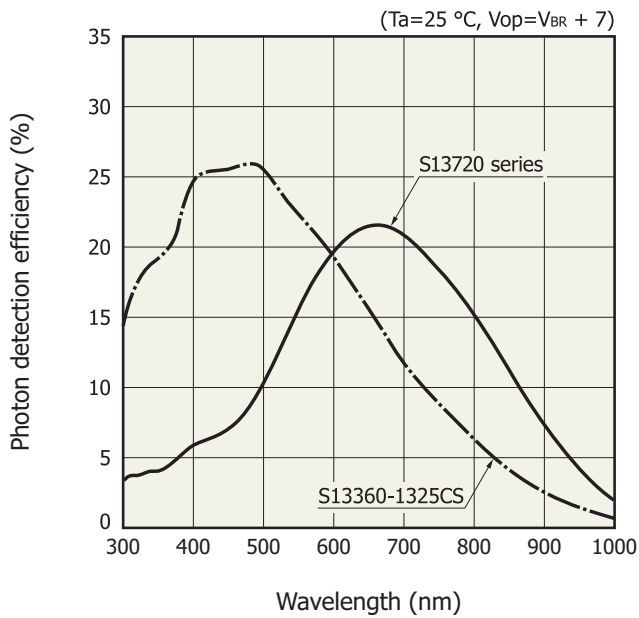
**Electrical and optical characteristics (Typ. Ta=25 °C, overvoltage=7 V, unless otherwise noted)**

Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit
Spectral response range		$\lambda$	-	350 to 1000	-	nm
Peak sensitivity wavelength		$\lambda_p$	-	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		$M$	-	$1.1 \times 10^6$	-	-
Temperature coefficient of reverse voltage		$\Delta T V_{op}$	-	54	-	mV/°C

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

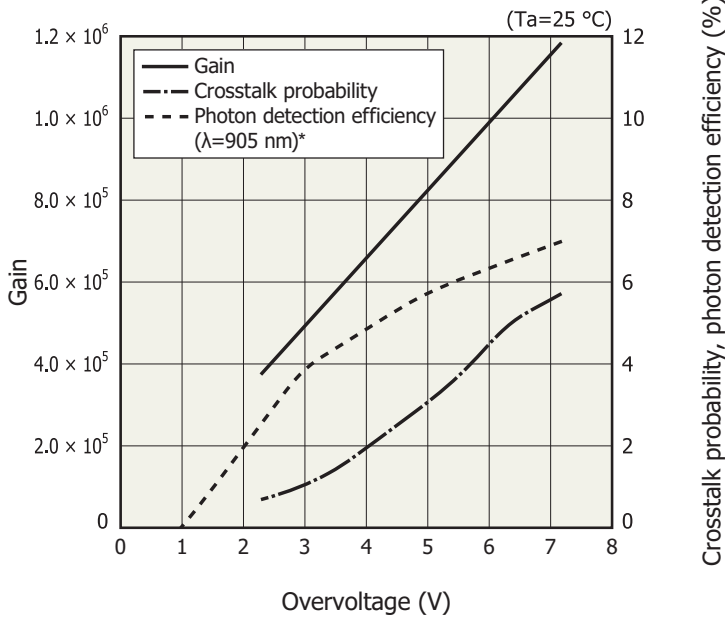
\*4: Refer to the label affixed to the product package. Recommended operating voltage variation in-reel products:  $\pm 0.25 \text{ V/reel}$

**Photon detection efficiency vs. wavelength (typical example)**



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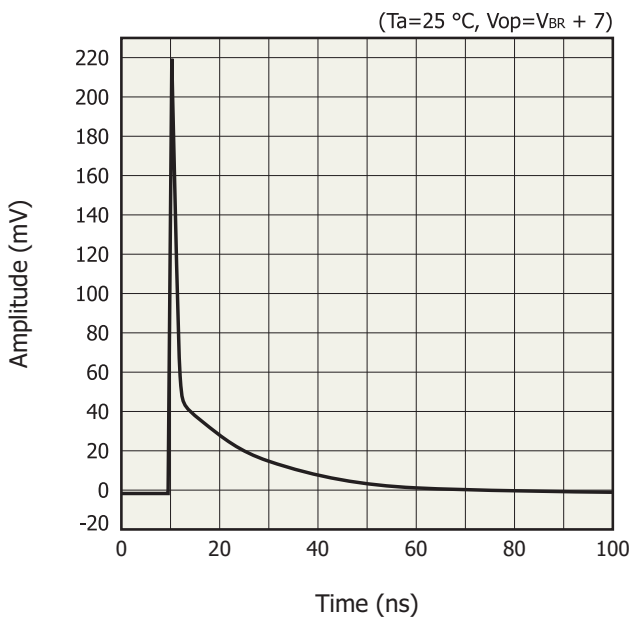
Gain, crosstalk probability, photon detection efficiency-overvoltage characteristics (typical example)



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

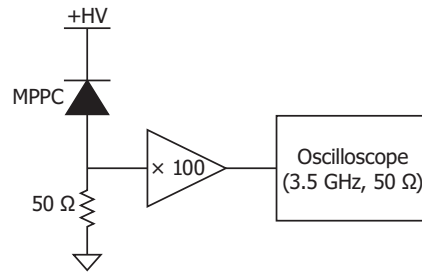
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Pulse waveform



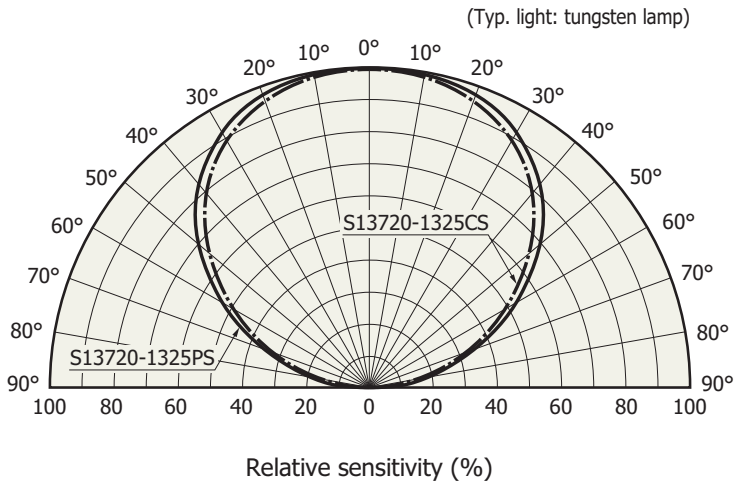
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Measurement circuit

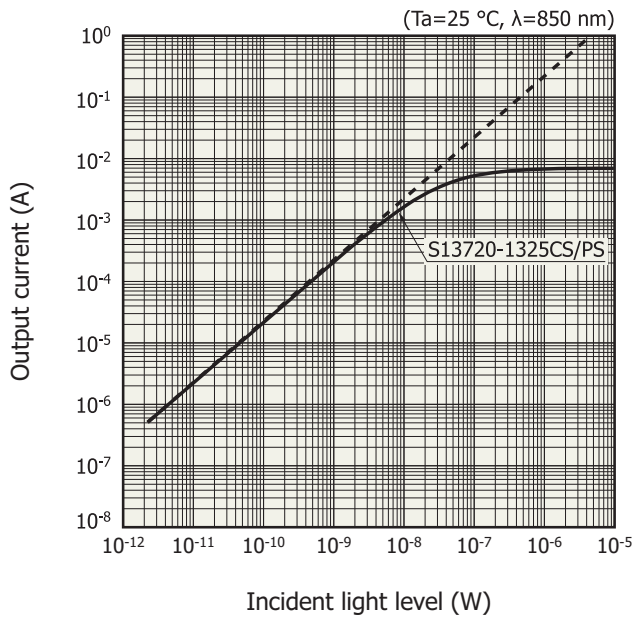


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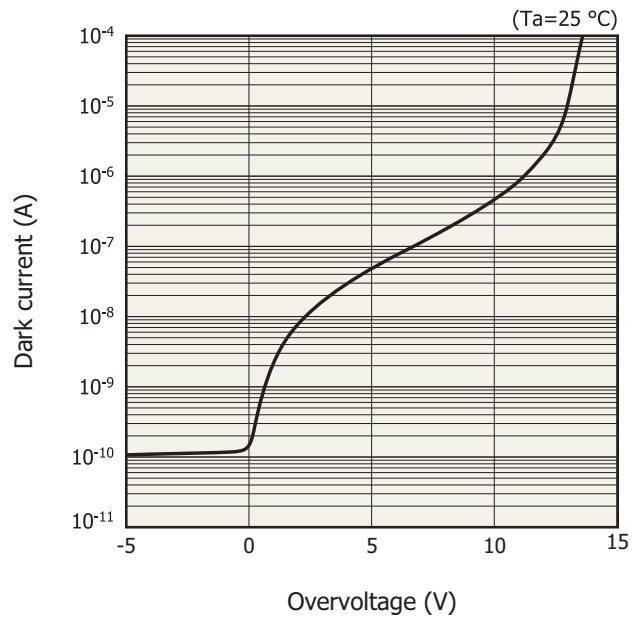
**Directivity**



**Linearity**

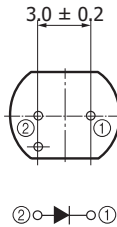
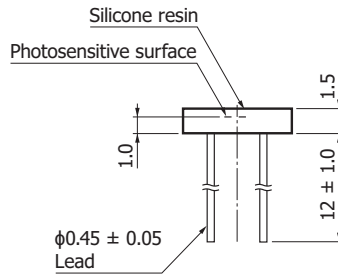
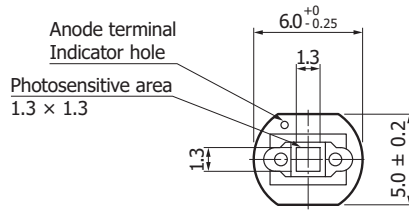


**Dark current vs. overvoltage**



Dimensional outlines (unit: mm)

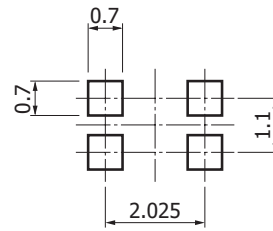
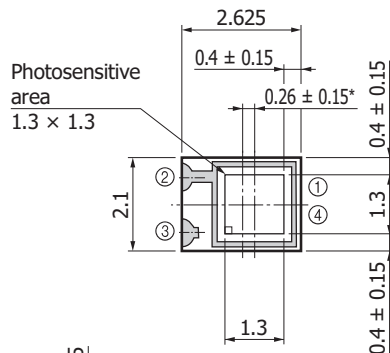
S13720-1325CS



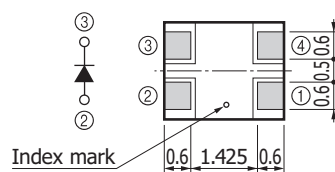
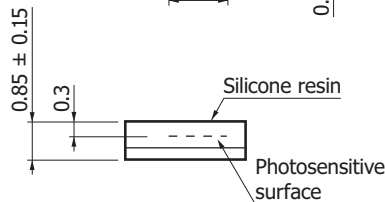
Tolerance unless otherwise noted: ±0.2  
Lead material: Fe-Ni-Co alloy  
Lead processing: Au plating  
Chip position accuracy:  
X, Y ≤ ±0.25 with respect to package center  
The coating resin may swell a maximum of  
0.1 mm above the top of the package.

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S13720-1325PS



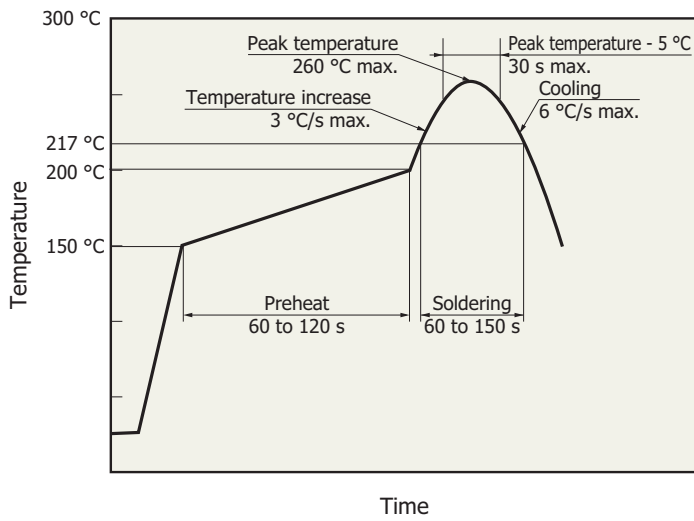
Recommended land pattern



- 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

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

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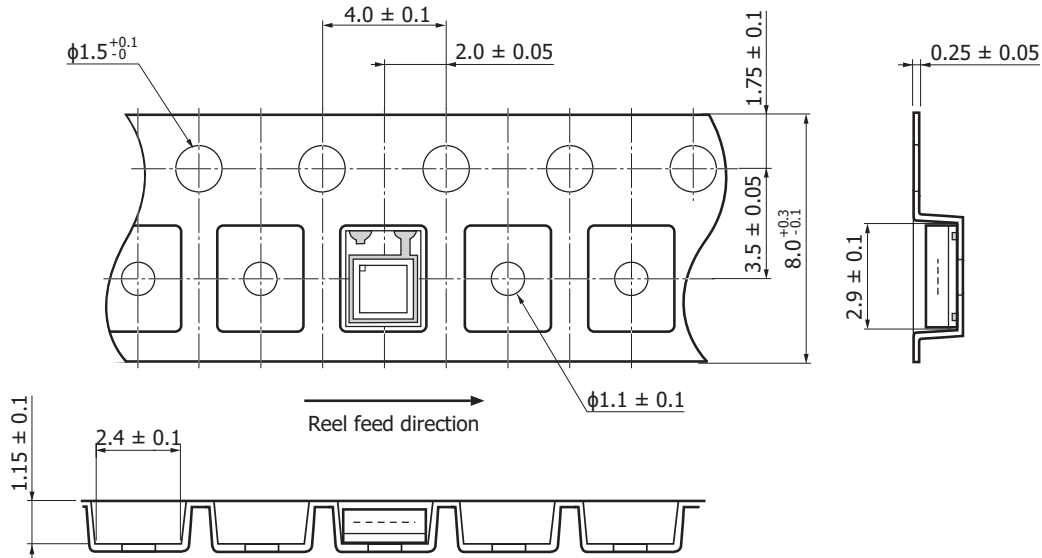
- This surface mount type package product supports lead-free soldering. After unpacking, store it in an environment at a temperature of 30 °C or less and a humidity of 60% or less, and perform soldering within 4 weeks.
- The effect that the product is subject to during reflow soldering varies depending 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](http://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**

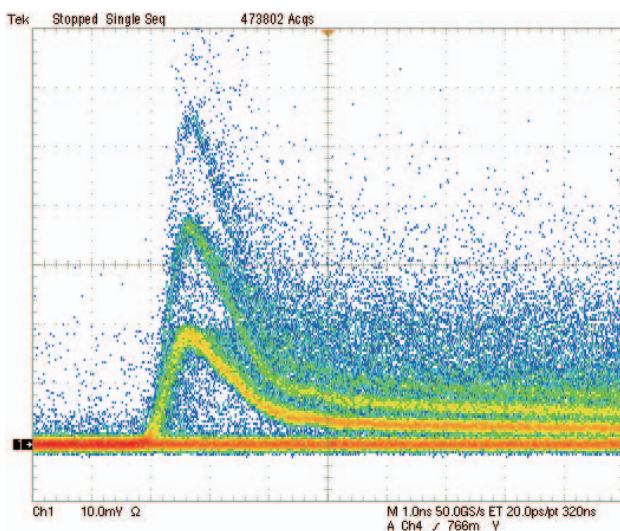
- Internal MPPC: S13720-1325CS
- High-speed response
- Built-in temperature compensation circuit
- Compact and lightweight



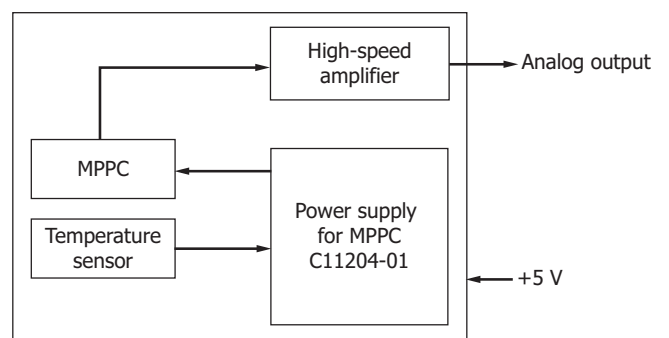
**Applications**

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

**Pulse waveform**



**Block diagram**



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Information described in this material is current as of May 2018.

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