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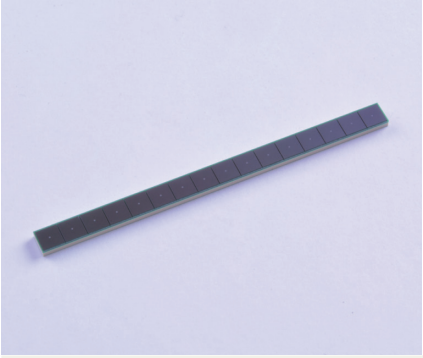
MPPC® (Multi-Pixel Photon Counter) arrays



S13363-3050NE-16

MPPC arrays in a chip size package miniaturized through the adoption of TSV structure

The S13363-3050NE-16 is a miniaturized one-dimensional 16 ch MPPC array using TSV (through-silicon via) and CSP (chip size package) technologies. The product has an effective photosensitive area of 3 × 3 mm per channel. The gap between channels is narrowed and the dead area is reduced. This is suitable for applications, such as nuclear medical, non-destructive inspection, and high energy physics experiment, that require photon counting measurement.

Features

- **Low crosstalk**
- **Low afterpulses**
- **Low voltage (V_{BR}=53 V typ.) operation**
- **High gain: 1.7 × 10^6 typ.**

Applications

- **High energy physics experiment**
- **Nuclear medicine**
- **Muon tomography**
- **Flow cytometry**

Structure

Parameter	Specification	Unit
Number of channels	16	-
Effective photosensitive area/channel	3 × 3	mm
Pixel pitch	50	μm
Number of pixels/channel	3584	-
Fill factor	74	%
Package type	Surface mount	-
Window material	Epoxy resin	-
Refractive index of window material	1.55	-

Absolute maximum ratings

Parameter	Symbol	Condition	Value	Unit
Operating temperature*1	Topr	No dew condensation*1	-20 to +60	°C
Storage temperature*1	Tstg	No dew condensation*1	-20 to +80	°C
Soldering temperature	Tsol		240 (twice)*2	°C

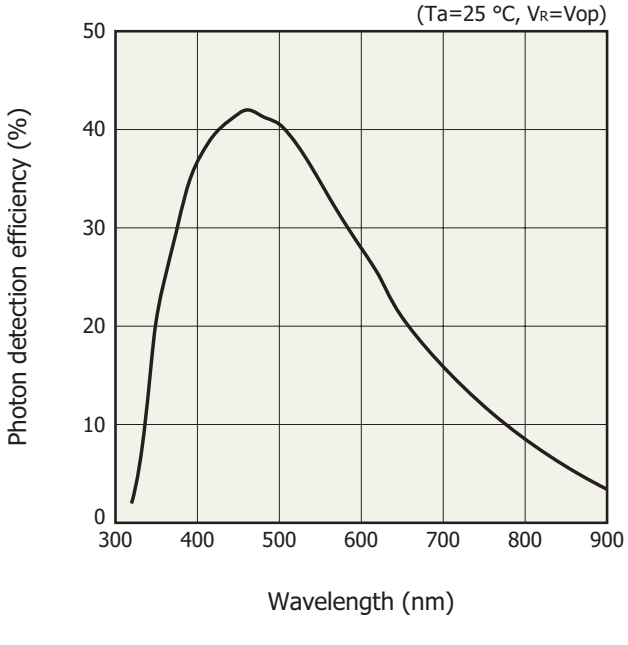
*1: When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*2: Reflow soldering, JEDEC J-STD-020 MSL 5a, see P.5
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, unless otherwise noted)

Parameter		Symbol	Condition	Value	Unit
Spectral response range		λ		320 to 900	nm
Peak sensitivity wavelength		λp		450	nm
Photon detection efficiency		PDE	λ=λp, V_R=Vop	40	%
Breakdown voltage		V_{BR}		53 ± 5	V
Recommended operating voltage		Vop		V_{BR} + 3	V
Vop variation between channels in one product	Typ.	ΔVop	V_R=Vop	0.1	V
	Max.			0.3	
Dark count rate	Typ.	DCR	V_R=Vop	0.5	Mcps
	Max.			1.5	
Terminal capacitance		Ct	V_R=Vop, f=100 kHz	320	pF
Gain		M	V_R=Vop	1.7×10^6	-
Temperature coefficient of recommended operating voltage		ΔTVop		54	mV/°C

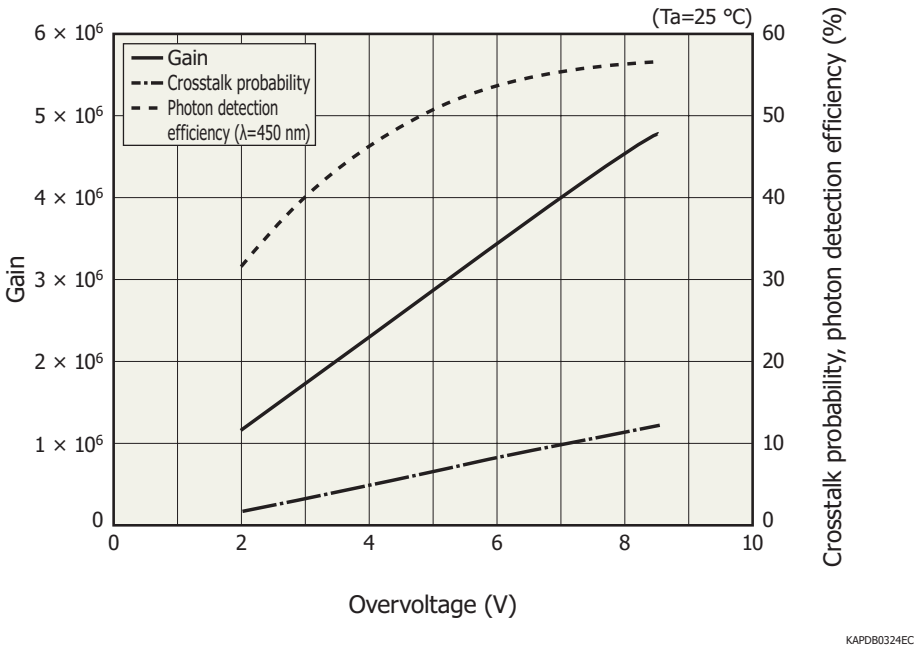
*3: Photon detection efficiency does not include crosstalk and afterpulses.
*4: Refer to the data attached to each product.

Photon detection efficiency vs. wavelength (typical example)



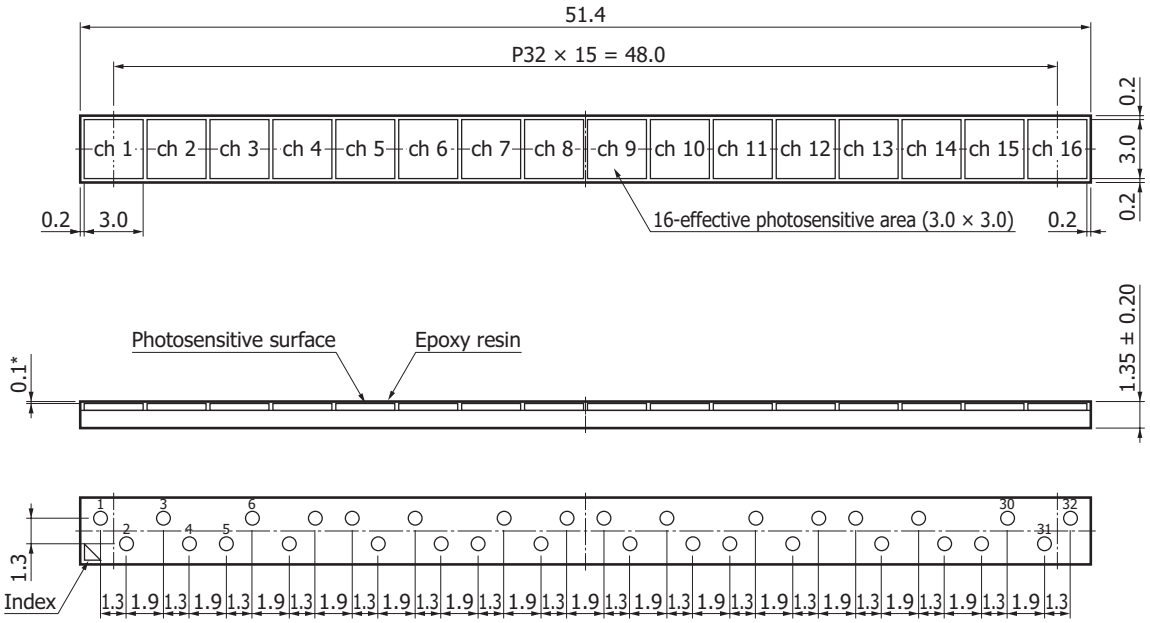
Photon detection efficiency does not include crosstalk and afterpulses.

Overvoltage vs. gain, crosstalk probability, photon detection efficiency (typical example)



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 outline (unit: mm)



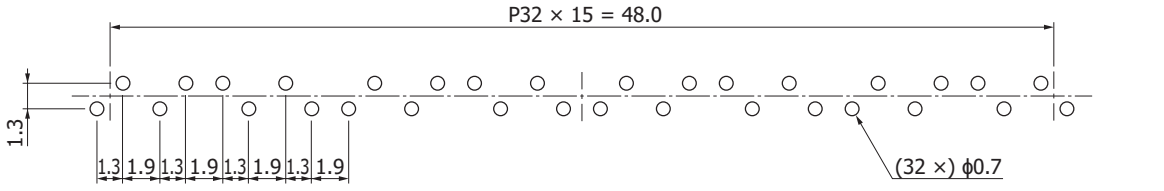
* Distance from package top to photosensitive surface

KAPDA0220EA

Pad no.	Connection	Pad no.	Connection	Pad no.	Connection	Pad no.	Connection
1	A (ch 1)	9	A (ch 5)	17	A (ch 9)	25	A (ch 13)
2	K (ch 1)	10	K (ch 5)	18	K (ch 9)	26	K (ch 13)
3	A (ch 2)	11	A (ch 6)	19	A (ch 10)	27	A (ch 14)
4	K (ch 2)	12	K (ch 6)	20	K (ch 10)	28	K (ch 14)
5	A (ch 3)	13	A (ch 7)	21	A (ch 11)	29	A (ch 15)
6	K (ch 3)	14	K (ch 7)	22	K (ch 11)	30	K (ch 15)
7	A (ch 4)	15	A (ch 8)	23	A (ch 12)	31	A (ch 16)
8	K (ch 4)	16	K (ch 8)	24	K (ch 12)	32	K (ch 16)

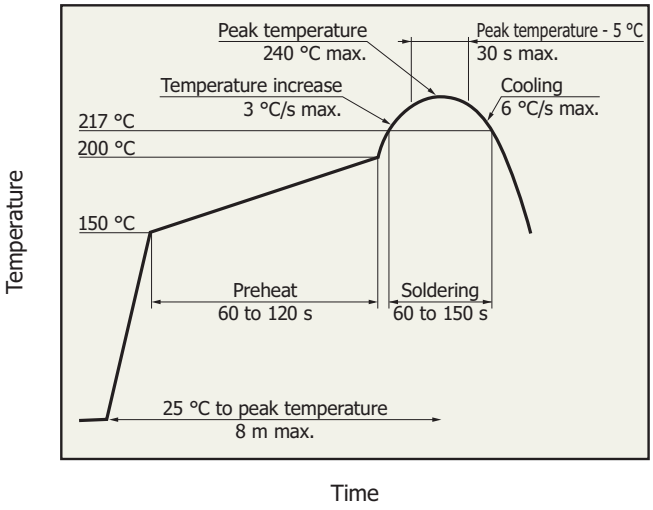
Note: A=Anode, K=Cathode

Recommended land pattern (unit: mm)



KAPDC0131EA

Recommended reflow soldering conditions



KSPDB0418EA

· 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 furnace that are used. Before actual reflow soldering, check for any problems by testing out the reflow soldering methods in advance.
· When three or more mounths have passed or if the packing bag has not been stored in an environment described above, perform baking. For the baking method, see the related information "Surface mount type products" precautions.

Precautions

· If necessary, incorporate appropriate protective circuits in power supplies, devices, and measuring instruments to prevent overvoltage and overcurrent.
· This product may be damaged by partial force, so please handle with care.

Related products

Power supply for MPPC C11204 series

The C11204 series is a high voltage power supply that is optimized for driving MPPCs. Since it has a temperature compensation function, MPPCs can be driven stably even in environments subject to temperature changes.

■ Power supplies for MPPC lineup

Type no.	Package type	Temperature stability (ppm/°C)	Voltage boost circuit	MR (magnetic resonance) compatibility	Features
C11204-01	With leads	±10	Yes	-	High precision Low ripple noise
C11204-02	Surface mount	±10	Yes	-	High precision Low ripple noise Compact: 11.5 × 11.5 mm
C11204-03	With leads	±10	-	Yes	MR compatible Low price
C11204-04	Surface mount	±30	-	Yes	MR compatible Low price Compact: 11.5 × 11.5 mm

MPPC modules C13368-3050EA-16

The C13368-3050EA-16 is a photon counting module capable of detecting very low level light. This module consists of a 16 ch MPPC array, current-to-voltage coverter circuit, high-voltage power supply circuit, and temperature compensation circuit, etc.

Related information

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

■ Precautions
· Disclaimer
· Metal, ceramic, plastic package products
· Surface mount type products

■ Technical information
· MPPC / Technical note

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