

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<sub>BR</sub>=53 V typ.) operation
- ➔ High gain: 1.7 × 10<sup>6</sup> 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.

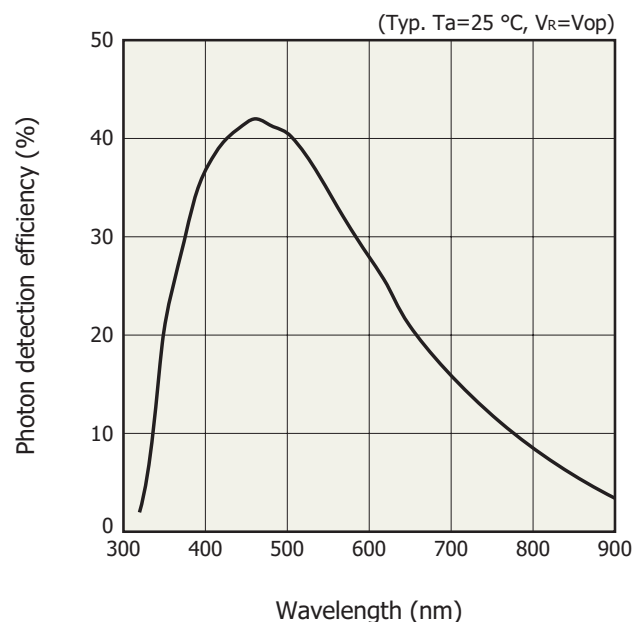
### Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

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

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

\*4: Refer to the data attached to each product.

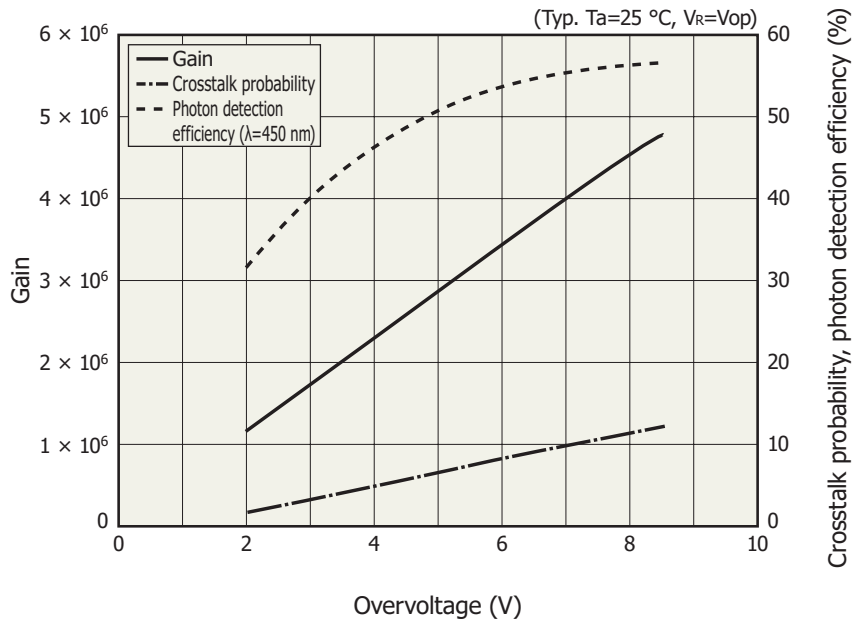
### Photon detection efficiency vs. wavelength



KAPDB0615EA

Photon detection efficiency does not include crosstalk and afterpulses.

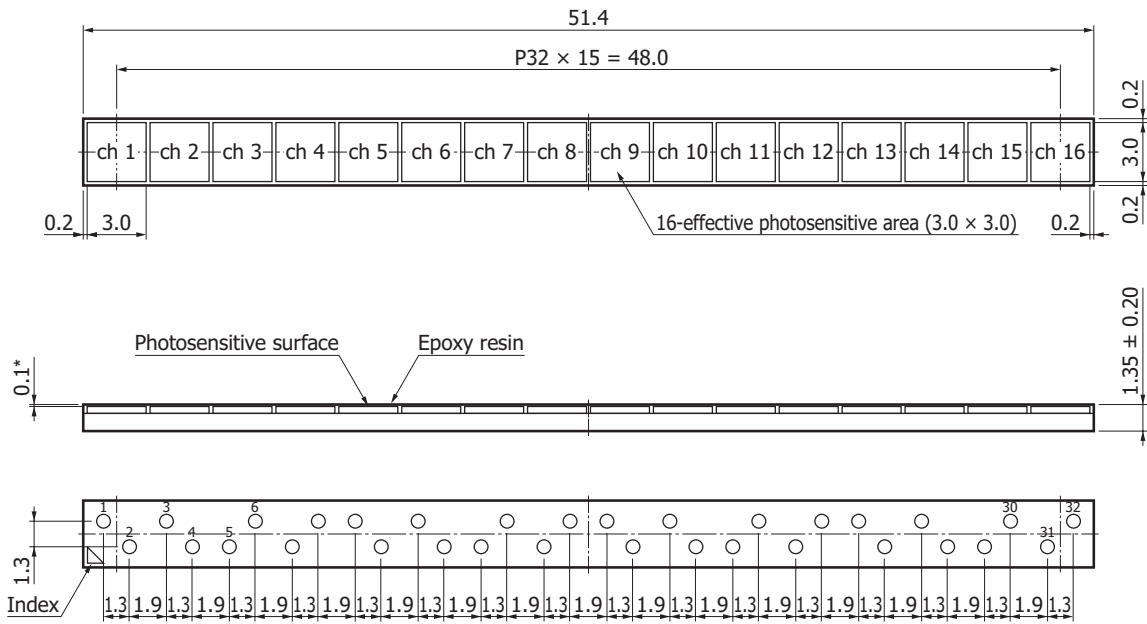
Overvoltage vs. gain, crosstalk probability, photon detection efficiency



KAPB0324EB

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)**



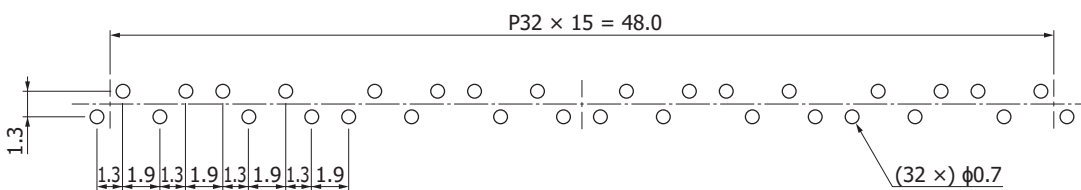
\* Distance from package top to photosensitive surface

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)

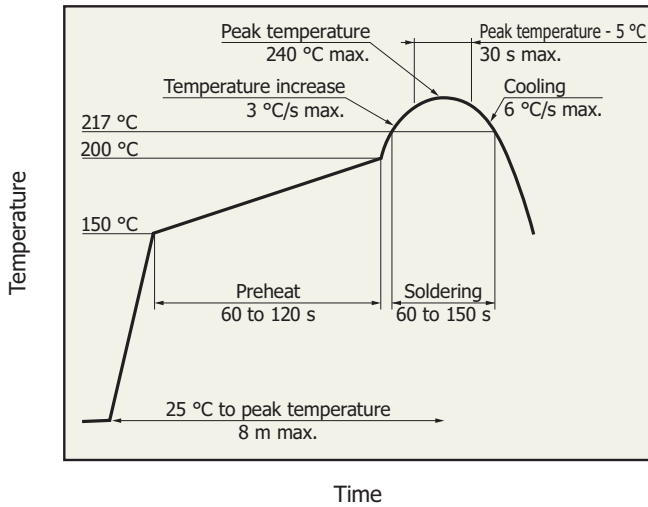
Note: A=Anode, K=Cathode

**Recommended land pattern (unit: mm)**



KAPDC0131EA

### Recommended reflow soldering conditions



KSPD80418EA

- 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 months 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 series

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



## Related information

[www.hamamatsu.com/sp/ssd/doc\\_en.html](http://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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Information described in this material is current as of May 2022.

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