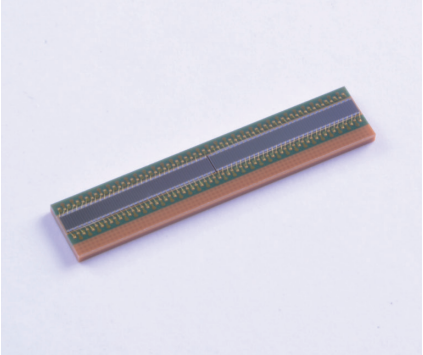
HAMAMATSU
PHOTON IS OUR BUSINESS

MPPC® (Multi-Pixel Photon Counter) array



S13552

Surface mount type one-dimensional 128-element MPPC array

The S13552 is a one-dimensional 128-element MPPC array. This is used by the SciFi (scintillating fiber) tracker in LHCb (Large Hadron Collider beauty experiment), one of detectors located at the LHC of CERN (European Organization for Nuclear Research).

Features

- **Low crosstalk**
- **Low afterpulses**
- **Low voltage (V_{BR}=53 V typ.) operation**

Applications

- **High energy physics experiment**

Structure

Parameter	Specification	Unit
Number of channels	128 (1 × 64 ch, 2 chips)	-
Effective photosensitive area/channel	230 × 1625	μm
Pixel pitch	57.5 × 62.5	μm
Number of pixels/channel	104	-
Fill factor	78	%
Package type	Surface mount	-
Window material	Epoxy resin	-
Refractive index of window material	1.55	-

Absolute maximum ratings

Parameter	Symbol	Condition	Valu	Unit
Operating temperature*1	Topr	No dew condensation*1	-40 to +60	°C
Storage temperature*1	Tstg	No dew condensation*1	-40 to +80	°C
Soldering temperature	Tsol		240 (3 times)*2	°C

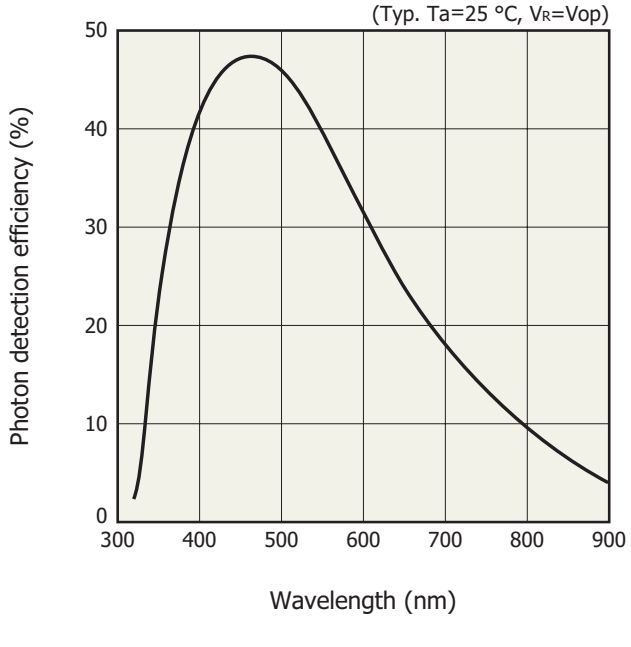
*1: When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*2: Reflow soldering, JEDEC J-STD-020 MSL 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 (Ta=25 °C)

Parameter		Symbol	Condition	Value	Unit
Spectral response range		λ		320 to 900	nm
Peak sensitivity wavelength		λp		450	nm
Photon detection efficiency*3		PDE	λ=λp, V_R=Vop	47	%
Breakdown voltage		V_{BR}		53 ± 5	V
Vop variation between channels in one product	Typ.	ΔVop	V_R=Vop	0.4	V
	Max.			1	
Recommended operating voltage*4		Vop		V_{BR} + 3.5	V
Dark count rate	Typ.	DCR	V_R=Vop	60	kcps
	Max.			300	
Terminal capacitance		Ct	V_R=Vop, f=100 kHz	320	pF
Gain		M	V_R=Vop	3.0×10^6	-
Temperature coefficient of recommended operating voltage		ΔTVop		54	mV/°C

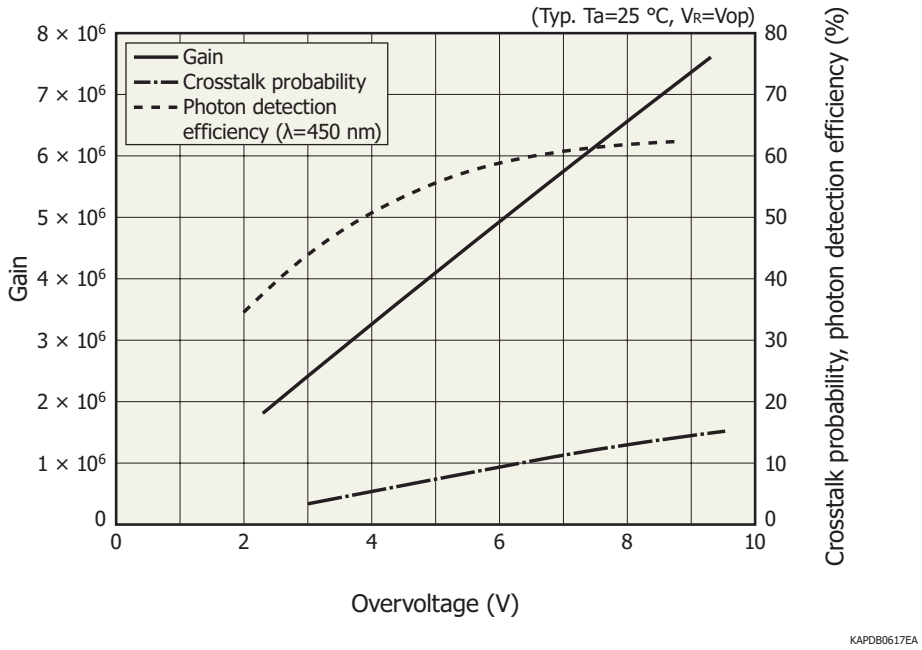
*3: Photon detection efficiency does not include crosstalk and afterpulses.
*4: Refer to the data attached to each product.

Photon detection efficiency vs. wavelength



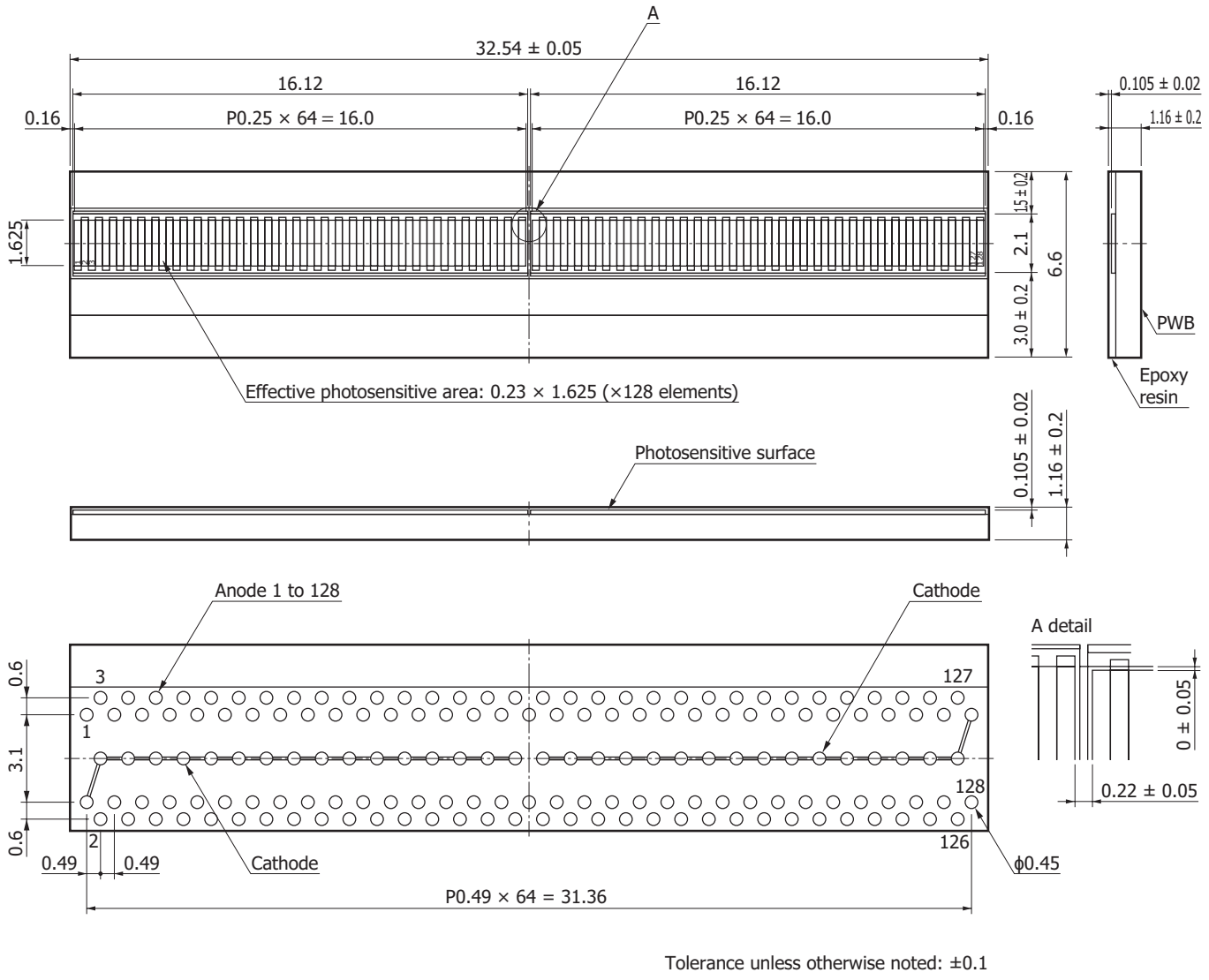
Photon detection efficiency does not include crosstalk and afterpulses.

Overvoltage vs. gain, crosstalk probability, photon detection efficiency



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 rate and crosstalk at the same time, so an optimum operating voltage must be selected to match the application.

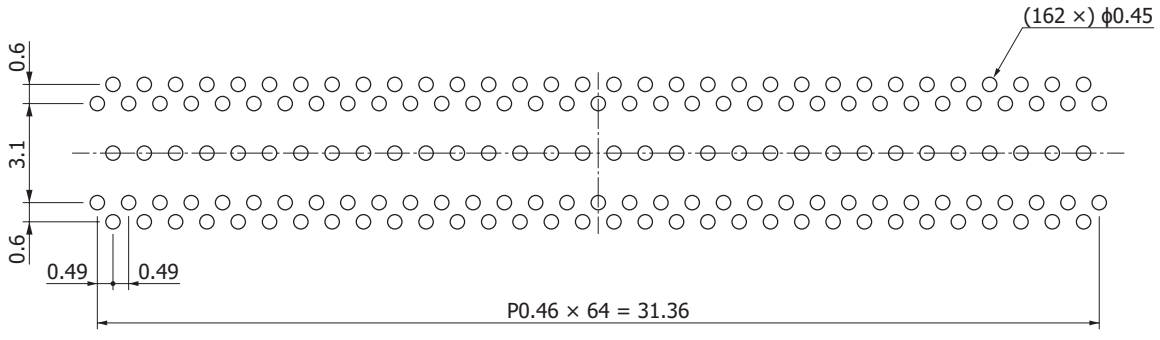
Dimensional outline (unit: mm)



Tolerance unless otherwise noted: ±0.1

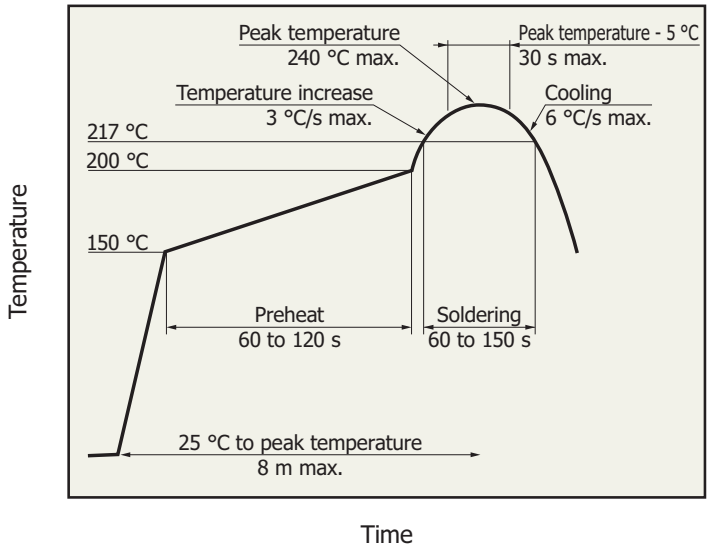
KAPDA0221EA

Recommended land pattern (unit: mm)



KAPDC0132EA

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.

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

MPPC is a registered trademark of Hamamatsu Photonics K.K. (China, EU, Japan, Korea, Switzerland, UK, U.S.A)
Information described in this material is current as of May 2022.
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, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: usa@hamamatsu.com
Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH.: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de
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 E-mail: infos@hamamatsu.fr
United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court,10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01 E-mail: info@hamamatsu.se
Italy: HAMAMATSU PHOTONICS ITALIA S.R.L.: Strada della Moia, 1 int. 6, 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it
China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201 Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn
Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 8F-3, No.158, Section 2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw