

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	Glass epoxy	-
Seal 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}	-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.

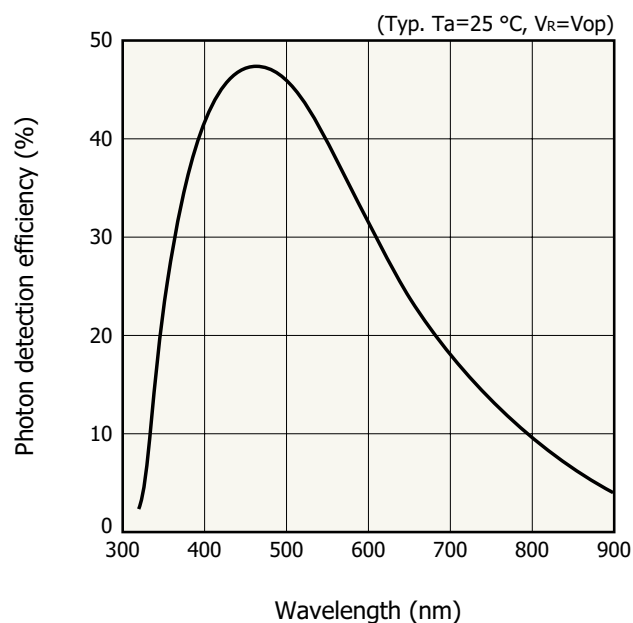
Electrical and optical characteristics (Ta=25 °C)

Parameter		Symbol	Condition	Value	Unit
Spectral response range		λ		320 to 900	nm
Peak sensitivity wavelength		λ_p		450	nm
Photon detection efficiency*3		PDE	$\lambda=\lambda_p, V_R=V_{op}$	47	%
Breakdown voltage		V_{BR}		53 ± 5	V
Vop variation between channels in one product	Typ.	ΔV_{op}	$V_R=V_{op}$	0.4	V
	Max.			1	
Recommended operating voltage*4		V_{op}		$V_{BR} + 3.5$	V
Dark count rate	Typ.	DCR	$V_R=V_{op}$	60	kcps
	Max.			300	
Terminal capacitance		C_t	$V_R=V_{op}, f=100\text{ kHz}$	14	pF
Gain		M	$V_R=V_{op}$	3.0×10^6	-
Temperature coefficient of recommended operating voltage		ΔTV_{op}		54	mV/°C

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

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

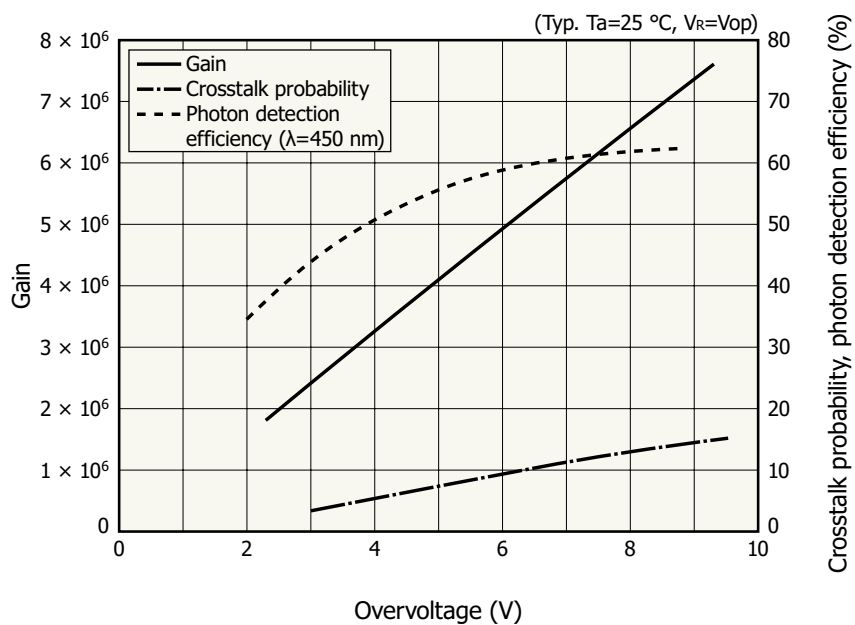
Photon detection efficiency vs. wavelength



KAPDB0616EA

Photon detection efficiency does not include crosstalk and afterpulses.

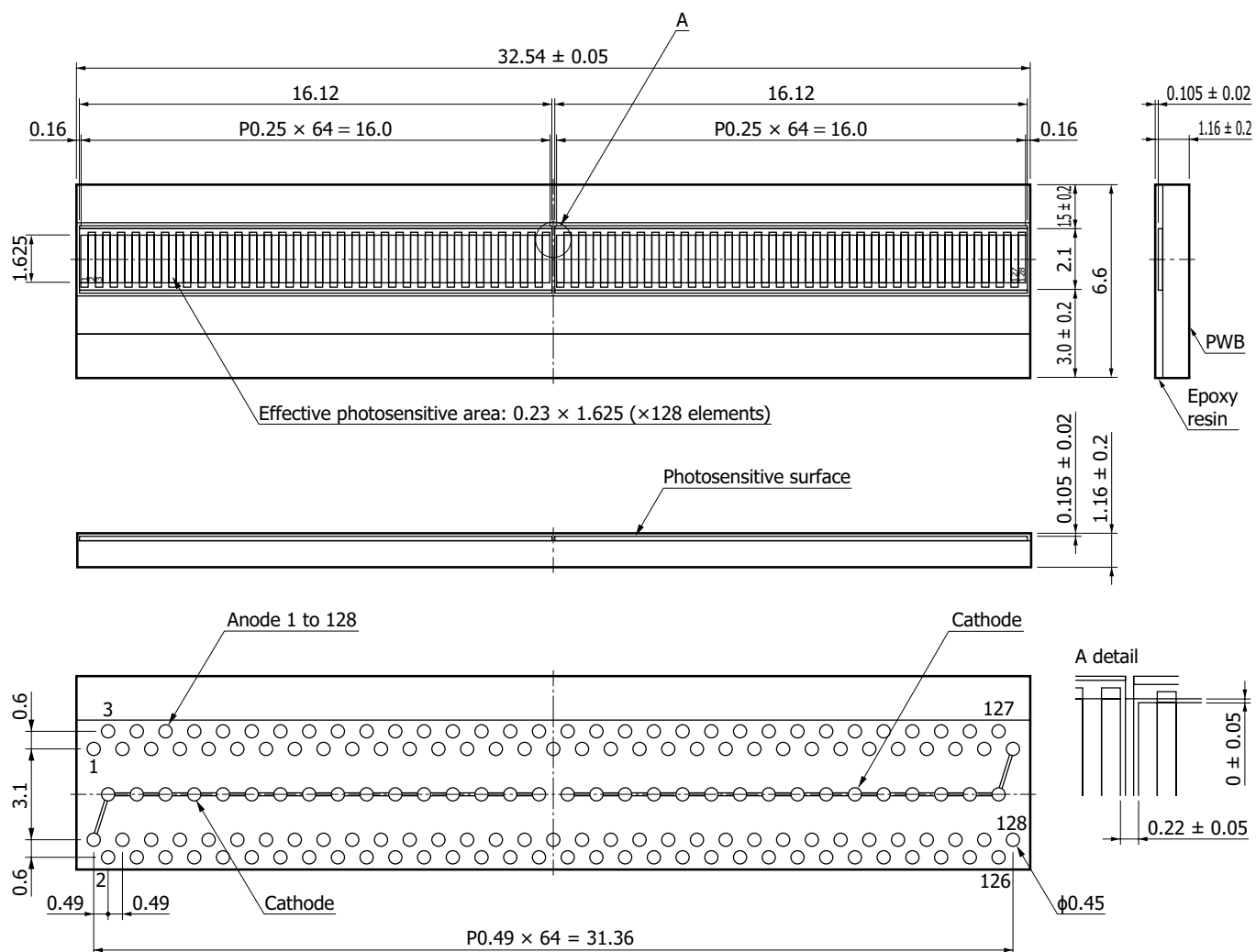
Overvoltage vs. gain, crosstalk probability, photon detection efficiency



KAPD80617EA

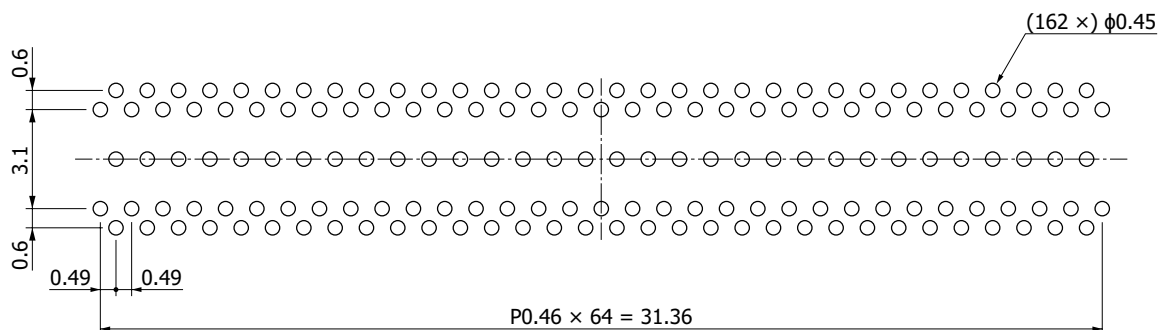
MPPC characteristics vary with the operating voltage. Although increasing the operating voltage improves the photon detection efficiency and time resolution, it also increases the dark count rate and crosstalk at the same time, so an optimum operating voltage must be selected to match the application.

Dimensional outline (unit: mm)

Tolerance unless otherwise noted: ± 0.1

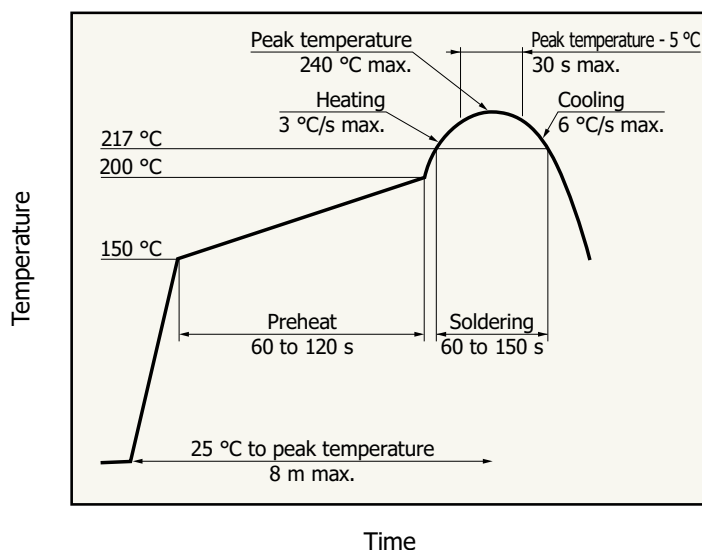
KAPDA0221EA

Recommended land pattern (unit: mm)



KAPDC0132EA

Recommended reflow soldering conditions



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 12 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, refer to "Precautions / Surface mount type products" in the related information .

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
- Precautions / Metal, ceramic, plastic package products
- Precautions / Surface mount type products

Catalogs

- Product information / MPPC
- Technical note / MPPC
- Literature / MPPC

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Information described in this material is current as of May 2025.

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