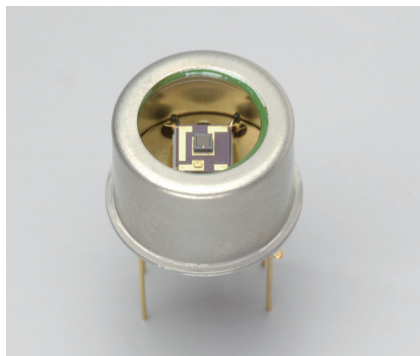


MPPC® (multi-pixel photon counter)



S12576-050 S12577-050

Low afterpulse, for very low light-level measurement
Photosensitive area: 1 × 1 mm, 3 × 3 mm

These MPPCs have thermoelectric coolers to prevent the S/N from degrading due to dark count. For every approximately 8 °C reduction in element temperature, the dark count is halved.

Features

- Low afterpulse
- High fill factor
- High photon detection efficiency
- Wide operating voltage range
- Low dark count (no more than 1/20 the count at normal temperature through cooling)

Applications

- Scintillation measurement
- Low-light-level detection
- Scattered light measurement

Structure

Parameter	Symbol	S12576-050	S12577-050	Unit
Effective photosensitive area	-	1 × 1	3 × 3	mm
Pixel pitch	-	50		µm
Number of pixels	-	400	3600	-
Package	-	Metal (TO-8)		-
Window	-	Borosilicate glass		-
Window refractive index	-	1.52		-
Cooling	-	Two-stage TE cooler		-

Absolute maximum ratings (Ta=25 °C)

Parameter	Symbol	Condition	Value	Unit
Operating temperature	Topr	No condensation	-20 to +60	°C
Storage temperature	Tstg	No condensation	-20 to +85	°C
Element temperature	Td	During operation	-25 to ambient temperature	°C
Thermistor power dissipation	Pd_th		0.2	mW
TE-cooler allowable current	ITE max		1.0	A
TE-cooler allowable voltage	VTE max		0.9	V

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.

Thermistor characteristics

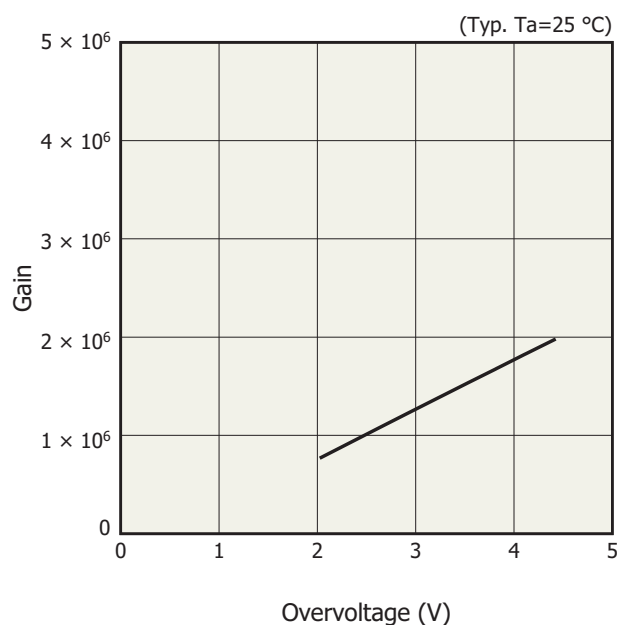
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Thermistor resistance	Rth	T=25 °C	-	9	-	kΩ
Thermistor B constant	B	T1=25 °C, T2=50 °C	-	3410	-	K

Electrical and optical characteristics (Ta=25 °C, Td=-10 °C*, unless otherwise noted)

Parameter	Symbol	Condition	S12576-050			S12577-050			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ		320 to 900			320 to 900			nm
Peak sensitivity wavelength	λ_p		-	450	-	-	450	-	nm
Photon detection efficiency	PDE	$\lambda = \lambda_p$	-	35	-	-	35	-	%
Dark count	-	Threshold: 0.5 p.e.	-	5	10	-	50	100	kcps
Time resolution (FWHM)	-	1 p.e.	-	250	-	-	250	-	ps
Terminal capacitance	Ct		-	35	-	-	320	-	pF
Gain	M		-	1.25×10^6	-	-	1.25×10^6	-	-
Gain temperature coefficient	ΔTM		-	2.7×10^4	-	-	2.7×10^4	-	/°C
Breakdown voltage	VBR		-	62.9 ± 10	-	-	62.9 ± 10	-	V
Recommended operating voltage	Vop		-	VBR + 2.6	-	-	VBR + 2.6	-	V
Temperature coefficient of recommended operating voltage	$\Delta TVop$		-	60	-	-	60	-	mV/°C

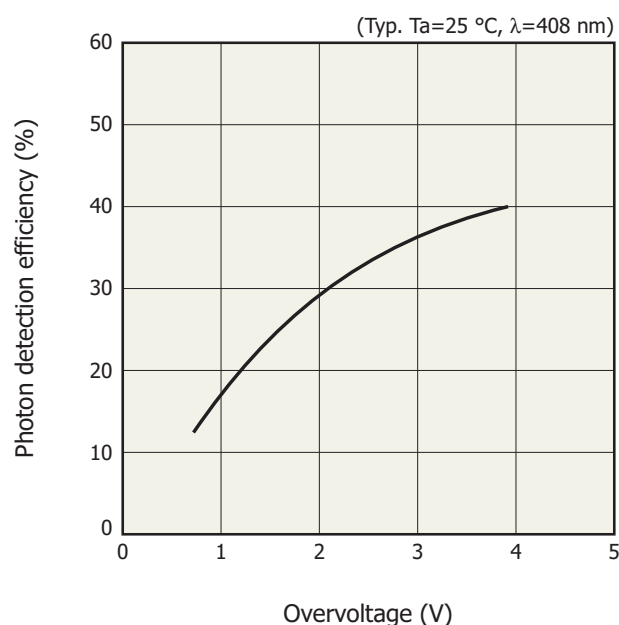
* At the operating voltage that allows the gain listed on this datasheet to be obtained (see the data supplied with the product)

Gain vs. overvoltage



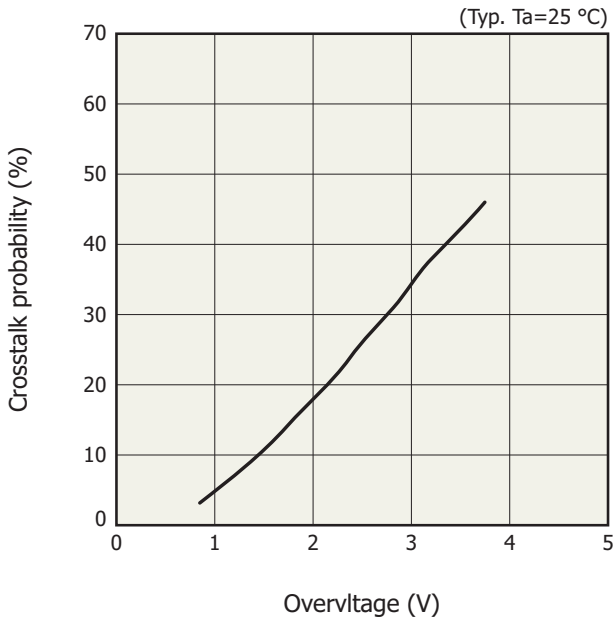
KAPD80247EA

Photon detection efficiency vs. overvoltage



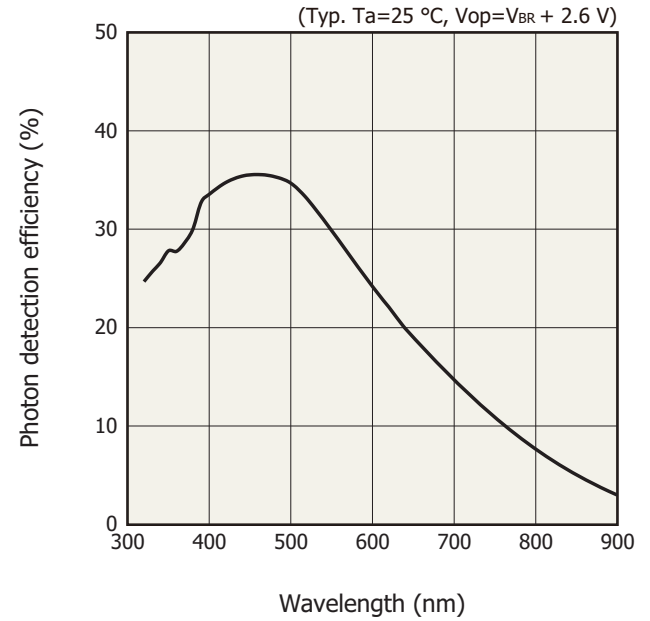
KAPD80248EB

❑ Crosstalk probability vs. overvoltage



KAPD80249EB

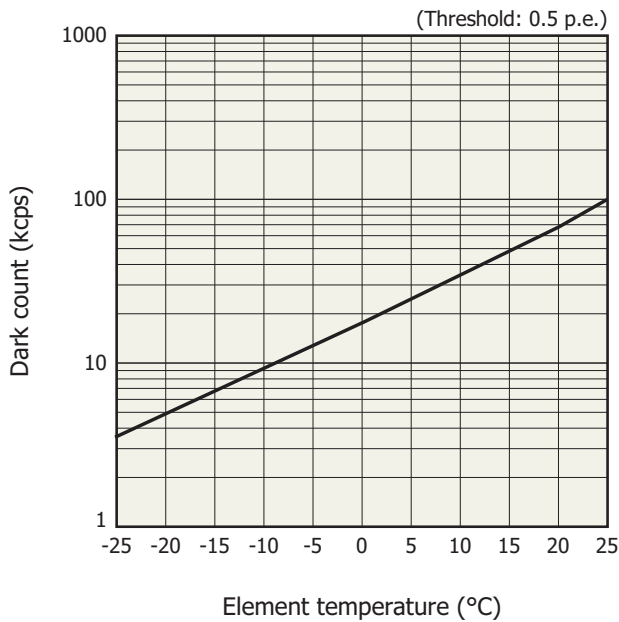
❑ Photon detection efficiency vs. wavelength



KAPD80220EA

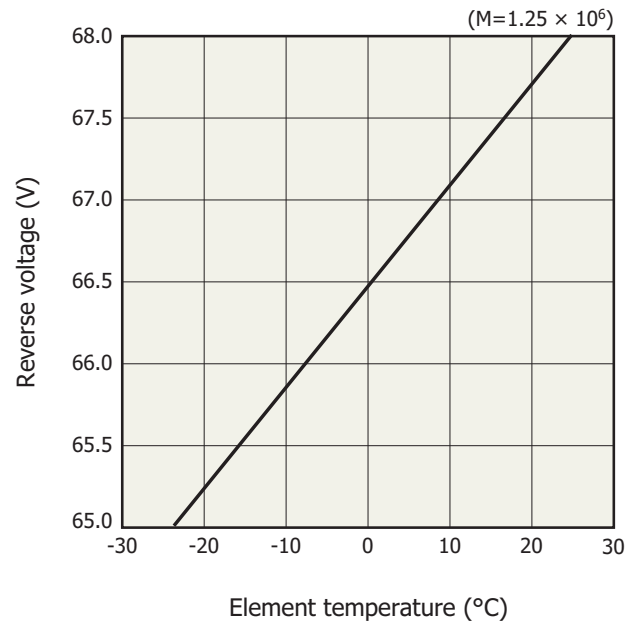
Photon detection coefficient does not include crosstalk or afterpulses.

❑ Dark count vs. element temperature (S12576-050, typical example)



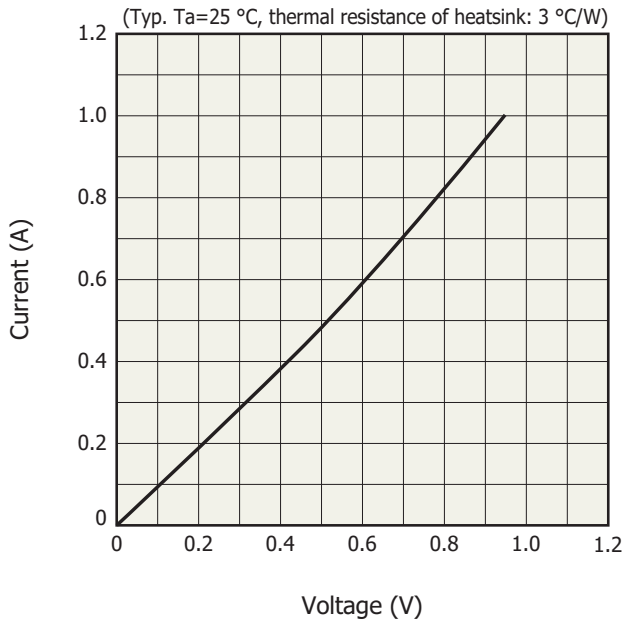
KAPD80218EA

❑ Reverse voltage vs. element temperature (S12576-050, typical example)

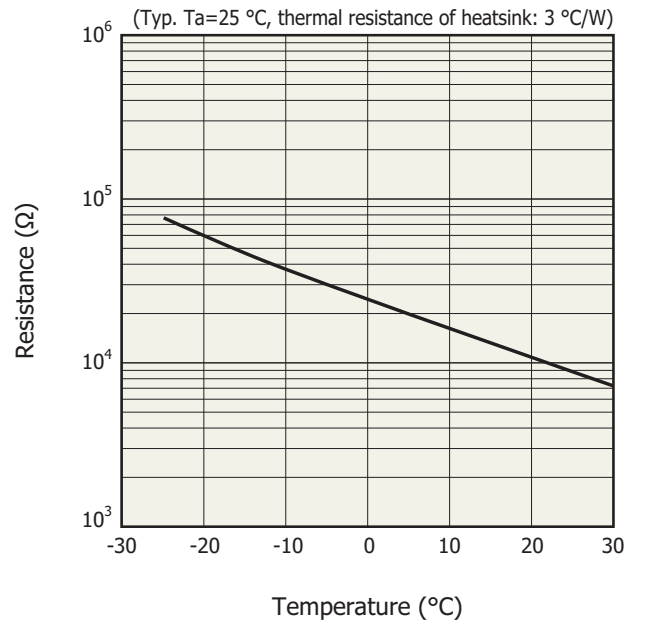


KAPD80219EA

Current vs. voltage characteristics of TE-cooler

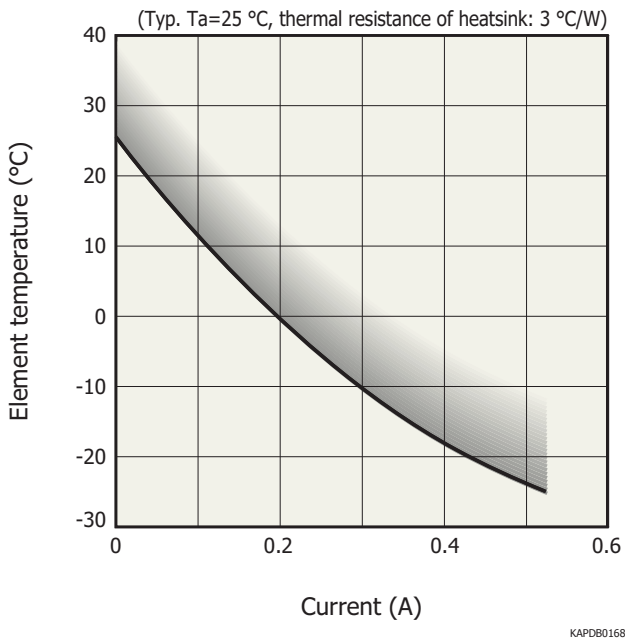


Thermistor temperature characteristics



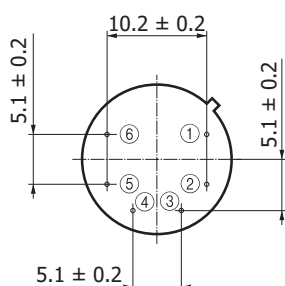
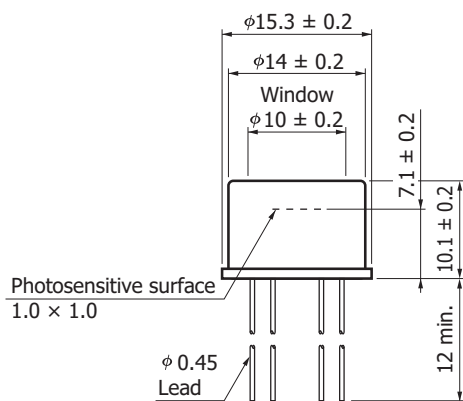
Thermistor resistance ($T=25\text{ }^\circ\text{C}$)= $9\text{ k}\Omega$, thermistor B constant:
 $B(25/50)=3410\text{ K}$

Cooling characteristics of TE-cooler



In this data, MPPC is not operated. When MPPC is in operation, the data will vary because the amount of heat generated in MPPC changes depending on the applied reverse voltage and incident light level.

Dimensional outline (unit: mm)



Distance from photosensitive area center to cap center

$$-0.3 \leq X \leq +0.3$$

$$-0.3 \leq Y \leq +0.3$$

- ① Detector (anode)
- ② Detector (cathode)
- ③ TE-cooler (-)
- ④ TE-cooler (+)
- ⑤⑥ Thermistor

KAPDA0145EA

Precautions

- Be sure to connect the pins correctly; otherwise the element may break.
- If necessary, incorporate appropriate protective circuits in power supplies, devices, and measuring instruments to prevent overvoltage and overcurrent.
- Be careful in handling the MPPC as the light input window and the built-in TE-cooler are fragile. If the window cracks or breaks and moisture enters inside the package, condensation will form on the photosensitive surface and cause abnormal operation.
- See the precautions supplied with the product.

Related product

☒ Temperature controller for TE cooler C1103-04

The C1103-04 is a controller that maintains constant element temperature by adjusting the current that flows through a one-stage or two-stage TE-cooler. You can set the element temperature using the temperature adjustment knob.



■ Accessories

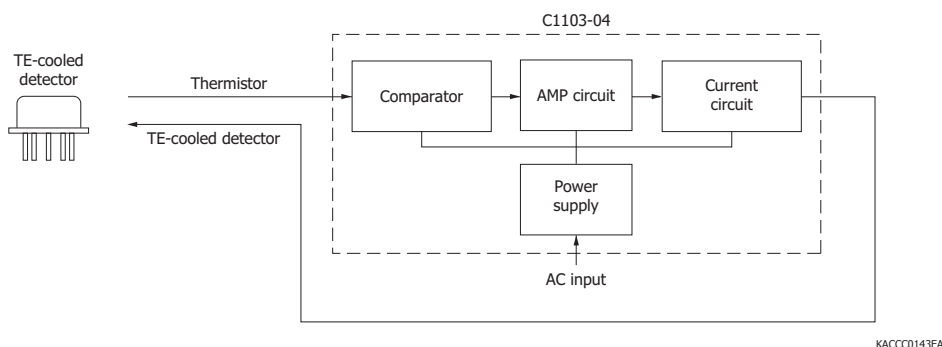
- Instruction manual
- 4-core cable (with connector) A4372-05

■ Specifications (common)

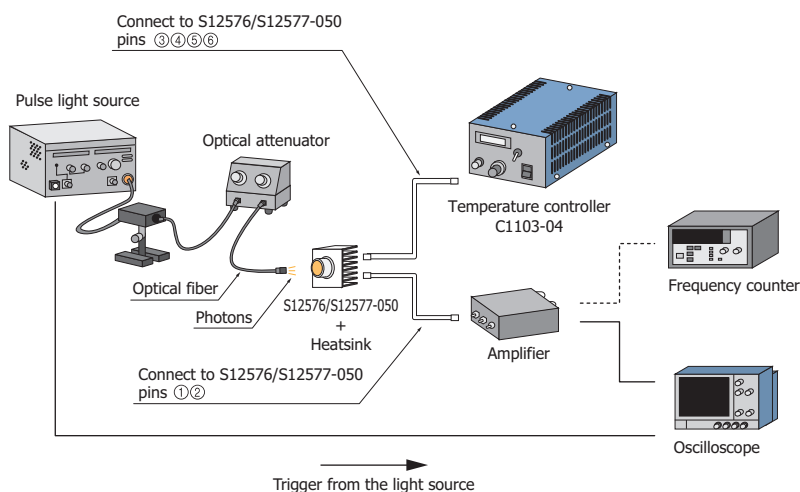
Setting element temperature	-30 to +20 °C
Compatible products	One-stage or two-stage TE-cooled type
Temperature stability	±0.1 °C or less
Control output current	1.2 A max.
Power supply*	100 V ± 10%, 50/60 Hz
Power consumption	30 VA
Dimension/weight	108 (W) × 87 (H) × 190 (D) mm/approx. 1.9 kg
Operating temperature	+10 to +40 °C
Operating humidity	90% or less
Storage temperature	+10 to +40 °C

* The external power supply input can be changed to 100 V, 115 V, or 230 V prior to shipping.

■ Block diagram



■ Connection example



Related information

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

■ Precautions

· Notice

Information described in this material is current as of December, 2014.

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.

HAMAMATSUwww.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, N.J. 08807, U.S.A., Telephone: (1) 908-231-0960, Fax: (1) 908-231-1218

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49) 8152-375-0, Fax: (49) 8152-265-8

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

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44) 1707-294888, Fax: (44) 1707-325777

North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01

Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39) 02-93581733, Fax: (39) 02-93581741

China: Hamamatsu Photonics (China) Co., Ltd.: B1201, Jiaming Center, No.27 Dongsanhuan Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86) 10-6586-6006, Fax: (86) 10-6586-2866