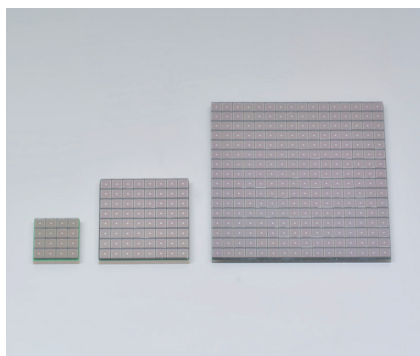


MPPC[®] arrays

S13615 series



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

The S13615 series is a microfabricated MPPC (multi-pixel photo counter) array for precision measurement that uses TSV (through-silicon via) and CSP (chip size package) technologies. The adoption of TSV structure made it possible to eliminate wiring on the photosensitive area side, resulting in a compact structure with little dead space. Its photosensitive area is smaller (1 × 1 mm) than the previous product S13361 series, and so provides a high spatial resolution. The four-side buttable structure allows multiple devices to be arranged side by side to fabricate large-area devices. It is suitable for medical and nondestructive inspections, environmental analyses, high energy physics experiments, and other applications that require photon counting measurements.

Features

- ➔ Compact chip size package with little dead space
- ➔ Excellent photon-counting capability (excellent detection efficiency versus number of incident photons)
- ➔ Low crosstalk
- ➔ Low afterpulses
- ➔ Low voltage (VBR=53 V typ.) operation
- ➔ Small photosensitive area: 1 × 1 mm

Applications

- ➔ Nuclear medicine
- ➔ PET
- ➔ Non-destructive inspection
- ➔ Environmental analysis
- ➔ High energy physics experiment

Structure

Type no.	Number of channels	Effective photosensitive area/ch (mm)	Pixel pitch (μm)	Number of pixels/ch	Fill factor (%)	Package	Window material	Refractive index of window material
S13615-1025N-04	4 × 4	1.0 × 1.0	25	1584	47	Surface mount type	Glass	1.51
S13615-1025N-08	8 × 8							
S13615-1025N-16	16 × 16							
S13615-1050N-04	4 × 4		50	396	74			
S13615-1050N-08	8 × 8							
S13615-1050N-16	16 × 16							

Absolute maximum ratings

Type no.	Operating temperature T _{opr} (°C)	Storage temperature T _{stg} (°C)	Soldering conditions*1 T _{sol}
S13615-1025N series S13615-1050N series	-20 to +60	-20 to +80	Peak temperature: 240 °C, twice*2

*1: No dew condensation

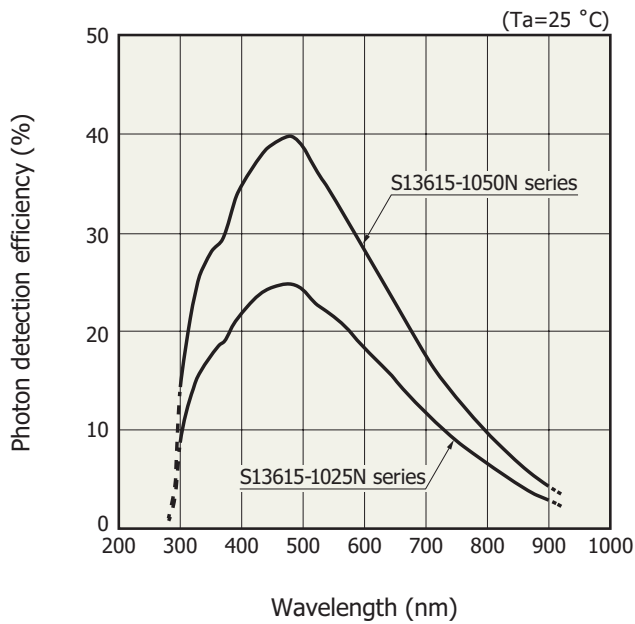
*2: JEDEC level 5a

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.

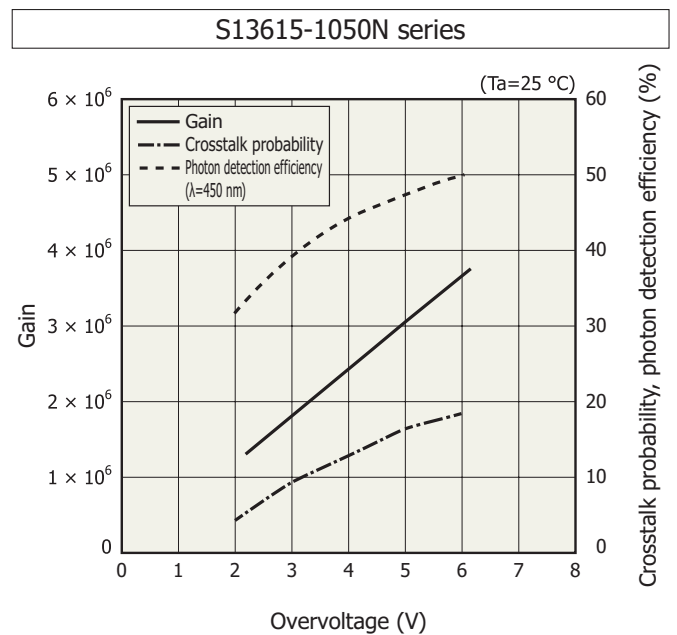
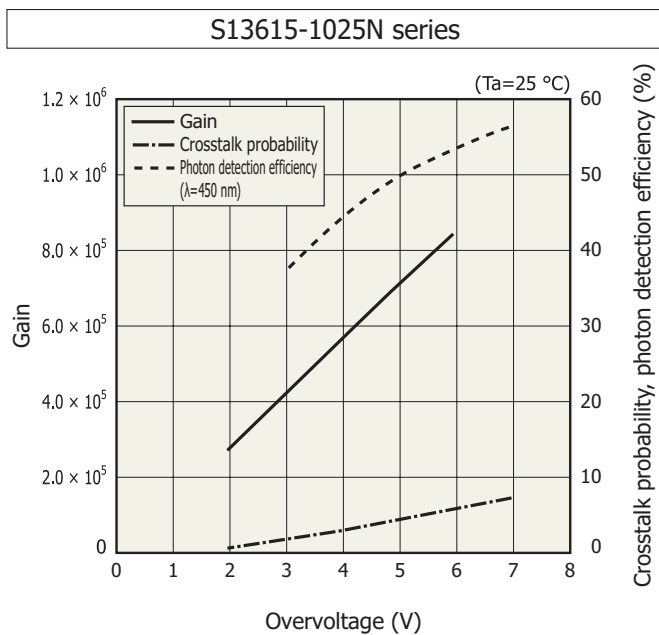
Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Spectral response range λ (nm)	Spectral response range λ_p (nm)	Photon detection efficiency PDE $\lambda=\lambda_p$ (%)	Dark count (kcps)		Crosstalk probability (%)	Terminal capacitance C_t (pF)	Gain M	Breakdown voltage V_{BR} (V)	Recommended operating voltage V_{op} (V)	Operating voltage fluctuation between channels (V)		Recommended operating voltage temperature coefficient ΔTV_{op} (mV/°C)
				Typ.	Max.						Typ.	Max.	
S13615-1025N series	300 to 900	450	25	90	270	3	40	7.0×10^5	53 ± 5	$V_{BR} + 5$	± 0.05	± 0.15	54
S13615-1050N series			40			10							

Photon detection efficiency vs. wavelength (typical example)

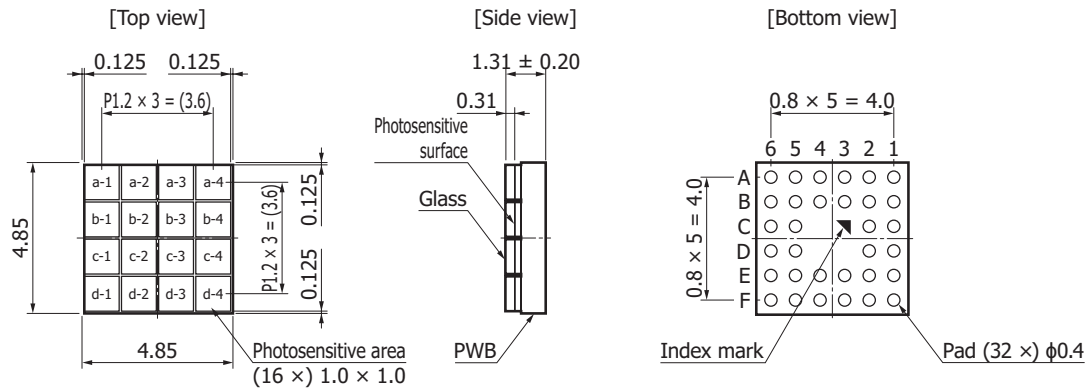


Gain, crosstalk probability, photon detection efficiency - overvoltage characteristics (typical example)



Dimensional outlines (unit: mm)

S13615-1025N-04, S13615-1050N-04



Tolerance unless otherwise noted: ± 0.1

KAPDA0189EA

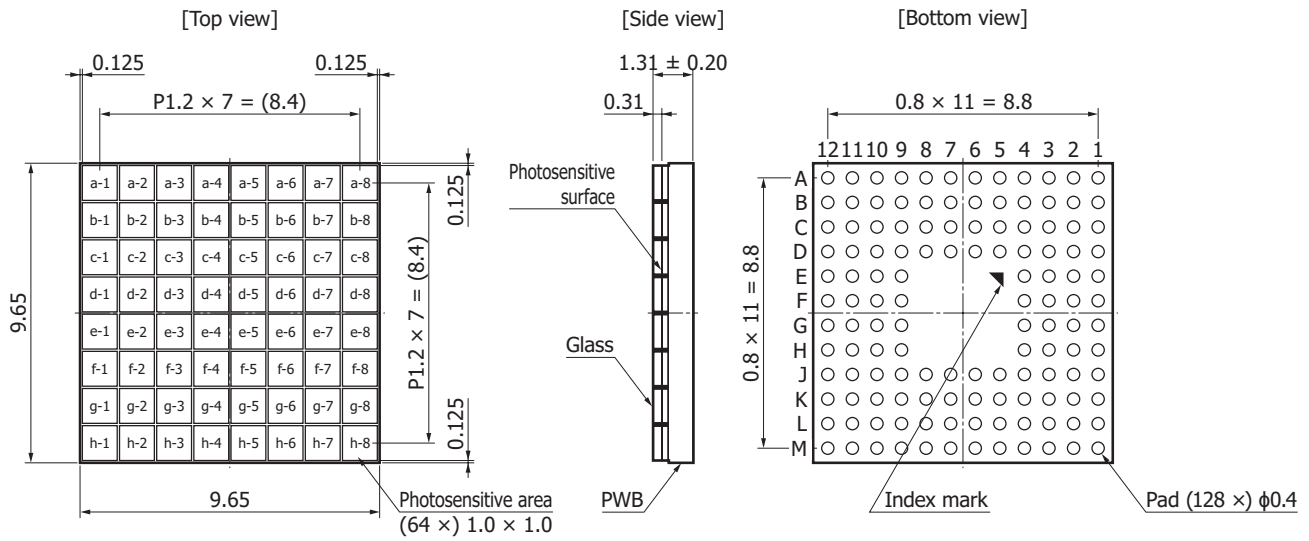
Pin connections

	6	5	4	3	2	1
A	A(a-4)	K(a-4)	A(a-2)	K(a-2)	A(a-1)	K(a-1)
B	A(a-3)	K(a-3)	A(b-3)	K(b-3)	A(b-1)	K(b-1)
C	A(b-4)	K(b-4)			A(b-2)	K(b-2)
D	A(c-4)	K(c-4)			A(c-1)	K(c-1)
E	A(c-3)	K(c-3)	A(d-2)	K(d-2)	A(c-2)	K(c-2)
F	A(d-4)	K(d-4)	A(d-3)	K(d-3)	A(d-1)	K(d-1)

K: cathode

A: anode

S13615-1025N-08, S13615-1050N-08



Tolerance unless otherwise noted: ± 0.1

KAPDA0190EA

■ Pin connections

	12	11	10	9	8	7	6	5	4	3	2	1
A	A(a-8)	K(a-8)	A(a-7)	K(a-7)	A(a-5)	K(a-5)	A(a-4)	K(a-4)	A(a-2)	K(a-2)	A(a-1)	K(a-1)
B	A(b-7)	K(b-7)	A(b-6)	K(b-6)	A(a-6)	K(a-6)	A(a-3)	K(a-3)	A(b-3)	K(b-3)	A(b-2)	K(b-2)
C	A(b-8)	K(b-8)	A(c-6)	K(c-6)	A(b-5)	K(b-5)	A(b-4)	K(b-4)	A(c-3)	K(c-3)	A(b-1)	K(b-1)
D	A(c-8)	K(c-8)	A(c-7)	K(c-7)	A(c-5)	K(c-5)	A(c-4)	K(c-4)	A(c-2)	K(c-2)	A(c-1)	K(c-1)
E	A(d-8)	K(d-8)	A(d-6)	K(d-6)					A(d-3)	K(d-3)	A(d-1)	K(d-1)
F	A(d-7)	K(d-7)	A(d-5)	K(d-5)					A(d-4)	K(d-4)	A(d-2)	K(d-2)
G	A(e-8)	K(e-8)	A(e-6)	K(e-6)					A(e-3)	K(e-3)	A(e-1)	K(e-1)
H	A(e-7)	K(e-7)	A(e-5)	K(e-5)					A(e-4)	K(e-4)	A(e-2)	K(e-2)
E	A(f-8)	K(f-8)	A(f-7)	K(f-7)	A(f-5)	K(f-5)	A(f-4)	K(f-4)	A(f-2)	K(f-2)	A(f-1)	K(f-1)
K	A(g-8)	K(g-8)	A(g-6)	K(g-6)	A(f-6)	K(f-6)	A(f-3)	K(f-3)	A(g-3)	K(g-3)	A(g-1)	K(g-1)
L	A(g-7)	K(g-7)	A(h-6)	K(h-6)	A(g-5)	K(g-5)	A(g-4)	K(g-4)	A(h-3)	K(h-3)	A(g-2)	K(g-2)
M	A(h-8)	K(h-8)	A(h-7)	K(h-7)	A(h-5)	K(h-5)	A(h-4)	K(h-4)	A(h-2)	K(h-2)	A(h-1)	K(h-1)

K: cathode

A: anode

■ Pin connections

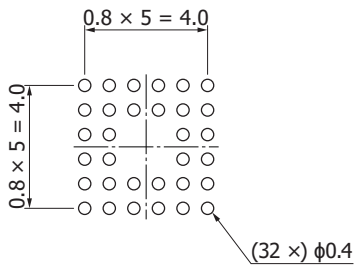
	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
A	K(a-16)	A(a-15)	K(a-15)	A(a-14)	K(a-14)	A(a-13)	K(a-13)	A(a-11)	K(a-11)	A(a-9)	K(a-9)	A(a-7)	K(a-7)	A(a-5)	K(a-5)	A(a-4)	K(a-4)	A(a-3)	K(a-3)	A(a-2)	K(a-2)	A(a-1)	K(a-1)
B	A(a-16)	A(b-15)	K(b-15)	A(b-14)	K(b-14)	A(a-12)	K(a-12)	A(b-11)	K(b-11)	A(a-10)	K(a-10)	A(a-8)	K(a-8)	A(a-6)	K(a-6)	A(b-6)	K(b-6)	A(b-4)	K(b-4)	A(b-2)	K(b-2)	A(b-1)	K(b-1)
C	K(c-16)	A(b-16)	K(b-16)	A(b-13)	K(b-13)	A(b-12)	K(b-12)	A(b-10)	K(b-10)	A(b-9)	K(b-9)	A(b-8)	K(b-8)	A(b-7)	K(b-7)	A(b-5)	K(b-5)	A(b-3)	K(b-3)	A(c-3)	K(c-3)	A(c-1)	K(c-1)
D	A(c-16)	A(c-15)	K(c-15)	A(c-14)	K(c-14)	A(c-13)	K(c-13)	A(c-11)	K(c-11)	A(c-10)	K(c-10)	A(c-8)	K(c-8)	A(c-7)	K(c-7)	A(c-6)	K(c-6)	A(c-5)	K(c-5)	A(c-4)	K(c-4)	A(c-2)	K(c-2)
E	K(d-16)	A(d-15)	K(d-15)	A(d-14)	K(d-14)	A(c-12)	K(c-12)	A(d-11)	K(d-11)	A(c-9)	K(c-9)	A(d-8)	K(d-8)	A(d-7)	K(d-7)	A(d-6)	K(d-6)	A(d-4)	K(d-4)	A(d-3)	K(d-3)	A(d-2)	K(d-2)
F	A(d-16)	A(e-15)	K(e-15)	A(d-13)	K(d-13)	A(d-12)	K(d-12)	A(d-10)	K(d-10)	A(d-9)	K(d-9)	A(e-9)	K(e-9)	A(e-7)	K(e-7)	A(e-6)	K(e-6)	A(d-5)	K(d-5)	A(e-2)	K(e-2)	A(d-1)	K(d-1)
G	K(f-16)	A(e-16)	K(e-16)	A(e-14)	K(e-14)	A(e-13)	K(e-13)	A(e-11)	K(e-11)	A(e-10)	K(e-10)	A(f-9)	K(f-9)	A(e-8)	K(e-8)	A(e-5)	K(e-5)	A(e-4)	K(e-4)	A(e-3)	K(e-3)	A(e-1)	K(e-1)
H	A(f-16)	A(f-15)	K(f-15)	A(f-13)	K(f-13)	A(e-12)	K(e-12)	A(f-11)	K(f-11)	A(f-10)	K(f-10)	A(f-8)	K(f-8)	A(f-6)	K(f-6)	A(f-5)	K(f-5)	A(f-4)	K(f-4)	A(f-3)	K(f-3)	A(f-2)	K(f-2)
E	A(g-16)	K(g-16)	A(g-15)	K(g-15)	A(f-12)	K(f-12)	A(g-12)	K(g-12)	K(g-11)	A(g-9)	K(g-9)	K(g-8)	A(f-7)	K(f-7)	K(g-7)	A(g-5)	K(g-5)	A(g-3)	K(g-3)	A(g-2)	K(g-2)	A(f-1)	K(f-1)
K	A(h-16)	K(h-16)	A(f-14)	K(f-14)	A(g-13)	K(g-13)	A(g-11)	K(g-11)	A(g-10)						A(g-7)	A(g-6)	K(g-6)	A(g-4)	K(g-4)	A(h-3)	K(h-3)	A(g-1)	K(g-1)
L	A(h-15)	K(h-15)	A(g-14)	K(g-14)	A(h-13)	K(h-13)	A(h-11)	K(h-11)	A(h-9)		K(h-9)	A(g-8)	A(h-7)		K(h-7)	A(h-6)	K(h-6)	A(h-5)	K(h-5)	A(h-4)	K(h-4)	A(h-2)	K(h-2)
M	A(j-15)	K(j-15)	A(h-14)	K(h-14)	A(h-12)	K(h-12)	A(h-10)	K(h-10)	A(j-9)		K(j-9)	NC	A(h-8)		K(h-8)	A(j-6)	K(j-6)	A(j-5)	K(j-5)	A(j-2)	K(j-2)	A(h-1)	K(h-1)
N	A(j-16)	K(j-16)	A(j-14)	K(j-14)	A(j-13)	K(j-13)	A(j-12)	K(j-12)	A(j-10)		K(j-10)	K(k-9)	A(j-8)		K(j-8)	A(j-7)	K(j-7)	A(j-4)	K(j-4)	A(j-3)	K(j-3)	A(j-1)	K(j-1)
P	A(k-16)	K(k-16)	A(k-14)	K(k-14)	A(k-12)	K(k-12)	A(j-11)	K(j-11)	K(k-10)						K(k-6)	A(k-5)	K(k-5)	A(k-3)	K(k-3)	A(k-2)	K(k-2)	A(k-1)	K(k-1)
R	A(l-16)	K(l-16)	A(k-15)	K(k-15)	A(k-13)	K(k-13)	A(k-11)	K(k-11)	A(k-10)	A(l-10)	K(l-10)	A(k-9)	A(k-7)	K(k-7)	A(k-6)	A(k-4)	K(k-4)	A(l-5)	K(l-5)	A(l-3)	K(l-3)	A(l-1)	K(l-1)
T	K(m-16)	A(l-15)	K(l-15)	A(l-14)	K(l-14)	A(l-13)	K(l-13)	A(l-12)	K(l-12)	A(l-11)	K(l-11)	A(k-8)	K(k-8)	A(l-8)	K(l-8)	A(l-7)	K(l-7)	A(l-6)	K(l-6)	A(l-4)	K(l-4)	A(l-2)	K(l-2)
U	A(m-16)	A(m-15)	K(m-15)	A(m-14)	K(m-14)	A(m-13)	K(m-13)	A(m-11)	K(m-11)	A(m-10)	K(m-10)	A(l-9)	K(l-9)	A(m-7)	K(m-7)	A(m-5)	K(m-5)	A(m-3)	K(m-3)	A(m-2)	K(m-2)	A(m-1)	K(m-1)
V	K(n-16)	A(n-15)	K(n-15)	A(n-14)	K(n-14)	A(m-12)	K(m-12)	A(n-11)	K(n-11)	A(n-9)	K(n-9)	A(m-9)	K(m-9)	A(m-8)	K(m-8)	A(m-6)	K(m-6)	A(m-4)	K(m-4)	A(n-2)	K(n-2)	A(n-1)	K(n-1)
W	A(n-16)	A(p-16)	K(p-16)	A(n-13)	K(n-13)	A(n-12)	K(n-12)	A(n-10)	K(n-10)	A(p-9)	K(p-9)	A(n-8)	K(n-8)	A(n-7)	K(n-7)	A(n-5)	K(n-5)	A(n-4)	K(n-4)	A(n-3)	K(n-3)	A(p-1)	K(p-1)
Y	K(r-16)	A(p-15)	K(p-15)	A(p-14)	K(p-14)	A(p-12)	K(p-12)	A(p-11)	K(p-11)	A(p-10)	K(p-10)	A(p-8)	K(p-8)	A(n-6)	K(n-6)	A(p-6)	K(p-6)	A(p-4)	K(p-4)	A(p-3)	K(p-3)	A(p-2)	K(p-2)
AA	A(r-16)	A(r-15)	K(r-15)	A(r-13)	K(r-13)	A(p-13)	K(p-13)	A(r-10)	K(r-10)	A(r-9)	K(r-9)	A(r-8)	K(r-8)	A(p-7)	K(p-7)	A(r-5)	K(r-5)	A(p-5)	K(p-5)	A(r-2)	K(r-2)	A(r-1)	K(r-1)
AB	K(t-16)	A(t-14)	K(t-14)	A(r-14)	K(r-14)	A(r-12)	K(r-12)	A(r-11)	K(r-11)	A(t-9)	K(t-9)	A(t-7)	K(t-7)	A(r-7)	K(r-7)	A(r-6)	K(r-6)	A(r-4)	K(r-4)	A(r-3)	K(r-3)	A(t-1)	K(t-1)
AC	A(t-16)	A(t-15)	K(t-15)	A(t-13)	K(t-13)	A(t-12)	K(t-12)	A(t-11)	K(t-11)	A(t-10)	K(t-10)	A(t-8)	K(t-8)	A(t-6)	K(t-6)	A(t-5)	K(t-5)	A(t-4)	K(t-4)	A(t-3)	K(t-3)	A(t-2)	K(t-2)

K: cathode

A: anode

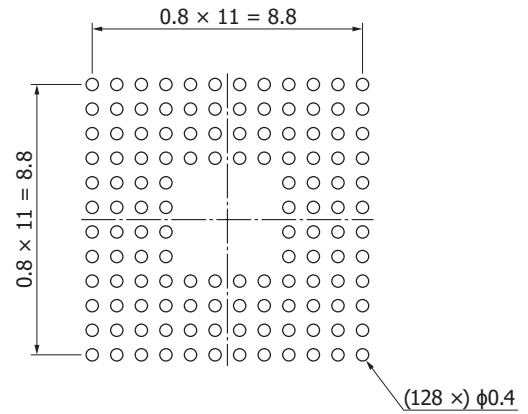
Recommended land pattern (unit: mm)

S13615-1025N-04, S13615-1050N-04



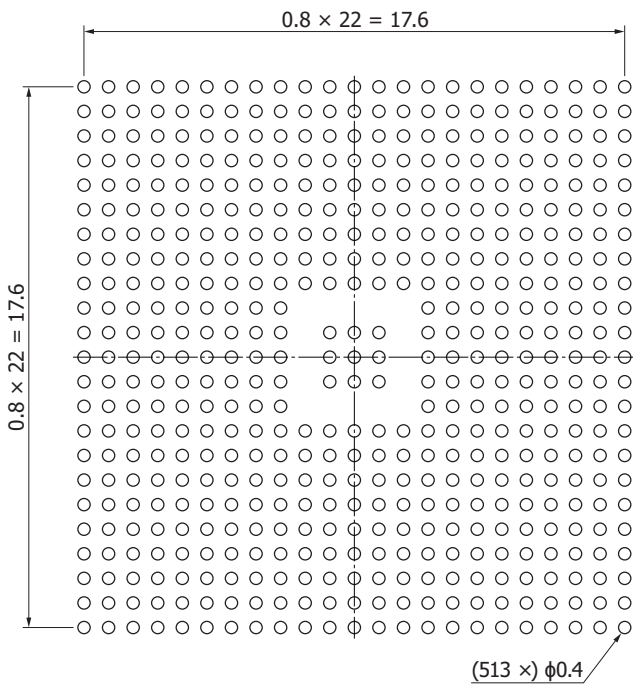
KAPDC0104EA

S13615-1025N-08, S13615-1050N-08



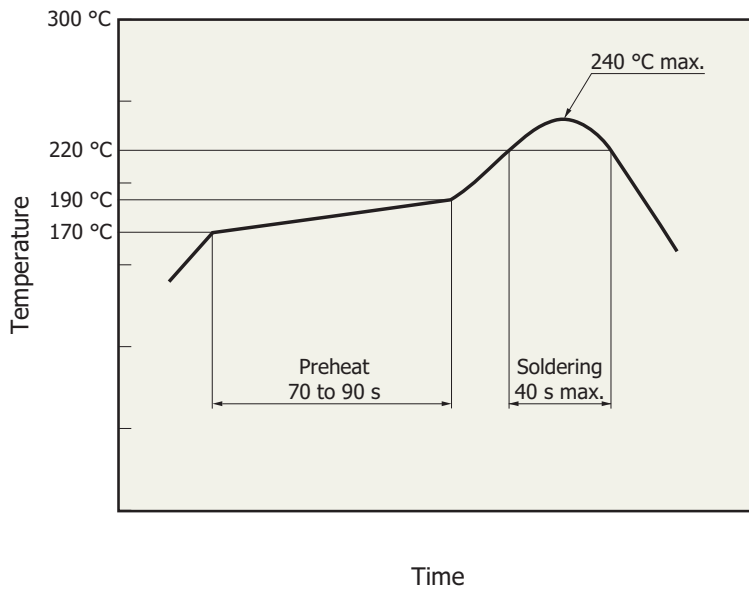
KAPDC0105EA

S13615-1025N-16, S13615-1050N-16



KAPDC0106EA

Measured example of temperature profile with our hot-air reflow oven for product testing



KPICB0171EA

- Surface mount type 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 receives during reflow soldering varies depending on the circuit board and reflow oven that are used. When you set reflow soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

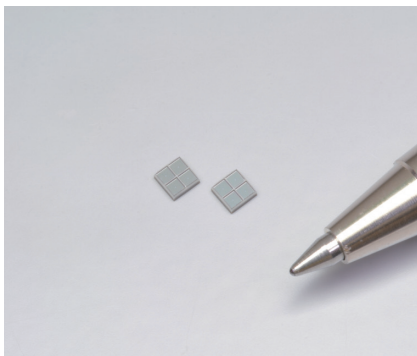
Precautions

- If necessary, incorporate appropriate protective circuits in power supplies, devices, and measuring instruments, etc. to prevent over-voltage and overcurrent.

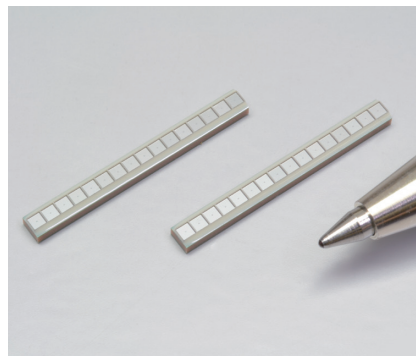
Custom products

Custom products are also available with different numbers of channels and so on.

Product examples



2 × 2 ch



1 × 16 ch

Related information

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

■ Precautions

- Disclaimer
- Surface mount type products

MPPC is a registered trademark of Hamamatsu Photonics K.K.

The content of this document is current as of March 2020.

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, N.J. 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, D-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, United Kingdom, 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, 20020 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.: B1201, Jiaming Center, No.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, Section2, 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