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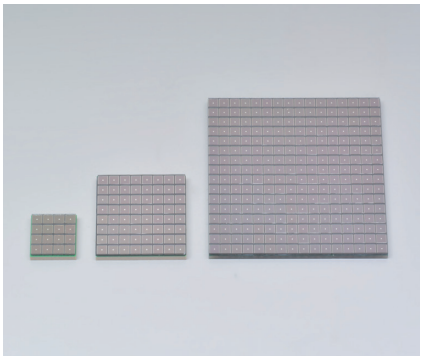
MPPC® arrays



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 (V_{BR}=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

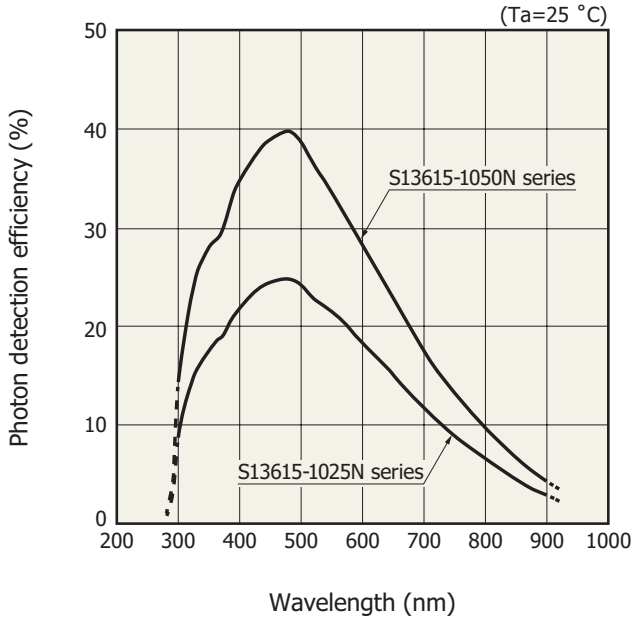
Type no.	Operating temperature Topr (°C)	Storage temperature Tstg (°C)	Soldering temperature*1 Tsol (°C)
S13615-1025N series	-20 to +60	-20 to +80	240 (twice)*2
S13615-1050N series			

*1: No dew condensation
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.8
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 λp (nm)	Photon detection efficiency PDE λ=λp (%)	Dark count (kcps) Typ.	Dark count (kcps) Max.	Crosstalk probability (%)	Terminal capacitance Ct (pF)	Gain M	Breakdown voltage V_{BR} (V)	Recommended operating voltage Vop (V)	Operating voltage fluctuation between channels (V) Typ.	Operating voltage fluctuation between channels (V) Max.	Recommended operating voltage temperature coefficient ΔTVop (mV/°C)
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		1.7×10^6		V_{BR} + 3			

Photon detection efficiency vs. wavelength (typical example)



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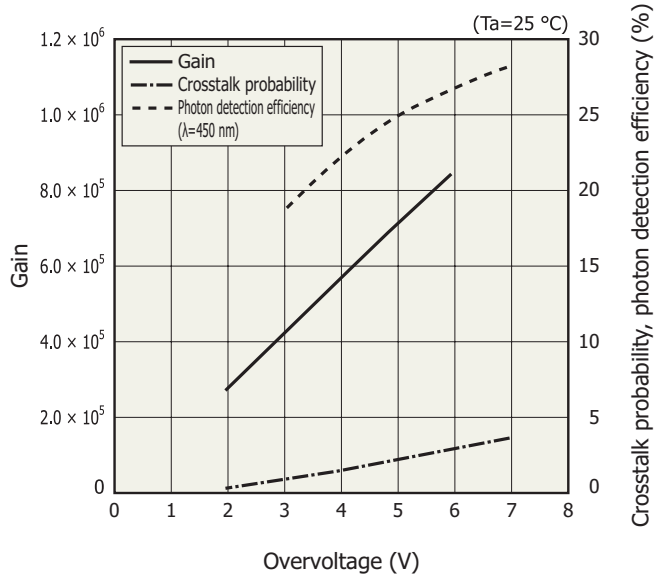
Gain, crosstalk probability, photon detection efficiency - overvoltage characteristics (typical example)

S13615-1025N series



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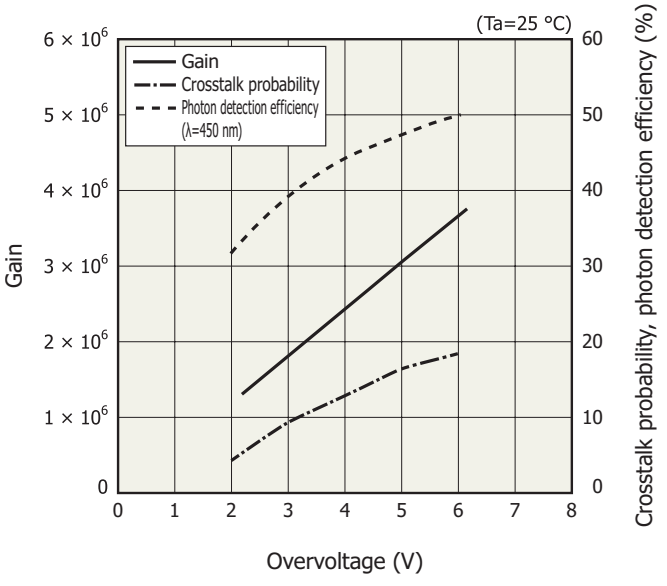
S13615-1050N series



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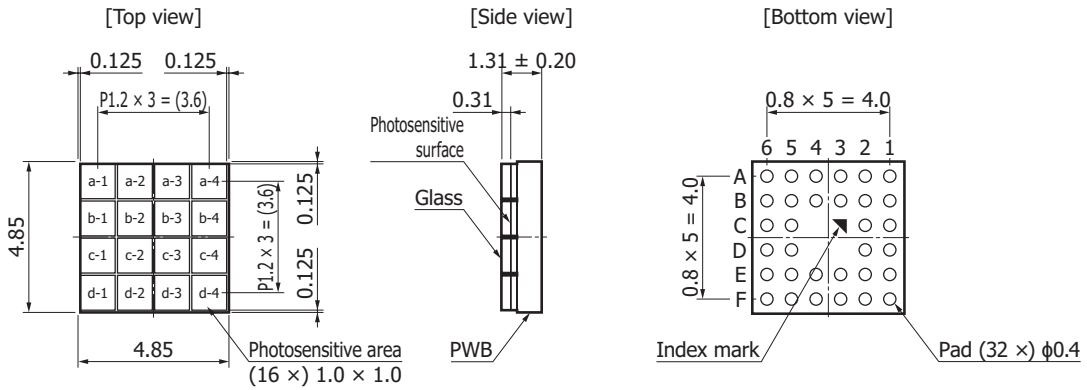
Dimensional outlines (unit: mm)

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



Tolerance unless otherwise noted: ±0.1

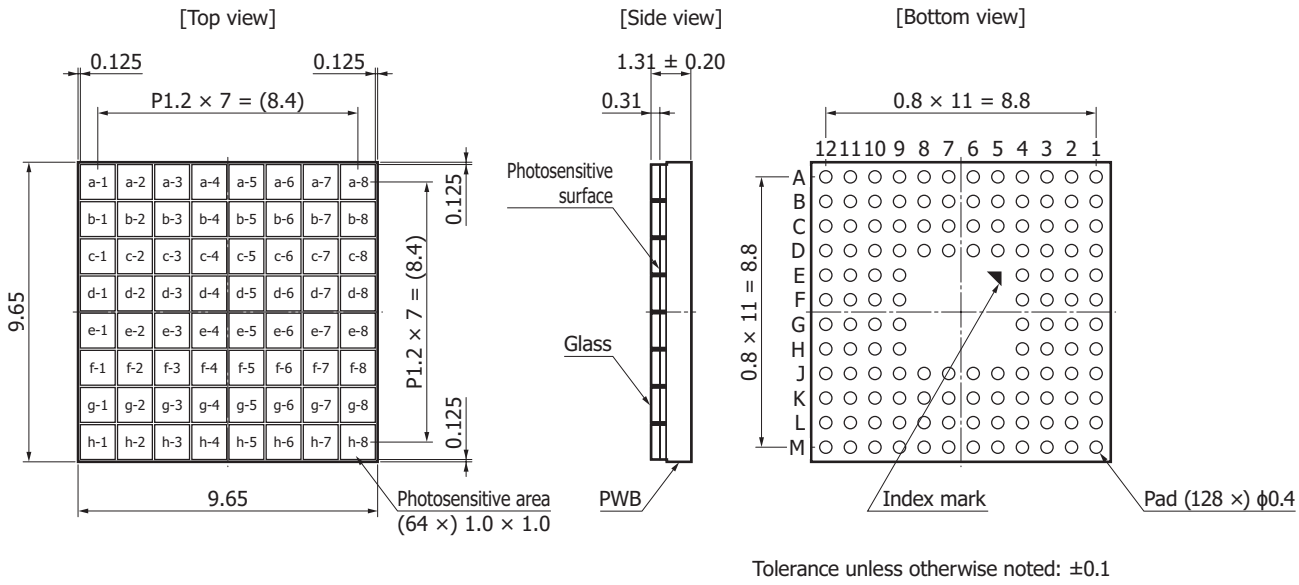
KAPDA0189EA

Pad 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

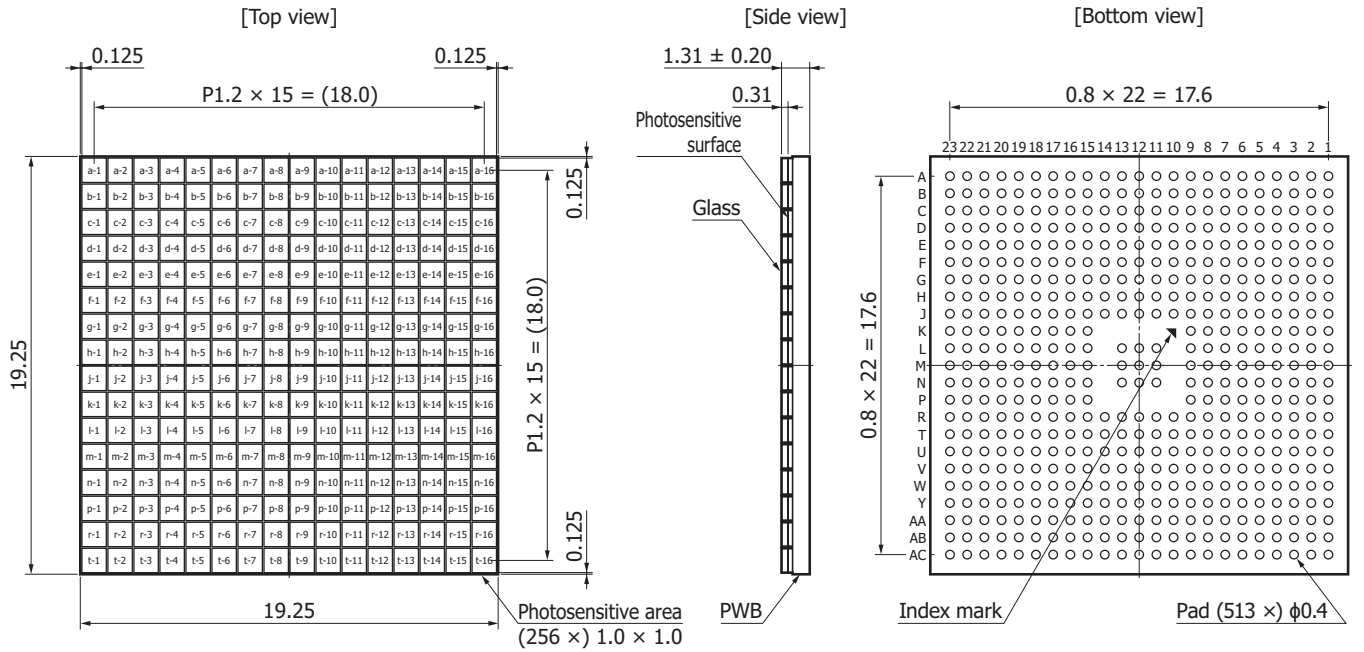
KAPDA0190EA

Pad 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

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



Tolerance unless otherwise noted: ±0.1

KAPDA0191EA

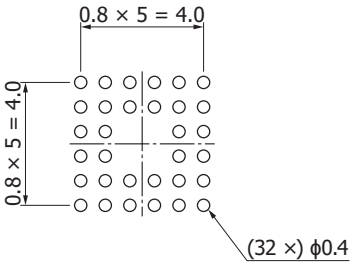
Pad connections

	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-10)	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 patterns (unit: mm)

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



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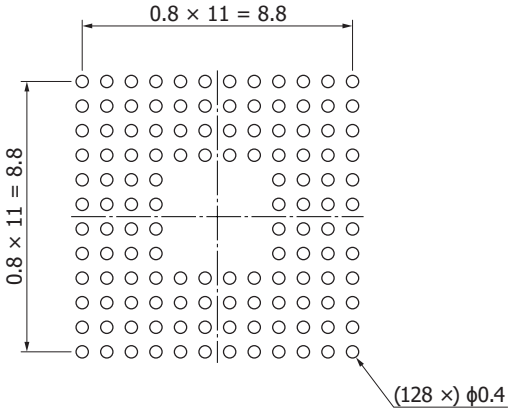
S13615-1025N-08, S13615-1050N-08



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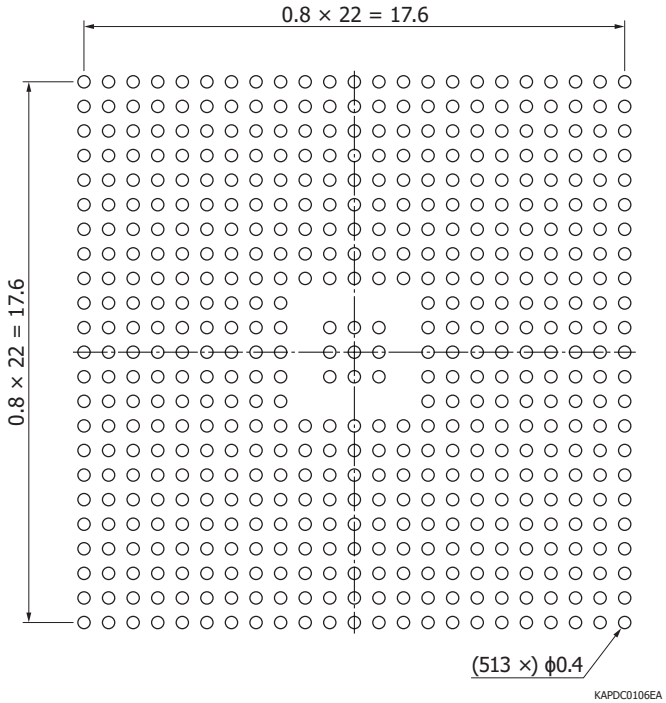
S13615-1025N-16, S13615-1050N-16



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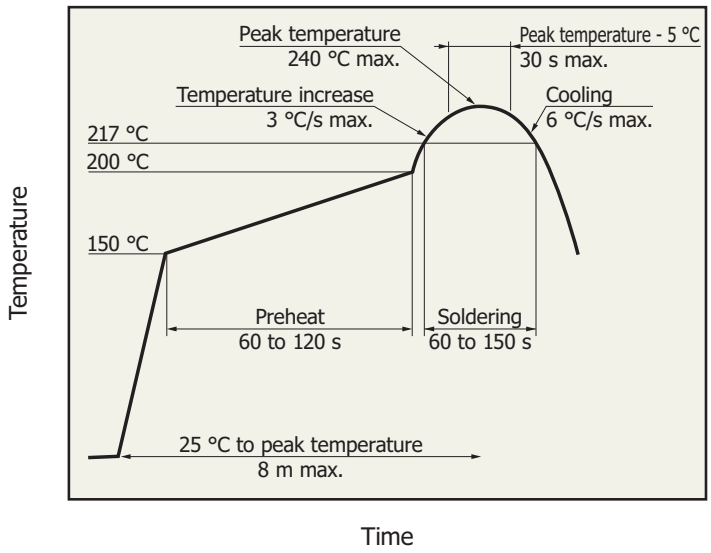
Recommended reflow soldering conditions



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· 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.

Related information

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

■ Precautions
· Disclaimer
· Surface mount type products

■ Technical information
· MPPC / Technical note

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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.
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