



S16786-0515WM

Near-infrared high-sensitivity MPPC

The S16786-0515WM is a near-infrared high-sensitivity MPPC (SiPM) designed for LiDAR applications. The smaller SPAD (Single Photon Avalanche Diode) size improves the dynamic range, and the microlens provide a high PDE (Photon Detection Efficiency). And MPPCs come standard with a trench to reduce crosstalk.

Features

- High photon detection efficiency: 15% ($\lambda=905$ nm)
- Low crosstalk probability: 2% typ.
- Equipped with microlens

Applications

- Distance measurement
- LiDAR

Structure

| Parameter | Specification | Unit |
|-------------------------------------|------------------------------------|------|
| Effective photosensitive area | 0.5 × 0.5 | mm |
| Pixel pitch | 15 | μm |
| Number of pixels | 1089 | - |
| Fill factor | 90 | % |
| Package | Glass epoxy | - |
| Window material | Borosilicate glass with AR coating | - |
| Refractive index of window material | 1.53 | - |
| Thermal resistance*1 | 397 | °C/W |

*1: Between junction temperature and ambient temperature (typical example)

Absolute maximum ratings

| Parameter | Symbol | Condition | Value | Unit |
|-----------------------|------------------|-----------------------|-----------------|------|
| Operating temperature | Topr | No dew condensation*2 | -40 to +105 | °C |
| Storage temperature | Tstg | No dew condensation*2 | -40 to +125 | °C |
| Soldering temperature | Tsol | | 260 (3 times)*3 | °C |
| Output current (DC) | I _{max} | Average value | 1 | mA |

*2: 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.

*3: Reflow soldering, JEDEC J-STD-020 MSL 2a, see P.7

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 | Min. | Typ. | Max. | Unit |
|-------------------------------------|-------------------|--|------|------------------------|------|---------------|
| Spectral response range | λ | | - | 400 to 1000 | - | nm |
| Peak sensitivity wavelength | λ_p | | - | 660 | - | nm |
| Photon detection efficiency*4 | PDE | $\lambda=905\text{ nm}, V_R=V_{BR} + 14\text{ V}$ *5 | - | 15 | - | % |
| Breakdown voltage | V_{BR} | | - | 42 | - | V |
| Recommended operating voltage*6 | V_{op} | *5 | - | $V_{BR} + 14\text{ V}$ | - | V |
| V_{op} variation in a reel*7 | - | | - | ± 0.5 | - | V |
| Dark current | I_D | $V_R=V_{BR} + 14\text{ V}$ | - | 0.01 | - | μA |
| Dark count rate*8 | DCR | $V_R=V_{BR} + 14\text{ V}$ | - | 100 | 500 | kcps |
| Crosstalk probability | | $V_R=V_{BR} + 14\text{ V}$ | - | 2 | - | % |
| Afterpulse probability | | $V_R=V_{BR} + 14\text{ V}$ | - | - | 1 | % |
| Recovery time | t_{recvr} | $V_R=V_{BR} + 14\text{ V}$ | - | 25 | - | ns |
| Terminal capacitance | C_t | $V_R=V_{BR} + 14\text{ V}, f=100\text{ kHz}$ | - | 8 | - | pF |
| Gain | M | $V_R=V_{BR} + 14\text{ V}$ | - | 7.0×10^5 | - | - |
| Temperature coefficient of V_{op} | $\Delta T V_{op}$ | | - | 70 | - | mV/°C |

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

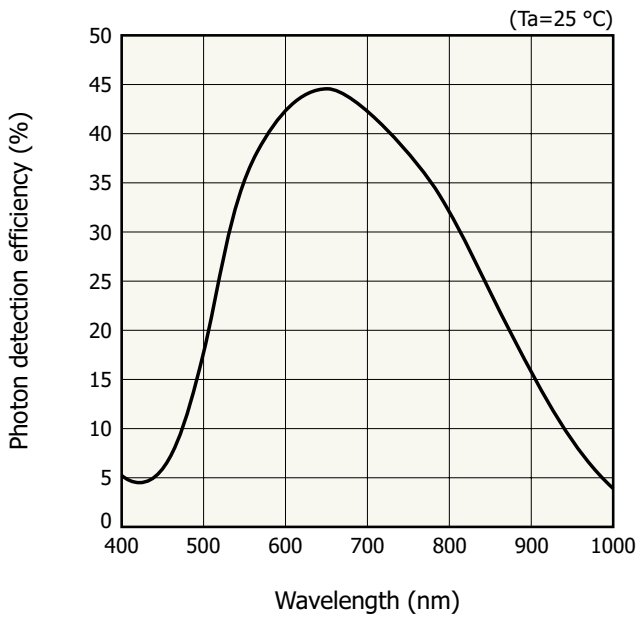
*5: When using V_R more than $V_{BR} + 14\text{ V}$, provide a protective resistance over 5 k Ω or an appropriate current limiting circuit.

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

*7: The center value of the recommended operating voltage (V_{op}) of products in the reel is indicated on the label attached to the reel.

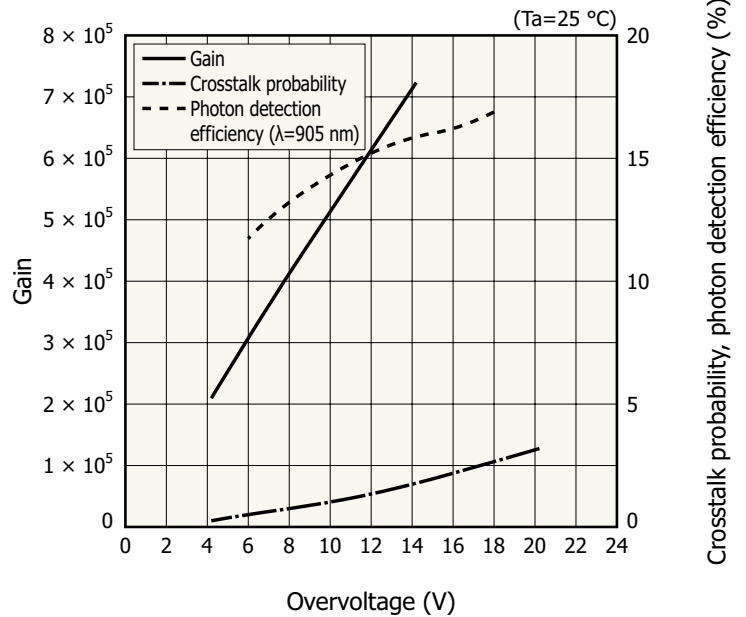
*8: Threshold=0.5 p.e.

Photon detection efficiency vs. wavelength (typical example)



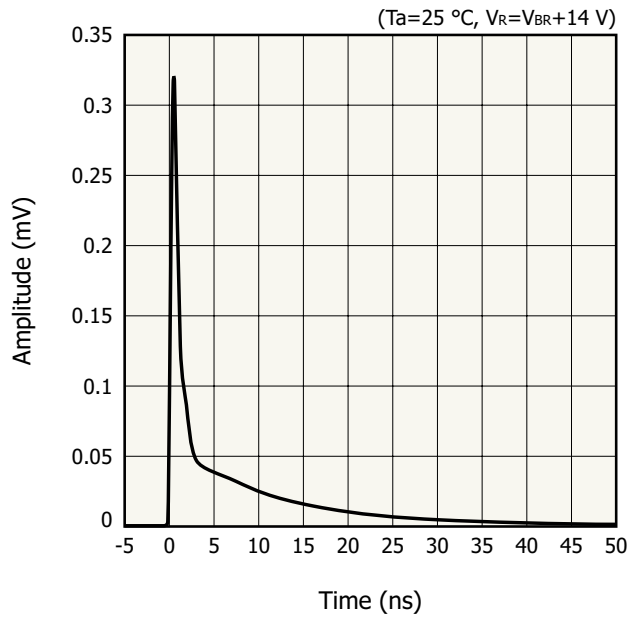
KAPDB0660EA

Gain, crosstalk probability, photon detection efficiency vs. overvoltage (typical example)

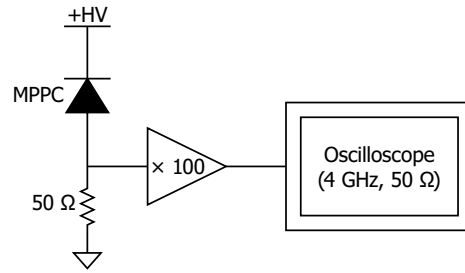


KAPDB0661EA

Pulse waveform (typical example)



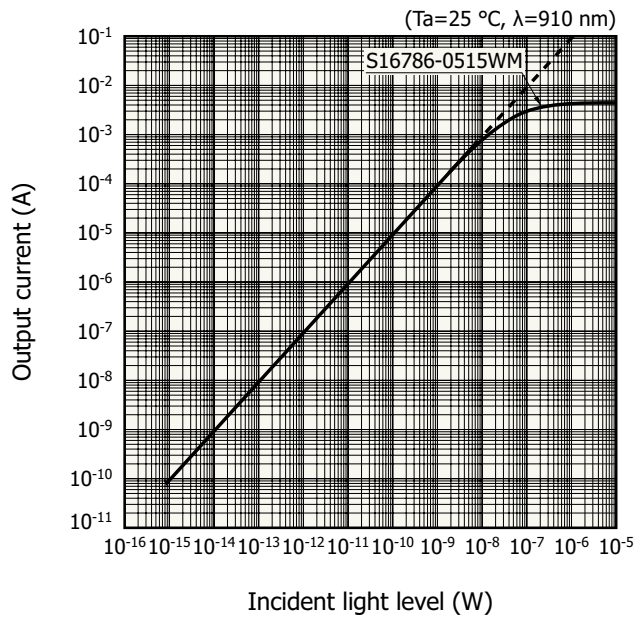
■ Measurement circuit



KAPDC0143EA

KAPDB0662EA

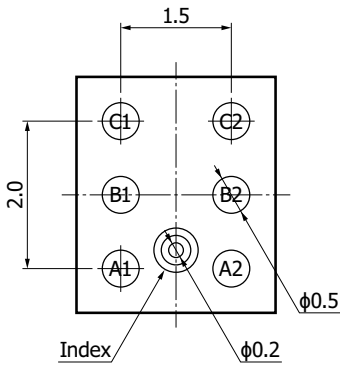
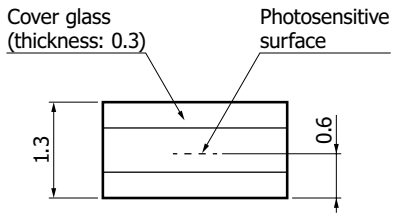
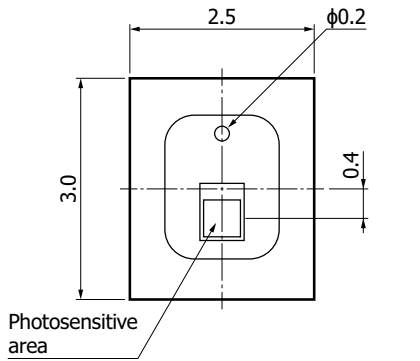
Linearity (typical example)



* This graph does not include the reduction of linearity due to heat.

KAPDB0663EA

Dimensional outline (unit: mm)

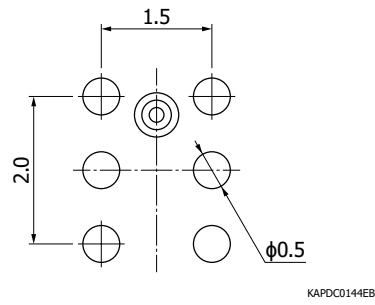


| Pad No. | Electrode |
|---------|-----------|
| A1 | Anode |
| A2 | Cathode |
| B1 | Anode |
| B2 | Anode |
| C1 | Anode |
| C2 | Anode |

Tolerance unless otherwise noted: ± 0.2 mm

KAPDA0233EB

Recommended land pattern (unit: mm)



KAPDC0144EB

Precautions during reflow soldering

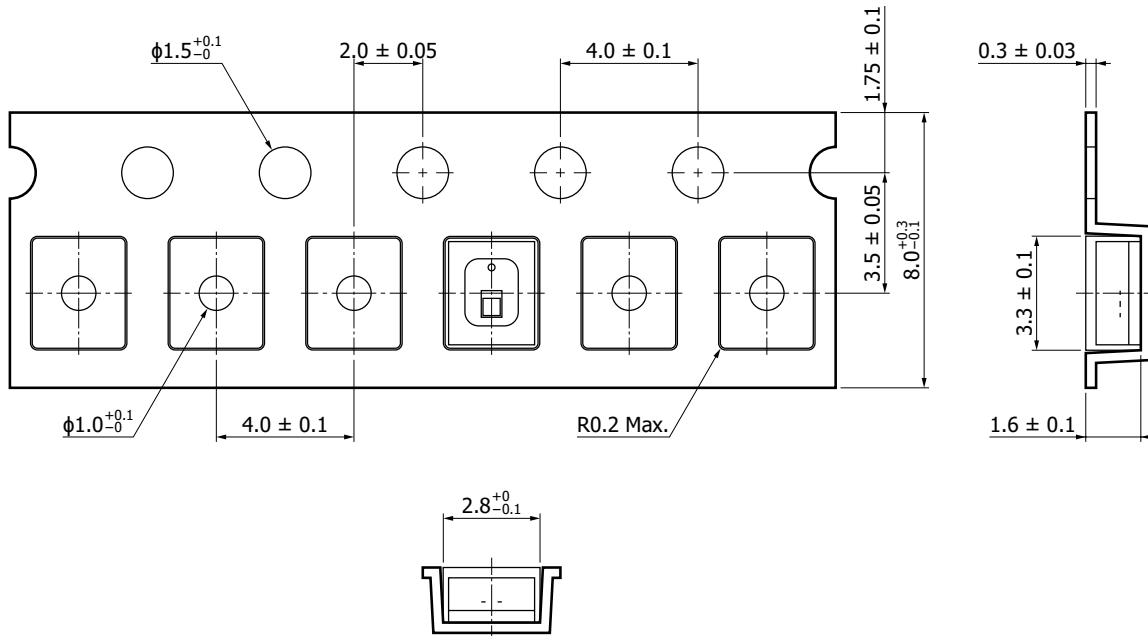
Take care to prevent excess flux. If there is excess flux, then flux may enter the product through the air hole.

Standard packing specifications

■ Reel (conforms to JEITA ET-7200)

| Outer diameter | Hub diameter | Tape width | Material | Electrostatic characteristics |
|----------------|--------------|------------|----------|-------------------------------|
| 180 mm | 60 mm | 8 mm | PS | Conductive |

■ Embossed tape (unit: mm, material: PS, conductive)



KAPDC0145EA

■ Packing quantity

2000 pcs/reel

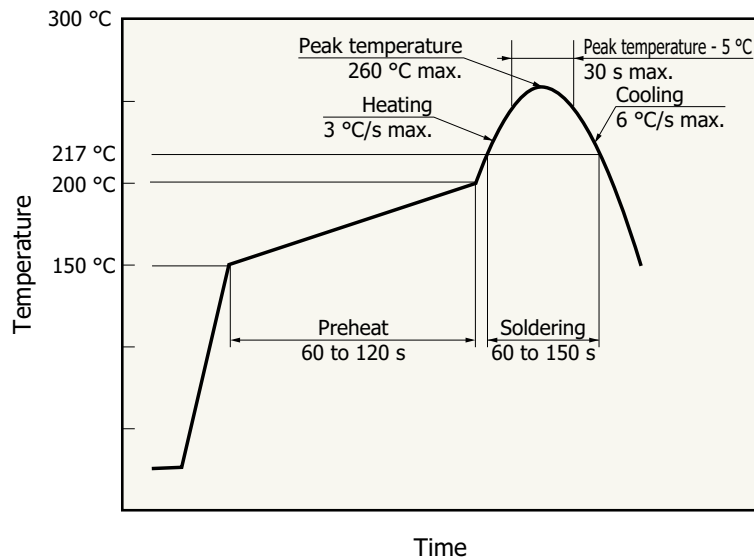
■ Packing type

Reel and desiccant in moisture-proof packaging (vacuum-sealed)

Precaution

- Overcurrent may flow depending on ambient temperature, incident light level, heat dissipation status, and applied bias. If an overcurrent flows, the element temperature may rise, causing damage to the product.
- Do not do cleaning or vapor phase soldering, as cleaning liquid or water may get inside the package through the air hole on the bottom of the package.
- The top of the package is glass. Be careful not to pinch it too hard with metal tweezers, as this can cause cracks or flakes.

Recommended reflow soldering conditions



KMPDB0405EC

- After unpacking, store the device in an environment at a temperature range of 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 4 weeks.
- 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.

Baking

If more than 12 months have passed in the unopened state, or storage conditions are exceeded after opening the package, baking is required to remove moisture before reflow soldering. For the baking, refer to "Precautions / Surface mount type products" in the related information.

Recommended baking conditions

Temperature: 120 °C, 3 hours, up to twice

Note: Before setting the baking conditions, perform experiments to confirm that no problems occur with the product.

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

MPPC is a registered trademark of Hamamatsu Photonics K.K. (EU, Japan, Korea, Switzerland, UK, U.S.A.)
Information described in this material is current as of July 2025.

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

Optical Semiconductor Sales, HAMAMATSU PHOTONICS K.K.

1126-1 Ichino-cho, Chuo-ku, Hamamatsu City, Shizuoka Pref., 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

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: info@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.: 13F 1, No.101, Section 2, Gongdao 5th Road, East Dist., Hsinchu City, 300046, Taiwan(R.O.C) Telephone: (886)3 659 0080, Fax: (886)3 659 0081 E mail: info@hamamatsu.com.tw

Korea: HAMAMATSU PHOTONICS KOREA CO., LTD.: A 912, 167, Songpa daero, Seoul, 05855, Korea, Telephone: (82)2 2054 8202, Fax: (82)2 2054 8207 E mail: sales@hpkr.co.kr