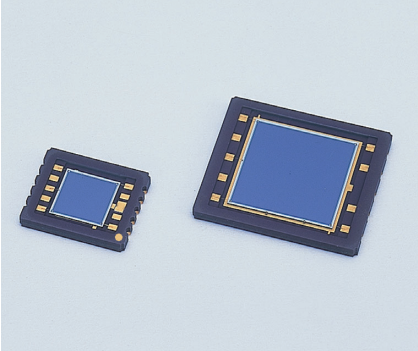
HAMAMATSU
PHOTON IS OUR BUSINESS

Two-dimensional PSD



S5990-01, S5991-01

Improved tetra-lateral type for surface mounting

Features

- **Large photosensitive area**
  S5990-01: 4 × 4 mm
  S5991-01: 9 × 9 mm
- **Chip carrier package for surface mounting (automatic mounting with solder reflow)**
  Thin package: 1.26 mmt
- **Improved tetra-lateral type (pin-cushion type) delivers superior position detection.**
- **Evaluation circuit board provided (sold separately)**
  C4674-01 (DC signal processing circuit)

Applications

- **Light spot detection**
- **Pointing device (computer mouse, track-ball)**
- **Position measurement**

Absolute maximum ratings (Ta=25 °C)

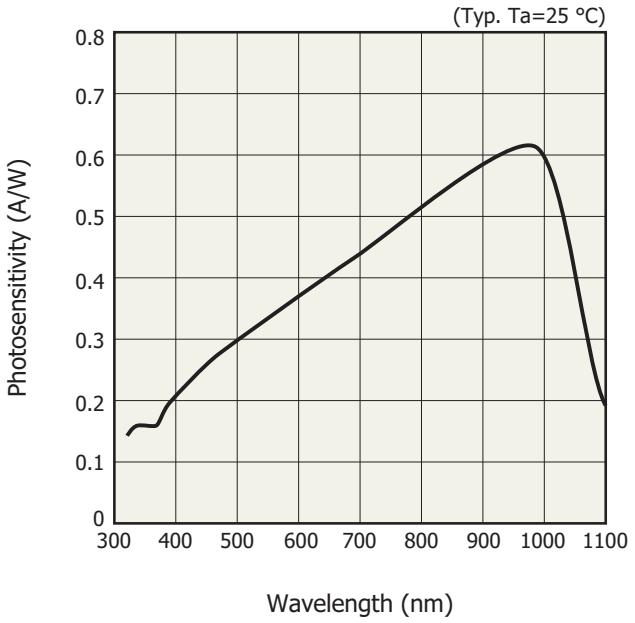
Parameter	Symbol	Value	Unit
Reverse voltage	V_R max	20	V
Operating temperature	Topr	-20 to +60	°C
Storage temperature	Tstg	-20 to +80	°C

Electrical and optical characteristics (Ta=25 °C)

Parameter	Symbol	Condition	S5990-01			S5991-01			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ		-	320 to 1100	-	-	320 to 1100	-	nm
Peak sensitivity wavelength	λp		-	960	-	-	960	-	nm
Photosensitivity	S	λ=λp	-	0.6	-	-	0.6	-	A/W
Interelectrode resistance	Rie	Vb=0.1 V	5	7	15	5	7	15	kΩ
Position detection error	E	λ=900 nm, V_R=5 V light spot size: ϕ0.2 mm *	-	±70	±150	-	±150	±250	μm
Saturation photocurrent	Ist	λ=900 nm, V_R=5 V R_L=1 kΩ	-	500	-	-	500	-	μA
Dark current	I_D	V_R=5 V	-	0.5	10	-	1	50	nA
Rise time	tr	V_R=5 V, R_L=1 kΩ λ=900 nm	-	1	-	-	2	-	μs
Terminal capacitance	Ct	V_R=5 V, f=10 kHz	-	150	300	-	500	1000	pF
Position resolution	ΔR	Io=1 μA, B=1 kHz *	-	0.7	-	-	1.5	-	μm

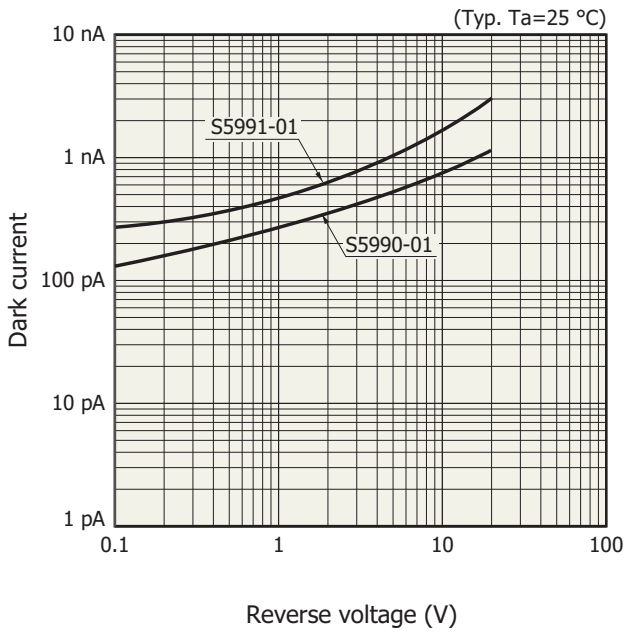
* In the range that is 80% from the center to the edge. Recommended light spot size is larger than ϕ0.2 mm.

Spectral response



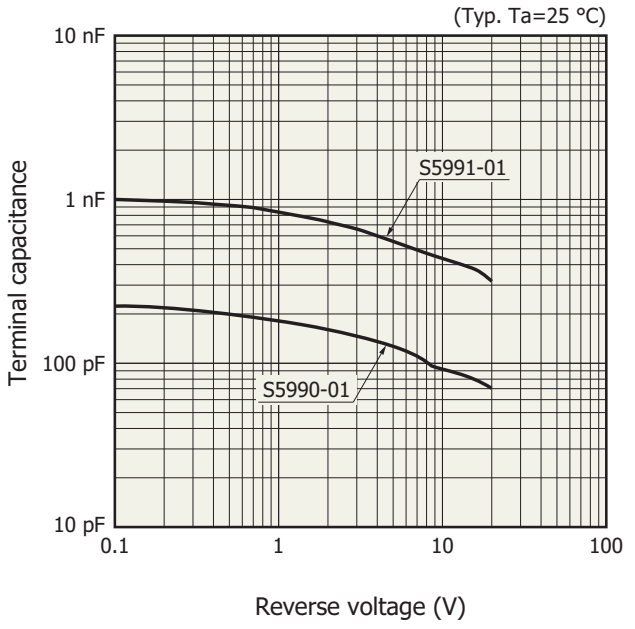
KPSDB0026EA

Dark current vs. reverse voltage



KPSDB0068EA

Terminal capacitance vs. reverse voltage

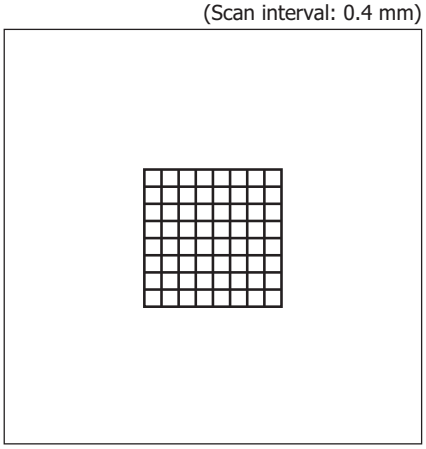


KPSDB0073EA

Example of position detectability (Ta=25 °C, λ=830 nm, light spot size: ϕ0.2 mm)

S5990-01

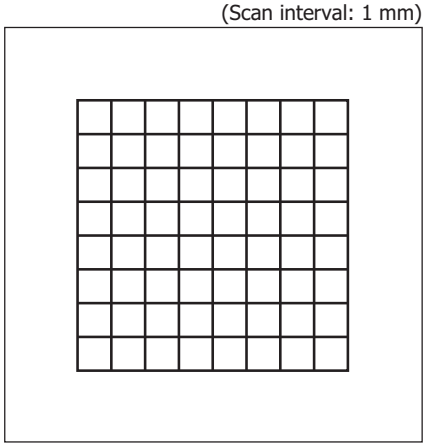
(Scan interval: 0.4 mm)



KPSDC0064EA

S5991-01

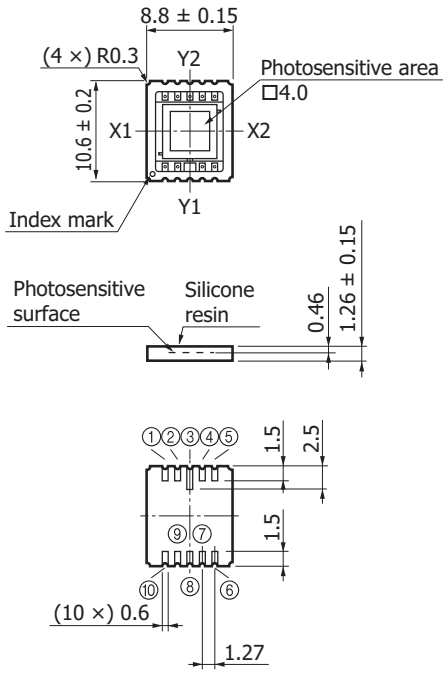
(Scan interval: 1 mm)



KPSDC0065EA

Dimensional outlines (unit: mm)

S5990-01



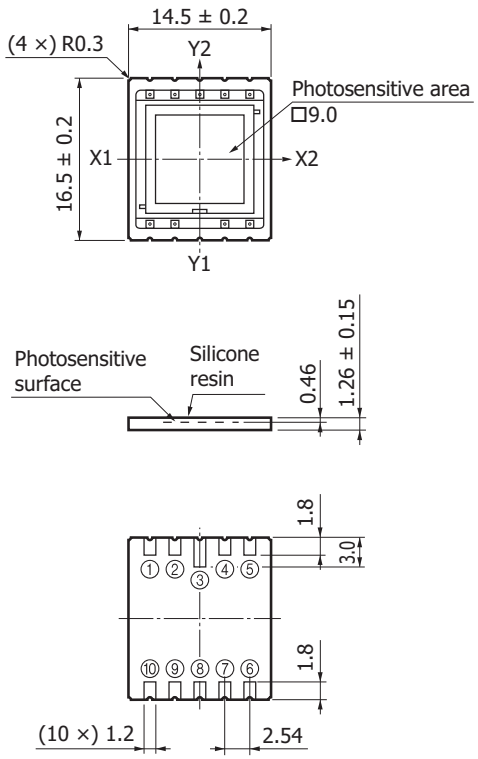
Burrs shall protrude no more than 0.3 mm on any side of package.

① Anode X1 (I_1)
② NC
③ NC
④ NC
⑤ Anode Y1 (I_3)
⑥ Anode X2 (I_2)
⑦ NC
⑧ Cathode
⑨ NC
⑩ Anode Y2 (I_4)

③ pin should be open-circuited

KPSDA0044EB

S5991-01



Burrs shall protrude no more than 0.3 mm on any side of package.

① Anode X1 (I_1)
② NC
③ NC
④ NC
⑤ Anode Y1 (I_3)
⑥ Anode X2 (I_2)
⑦ NC
⑧ Cathode
⑨ NC
⑩ Anode Y2 (I_4)

③ pin should be open-circuited

KPSDA0045EA

Conversion formula

$$\frac{(I_2 + I_3) - (I_1 + I_4)}{I_1 + I_2 + I_3 + I_4} = \frac{2x}{L}$$

$$\frac{(I_2 + I_4) - (I_1 + I_3)}{I_1 + I_2 + I_3 + I_4} = \frac{2y}{L}$$

x, y: position coordinate of light spot
S5990-01: L=4.5 mm
S5991-01: L=10 mm

Precautions

- The light input window of this product uses soft silicone resin. Avoid touching the window to keep it from grime and damage that can decrease sensitivity. External force applied to the resin surface may deform or cut off the wires, so do not touch the window to prevent such troubles.
- Use rosin flux when soldering, to prevent the terminal lead corrosion. Reflow oven temperature should be at 260 °C maximum for 5 seconds maximum time under the conditions that no moisture absorption occurs.
  Reflow soldering conditions differ depending on the type of PC board and reflow oven. Carefully check these conditions before use.
- Silicone resin swells when it absorbs organic solvent, so do not use any solvent other than alcohol.
- Avoid unpacking until you actually use this product to prevent the terminals from oxidation and dust deposits or the coated resin from absorbing moisture.
  When the product is stored for 3 months while not unpacked or 24 hours have elapsed after unpacking, perform baking in nitrogen atmosphere at 150 °C for 3 to 5 hours or at 120 °C for 12 to 15 hours before use.

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, P.O.Box 6910, Bridgewater, N.J. 08807-0910, 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: Thorshamnsgatan 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) 02-935-81-733, Fax: (39) 02-935-81-741
China: Hamamatsu Photonics (China) Co., Ltd.: 1201 Tower B, Jiaming Center, No.27 Dongsanhuan Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86) 10-6586-6006, Fax: (86) 10-6586-2866

Cat. No. KPSD1010E05 May 2013 DN