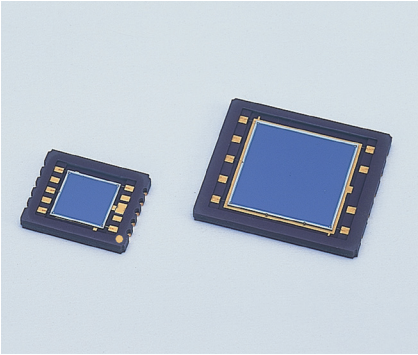
HAMAMATSU
PHOTON IS OUR BUSINESS

Two-dimensional PSD

S5990/S5991 series



Surface mountable, high-accuracy position sensitive detectors

Features

- **Surface mount type ceramic chip carrier package**
- **Excellent position detectability**
- **Compatible with lead-free solder reflow**
- **Packing**
  Tray: S5990-01, S5991-01
  Reel: S5990-11, S5991-11

Applications

- **Light spot detection**
- **Pointing device**
- **Various types of position detection**

Options (sold separately)

- **Signal processing circuit for 2-D PSD** **C4674-01**

Structure

Parameter	Symbol	S5990-01/-11	S5991-01/-11	Unit
Photosensitive area	A	4 × 4	9 × 9	mm
Package	-	Ceramic		-
Window material	-	Silicone resin		-

Absolute maximum ratings (Ta=25 °C)

Parameter	Symbol	Value	Unit
Reverse voltage	V_R max	20	V
Operating temperature*1	Topr	-20 to +60	°C
Storage temperature*1	Tstg	-20 to +80	°C
Soldering conditions	-	Peak temperature: 240 °C, 1 time*2	-

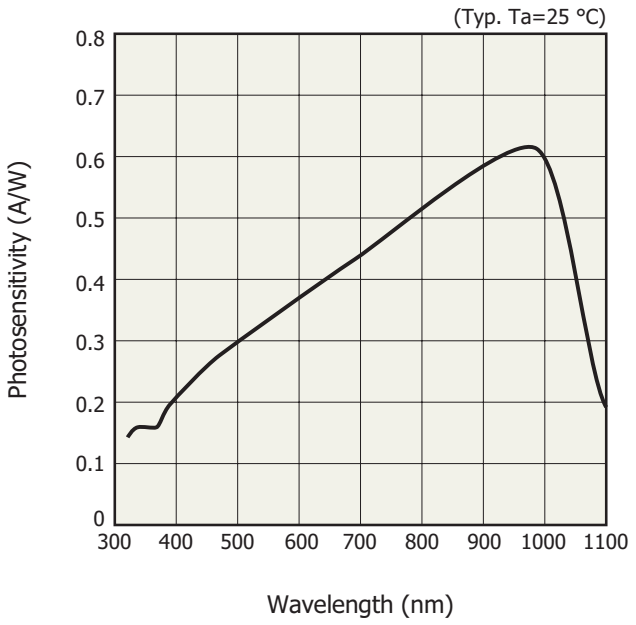
*1: No dew condensation. When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*2: JEDEC J-STD-020 MSL 5a. 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)

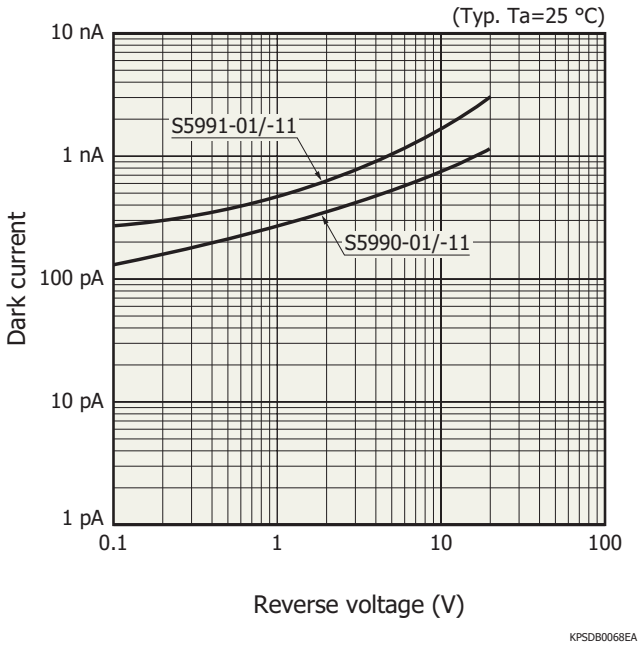
Parameter	Symbol	Condition	S5990-01/-11			S5991-01/-11			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ		-	320 to 1100	-	-	320 to 1100	-	nm
Peak sensitivity wavelength	λp		-	960	-	-	960	-	nm
Photosensitivity	S	λ=λp	-	0.6	-	-	0.6	-	A/W
Interelectrode resistance	Rie	Vb=0.1 V	5	7	15	5	7	15	kΩ
Position detection error	E	λ=900 nm, V_R=5 V, ϕ0.2 mm light spot*3	-	±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	VR=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*3	-	0.7	-	-	1.5	-	μm

*3: Specified within a circle that is 80% of the photosensitive area. Recommended light spot size: ϕ0.2 mm or more

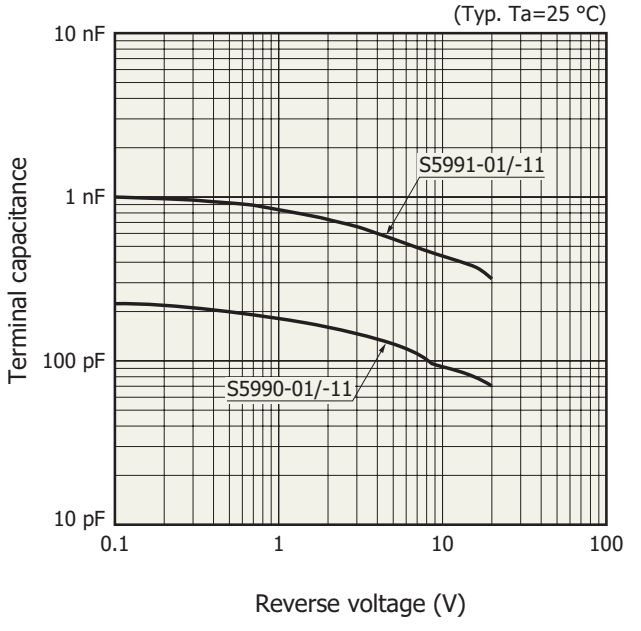
Spectral response



Dark current vs. reverse voltage

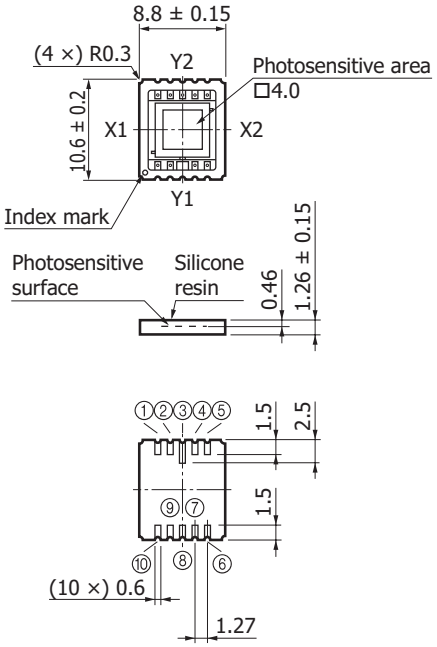


Terminal capacitance vs. reverse voltage



Dimensional outlines (unit: mm)

S5990-01/-11



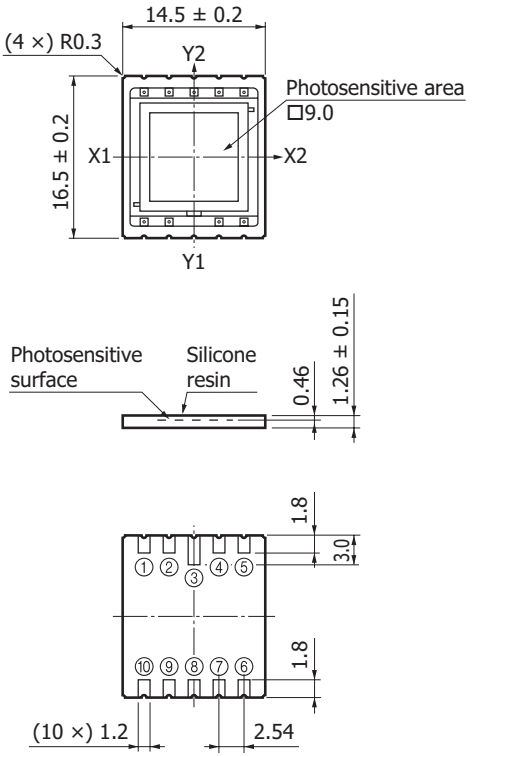
Burrs shall protrude no more than 0.3 mm on any side of package.

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/-11



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

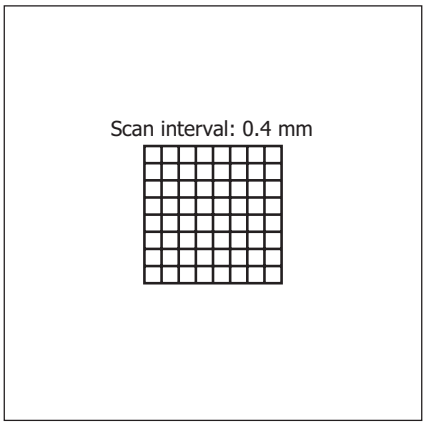
$$\frac{(I_2 + I_3) - (I_1 + I_4)}{I_1 + I_2 + I_3 + I_4} = \frac{2x}{L}$$

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

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

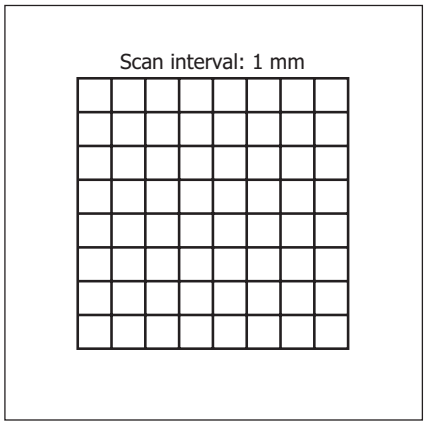
Example of position detectability (Ta=25 °C, λ=900 nm, light spot size: ϕ0.2 mm)

S5990-01/-11



KPSDC0064EA

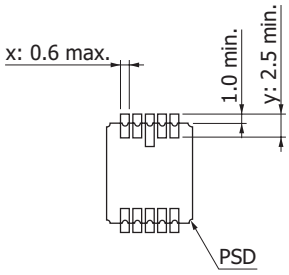
S5991-01/-11



KPSDC0065EA

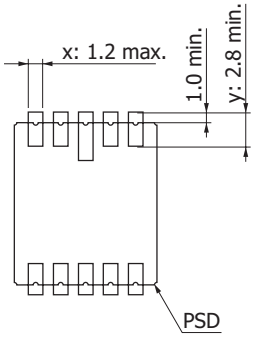
Recommended land patterns (unit: mm)

S5990-01/-11



KPSDC0095EA

S5991-01/-11



KPSDC0094EC

1. Solder all terminals.
2. Do not make the land area larger than necessary.
3. It is preferable that the land sizes be about equal.
4. Make land width x about the same as the terminal width.
5. Make land height y at least 1 mm longer than the terminal height, protruding outside the package.

Standard packing specifications

S5990-01, S5991-01

■ Packing quantity
S5990-01: 100 pcs max./tray
S5991-01: 50 pcs max./tray

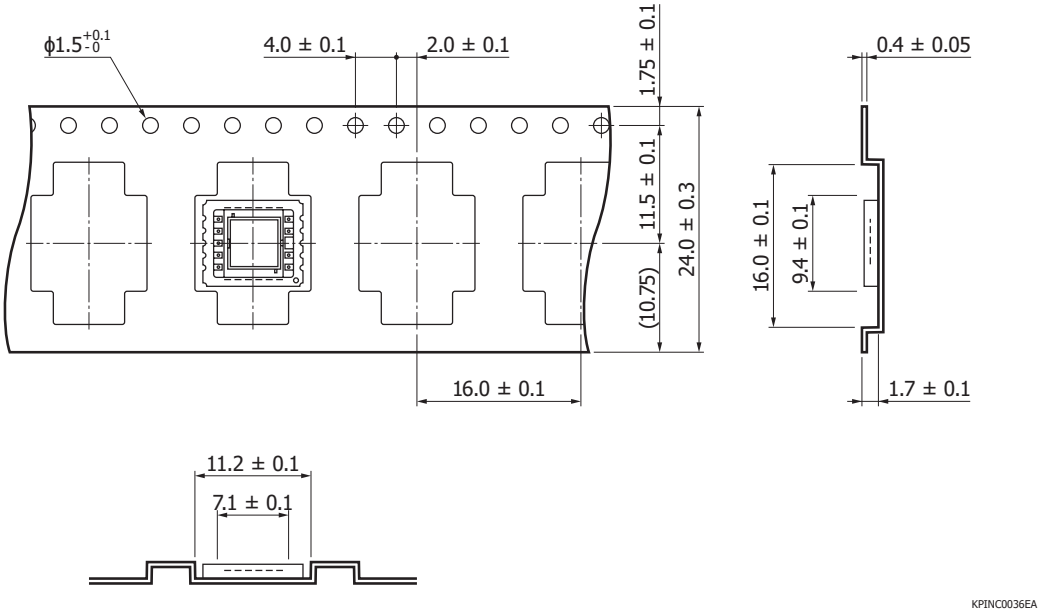
■ Packing state
Tray and desiccant in moisture-proof packaging (vacuum-sealed)

S5990-11

■ Reel (conforms to JEITA ET-7200)

Reel outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
ϕ254 mm	ϕ100 mm	24 mm	PS	Conductive

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



■ Packing quantity
1000 pcs/reel

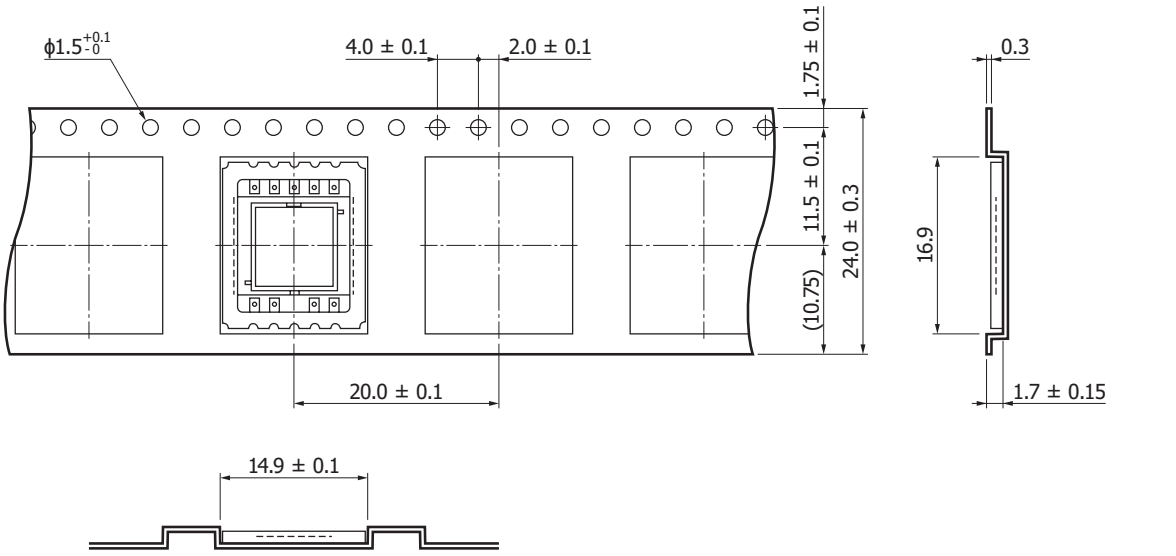
■ Packing state
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

S5991-11

■ Reel (conforms to JEITA ET-7200)

Reel outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
ϕ330 mm	ϕ80 mm	24 mm	PS	Conductive

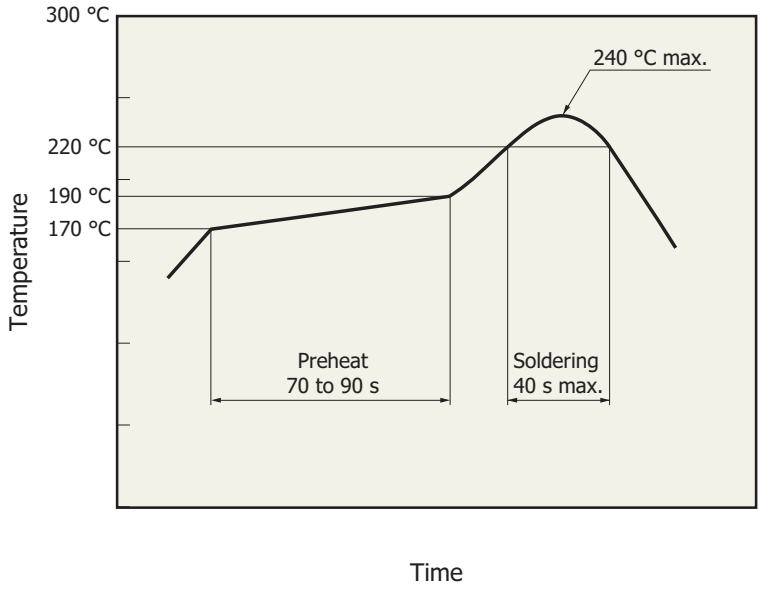
■ Embossed tape (unit: mm, material: PS, conductive)



■ Packing quantity
100 pcs/reel

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

Recommended reflow soldering conditions



Precautions

· This product's light input window uses soft silicone resin. Stain or scratch in the light input window degrades the sensitivity. Avoid contact with the light input window, as applying external force to the resin surface may cause the wire to deform and break.

· When soldering, use rosin-based flux to prevent terminal corrosion. Solder at 260 ° C or less within 5 seconds without moisture absorption. Check carefully the conditions of reflow soldering, since they vary depending on the board and reflow oven in use.

· Silicone resin swells with organic solvents. So do not use anything other than alcohol.

· Avoid opening the bag until immediately before using the product so as to prevent oxidation or contamination of terminals or moisture absorption of resin filling.
In addition, if 3 months have passed in an unopened state or 24 hours have passed after opening, bake in nitrogen atmosphere for 3 to 5 hours at 150 °C, or for 12 to 15 hours at 120 °C before use.

Related information

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

■ Precautions
· Disclaimer
· Surface mount type products

■ Technical information
· PSD

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

Cat. No. KPSD1010E07 Jan. 2020 DN