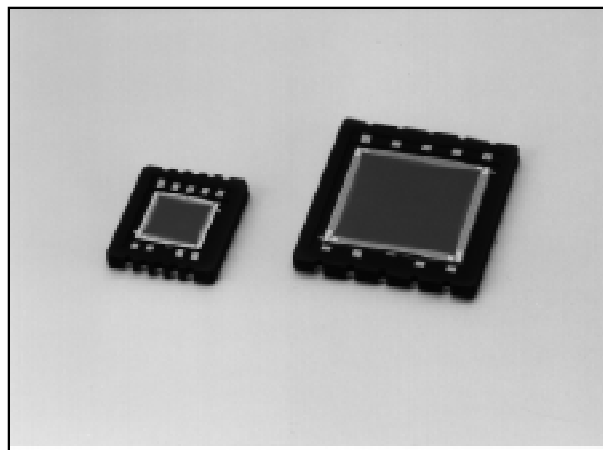


### Surface mount type PSDs (pin-cushion types)

#### FEATURES

- Large active 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 mm
- Improvement in position detection error  
1/5 or below compared with the conventional types  
(S5990, S5991)



#### APPLICATIONS

- Spot light detection
- Pointing device (computer mouse, track-ball)
- Position measurement

#### ■ ABSOLUTE MAXIMUM RATINGS (Ta=25 °C)

Parameter	Symbol	Value	Unit
Reverse Voltage	V <sub>R</sub> Max.	20	V
Operating Temperature	T <sub>opr</sub>	-20 to +60	°C
Storage Temperature	T <sub>stg</sub>	-20 to +80	°C

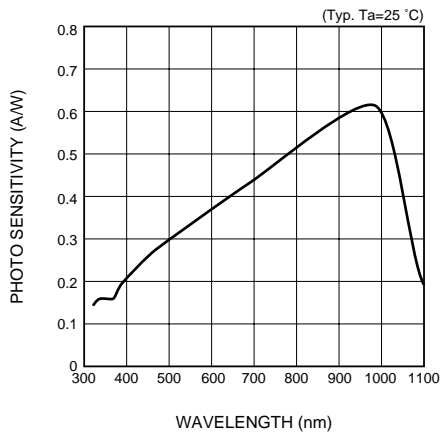
#### ■ ELECTRICAL AND OPTICAL CHARACTERISTICS (Ta=25 °C)

Parameter	Symbol	Condition	S5990-01			S5991-01			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral Response Range	$\lambda$		-	320 to 1100	-	-	320 to 1100	-	nm
Peak Sensitivity Wavelength	$\lambda_p$		-	960	-	-	960	-	nm
Photo Sensitivity	S	$\lambda = \lambda_p$	-	0.6	-	-	0.6	-	A/W
Interelectrode Resistance	R <sub>ie</sub>	V <sub>b</sub> =0.1 V	5	7	15	5	7	15	k $\Omega$
Position Detection Error	E	$\lambda = 900$ nm V <sub>R</sub> =5 V, spot light size: $\phi 0.2$ mm *	-	$\pm 70$	-	-	$\pm 150$	-	$\mu$ m
Maximum Photocurrent	I <sub>st</sub>	$\lambda = 900$ nm V <sub>R</sub> =5 V R <sub>L</sub> =1 k $\Omega$	-	500	-	-	500	-	$\mu$ A
Dark Current	I <sub>D</sub>	V <sub>R</sub> =5 V	-	0.5	10	-	1	50	nA
Rise Time	t <sub>r</sub>	V <sub>R</sub> =5 V, R <sub>L</sub> =1 k $\Omega$ $\lambda = 900$ nm	-	1	-	-	2	-	$\mu$ s
Terminal Capacitance	C <sub>t</sub>	V <sub>R</sub> =5 V, f=10 kHz	-	150	300	-	500	1000	pF
Position Resolution	$\Delta R$	I <sub>o</sub> =1 $\mu$ A, B=1 kHz *	-	0.7	-	-	1.5	-	$\mu$ m

\* In the range that is 80 % from the center to the edge. Recommended spot light size is larger than  $\phi 0.2$  mm.

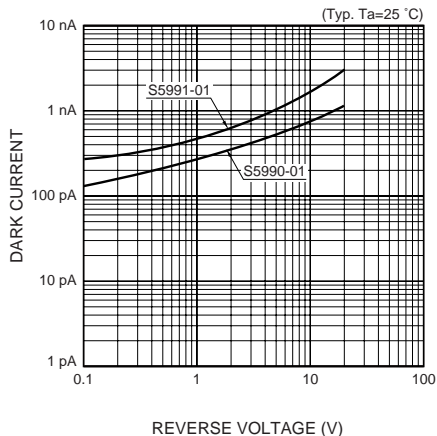
# TWO-DIMENSIONAL PSDs S5990-01, S5991-01

Figure 1: Spectral Response



KPSDB0026EA

Figure 2: Dark Current vs. Reverse Voltage



KPSDB0068EA

Figure 3: Terminal Capacitance vs. Reverse Voltage

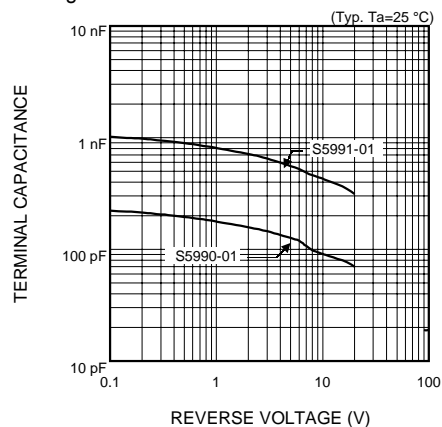
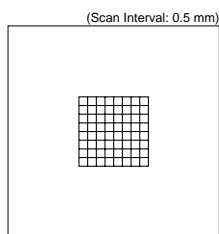


Figure 4: Example of Position Detectability

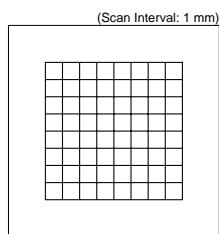
(Ta=25 °C, λ=830 nm,  
Spot light size: φ0.2 mm)

●S5990-01



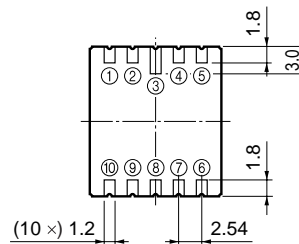
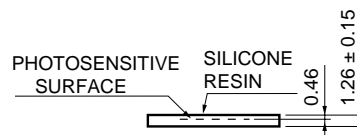
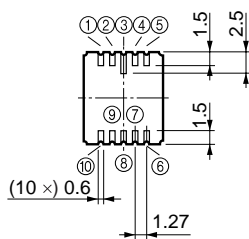
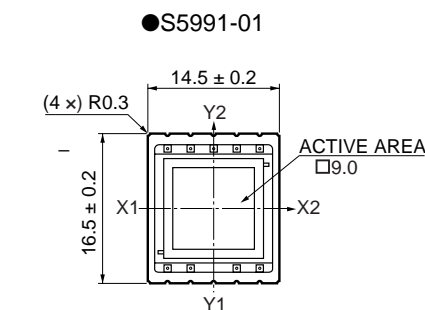
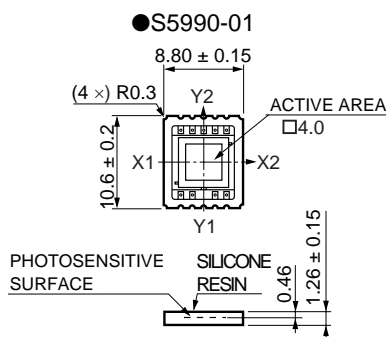
KPSDC0064EA

●S5991-01



KPSDC0065EA

Figure 5: Dimensional Outline (Unit: mm)



KPSDA0044EA

## CONVERSION FORMULA

$$\frac{(l_2 + l_3) - (l_1 + l_4)}{l_1 + l_2 + l_3 + l_4} = \frac{2x}{L}$$

$$\frac{(l_2 + l_4) - (l_1 + l_3)}{l_1 + l_2 + l_3 + l_4} = \frac{2y}{L}$$

x, y: position coordinate of spot light

S5990-01: L=4.5 mm

S5991-01: L=10 mm

The burr of 0.3 mm maximum on each side should be allowed.

- ① ANODE X1 (I1)
- ② NC
- ③ NC \*
- ④ NC
- ⑤ ANODE Y1 (I3)
- ⑥ ANODE X2 (I2)
- ⑦ NC
- ⑧ CATHODE
- ⑨ NC
- ⑩ ANODE Y2 (I4)

\*③ pin should be open-circuited (even not to be grounded).

KPSDA0045EA

# HAMAMATSU

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Hamamatsu City, 435-8558 Japan, Telephone: (81) 053-434-3311, Fax: (81) 053-434-5184, <http://www.hamamatsu.com>

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) 08152-3750, Fax: (49) 08152-2658

France: Hamamatsu Photonics France: S.A.R.L.: 8, 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 00

United Kingdom: Hamamatsu Photonics UK Limited: Lough Point, 2 Gladbeck Way, Windmill Hill, Enfield, Middlesex EN2 7JA, United Kingdom, Telephone: (44) 020-8367-3560, Fax: (44) 020-8367-6384

North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171 41 Solna, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01

Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Moia, 1/E, 20020 Arese, Milano, Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741

Cat. No. KPSD1014E01

Apr. 1999 SI

Printed in Japan (1, 000)