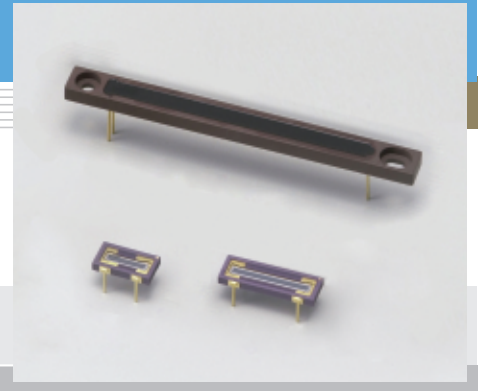


One-dimensional PSD S3931, S3932, S3270

6 to 37 mm resistance length PSD for precision distance measurement



Hamamatsu provides various types of one-dimensional PSD (Position Sensitive Detector) designed for precision distance measurement such as displacement meters.

S3931 and S3932 have an active area of 1 × 6 mm and 1 × 12 mm respectively, and are mounted on a compact ceramic package with a transparent resin window. Variant types (S3931-01, S3932-01) with a visible-cut resin window are also available.

S3270 offers an active area longer than 30 mm, allowing position detection at a long distance. S3270 has a visible-cut resin window, and S3270-01 with a transparent resin window is also available.

Features

- Superior position detection ability
- High reliability
- S3931, S3932: Easy to use 4-pin small ceramic package
- Long and narrow active area
S3270: 1 × 37 mm

Applications

- Displacement sensing
- Distance measurement
- Proximity switching

General ratings / Absolute maximum ratings

Type No.	Package	Window material *1	Active area size (mm)	Absolute maximum ratings		
				Reverse voltage VR Max. (V)	Operating temperature Topr (°C)	Storage temperature Tstg (°C)
S3931	Ceramic	R	1 × 6	20	-10 to +60	-20 to +80
S3932		R	1 × 12			
S3270 *2		R (B)	1 × 37		-10 to +75	

Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type No.	Spectral response range λ (nm)	Peak sensitivity wavelength λp (nm)	Photo sensitivity S λ=λp (A/W)	Interelectrode resistance Rie Vb=0.1 V (kΩ)			Position detection error *3 E VR=5 V light spot φ200 μm (μm)		Saturation photocurrent *4 VR=5 V RL=1 kΩ (μA)	Dark current ID VR=5 V (nA)		Temp. coefficient of ID TCID (times/°C)	Rise time tr VR=5 V RL=1 kΩ (μs)	Terminal capacitance Ct VR=5 V f=10 kHz (pF)	Position resolution *5 (μm)
				Min.	Typ.	Max.	Typ.	Max.		Typ.	Max.				
				(kΩ)	(kΩ)	(kΩ)	(μm)	(μm)		(nA)	(nA)				
S3931	320 to 1100	920	0.55	30	50	80	±30	±120	100	0.15	10	1.15	1.5	40	0.2
S3932				±60	±240	0.2	20	3.0		80	0.3				
S3270	700 to 1100	960	0.55	10	15	20	±100	±400	300	0.5	20	1.0	100	2.8	

*1: R: clear resin coating, R (B): visible-cut resin coating.

*2: Works with microscopic spot light detection.

*3: A range of 75 % of that from the center of the photosensitive surface to the edge.

*4: The upper limit of linearity of photocurrent in response to the quantity of light is defined as the point where the linearity deviates by 10 %.

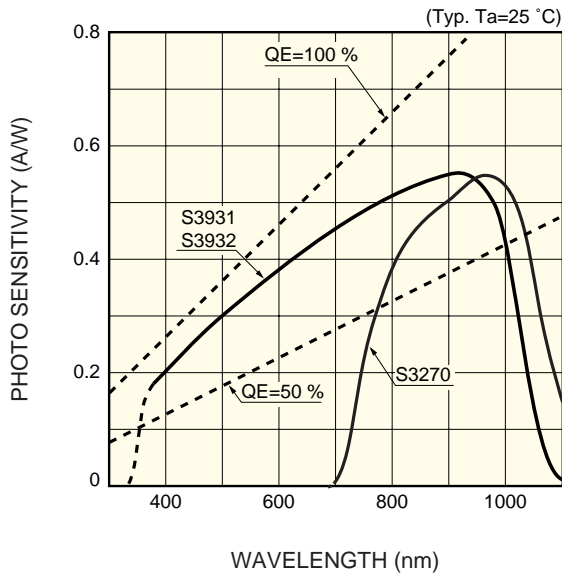
*5: Position resolution

This is the minimum detectable light spot displacement. The detection limit is indicated by the distance on the photosensitive surface. The numerical value of the resolution of a position sensor using a PSD is proportional to both the length of the PSD and the noise of the measuring system (resolution deteriorates) and inversely proportional to the photocurrent (incident energy) of the PSD (resolution improves).

Light source: LED (900 nm)
Spot light size: φ 200 μm
Frequency range: 1 kHz

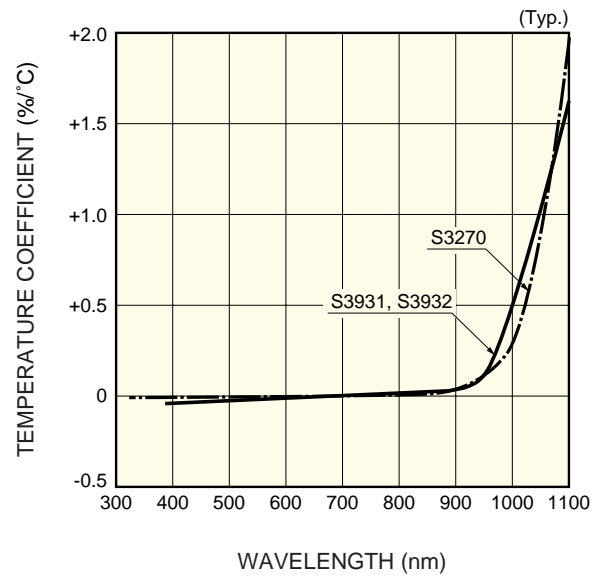
Photocurrent: 1 μA
Circuit system input noise: 1 μV (1 kHz)
Interelectrode resistance: Typical value (refer to the specification table)

■ Spectral response



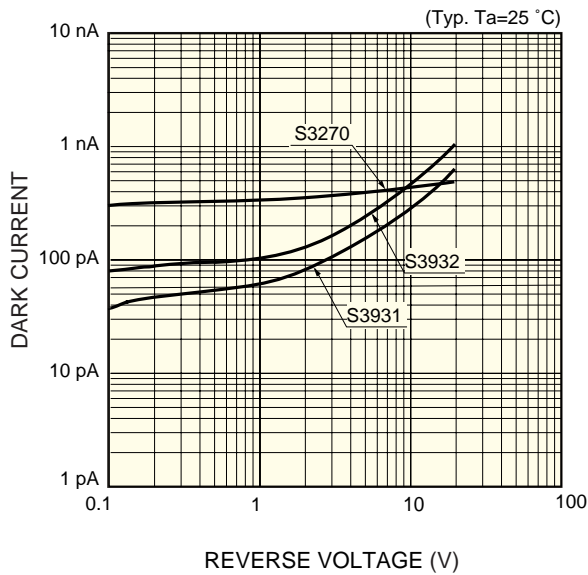
KPSDB0069EC

■ Photo sensitivity temperature characteristics



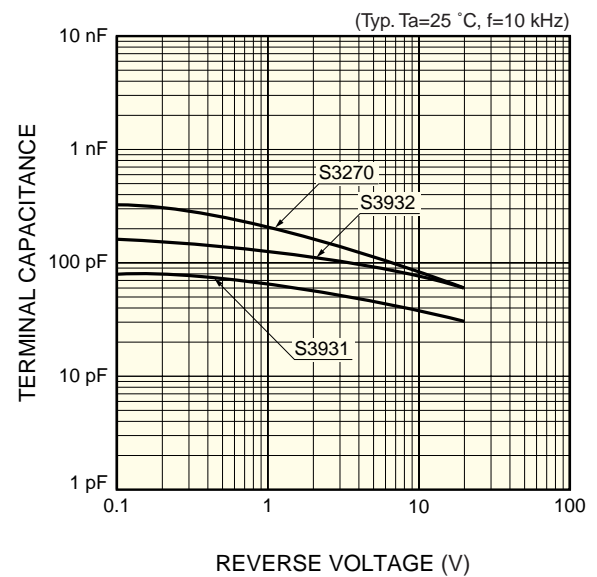
KPSDB0070EC

■ Dark current vs. reverse voltage



KPSDB0071EC

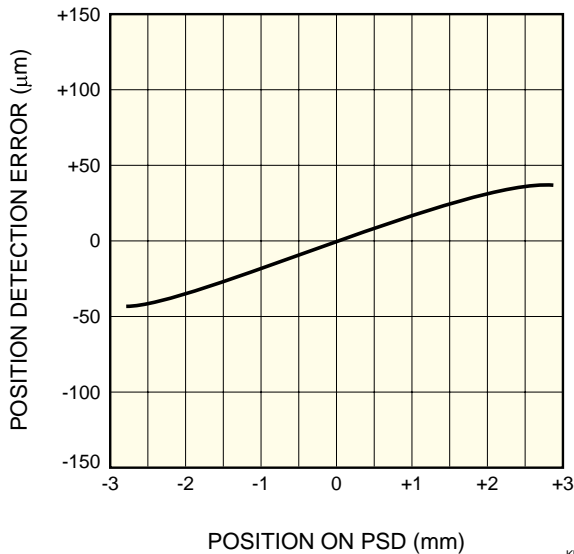
■ Terminal capacitance vs. reverse voltage



KPSDB0072EC

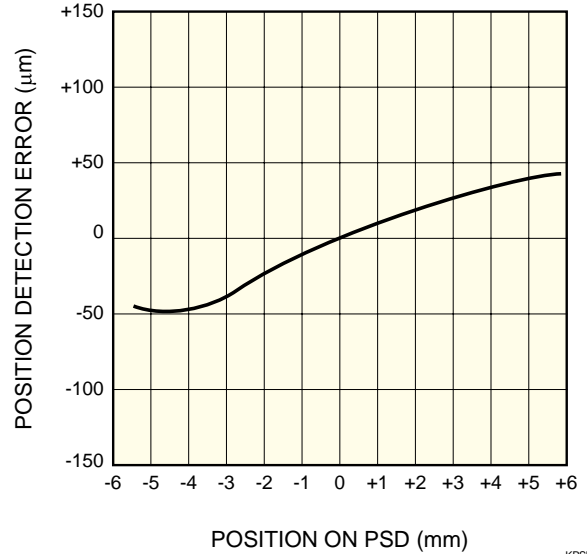
■ Example of position detectability ($T_a=25\text{ }^\circ\text{C}$, $\lambda=900\text{ nm}$, spot light size: $\phi 0.2\text{ mm}$)

S3931



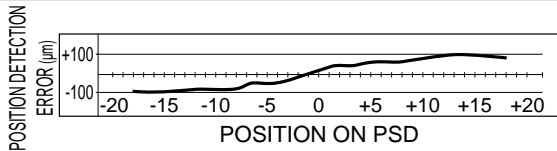
KPSDB0011EB

S3932



KPSDB0012EB

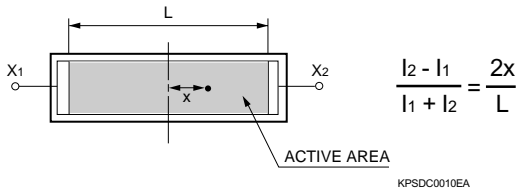
S3270



KPSDC0068EA

■ Conversion formula of spot light position on the PSD

If output signals (photocurrent) I_1 and I_2 are obtained from electrodes X_1 and X_2 , then the light spot position (x) on the PSD can be found by the following formula.

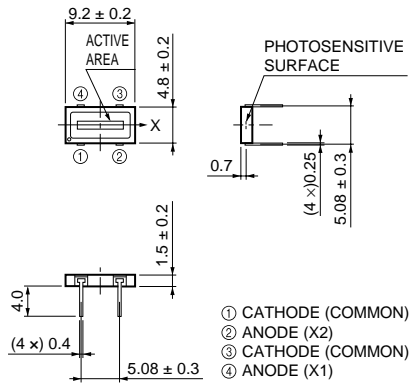


■ Correction for position detection error

Position detection characteristics obtained by the above formula can be corrected to reduce position detection errors. For example, the maximum position detection error ($\pm 120\text{ }\mu\text{m}$) of S3931 can be significantly reduced to $\pm 9\text{ }\mu\text{m}$ by using the least square method.

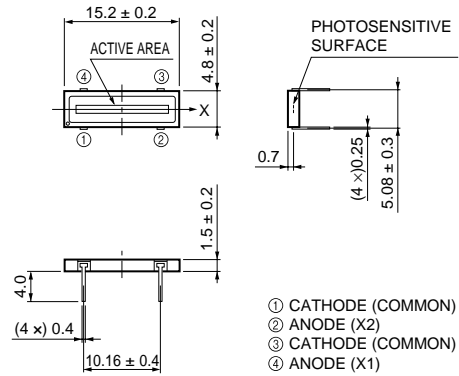
■ Dimensional outlines (unit: mm)

S3931



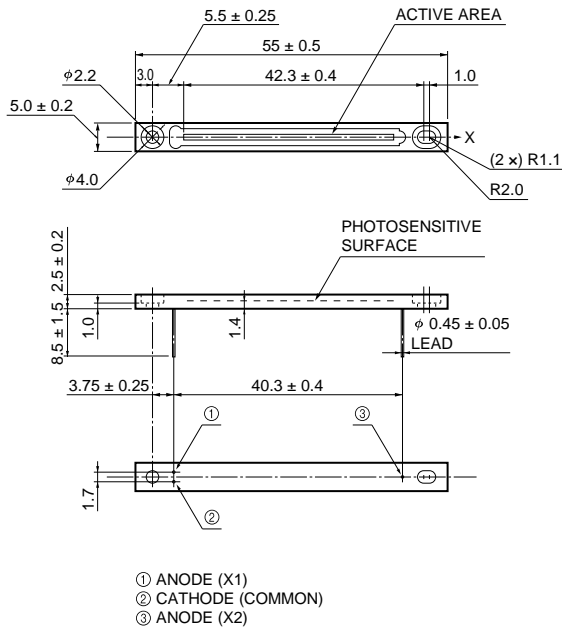
KPSDA0048EA

S3932



KPSDA0049EA

S3270



KPSDA0050EB

Information described in this material is current as of April, 2011. Product specifications are subject to change without prior notice due to improvements or other reasons. Before assembly into final products, please contact us for the delivery specification sheet to check the latest information.

Type numbers of products listed in the delivery specification sheets or supplied as samples may have a suffix "(X)" which means preliminary specifications or a suffix "(Z)" which means developmental 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.

HAMAMATSU

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, 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) 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: 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 int. 6, 20020 Arese, (Milano), Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741