

One-dimensional PSD

S3931 S3932

6 to 12 mm resistance length PSD for precision distance measurement

Hamamatsu provides various types of one-dimensional PSD (position sensitive detectors) designed for precision distance measurement such as displacement meters. The S3931 and S3932 have a photosensitive 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.

Features

- Superior position detection ability
- High reliability
- **■** S3931, S3932: Easy to use 4-pin small ceramic package

Applications

- **→** Displacement sensing
- **→** Distance measurement
- Proximity switching

Structure / Absolute maximum ratings

Type no.	Package	Window material	Photosensitive area	Absolute maximum ratings					
				Reverse voltage	Operating temperature	Storage temperature			
			size	VR max	Topr*1	Tstg*1			
			(mm)	(V)	(°C)	(°C)			
S3931	Corprois	Epoxy resin	1 × 6	20	-10 to +60	-20 to +80			
S3932	Ceramic		1 × 12	20	-10 (0 +60				

^{*1:} No dew condensation

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.

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 (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Spectral response range	onse sensitivity wavelength	Photo sensitivity S λ=λp	resistance Rie		light snot \$200 um		Saturation photocurrent*3	VR=5 V		coefficient of ID	VR=5 V	Ct	Position resolution*4	
	^	λр	Λ-ΛΡ	Min.	Тур.	Max.	Тур.	Max.	IVL-1 K22	Тур.	Max.	TCID	KL-1 K32	f=10 kHz	
	(nm)	(nm)	(A/W)	(kΩ)	$(k\Omega)$	(kΩ)	(µm)	(µm)	(µA)	(nA)	(nA)	(times/°C)	(µs)	(pF)	(µm)
S3931	320 to 1100	920	0.55	30	50	80	±30	±120	100	0.15	10	1.15	1.5	40	0.2
S3932	320 (0 1100	920	0.55	30	50	00	±60	±240	100	0.2	20	1.15	3.0	80	0.3

^{*2:} A range of 75% of that from the center of the photosensitive surface to the edge

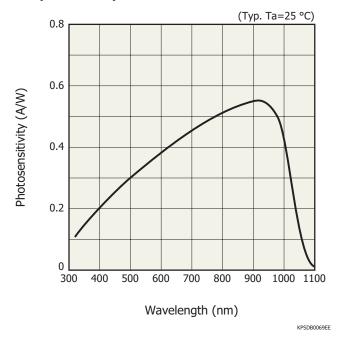
This is the minimum detectable light spot displacement. The detection limit is indicated by the distance on the photosensitive surface. The numerical value of the resolution of a position sensor using a PSD is proportional to both the length of the PSD and the noise of the measuring system (resolution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

- · Light source: LED (900 nm)
- · Light spot size: φ200 μm
- · Photocurrent: 1 μA
- \cdot Circuit system input noise: 1 μV (1 kHz)
- · Frequency range: 1 kHz
- · Interelectrode resistance: Typical value (refer to the specification table)

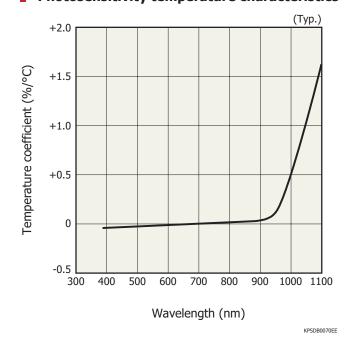
^{*3:} The upper limit of linearity of photocurrent in response to the quantity of light is defined as the point where the linearity deviates by 10%.

^{*4:} Position resolution

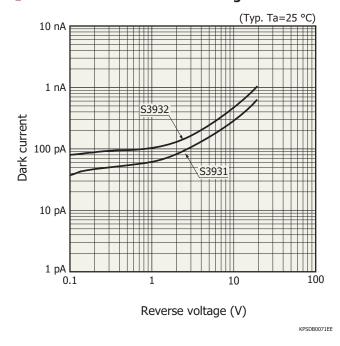
Spectral response



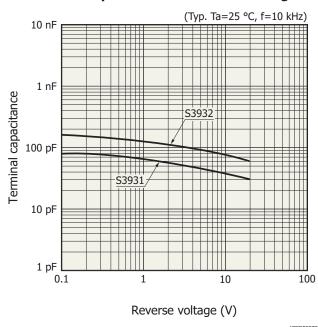
Photosensitivity temperature characteristics



- Dark current vs. reverse voltage

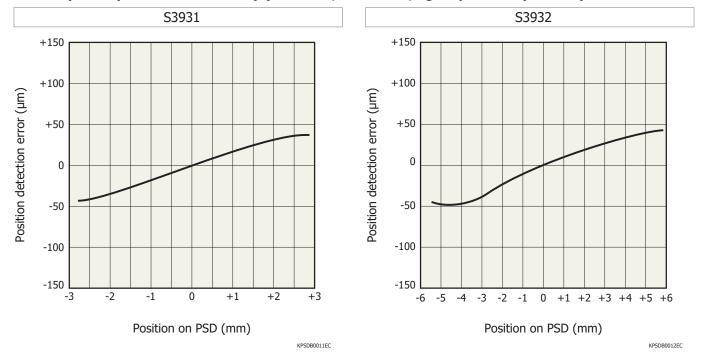


- Terminal capacitance vs. reverse voltage



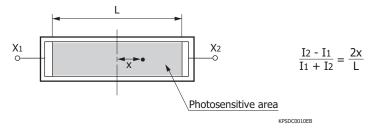
KPSDB0072EE

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



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.



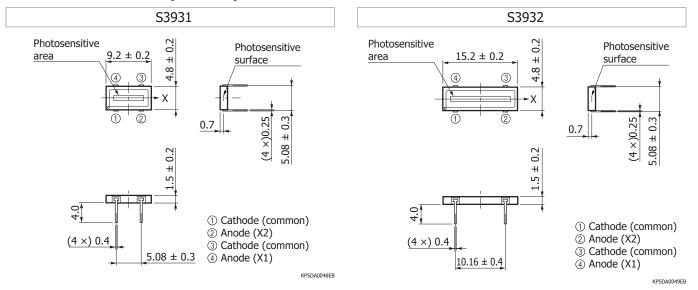
Correction of position detection error

If the light spot position calculated by the above conversion formula is corrected by the least squares method, position detection error can be reduced.

■ Example of position detection error correction (S3931) Before correction: ±120 μm max.

After correction: ±9 μm max.

Dimensional outlines (unit: mm)



Recommended soldering condition

Solder temperature: 260 °C (5 s or less, once), Keep at least 2 mm away from the root of the lead Note: When you set soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

Related information

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

- Precautions
- Disclaimer
- · Metal, ceramic, plastic package products
- Technical information
- · PSD

Information described in this material is current as of July 2020.

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.

MAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

HAMAMAISU 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: (1908-231-0960, Fax: (1908-231-1218, E-mail: usa@hamamatsu.com
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, 0-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-275-0, Fax: (49)8152-265-8, E-mail: info@hamamatsu.de
France: Hamamatsu Photonicis 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 Photonicis 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 Arsees (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, Jäming Center, 27 Dongsanhuan Bellu, Chaoyang District, 100020 Beijing, PR.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, Gongdoo 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0081, Fax: (886)3-659-0081, E-mail: info@hamamatsu.com.cn