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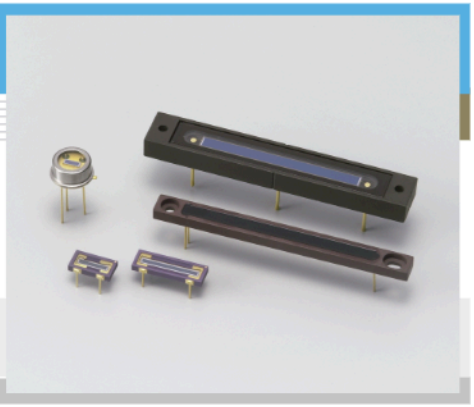
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One-dimensional PSD
S3979, S3931, S3932, S1352, S3270

3 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. S3979 has a 1 × 3 mm active area sealed in a TO-5 package. 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. S1352 and S3270 offer 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
  S1352: 2.5 × 34 mm
  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)
S3979	TO-5	K	1 × 3	20	-10 to +60	-20 to +80
S3931	Ceramic	R	1 × 6			
S3932		R	1 × 12			
S1352 *2		K	2.5 × 34			
S3270 *2		R (B)	1 × 37		-10 to +75	

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

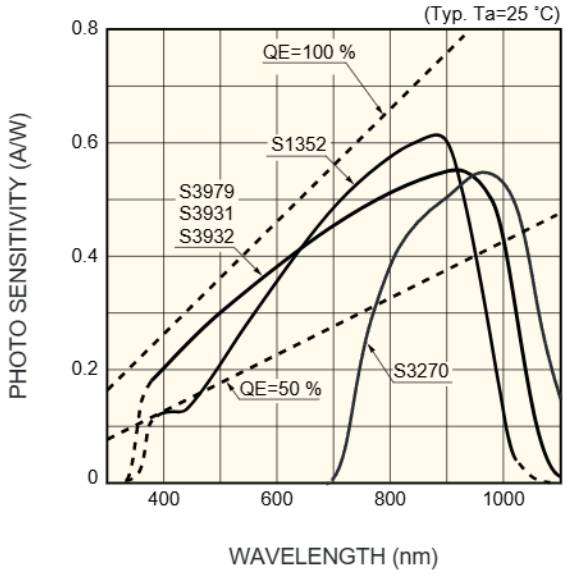
Type No.	Spectral response range λ (nm)	Peak sensitivity wavelength λp (nm)	Photo sensitivity S λ=λp (A/W)	Interelectrode resistance Rie Vb=0.1 V			Position detection error *3 E VR=5 V light spot φ200 μm		Saturation photocurrent *4 VR=5 V RL=1 kΩ (μA)	Dark current ID VR=5 V		Temp. coefficient of ID TCID (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. (kΩ)	Typ. (kΩ)	Max. (kΩ)	Typ. (μm)	Max. (μm)		Typ. (nA)	Max. (nA)				
S3979	320 to 1100	920	0.55	100	140	180	±15	±60	40	0.1	5	1.15	2.5	20	0.1
S3931				30	50	80	±30	±120	100	0.15	10		1.5	40	0.2
S3932							±60	±240		0.2	20		3.0	80	0.3
S1352			0.6	10	20	30	±125	±500	250	2	150		0.7	150	2.1
S3270	700 to 1100	960	0.55	10	15	20	±100	±400	300	0.5	20		1.0	100	2.8

*1: K: borosilicate glass, 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) — Photocurrent: 1 μA
Spot light size: φ 200 μm — Circuit system input noise: 1 μV (1 kHz)
Frequency range: 1 kHz — Interelectrode resistance: Typical value (refer to the specification table)

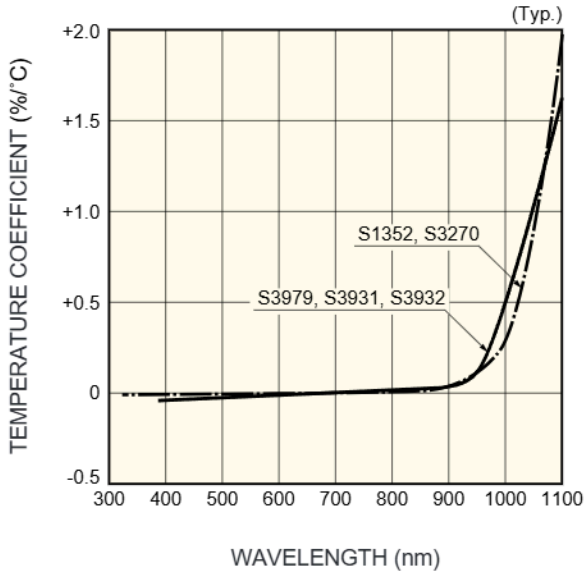
SOLID STATE DIVISION

■ Spectral response



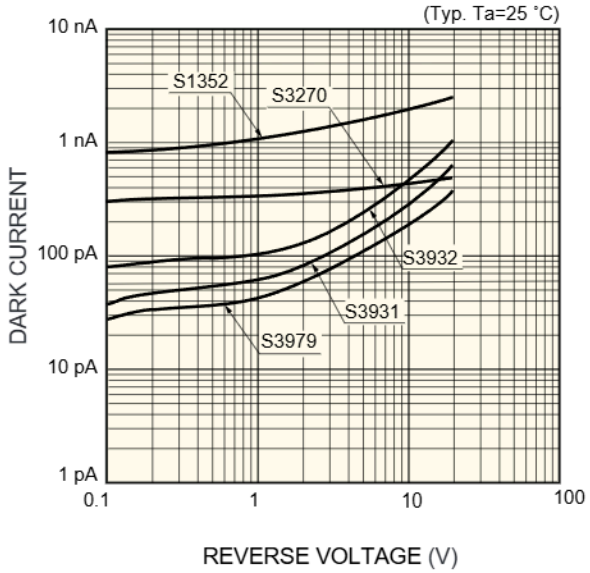
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■ Photo sensitivity temperature characteristics



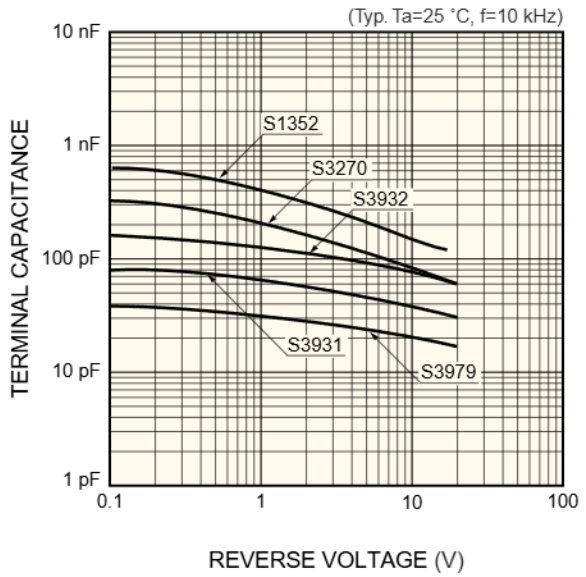
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■ Dark current vs. reverse voltage



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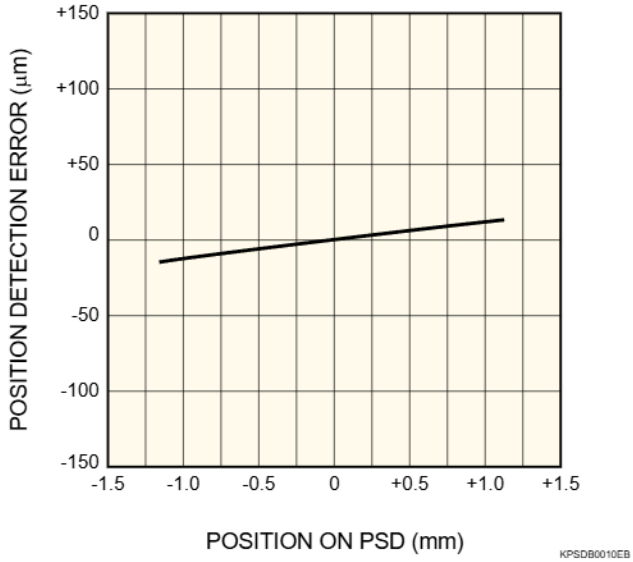
■ Terminal capacitance vs. reverse voltage



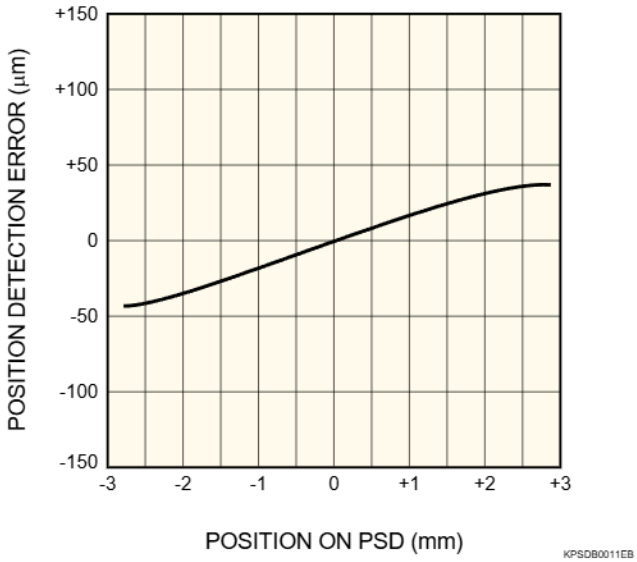
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■ Example of position detectability (Ta=25 °C, λ=900 nm, spot light size: φ0.2 mm)

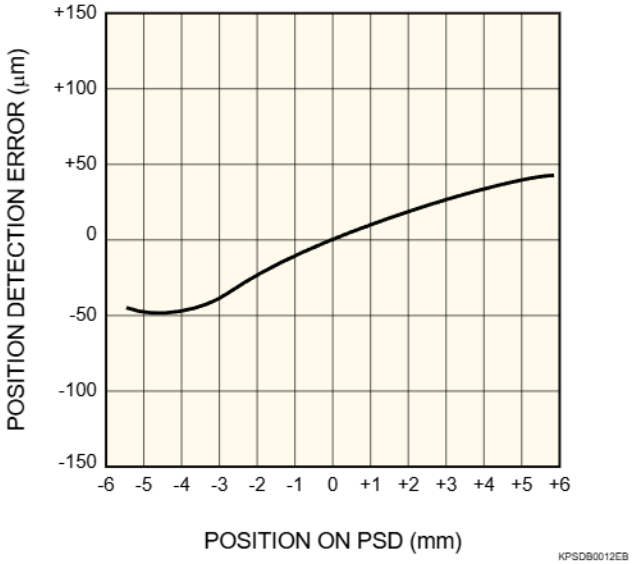
S3979



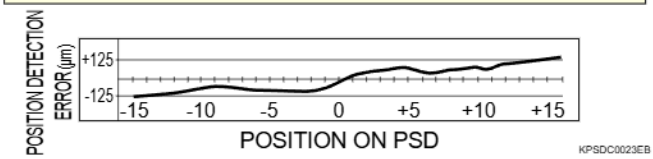
S3931



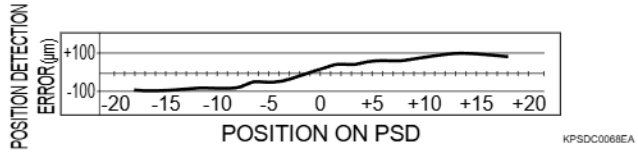
S3932



S1352

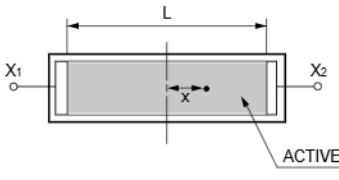


S3270



■ 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.



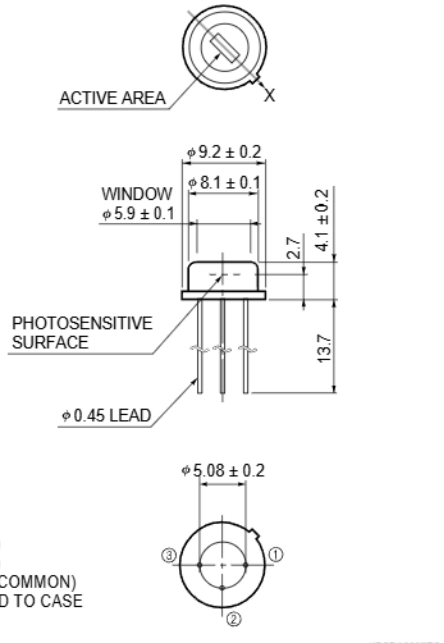
$$\frac{I_2 - I_1}{I_1 + I_2} = \frac{2x}{L}$$

■ Correction for position detection error

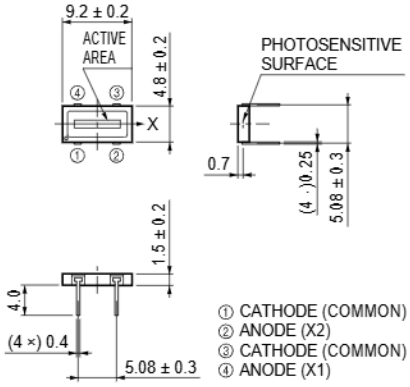
Position detection characteristics obtained by the above formula can be corrected to reduce position detection errors. For example, the maximum position detection error (±120 ∝m) of S3931 can be significantly reduced to ±9 ∝m by using the least square method.

■ Dimensional outlines (unit: mm)

S3979

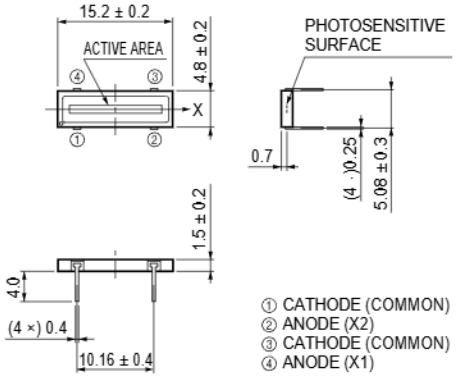


S3931



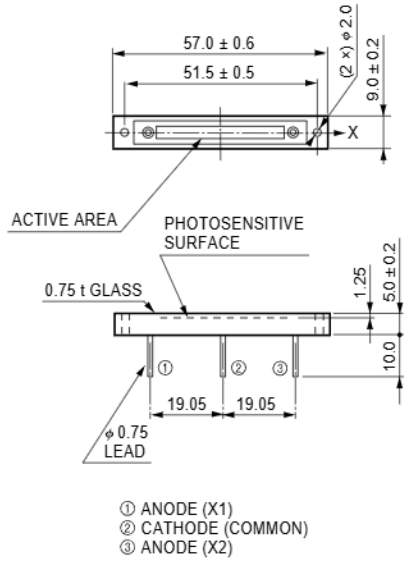
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S3932



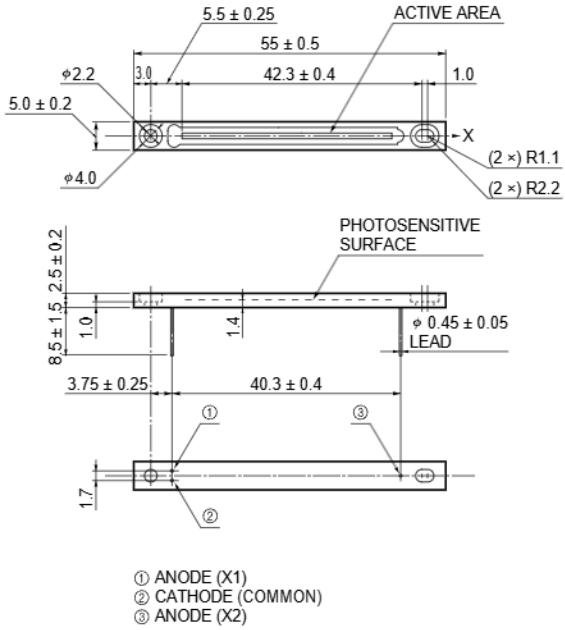
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S1352



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S3270



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