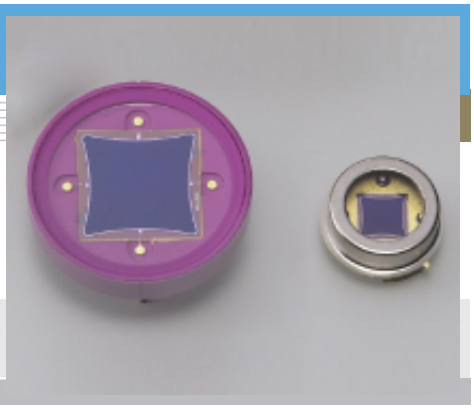
Two-dimensional PSD
S1880, S2044

Non-discrete position sensor utilizing photodiode surface resistance



PSD (Position Sensitive Detector) is an optoelectronic position sensor utilizing photodiode surface resistance. Unlike discrete element detectors such as CCD, PSD provides continuous position data and features high position resolution and high-speed response.

Features

- High position resolution
- Wide spectral response range
- High-speed response
- Simultaneous measurements of position and intensity
- Position is measured independent of light-spot size
- High reliability

Applications

- Optical position and angle sensing
- Remote optical control systems
- Automatic range finder systems
- Displacement and vibration monitors
- Laser beam alignment
- Medical equipment

■ General ratings / Absolute maximum ratings

Parameter	Symbol	S1880	S2044	Unit
Package	-	Ceramic	Metal	-
Active area size	-	12 × 12	4.7 × 4.7	mm
Reverse voltage	V_R Max.	20		V
Operating temperature	Topr	-10 to +60		°C
Storage temperature	Tstg	-20 to +80		°C

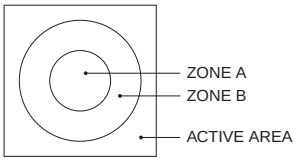
■ Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Parameter		Symbol	Condition	S1880			S2044			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range		λ		-	320 to 1060	-	-	320 to 1060	-	nm
Peak sensitivity wavelength		λp		-	920	-	-	920	-	nm
Photo sensitivity		S	λ=λp	-	0.6	-	-	0.6	-	A/W
Interelectrode resistance *1		Rie	Vb=1 V	5	10	15	5	10	15	kΩ
Position detection error *2	ZONE A	E		-	±80	±150	-	±40	±100	μm
	ZONE B			-	±150	±250	-	±70	±150	
Saturation current		Ist	V_R=5 V R_L=1 kΩ	-	0.5	-	-	0.5	-	mA
Dark current		I_D	V_R=5 V	-	1.0	500	-	0.5	5	nA
Temp. coefficient of I_D		T_{CID}		-	1.15	-	-	1.15	-	times/°C
Rise time		tr	V_R=5 V R_L=1 kΩ	-	1.5	-	-	0.3	-	μs
Terminal capacitance		Ct	V_R=5 V f=10 kHz	-	300	-	-	45	-	pF
Position resolution *3		-		-	1.5	-	-	0.6	-	μm

*1: Measured between two output terminals opposite to each other, and the other terminals are open-circuited on measurement.

*2: The radius of Zones A and B depend on the product type. They are determined as follws:

Type No.	ZONE A (mm)	ZONE B (mm)
S1880	2.5	5
S2044	0.9	4 × 4 (quadrate)



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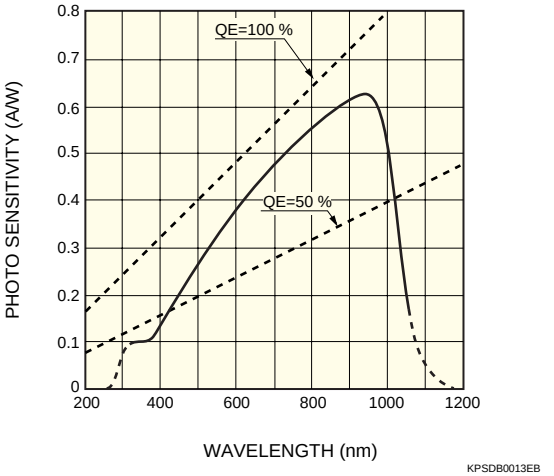
*3: Position resolution

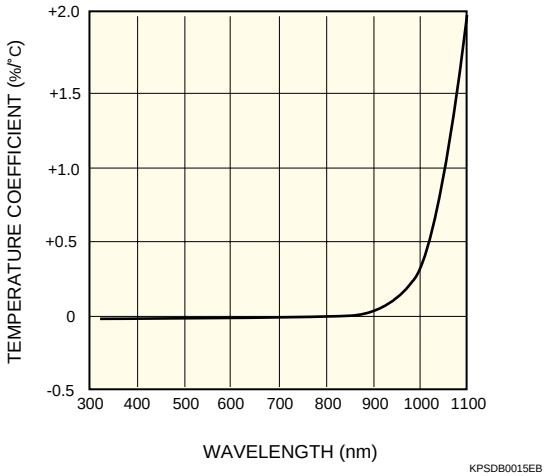
This is the minimum detectable light spot displacement. The detection limit is indicated by distance on the photosensitive surface. The numerical value of the resolution of a position sensor using a PSD is proporional to both the length of the PSD and the noise of the measuring system (resolution deteriorates)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

- Light source: LED (900 nm)
- Spot Light size: ϕ200 μm
- Frequency range: 1 kHz
- Photocurrent: 1 μA
- Circuit system input noise: 1 μV (1 kHz)
- Interelectrode resistance: Typical value (Refer to specification table.)

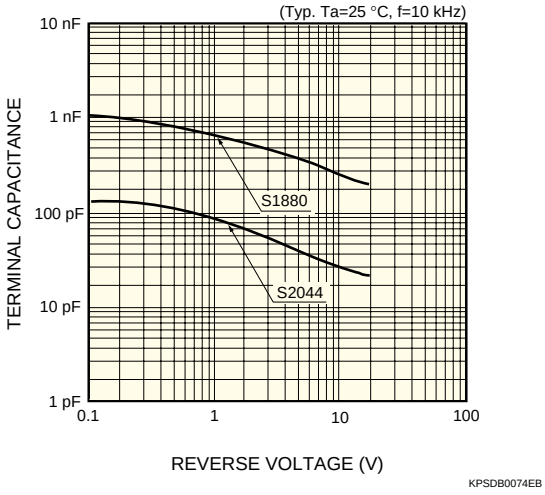
■ Spectral response



■ Photo sensitivity temperature characteristic

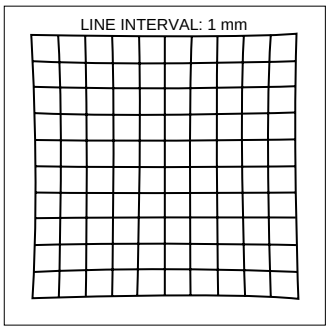


■ Terminal capacitance vs. reverse voltage



■ Example of position detectability (Ta=25 °C, λ=900 nm, spot light size: ϕ200 μm)

S1880	S2044



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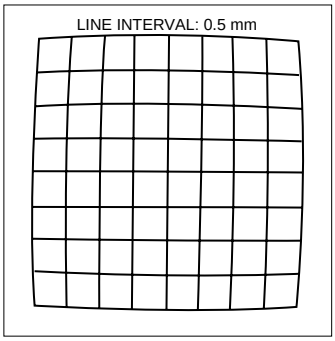

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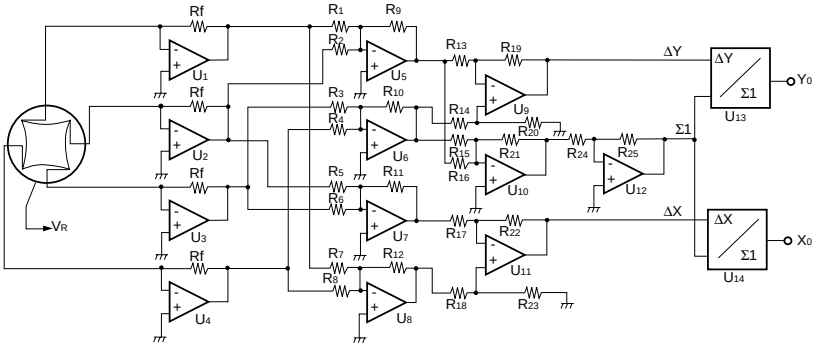
■ Example of DC-operating circuit



R1 - R25: same value
Rf: depends on input level
U1 - U4: low drift head amplifier, TL071, etc.
U13, U14: analog divider, AD538 (Analog Devices), etc.

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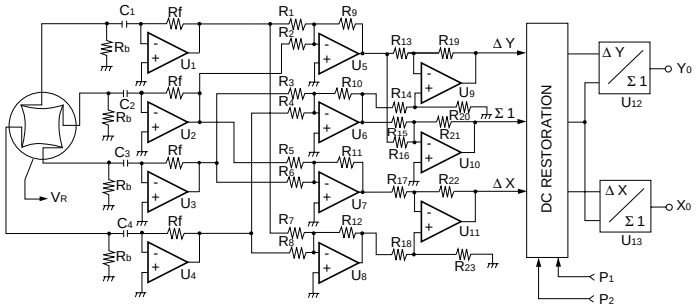
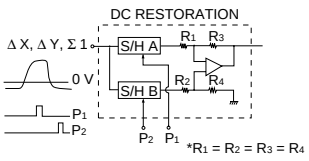
■ Example of AC-operating circuit



R1 - R24: same value
Rf: depends on input level
U1 - U4: low drift head amplifier, TL071, etc.
U12, U13: analog divider, AD538 (Analog Devices), etc.



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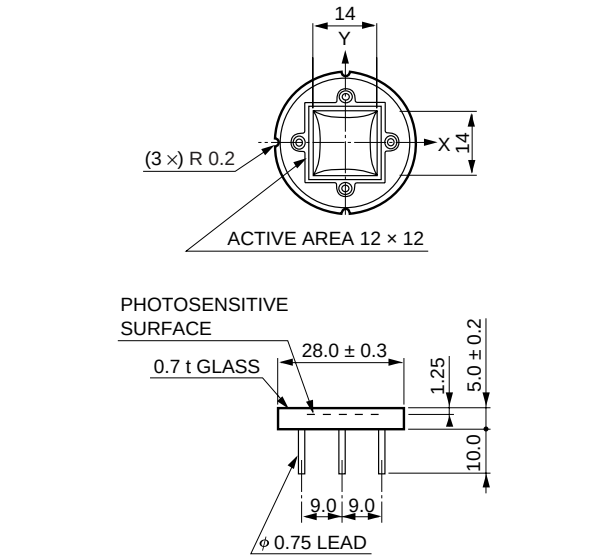
■ Dimensional outlines (unit: mm)

S1880



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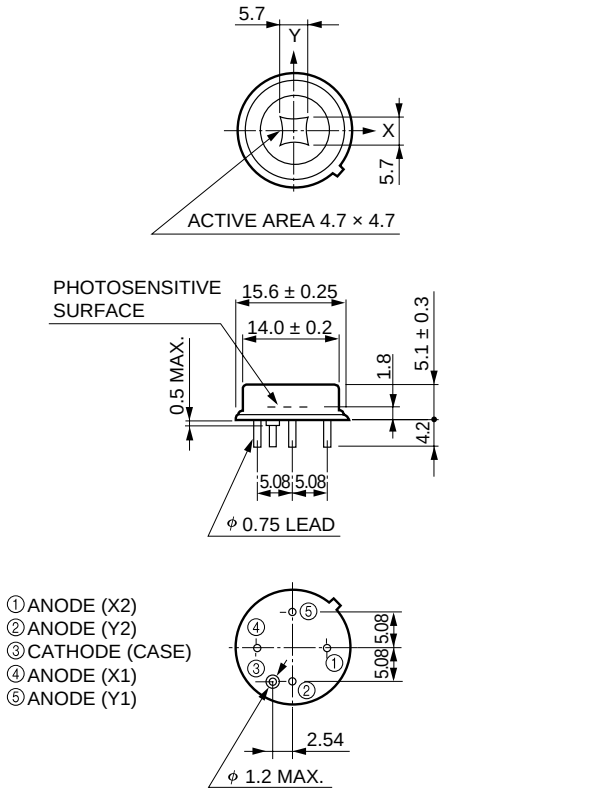
S2044



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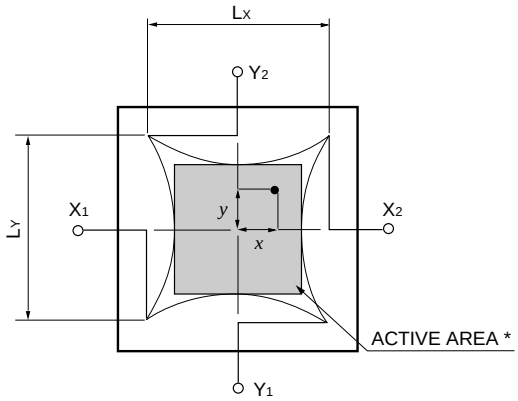
■ Active area chart



* Active area is specified at the inscribed square.

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■ Position conversion formula

$$\frac{(I_{X2} + I_{Y1}) - (I_{X1} + I_{Y2})}{I_{X1} + I_{X2} + I_{Y1} + I_{Y2}} = \frac{2x}{L_X}$$

$$\frac{(I_{X2} + I_{Y2}) - (I_{X1} + I_{Y1})}{I_{X1} + I_{X2} + I_{Y1} + I_{Y2}} = \frac{2y}{L_Y}$$

S1880: L_X=14 mm
L_Y=14 mm
S2044: L_X=5.7 mm
L_Y=5.7 mm

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) 08152-3750, Fax: (49) 08152-2658
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/E, 20020 Arese, (Milano), Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741

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