



Two-dimensional PSD S1200, S1300, S1880, S1881, 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. PSD can be broadly divided into one-dimensional type and two-dimensional type. Two-dimensional type is further classified by structure into duo-lateral type and tetra-lateral type. The duo-lateral type has superior position detection ability such as smaller position detection error and high position resolution.

Listed in this catalog are typical two-dimensional type PSDs. Other types of PSDs such as one-dimensional type, electron beam detection type and high-energy particle detection type are also available.

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

Type No.	Dimensional outline	Package	Active area size (mm)	Absolute maximum ratings		
				Reverse voltage VR Max. (V)	Operating temperature Topr (°C)	Storage temperature Tstg (°C)
Duo-lateral type two-dimensional PSD						
S1300	①	Ceramic	13 × 13	20	-10 to +60	-20 to +80
Tetra-lateral type two-dimensional PSD						
S1200	②	Ceramic	13 × 13	20	-10 to +60	-20 to +80
Pin-cushion type two-dimensional PSD						
S2044	③	Metal	4.7 × 4.7	20	-10 to +60	-20 to +80
S1880	④	Ceramic	12 × 12			
S1881	⑤		22 × 22			

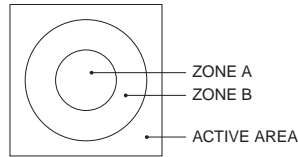
Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type No.	Spectral response range λ (nm)	Peak sensitivity wavelength λp (nm)	Photo sensitivity S λ=λp (A/W)	Interelectrode resistance *1 (kΩ)			Position detection error *2 E (μm)				Saturation current Ist VR=5 V RL=1 kΩ (mA)	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 *3 (μm)
				Min. (kΩ)	Typ. (kΩ)	Max. (kΩ)	ZONE A		ZONE B			Typ. (nA)	Max. (nA)				
							Typ. (μm)	Max. (μm)	Typ. (μm)	Max. (μm)							
Duo-lateral type two-dimensional PSD																	
S1300	320 to 1100	960	0.6	5	10	15	±80	±150	±150	±250	0.5	10	2000	1.15	0.8	250	1.4
Tetra-lateral type two-dimensional PSD																	
S1200	320 to 1060	920	0.6	5	10	15	±150	±300	±1200	±1500	0.5	3.0	500	1.15	1.5	250	1.4
Pin-cushion type two-dimensional PSD																	
S2044	320 to 1060	920	0.6	5	10	15	±40	±100	±70	±150	0.5	0.5	5	1.15	0.3	45	0.6
S1880							±80	±150	±150	±250		1.0	500		1.5	300	1.5
S1881							±150	±300	±400	±600		50	1000		3	900	2.8

*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 follows:

Type No.	ZONE A (mm)	ZONE B (mm)
S1300	2.5	5
S1200	2.5	5
S2044	0.9	4 × 4 (quadrate)
S1880	2.5	5
S1881	5	10



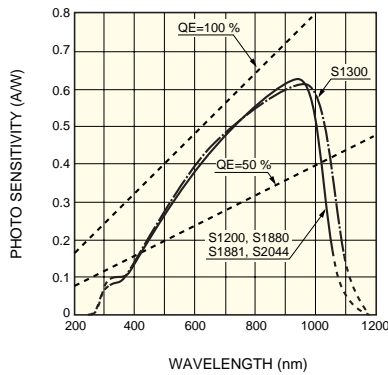
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*3: Position resolution

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 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).

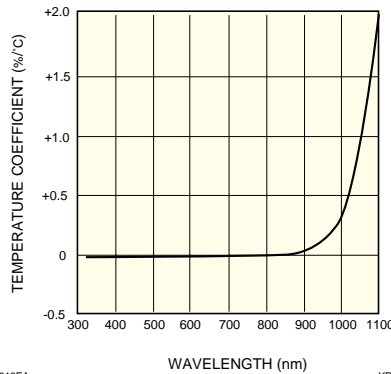
- Light source: LED (900 nm)
- Spot Light size: $\phi 200 \mu\text{m}$
- Frequency range: 1 kHz
- Photocurrent: $1 \mu\text{A}$
- Circuit system input noise: $1 \mu\text{V}$ (1 kHz)
- Interelectrode resistance: Typical value (Refer to specification table.)

■ Spectral response



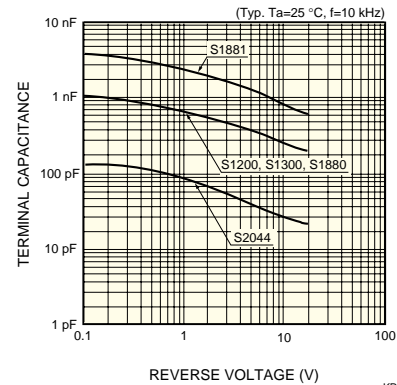
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■ Photo sensitivity temperature characteristic



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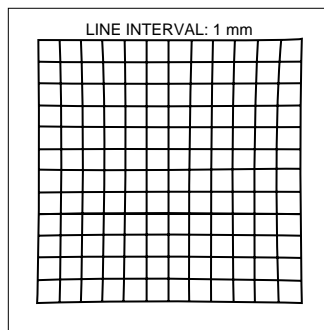
■ Terminal capacitance vs. reverse voltage



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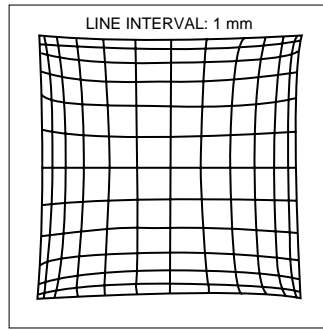
■ Example of position detectability ($T_a=25^\circ\text{C}$, $\lambda=900 \text{ nm}$, spot light size: $\phi 200 \mu\text{m}$)

① S1300



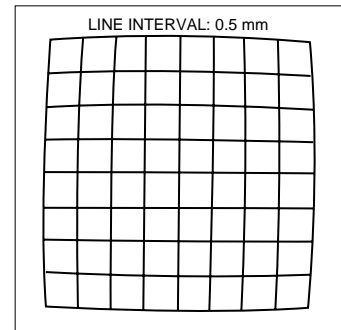
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② S1200



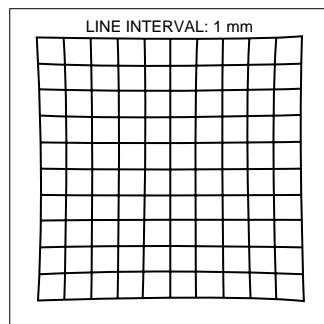
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③ S2044



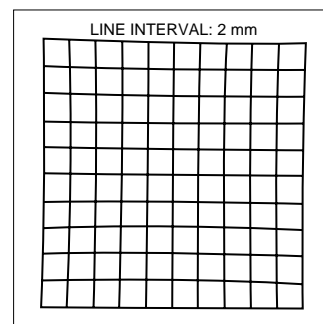
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④ S1880



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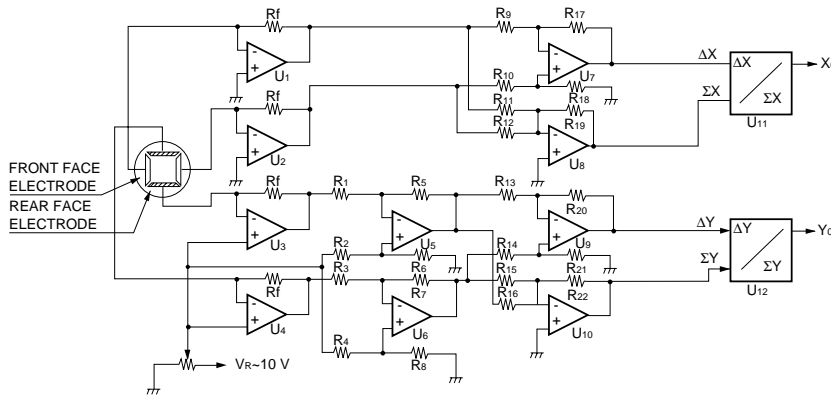
⑤ S1881



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Example of DC-operating circuit

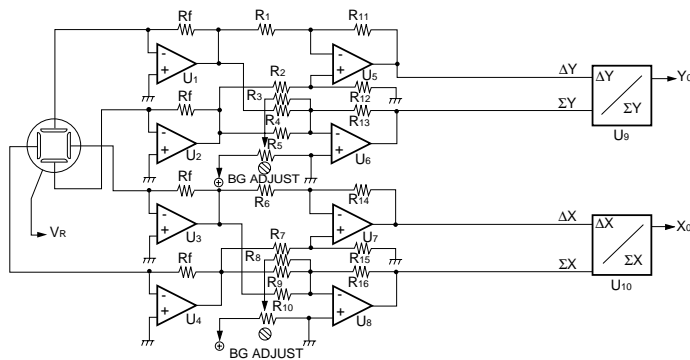
Duo-lateral type



R1 - R22: same value
 Rf: depends on input level
 U1 - U4: low drift head amplifier, TL071, etc.
 U11, U12: analog divider, AD538 (Analog Devices), etc.

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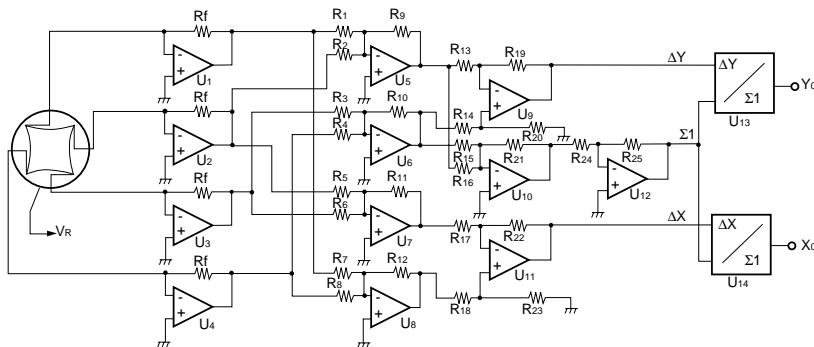
Tetra-lateral type



R1 - R16: same value
 U1 - U4: low drift head amplifier, TL071, etc.
 BG ADJUST: dark current, background canceling V.R.
 U9, U10: analog divider, AD538 (Analog Devices), etc.

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Pin-cushion type

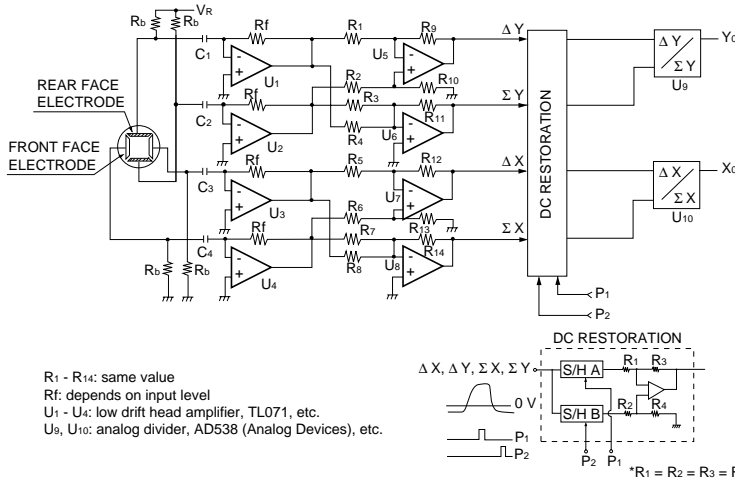


R1 - R25: same value
 Rf: depends on input level
 U1 - U4: low drift head amplifier, TL071, etc.
 U13, U14: analog divider, AD538 (Analog Devices), etc.

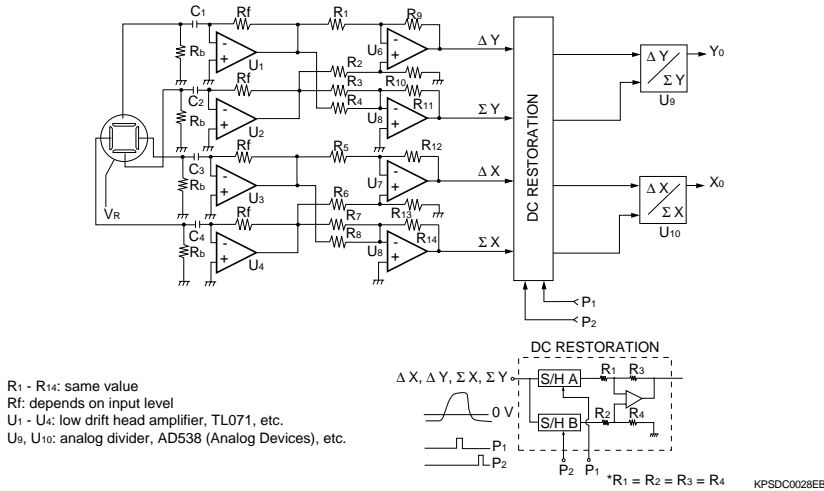
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■ Example of AC-operating circuit

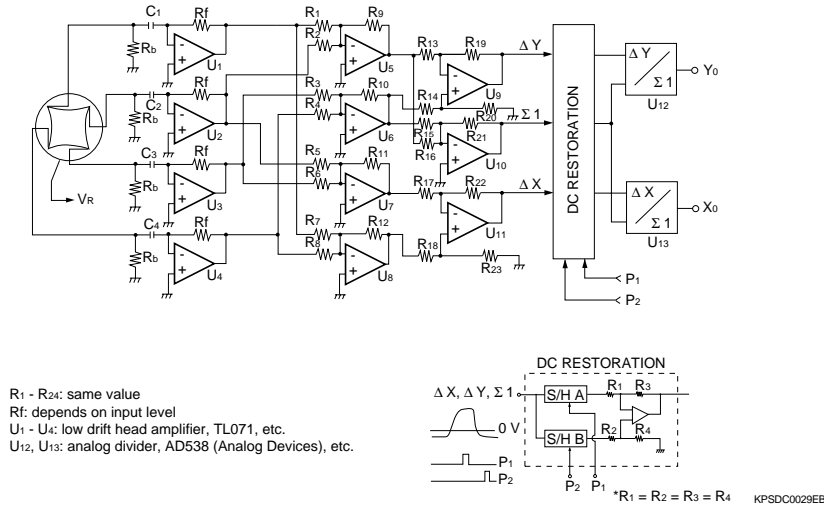
Duo-lateral type



Tetra-lateral type

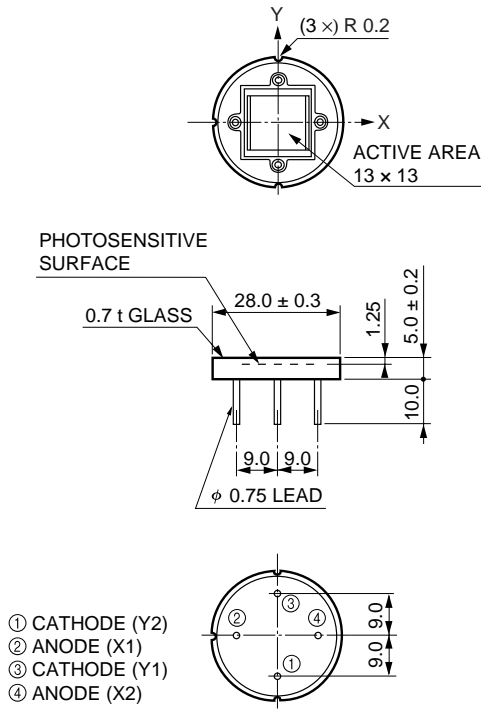


Pin-cushion type



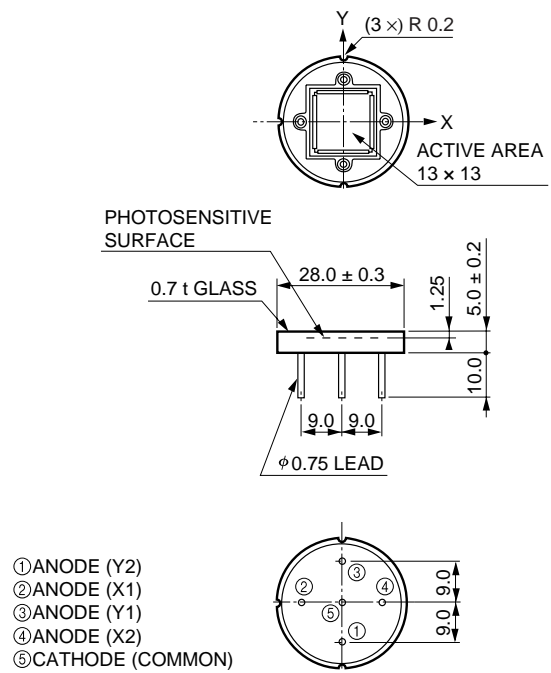
Dimensional outlines (unit: mm)

① S1300



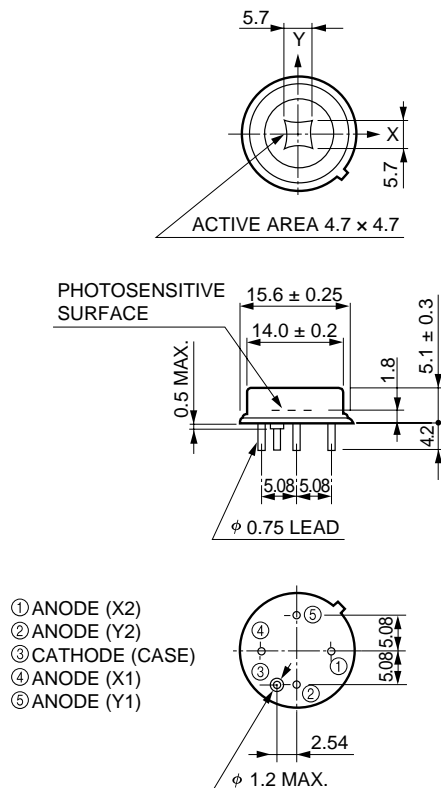
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② S1200



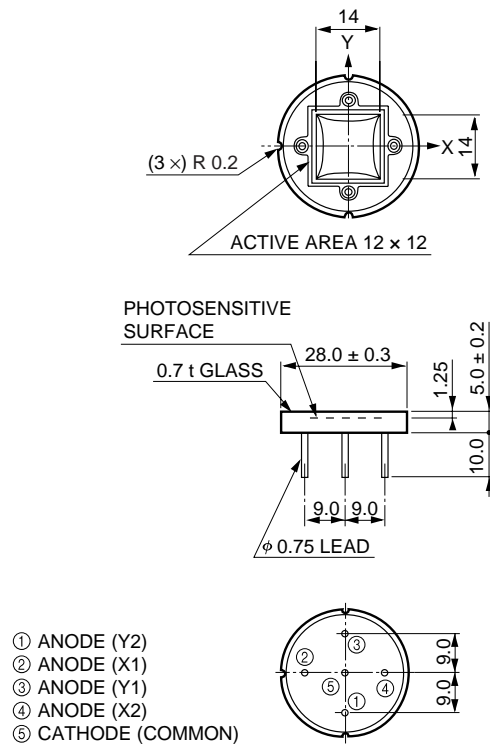
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③ S2044



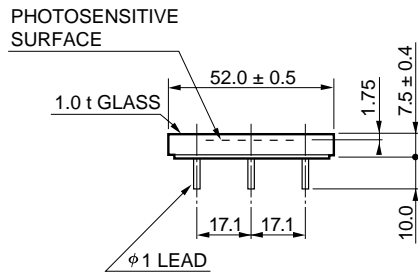
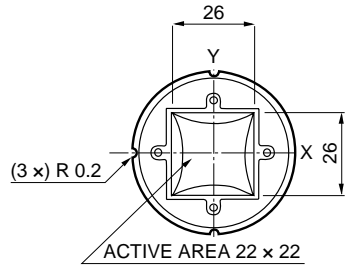
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④ S1880

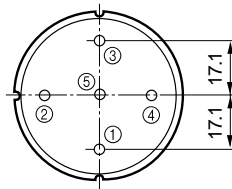


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⑤ S1881



- ① ANODE (Y1)
- ② ANODE (X1)
- ③ ANODE (Y2)
- ④ ANODE (X2)
- ⑤ CATHODE (COMMON)



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