

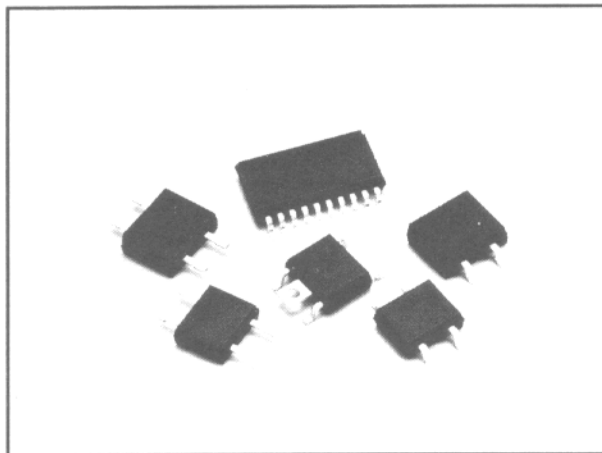
Surface-mountable plastic package PSDs

FEATURES

- Surface mountable
- Superior position detection capability
- Reduced noise originating from extraneous light such as fluorescent lamps
- High reliability
- Thin, subminiature epoxy-resin molded package

APPLICATIONS

- Camera autofocus
- Range-finding
- Proximity switching
- Offset measurement



The S4580 to S4584, S5629 and S7105 are surface mountable 1-D PSDs (position sensitive detectors) molded into subminiature plastic packages. They provide superior position detection characteristics, low noise even under extraneous light, and high reliability.

■ABSOLUTE MAXIMUM RATINGS (Ta=25 °C)

Parameter	Symbol	Value	Unit
Reverse Voltage	VR Max.	20	V
Operating Temperature	Topr	-25 to +85	°C
Storage Temperature	Tstg	-40 to +100	°C

■SPECIFICATIONS (Ta=25 °C)

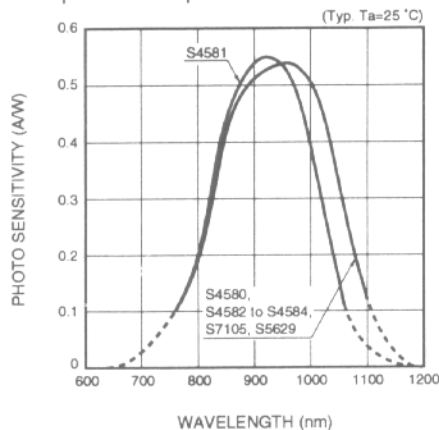
Parameter	Symbol	Condition	S4580	S4581	S4582	S4583	S4584	S7105	S5629	Unit
Active Area	-		0.8×1.5	1×2	1×2.5	1×3	1×3.5	1×4.2	1×6	mm
Resistance Length	-		1.5	2	2.5	3	3.5	4.2	6	mm
Spectral Response Range	λ	Typ.	760 to 1100	760 to 1060	760 to 1100					nm
Peak Sensitivity Wavelength	λ_p	Typ.	960	920	960					nm
Photo Sensitivity	S	$\lambda=900$ nm	Typ.	0.5						A/W
Index of Refraction of Package	-	$\lambda=900$ nm	Typ.	1.53						-
Position Detection Error ^{*1}	-	VR=1 V Light spot: $\phi 0.3$ mm	Typ.	± 10			± 15		± 20	μm
			Max.	± 20	± 25	± 30	± 35	± 40	± 60	
Interelectrode Resistance	Rie	Vb=0.1 V	Min.	100					30	k Ω
			Typ.	140					50	
			Max.	180					80	
Dark Current	ID	VR=1 V	Typ.	0.05			0.1			nA
			Max.	1			2			
Temperature Coefficient of Dark Current	-		Typ.	1.15						times/°C
Rise Time ^{*2}	tr	VR=1 V RL=1 k Ω	Typ.	10						μs
			Max.	30						
Terminal Capacitance	Ct	VR=1 V f=10 kHz	Typ.	15				40	60	pF
			Max.	30				80	90	
Saturation Current ^{*3}	-	VR=1 V	Min.	30					80	μA

*1: In the range 75 % from the center of the active area to the edge.

*2: Time required for the PSD output to increase from 10 % to 90 % of the steady level in response to a stepped light input.

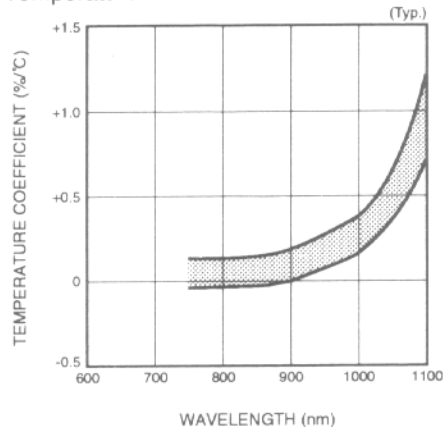
*3: The upper limit of photocurrent linearity with respect to the total incident light level. This is defined as the photocurrent at which the linearity deviates by 10 %.

Figure 1: Spectral Response



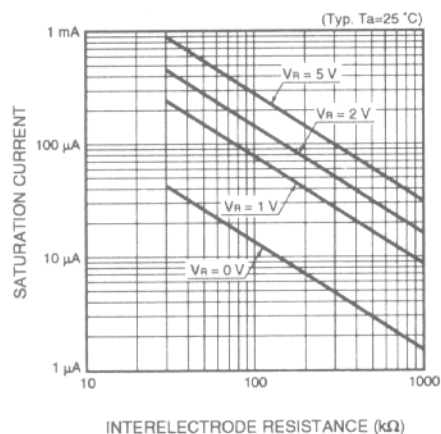
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Figure 2: Temperature Characteristic of Photo Sensitivity



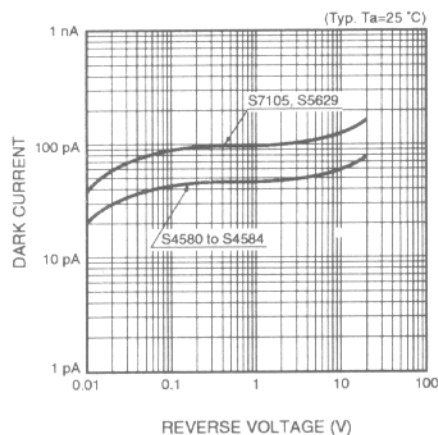
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Figure 3: Saturation Current vs. Interelectrode Resistance



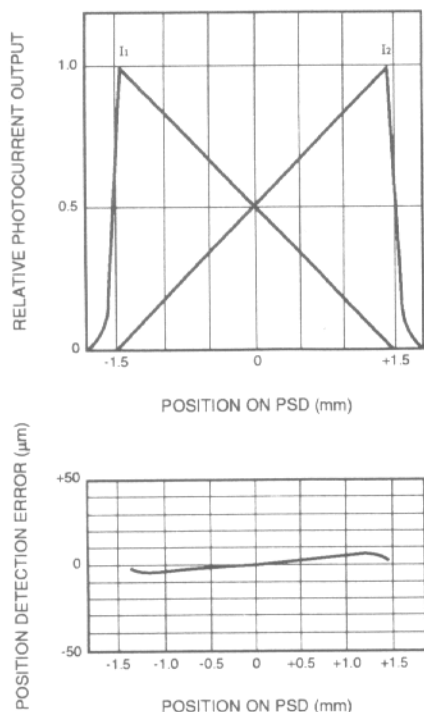
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Figure 4: Dark Current vs. Reverse Voltage



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Figure 5: Position Detection Characteristics (S4583, Active area: 1 × 3 mm)



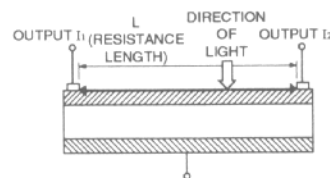
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Definition of position detection error

If the electrical center of a PSD is assumed to be the position of incident light where photocurrent I_1 equals I_2 , the position detection error of each incident position is defined as follows:

$$\text{Position detection error } (\mu\text{m}) = \text{incident position} - \frac{I_2 - I_1}{I_1 + I_2} \times \frac{L}{2}$$

It is noted that the incident position is regarded as (-) on the I_1 side and as (+) on the I_2 side, with the electrical center regarded as 0.

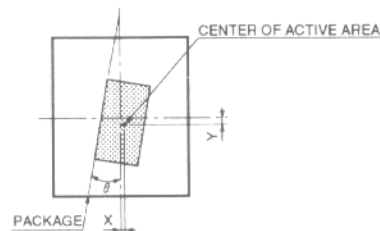


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Figure 6: Chip Position Accuracy

The chip is mounted with the following accuracy with respect to the package dimensions marked * (Figure 7).

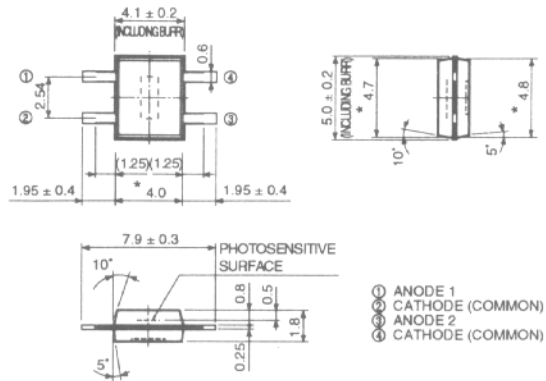
$$X \leq 0.2 \text{ mm}, Y \leq 0.2 \text{ mm}, \theta \leq 2^\circ$$



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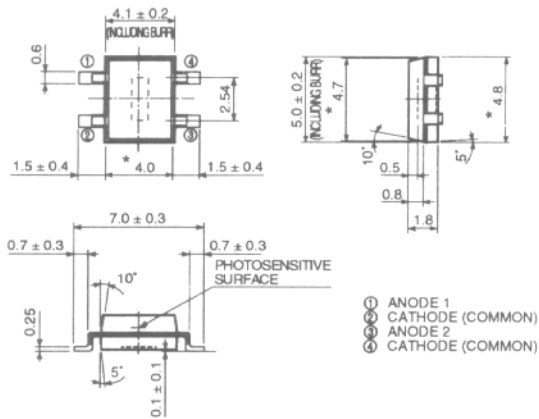
Figure 7: Dimensional Outlines (Unit: mm)
Tolerance unless otherwise specified : ± 0.1 mm

•S4580 to S4584 (Flat type)



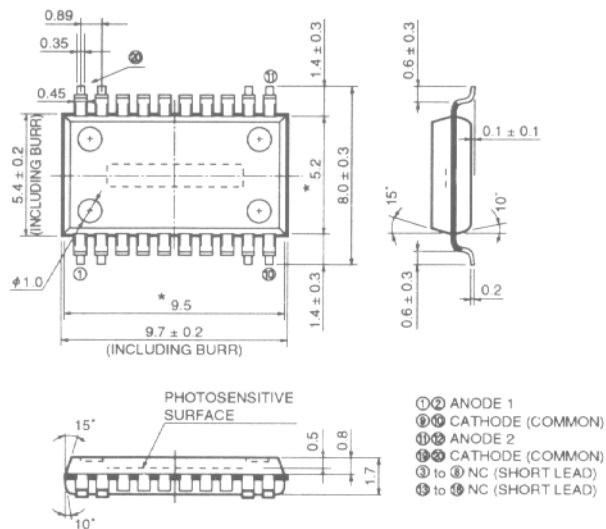
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•S4580-04 to S4584-04 (Gull wing type)



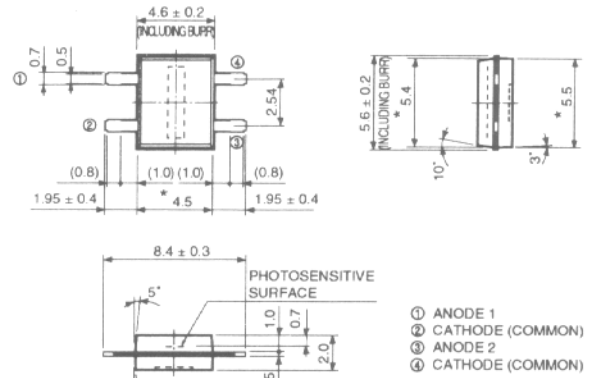
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•S5629



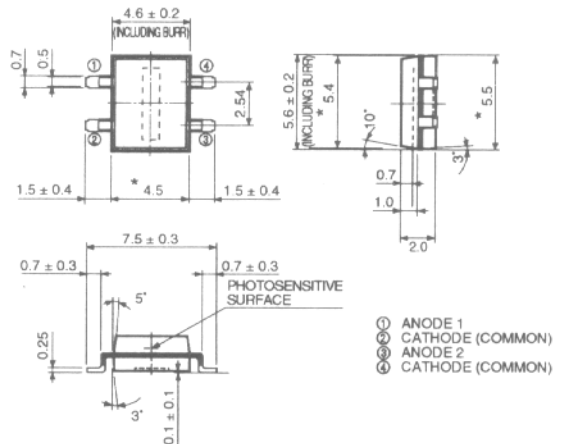
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•S7105 (Flat type)



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•S7105-04 (Gull wing type)



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Options

Clear plastic package and high interelectrode resistance type are also available in these PSD series.

•Clear plastic package type

This type allows a wide spectral response range from the visible to near IR region.

S4581: 320 to 1060 nm

S4580, S4582, S4583, S4584, S5629 and S7105: 320 to 1100 nm

•High interelectrode resistance type

Increasing the interelectrode resistance can reduce its noise. Devices with resistance as high as 1 M can be fabricated.

PRECAUTIONS FOR USE

1. Light spot

If the light spot size is too small, accurate position data may not be obtained. Use a light spot larger than 0.2 mm in diameter on the PSD chip.

2. Soldering

The plastic package is less resistant to heat when compared to general IC packages. Take sufficient care when soldering the plastic package.

a) Manual soldering

As a general guide, solder the device at 230 °C or below within 5 seconds per lead.

b) Reflow soldering

When heating the entire package in reflow soldering, use of infrared reflow soldering is recommended. Figure 8 shows a typical temperature profile for reflow soldering vs. elapsed time. Because the most important point for concern is to suppress the temperature rise of the package, placing a reflector on the package is recommended when necessary. In addition, other soldering conditions must be taken into account so no reliability problems occur.

c) Baking before mounting

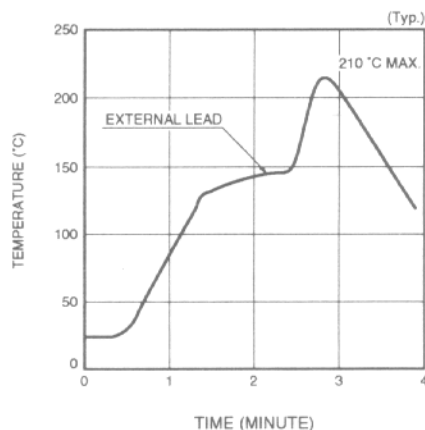
To prevent the possible troubles traceable to reflow soldering, it is recommended that the device be baked before mounting.

Recommended baking conditions: 120 °C for 12 to 16 hours, or 150 °C for 3 to 5 hours

3. Storage

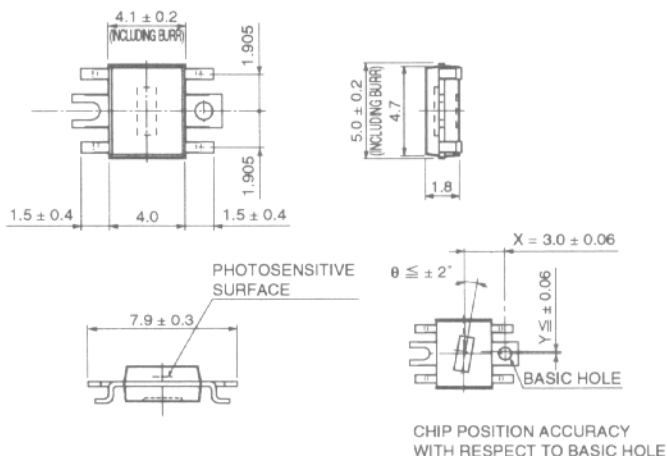
To prevent the package from absorbing moisture, and to protect the terminal leads from oxidation and stain, avoid unpacking the devices until you actually use them. Even before the devices are unpacked, avoid storing them in locations subject to water leakage, moisture condensation, direct sunlight, corrosive gases, high temperature and high humidity. After unpacking, always keep the devices in a desiccator (dry nitrogen flow type is preferable.)

Figure 8: Temperature Profile



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Figure 9: PSD with Mounting Terminals (Unit: mm)



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Hamamatsu also manufactures custom PSDs to meet your special requirements. As examples, the devices below are available on request.

●PSD with mounting terminals (Figure 9)

This type of PSD has mounting terminals that facilitate mounting and positioning of the device in an instrument.

●Multiple PSD arrays

These devices have a multiple PSD array fabricated on a single chip with a high degree of geometrical accuracy.

We will welcome your inquiries regarding specs for other custom devices. Please consult our sales office.

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