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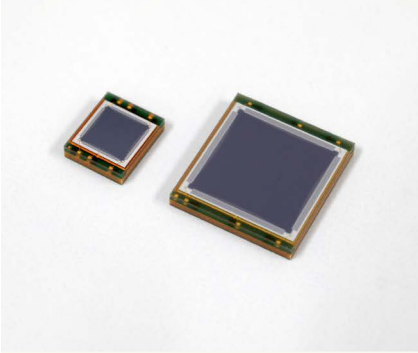
Two-dimensional PSD



S15534 NEW S15535

Surface mount type, high-accuracy position sensitive detector

The S15534 and S15535 are surface mount type two-dimensional PSDs with excellent position detection characteristics. They are smaller than the conventional S5990-01.

Features

- **Surface mount type**
- **Excellent position detectability**
- **Small package**
- **Compatible with lead-free solder reflow**

Applications

- **Light spot detection**
- **Pointing device**
- **Various types of position detection**

Structure

Parameter	Symbol	S15534	S15535 NEW	Unit
Photosensitive area	A	4 × 4	9 × 9	mm
Package	-	Glass epoxy		-
Window material	-	Silicone resin		-

Absolute maximum ratings

Parameter	Symbol	Value	Unit
Reverse voltage	V_R max	20	V
Operating temperature*1	Topr	-20 to +60	°C
Storage temperature*1	Tstg	-20 to +80	°C
Soldering temperature	Tsol	260 (3 times)*2	°C

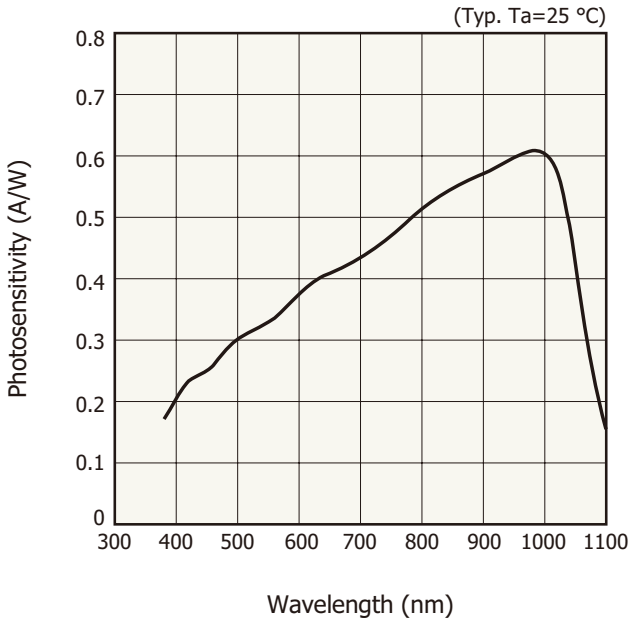
*1: No dew condensation. When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*2: Reflow soldering, JEDEC J-STD-020 MSL 3, see P.8 (S15534)
Reflow soldering, JEDEC J-STD-020 MSL 4, see P.8 (S15535)
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 (Ta=25 °C)

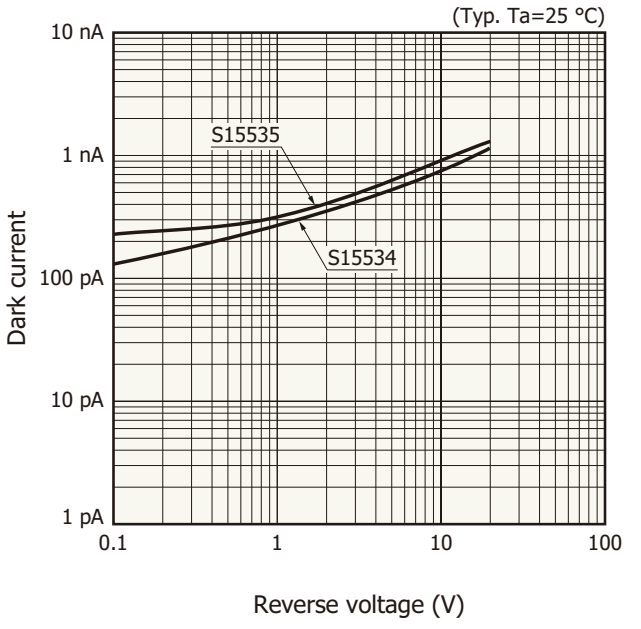
Parameter	Symbol	Condition	S15534			S15535 NEW			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ		-	380 to 1100	-	-	380 to 1100	-	nm
Peak sensitivity wavelength	λp		-	980	-	-	980	-	nm
Photosensitivity	S	λ=λp	-	0.6	-	-	0.6	-	A/W
Interelectrode resistance	Rie	Vb=0.1 V	5	7	15	5	7	15	kΩ
Position detection error*3	E		-	±70	±150	-	±150	±250	μm
Saturation photocurrent	Ist	λ=900 nm, VR=5 V RL=1 kΩ	-	500	-	-	500	-	μA
Dark current	ID	VR=5 V	-	0.5	10	-	1	50	nA
Rise time	tr	VR=5 V, RL=1 kΩ λ=900 nm, 10 % to 90 %	-	1	-	-	2	-	μs
Terminal capacitance	Ct	VR=5 V, f=10 kHz	-	70	-	-	350	-	pF
Position resolution	ΔR	Io=1 μA, B=1 kHz*4	-	0.7	-	-	1.5	-	μm

*3: λ=900 nm VR=5 V, light spot: ϕ0.2 mm*4 (S15534)
λ=830 nm VR=5 V, light spot: ϕ0.2 mm*4 (S15535)
*4: Specified within a circle that is 80 % of the photosensitive area. Recommended light spot size: ϕ0.2 mm or more

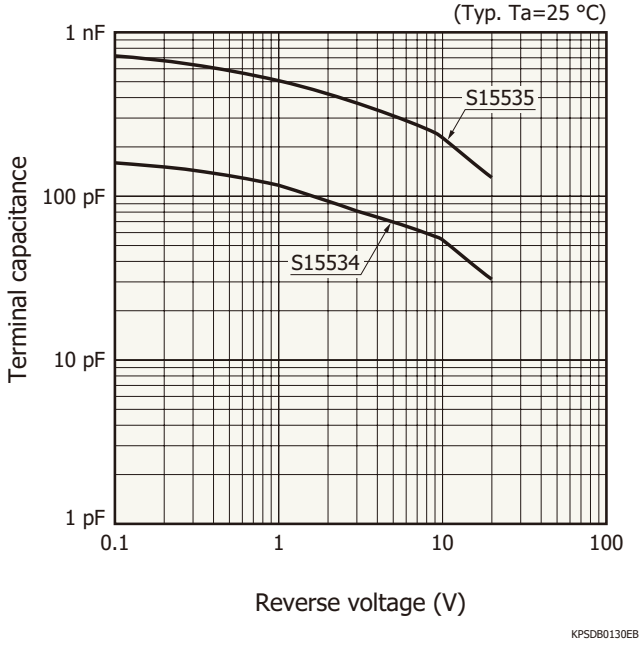
Spectral response



Dark current vs. reverse voltage



Terminal capacitance vs. reverse voltage



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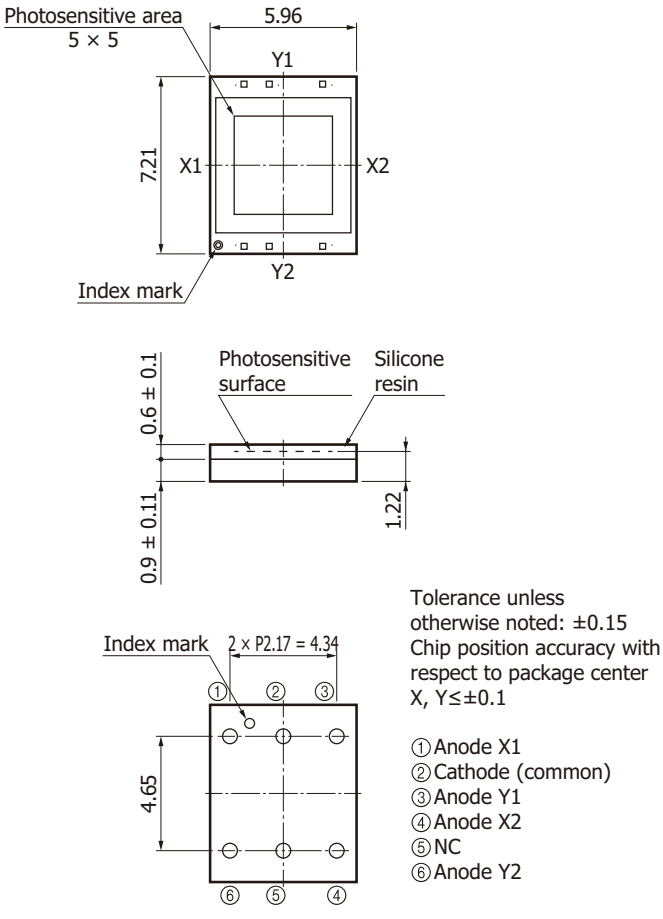
Dimensional outlines (unit: mm)

S15534



Tolerance unless otherwise noted: ±0.15
Chip position accuracy with respect to package center
X, Y≤±0.1

①Anode X1
②Cathode (common)
③Anode Y1
④Anode X2
⑤NC
⑥Anode Y2

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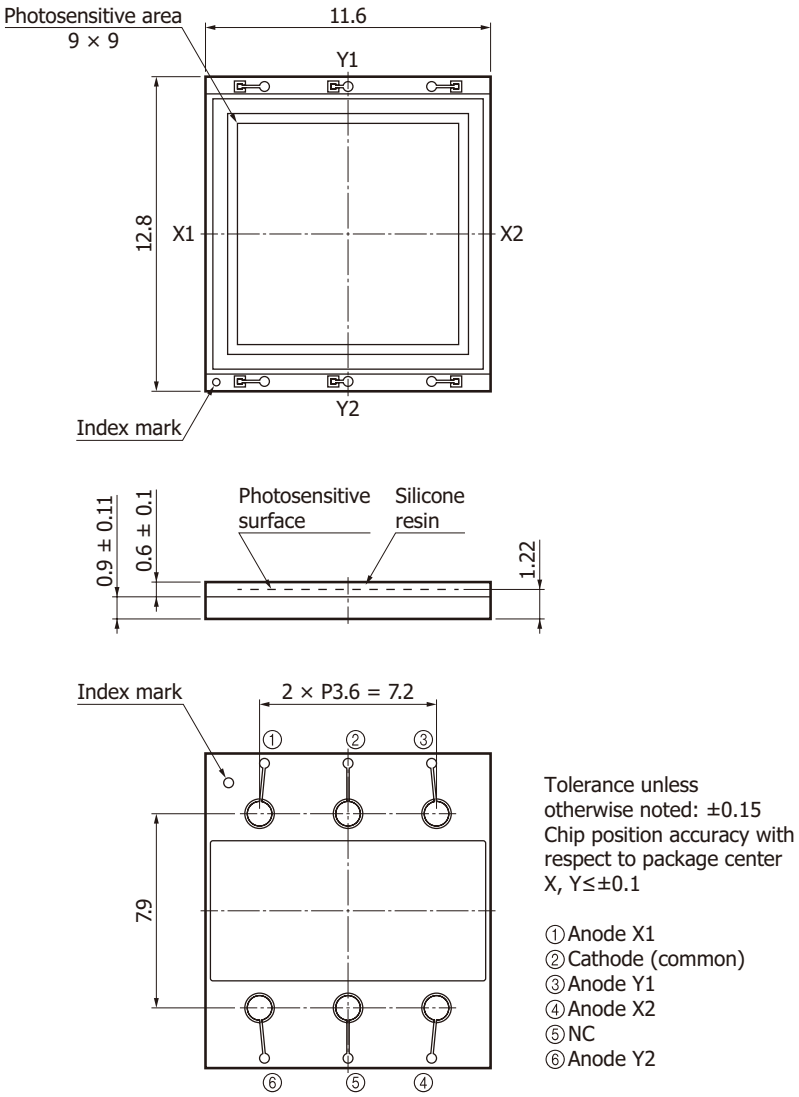
S15535



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Conversion formula of spot light position on the PSD

Output signals (photocurrent) I_{X1}, I_{X2}, I_{Y1}, I_{Y2} obtained from electrodes and the light spot position x, y can be found by the following formula.

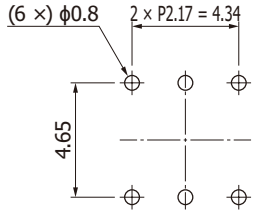
$$\frac{(I_{X2} + I_{Y1}) - (I_{X1} + I_{Y2})}{I_{X1} + I_{X2} + I_{Y1} + I_{Y2}} = \frac{2x}{L_X}$$

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

I_{X1} : Output signal from electrode X1
I_{X2} : Output signal from electrode X2
I_{Y1} : Output signal from electrode Y1
I_{Y2} : Output signal from electrode Y2
x, y : Position coordinate of light spot
L_X, L_Y: Resistance length (S15534=4.5 mm, S15535=10 mm)

Recommended land pattern (unit: mm)

S15534



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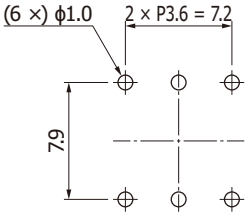
S15535



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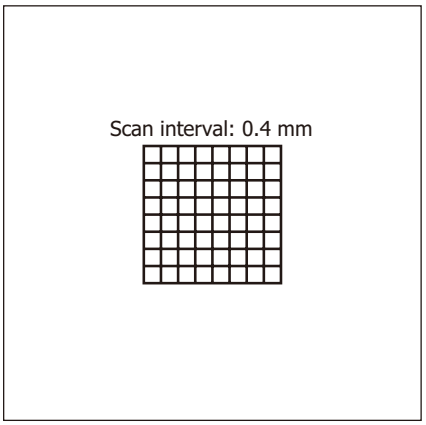
Example of position detectability

S15534

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



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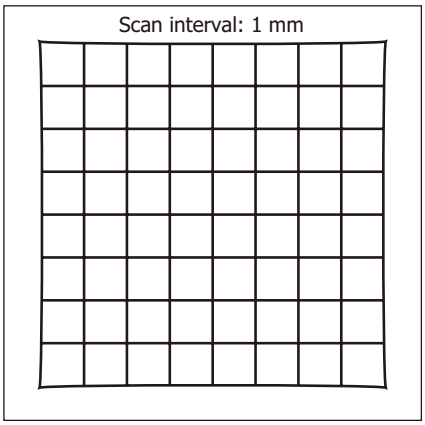
S15535

(Ta=25 °C, λ=830 nm, light spot size: ϕ0.2 mm)



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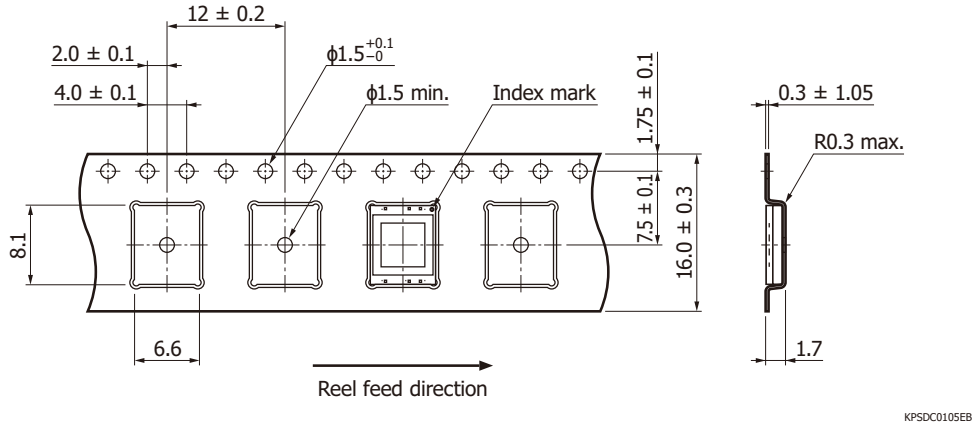
Standard packing specifications

S15534

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
ϕ330 mm	ϕ100 mm	16 mm	PS	Conductive

■ Embossed tape (unit: mm, material: PS, conductive)



■ Packing quantity
500 pcs/reel

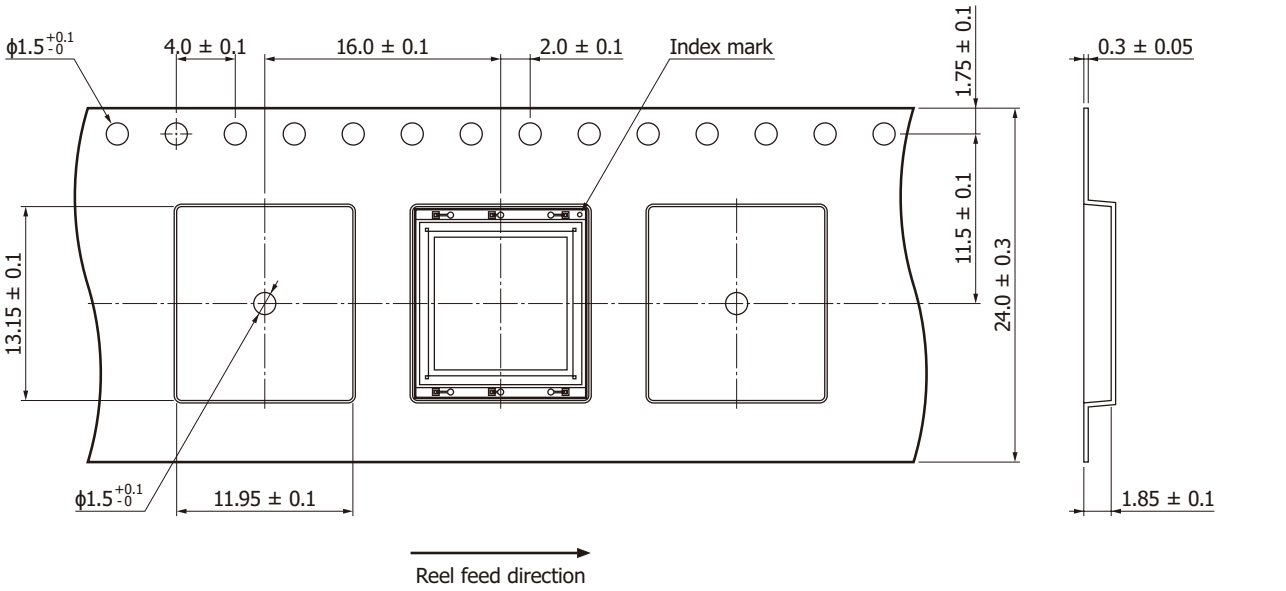
■ Packing state
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

S15535

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
ϕ330 mm	ϕ100 mm	24 mm	PS	Conductive

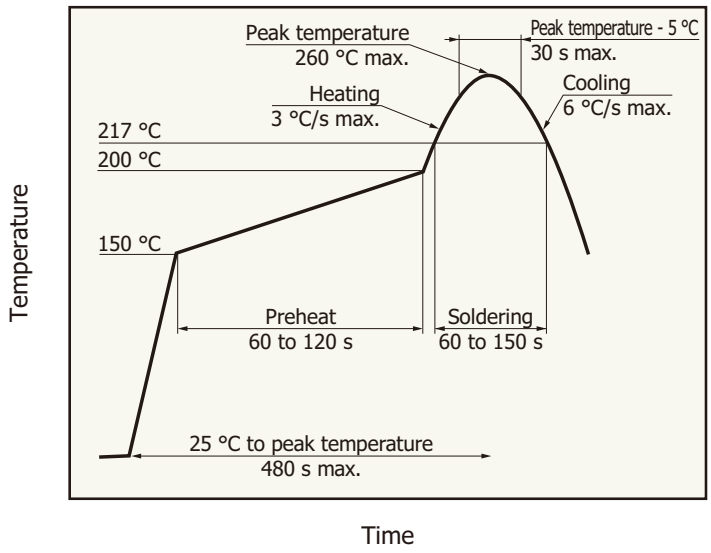
■ Embossed tape (unit: mm, material: PS, conductive)



■ Packing quantity
100 pcs/reel

■ Packing state
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

Recommended reflow soldering conditions



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- After unpacking, store in an environment at a temperature of 5 to 30 °C and a humidity 60% or less, and perform reflow soldering within 168 hours.

Type no.	Storage period
S15534	168 hours
S15535	72 hours

- The effect that the product receives during reflow soldering varies depending on the circuit board and reflow oven that are used. When you set reflow soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

Baking

If more than 12 months have passed in the unopened state, or storage conditions are exceeded after opening the package, baking is required to remove moisture before reflow soldering. For the baking, refer to "Precautions / Surface mount type products" in the related information.

■ Recommended baking conditions
Temperature: 150 °C (3 to 5 hours) or 120 °C (12 to 15 hours)
Note: Before setting the baking conditions, perform experiments to confirm that no problems occur with the product.

Related information

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

■ Precautions
· Disclaimer
· Precautions / Surface mount type products

■ Catalogs
· Technical note / PSD

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Visit our website for product and contact information.
www.hamamatsu.com
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