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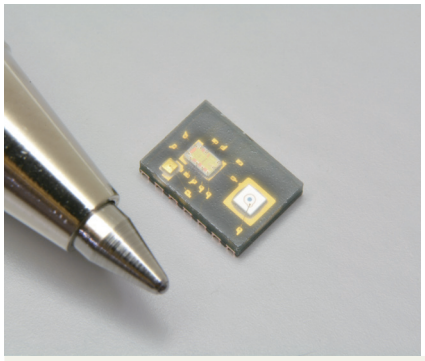
Photosensor with front-end IC



S13282-01CR

Compact APD suitable for various light level detection

The S13282-01CR is a compact optical device that integrates a Si APD and preamp. It has a built-in DC feedback circuit for reducing the effects of background light. It also provides excellent noise and frequency characteristics. We provide an evaluation kit for this product. Contact us for detailed information.

Features

- **High-speed response: 180 MHz**
- **Two-level gain switch function (low gain: single output, high gain: defferential output)**
- **Reduced background light effects**
- **Small waveform distortion when excessive light is incident**

Applications

- **Distance measurement**

Option

- **Driver circuit** **C13283-03**

Structure

Parameter	Symbol	Specification	Unit
Detector	-	Si APD	-
Photosensitive area size*1	A	ϕ0.2	mm
Package	-	Plastic	-

*1: Photosensitive area in which a typical gain can be obtained

Absolute maximum ratings

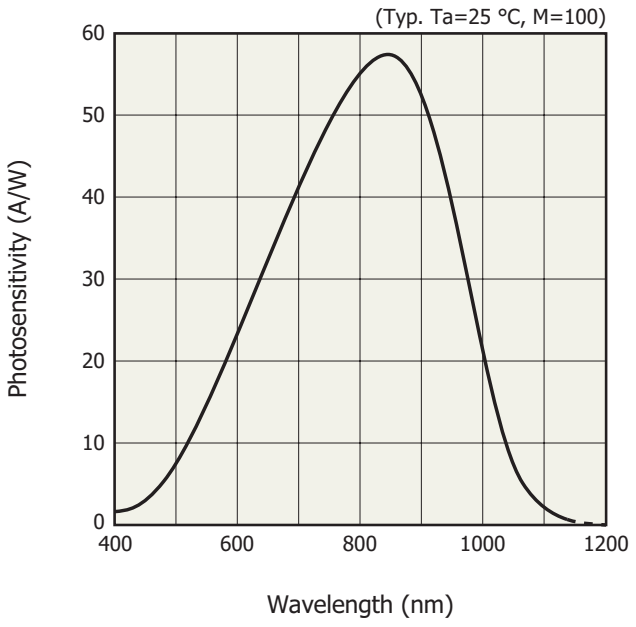
Parameter	Symbol	Condition	Value	Unit
Supply voltage (for preamp)	Vcc max		4.5	V
Reverse voltage (for APD)	V_APD		0 to V_{BR}	V
Reverse current (DC)	I_R max		0.2	mA
Forward current	I_F max		10	mA
DCFB terminal voltage	-		Vcc + 0.7	V
Gain terminal voltage	-		Vcc + 0.7	V
Operating temperature	Topr	No dew condensation*2	-30 to +85	°C
Storage temperature	Tstg	No dew condensation*2	-30 to +85	°C
Soldering conditions*3	-		Peak temperature 240 °C, 1 time (see P.5)	-

*2: When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*3: JEDEC level 5a
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	Min.	Typ.	Max.	Unit
Spectral response range	λ			400 to 1150		nm
Peak sensitivity wavelength	λp	M=100	-	840	-	nm
Photosensitivity	S	λ=λp, M=100, low gain	0.1	0.2	0.4	MV/W
		λ=λp, M=100, high gain	2	4	8	
Quantum efficiency	QE	λ=900 nm, M=1	-	70	-	%
Breakdown voltage	V_{BR}	I_D=100 µA	120	160	200	V
Temperature coefficient of breakdown voltage	ΔTV_{BR}		-	1.1	-	V/°C
Dark current	I_D	M=100	10	100	1000	pA
Temperature coefficient of dark current	ΔT_{ID}	M=100	-	1.1	-	times/°C
Current consumption	Ic	Low gain	17	25	32	mA
		High gain	20	28	35	
Low cutoff frequency	fcl	Low gain	-	0.01	-	MHz
		High gain	-	0.5	-	
High cutoff frequency	fch	Low gain	120	180	240	MHz
		High gain	100	160	220	
Input conversion noise power	en	f=10 MHz, M=100	-	50	100	$fW/Hz^{1/2}$
		f=100 MHz, M=100	-	65	130	
Output voltage level	-	Low gain	0.6	0.9	1.2	V
		High gain	0.7	1	1.3	
Output offset voltage	Voffset	High gain	-	-	±100	mV
Maximum output voltage amplitude	Vp-p max	Low gain	-	-0.5	-	V
		High gain	-	±0.7	-	
Supply voltage	Vcc1, Vcc2		3.135	3.3	3.465	V

Spectral response



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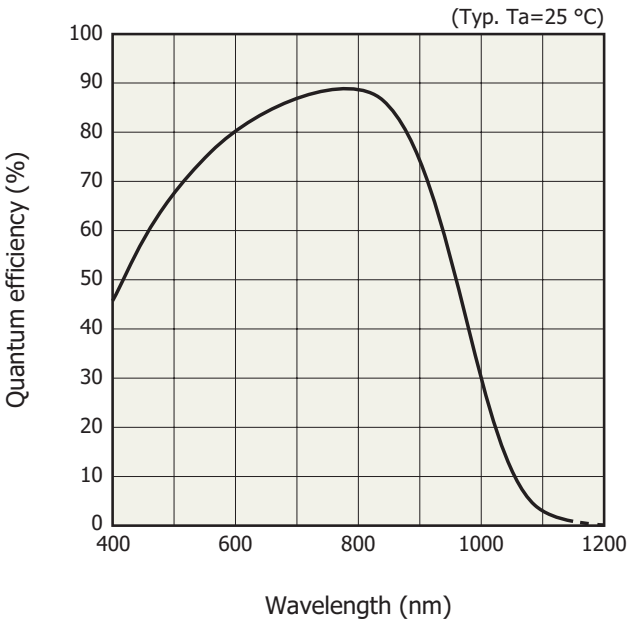
Quantum efficiency vs. wavelength



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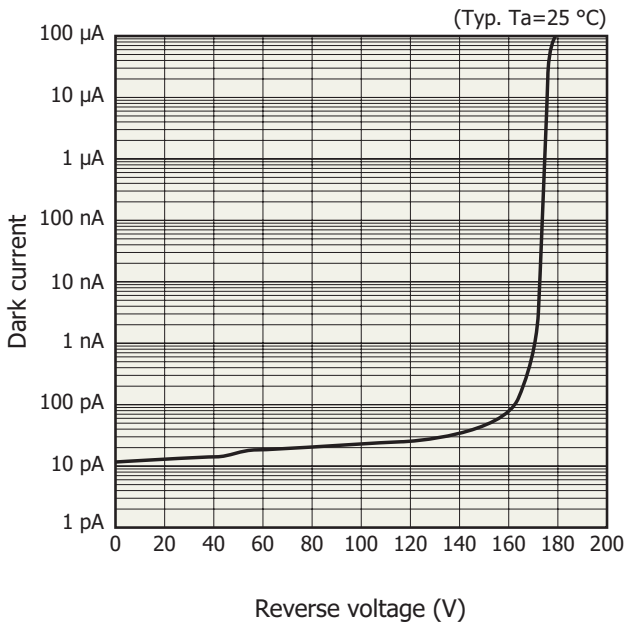
Dark current vs. reverse voltage



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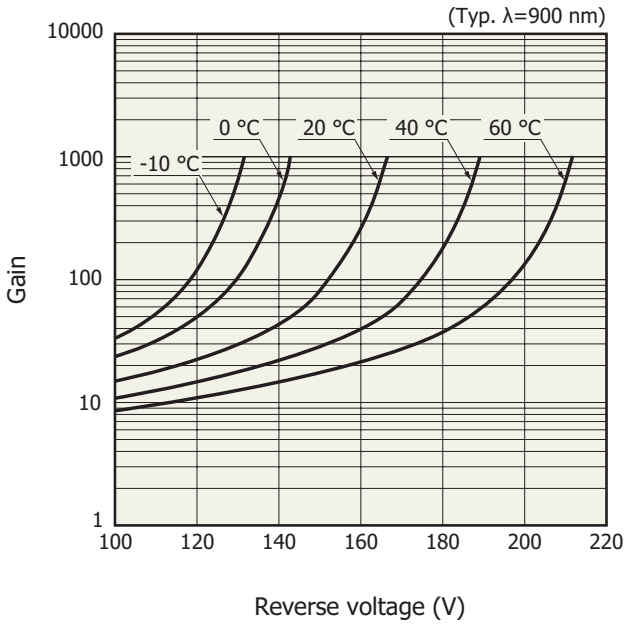
Gain vs. reverse voltage



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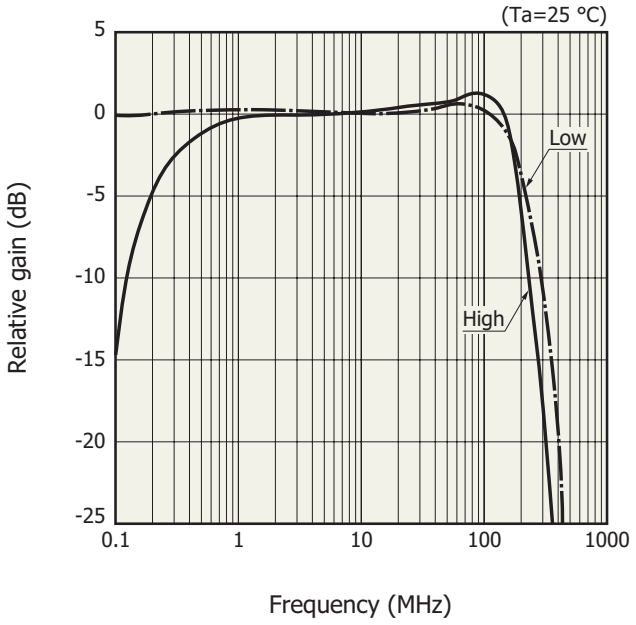
Frequency characteristics (typical example)



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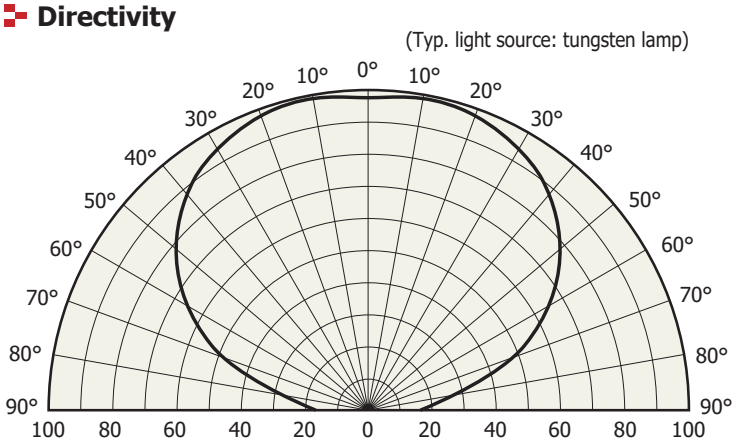
Directivity



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Truth table

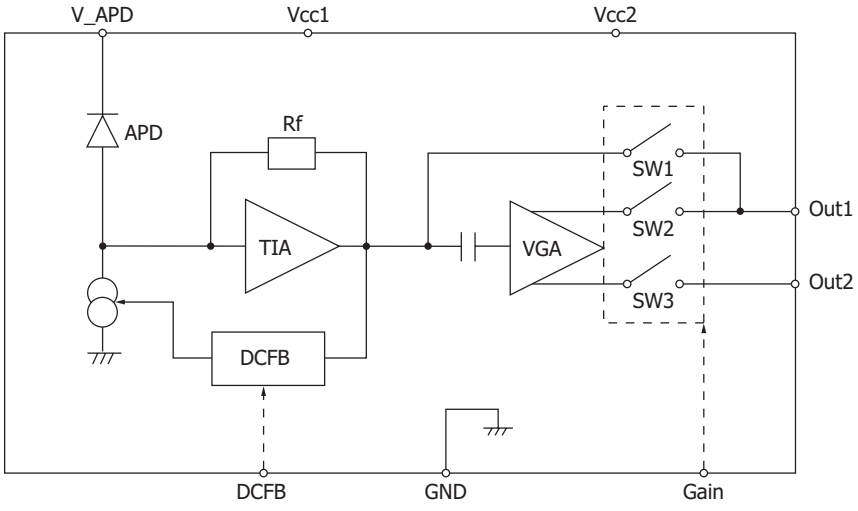
Gain selection

Gain selection	Gain
0	Low gain (× 1)
1	High gain (× 20)

DCFB_dis selection

DCFB_dis selection	Background light elimination function
0	ON
1	OFF

Block diagram



The DCFB (DC feedback) circuit detects the DC component of photocurrent, and reduces the effects of background light through the differential processor.

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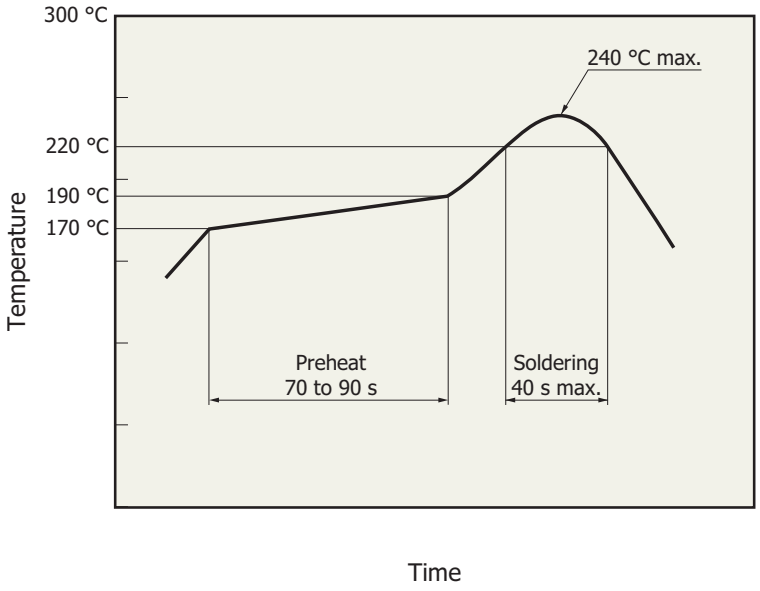
Measured example of temperature profile with our hot-air reflow oven for product testing



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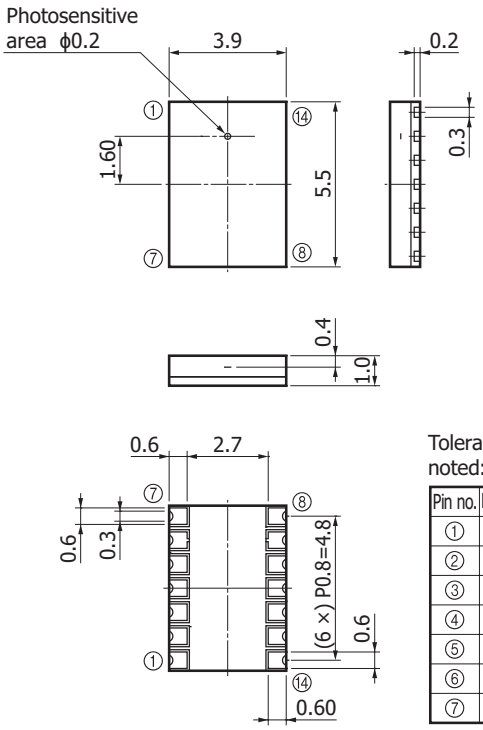
· This product supports lead-free soldering. After unpacking, store it in an environment at a temperature of 30 °C or less and a humidity of 60% or less, and perform soldering within 24 hours.
· The effect that the product receives during reflow soldering varies depending on the circuit board and reflow oven that are used. Before actual reflow soldering, check for any problems by testing out the reflow soldering methods in advance.

Dimensional outline (unit: mm)



Tolerance unless otherwise noted: ±0.1

Pin no.	Function	Pin no.	Function
①	NC	⑧	Out2
②	NC	⑨	GND
③	GND	⑩	Gain
④	GND	⑪	Vcc2
⑤	DCFB	⑫	Vcc1
⑥	GND	⑬	NC
⑦	Out1	⑭	V_APD

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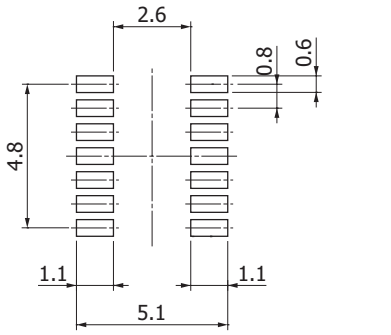
Recommended land pattern (unit: mm)



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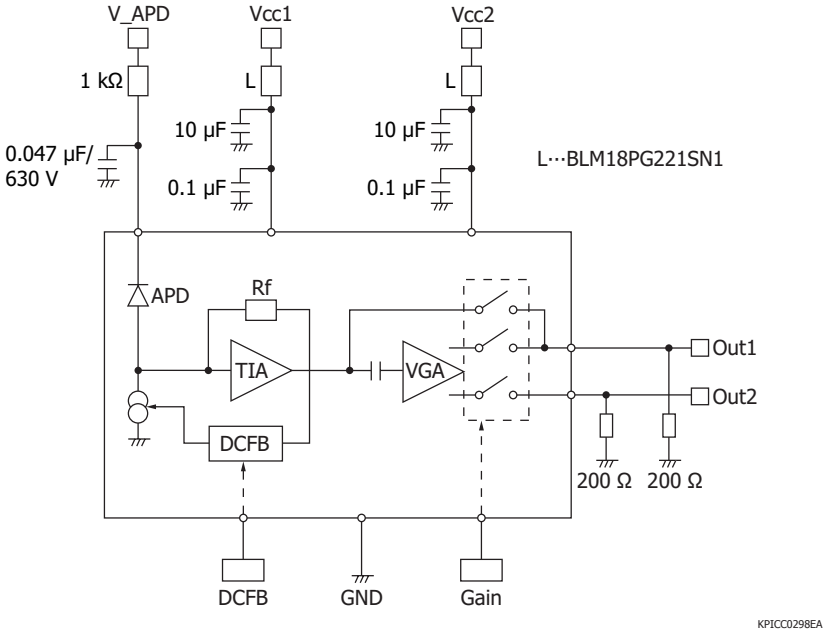
Connection example



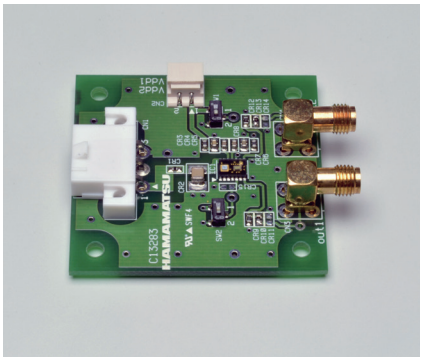
Related information

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

■ Precautions
· Disclaimer
· Metal, ceramic, plastic packages
· Surface mount type products

Evaluation kit for photosensor with front-end IC (S13282-01CR)

An evaluation kit [48 mm (H) × 50 mm (V)] for understanding the operating principle of Hamamatsu's S13282-01CR photosensor with front-end IC is available. Contact us for detailed information.



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