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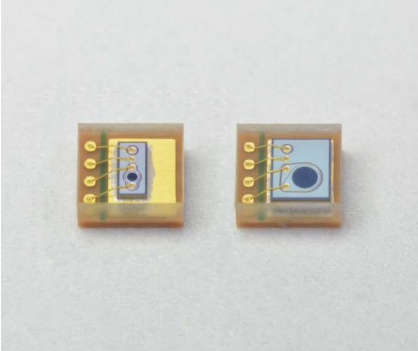
NEW

Si APD

S15415 series



High-speed, compact Si APD that does not require temperature adjustment

The S15415 series is a gain-stabilized APD (GS APD) with a built-in temperature compensation function inside the sensor. This realizes constant gain without the need for temperature adjustment. It is suitable for laser monitors of optical rangefinders used in a wide range of applications, from consumer to industrial.

Features

- **Built-in temperature compensation function**
- **Compact package: 2.0 × 1.8 × 0.85^{t} mm**
- **Peak sensitivity wavelength: 840 nm (M=50)**
- **High-speed response: Cutoff frequency=500 MHz typ. (λ=905 nm, M=50)**

Applications

- **Optical rangefinders**

Structure

Parameter	S15415-02	S15415-05	Unit
Photosensitive area*1	ϕ0.2	ϕ0.5	mm
Package	Glass epoxy		-
Seal material	Silicone resin		-

*1: Area in which a typical gain can be obtained

Absolute maximum ratings

Parameter	Symbol	Specification	Unit
Anode reverse current (DC)	I_R anode max	0.1	mA
Forward current	I_F max	10	mA
Operating temperature*2	Topr	-30 to +105	°C
Storage temperature*2	Tstg	-40 to +105	°C
Soldering temperature	Tsol	260 (3 times)*3	°C

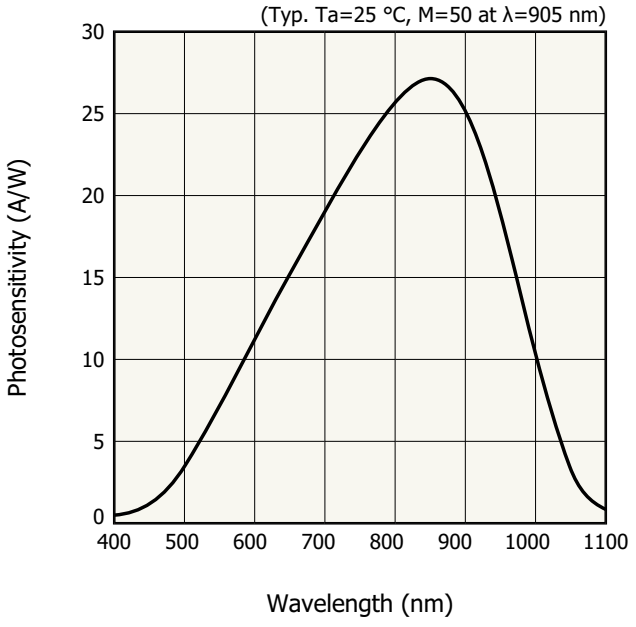
*2: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*3: Reflow soldering, JEDEC J-STD-020 MSL 2a, see P.5
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, unless otherwise noted)

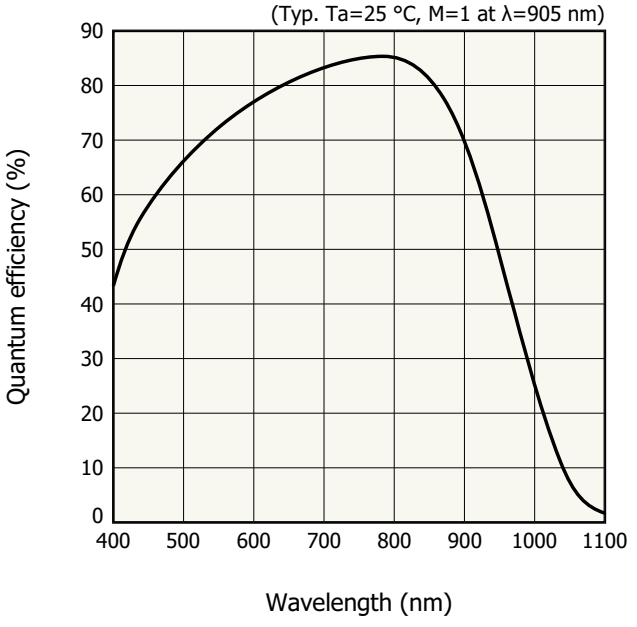
Parameter	Symbol	Condition	S15415-02			S15415-05			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ		400 to 1100						nm
Peak sensitivity wavelength	λp		-	840	-	-	840	-	nm
Photosensitivity	S	λ=905 nm, M=1	-	0.5	-	-	0.5	-	A/W
Quantum efficiency	QE	λ=905 nm, M=1	-	70	-	-	70	-	%
Operating reverse voltage	Vop	Gain-stabilized mode operation*4	185 + 1.1 × (Ta opr - 25)*5	-	-	185 + 1.1 × (Ta opr - 25)*5	-	-	V
Temperature coefficient of operating reverse voltage	ΔTVop		-	1.1	-	-	1.1	-	V/°C
Dark current	ID	Gain-stabilized mode operation*4	-	20	200	-	40	400	pA
Dark current temperature coefficient	ΔTID	M=50	-	1.1	-	-	1.1	-	times/°C
Cutoff frequency	fc	M=50, RL=50 Ω λ=905 nm, -3 dB	-	500	-	-	500	-	MHz
Terminal capacitance	Ct	M=50, f=1 MHz	-	0.5	-	-	1.1	-	pF
Excess noise figure	x	M=50, λ=905 nm	-	0.3	-	-	0.3	-	-
Gain	M	Gain-stabilized mode operation*4, λ=905 nm	40	50	60	40	50	60	-
Gain control range	-	λ=905 nm	-	30 to 100	-	-	30 to 100	-	-

*4: Apply bias voltage to anode. IR anode limit=10 μA, guard pin=GND
*5: Ta opr=assumed maximum operating temperature (°C)

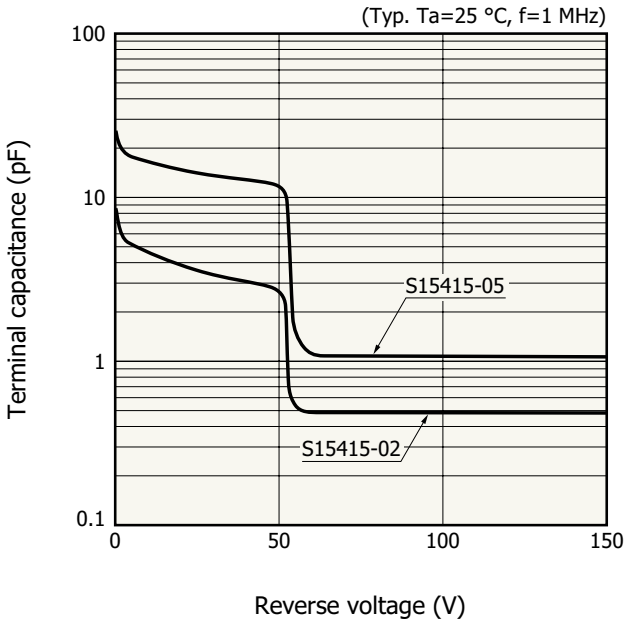
Spectral response



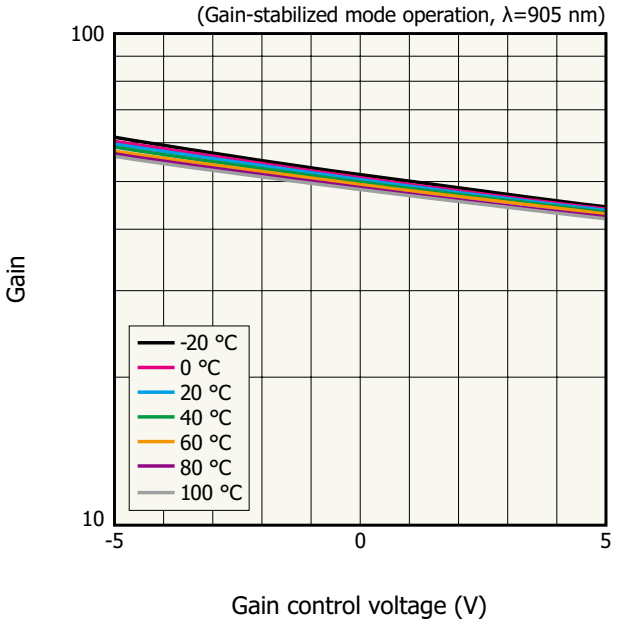
Quantum efficiency vs. wavelength



Terminal capacitance vs. reverse voltage

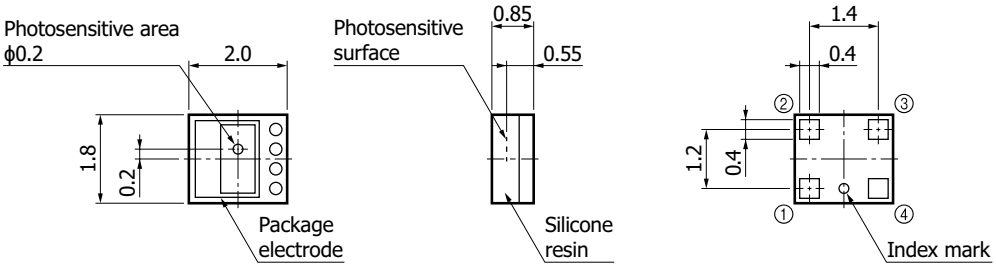


Gain vs. gain control voltage (typical example)

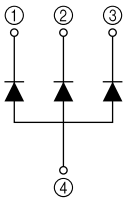


Dimensional outlines (unit: mm)

S15415-02



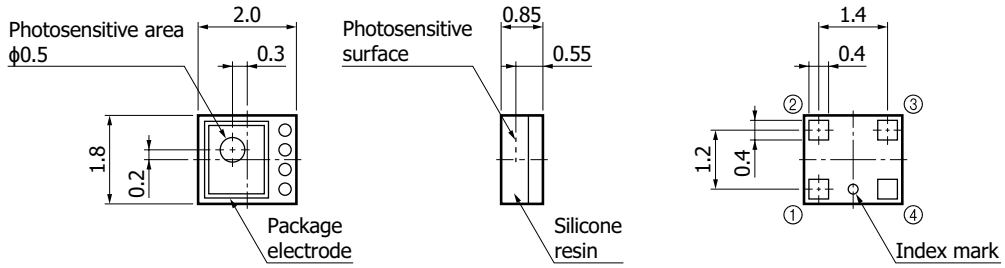
Tolerance unless otherwise noted: ±0.2
Chip position accuracy with respect to package electrode pattern center: X, Y ≤ ±0.2



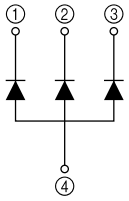
①	Gain control	Gain control voltage input (connect to GND)
②	Output	APD output
③	Guard	Leakage current output (connect to GND)
④	Anode	Bias voltage input

KAPDA0229EA

S15415-05



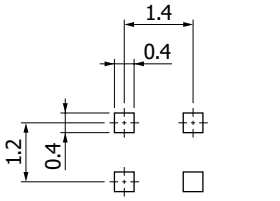
Tolerance unless otherwise noted: ±0.2
Chip position accuracy with respect to package electrode pattern center: X, Y ≤ ±0.2



①	Gain control	Gain control voltage input (connect to GND)
②	Output	APD output
③	Guard	Leakage current output (connect to GND)
④	Anode	Bias voltage input

KAPDA0230EA

Recommended land pattern



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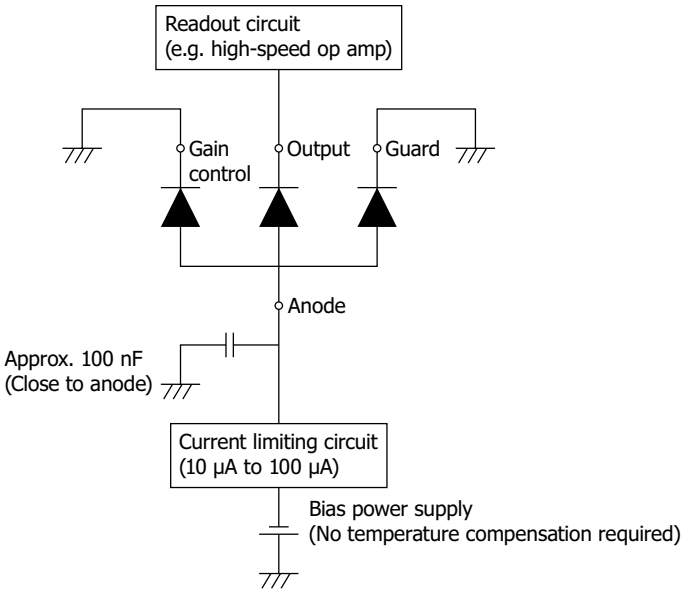
Connection example



· Connection to a bias power supply and a current limiting circuit are essential.
· The gain can be controlled by applying a voltage to the gain pin.
· We recommend connecting a capacitor near the anode pin to stabilize the bias voltage.

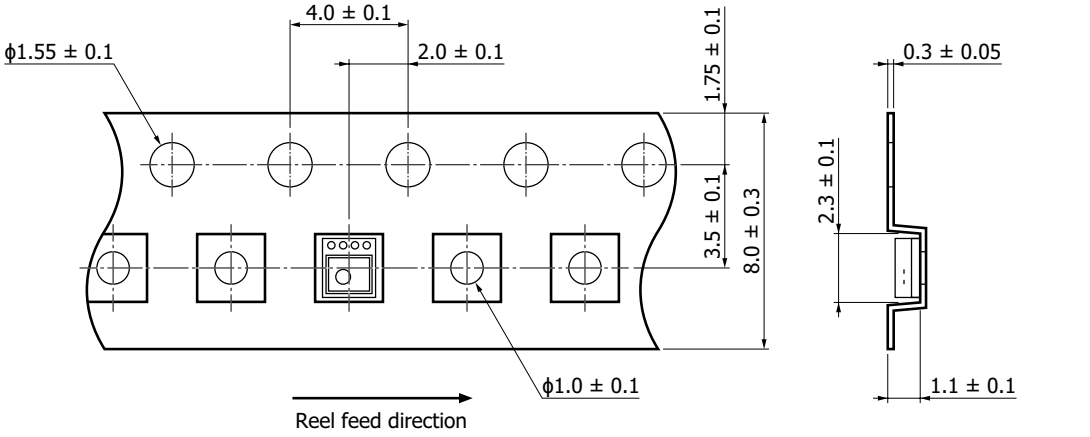
KAPDC0137EB

Standard packing specifications

■ Reel (conforms to JEITA ET-7200)

Appearance	Hub diameter	Tape width	Material	Electrostatic characteristics
ϕ180 mm	ϕ60 mm	8 mm	PS	Conductive

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

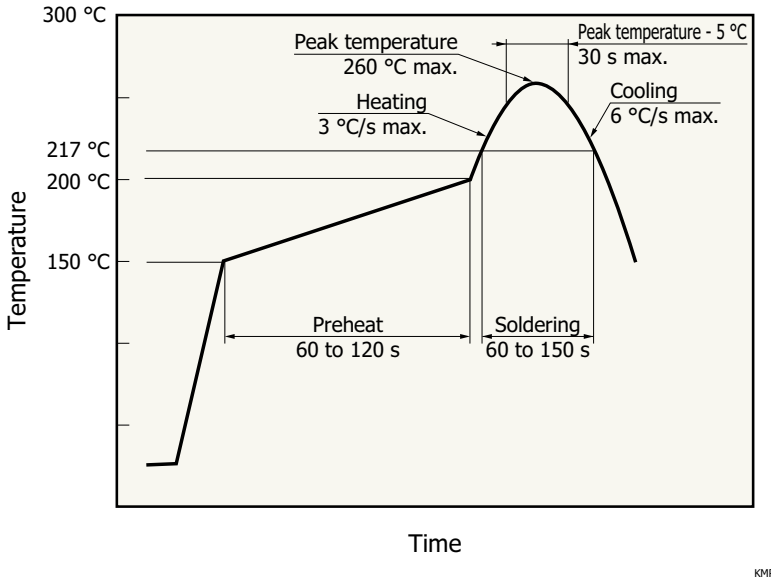


KAPDC0139EA

■ Packing quantity
1000 pcs/reel

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

Recommended reflow soldering conditions



KMPDB0405EC

- After unpacking, store in an environment at a temperature of 30 °C or less and a humidity of 60% or less, and perform reflow soldering within 4 weeks.
- 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 12 months have passed without unpacking or the above storage period has passed after unpacking, perform baking before reflow soldering to dehumidify. For the baking, refer to "Precautions / Surface mount type products" in the related information.

■ Recommended baking conditions
· Temperature: 150 °C, 3 hours, up to twice
Note: When you set baking conditions, check that problems do not occur in the product by testing out the conditions in advance.

Related products

Photosensor with front-end IC S16429 series

This device is for direct TOF (time-of-flight) distance measurement, integrating the S15415 series and a transimpedance amplifier. It offers low-noise and high-speed response.

Features

- **Stable gain against temperature fluctuations**
- **No gain adjustment according to individual differences required**
- **High-speed response**
- **Low noise**

Type no.	Built-in element	Cutoff frequency
S16429-01CT	S15415-02	300 MHz
S16429-02CT	S15415-05	280 MHz

Related information

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

■ Precautions
· Disclaimer
· Precautions / Surface mount type products

■ Catalogs
· Technical note / Si APD

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