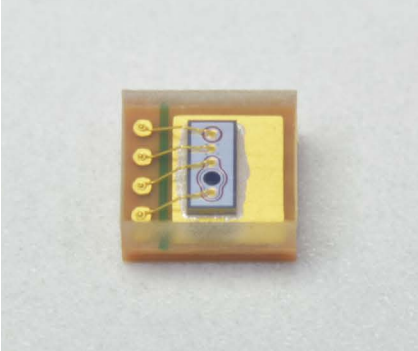
HAMAMATSU
PHOTON IS OUR BUSINESS

NEW

Si APD



S15413-02

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

The S15413-02 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: 760 nm (M=50)**
- **High-speed response: Cutoff frequency=1.5 GHz typ. (λ=660 nm, M=50)**

Applications

- **Optical rangefinders**

Structure

Parameter	Specification	Unit
Photosensitive area*1	ϕ0.2	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

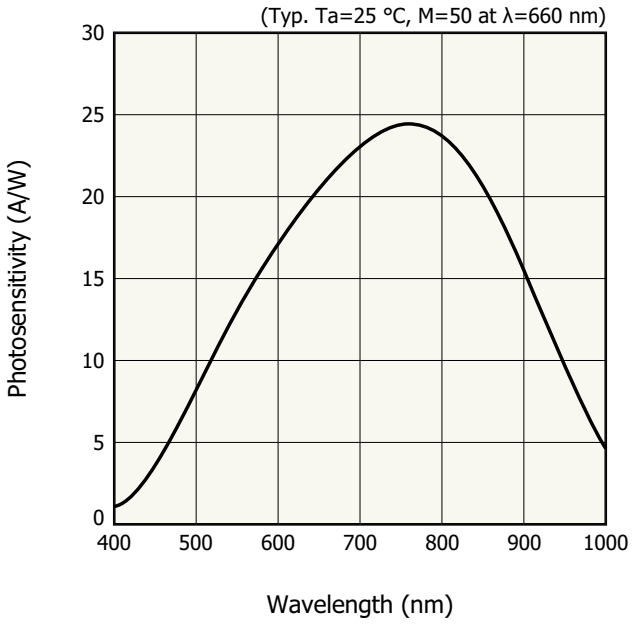
*2: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*3: Reflow soldering, 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)

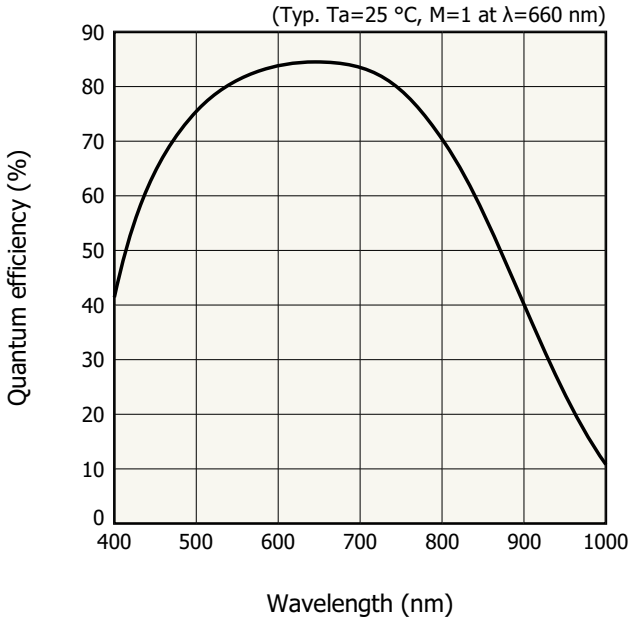
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Spectral response range	λ			400 to 1000		nm
Peak sensitivity wavelength	λp		-	760	-	nm
Photosensitivity	S	λ=660 nm, M=1	-	0.42	-	A/W
Quantum efficiency	QE	λ=660 nm, M=1	-	85	-	%
Operating reverse voltage	Vop	Gain-stabilized mode operation*4	110 + 0.42 × (Ta opr -25)*5	-	-	V
Temperature coefficient of operating reverse voltage	ΔTVop		-	0.42	-	V/°C
Dark current	ID	Gain-stabilized mode operation*4	-	10	100	pA
Dark current temperature coefficient	ΔTID	M=50	-	1.1	-	times/°C
Cutoff frequency	fc	M=50, RL=50 Ω λ=660 nm, -3 dB	-	1.5	-	GHz
Terminal capacitance	Ct	M=50, f=1 MHz	-	0.6	-	pF
Excess noise figure	x	M=50, λ=660 nm	-	0.3	-	-
Gain	M	Gain-stabilized mode operation*4, λ=660 nm	40	50	60	-
Gain control range	-	λ=660 nm	-	30 to 100	-	-

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

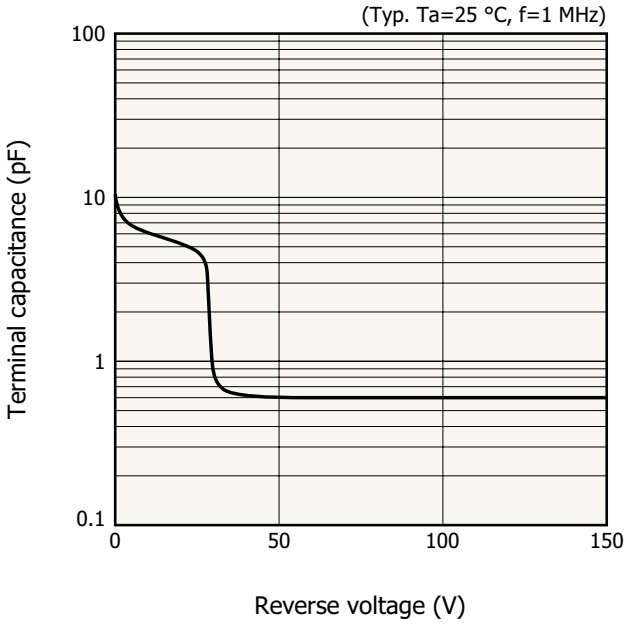
Spectral response



Quantum efficiency vs. wavelength

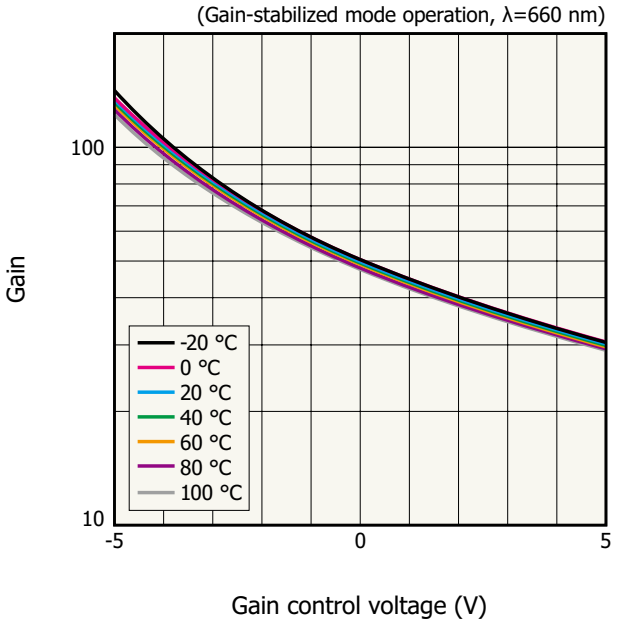


Terminal capacitance vs. reverse voltage



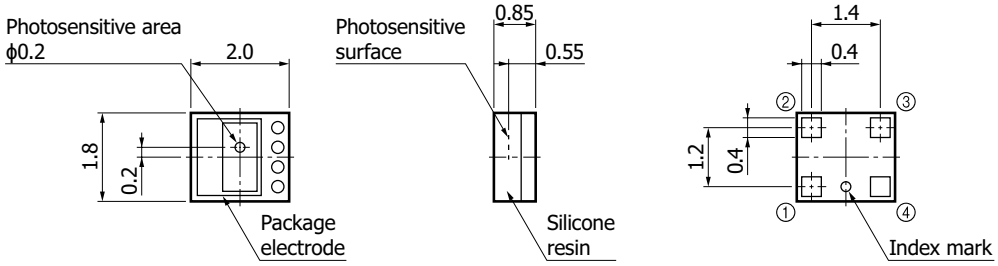
KAPDB0655EA

Gain vs. gain control voltage (typical example)

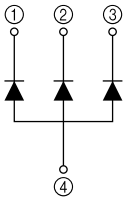


KAPDB0656EA

Dimensional outlines (unit: mm)



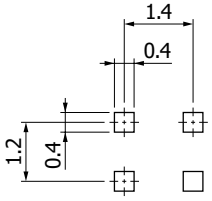
Tolerance unless otherwise noted: ±0.2
Chip position accuracy with respect to package electrode pattern center: X, Y ≤ ±0.2



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

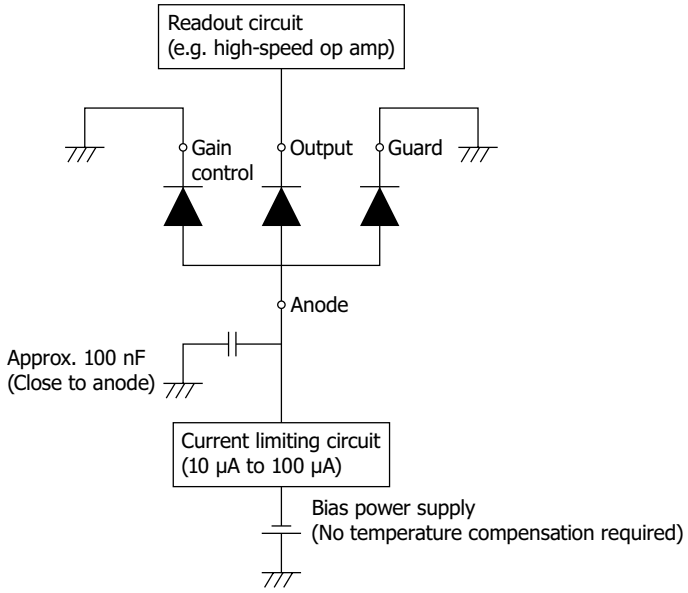
KAPDA0229EA

Recommended land pattern



KAPDC0138EA

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.

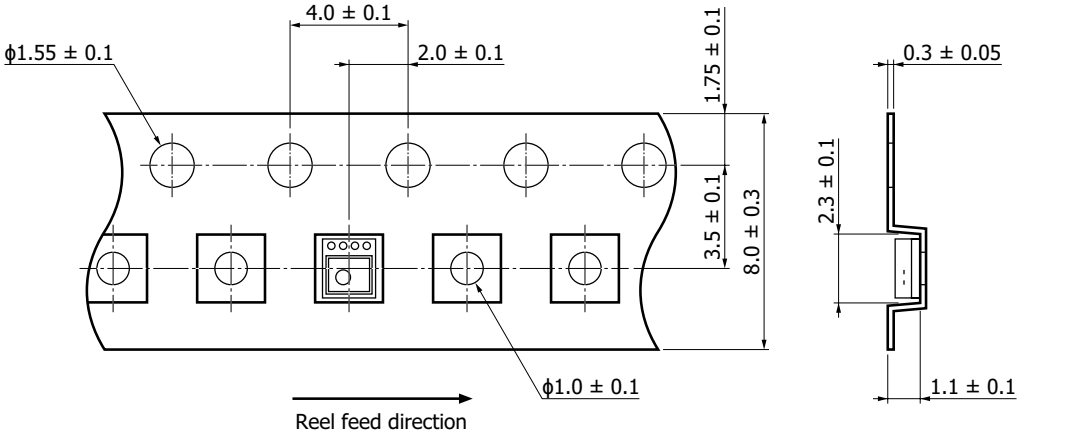
KAPDC0137EB

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)

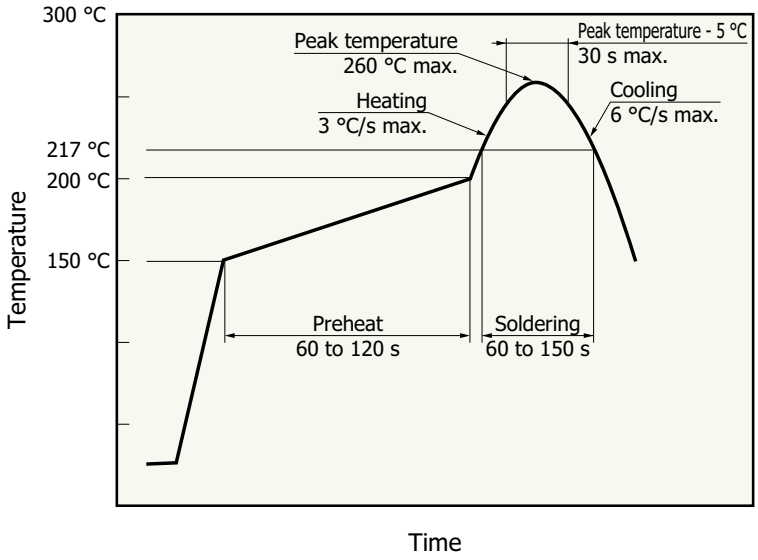


KAPDC0139EA

■ 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 information

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

■ Precautions
- Disclaimer
- Precautions / Surface mount type products

■ Catalogs
- Technical note / Si APD

The content of this document is current as of March 2025.
Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.
The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use.
Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

HAMAMATSU www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Chuo-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184
U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218
Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de
France: HAMAMATSU PHOTONICS FRANCE S.A.R.L.: 19 Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr
United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court,10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35, 16440 Kista, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: info@hamamatsu.se
Italy: HAMAMATSU PHOTONICS ITALIA S.R.L.: Strada della Moia, 1 int. 6 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it
China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201, Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn
Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 13F-1, No.101, Section 2, Gongdao 5th Road, East Dist., Hsinchu City, 300046, Taiwan(R.O.C) Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw