

S12023 series, etc.

Low bias operation, for 800 nm band

These are 800 nm band near-infrared Si APDs that can operate at low voltages, 200 V or less. They are suitable for applications such as FSO (free space optics) and optical rangefinders.

Features

- Stable operation at low bias
- High-speed response
- High sensitivity and low noise

Applications

- FSO
- Optical rangefinders

Structure / Absolute maximum ratings

Type no.	Dimensional outline/Window material*1	Package	Effective photosensitive area size*2 (mm)	Absolute maximum ratings		
				Operating temperature T _{opr} (°C)	Storage temperature T _{stg} (°C)	Soldering conditions
S12023-02	(1)/K	TO-18	φ0.2	-20 to +85	-55 to +125	260 °C or less, within 10 s
S12023-05	(1)/K		φ0.5			
S12051	(2)/L					
S12086	(3)/L					
S12023-10	(1)/K		φ1.0			
S12023-10A*3	(1)/K					
S3884	(4)/K	TO-5	φ1.5			
S2384	(5)/K		φ3.0			
S2385	(6)/K	TO-8	φ5.0			

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.

*1: K=borosilicate glass, L=lens type borosilicate glass

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

*3: This is a variant of the S12023-10 in which the device chip is light-shielded by aluminum layer except for the photosensitive area.

Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Spectral response range λ (nm)	Peak sensitivity wavelength λ_p (nm)	Photo-sensitivity S M=1 $\lambda=800$ nm (A/W)	Quantum efficiency QE M=1 $\lambda=800$ nm (%)	Breakdown voltage V _{BR} I _D =100 μ A		Temp. co-efficient of V _{BR} (V/°C)	Dark current I _D ^{*4}		Cutoff frequency f _c R _L =50 Ω (MHz)	Terminal capacitance C _t ^{*4} (pF)	Excess noise figure x $\lambda=800$ nm ^{*4}	Gain M $\lambda=800$ nm
					Typ. (V)	Max. (V)		Typ. (nA)	Max. (nA)				
S12023-02	400 to 1000	800	0.5	75	150	200	0.65	0.05	0.5	1000	1	0.3	100
S12023-05								0.1	1				
S12051										0.2	2		
S12086								0.5	5				
S12023-10										1	10		
S12023-10A ^{*3}								3	30				
S3884										60			
S2384								40					
S2385													

*4: Values measured at a gain listed in the characteristics table

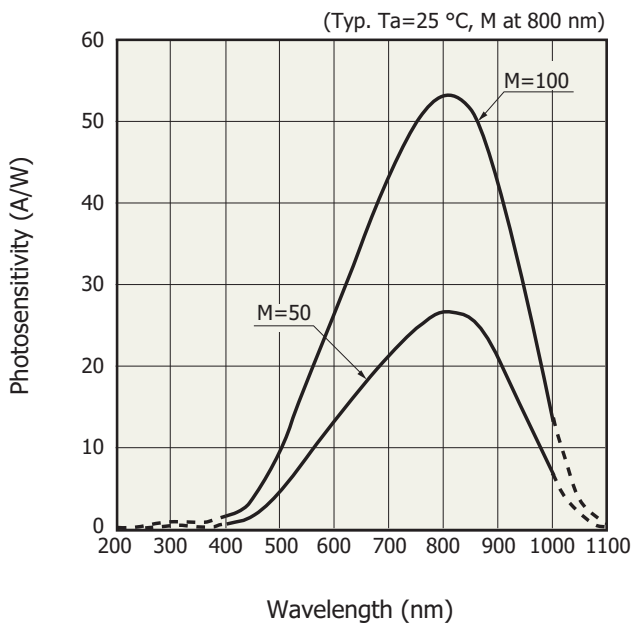
Note: Breakdown voltage can be specified by using the suffix of type number as examples shown below.

S12023-02-01: 80 to 120 V

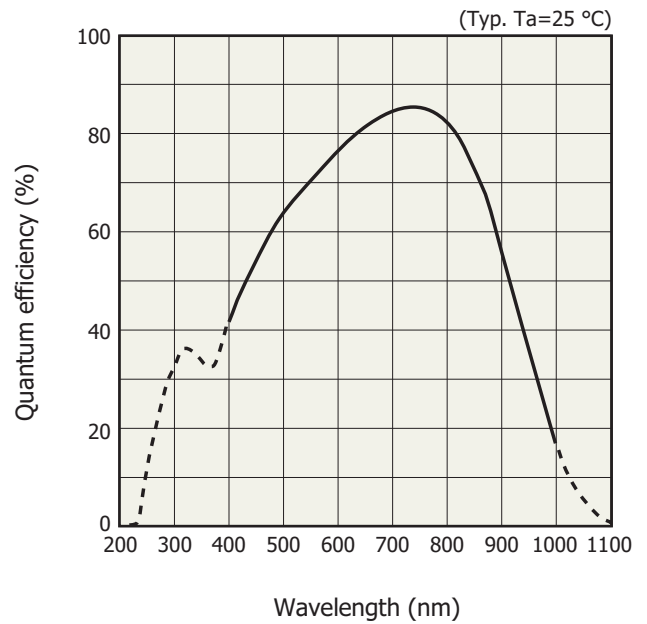
S12023-02-02: 120 to 160 V

S12023-02-03: 160 to 200 V

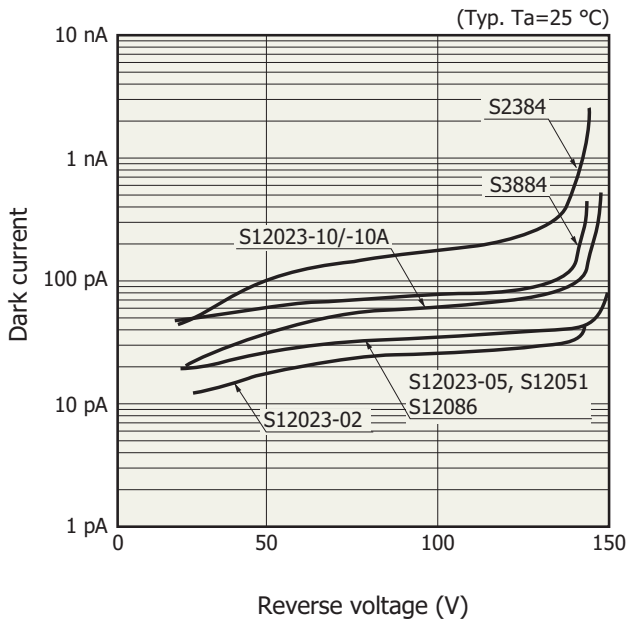
Spectral response



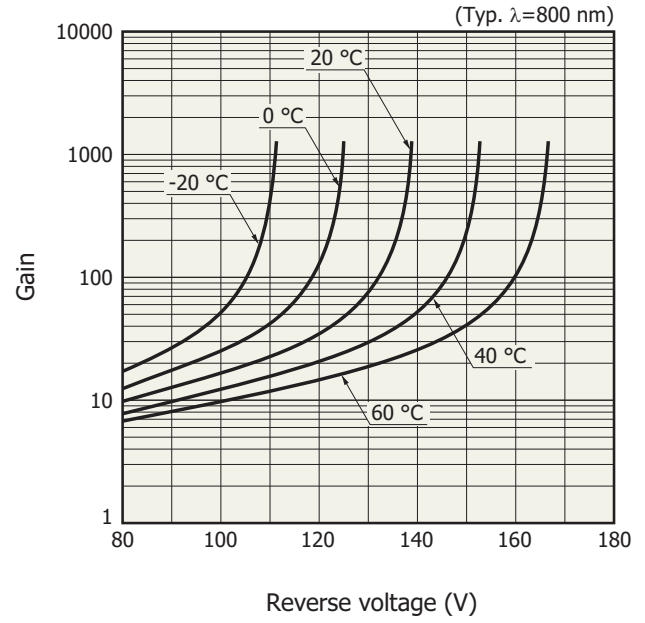
Quantum efficiency vs. wavelength



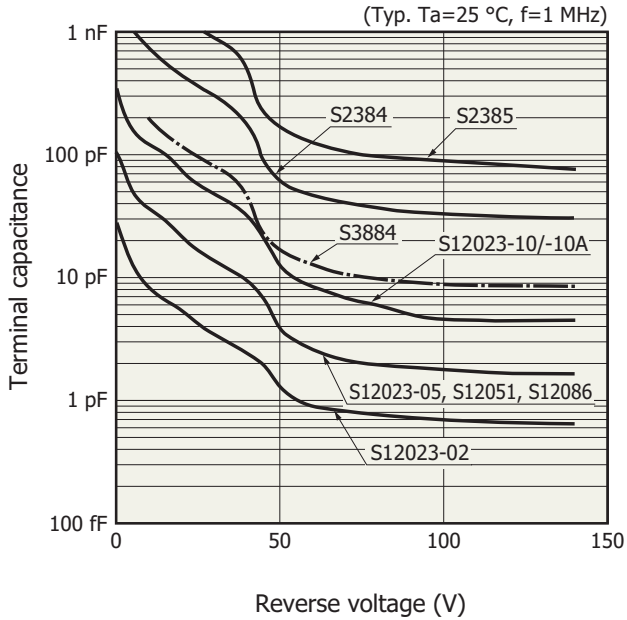
Dark current vs. reverse voltage



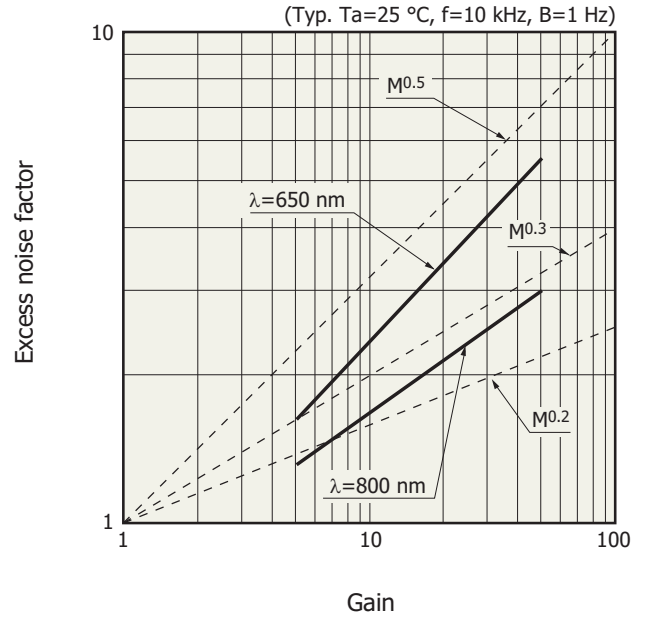
Gain vs. reverse voltage



Terminal capacitance vs. reverse voltage

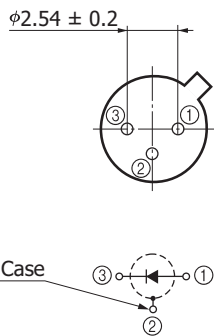
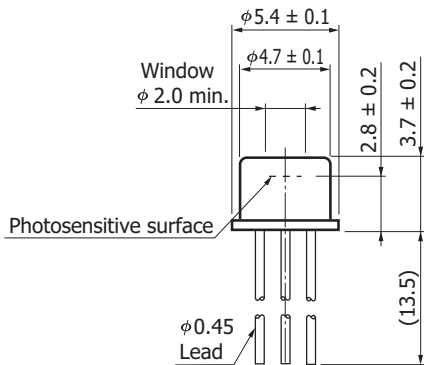


Excess noise factor vs. gain



Dimensional outlines (unit: mm)

(1) S12023-02/-05/-10/-10A

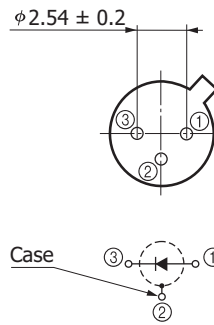
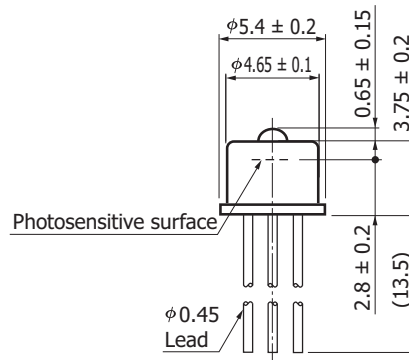


Distance from photosensitive area center to cap center
 $-0.2 \leq X \leq +0.2$
 $-0.2 \leq Y \leq +0.2$

The glass window may extend a maximum of 0.2 mm above the upper surface of the cap.

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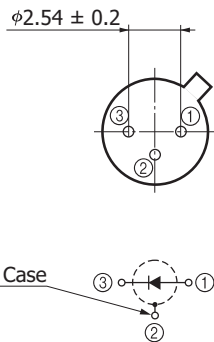
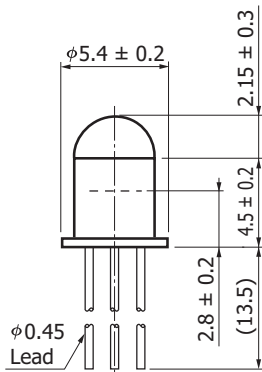
(2) S12051



Distance from photosensitive area center to cap center
 $-0.2 \leq X \leq +0.2$
 $-0.2 \leq Y \leq +0.2$

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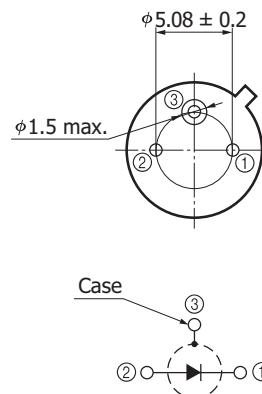
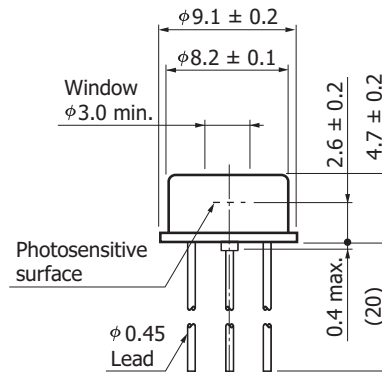
(3) S12086



Distance from photosensitive area center to cap center
 $-0.2 \leq X \leq +0.2$
 $-0.2 \leq Y \leq +0.2$

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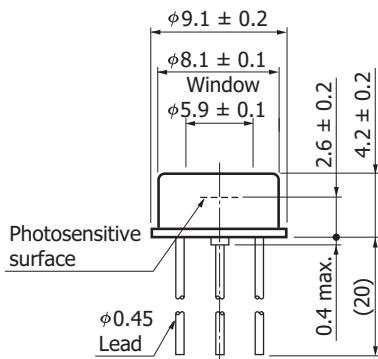
(4) S3884



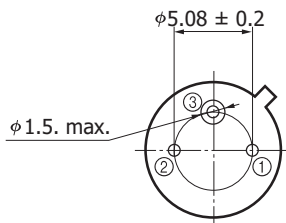
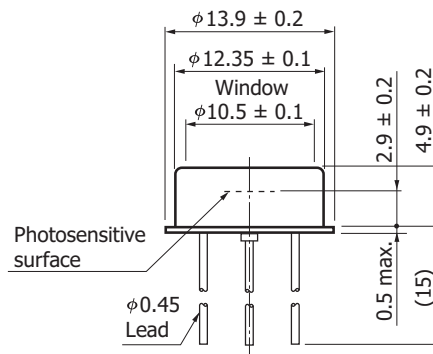
Distance from photosensitive area center to cap center
 $-0.3 \leq X \leq +0.3$
 $-0.3 \leq Y \leq +0.3$

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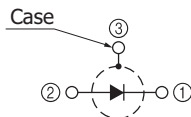
(5) S2384



(6) S2385

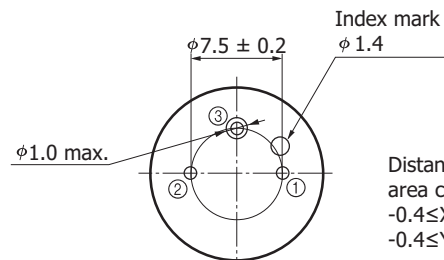


Distance from photosensitive area center to cap center
 $-0.3 \leq X \leq +0.3$
 $-0.3 \leq Y \leq +0.3$

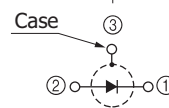


The glass window may extend a maximum of 0.2 mm above the upper surface of the cap.

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Distance from photosensitive area center to cap center
 $-0.4 \leq X \leq +0.4$
 $-0.4 \leq Y \leq +0.4$



The glass window may extend a maximum of 0.2 mm above the upper surface of the cap.

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Replacements for previous products

Previous product (listed on the previous datasheet)*	Replacement (listed on this datasheet)
S2381	S12023-02
S2382	S12023-05
S5139	S12051
S8611	S12086
S2383	S12023-10
S2383-10	S12023-10A

* Products that have been removed from this datasheet

Related information

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

■ Precautions

- Notice
- Metal, ceramic, plastic package products / Precautions

■ Technical information

- Si APD / Technical information

Information described in this material is current as of February, 2014.

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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.

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