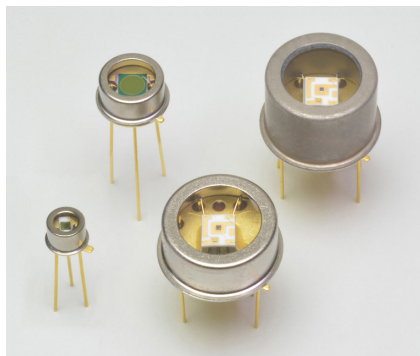


# InGaAs PIN photodiodes

G12181 series



**Long wavelength type  
(cutoff wavelength: 1.85 to 1.9  $\mu\text{m}$ )**

## Features

- Cutoff wavelength: 1.85 to 1.9  $\mu\text{m}$
- Low cost
- Photosensitive area:  $\phi 0.3$  to  $\phi 3$  mm
- Low noise
- High sensitivity
- High reliability
- High-speed response

## Applications

- Optical power meters
- Gas analyzers
- Moisture meters
- NIR (near infrared) photometry

## Options

- Amplifier for InGaAs PIN photodiode **C4159-03**
- Heatsink for one-stage TE-cooled type **A3179**
- Heatsink for two-stage TE-cooled type **A3179-01**
- Temperature controller for TE-cooled type **C1103-04**

## Structure

Type no.	Dimensional outline /Window material*1	Package	Cooling	Photosensitive area (mm)
G12181-003K	(1)/K	TO-18	Non-cooled	$\phi 0.3$
G12181-005K				$\phi 0.5$
G12181-010K				$\phi 1$
G12181-020K	(2)/K	TO-5		$\phi 2$
G12181-030K				$\phi 3$
G12181-103K				One-stage TE-cooled
G12181-105K	$\phi 0.5$			
G12181-110K	$\phi 1$			
G12181-120K	$\phi 2$			
G12181-130K	$\phi 3$			
G12181-203K	(4)/K	TO-8	Two-stage TE-cooled	
G12181-205K				$\phi 0.5$
G12181-210K				$\phi 1$
G12181-220K				$\phi 2$
G12181-230K				$\phi 3$

\*1: K=Borosilicate glass

The G12181 series may be destroyed or deteriorated by electrostatic discharge, etc. Be carefull when using the G12181 series.

### ▣ Absolute maximum ratings (Ta=25 °C, unless otherwise noted)

Type no.	Thermister power dissipation Pd_th (mW)	TE-cooler allowable current ITE max (A)	TE-cooler allowable voltage VTE max (V)	Reverse voltage VR max (V)	Operating temperature*2 Topr (°C)	Storage temperature*2 Tstg (°C)
G12181-003K	-	-	-	1	-40 to +85	-55 to +125
G12181-005K						
G12181-010K						
G12181-020K						
G12181-030K						
G12181-103K	0.2	1.5	1.0	1	-40 to +70*3	-55 to +85
G12181-105K						
G12181-110K						
G12181-120K						
G12181-130K						
G12181-203K		1.0	1.2			
G12181-205K						
G12181-210K						
G12181-220K						
G12181-230K						

\*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: Chip temperature and package temperature

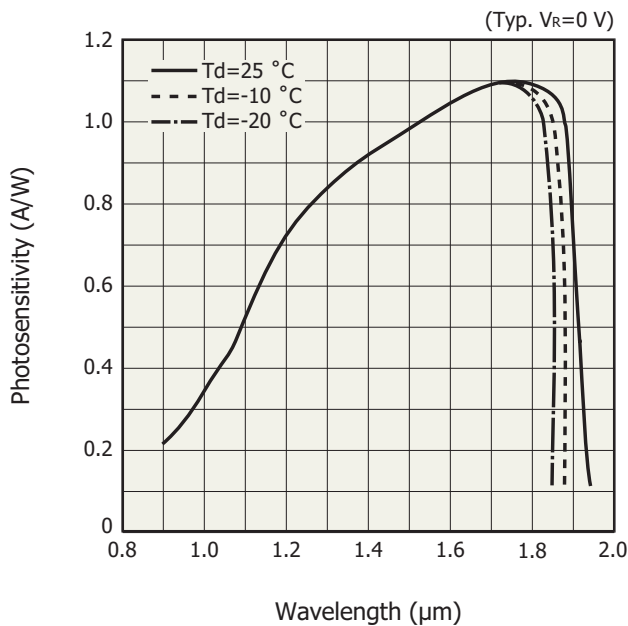
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

### ▣ Electrical and optical characteristics (Typ. unless otherwise noted)

Type no.	Measurement Condition	Thermistor resistance (+25 °C) Rth (kΩ)	Thermistor B constant (-20/+25 °C) B (K)	Spectral response range λ (μm)	Peak sensitivity wavelength λp (μm)	Photo sensitivity S λ=λp		Dark current ID VR=0.5 V		Temp. coefficient of ID VR=0.5 V (times/°C)
	Element temperature Tchip (°C)					Min. (A/W)	Typ. (A/W)	Typ. (nA)	Max. (nA)	
G12181-003K	25	-	-	0.9 to 1.9	1.75	0.9	1.1	1	10	1.07
G12181-005K								3	30	
G12181-010K								10	100	
G12181-020K								50	500	
G12181-030K								100	1000	
G12181-103K	-10	9.0	3300	0.9 to 1.87	1.75	0.9	1.1	0.1	1	
G12181-105K								0.3	3	
G12181-110K								1	10	
G12181-120K								5	50	
G12181-130K								10	100	
G12181-203K	-20	9.0	3300	0.9 to 1.85	1.75	0.9	1.1	0.05	0.5	
G12181-205K								0.15	1.5	
G12181-210K								0.5	5	
G12181-220K								2.5	25	
G12181-230K								5	50	

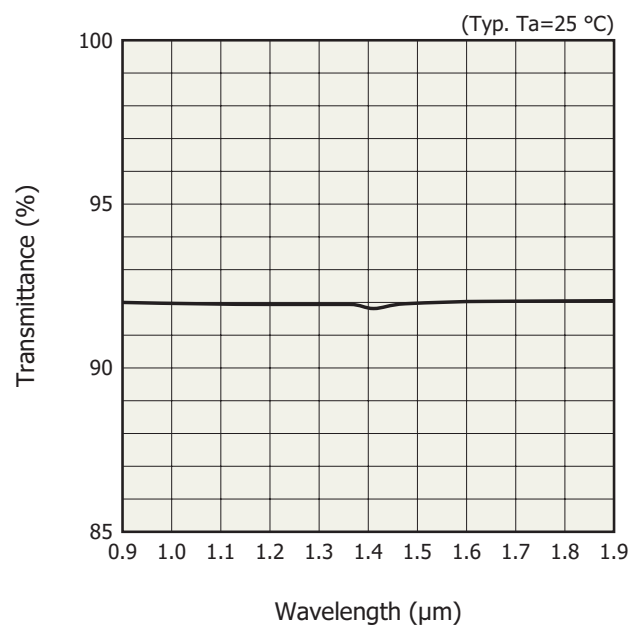
Type no.	Measurement Condition	Cutoff frequency $f_c$		Terminal capacitance $C_t$		Shunt resistance $R_{sh}$		Detectivity $D^*$		Noise equivalent power NEP	
	Element temperature	$V_R=0\text{ V}$ $R_L=50\ \Omega$		$V_R=0\text{ V}$ $f=1\text{ MHz}$		$V_R=10\text{ mV}$		$\lambda=\lambda_p$		$\lambda=\lambda_p$	
	$T_{chip}$ (°C)	Min. (MHz)	Typ. (MHz)	Typ. (pF)	Max. (pF)	Min. (M $\Omega$ )	Typ. (M $\Omega$ )	Min. (cm $\cdot$ Hz $^{1/2}$ /W)	Typ. (cm $\cdot$ Hz $^{1/2}$ /W)	Typ. (W/Hz $^{1/2}$ )	Max. (W/Hz $^{1/2}$ )
G12181-003K	25	40	90	25	50	10	50	$3 \times 10^{11}$	$1 \times 10^{12}$	$2 \times 10^{-14}$	$5 \times 10^{-14}$
G12181-005K		15	35	70	150	4	20			$3 \times 10^{-14}$	$8.5 \times 10^{-14}$
G12181-010K		5	10	230	500	1	5			$6 \times 10^{-14}$	$2 \times 10^{-13}$
G12181-020K		1.2	2.5	1000	2000	0.2	1			$1.5 \times 10^{-13}$	$4 \times 10^{-13}$
G12181-030K		1	1.5	2000	3000	0.1	0.5			$2 \times 10^{-13}$	$5 \times 10^{-13}$
G12181-103K	-10	40	140	22	50	130	650	$2 \times 10^{12}$	$5.5 \times 10^{12}$	$5 \times 10^{-15}$	$1.5 \times 10^{-14}$
G12181-105K		15	50	64	150	50	250			$7 \times 10^{-15}$	$2 \times 10^{-14}$
G12181-110K		5	16	200	500	13	65			$1.5 \times 10^{-14}$	$4 \times 10^{-14}$
G12181-120K		1.2	3.5	900	2000	2.8	14			$3.5 \times 10^{-14}$	$9 \times 10^{-14}$
G12181-130K		1	1.8	1800	3000	1.3	6.5			$5 \times 10^{-14}$	$1.5 \times 10^{-13}$
G12181-203K	-20	40	150	20	50	280	1400	$3 \times 10^{12}$	$8.5 \times 10^{12}$	$3.5 \times 10^{-15}$	$9 \times 10^{-15}$
G12181-205K		15	53	60	150	110	550			$5 \times 10^{-15}$	$1.5 \times 10^{-14}$
G12181-210K		5	17	195	500	28	150			$1 \times 10^{-14}$	$3 \times 10^{-14}$
G12181-220K		1.2	3.7	850	2000	5.5	28			$2.5 \times 10^{-14}$	$6.5 \times 10^{-14}$
G12181-230K		1	1.9	1700	3000	2.8	14			$3.5 \times 10^{-14}$	$9 \times 10^{-14}$

**Spectral response**



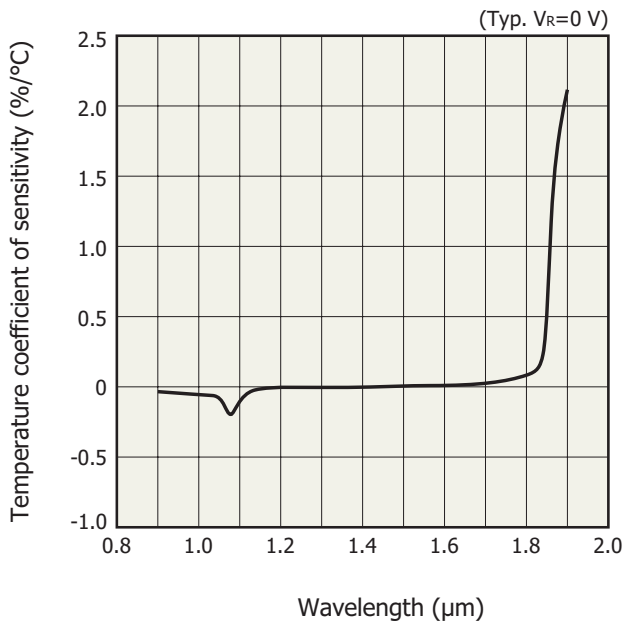
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**Spectral transmittance of window material**

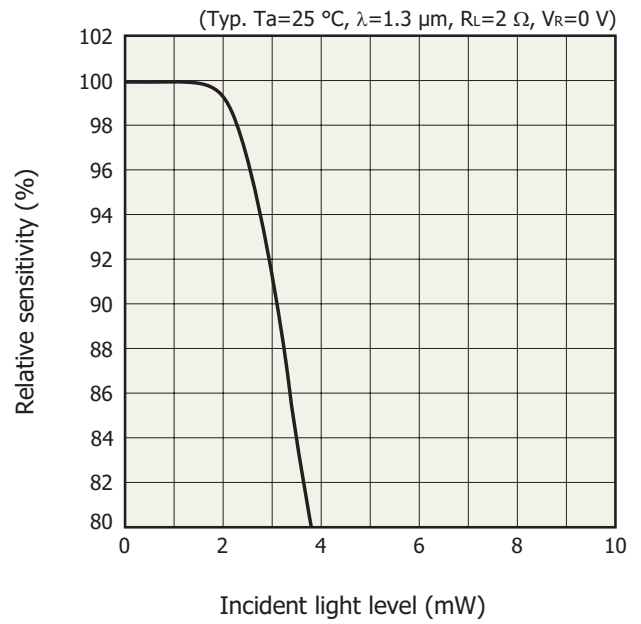


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▣ Photosensitivity temperature characteristics

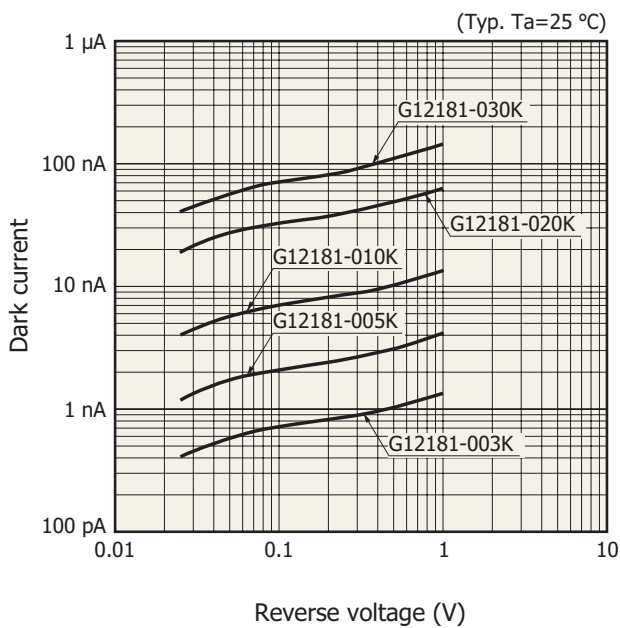


▣ Linearity (G12181-010K)

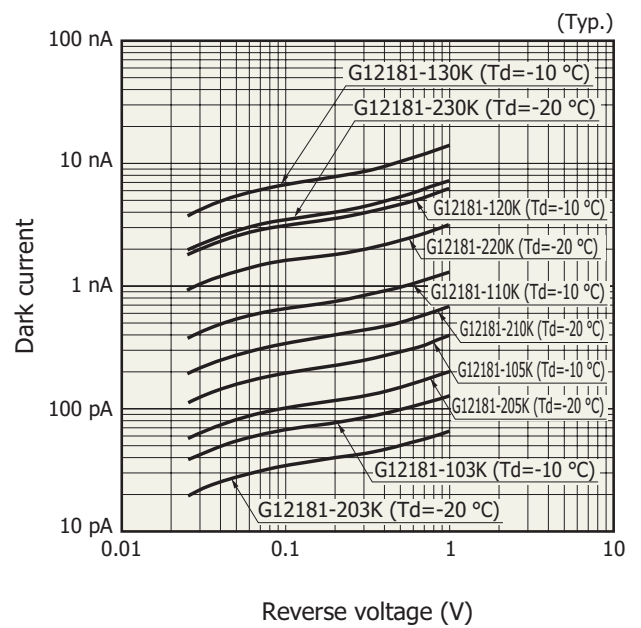


▣ Dark current vs. reverse voltage

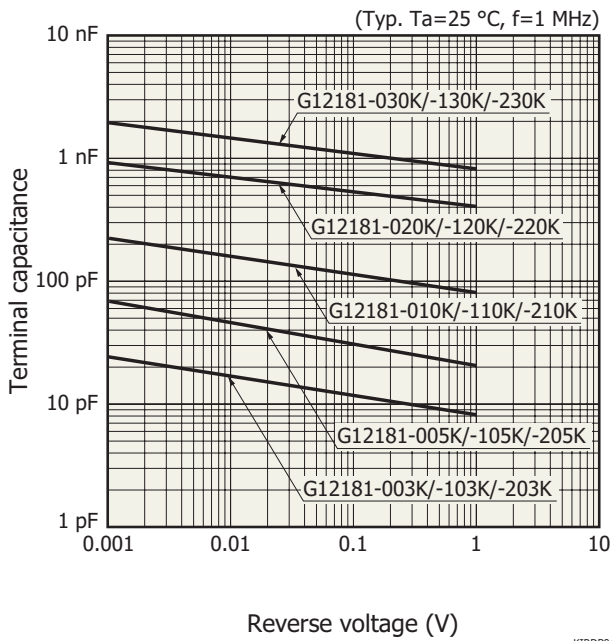
Non-cooled type



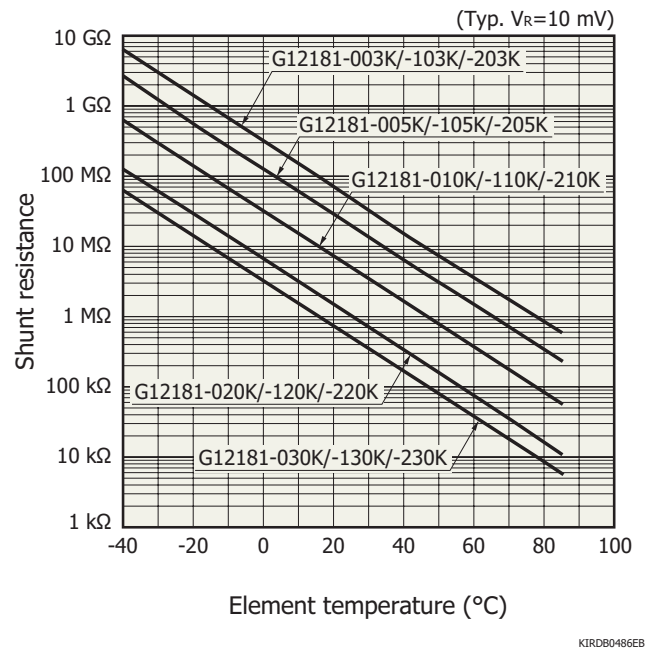
TE-cooled type



Terminal capacitance vs. reverse voltage

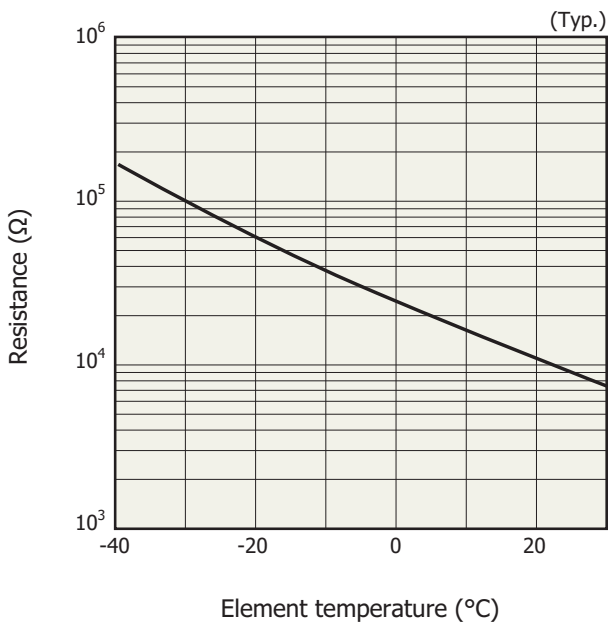


Shunt resistance vs. element temperature

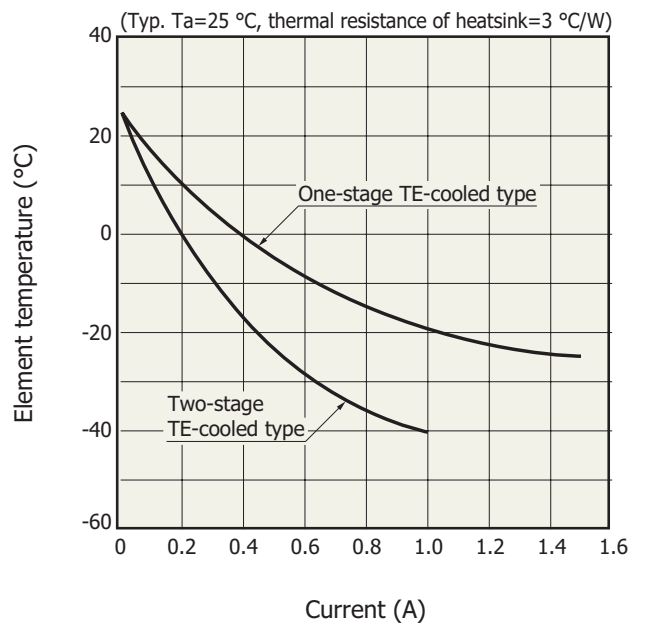


The operating temperature for one-stage and two-stage TE-cooled types is up to 70 °C.

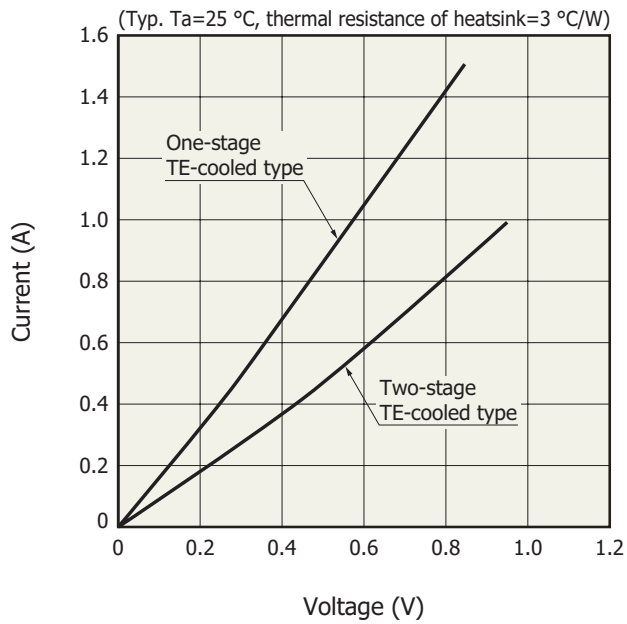
Thermistor temperature characteristics



Cooling characteristics of TE-cooler



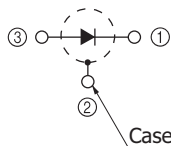
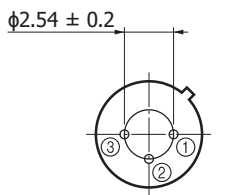
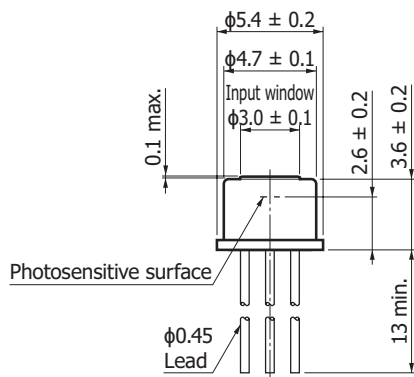
**Current vs. voltage (TE-cooler)**



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**Dimensional outlines (unit: mm)**

(1) G12181-003K/-005K/-010K

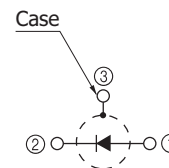
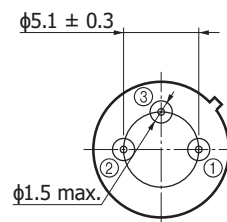
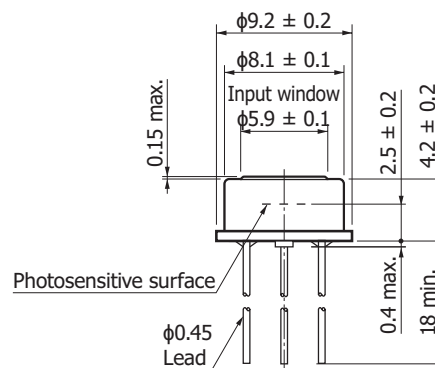


Distance from photosensitive area center to cap center

$$-0.2 \leq X \leq +0.2$$

$$-0.2 \leq Y \leq +0.2$$

(2) G12181-020K/-030K



Distance from photosensitive area center to cap center

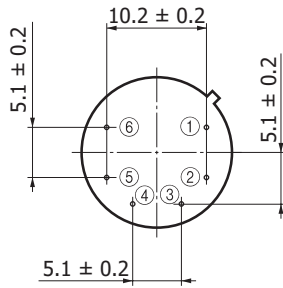
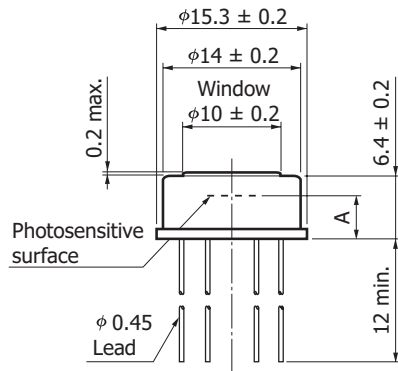
$$-0.2 \leq X \leq +0.2$$

$$-0.2 \leq Y \leq +0.2$$

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(3) G12181-103K/-105K/-110K/-120K/-130K



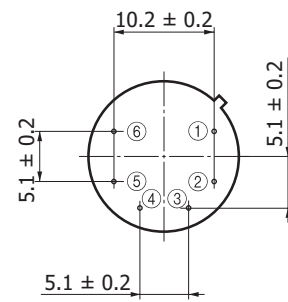
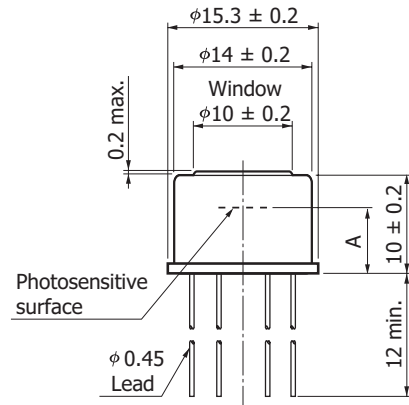
- ① Detector (anode)
- ② Detector (cathode)
- ③ TE-cooler (-)
- ④ TE-cooler (+)
- ⑤⑥ Thermistor

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

	G12181-103K /-105K/-110K	G12181-120K /-130K
A	4.3 ± 0.2	4.4 ± 0.2

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(4) G12181-203K/-205K/-210K/-220K/-230K



- ① Detector (anode)
- ② Detector (cathode)
- ③ TE-cooler (-)
- ④ TE-cooler (+)
- ⑤⑥ Thermistor

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

	G12181-203K /-205K/-210K	G12181-220K /-230K
A	6.6 ± 0.2	6.7 ± 0.2

KIRDA0225EA

### Recommended soldering conditions

Solder temperature: 260 °C (10 s or less, once)

Solder the leads at a point at least 1 mm away from the package body.

Note: When you set soldering 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](http://www.hamamatsu.com/sp/ssd/doc_en.html)

#### ■ Precautions

- Disclaimer
- Safety consideration
- Compound opto-semiconductors (photosensors, light emitters)

Information described in this material is current as of January 2021.

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.

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