

Infrared Detectors & Modules



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 notice

Infrared Detector Modules with integrated preamps

Model #	Wavelength Range	Peak wavelength (μm)	active area	NEP (MAX) at peak wavelength (W/Hz ^{1/2})	Frequency response	Price, US\$, FOB Brookline MA USA	Notes
C12494-210M (HS-3)	3.3 to 8.3	6.7	1 mm dia	3.00E-10	5 Hz to > 80 kHz	\$4,987	1
C12494-210S (HS-4)	1.5 to 5.9	4.9	1 mm dia	3.00E-10	5 Hz to > 80 kHz	\$4,383	1
C12494-211L (HS-1)	2.6 to 10.2	5.6	1x1 mm	9.00E-09	DC to > 750 kHz	\$4,685	1
C12494-222S (HS-5)	1.5 to 5.1	4.1	2x2 mm	8.00E-10	DC to 1 MHz	\$2,733	1
P16702-01MN TO-5 Hybrid	1.5 to 11	5.6	1x1 mm	2.50E-09	DC to > 100 MHz	\$1,814	NEW

Note 1 > Device contains TE cooler and preamp. Delivered with 6 conductor cable A4372 for power. Requires customer supplied regulated power supply +15V, - 15V and +2.5V. Power should be < 5 mV ripple. Signal on customer supplied BNC cable.

Mid-IR Gigahertz detectors

P16309-01	3.5 to 5.4	4.65	4.5 mm dia	1.00E-09	DC to > 18 GHz	\$6,800	3
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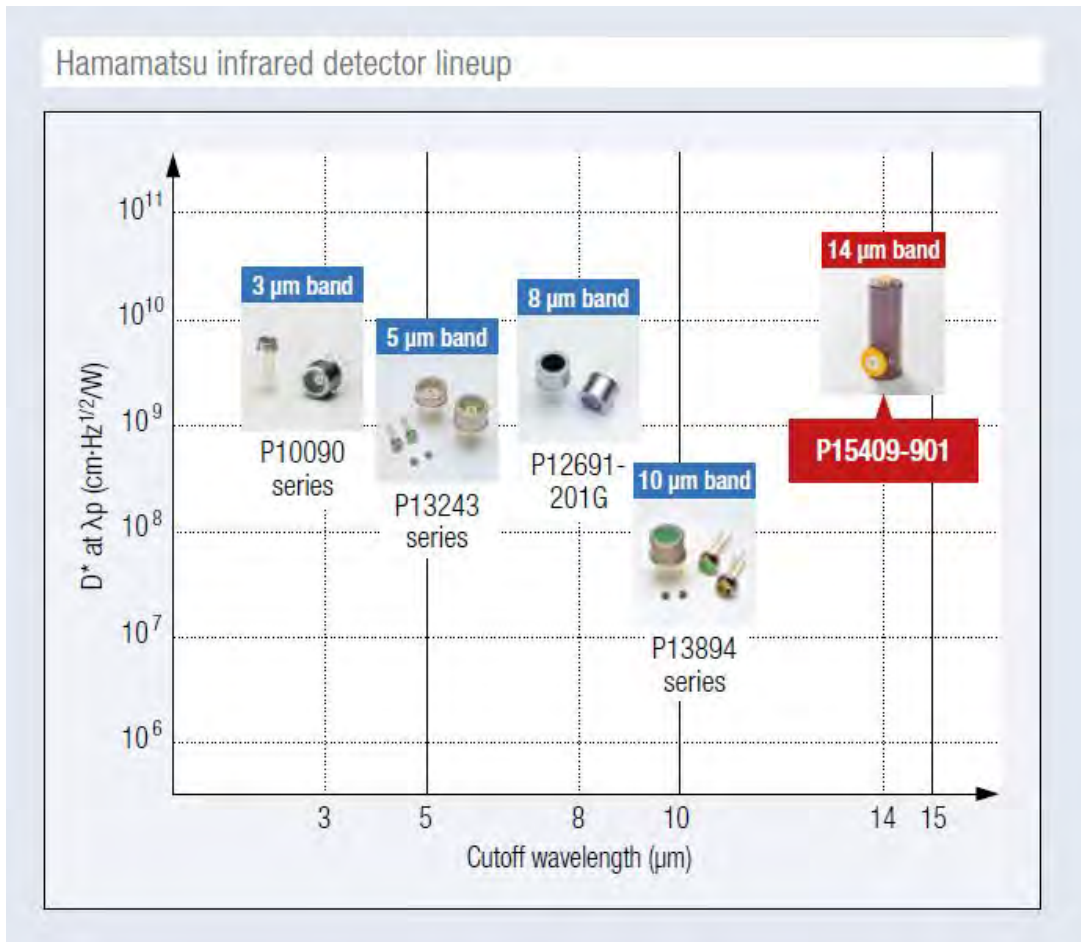
Note 3 > Detector requires no power. Signal on customer supplied SMA cable. Requires customer supplied amplifier. Amplifier possibilities include Becker & Hickl HFAH-20, 500 kHz to 2.9 GHz and Keysight 83006A, 10 MHz to 26.5 GHz

Please consult detailed data sheets for complete specifications

Compound semiconductor photosensors

Available from Boston Electronics

Product name	Spectral response range (μm)	Features
	0 5 10 15 20 25	
InAs photovoltaic detectors	1 3.8	<ul style="list-style-type: none"> Covers a spectral response range close to PbS but offers higher response speed
InSb photovoltaic detectors	1 5.5	<ul style="list-style-type: none"> High sensitivity in so-called atmospheric window (3 to 5 μm) High-speed response
InSb photoconductive detectors	1 6.7	<ul style="list-style-type: none"> Detects wavelengths up to around 6.5 μm, with high sensitivity over long periods of time by thermoelectric cooling
InAsSb photovoltaic detectors	1 11	<ul style="list-style-type: none"> Infrared detector with cutoff wavelength of 5 μm, 8 μm or 10 μm bands High-speed response and high reliability
Type II superlattice infrared detector	1 14.5	<ul style="list-style-type: none"> InAs and GaSb superlattice structure enables the detection up to around 14.5 μm



InAsSb photovoltaic detector with preamp



P16702-011MN

Infrared detector with preamp offering high sensitivity in the mid-infrared region (up to 11 μm)

It is a compact infrared detector that integrates an InAsSb photovoltaic detector (up to 11 μm) and a preamp. It is approximately 1/200 th the size of previous module products, and achieves a response speed of 100 MHz, which is twice as fast. This product is an environmentally friendly infrared detector and do not use lead, mercury, or cadmium, which are substances restricted by the RoHS directive.

Features

- ➔ Compact (TO-5)
- ➔ High-speed response (DC to 100 MHz)
- ➔ RoHS compliant (lead, mercury, cadmium free)

Applications

- ➔ Gas analysis (combined with QCL)
- ➔ CO₂ laser monitor
- ➔ Non-invasive blood analysis

Structure

Parameter	Specification	Unit
Photosensitive area	0.7 × 0.7	mm
Package	TO-5	-
Window material	No	-
Field of view (FOV)	97	degrees

Absolute maximum ratings (Ta=25 °C)

Parameter	Symbol	Value	Unit
Supply voltage (for preamp)	Vcc	+4	V
Reverse voltage (for element)	VR	+1	V
Operating temperature*1	Topr	-30 to +60	°C
Storage temperature*1	Tstg	-30 to +60	°C
Incident light level	Pin	1	W/mm ²

*1: No dew condensation

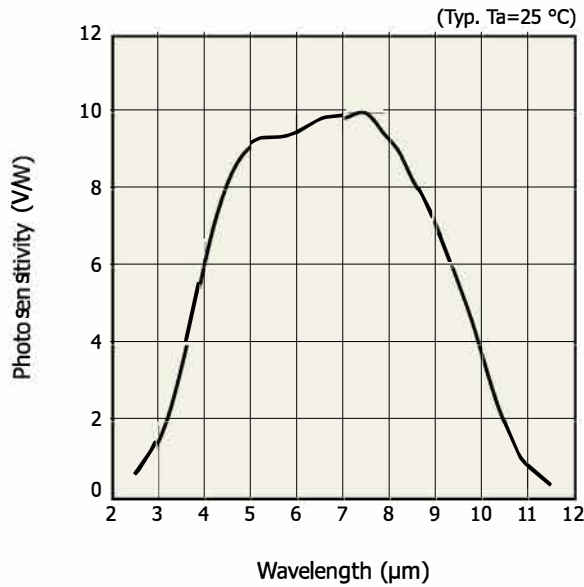
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Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

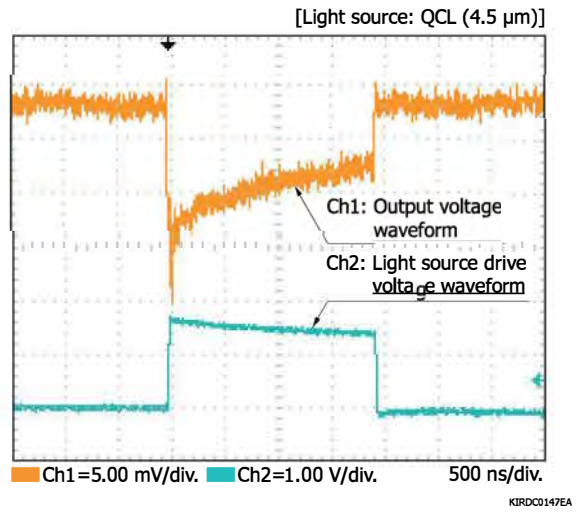
Electrical and optical characteristics (Typ. Ta=25 °C, Vcc=+3.3 V, 50 Ω system, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitivity wavelength	λp		-	7.4	-	μm
Cutoff wavelength	λc		9.7	11	-	μm
Photosensitivity	S	λ=λp	-	10	-	V/W
Reverse voltage (for element)	VR		-	0.7	-	V
Noise equivalent power	NEP	λ=λp, f=50 kHz	-	8.0 × 10 ⁻⁹	5.0 × 10 ⁻⁸	W/Hz ^{1/2}
Frequency characteristics	FcL	-3 dB	-	DC	-	-
	FcH	-3 dB	80	100	-	MHz
Output voltage level	-		0.6	0.9	1.2	V
Maximum output voltage amplitude	Vp-p max		-	-0.5	-	V
Supply voltage (for preamp)	Vcc		3.2	3.3	3.4	V
Current consumption	Ic		20	26	35	mA

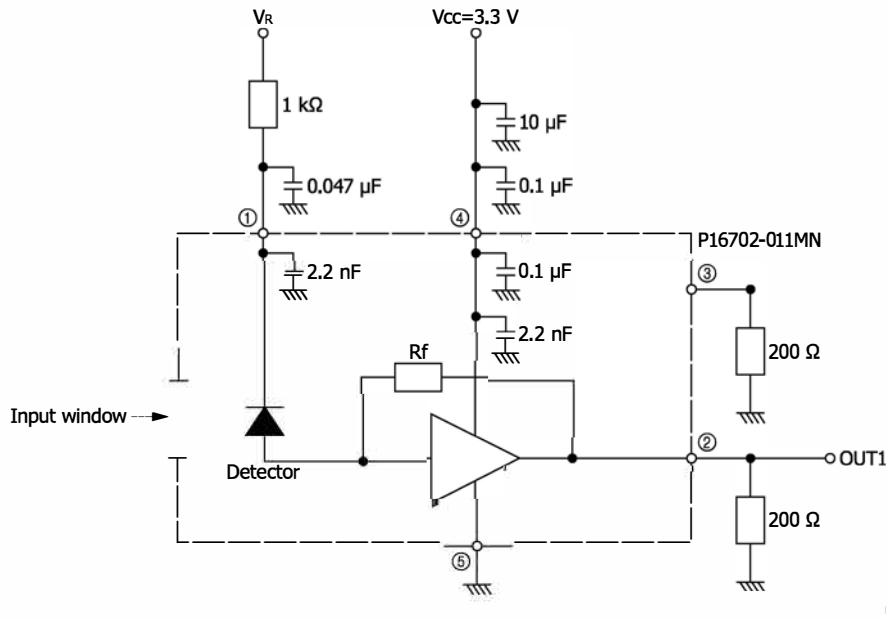
Spectral response



Output waveform example



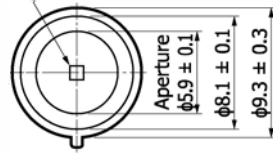
Connection example



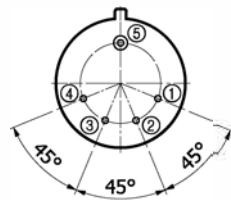
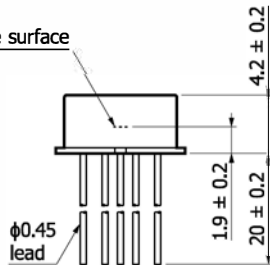
Note: Please connect the same resistance to the terminal ②③.
Make sure to connect a bypass capacitor (0.1 to 10 μF) to the supply voltage ④ to prevent oscillation.

Dimensional outline (unit: mm)

Photosensitive area



Photosensitive surface



- ① V_R
- ② OUT1
- ③ For resistor
- ④ V_{CC}
- ⑤ GND

Note: Please connect the same resistance to the terminal ②③.
 Make sure to connect a bypass capacitor (0.1 to 10 μF)
 to the supply voltage ④ to prevent oscillation.

K1RDA0289EA

Precautions

■ Electrostatic breakdown

The P16702-011MN may be damaged or deteriorated by static electricity. Please refer to precautions of "compound opto-semiconductors (photosensors, light emitters)" for use.

■ Wiring

Applying voltage or current with the wrong polarity to electronic parts such as a preamp may degrade the characteristics or destroy the elements. Please refer to the dimensional outline to do wiring correctly.

Related information

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

- Precautions
 - Disclaimer
 - Safety consideration
 - Unsealed products
 - Compound opto-semiconductors (photosensors, light emitters)
- Technical note
 - Compound semiconductor photosensors



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Infrared detector modules with preamp



Thermoelectrically cooled types

Easy-to-use detector modules with built-in preamps

Infrared detector modules operate just by connecting to DC power supplies. Low noise thermoelectric cooled types using InGaAs, InAs or InAsSb elements are available. We welcome requests for custom devices that suit your application.

Features

- High S/N
- Compact size
- Easy to use
Operates just by connecting to DC power supply
- Circuit design optimized for detector characteristics
- Built-in temperature control circuit (TE-cooled type)

Applications

- Infrared detection

Accessories

- 6-conductor cable for TE-cooled type (for DC power supply): 2 m (with one side connector) A4372-07
- Instruction manual

Structure

Type no.	Detector element	Cooling	Window material	Photosensitive area (mm)	Supply voltage	
					V _{CC} *1 (V)	V _p *1 (V)
C12483-250	InGaAs (G12180-250A)	Two-stage TE-cooled	AR coated (1.55 μm peak) borosilicate glass	φ5	±15 ± 0.5	+2.5 ^{+0.5} _{-0.1}
C12485-210	InGaAs (G12182-210K)		Borosilicate glass	φ1		
C12486-210	InGaAs (G12183-210K)		Sapphire glass	2 × 2		
C12492-210	InAs (P10090-21)			φ1		
C12494-222S NEW	InAsSb (P13243-222MS)			1 × 1		
C12494-210S	InAsSb (P11120-201)		AR coated Ge			
C12494-210M	InAsSb (P12691-201G)					
C12494-211L	InAsSb (P13894-211MA)					

*1: V_{CC}=power supply for circuit, V_p=power supply for cooling

➤ Absolute maximum ratings

Type no.	Incident light level (μW)	Supply voltage		Operating temperature* ² T _{opr} (°C)	Storage temperature* ² T _{stg} (°C)
		V _{cc} (V)	V _p (V)		
C12483-250	0.2	±18	+5	0 to +40	-20 to +50
C12485-210	0.06				
C12486-210	0.07				
C12492-210	2.6				
C12494-222S NEW	14 mW				
C12494-210S	26				
C12494-210M					
C12494-211L					

*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.

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.

➤ Optical characteristics (Typ. T_a=25 °C, unless otherwise noted)

Type no.	Chip temperature at rated supply voltage T _{chip} (°C)	Peak sensitivity wavelength λ _p (μm)	Cutoff wavelength λ _c (μm)	Photosensitivity* ³ S λ=λ _p		Noise equivalent power NEP λ=λ _p	
				Min. (V/W)	Typ. (V/W)	Typ. (W/Hz ^{1/2})	Max. (W/Hz ^{1/2})
				C12483-250	-15	1.55	1.66
C12485-210	1.95	2.05	1.1 × 10 ⁸	1.8 × 10 ⁸		1 × 10 ⁻¹³	3 × 10 ⁻¹²
C12486-210	2.3	2.56	1 × 10 ⁸	2 × 10 ⁸		4 × 10 ⁻¹³	6 × 10 ⁻¹²
C12492-210	-28	3.25	3.45	0.8 × 10 ⁷	1 × 10 ⁷	6 × 10 ⁻¹²	1 × 10 ⁻¹¹
C12494-222S NEW		4.1	5.1	5 × 10 ²	7 × 10 ²	8 × 10 ⁻¹⁰	1.2 × 10 ⁻⁹
C12494-210S		4.9	5.9	5 × 10 ⁵	7.5 × 10 ⁵	1 × 10 ⁻¹⁰	3 × 10 ⁻¹⁰
C12494-210M		6.7	8.3				
C12494-211L		5.6	10.2	2.5 × 10 ^{2*} 4	3.5 × 10 ^{2*} 4	1.5 × 10 ⁻⁹	4.5 × 10 ⁻⁹

*3: f=100 Hz (C12483-250, C12485-210, C12486-210), f=1.2 kHz (C12492-210, C12494-210S/-210M), f=600 Hz (C12494-211L/-222S)

*4: Uniform irradiation on the entire photosensitive area.

➤ Electrical characteristics (Typ. T_a=25 °C, unless otherwise noted)

Type no.	Frequency response -3 dB (Hz)			Output impedance (Ω)	Maximum output voltage R _L =1 kΩ (V)	Current consumption* ⁵				
	F _{cL} Typ.	F _{cH}				V _{cc}		V _p		
		Min.	Typ.			Typ. (mA)	Max. (mA)	Typ. (mA)	Max. (mA)	
C12483-250	DC	900	1.1 k	50	+10	+30, -22	+50, -30	+500	+1100	
C12485-210	DC	1.5 k	2.2 k			+30, -13	+60, -30			
C12486-210	DC	2.1 k	3 k			+30, -14				
C12492-210	5	40 k	50 k			±13	+30, -20	+80, -30		+600
C12494-222S NEW	DC	750 k	1 M			+10				
C12494-210S	5	80 k	100 k			±13				
C12494-210M										
C12494-211L	DC	750 k	1 M			+10				+500

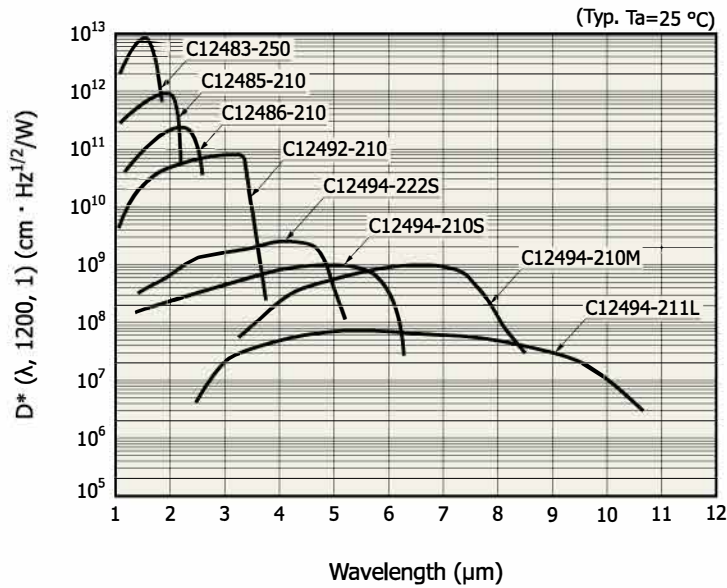
*5: V_{cc}=±15 V, V_p=2.5 V (C12485-210, C12486-210, C12483-250, C12492-210, C12494-210S/-222S/-210M/-211L)

Recommended DC power supply (analog power supply): PW18-1.3ATS (TEXIO Technology), E3630A (Keysight Technologies)

Current capacity: More than 1.5 times the maximum current consumption

Ripple noise: 5 mVp-p or less (±15 V, +2.5 V power supply)

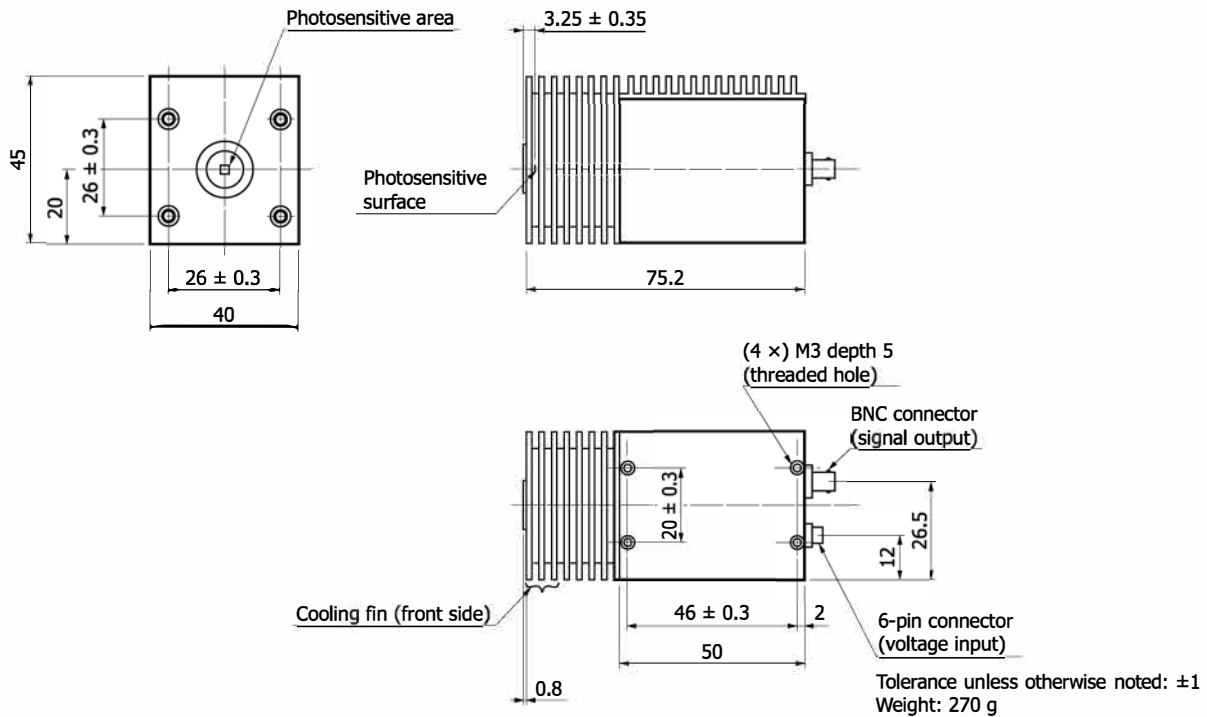
Spectral response



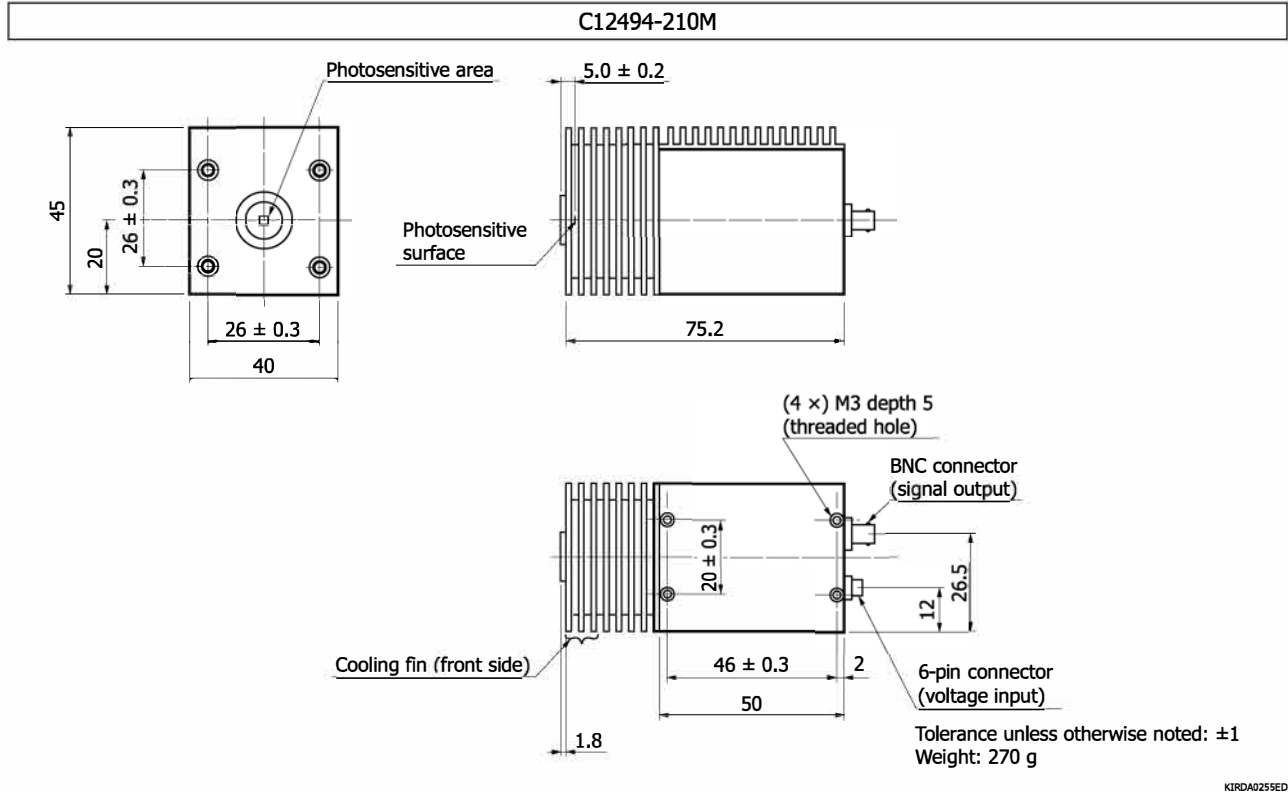
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Dimensional outlines (unit: mm)

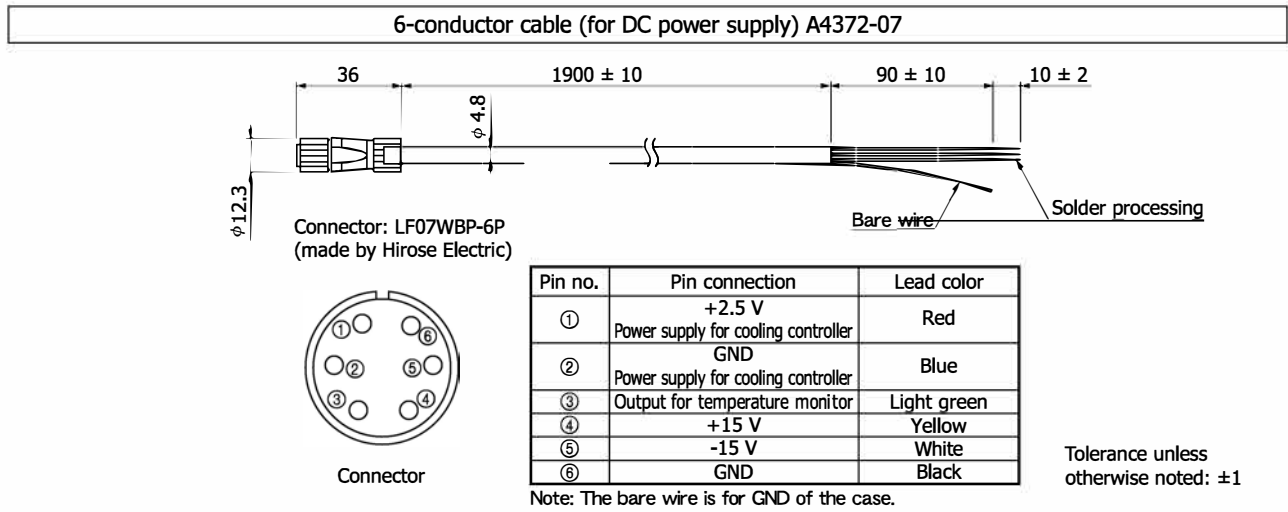
C12485-210, C12486-210, C12483-250, C12492-210, C12494-210S/-222S/-211L



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Note: The cooling fin (front side) is removable.



■ Precautions

- Always use a dual-polarity ± 15 V or ± 2.5 V power supply to operate this detector. Never use a single-polarity power supply. Using a single-polarity power supply may cause the amplifier in the detector module to break down.
- Regarding TE-cooled type, always supply +2.5 V to cool the detector element.
- Be careful not to apply excessive force to the detector surface. Applying excessive force may damage the light input window. Do not directly touch the light input window with bare hands. If dust or dirt gets on the window, wipe it gently using ethyl alcohol.
- Do not drop this product or do not apply excessive shock to it.

■ Related information

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

■ Precautions

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

■ Technical note

- Compound semiconductor photosensors



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■ **Features**

- Ultrafast MIR photodetector with over 20 GHz response
- Response frequency range (-3 dB): DC to 20 GHz
- Peak sensitive wavelength: 4.65 μm
- Photosensitivity: 1 mA/W (Typ.)
- No cooling, and no operation bias are required

■ **Applications**

- Heterodyne detection
- High frequency/high time resolved measurement



■ **Outline**

This is a ultrafast mid-infrared photodetector with a response bandwidth of 20 GHz (-3 dB). It operates bias free with no cooling required, so no external power supplies are needed. Setup happens in two simple steps: connecting the SMA fitting to measuring instruments (oscilloscope etc.), and directing light incidence to the internal focusing lens.

■ **General ratings**

Parameter	Description	Unit
Connector type	SMA	—
Cooling	Non-cooled	—
Lens	Focusing lens *1	—
Aperture	$\phi 4.5$	mm
Polarizing direction	Marked in the body *2	—

*1 Incident light have to be colimated.

*2 See "Figure 4"

■ **Absolute maximum ratings**

Parameter	Symbol	Value	Unit
Operating temperature *1	T_{opr}	-10 to +50	$^{\circ}\text{C}$
Storage temperature *1	T_{stg}	-10 to +50	$^{\circ}\text{C}$
Incident light level	P_{max}	1	W/cm^2

*1 No condensation

* No bias is required for the operation.

* Ambient temperature: $T_a=25^{\circ}\text{C}$

■ **Electrical and optical characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitive wavelength	λ_p	—	4.60	4.65	4.70	μm
Photosensitivity	S	$\lambda=\lambda_p, f_0=800\text{ Hz}, \Delta f=1\text{ Hz}$	0.5	1.0	—	mA/W
Detectivity	D^*	$\lambda=\lambda_p, f_0=800\text{ Hz}, \Delta f=1\text{ Hz}$	8.0×10^8	1.5×10^9	—	$\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$
Noise equivalent power	NEP	$\lambda=\lambda_p, f_0=800\text{ Hz}$	—	3.0×10^{-10}	1.0×10^{-9}	$\text{W}/\text{Hz}^{1/2}$
Cut-off frequency	f_c	-3 dB down, $Z_i=50\ \Omega$	18	20	—	GHz
Terminal capacitance	C_t	$f=1\text{ MHz}$	—	1.1	1.5	pF
Shunt resistance	R_{sh}	$V_{meas}=10\text{ mV}$	70	90	110	k Ω

* Ambient temperature: $T_a=25^{\circ}\text{C}$

Boston Electronics are an authorized distributor and online store

Quantum Cascade Photodetector P16309-01

Figure 1: Spectral response (example)

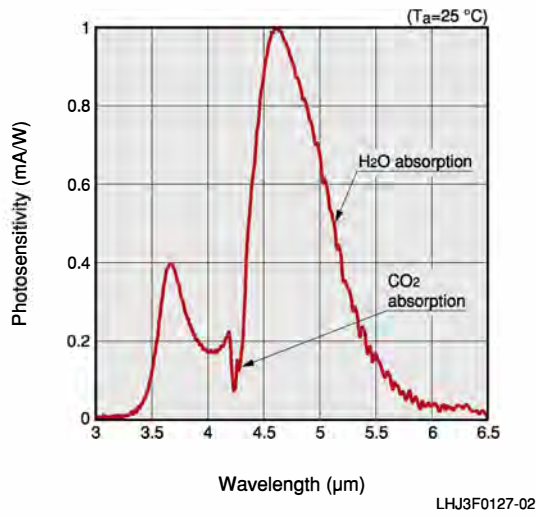


Figure 2: Response frequency (example)

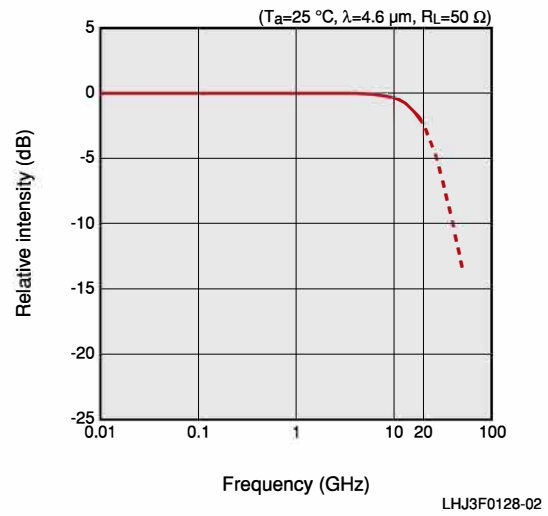
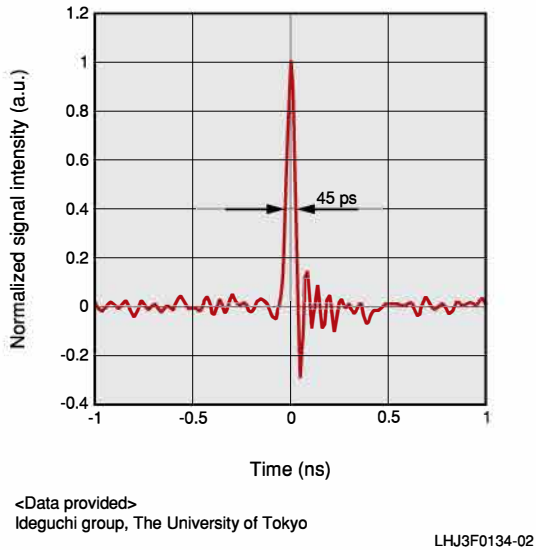
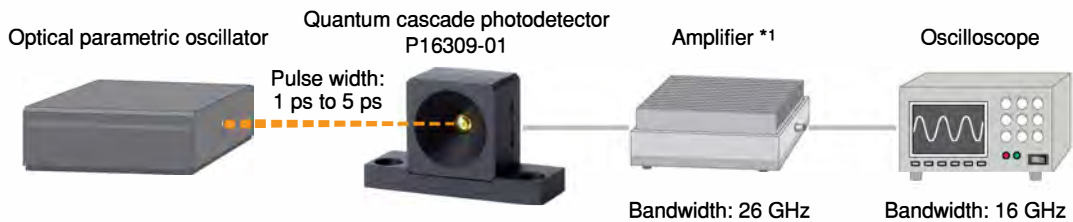


Figure 3: Ultrashort pulse waveform measurement

● Measurement example



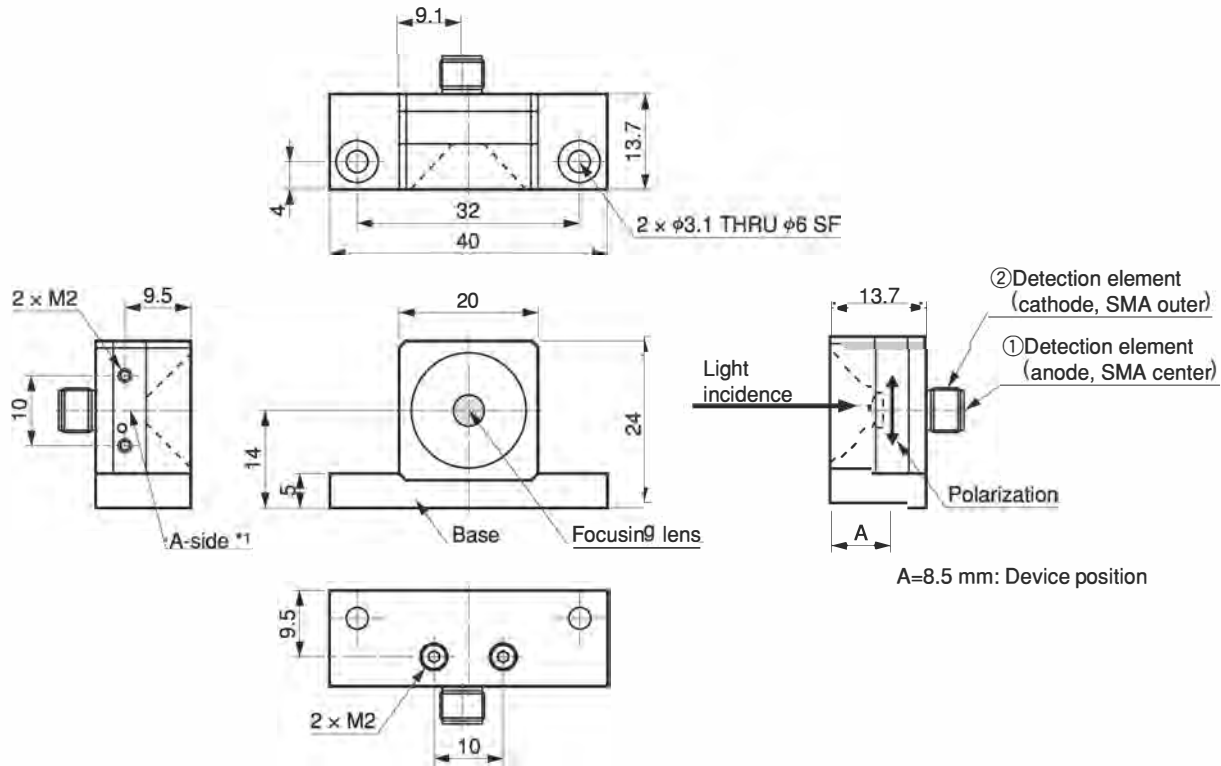
● Measurement configuration



*1 An example: Keysight technologies, 83006A

Quantum Cascade Photodetector P16309-01

Figure 4: Dimensions (unit: mm)



- *1 A-side can be fixed on the base as the bottom aspect.
- * Tolerances: ± 0.3 mm (dimension without an indication)
- * Both of ① and ② are electrically insulated from the package.

LHJ3F0111-02



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● Information described in this material current as of February 2022. Specifications are subject to change without notice.

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Cat. No.LQCD3001E02
FEB. 2022 IP

InAsSb photovoltaic detectors



P13243 series

High sensitivity, high-speed response infrared detector up to 5 μm band.

The P13244 series are photovoltaic type detectors that have high sensitivity in the spectral band up to 5 μm. This high sensitivity has been achieved due to Hamamatsu's unique crystal growth technology and process technology. These products are environmentally friendly as they do not use lead, mercury, or cadmium which are substances restricted by the RoHS Directive. Therefore, they are replacements for previous products that contain these substances. The non-cooled types offer easy handling and include the surface mount ceramic type which compatible with lead-free solder reflow. The surface mount ceramic type is compact and suitable for automated mounting. The series also includes the TE-cooled type with a large photosensitive area which delivers stable, high S/N measurement.

Features

- ➔ High sensitivity
- ➔ High-speed response
- ➔ High shunt resistance
- ➔ Compact, surface mount type ceramic package (P13243-013CA)
- ➔ Compatible with lead-free solder reflow (P13243-013CA)
- ➔ TE-cooled type (P13243-122MS/-222MS)
- ➔ RoHS compliant (lead, mercury, cadmium free)

Applications

- ➔ Gas detection (CH₄, CO₂, CO, etc.)
- ➔ Radiation thermometers
- ➔ Flame detection (CO₂ resonance radiation)

Options (sold separately)

- ➔ 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**
- ➔ Amplifier for infrared detector **C4159-01**

Structure

Type no.	Photosensitive area (mm)	Package	Window material	Cooling	Field of view FOV (degrees)
P13243-011MA	0.7 × 0.7	TO-46	Si with AR coating*1	Non-cooled	90
P13243-013CA		Ceramic			102
P13243-022MS	2 × 2	TO-5	Sapphire	Non-cooled	97
P13243-122MS		TO-8		One-stage TE-cooled	134
P13243-222MS				Two-stage TE-cooled	113

*1: Refer to the spectral transmittance of window materials (P.3).

Absolute maximum ratings

Type no.	TE-cooler allowable current (A)	Thermistor power dissipation (mW)	Reverse voltage V_R (V)	Operating temperature T_{opr}^{*2} (°C)	Storage temperature T_{stg}^{*2} (°C)	Maximum incident light level (W/cm ²)	Soldering temperature T_{sol} (°C)
P13243-011MA	-	-	1	-40 to +85	-40 to +85	1	-
P13243-013CA	-	-					240 (once) ^{*3}
P13243-022MS	-	-					-
P13243-122MS	1.5	0.2		-40 to +60	-40 to +60		-
P13243-222MS	1.0						-

*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 MSL2, see P.9

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. $T_a=25\text{ }^\circ\text{C}$, unless otherwise noted)

Type no.	Chip temperature T_{chip} (°C)	Peak sensitivity wavelength λ_p (μm)	Cutoff wavelength λ_c (μm)	Photosensitivity S^{*4} $\lambda=\lambda_p$ (mA/W)	Shunt resistance R_{sh} $V_R=10\text{mV}$ (kΩ)	Detectivity D^* ($\lambda_p, 1200, 1$)		Noise equivalent power NEP $\lambda=\lambda_p$		Rise time t_r^{*5} (ns)	Terminal capacitance C_t^{*6} (pF)
						Min. (cm·Hz ^{1/2} /W)	Typ. (cm·Hz ^{1/2} /W)	Typ. (W/Hz ^{1/2})	Max. (W/Hz ^{1/2})		
P13243-011MA	25	4.1	5.3	4.5	300	8.0×10^8	1.0×10^9	7.0×10^{-11}	8.8×10^{-11}	15	0.7
P13243-013CA				8.0	7	8.0×10^8	1.0×10^9	2.0×10^{-10}	2.5×10^{-10}	100	
P13243-022MS	25		5.2	8.6	19	1.0×10^9	1.9×10^9	1.0×10^{-10}	2.0×10^{-10}	100	20
P13243-122MS	-10		5.1	8.8	33	1.6×10^9	2.8×10^9	0.7×10^{-10}	1.3×10^{-10}		
P13243-222MS	-30										

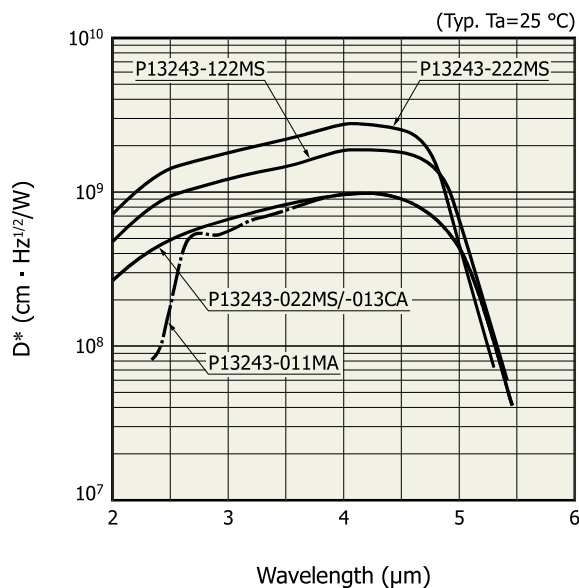
*4: Uniform irradiation on the entire photosensitive area

*5: $V_R=0\text{ V}$, $R_L=50\text{ }\Omega$, 10 to 90%, $\lambda=1.55\text{ }\mu\text{m}$

*6: $V_R=0\text{ V}$, $f=1\text{ MHz}$

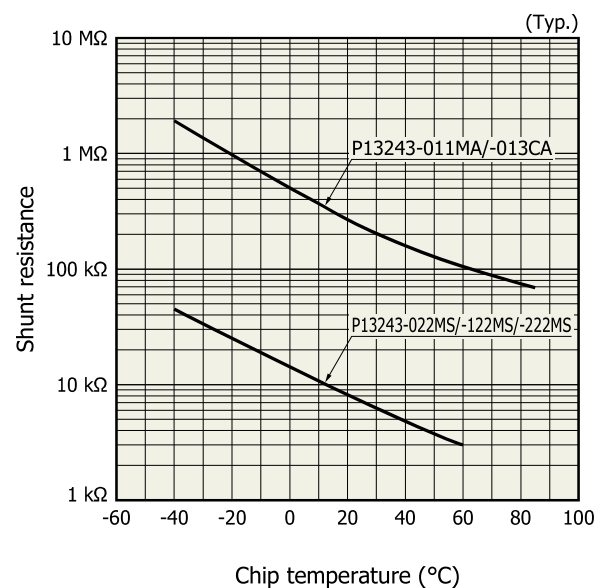
Note: Uniform irradiation must be applied to the entire photosensitive area during use.

Spectral response (D^*)



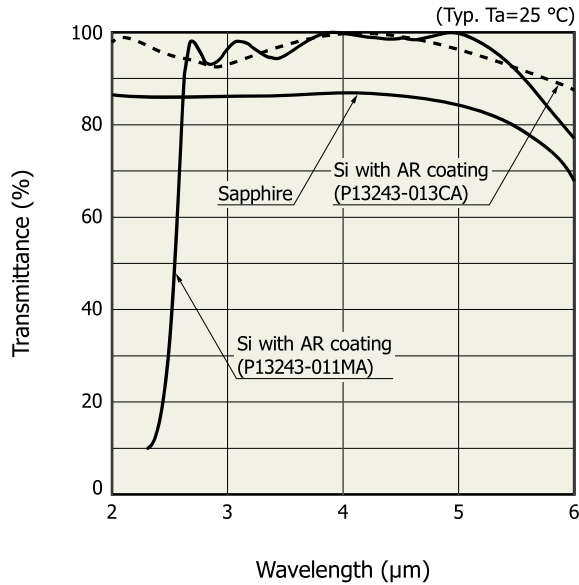
KIRD80658ED

Shunt resistance vs. chip temperature



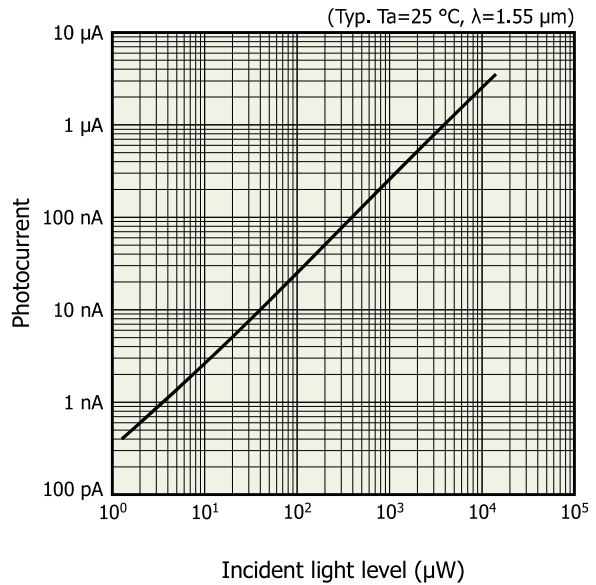
KIRD80659EC

Spectral transmittance of window materials



KIRDB0660EB

Linearity

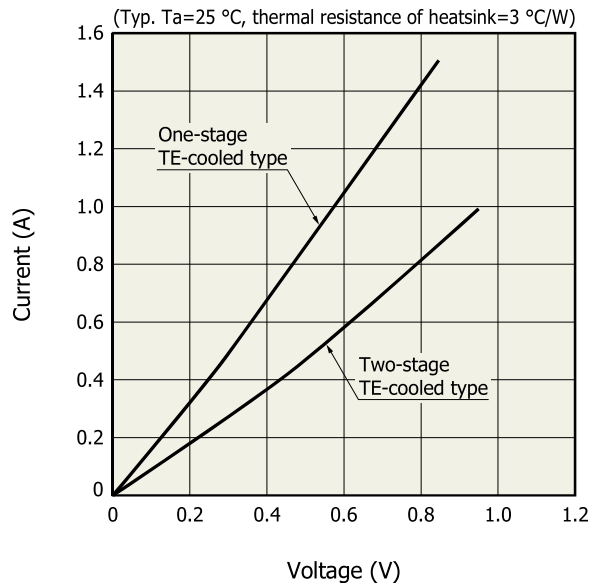


KIRDB0615EB

TE-cooler specifications ($T_a=25\text{ }^\circ\text{C}$, unless otherwise noted)

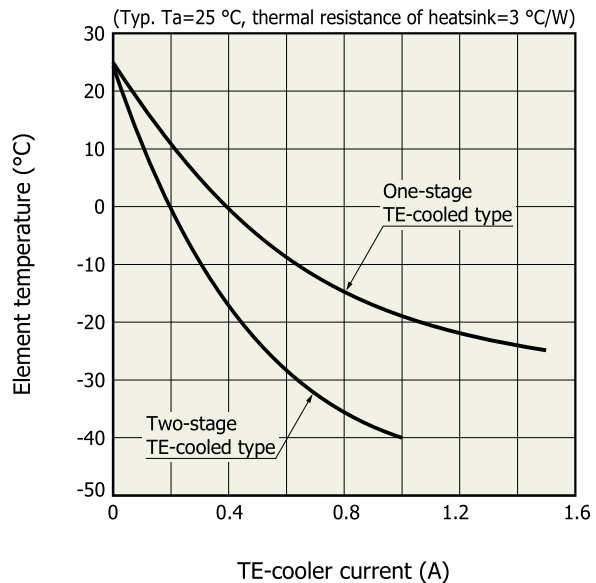
Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit
TE-cooler allowable current	One-stage TE-cooled	Ic max	-	-	1.5	A
	Two-stage TE-cooled		-	-	1.0	
TE-cooler allowable voltage	One-stage TE-cooled	Vc max	-	-	1.0	V
	Two-stage TE-cooled		-	-	1.2	
Thermistor resistance		Rth	-	9	-	k Ω
Thermistor B constant	$T_1=25\text{ }^\circ\text{C}$, $T_2=-20\text{ }^\circ\text{C}$	B	-	3300	-	K
Thermistor power dissipation		Pth	-	-	0.2	mW

Current vs. voltage characteristics of TE-cooler



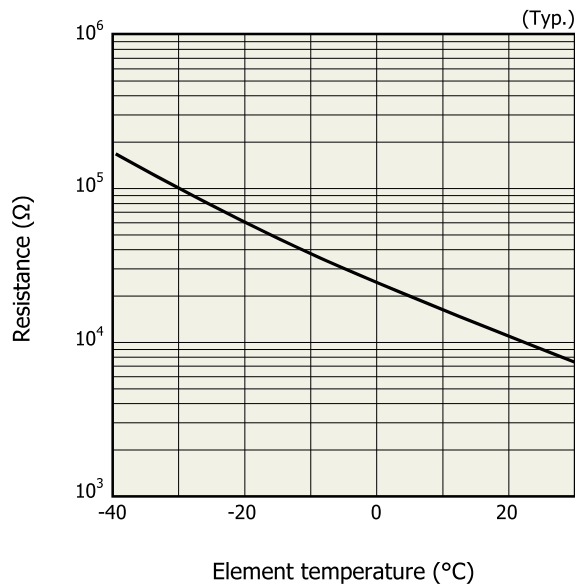
KIRDB0115EB

Cooling characteristics of TE-cooler



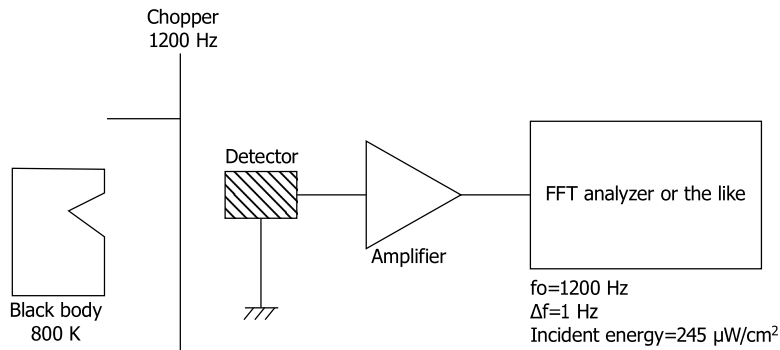
KIRDB0181EA

❖ Thermistor temperature characteristics



KIRDB0116EA

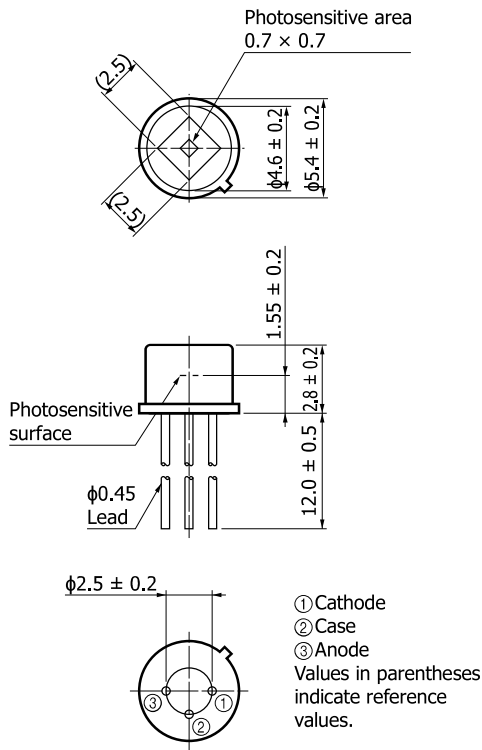
❖ Block diagram for characteristic measurement



KIRDC0125EA

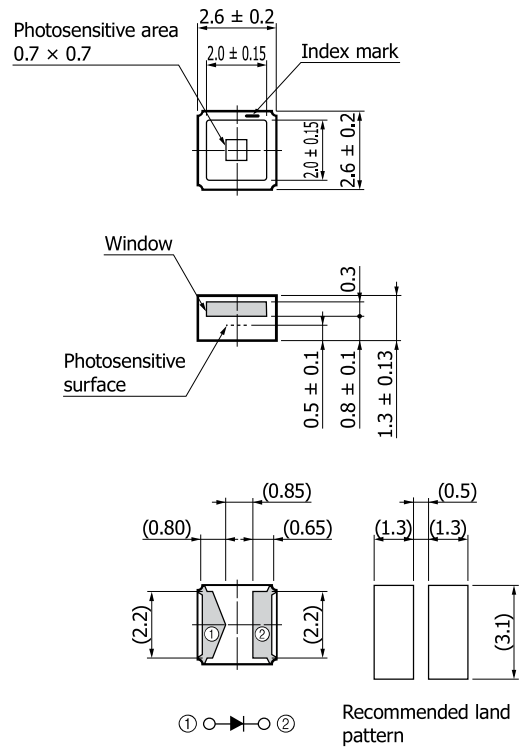
Dimensional outlines (unit: mm)

P13243-011MA



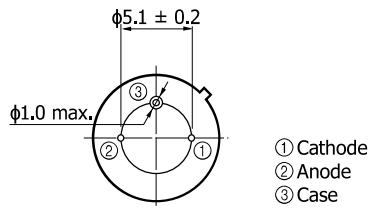
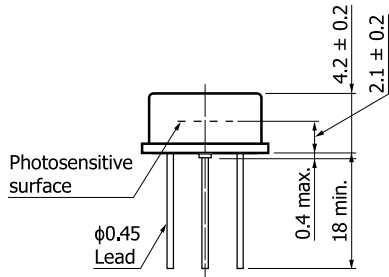
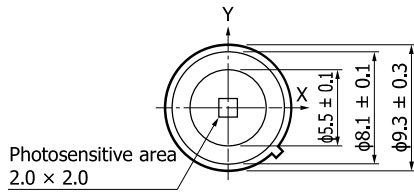
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P13243-013CA



KIRDA0259EE

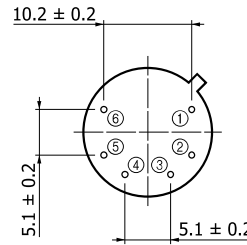
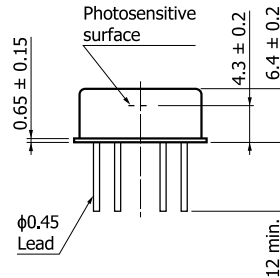
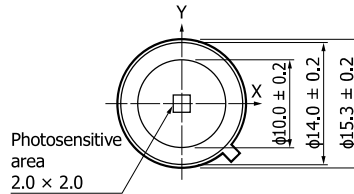
P13243-022MS



- ① Cathode
- ② Anode
- ③ Case

KIRDA0272EC

P13243-122MS

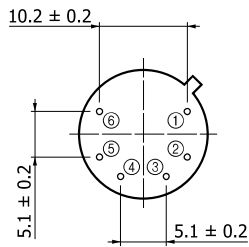
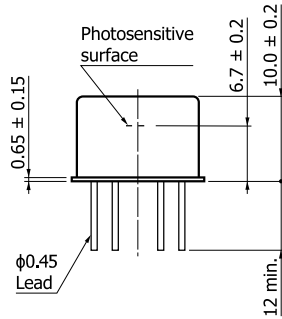
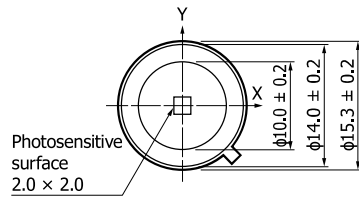


Distance from photosensitive area center to cap center
 $-0.3 \leq X \leq +0.3$
 $-0.3 \leq Y \leq +0.3$

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

KIRDA0260ED

P13243-222MS



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

- ① Detector (anode)
- ② Detector (cathode)
- ③ TE-cooler (-)
- ④ TE-cooler (+)
- ⑤ ⑥ Thermistor

KIRDA0261EE

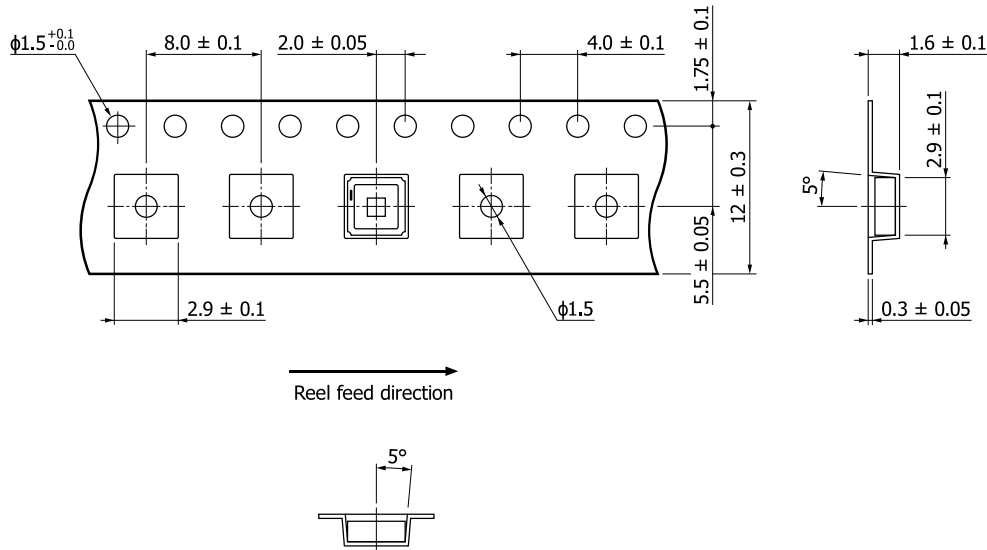
Standard packing specifications

P13243-013CA

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
φ180 mm	φ60 mm	12 mm	PS	Conductive

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



KLEDC0143EA

■ Packing quantity

500 pcs/reel

■ Packing state

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

Recommended soldering conditions

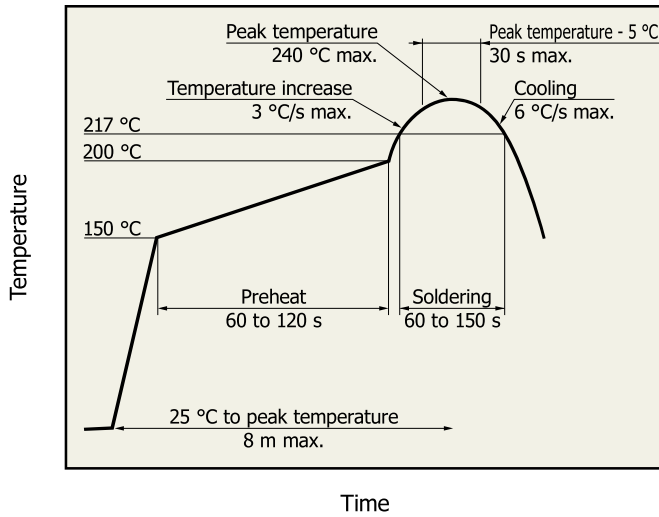
P13243-011MA/-022MS/-122MS/-222MS

· 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 condition in advance.

P13243-013CA

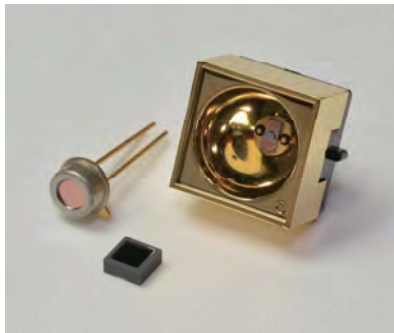


- After unpacking, store the device in an environment at a temperature range of 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 1 year.
- The effect that the product receives during reflow soldering varies depending on the circuit board and reflow oven that are used. When you set reflow soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

KSPDB0418EA

Related products

Mid infrared LED L15893/L15894/L15895 series



Hamamatsu's unique crystal growth and process technologies enable mid infrared LEDs with peak emission wavelengths of 3.3 μm , 3.9 μm , and 4.3 μm .

Type no.	Package
L15893-0330C, L15894-0390C, L15895-0430C	Ceramic
L15893-0330M, L15894-0390M, L15895-0430M	TO-46
L15893-0330ML, L15894-0390ML, L15895-0430ML	TO-46 with reflector

Related information

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

- Precautions
 - Disclaimer
 - Compound opto-semiconductors (photosensors, light emitters)

- Technical information
 - Compound semiconductor photosensors / Technical note



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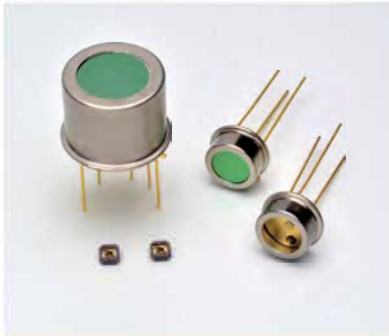
North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01, E-mail: info@hamamatsu.se

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Taiwan: Hamamatsu Photonics Taiwan Co., Ltd.: 8F-3, No. 158, Section2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081, E-mail: info@hamamatsu.com.tw

InAsSb photovoltaic detectors



P13894 series

High-speed response and high sensitivity in the spectral band up to 11 μm, infrared detectors

The P13894 series are photovoltaic type detectors that have achieved high sensitivity in the spectral range up to 11 μm using Hamamatsu unique crystal growth technology and process technology. These products are environmentally friendly infrared detectors and do not use mercury or cadmium, which are substances restricted by the RoHS Directive. They are replacements for previous products that contain these substances. A compact surface mount type has been added to the easily handled non-cooling type.

Features

- High sensitivity
- High-speed response
- High shunt resistance
- Non-cooled (P13894-011CN/-011NA/-011MA)
- Compact, surface mount ceramic package (P13894-011CN)
- Compatible with lead-free reflow soldering (P13894-011CN)

Applications

- Gas detection (CH₄, CO₂, CO, NH₃, O₃, etc.)
- Radiation thermometers

Options (sold separately)

- Heatsink for two-stage TE-cooled type **A3179-01**
- Temperature controller for TE-cooled type **C1103-04**
- Amplifier for infrared detector **C4159-01**

Structure

Parameter	NEW P13894-011CN	P13894-011NA	P13894-011MA	P13894-211MA	Unit
Window material	None	None	Ge with AR coating	Ge with AR coating	-
Package	Ceramic	TO-5		TO-8	-
Cooling	Non-cooled			Two-stage TE-cooled	-
Photosensitive area	1 × 1				mm
Field of view (FOV)	102	97		113	degrees

Absolute maximum ratings

Parameter	Symbol	Condition	NEW P13894-011CN	P13894-011NA	P13894-011MA	P13894-211MA	Unit
Reverse voltage	V _R		1				V
Operating temperature	T _{opr}	No dew condensation*1	-40 to +85		-40 to +60		°C
Storage temperature	T _{stg}	No dew condensation*1	-40 to +85		-40 to +60		°C
Soldering conditions			*2	260 °C or less, within 10 s			-

*1: 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.

*2: Peak temperature: 240 °C max. See P7. JEDEC J-STD-020 MSL 2

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.

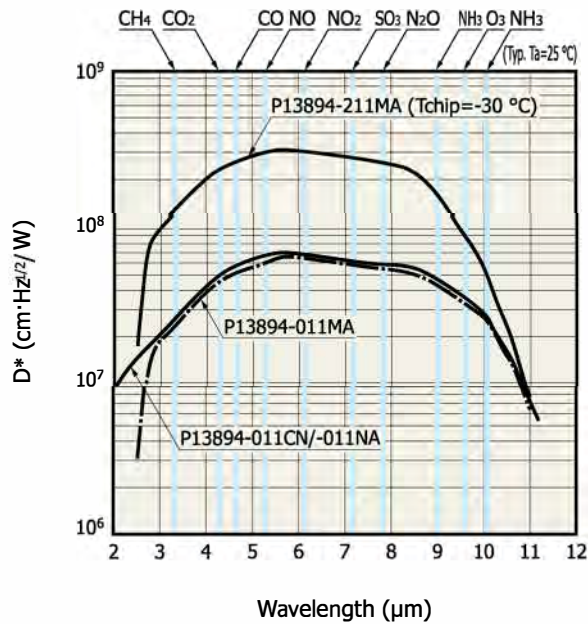
Electrical and optical characteristics (Ta=25 °C)

Parameter	Symbol	Condition	P13894-011CN/-011NA			P13894-011MA			P13894-211MA			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Chip temperature	Tchip		25			25			-30			°C
Peak sensitivity wavelength	λ_p		-	5.6	-	-	5.6	-	-	5.6	-	μm
Cutoff wavelength	λ_c		9.7	11.0	-	9.7	11.0	-	8.9	10.2	-	μm
Photosensitivity	S	$\lambda = \lambda_p^{*3}$	1.4	2.0	-	1.3	1.9	-	2.8	3.8	-	mA/W
Shunt resistance	Rsh	$V_R = 10 \text{ mV}$	1.5	2.0	-	1.5	2.0	-	7.5	10.0	-	$\text{k}\Omega$
Detectivity	D*	($\lambda_p, 1200, 1$)	4.0×10^7	7.0×10^7	-	3.8×10^7	6.5×10^7	-	1.8×10^8	3.2×10^8	-	$\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$
Noise equivalent power	NEP	$\lambda = \lambda_p$	-	1.4×10^{-9}	2.5×10^{-9}	-	1.5×10^{-9}	2.6×10^{-9}	-	3.1×10^{-10}	5.6×10^{-10}	$\text{W}/\text{Hz}^{1/2}$
Terminal capacitance	Ct	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$	-	0.6	-	-	0.6	-	-	0.6	-	pF
Rise time	tr	10 to 90%, no window, $\lambda = 1.55 \mu\text{m}$	-	3	10	-	3	10	-	3	10	ns

*3: Uniform irradiation on the entire photosensitive area

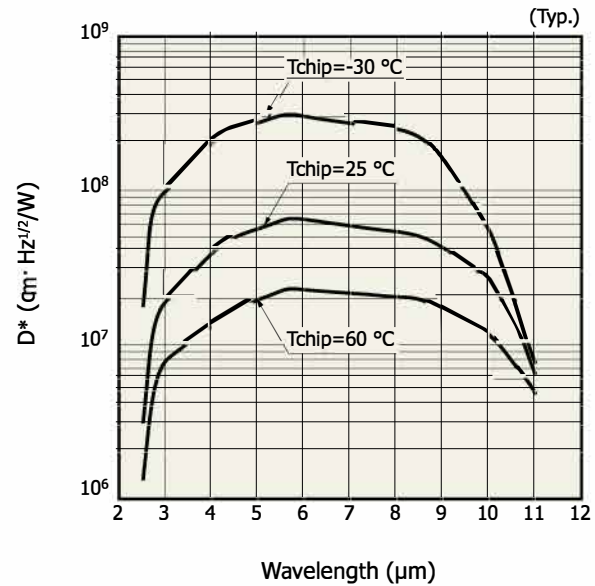
Note: Uniform irradiation must be applied to the entire photosensitive area during use.

Spectral response (D*)



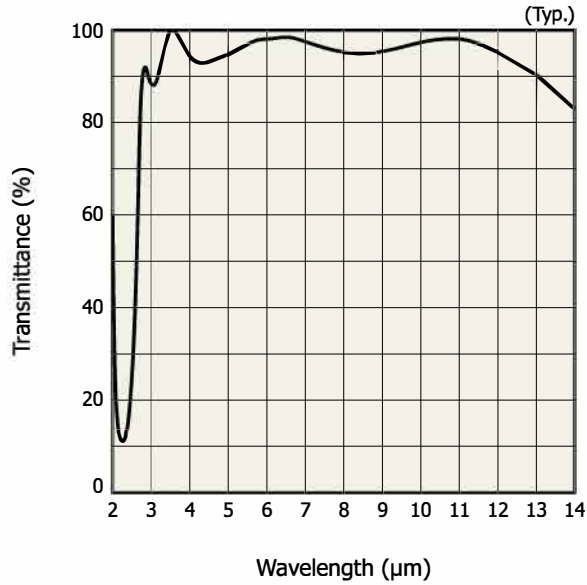
KIRD0632EB

Sensitivity temperature characteristics (P13894-011MA/-211MA)



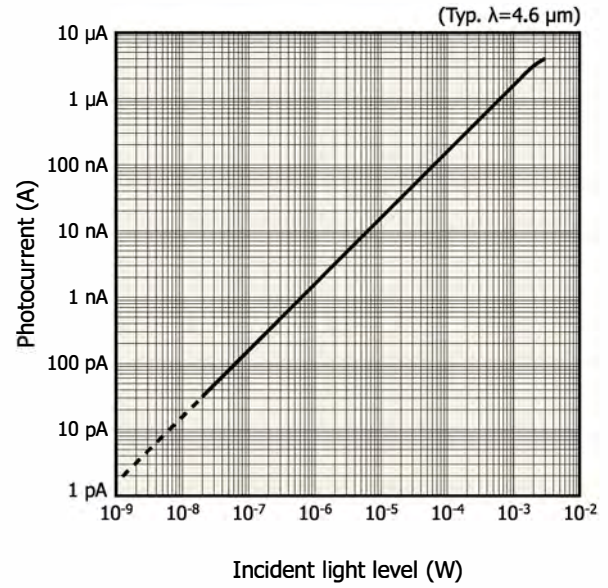
KIRD0633EA

Spectral transmittance of window material



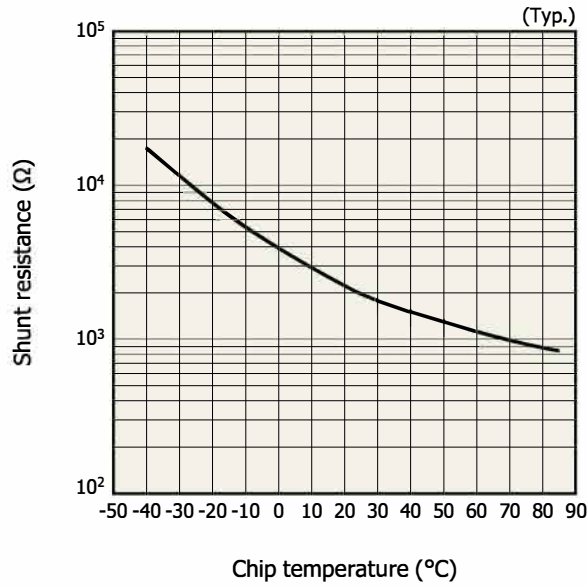
KIRDB0629EA

Linearity (P13894-011CN/-011NA)



KIRDB0630EA

Shunt resistance vs. chip temperature

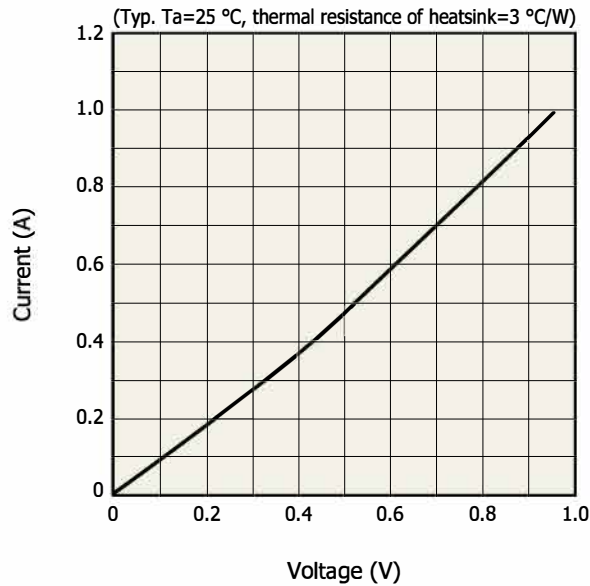


KIRDB0628EA

▣ Specifications of two-stage TE-cooler (Ta=25 °C)

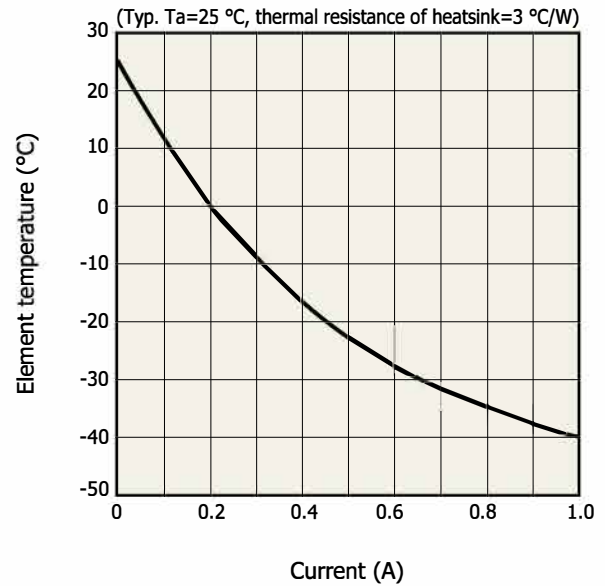
Parameter	Symbol	Min.	Typ.	Max.	Unit
Allowable current	Ic	-	-	1.0	A
Allowable voltage	Vc	-	-	0.95	V
Thermistor resistance	Rth	8.1	9.0	9.9	kΩ
Thermistor power dissipation	Pth	-	-	0.2	mW

▣ Current vs. voltage characteristics of TE-cooler



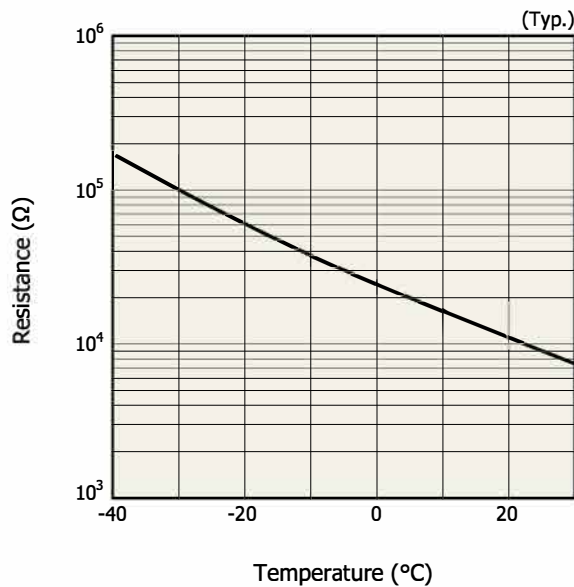
KIRDB0459EA

▣ Cooling characteristics of TE-cooler



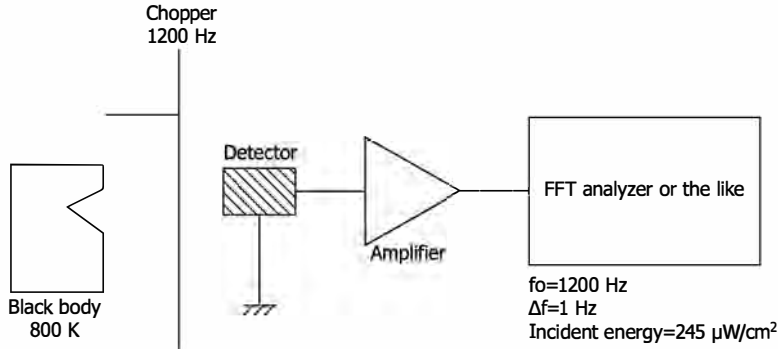
KIRDB0464EA

▣ Thermistor temperature characteristics



KIRDB0116EB

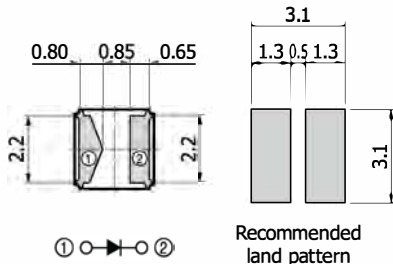
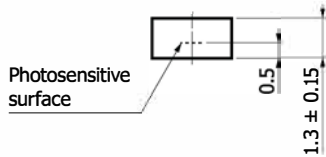
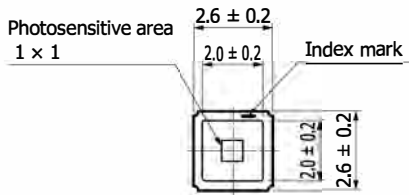
Measurement circuit example



KIRDC0127EA

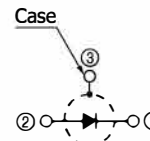
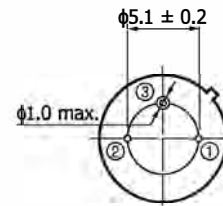
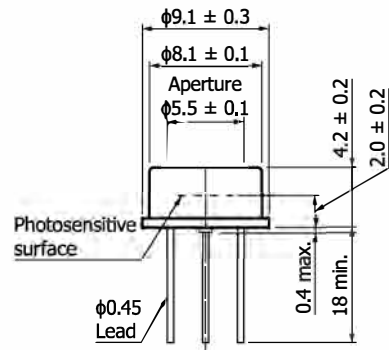
Dimensional outline (unit: mm)

P13894-011CN



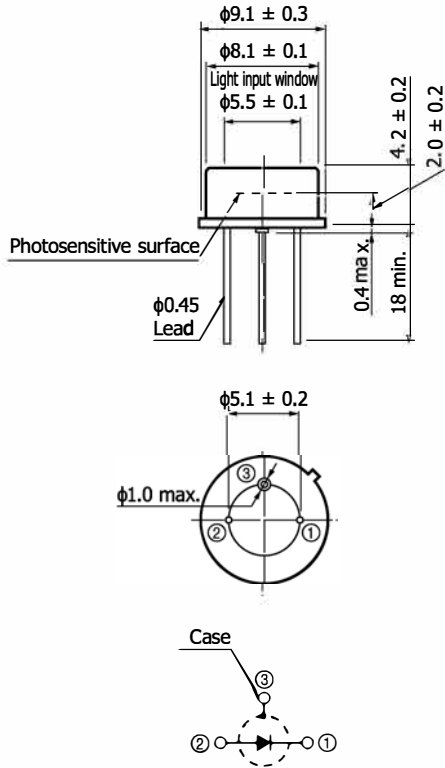
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P13894-011NA

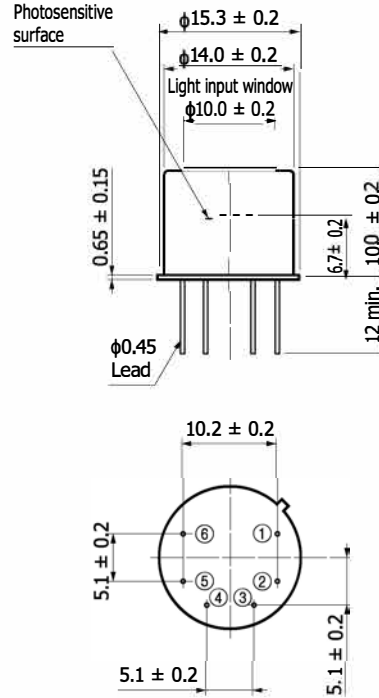


KIRDA0256EB

P13894-011MA



P13894-211MA

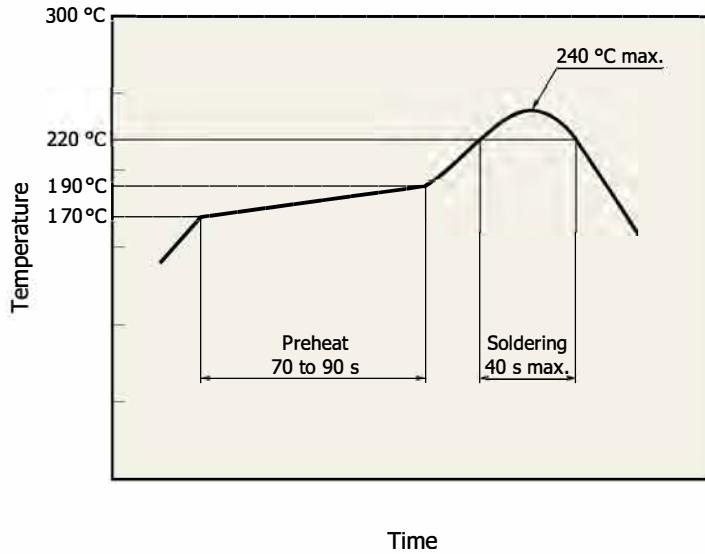


- ① Detector (anode)
- ② Detector (cathode)
- ③ TE-cooler (-)
- ④ TE-cooler (+)
- ⑤⑥ Thermistor

KIRDA0258EB

KIRDA0257EA

Recommended reflow soldering conditions



KIRD0648EB

- After unpacking, store the device in an environment at a temperature range of 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 1 year.
- 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.

Related information

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

- Precautions
- Disclaimer



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Taiwan: Hamamatsu Photonics Taiwan Co., Ltd.: 8F-3, No. 158, Section2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081, E-mail: info@hamamatsu.com.tw

InAsSb photovoltaic detector



P11120-201

High-speed response and high sensitivity in the 5 μm spectral band
Thermoelectrically cooled infrared detector with no liquid nitrogen required

The P11120-201 is an infrared detector that provides high sensitivity in the 5 μm spectral band due to our unique crystal growth technology. The InAsSb photovoltaic detector has a PN junction that ensures high-speed response and high reliability. Typical applications include gas analysis such as CO₂, SO_x, CO and NO_x. The P11120-201 is environmentally friendly infrared detector and do not use lead, mercury or cadmium, which are substances restricted by the RoHS Directive. They are replacements for previous products that contain these substances.

Features

- High-speed response
- High sensitivity
- High reliability
- RoHS compliant

Applications

- Gas analysis
- Radiation thermometers
- Thermal imaging
- Remote sensing
- FTIR
- Spectrophotometry

Options (sold separately)

- Heatsink for two-stage TE-cooled type **A3179-01**
- Temperature controller **C1103-04**
- Amplifier for infrared detector **C4159-07**
- Infrared detector module with preamp **C12494-210S**

Structure

Parameter	Specification	Unit
Window material	Sapphire	-
Package	TO-8	-
Cooling	Two-stage TE-cooled	-
Photosensitive area	φ1.0	mm

Absolute maximum ratings

Parameter	Symbol	Value	Unit
Thermistor power dissipation	-	0.2	mW
Reverse voltage	V _R	0.1	V
Operating temperature*1 *2	T _{opr}	-40 to +60	°C
Storage temperature*1	T _{stg}	-55 to +60	°C

*1: No dew condensation

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.

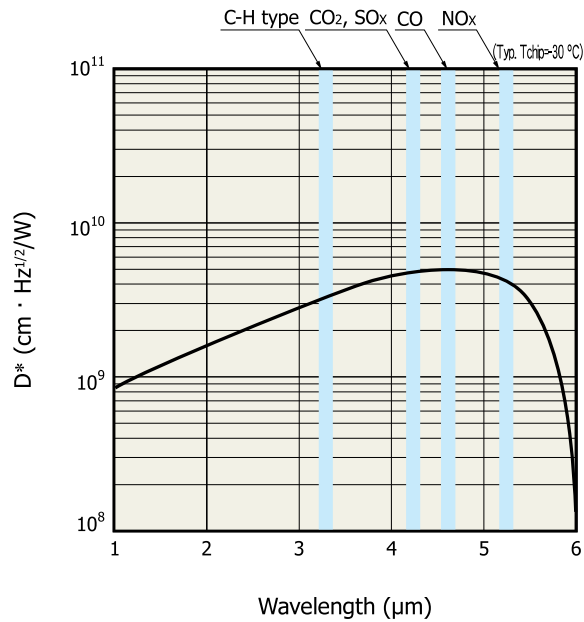
*2: Chip temperature and package temperature

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 (Tchip=-30 °C)

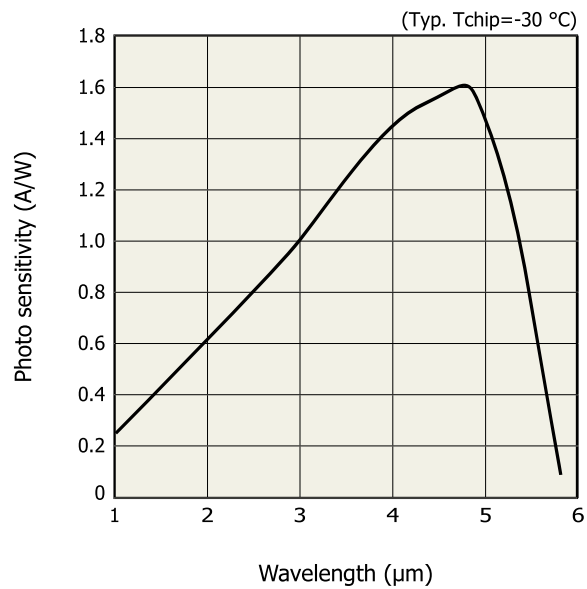
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitivity wavelength	λ_p		4.0	4.9	-	μm
Cutoff wavelength	λ_c		5.6	5.9	-	μm
Photo sensitivity	S	$\lambda = \lambda_p$	0.8	1.6	-	A/W
Shunt resistance	Rsh	$V_R = 10 \text{ mV}$	10	13	-	Ω
Detectivity	D^*	$(\lambda_p, 1200, 1)$	3.5×10^9	5.0×10^9	-	$\text{cm} \cdot \text{Hz}^{1/2} / \text{W}$
Noise equivalent power	NEP	$\lambda = \lambda_p$	-	1.8×10^{-11}	2.5×10^{-11}	$\text{W} / \text{Hz}^{1/2}$
Rise time	tr	$V_R = 0 \text{ V}, R_L = 50 \Omega$ 0 to 63%	-	0.4	-	μs

Spectral response (D^*)



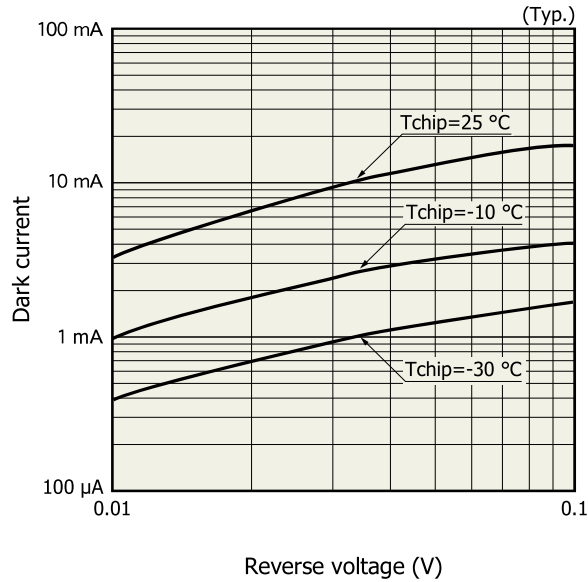
KIRD0452EB

Spectral response

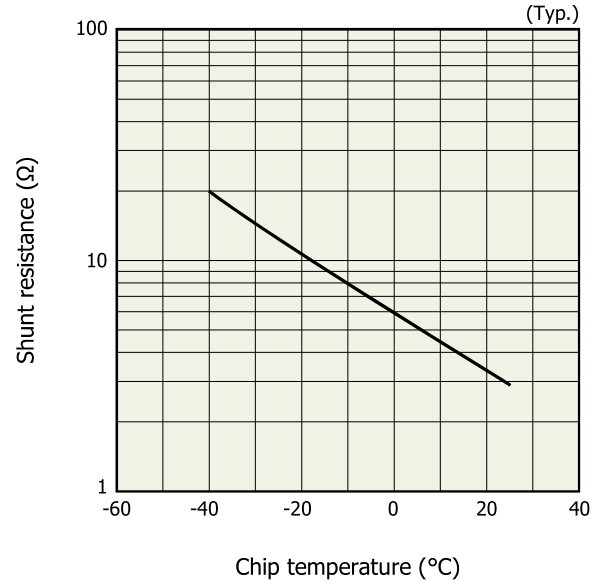


KIRD0453EB

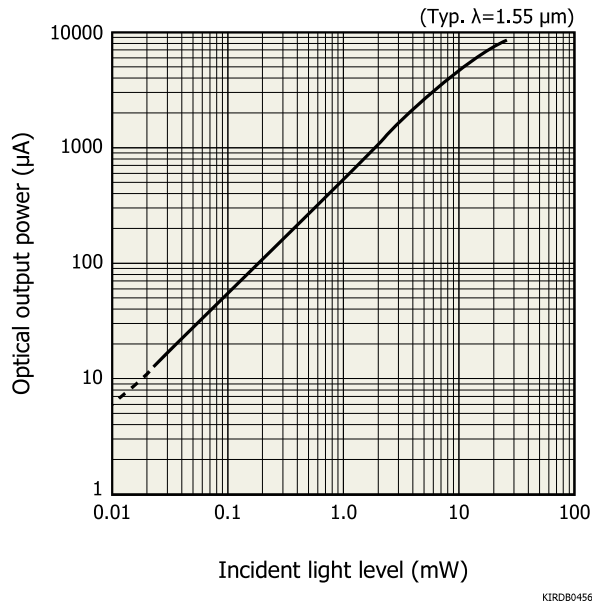
Dark current vs. reverse voltage



Shunt resistance vs. chip temperature



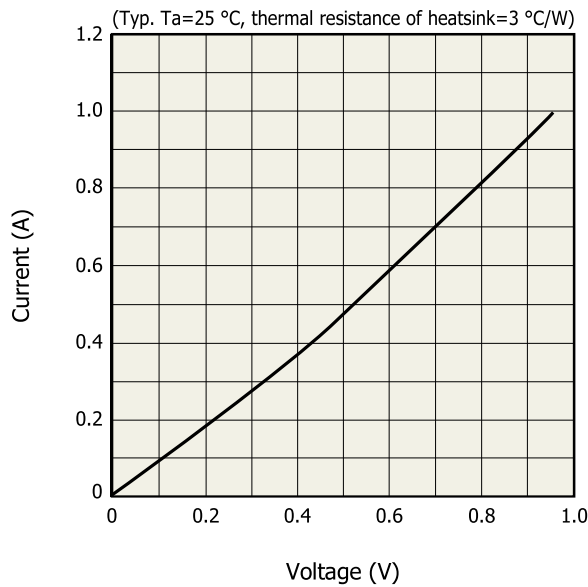
Linearity



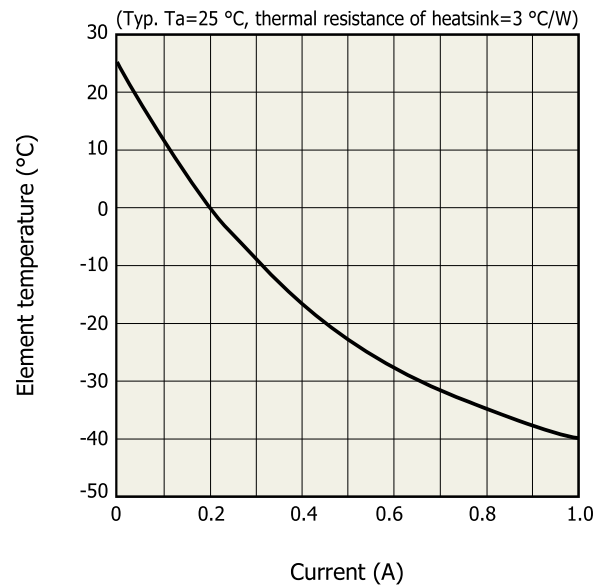
▣ Specifications of two-stage TE-cooler ($T_a=25\text{ }^\circ\text{C}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Allowable current	Ic	-	-	1.0	A
Allowable voltage	Vc	-	-	0.95	V
Thermistor resistance	Rth	8.1	9.0	9.9	k Ω
Thermistor power dissipation	Pth	-	-	0.2	mW

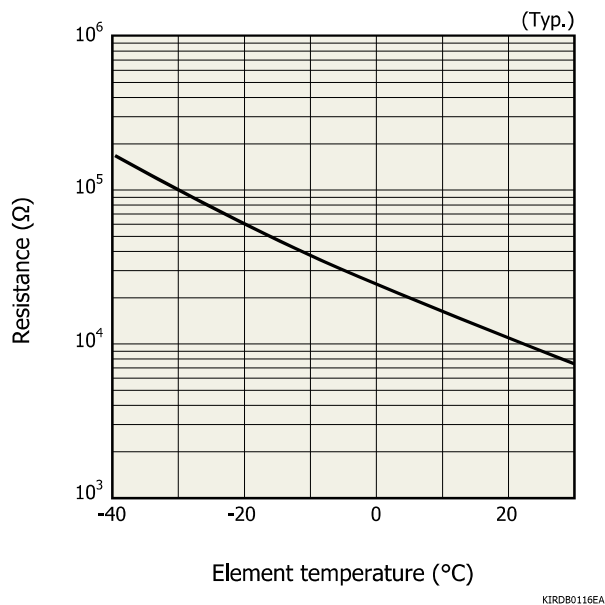
▣ Current vs. voltage of TE-cooled type



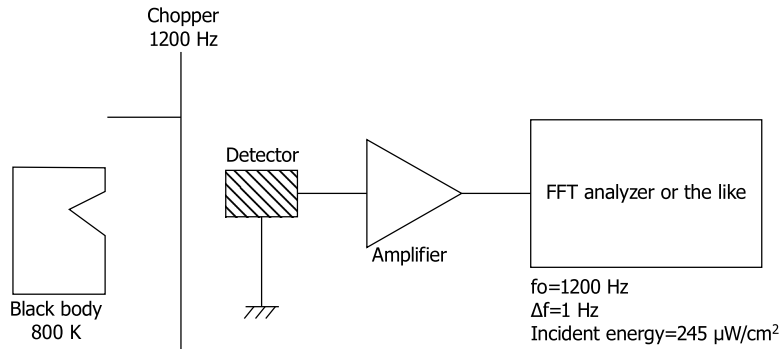
▣ Cooling characteristics of TE-cooled type



▣ Thermistor temperature characteristic

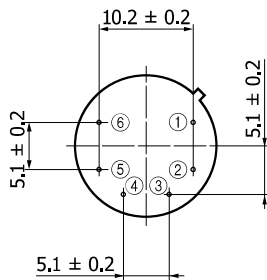
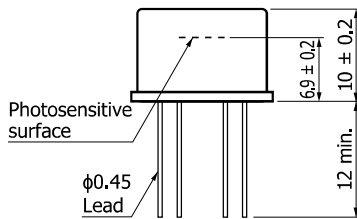
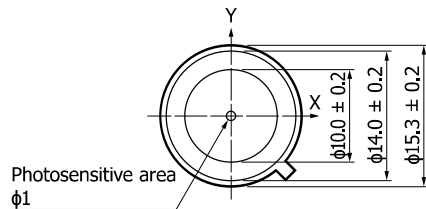


Measurement circuit example



KIRDC0127EA

Dimensional outline (unit: mm)



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

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

KIRDA0212EA

Recommended soldering conditions

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

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

■ Precautions

- Disclaimer
- Compound opto-semiconductors



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InAsSb photovoltaic detector



P12691-201G

**High-speed response and high sensitivity in the 8 μm spectral band
Thermoelectrically cooled infrared detector with no liquid nitrogen required**

The P12691-201G is an infrared detector that provides high sensitivity in the 8 μm spectral band by employing our unique crystal growth technology, back-illuminated structure and integrating a lens. The InAsSb photovoltaic detector has a PN junction that ensures high-speed response and high reliability. Typical applications include gas analysis such as NO, NO₂, SO₂, and H₂S. The P12691-201G is easy to use as it uses a compact package (TO-8) not requiring liquid nitrogen.

Features

- High-speed response
- High sensitivity
- High reliability
- Compact, thermoelectrically cooled TO-8 package
- RoHS compliant
- Can be assembled in a module with QCL

Applications

- Gas analysis
- Radiation thermometers
- Thermal imaging
- Remote sensing
- FTIR
- Spectrophotometers

Options (sold separately)

- Heatsink for two-stage TE-cooled type **A3179-01**
- Temperature controller **C1103-04**
- Infrared detector module with preamp **C4159-07**

Structure

Parameter	Specification	Unit
Window material	Ge with AR coating	-
Package	TO-8	-
Cooling	Two-stage TE cooler	-
Photosensitive area	φ1.0	mm

Absolute maximum ratings

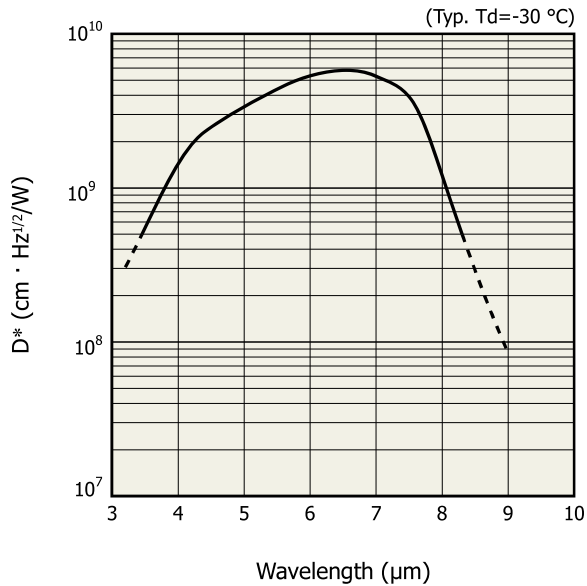
Parameter	Symbol	Value	Unit
Thermistor power dissipation	Pd_th	0.2	mW
TE-cooler allowable current	ITE max.	1	A
Reverse voltage	VR	0.1	V
Operating temperature	Topr	-40 to +60	°C
Storage temperature	Tstg	-55 to +60	°C

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 (Td=-30 °C)

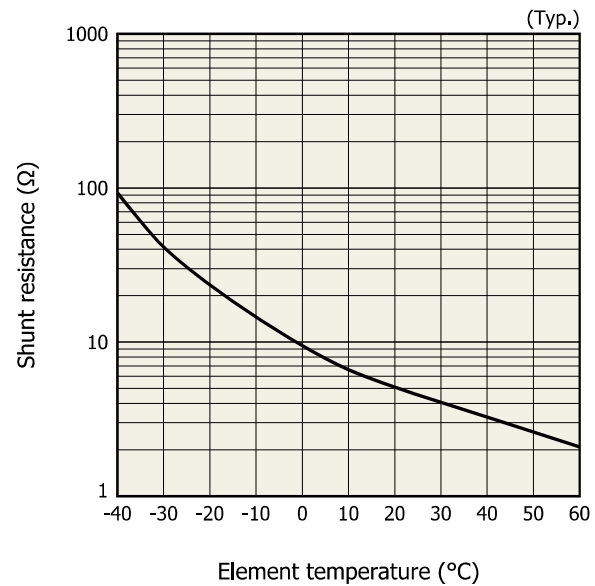
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitivity wavelength	λ_p		-	6,7	-	μm
Cutoff wavelength	λ_c		8,2	8,3	-	μm
Photosensitivity	S	$\lambda = \lambda_p$	0,8	1,2	-	A/W
Shunt resistance	Rsh	$V_R = 10 \text{ mV}$	13	40	-	Ω
Detectivity	D*	$(\lambda_p, 1200, 1)$	$4,0 \times 10^9$	$6,0 \times 10^9$	-	$\text{cm} \cdot \text{Hz}^{1/2} / \text{W}$
Noise equivalent power	NEP	$\lambda = \lambda_p$	-	$1,5 \times 10^{-11}$	$2,3 \times 10^{-11}$	$\text{W} / \text{Hz}^{1/2}$
Rise time	tr	$V_R = 0 \text{ V}, R_L = 50 \Omega$ 0 to 63%	-	-	10	ns

Spectral response (D*)



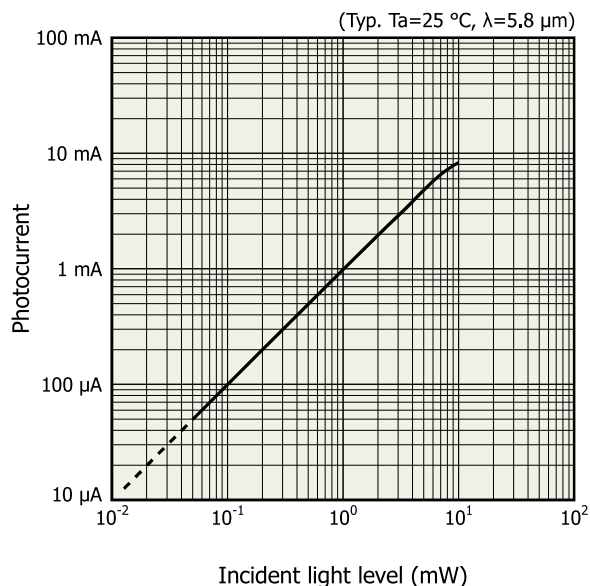
KIRD80592EA

Shunt resistance vs. element temperature



KIRD80647EA

Linearity

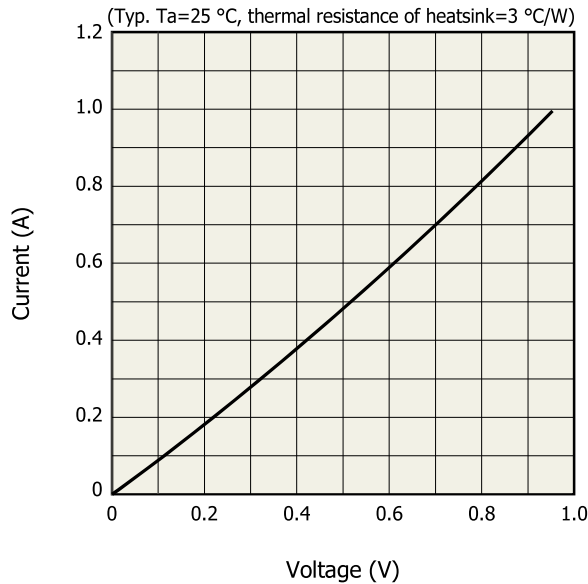


KIRD80667EA

▣ Specifications of two-stage TE-cooler (Ta=25 °C)

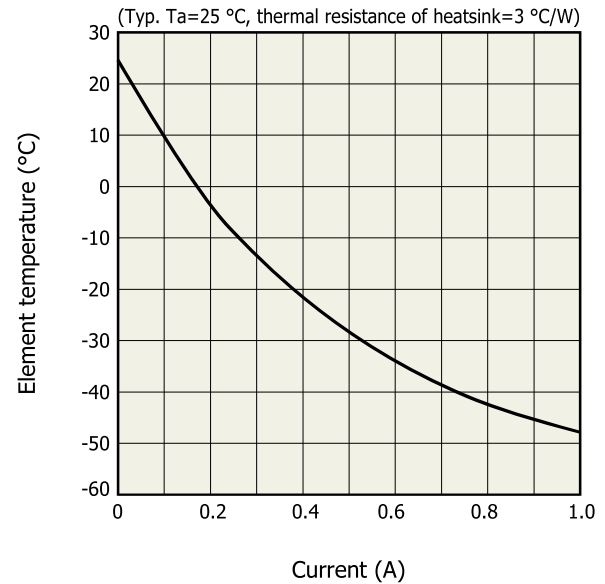
Parameter	Symbol	Min.	Typ.	Max.	Unit
TE cooler allowable current	ITE max.	-	-	1.0	A
TE cooler allowable voltage	VTE max.	-	-	0.95	V
Thermistor resistance	Rth	8.1	9.0	9.9	kΩ
Thermistor power dissipation	Pd_th	-	-	0.2	mW

▣ Current vs. voltage characteristics of TE-cooler



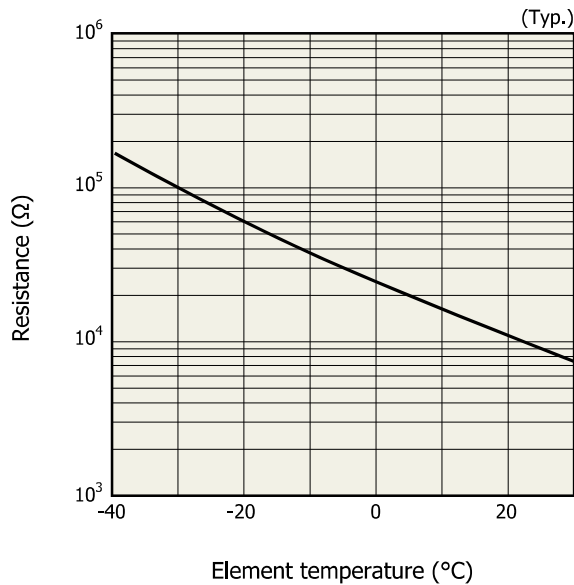
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▣ Cooling characteristics of TE-cooler



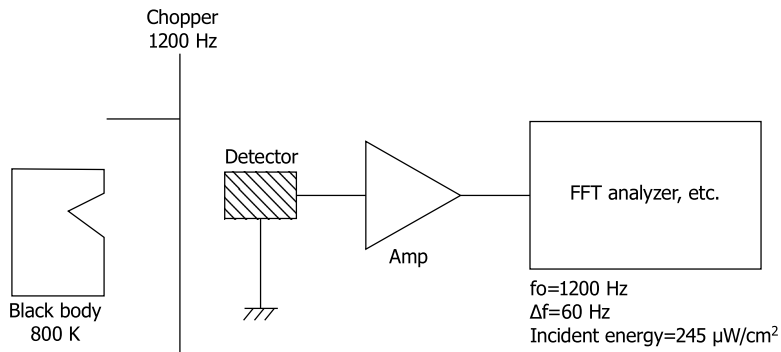
KIRDB0668EA

▣ Thermistor temperature characteristics



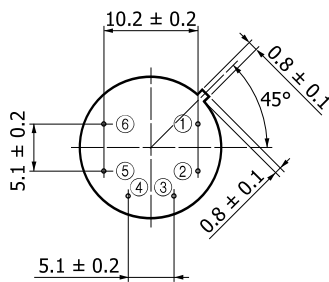
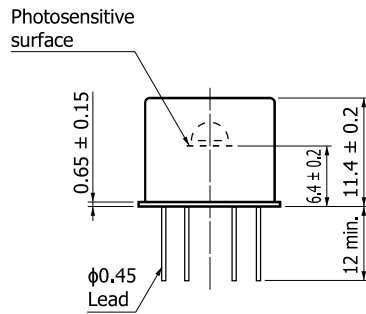
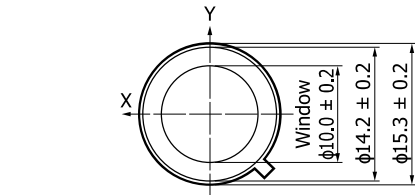
KIRDB0116EA

Measurement circuit example



KIROCO125EA

Dimensional outline (unit: mm)



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

KIRDA0242EA

Related information

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

■ Precautions

- Notice
- Metal, ceramic, plastic products

■ Technical information

- Infrared detector / Technical information



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InAsSb photovoltaic detector



P16112-011MA

P16612-011CA/CN

P16849-013CN

Infrared detectors with improved photosensitivity temperature coefficient (up to 5 μm band)

These are infrared detectors that have high sensitivity in the spectral band up to 5 μm. This high sensitivity has been achieved due to Hamamatsu's unique crystal growth technology and process technology. By using a back-illuminated structure, we greatly improved the sensitivity temperature coefficient compared to the front-illuminated type. Windowless types that customers can attach a filter on are also available. These products are environmentally friendly infrared detectors and do not use lead, mercury, or cadmium, which are substances restricted by the RoHS directive. These products replace conventional products containing these substances.

Features

- High sensitivity
- High-speed response
- High shunt resistance
- Compact, surface mount type ceramic package
- Compatible with lead-free solder reflow
- RoHS compliant (lead, mercury, cadmium free)

Applications

- Gas detection (CH₄, CO₂, CO, etc.)
- Radiation thermometers
- Flame detection (CO₂ resonance radiation)

Option (sold separately)

- Amplifier for infrared detector **C4159-01**

Structure

Type no.	Number of elements	Photosensitive area (mm)	Window material	Package	Cooling	Field of view FOV (degrees)
P16112-011MA	1	0.7 × 0.7	Si with AR coating	TO-46	Non-cooled	87
P16612-011CA						86
NEW P16612-011CN			None	Ceramic		86
NEW P16849-013CN	2	86				

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

Type no.	Reverse voltage V _R (V)	Operating temperature* ¹ T _{opr} (°C)	Storage temperature* ¹ T _{stg} (°C)	Incident light level (W/mm ²)	Soldering temperature T _{sol} (°C)
P16112-011MA	1	-40 to +85	-40 to +85	1	-
P16612-011CA					
NEW P16612-011CN					240 (once)* ²
NEW P16849-013CN					

*1: 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.

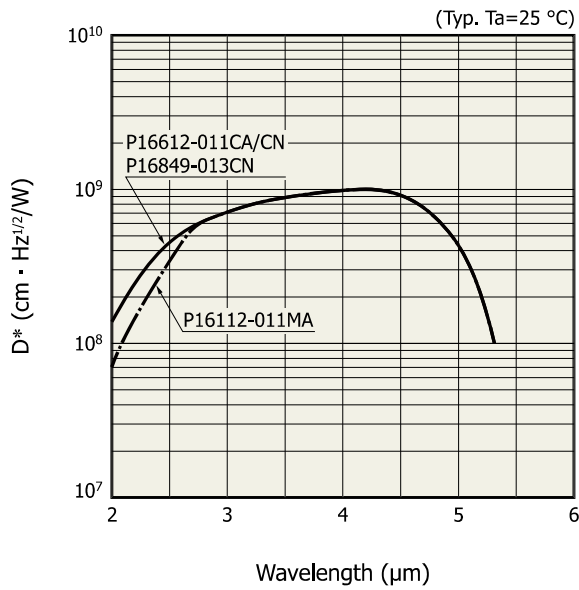
*2: Reflow soldering, JEDEC J-STD-020 MLS 2, see P.7

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)

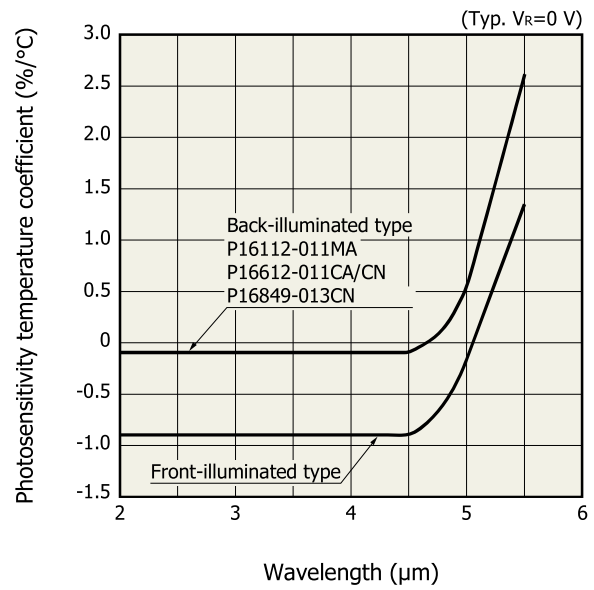
Type no.	Peak sensitivity wavelength λ_p (μm)	Cutoff wavelength λ_c (μm)	Photosensitivity $S_{\lambda=\lambda_p}$ (mA/W)	Shunt resistance R_{sh} $V_R=10$ mV (k Ω)	Detectivity D^* ($\lambda_p, 1200, 1$)		Noise equivalent power NEP $\lambda=\lambda_p$		Rise time t_r $V_R=0$ V $R_L=50$ Ω 10 to 90% (ns)	Terminal capacitance C_t $V_R=0$ V $f=1$ MHz (pF)
					Min. (cm \cdot Hz $^{1/2}$ /W)	Typ. (cm \cdot Hz $^{1/2}$ /W)	Typ. (W/Hz $^{1/2}$)	Max. (W/Hz $^{1/2}$)		
P16112-011MA	4.1	5.3	4.5	180	7.4×10^8	1.0×10^9	4.3×10^{-11}	6.5×10^{-11}	15	0.5
P16612-011CA										
NEW P16612-011CN										
NEW P16849-013CN										

Spectral response (D^*)



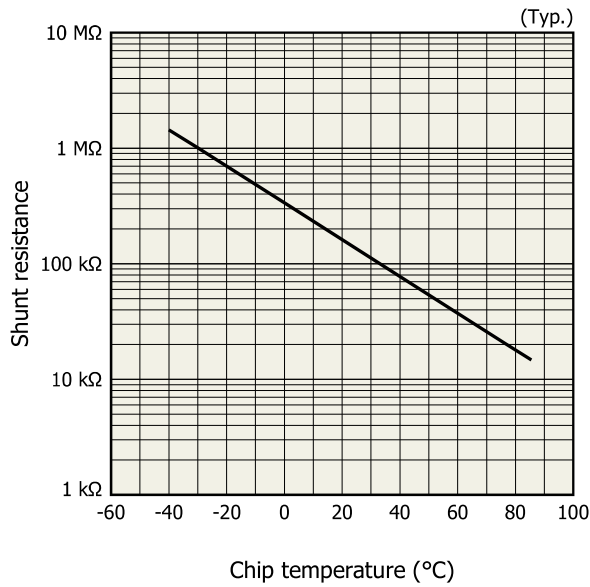
KJRD80715EC

Photosensitivity temperature characteristics



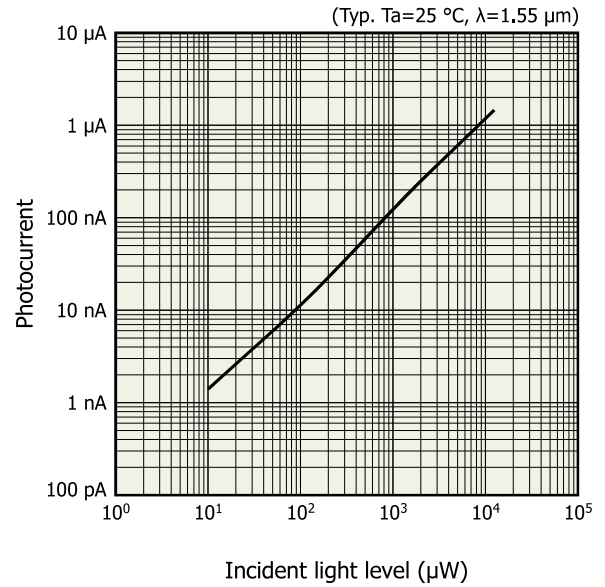
KJRD80716EB

❖ Shunt resistance vs. chip temperature



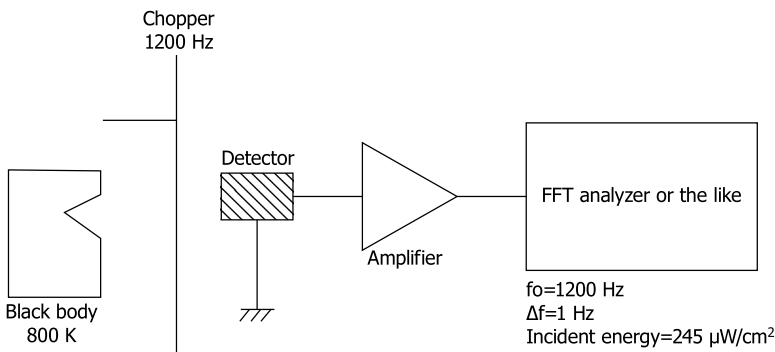
KIRD80717EA

❖ Linearity



KIRD80718EA

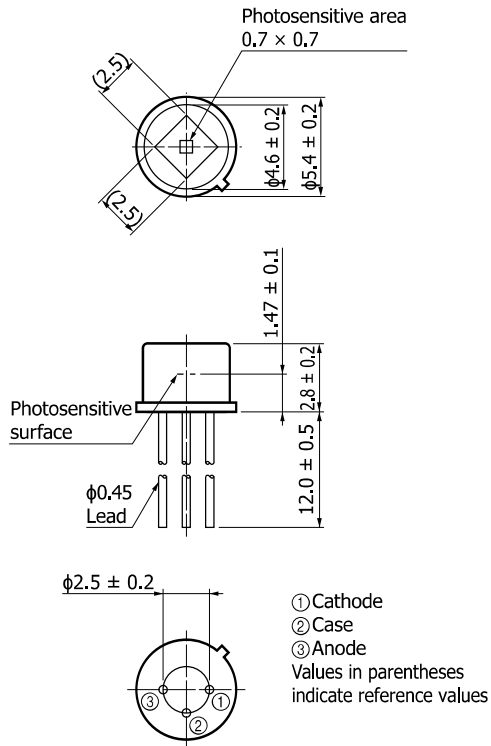
❖ Block diagram for characteristic measurement



KIRD00127EA

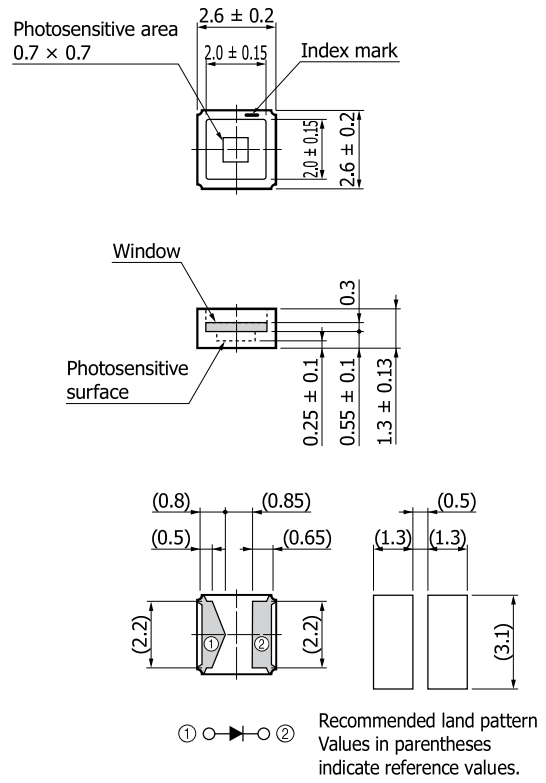
Dimensional outline (unit: mm)

P16112-011MA



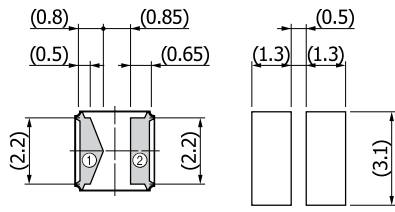
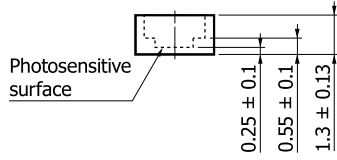
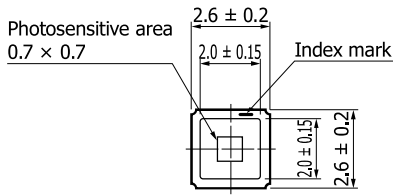
KIRDA0284EA

P16612-011CA



KIRDA0281EA

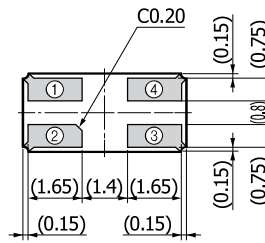
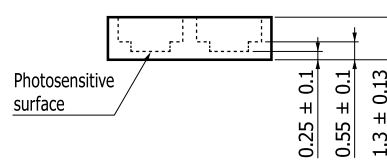
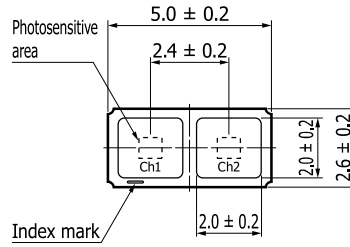
P16612-011CN



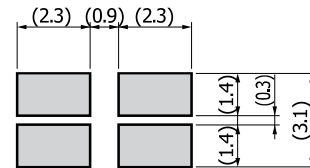
Recommended land pattern
Values in parentheses
indicate reference values.

KIRDA0285EB

P16849-013CN



- ① Cathode (Ch1)
 - ② Anode (Ch1)
 - ③ Anode (Ch2)
 - ④ Cathode (Ch2)
- Values in parentheses
indicate reference values.



Recommended land pattern

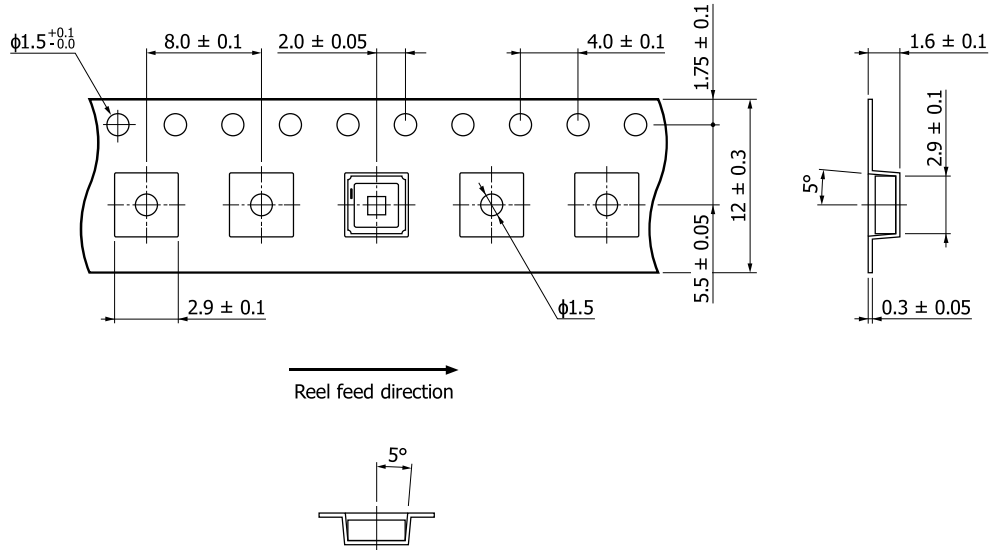
KIRDA0286EA

Standard packing specifications (P16612-011CA/CN)

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
φ180 mm	φ60 mm	12 mm	PS	Conductive

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



KLED0143EA

■ Packing quantity

500 pcs/reel

■ Packing state

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

Recommended soldering conditions

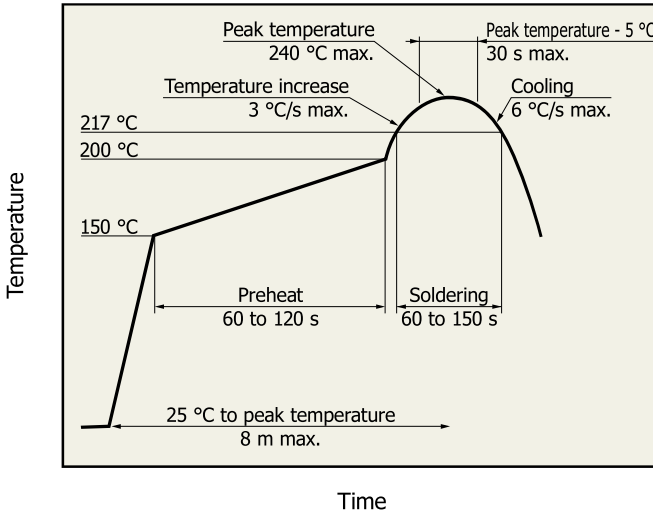
P16112-011MA

Solder temperature: 260 °C (5 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.

P16612-011CA/CN, P16849-013CN



- After unpacking, keep it in an environment at a temperature of 5 to 30 °C and a humidity of 60% or less, and perform soldering within 1 year.
- 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.

KSPD80418EA

Related information

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

- Precautions
 - Disclaimer
 - Safety consideration
 - Surface mount type products
 - Compound opto-semiconductors (photosensors, light emitters)

- Technical note
 - Compound semiconductor photosensors



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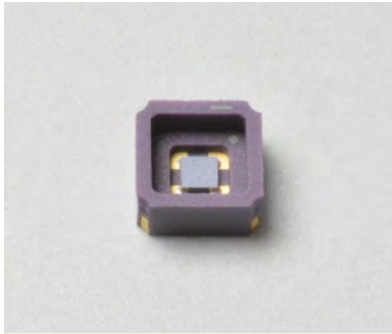
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InAsSb photovoltaic detector



P16613-011CN

Infrared detector capable of room temperature operation (up to 8 μm band)

The P16613-011CN is infrared detector that have high sensitivity in the spectral band up to 8 μm. This high sensitivity has been achieved due to Hamamatsu unique crystal growth technology and process technology. By using a back-illuminated structure, we achieved excellent sensitivity temperature characteristics. This product is an environmentally friendly infrared detector and does not use lead, mercury, or cadmium, which are substances restricted by the RoHS directive. This product replaces conventional products containing these substances.

Features

- High sensitivity
- High-speed response
- High shunt resistance
- Compact, surface mount type ceramic package
- Compatible with lead-free solder reflow
- RoHS compliant (lead, mercury, cadmium free)

Applications

- Gas detection (SO_x, NO_x, etc.)
- Radiation thermometers
- Mid infrared spectroscopy

Option (sold separately)

- Amplifier for infrared detector **C4159-01**

Structure

Parameter	Specification	Unit
Window material	None	-
Package	Ceramic	-
Photosensitive area	0.7 × 0.7	mm
Field of view	86	degrees

Absolute maximum rating (Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Value	Unit
Reverse voltage	V _R	1	V
Operating temperature*1	T _{opr}	-40 to +85	°C
Storage temperature*1	T _{stg}	-40 to +85	°C
Incident light level	Pin	1	W/mm ²
Soldering temperature	T _{sol}	240 (once)*2	°C

*1: 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.

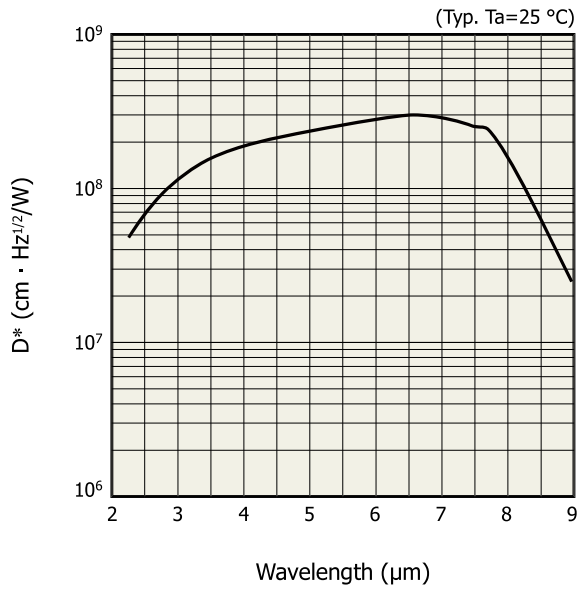
*2: Reflow soldering, JEDEC J-STD-020 MLS 2, see P.5

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)

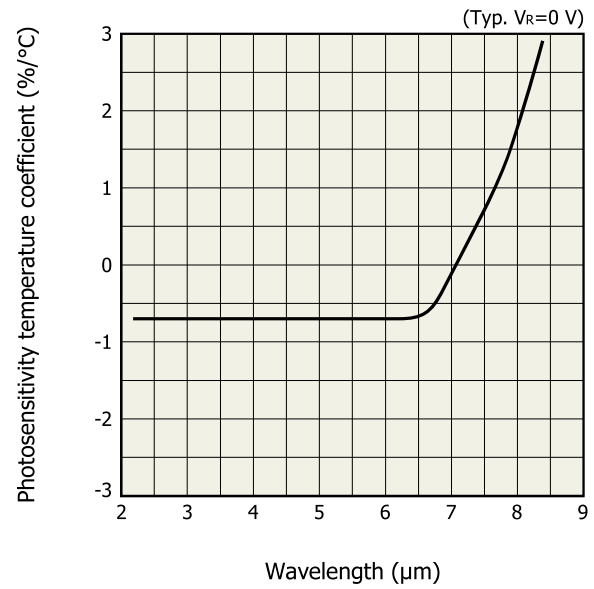
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Peak sensitivity wavelength	λ_p		-	6.5	-	μm
Cutoff wavelength	λ_c		8.0	8.3	-	μm
Photosensitivity	S	$\lambda = \lambda_p$	5.3	6.1	-	mA/W
Shunt resistance	Rsh	$V_R = 10 \text{ mV}$	4.9	8.3	-	$\text{k}\Omega$
Terminal capacitance	Ct	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$	-	0.8	-	pF
Detectivity	D^*	$(\lambda_p, 1200, 1)$	2.0×10^8	3.0×10^8	-	$\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$
Noise equivalent power	NEP	$\lambda = \lambda_p$	-	2.0×10^{-10}	2.7×10^{-10}	$\text{W}/\text{Hz}^{1/2}$
Rise time	t_r	$V_R = 0 \text{ V}, R_L = 50 \Omega,$ $10 \text{ to } 90\%$	-	3	10	ns

Spectral response (D^*)



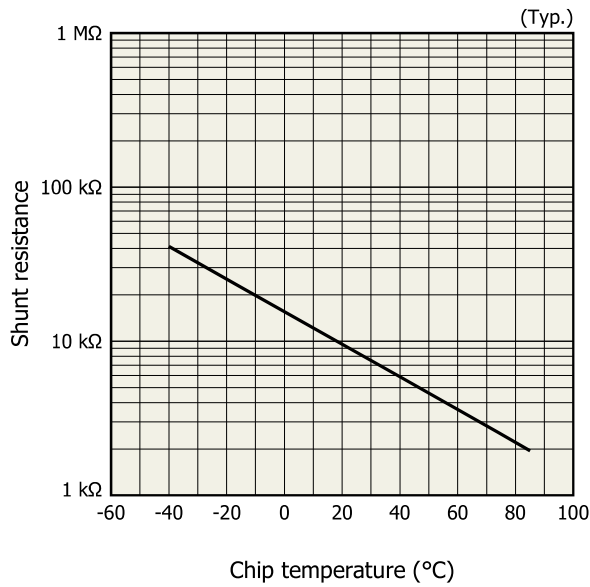
KIRD80720EA

Photosensitivity temperature characteristics



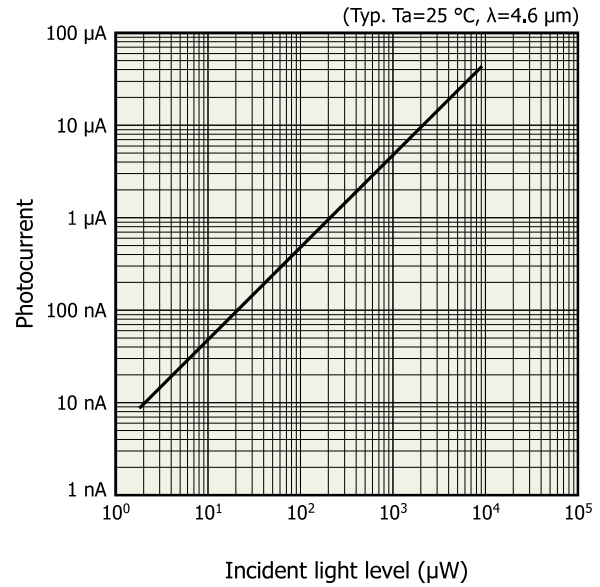
KIRD80721EA

Shunt resistance vs. chip temperature



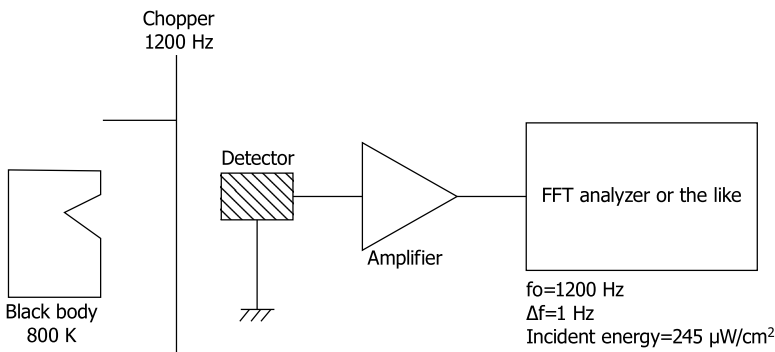
KIRDB0722EA

Linearity



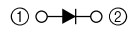
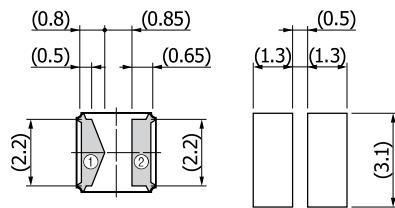
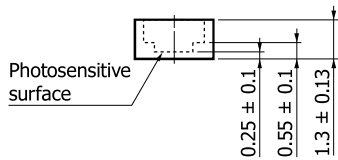
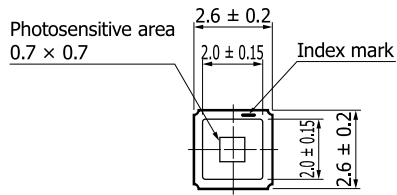
KIRDB0723EA

Block diagram for characteristic measurement



KIRDC0125EA

Dimensional outline (unit: mm)



Recommended land pattern
Values in parentheses
indicate reference values.

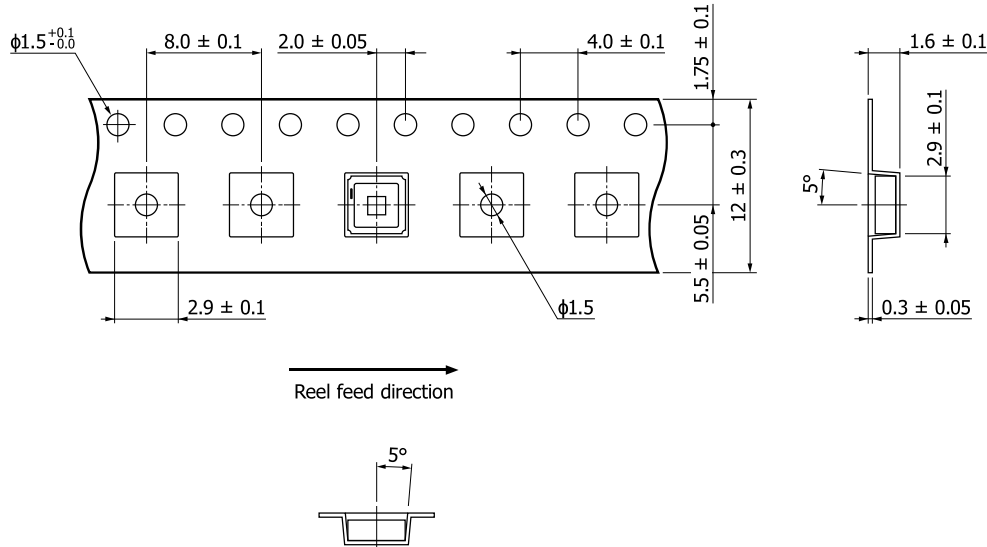
KIRDA0285EB

Standard packing specifications

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
φ180 mm	φ60 mm	12 mm	PS	Conductive

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



KLED0143EA

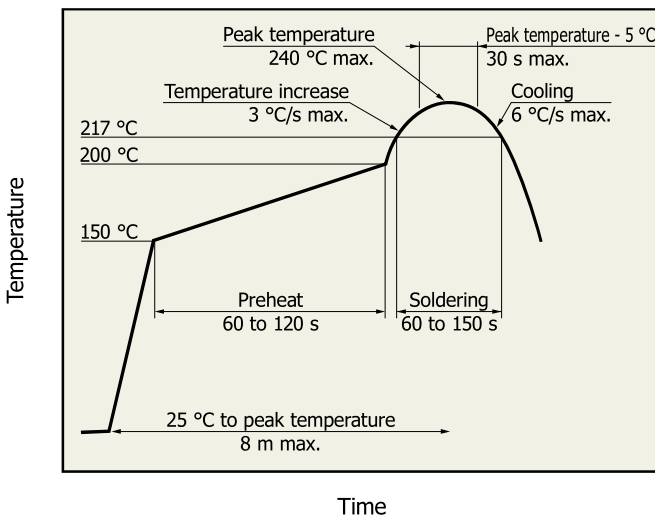
■ Packing quantity

100 pcs/reel

■ Packing state

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

Recommended reflow soldering conditions



KSPD0418EA

- After unpacking, keep it in an environment at 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 1 year.
- 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.

Related information

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

- Precautions
 - Disclaimer
 - Safety consideration
 - Surface mount type products
 - Unsealed products
 - Compound opto-semiconductors (photosensors, light emitters)
- Technical note
 - Compound semiconductor photosensors



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InAsSb photovoltaic detectors



[With band-pass filter]

P13243 series

Infrared detectors with band-pass filter (3.3 μm, 3.9 μm, 4.26 μm, 4.45 μm)

These are InAsSb photovoltaic detectors that use a band-pass filter for the window. Types using a band-pass filter with a center wavelength of 3.3 μm, 3.9 μm, or 4.26 μm are suitable for gas measurement, and a type using a band-pass filter of 4.45 μm is suitable for flame monitoring. These are environmentally friendly infrared detectors and do not use lead, mercury, or cadmium, which are substances restricted by the RoHS Directive. They are replacements for conventional products containing these substances. A two-element type that can detect two wavelengths is also available.

Features

- High sensitivity
- High-speed response
- High shunt resistance
- Compact, surface mount ceramic package
- Compatible with lead-free solder reflow (ceramic package)

Applications

- Gas measurement (CH₄, CO₂)
- Flame monitors (CO₂ resonance radiation)

Option (sold separately)

- Amplifier for infrared detector **C4159-01**

Structure

Type no.	Window material*1	Package	Cooling	Photosensitive area (mm)	Field of view FOV (degrees)		
P13243-033CF	BPF (3.3 μm)	Ceramic	Non-cooled	0.7 × 0.7	90		
P13243-033MF	BPF (3.3 μm)	TO-46			82		
P13243-039CF	BPF (3.9 μm)	Ceramic			90		
P13243-039MF	BPF (3.9 μm)	TO-46			82		
P13243-043CF	BPF (4.26 μm)	Ceramic			90		
P13243-043MF	BPF (4.26 μm)	TO-46			82		
P13243-045CF	BPF (4.45 μm)	Ceramic			90		
P13243-045MF	BPF (4.45 μm)	TO-46			82		
P13243-015CF	BPF (3.3 μm)	Ceramic					90
	BPF (3.9 μm)						
P13243-016CF	BPF (4.26 μm)						
	BPF (3.9 μm)						

*1: BPF: Band-pass filter

▣ Absolute maximum ratings

Type no.	Reverse voltage V_R (V)	Operating temperature T_{opr}^{*2} (°C)	Storage temperature T_{stg}^{*2} (°C)	Incident light level (W/cm ²)	Soldering temperature T_{sol} (°C)
P13243-033CF	1	-40 to +85	-40 to +85	1	240 (once) ^{*3}
P13243-033MF					-
P13243-039CF					240 (once) ^{*3}
P13243-039MF					-
P13243-043CF					240 (once) ^{*3}
P13243-043MF					-
P13243-045CF					240 (once) ^{*3}
P13243-045MF					-
P13243-015CF					240 (once) ^{*3}
P13243-016CF					240 (once) ^{*3}

*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 may cause deterioration in characteristics and reliability.

*3: Reflow soldering, JEDEC J-STD-020 MSL 2, 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 (Typ. $T_a=25\text{ }^\circ\text{C}$, unless otherwise noted)

Type no.	Center wavelength CWL			Spectral response half width FWHM		Photosensitivity S^{*4} $\lambda=CWL$ (mA/W)	Shunt resistance R_{sh} $V_R=10\text{ mV}$ (k Ω)	Detectivity D^* (CWL, 1200, 1)		Noise equivalent power NEP $\lambda=CWL$		Rise time t_r^{*5} (ns)	Terminal capacitance C_t^{*6} (pF)
	Min. (nm)	Typ. (nm)	Max. (nm)	Typ. (nm)	Max. (nm)			Min. (cm \cdot Hz ^{1/2} /W)	Typ. (cm \cdot Hz ^{1/2} /W)	Typ. (W/Hz ^{1/2})	Max. (W/Hz ^{1/2})		
P13243-033CF	3270	3300	3330	160	180	2.3	300	4.1 × 10 ⁸	5.1 × 10 ⁸	1.4 × 10 ⁻¹⁰	1.7 × 10 ⁻¹⁰	15	0.7
P13243-033MF													
P13243-039CF	3820	3900	3980	90	110	3.0		5.2 × 10 ⁸	6.5 × 10 ⁸	1.1 × 10 ⁻¹⁰	1.3 × 10 ⁻¹⁰		
P13243-039MF													
P13243-043CF	4217	4260	4303	140	160	3.1		5.5 × 10 ⁸	6.9 × 10 ⁸	1.0 × 10 ⁻¹⁰	1.3 × 10 ⁻¹⁰		
P13243-043MF													
P13243-045CF	4400	4450	4500	350	400	3.7		6.5 × 10 ⁸	8.2 × 10 ⁸	8.5 × 10 ⁻¹¹	1.1 × 10 ⁻¹⁰		
P13243-045MF													
P13243-015CF	3270	3300	3330	160	180	2.3		4.1 × 10 ⁸	5.1 × 10 ⁸	1.4 × 10 ⁻¹⁰	1.7 × 10 ⁻¹⁰		
P13243-015MF													
P13243-016CF	4217	4260	4303	140	160	3.1	5.5 × 10 ⁸	6.9 × 10 ⁸	1.0 × 10 ⁻¹⁰	1.3 × 10 ⁻¹⁰			
P13243-016MF											3820	3900	3980

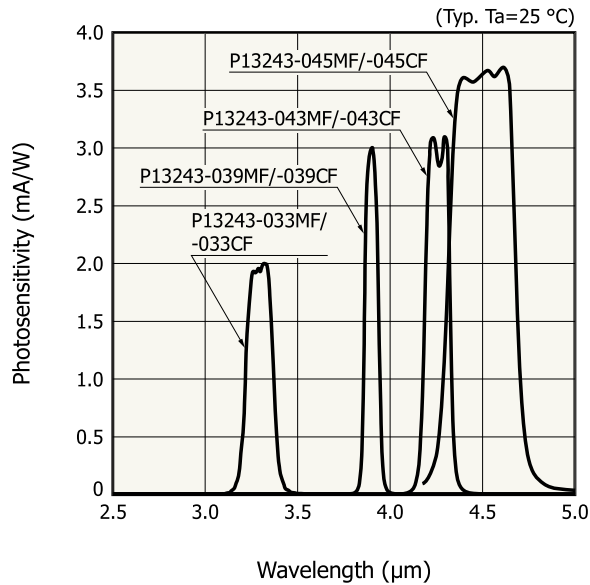
*4: Uniform irradiation on the entire photosensitive area

*5: $V=0\text{ V}$, $R_L=50\text{ }\Omega$, 10 to 90%, $\lambda=1.55\text{ }\mu\text{m}$

*6: $V_R=0\text{ V}$, $f=1\text{ MHz}$

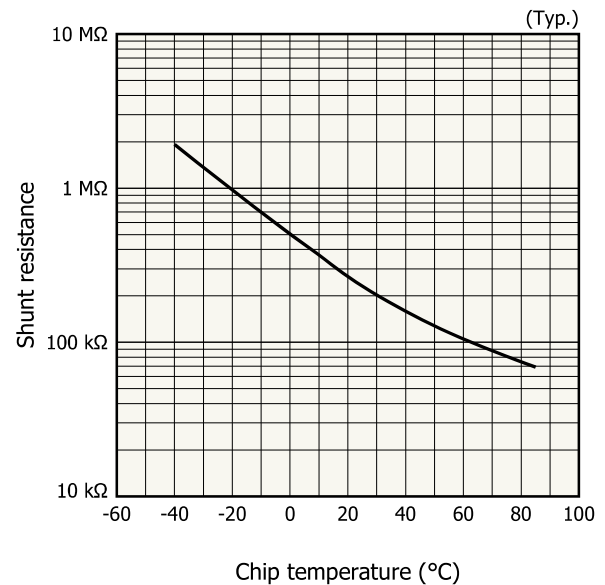
Note: Uniform irradiation must be applied to the entire photosensitive area during use.

Spectral response



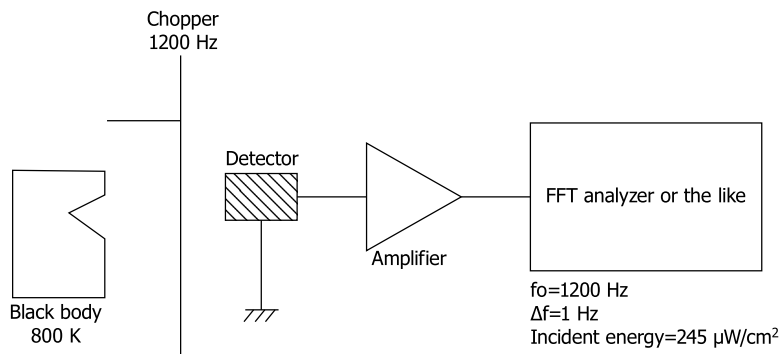
KIRDB0676EB

Shunt resistance vs. chip temperature



KIRDB0675EA

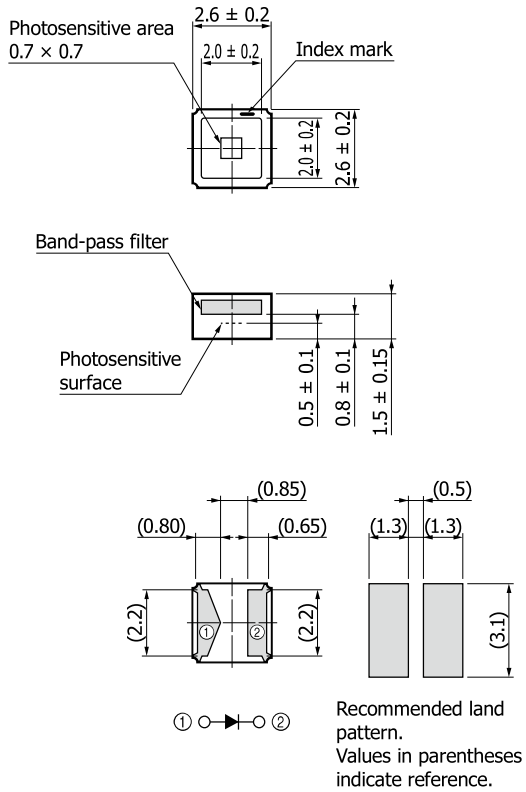
Measurement circuit example



KIRDC0125EB

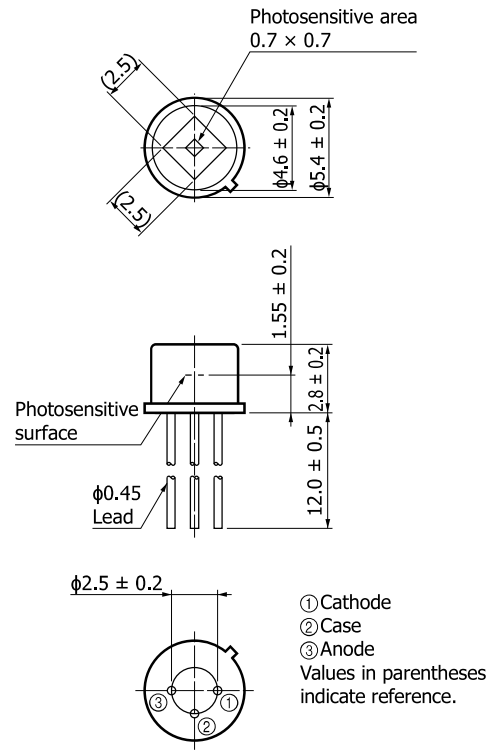
Dimensional outlines (unit: mm)

P13243-033CF/-039CF/-043CF/-045CF



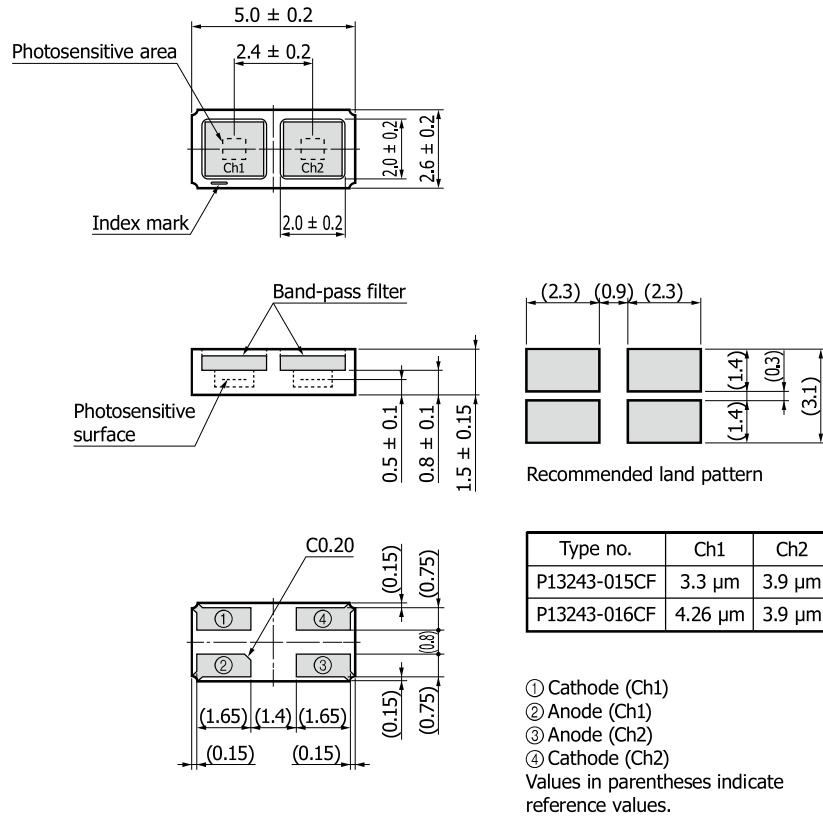
KIRDA0266EC

P13243-033MF/-039MF/-043MF/-045MF



KIRDA0249EF

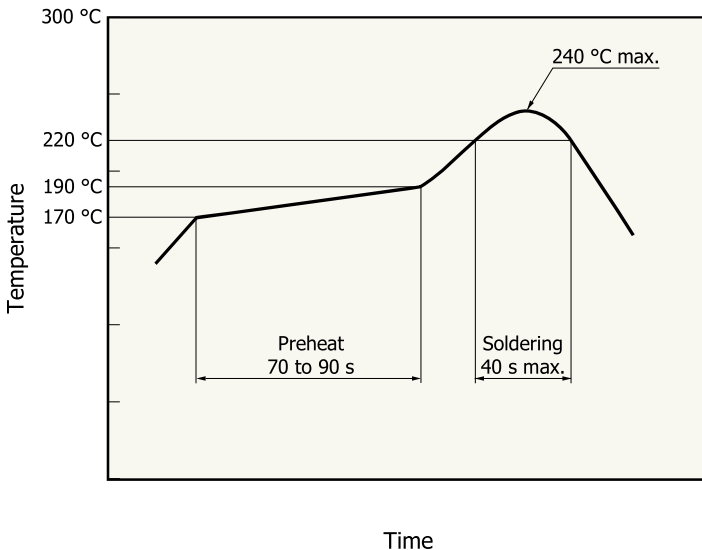
P13243-015CF/-016CF



KIRDA0267ED

Recommended soldering conditions

P13243-033CF/-039CF/-043CF/-045CF/-015CF/-016CF



- After unpacking, store the device in an environment at a temperature range of 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 1 year.
- 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.

KIRDB0648EB

P13243-033MF/-039MF/-043MF/-045MF

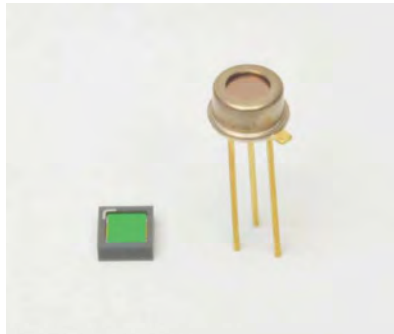
- Solder temperature: 240 °C max. (10 s or less, once)
 - Solder the leads at a point at least 1 mm away from the package body.
- Note: When you set soldering condition, check that problems do not occur in the product by testing out the condition in advance.

Related information

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

- Precautions
 - Disclaimer
 - Metal, ceramic, plastic package products
 - Compound opto-semiconductors (photosensors, light emitters)
- Technical information
 - Compound semiconductor photosensors / Technical note

[Related products] Mid infrared LEDs L15893/L15894/L15895 series



The L15893/L15894/L15895 series are mid infrared LEDs with the peak emission wavelength of 3.3 μm , 3.9 μm , and 4.3 μm respectively, manufactured using Hamamatsu unique crystal growth and process technologies.

Type no.	Package
L15893-0330C, L15894-0390C, L15895-0430C	Ceramic
L15893-0330M, L15894-0390M, L15895-0430M	Metal



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tel: 617-566-3821 | boselec@boselec.com

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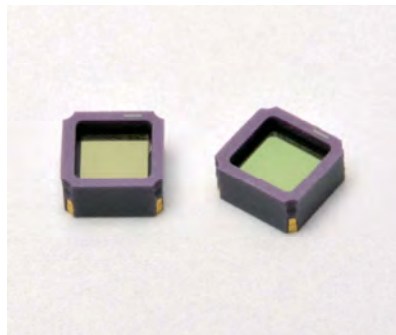
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InAsSb photovoltaic detector



P16612-011CA

Back-illuminated type infrared detector up to 5 μm band

The P16612-011CA is an infrared detector that has high sensitivity in the spectral band up to 5 μm . This high sensitivity has been achieved due to Hamamatsu's unique crystal growth technology and process technology. By using a back-illuminated structure, we greatly improved the sensitivity temperature coefficient compared to the front-illuminated type (P13243-013CA). This product is an environmentally friendly infrared detector and does not use lead, mercury, or cadmium, which are substances restricted by the RoHS directive. It is a replacement for conventional products that contain these substances.

Features

- High sensitivity
- High-speed response
- High shunt resistance
- Compact, surface mount type ceramic package
- Compatible with lead-free solder reflow
- RoHS compliant (lead, mercury, cadmium free)

Applications

- Gas detection (CH₄, CO₂, CO, etc.)
- Radiation thermometers
- Flame detection (CO₂ resonance radiation)

Option (sold separately)

- Amplifier for infrared detector **C4159-01**

Structure

Parameter	Specification	Unit
Window material	Si with AR coating	-
Package	Ceramic	-
Photosensitive area	0.7 × 0.7	mm
Field of view	86	degree

Absolute maximum rating

Parameter	Symbol	Value	Unit
Reverse voltage	V _R	1	V
Operating temperature*1	T _{opr}	-40 to +85	°C
Storage temperature*1	T _{stg}	-40 to +85	°C
Soldering temperature	T _{sol}	240 (once)*2	°C

*1: 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.

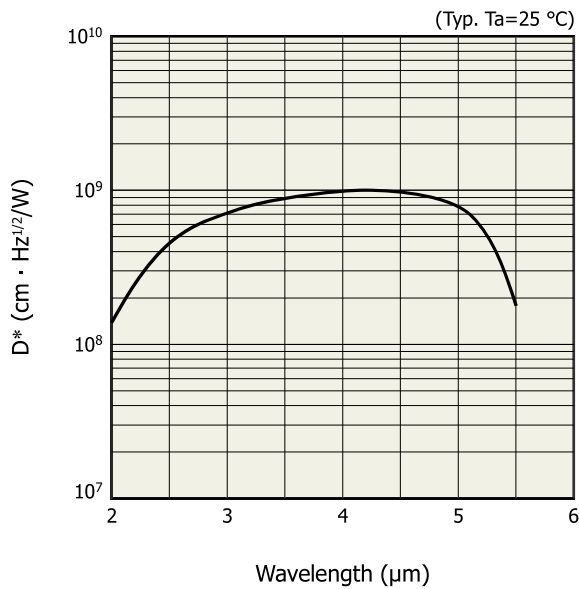
*2: Reflow soldering, JEDEC J-STD-020 MLS 2, see P.5

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)

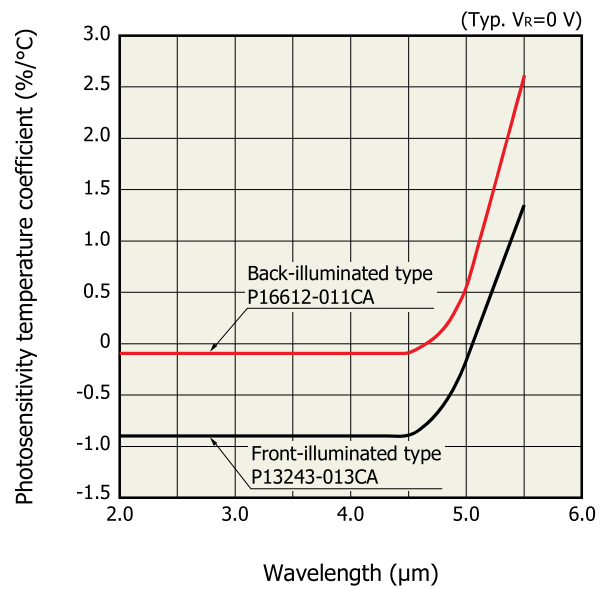
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Peak sensitivity wavelength	λ_p		-	4.1	-	μm
Cutoff wavelength	λ_c		5	5.3	-	μm
Photosensitivity	S	$\lambda = \lambda_p$	3.5	4.5	-	mA/W
Shunt resistance	Rsh	$V_R = 10 \text{ mV}$	80	180	-	k Ω
Terminal capacitance	Ct	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$	-	0.5	-	pF
Detectivity	D^*	$(\lambda_p, 1200, 1)$	7.4×10^8	1.0×10^9	-	cm $\cdot\text{Hz}^{1/2}/\text{W}$
Noise equivalent power	NEP	$\lambda = \lambda_p$	-	4.3×10^{-11}	6.5×10^{-11}	W/Hz $^{1/2}$
Rise time	tr	$V_R = 0 \text{ V}, R_L = 50 \Omega,$ 10 to 90%	-	15	25	ns

Spectral response (D^*)



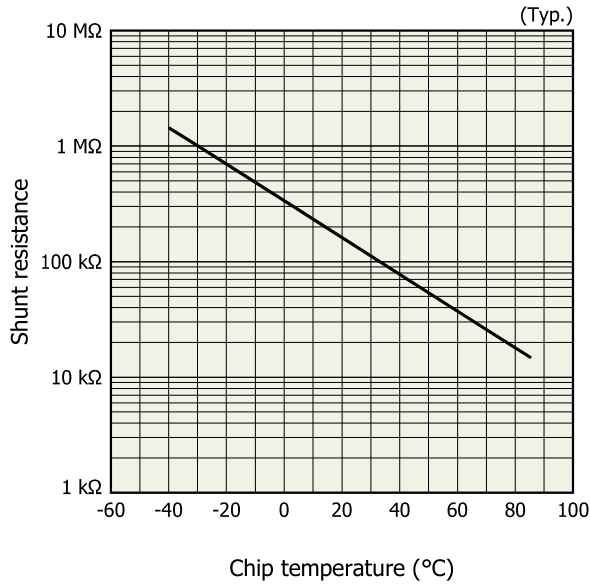
KIRDB0715EA

Photosensitivity temperature characteristics



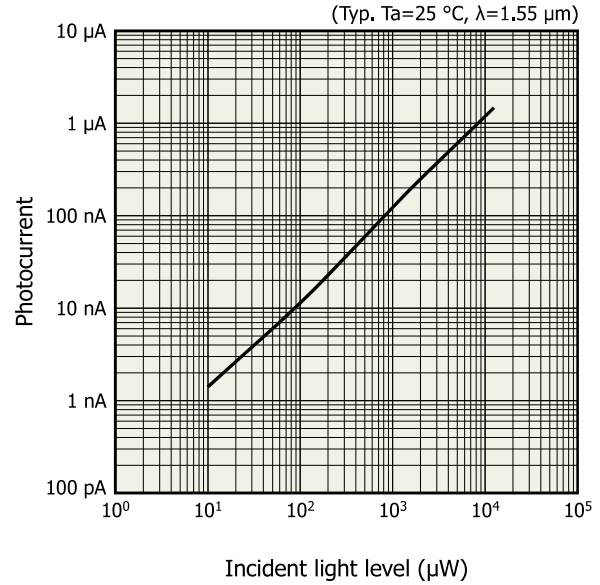
KIRDB0716EA

Shunt resistance vs. chip temperature



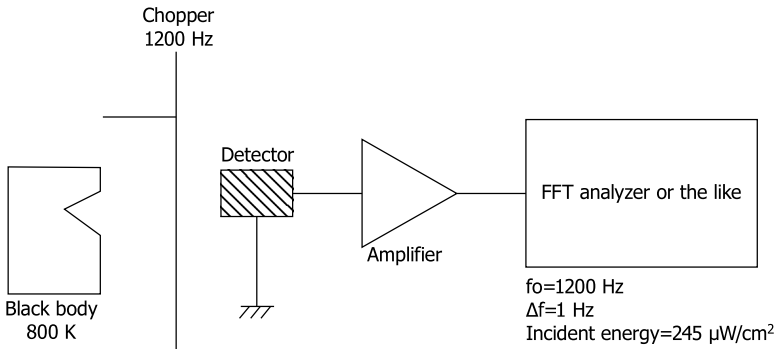
KIRDB0717EA

Linearity



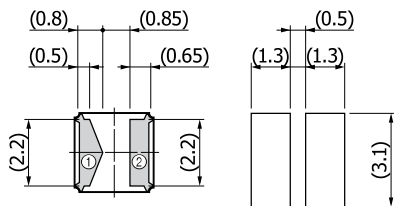
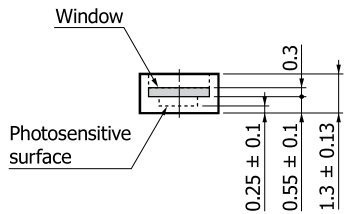
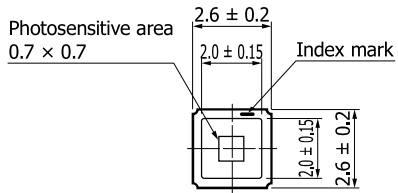
KIRDB0718EA

Block diagram for characteristic measurement



KIRDC0125EA

Dimensional outline (unit: mm)



Recommended land pattern
Values in parentheses indicate reference values

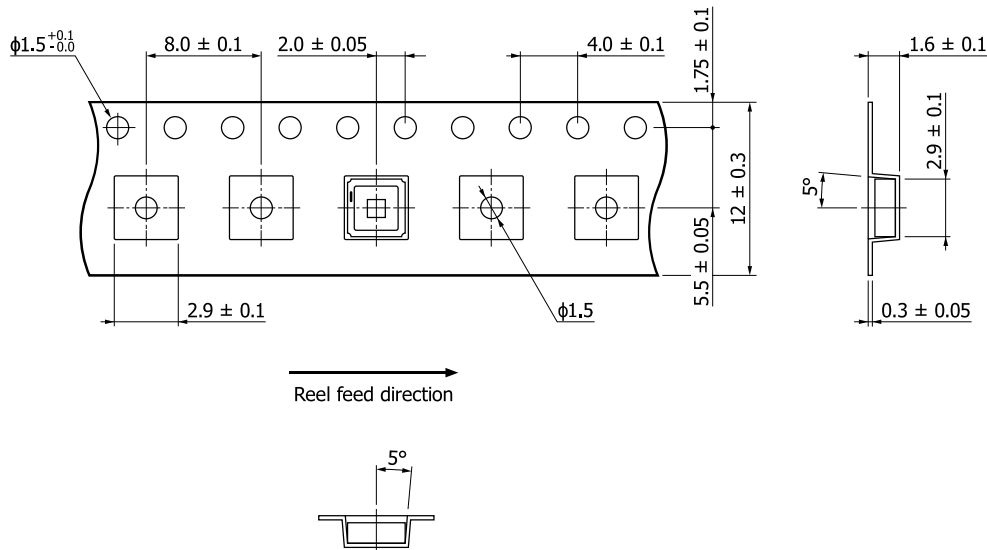
KIRDA0281EA

Standard packing specifications

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
φ180 mm	φ60 mm	12 mm	PS	Conductive

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



KLEDC0143EA

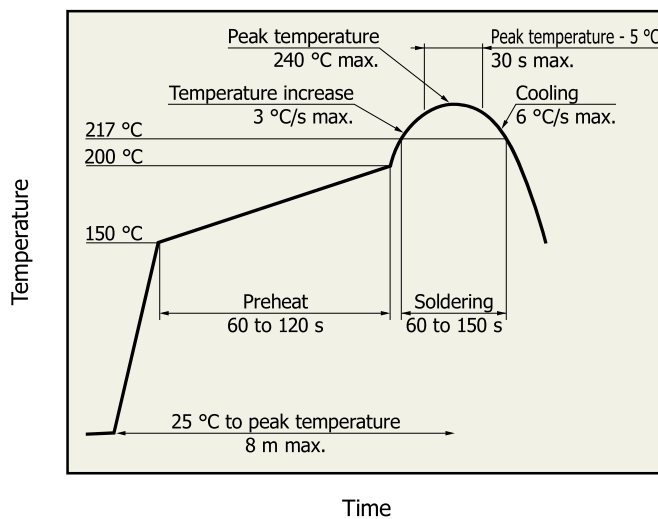
■ Packing quantity

500 pcs/reel

■ Packing state

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

Recommended reflow soldering conditions

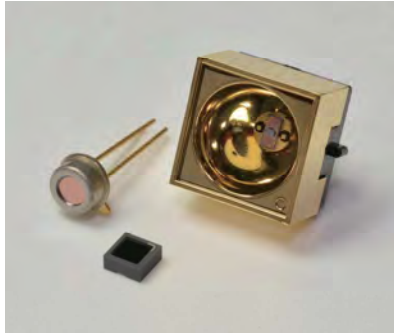


KSPDB0418EA

- After unpacking, keep it in an environment at 5 to 30 °C and a humidity of 60% or less, and perform soldering within 1 year.
- 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.

Related products

Mid infrared LEDs L15893/L15894/L15895 series



Hamamatsu's unique crystal growth and process technologies enable mid infrared LEDs with peak emission wavelengths of 3.3 μm , 3.9 μm , and 4.3 μm .

Type no.	Package
L15893-0330C, L15894-0390C, L15895-0430C	Ceramic
L15893-0330M, L15894-0390M, L15895-0430M	TO-46
L15893-0330ML, L15894-0390ML, L15895-0430ML	TO-46 with reflector

Related information

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

- Precautions
 - Disclaimer
 - Compound opto-semiconductors (photosensors, light emitters)
- Technical information
 - Compound semiconductor photosensors / Technical note



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Infrared detector modules with preamp

Metal dewar type

High sensitivity modules of easy-to-use

These devices combine a dewar type detector with a compatible preamplifier, and easily operate to detect infrared radiation just by connecting to a DC power supply. InGaAs, InSb, and Type II superlattice detectors are provided as standard devices (liquid nitrogen cooling). Custom-designed devices with different active areas, FOV or amplifier gain, etc. are also available to meet your specific needs.

Features

- **Compact integral detector unit**
- **Optimum connections between the detector element and preamplifier allow amplified signals to be easily obtained.**

Required power supply specifications

- G7754 series, P7751 series: ± 15 V (± 12.0 to ± 17.5 V can also be used)
- Current capacity: 1.5 times or more of each module's maximum current consumption
- Ripple noise: 5 mVp-p or less
- Analog power supply only
- Recommended DC power supplies: PW18-3AD (TEXIO)
E3630A (Keysight Technologies)

Applications

- **Infrared detection**

Accessories

- **Cable (for DC power supply):**
2 m (connector installed at one end) **A4372-02**
- **BNC-BNC coaxial cable (for signal output): 2 m**
- **Instruction manual**

Specifications / Absolute maximum ratings

Type no.	Detector element	Photo-sensitive area (mm)	External power supply*1				Absolute maximum ratings		
			Supply voltage (V)			Supply capacitance (mA)	External input voltage (V)	Operating temperature Topr (°C)	Storage temperature Tstg (°C)
			Min.	Typ.	Max.				
G7754-01	InGaAs (G12183-010 chip)	$\phi 1$	± 12.0	± 15.0	± 17.5	± 23	± 18	0 to +40	-20 to +50
G7754-03	InGaAs (G12183-030 chip)	$\phi 3$							
P7751-01	InSb (P5968-060)	$\phi 0.6$				± 30			
P7751-02	InSb (P5968-200)	$\phi 2$							
C15780-401	Type II superlattice (P15409-901)	$\phi 0.1$	± 14.5	± 15.0	± 15.5	+45, -30			

*1: Use only an analog power supply.

Note: Nitrogen hold time: 12 hours or more (at the time of shipment)

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. Ta=25 °C)

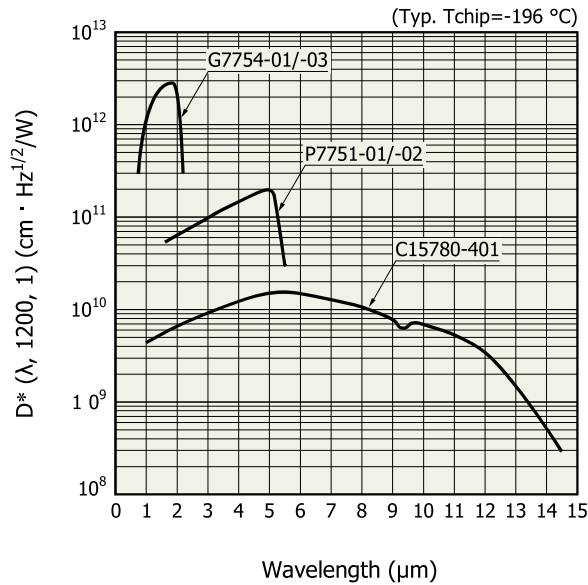
Type No.	Measurement condition	Peak sensitivity wavelength λ_p (μm)	Cutoff wavelength λ_c (μm)	Photo-sensitivity S $\lambda = \lambda_p$ *2 (V/W)	Noise equivalent power NEP $\lambda = \lambda_p$ (W/Hz ^{1/2})	Cutoff frequency f_c (Hz)	Output impedance (Ω)	Maximum output voltage $R_L = 1 \text{ k}\Omega$ (V)	Maximum current consumption*3 (mA)
	Element temperature T ($^{\circ}\text{C}$)								
G7754-01	-196	2.0	2.4	2×10^9	3×10^{-14}	2 to 500	50	± 10	± 15
G7754-03				5×10^8	1.5×10^{-13}	2 to 500		± 10	± 15
P7751-01*4		5.3	5.5	3×10^8	3×10^{-13}	5 to 10000		± 10	± 20
P7751-02*4				1.5×10^8	1×10^{-12}	5 to 12000		± 10	± 20
C15780-401*4		5.4	14.5	2×10^6	5.5×10^{-12}	7 to 100000		± 14	+30, -20

*2: $f = 100 \text{ Hz}$ (G7754-01, G7754-03), $f = 1.2 \text{ kHz}$ (P7751-01, P7751-02, C15780-401)

*3: $V_s = \pm 15 \text{ V}$

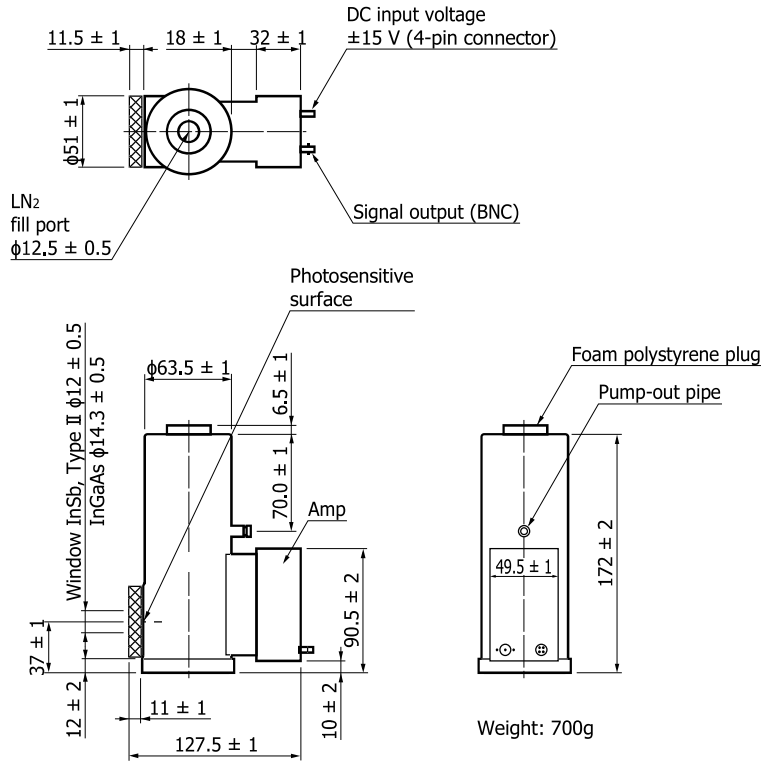
*4: $\text{FOV} = 60^{\circ}$

Spectral response



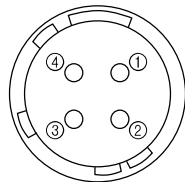
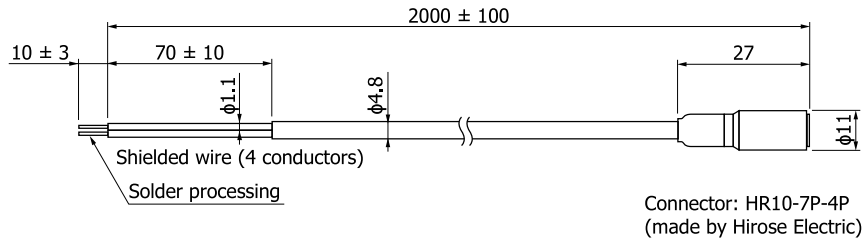
KIRD80076E1

Dimensional outline (unit: mm)



KIRDA0010EE

Cable (for DC power supply) A4372-02



Pin no.	Pin connection	Lead color
①	-Vs	Blue
②	GND	Black/white/blue stranded wire
③	GND	
④	+Vs	White

KIRDA0196EB

❏ Precaution for use

- The detector should not be placed horizontally during use.
- Using these detectors in an environment subjected to vibration may cause microphonic noise. Take measures to prevent vibration as needed.

❏ Related information

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

■ Precautions

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

■ Technical information

- Compound semiconductor photosensors / Technical note



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Type II superlattice infrared detector



P15409-901

High sensitivity, high-speed response infrared detector up to 14 μm band

P15409-901 is a Type II superlattice infrared detector with a sensitivity extended up to 14 μm band using Hamamatsu unique crystal growth technology and process technology. This product is environmentally friendly; it does not use lead, mercury or cadmium which are substances restricted by the RoHS Directive. Therefore, it is the replacement for conventional products that contain these substances.

Feature

- High sensitivity
- High-speed response
- Excellent linearity

Applications

- FTIR
- Gas detection
- Radiation thermometers

Option (sold separately)

- Amplifier for infrared detector **C4159-01**

Structure

Parameter	Specification	Unit
Window material	ZnSe	-
Package	Metal dewar	-
Cooling	Liquid nitrogen	-
Photosensitive area	φ0.1	mm

Absolute maximum ratings

Parameter	Symbol	Value	Unit
Reverse voltage	V _R	0.1	V
Operating temperature*1	T _{opr}	-40 to +60	°C
Storage temperature*1	T _{stg}	-55 to +60	°C

*1: 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.

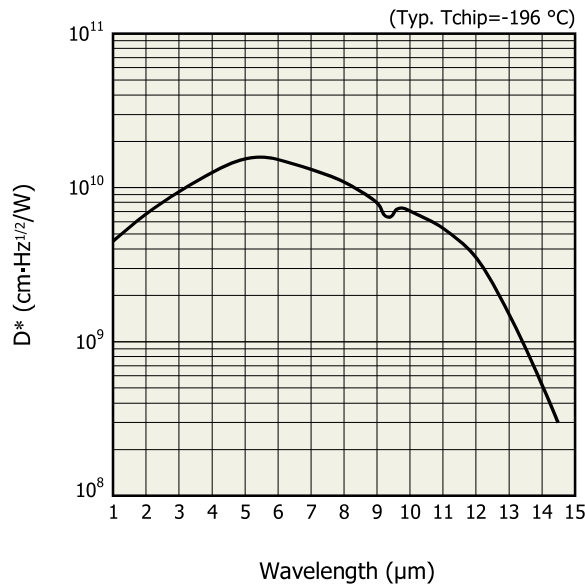
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical and optical characteristics (Tchip=-196 °C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitivity wavelength	λ_p		-	5.4	-	μm
Cutoff wavelength*2	λ_c		-	14.5	-	μm
Photosensitivity	S	$\lambda=\lambda_p$	-	2.6	-	A/W
Shunt resistance	Rsh	$V_R=10\text{ mV}$	-	2.5	-	k Ω
Terminal capacitance	Ct	$V_R=0\text{ V}, f=1\text{ MHz}$	-	50	-	pF
Detectivity	D*	$(\lambda_p, 1200, 1)$	5.0×10^9	1.6×10^{10}	-	$\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$
Noise equivalent power	NEP	$\lambda=\lambda_p$	-	5.5×10^{-12}	1.8×10^{-11}	$\text{W}/\text{Hz}^{1/2}$
Rise time	tr	$V_R=0\text{ V}, R_L=50\ \Omega,$ 0 to 63%	-	150	-	ns

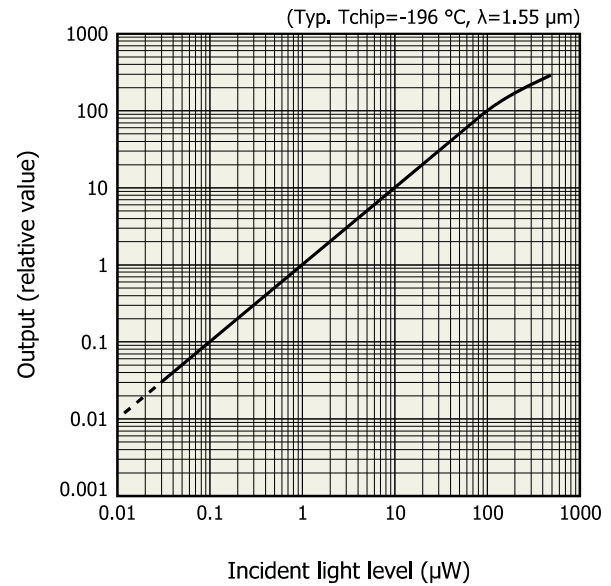
*2: Wavelength at which signal/noise=1

Spectral response (D*)



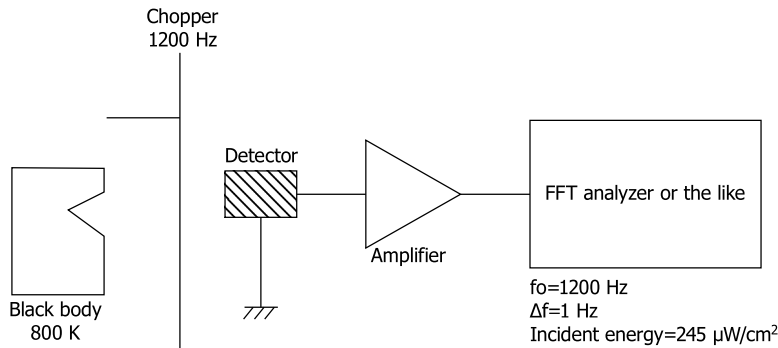
KIRD80673EB

Linearity



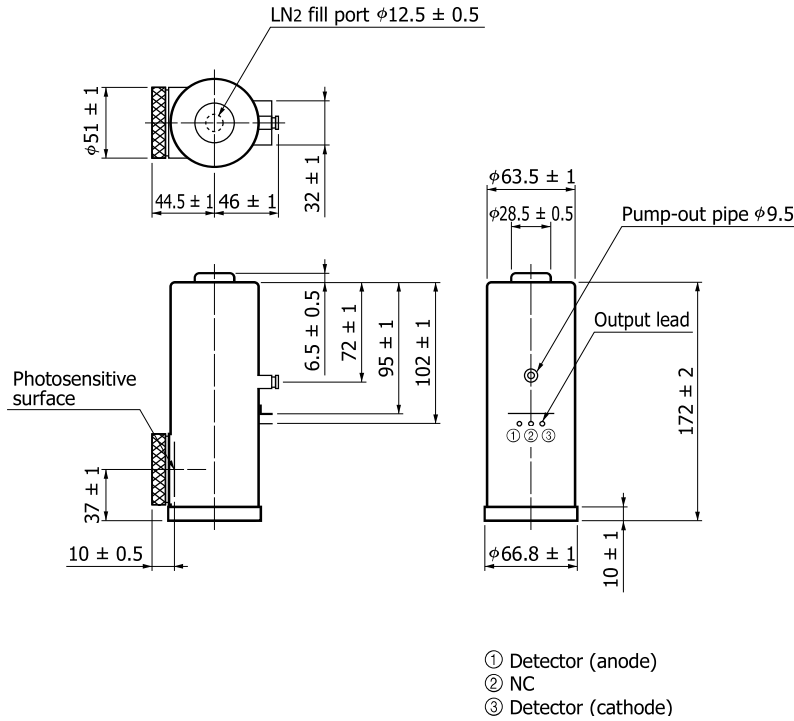
KIRD80677EB

Block diagram for characteristics measurement



KIRD0127EA

■ Dimensional outline (unit: mm)



KIRDA0190ED

■ Related information

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

■ Precaution

- Disclaimer

■ Technical information

- Compound semiconductor photosensors / Technical note



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