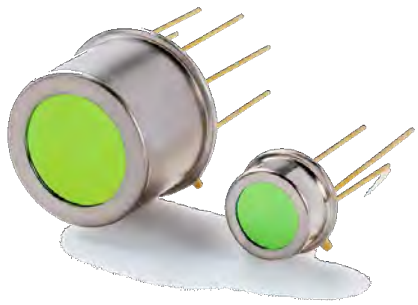
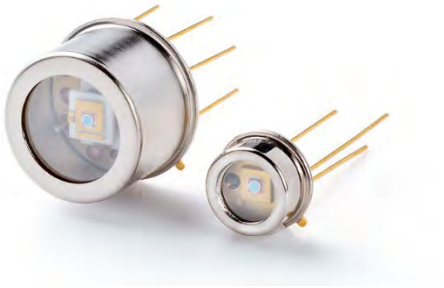
Boston Electronics

Infrared Detectors & Modules





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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	
					Vcc*1 (V)	Vp*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)					
C12492-210	InAs (P10090-21)		Sapphire glass	2 × 2		
C12494-222S	InAsSb (P13243-222MS)					
C12494-210S	InAsSb (P11120-201)		AR coated Ge	ϕ1		
C12494-210M	InAsSb (P12691-201G)					
C12494-211L	InAsSb (P13894-211MA)			1 × 1		

*1: Vcc=power supply for circuit, Vp=power supply for cooling

Absolute maximum ratings

Type no.	Incident light level*2 (μW)	Supply voltage		Operating temperature*3 Topr (°C)	Storage temperature*3 Tstg (°C)
		Vcc (V)	Vp (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	14 mW				
C12494-210S	26				
C12494-210M					
C12494-211L	28 mW				

*2: The value at which the output voltage of each module is maximized when light with the maximum sensitivity wavelength λp enters the device. This value does not cause immediate failure.
However, if light that destroys the device (1 W/cm^2 for all elements) enters the device, it may cause a drop in product quality.
*3: 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. Ta=25 °C, unless otherwise noted)

Type no.	Chip temperature at rated supply voltage Tchip (°C)	Peak sensitivity wavelength λp (μm)	Cutoff wavelength λc (μm)	Photosensitivity*4 S λ=λp		Noise equivalent power NEP λ=λp	
				Min. (V/W)	Typ. (V/W)	Typ. (W/Hz$^{1/2}$)	Max. (W/Hz$^{1/2}$)
C12483-250	-15	1.55	1.66	3.3×10^7	5.8×10^7	5.2×10^{-14}	7×10^{-13}
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		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	$2.5 \times 10^{2*5}$	$3.5 \times 10^{2*5}$	1.5×10^{-9}	4.5×10^{-9}

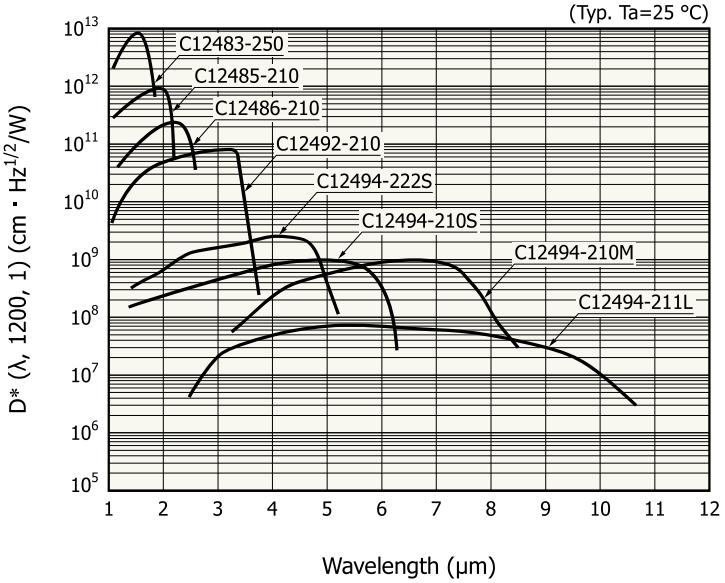
*4: f=100 Hz (C12483-250, C12485-210, C12486-210), f=1.2 kHz (C12492-210, C12494-210S/-210M), f=600 Hz (C12494-211L/-222S)
*5: Uniform irradiation on the entire photosensitive area.

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

Type no.	Frequency response -3 dB (Hz)			Output impedance (Ω)	Maximum output voltage RL=1 kΩ (V)	Current consumption*6			
	FcL	FcH				Vcc		Vp	
	Typ.	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, -14	+80, -30	+600	
C12494-222S	DC	750 k	1 M		+10	+30, -20			
C12494-210S	5	80 k	100 k		±13				
C12494-210M									
C12494-211L	DC	750 k	1 M		+10			+500	

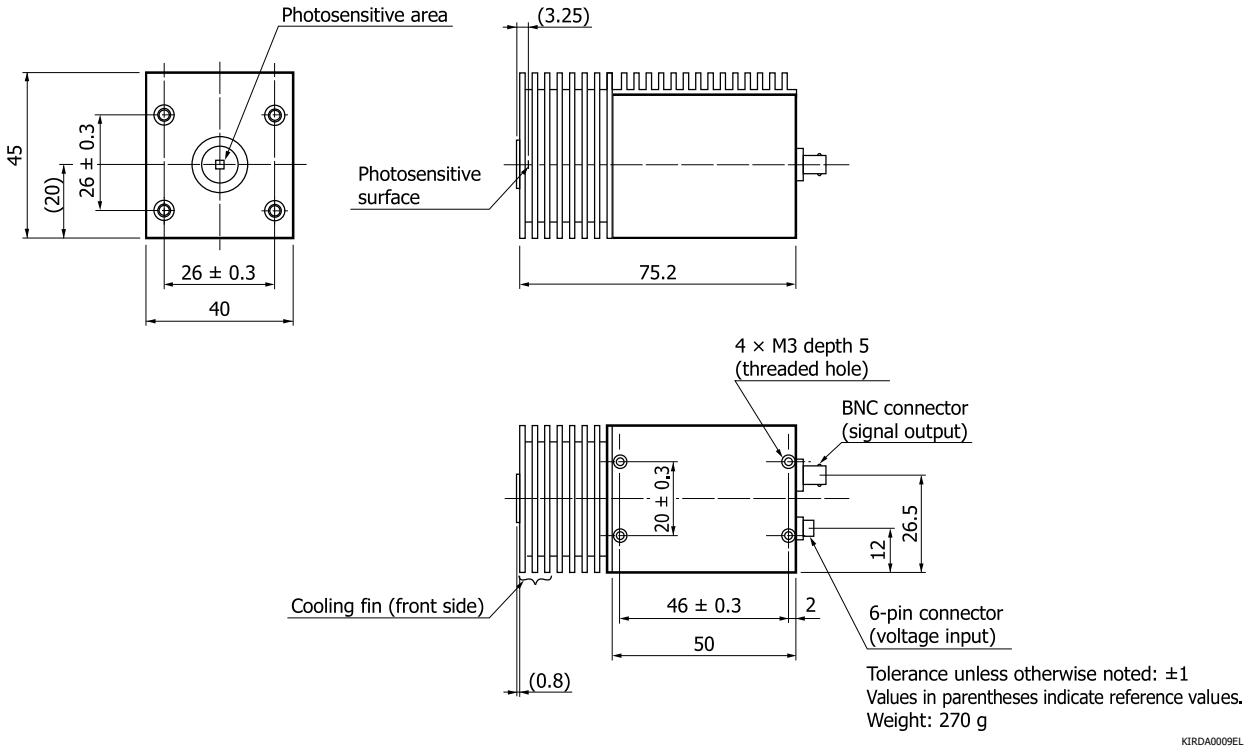
*6: Vcc=±15 V, Vp=2.5 V (C12485-210, C12486-210, C12483-250, C12492-210, C12494-210S/-222S/-210M/-211L)
Recommended DC power supply (analog power supply): PW18-1.3ATS (TEXIO Technology), E3630A (Keysight Technologies)
Current capacity: More than 1.5 times the maximum current consumption
Ripple noise: 5 mVp-p or less (±15 V, +2.5 V power supply)

Spectral response

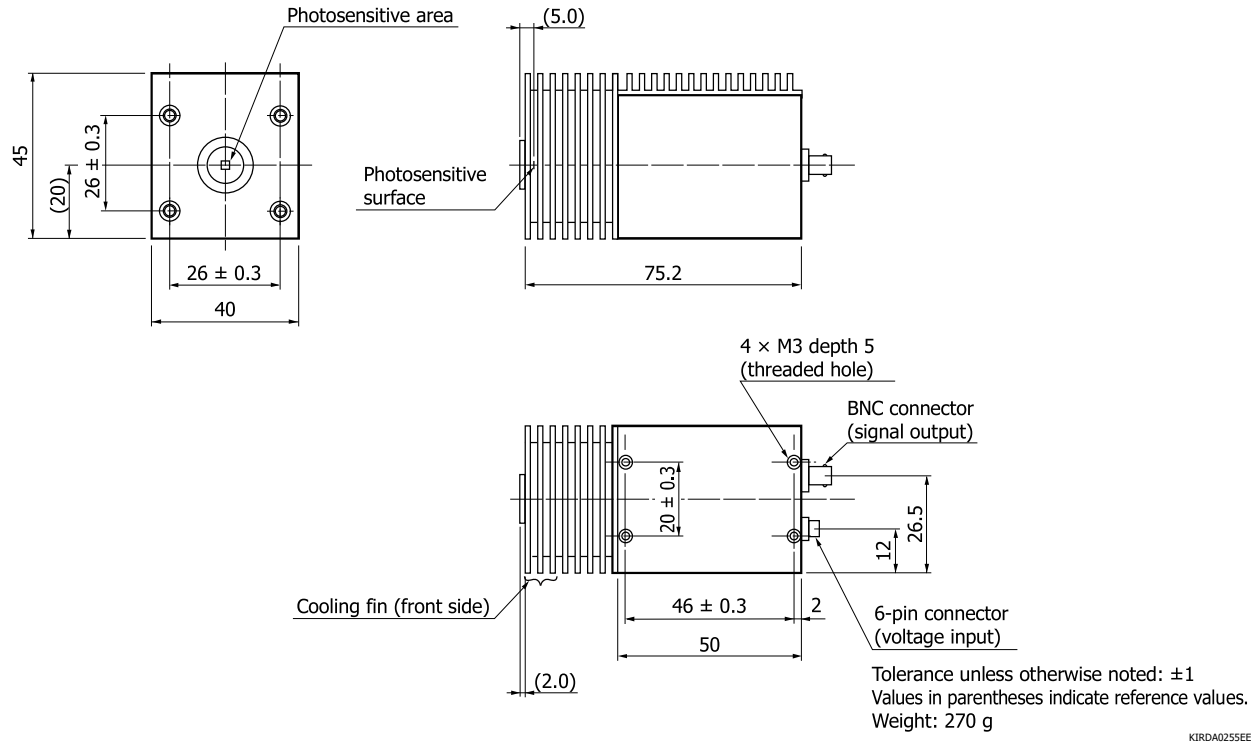


Dimensional outlines (unit: mm)

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

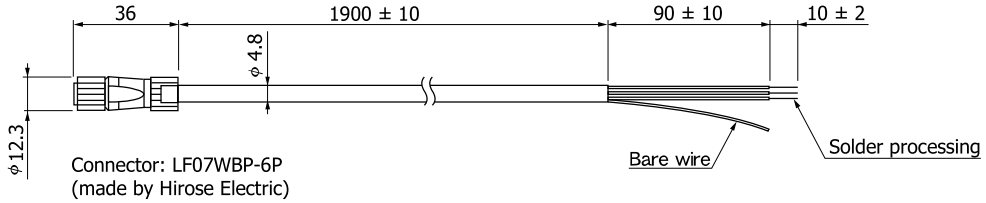


C12494-210M

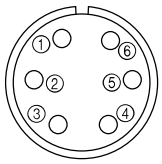


Note: The cooling fin (front side) is removable.

6-conductor cable (for DC power supply) A4372-07



Connector: LF07WBP-6P
(made by Hirose Electric)



Connector

Pin no.	Pin connection	Lead color
①	+2.5 V Power supply for cooling controller	Red
②	GND Power supply for cooling controller	Blue
③	Output for temperature monitor	Light green
④	+15 V	Yellow
⑤	-15 V	White
⑥	GND	Black

Note: The bare wire is for GND of the case.

Tolerance unless otherwise noted: ±1

KIRDA0241EC

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 / Opto-semiconductors
- Precautions / Compound opto-semiconductors (photosensors, light emitters)

■ Catalogs
- Selection guide / Infrared detectors
- Technical note / Compound semiconductor photosensors

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

Cat. No. KIRD1036E38 Mar. 2025 DN

Infrared detector modules with preamp

C17212-011, C17213-011, C17214-011

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

These are room-temperature modules with an integrated amplifier that can detect infrared light simply by connecting to a DC power supply. Using back-illuminated type InAsSb photodetectors, modules with wavelengths in the 5 µm, 8 µm, and 10 µm bands are available. We welcome requests for custom devices that suit your application.

Features

- **High-speed response: 10 MHz typ.**
- **Compact size**
- **Easy to use**
  Operates just by connecting to DC power supply
- **Circuit design optimized for detector characteristics**

Applications

- **High-speed gas analysis (combined with QCL)**
- **CO_2 laser monitor (C17214-011)**

Accessories

- **4-conductor cable (for DC power supply):**
  2 m (with one side connector) A4372-02
- **Instruction manual**

Structure

Type no.	Detector element	Window material	Photosensitive area (mm)	Supply voltage Vcc*1 (V)
C17212-011	InAsSb (P16112-011MA)	AR coated Si	0.7 × 0.7	±15 ± 0.5
C17213-011	InAsSb (P16113-011MN)	None		
C17214-011	InAsSb (P16114-011MN)			

*1: Vcc=power supply for circuit

Absolute maximum ratings

Type no.	Incident light level*2 (W)	Supply voltage Vcc (V)	Operating temperature Topr*3 (°C)	Storage temperature Tstg*3 (°C)
C17212-011	0.2	±18	0 to +40	-20 to +50
C17213-011	0.17			
C17214-011	0.2			

*2: The value at which the output voltage of each module is maximized when light with the maximum sensitivity wavelength λp enters the device. This value does not cause immediate failure.
However, if light that destroys the device (1 W/cm^2 for all elements) enters the device, it may cause a drop in product quality.
*3: 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.
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. Ta=25 °C, unless otherwise noted)

Type no.	Peak sensitivity wavelength λp (μm)	Cutoff wavelength λc (μm)	Photosensitivity*4 λ=λp		Noise equivalent power NEP λ=λp	
			Min. (V/W)	Typ. (V/W)	Typ. ($W/Hz^{1/2}$)	Max. ($W/Hz^{1/2}$)
C17212-011	4.1	5.3	35	50	1.5×10^{-9}	4.0×10^{-9}
C17213-011	6.5	8.3	45	60	2.0×10^{-9}	6.0×10^{-9}
C17214-011	7.4	11	35	50	2.0×10^{-9}	6.0×10^{-9}

*4: f=600 Hz

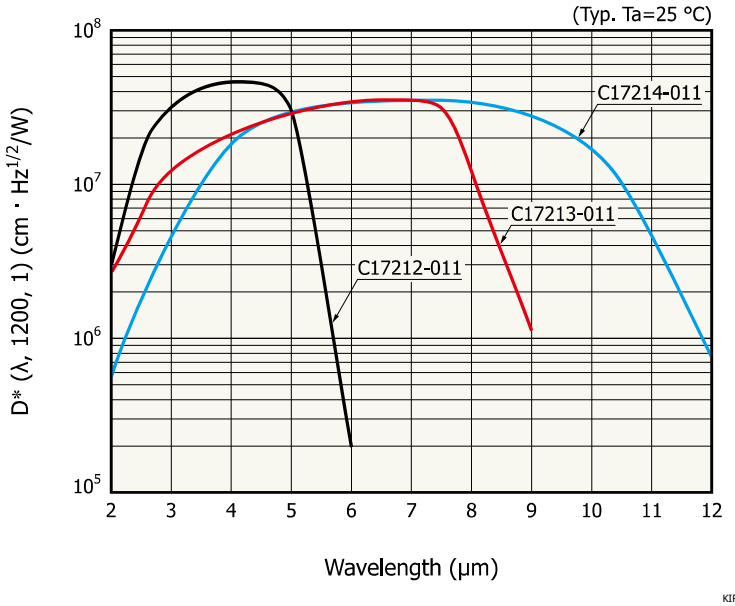
Electrical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Frequency response -3 dB		Output impedance (Ω)	Maximum output voltage RL=1 MΩ (V)	Current consumption*5 Vcc	
	FcL Typ. (Hz)	FcH Typ. (MHz)			Typ. (mA)	Max. (mA)
C17212-011	DC	10	50	10	±12	±18
C17213-011						
C17214-011						

*5: Vcc=±15 V
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 power supply)

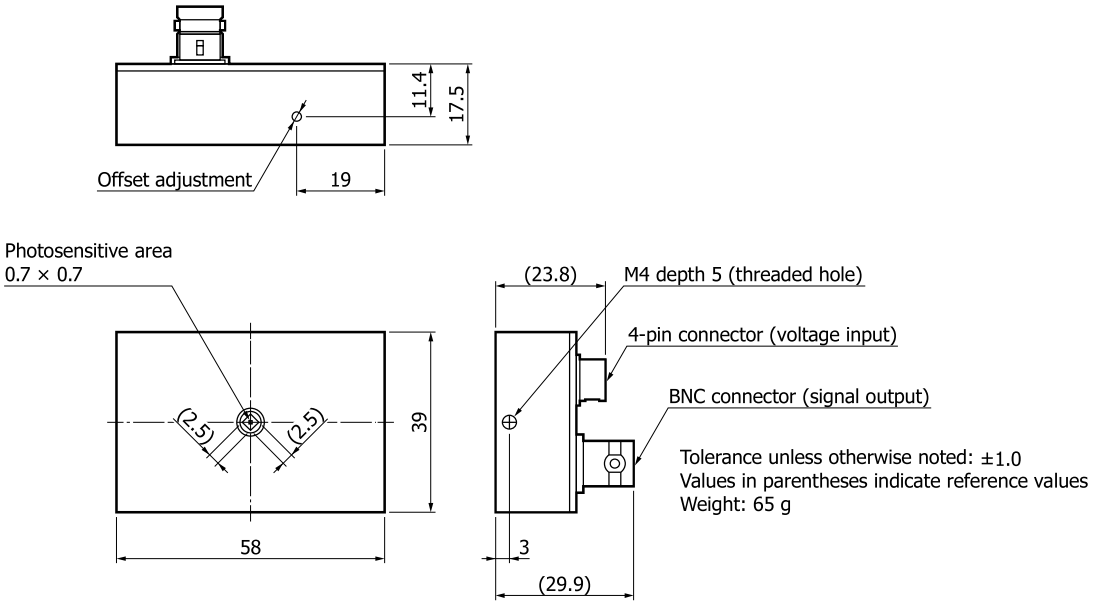
Current consumption (min.)	Voltage
+30 mA	+15 V
-30 mA	-15 V

Spectral response



Dimensional outlines (unit: mm)

C17212-011



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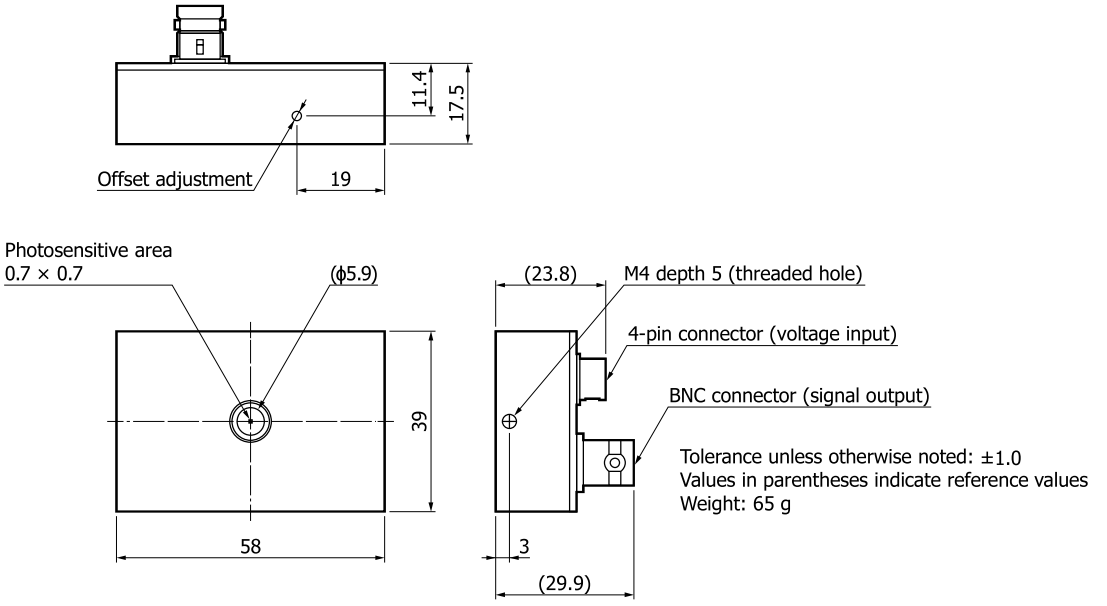
C17213-011, C17214-011



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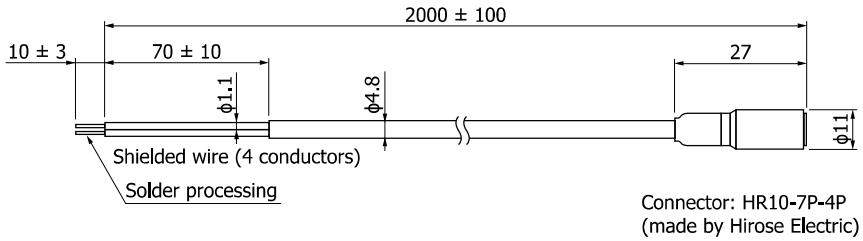
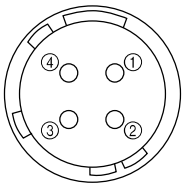
4-conductor cable (for DC power supply) A4372-02



Connector: HR10-7P-4P
(made by Hirose Electric)



As viewed from connector side

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

Tolerance unless otherwise noted: ±1

KIRDA0196EB

Precautions

- Always use a dual-polarity ±15 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.
- The detection elements of C17213-011 and C17214-011 do not have the chip part protected by a window material, etc. Please refer to "Precautions / Unsealed Products" and handle with care.
- 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
- Precautions / Unsealed products
- Precautions / Compound opto-semiconductors (photosensors, light emitters)

■ Catalogs
- Selection guide / Infrared detectors
- Technical note / Compound semiconductor photosensors

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HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Chuo-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184
U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908 231 0960, Fax: (1)908 231 1218
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Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 13F 1, No.101, Section 2, Gongdao 5th Road, East Dist., Hsinchu City, 300046, Taiwan(R.O.C) Telephone: (886)3 659 0080, Fax: (886)3 659 0081 E mail: info@hamamatsu.com.tw

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NEW

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)**
- **CO_2 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)

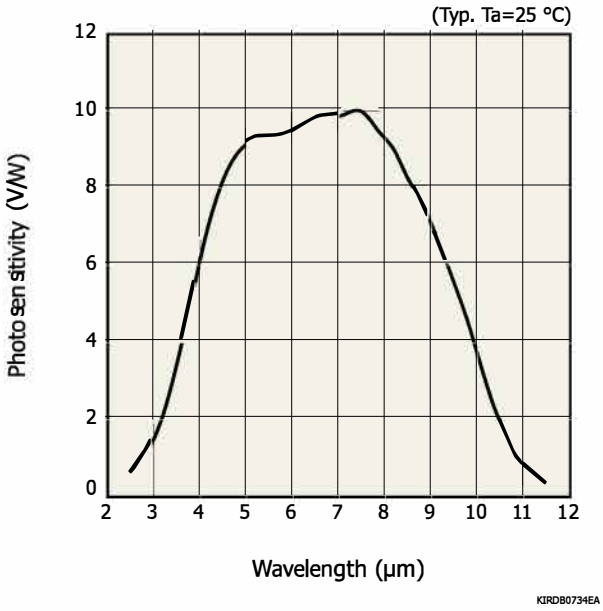
Parameter	Symbol	Value	Unit
Supply voltage (for preamp)	Vcc	+4	V
Reverse voltage (for element)	V_R	+1	V
Operating temperature*1	Topr	-30 to +60	°C
Storage temperature*1	Tstg	-30 to +60	°C
Incident light level	Pin	1	W/mm^2

*1: No dew condensation
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.

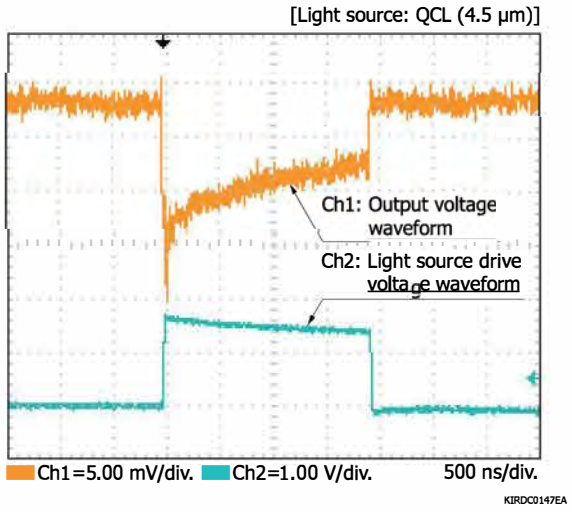
Electrical and optical characteristics (Typ. Ta=25 °C, Vcc=+3.3 V, 50 Ω system, unless otherwise noted)

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)	V_R		-	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	f_{CL}	-3 dB	-	DC	-	-
	f_{CH}	-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

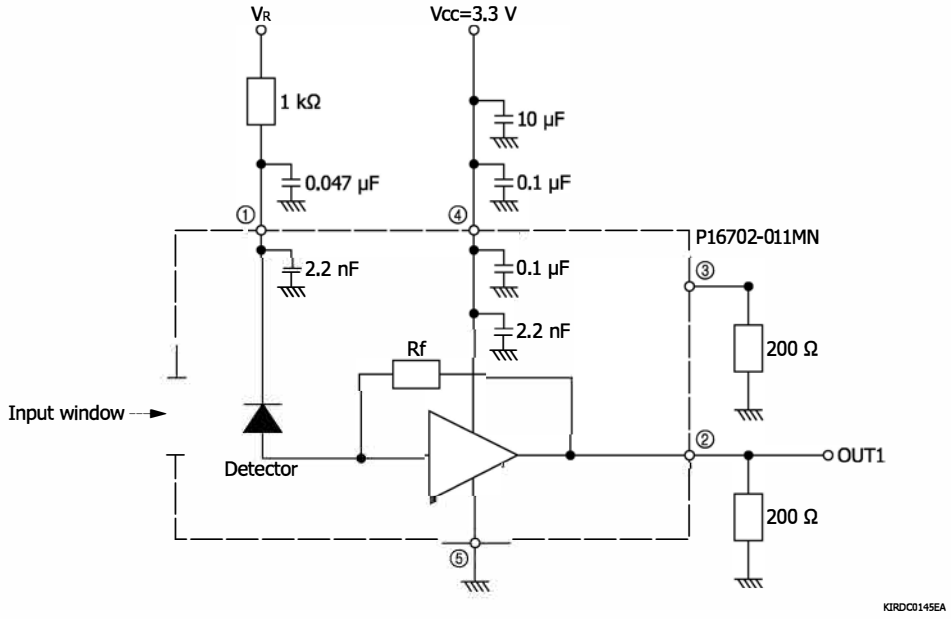
Spectral response



Output waveform example

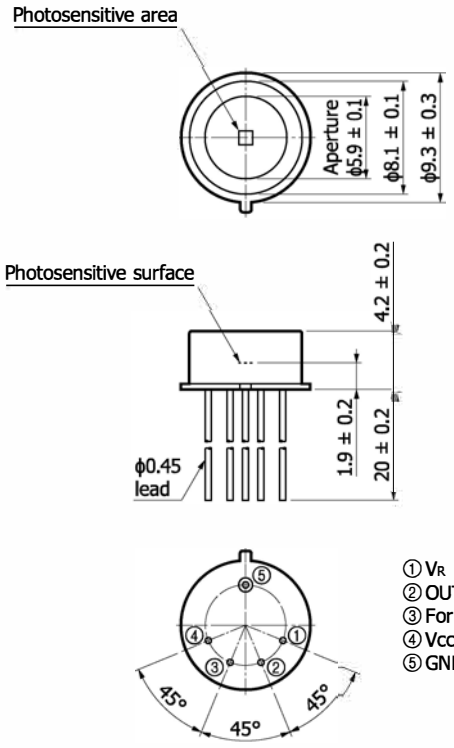


Connection example



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)



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.

KIRDA0289EA

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.

BostonElectronics

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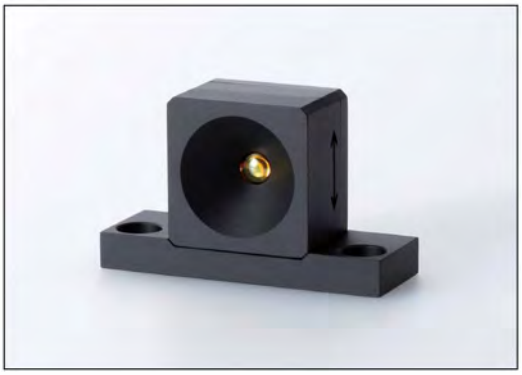
Quantum Cascade Photodetector
P16309-01

■ 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	φ4.5	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
Opearting temperature *1	T_{opr}	-10 to +50	°C
Storage temperature *1	T_{stg}	-10 to +50	°C
Incident light level	P_{max}	1	W/cm²

*1 No condensation
* No bias is required for the operation.
* Ambient temperature: T_a=25 °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 Hz, Δf=1 Hz	0.5	1.0	—	mA/W
Detectivity	D*	$\lambda=\lambda_p$, f_0=800 Hz, Δf=1 Hz	8.0×10^8	1.5×10^9	—	cm·Hz$^{1/2}$/W
Noise equivalent power	NEP	$\lambda=\lambda_p$, f_0=800 Hz	—	3.0×10^{-10}	1.0×10^{-9}	W/Hz$^{1/2}$
Cut-off frequency	f_c	-3 dB down, Zi=50 Ω	18	20	—	GHz
Terminal capacitance	C_t	f=1 MHz	—	1.1	1.5	pF
Shunt resistance	R_{sh}	V_{meas}=10 mV	70	90	110	kΩ

* Ambient temperature: T_a=25 °C

Quantum Cascade Photodetector P16309-01

Figure 1: Spectral response (example)

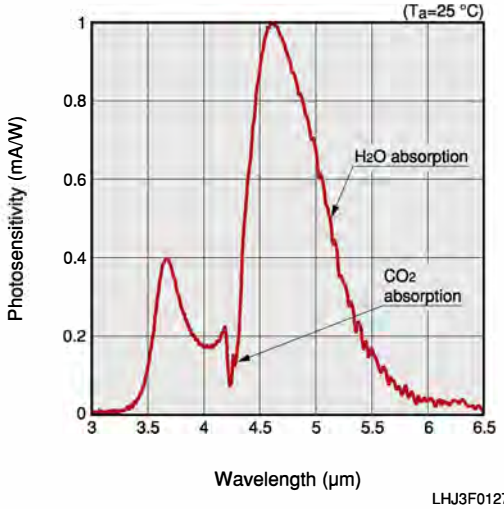


Figure 2: Response frequency (example)

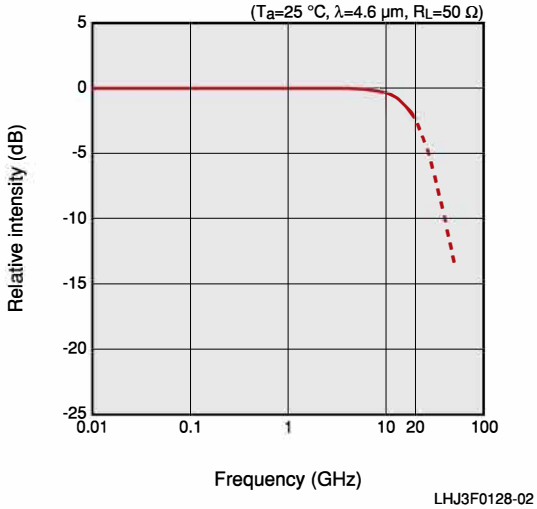
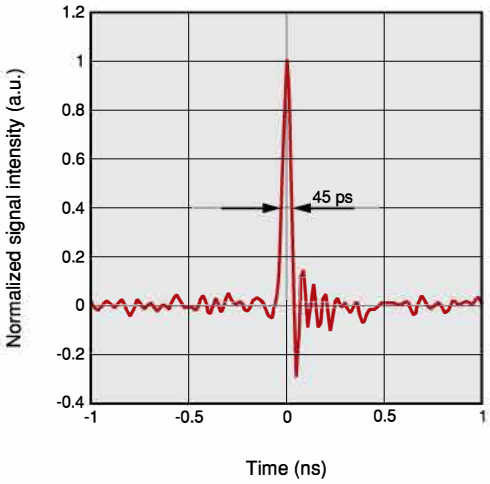


Figure 3: Ultrashort pulse waveform measurement

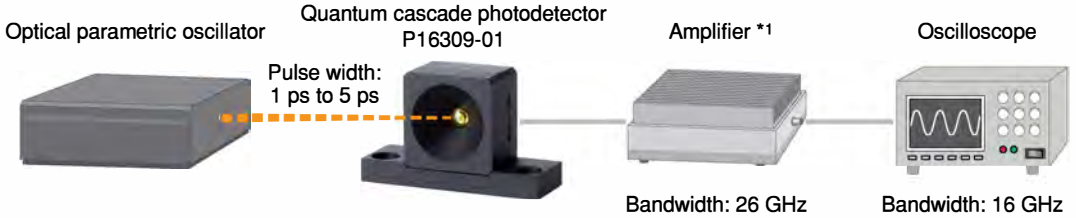
●Measurement example



<Data provided>
Ideguchi group, The University of Tokyo

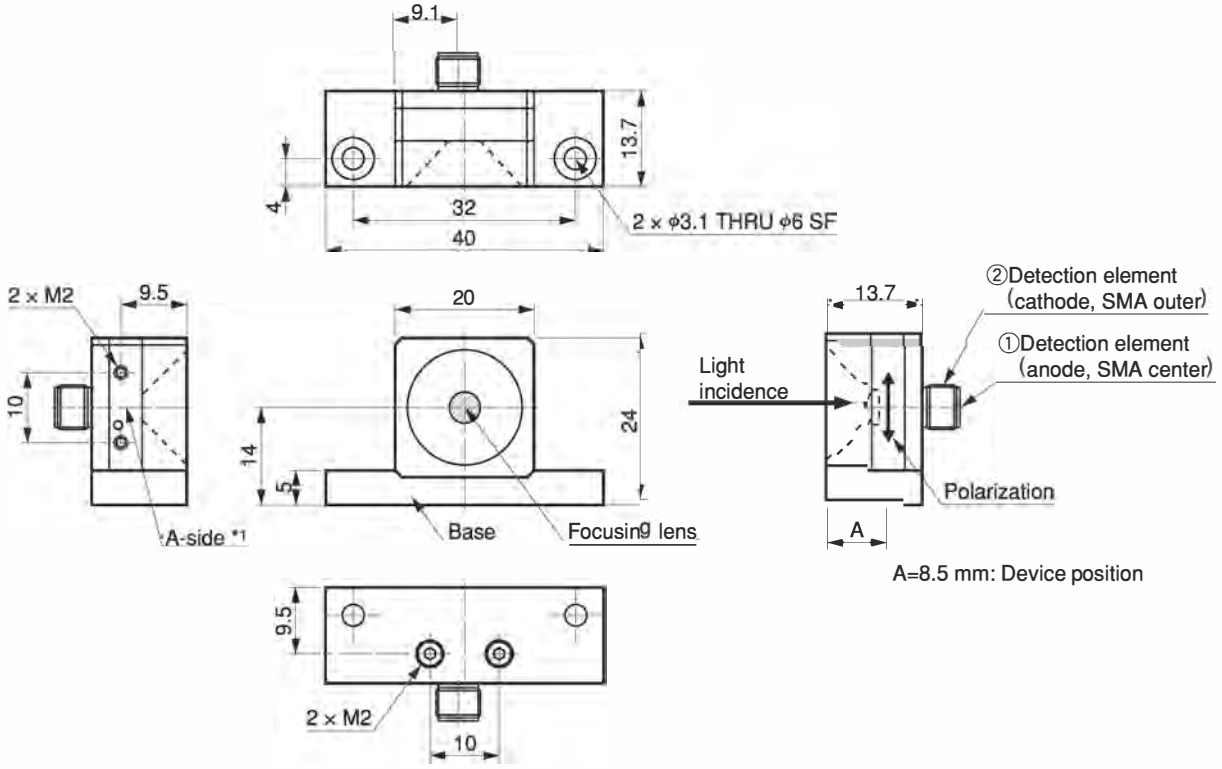
LHJ3F0134-02

●Measurement configuration



*1 An example: Keysight technologies, 83006A

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

HAMAMATSU PHOTONICS K.K. www.hamamatsu.com

Laser Promotion Division, Business Promotion G.
1-8-3, Shinmiyakoda, Kita-ku, Hamamatsu City, Shizuoka, 431-2103, Japan, Telephone: (81)53-484-1301, Fax: (81)53-484-1302, E-mail: sales-laser@lpd.hpk.co.jp

U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: usa@hamamatsu.com
Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH.: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de
France: HAMAMATSU PHOTONICS FRANCE S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr
United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court,10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01 E-mail: info@hamamatsu.se
Italy: HAMAMATSU PHOTONICS ITALIA S.R.L.: Strada della Moia, 1 int. 6, 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it
China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201 Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn
Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 8F-3, No.158, Section 2, 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

Cat. No.LQCD3001E02
FEB. 2022 IP

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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 CO_2, SOx, CO and NOx. 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

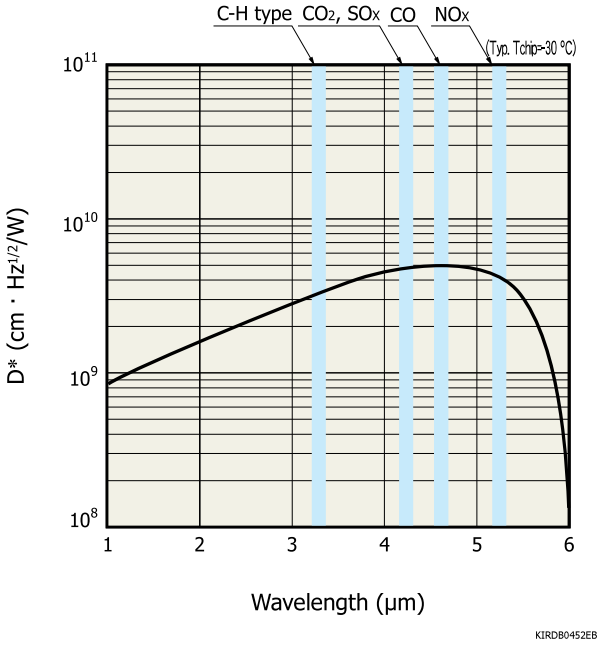
Parameter	Symbol	Value	Unit
Thermistor power dissipation	-	0.2	mW
Reverse voltage	V_R	0.1	V
Operating temperature*1 *2	Topr	-40 to +60	°C
Storage temperature*1	Tstg	-55 to +60	°C

*1: No dew condensation
When there is a temperature difference between a product and the surounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in charactaristics and relaiablity.
*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.

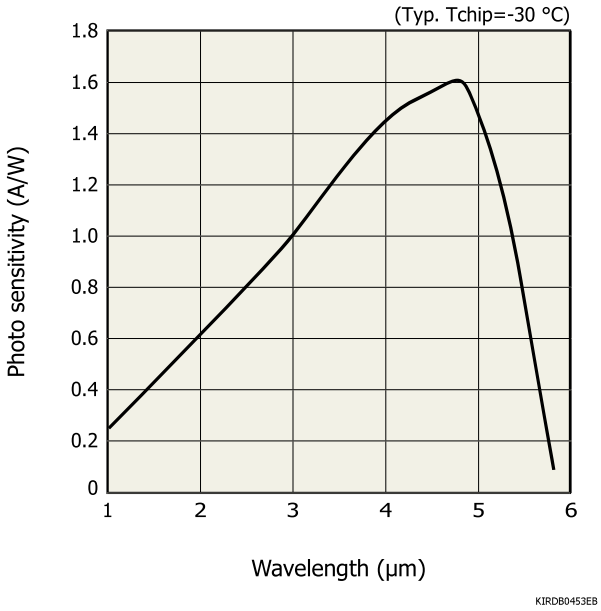
Electrical and optical characteristics (Tchip=-30 °C)

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

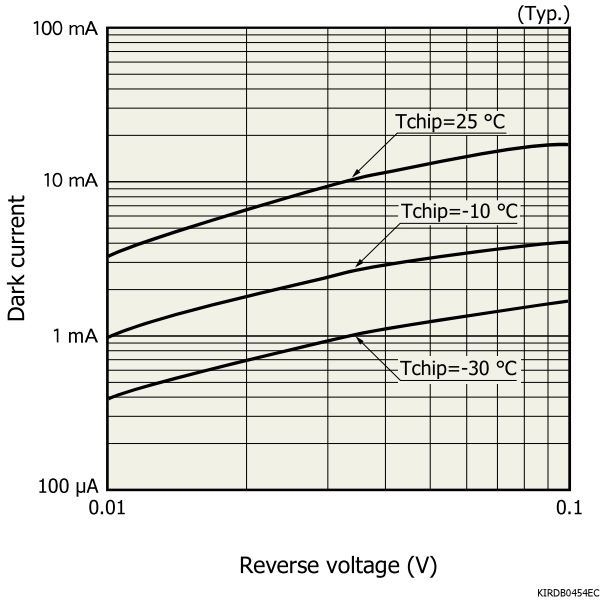
Spectral response (D*)



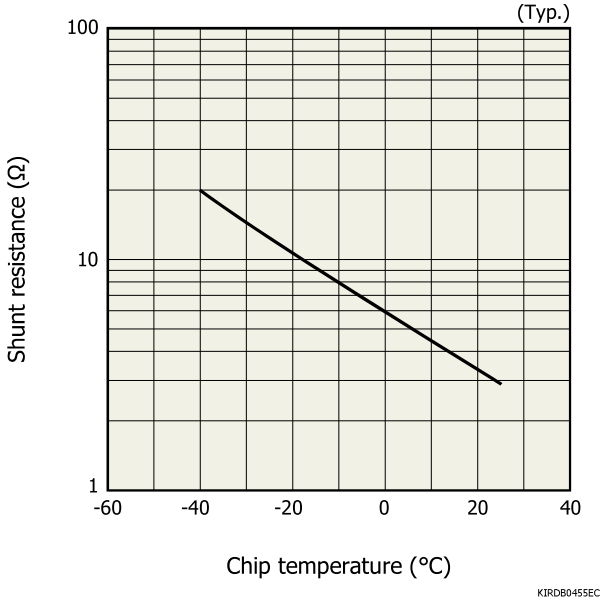
Spectral response



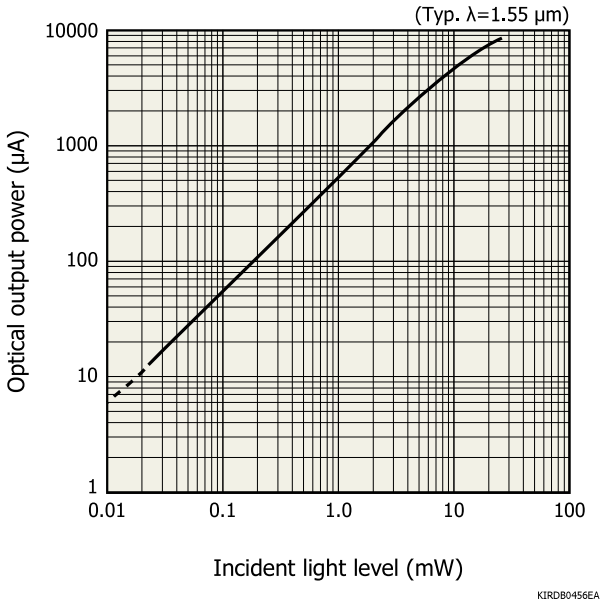
Dark current vs. reverse voltage



Shunt resistance vs. chip temperature



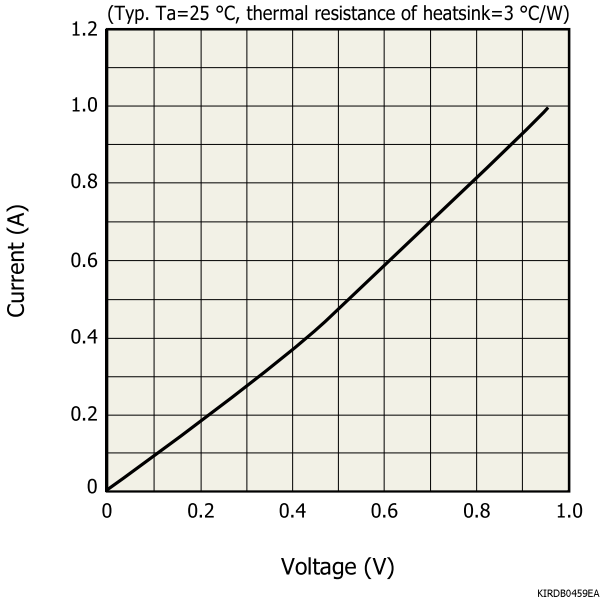
Linearity



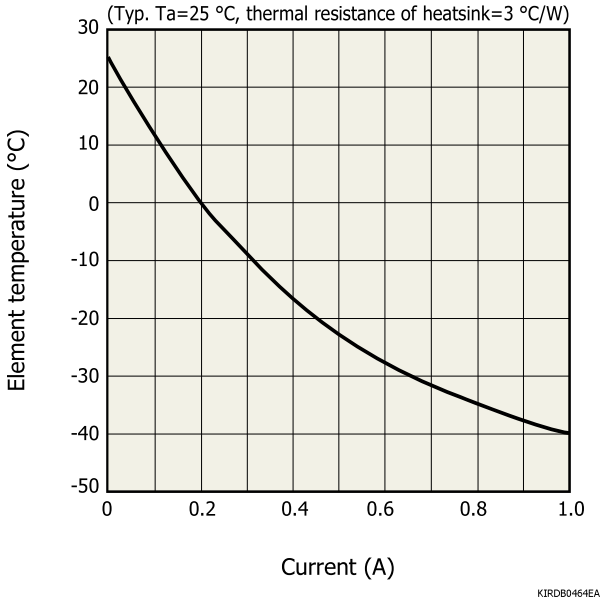
Specifications of two-stage TE-cooler (Ta=25 °C)

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

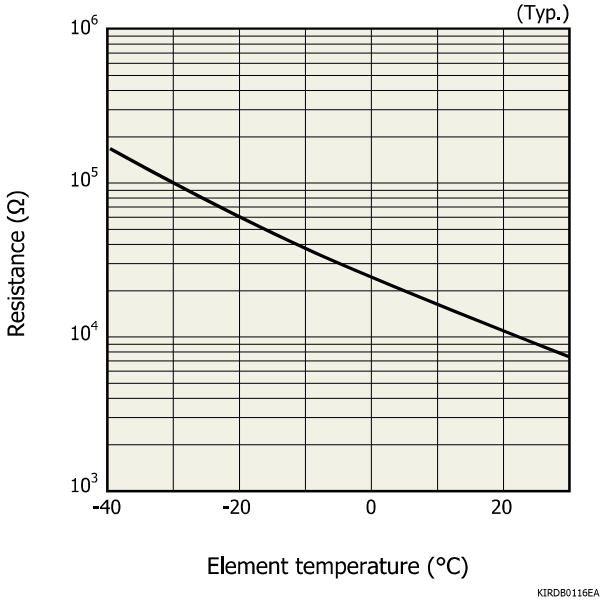
Current vs. voltage of TE-cooled type



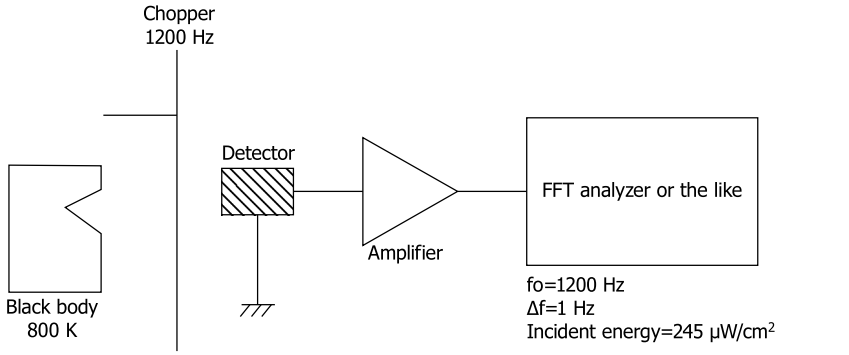
Cooling characteristics of TE-cooled type



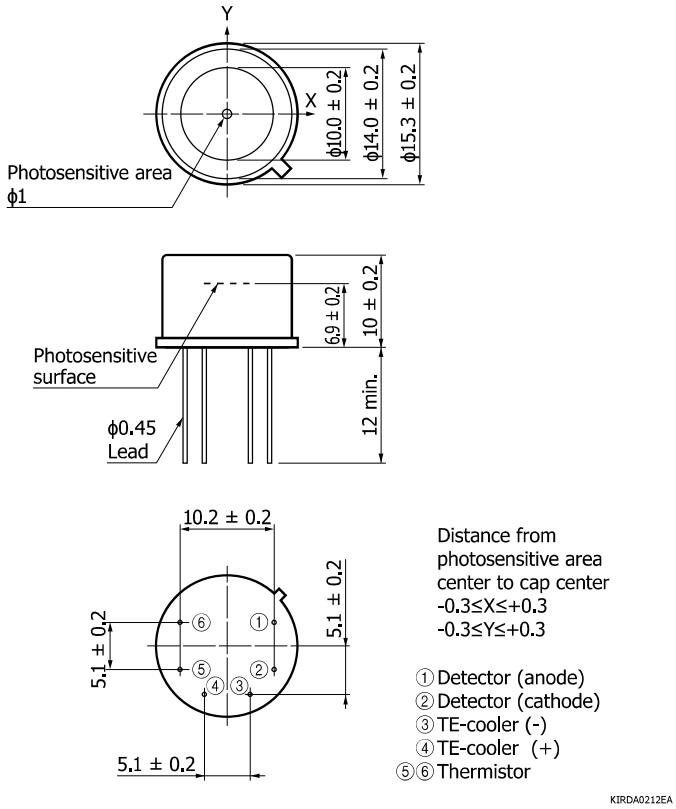
Thermistor temperature characteristic



Measurement circuit example



Dimensional outline (unit: mm)



Recommended soldering conditions

· Solder temperature: 260 ℃ (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.

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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, NO_2, SO_2, and H_2S. 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

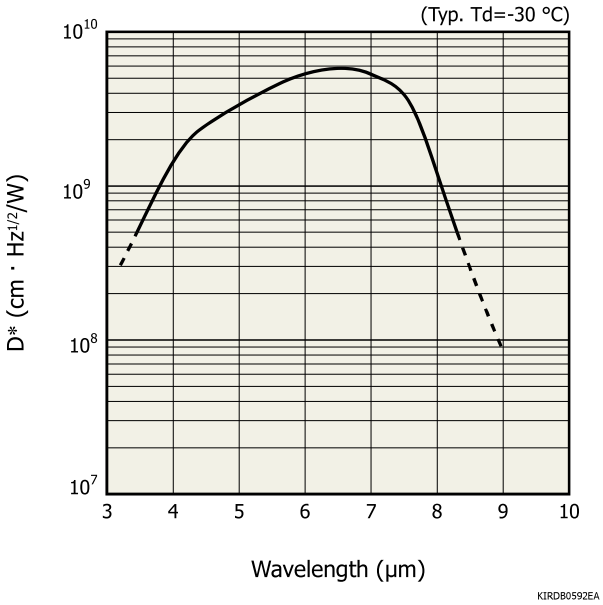
Parameter	Symbol	Value	Unit
Thermistor power dissipation	Pd_th	0.2	mW
TE-cooler allowable current	ITE max.	1	A
Reverse voltage	V_R	0.1	V
Operating temperature	Topr	-40 to +60	°C
Storage temperature	Tstg	-55 to +60	°C

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.

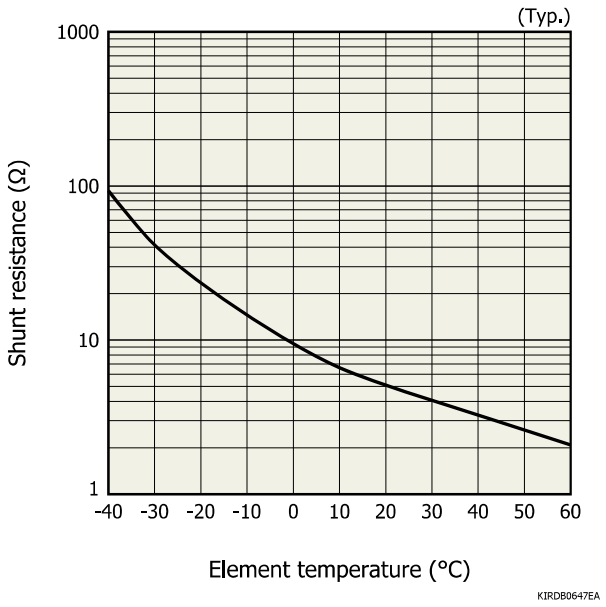
Electrical and optical characteristics (Td=-30 °C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitivity wavelength	λp		-	6.7	-	µm
Cutoff wavelength	λc		8.2	8.3	-	µm
Photosensitivity	S	λ=λp	0.8	1.2	-	A/W
Shunt resistance	Rsh	VR=10 mV	13	40	-	Ω
Detectivity	D*	(λp, 1200, 1)	4.0×10^{9}	6.0×10^{9}	-	cm·Hz$^{1/2}$/W
Noise equivalent power	NEP	λ=λp	-	1.5×10^{-11}	2.3×10^{-11}	W/Hz$^{1/2}$
Rise time	tr	VR=0 V, RL=50 Ω 0 to 63%	-	-	10	ns

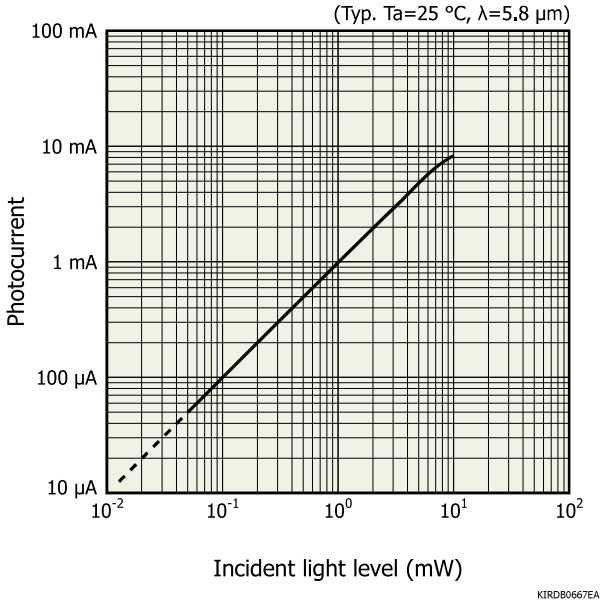
Spectral response (D*)



Shunt resistance vs. element temperature



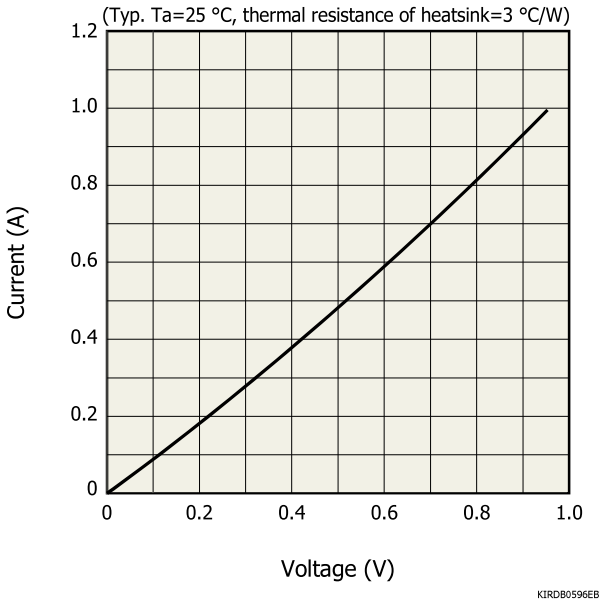
Linearity



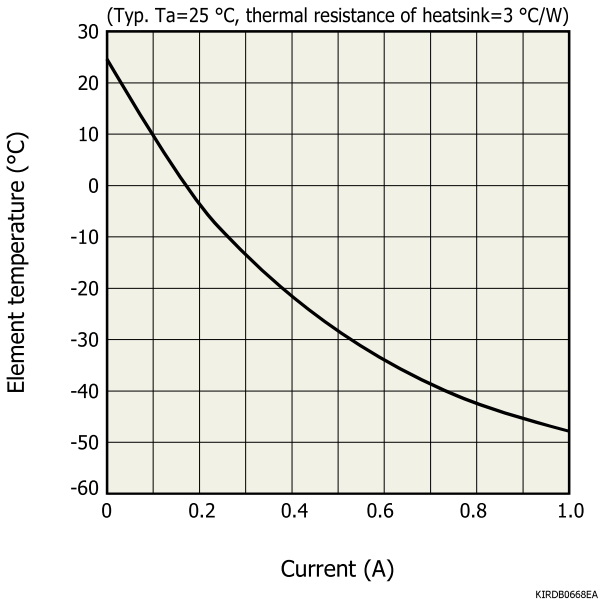
Specifications of two-stage TE-cooler (Ta=25 °C)

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

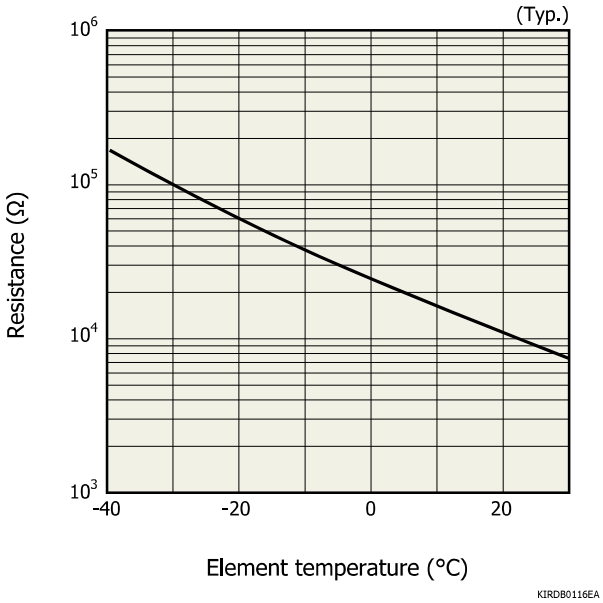
Current vs. voltage characteristics of TE-cooler



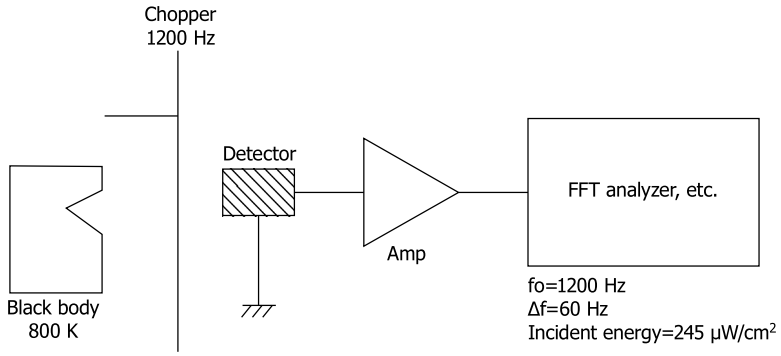
Cooling characteristics of TE-cooler



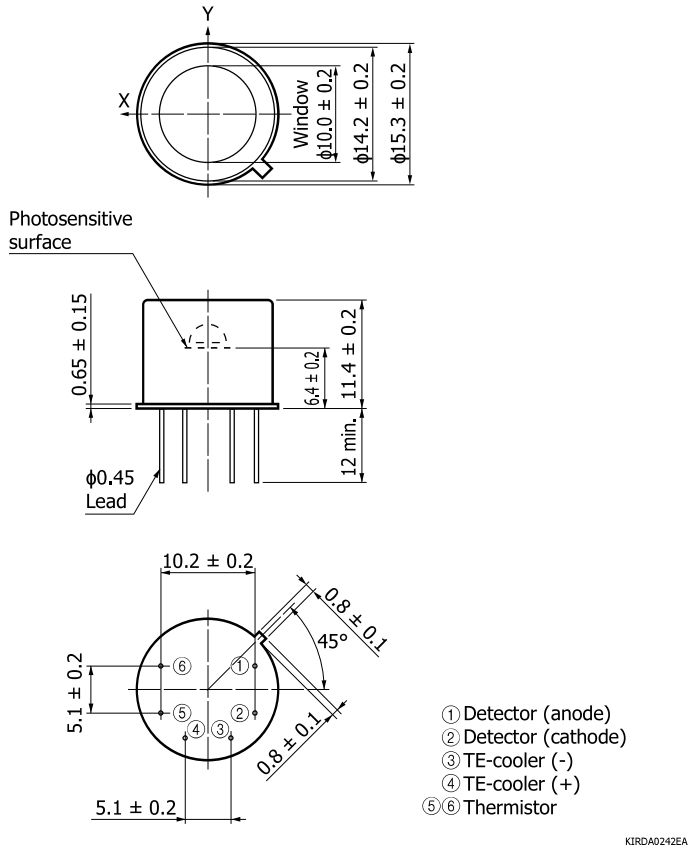
Thermistor temperature characteristics



Measurement circuit example



Dimensional outline (unit: mm)



InAsSb photovoltaic detectors

P13243 series

High sensitivity, high-speed response infrared detectors with large photosensitive area (up to 5 µm band)

The P13424 series are photovoltaic type detectors that have high sensitivity in the spectral band up to 5 µm band. 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 easily handled non-cooled type and the TE-cooled type capable of stable high S/N measurement are available.

Features

- **High sensitivity**
- **High-speed response**
- **High shunt resistance**
- **RoHS compliant (lead, mercury, cadmium free)**

Applications

- **Gas detection (CH_4, CO_2, CO, etc.)**
- **Radiation thermometers**
- **Flame detection (CO_2 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)
P13243-022MS	2 × 2	TO-5	Sapphire	Non-cooled	97
P13243-122MS		TO-8		One-stage TE-cooled	134
P13243-222MS				Two-stage TE-cooled	113

Absolute maximum ratings

Type no.	TE-cooler allowable current (A)	Thermistor power dissipation (mW)	Reverse voltage V_R (V)	Operating temperature Topr*1 (°C)	Storage temperature Tstg*1 (°C)	Incident light level Pin (W/mm^2)
P13243-022MS	-	-	1	-40 to +85	-40 to +85	1
P13243-122MS	1.5	0.2		-40 to +60	-40 to +60	
P13243-222MS	1.0					

*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.

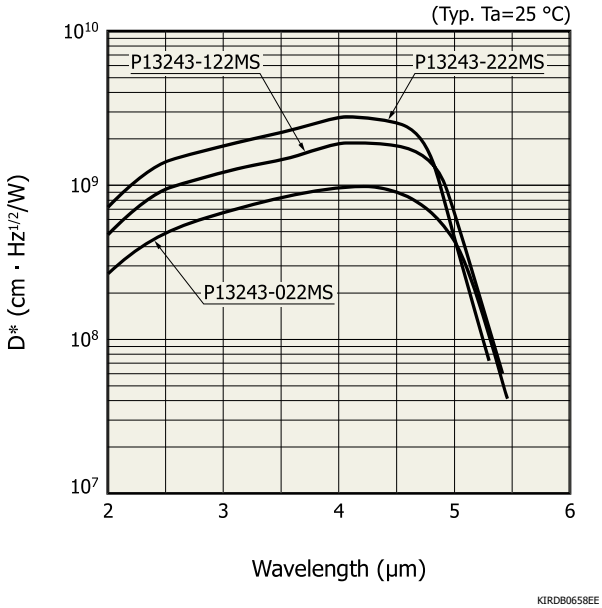
Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Chip temperature Tchip (°C)	Peak sensitivity wavelength λp (μm)	Cutoff wavelength λc (μm)	Photosensitivity S*2 λ=λp (mA/W)	Shunt resistance Rsh VR=10mV (kΩ)	Detectivity D* (λp, 1200, 1) Min. (cm·Hz$^{1/2}$/W)	Detectivity D* (λp, 1200, 1) Typ. (cm·Hz$^{1/2}$/W)	Noise equivalent power NEP λ=λp Typ. (W/Hz$^{1/2}$)	Noise equivalent power NEP λ=λp Max. (W/Hz$^{1/2}$)	Rise time tr*3 (ns)	Terminal capacitance Ct*4 (pF)
P13243-022MS	25	4.1	5.3	8.0	7	8.0×10^{8}	1.0×10^{9}	2.0×10^{-10}	2.5×10^{-10}	100	20
P13243-122MS	-10		5.2	8.6	19	1.0×10^{9}	1.9×10^{9}	1.0×10^{-10}	2.0×10^{-10}		
P13243-222MS	-30		5.1	8.8	33	1.6×10^{9}	2.8×10^{9}	0.7×10^{-10}	1.3×10^{-10}		

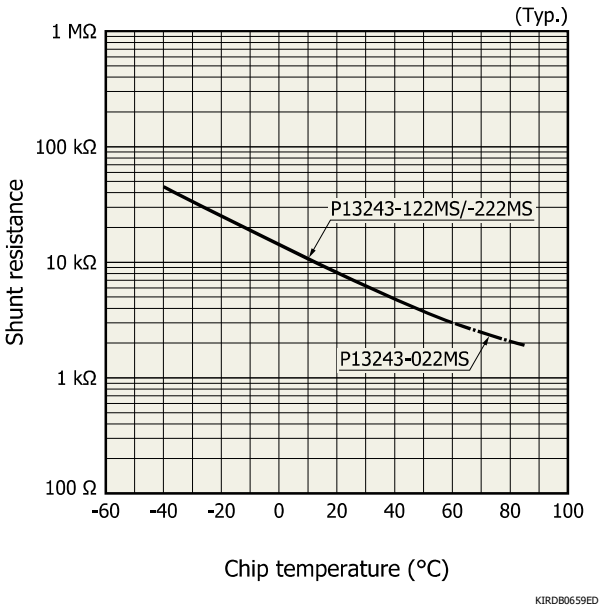
*2: Uniform irradiation on the entire photosensitive area
*3: VR=0 V, RL=50 Ω, 10 to 90%, λ=1.55 μm
*4: VR=0 V, f=1 MHz

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

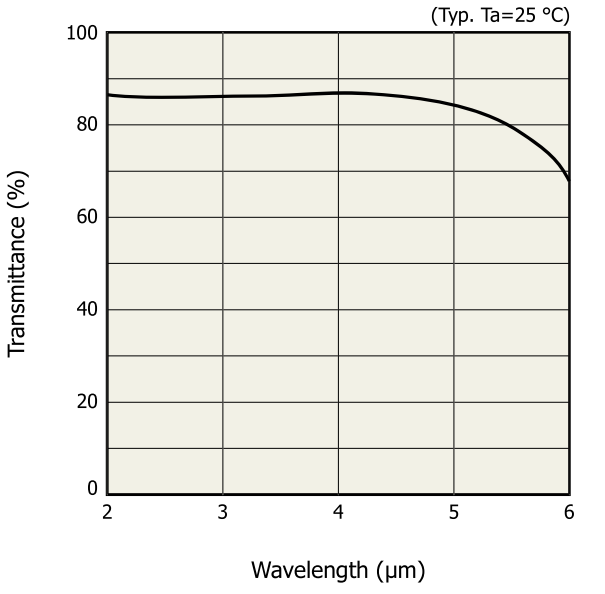
Spectral response (D*)



Shunt resistance vs. chip temperature

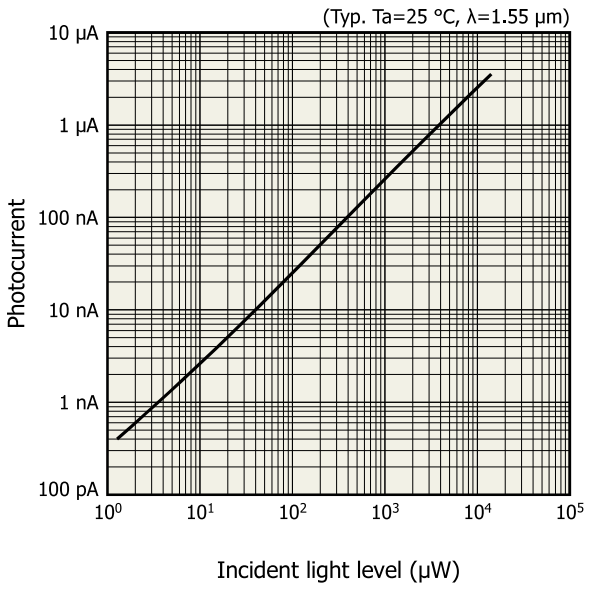


Spectral transmittance of window materials



KIRDB0660EC

Linearity

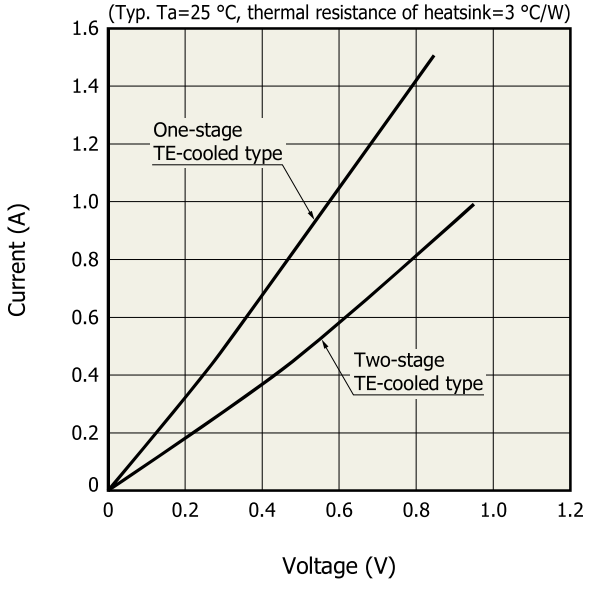


KIRDB0615EB

TE-cooler specifications (Ta=25 °C, unless otherwise noted)

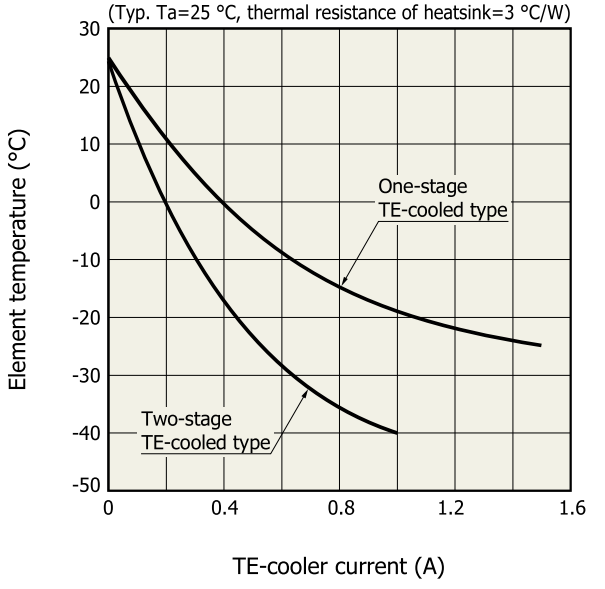
Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit
TE-cooler allowable current	One-stage TE-cooled	Ic max	-	-	1.5	A
	Two-stage TE-cooled		-	-	1.0	
TE-cooler allowable voltage	One-stage TE-cooled	Vc max	-	-	1.0	V
	Two-stage TE-cooled		-	-	1.2	
Thermistor resistance		Rth	8.1	9.0	9.9	kΩ
Thermistor B constant	T1=25 °C, T2=-30 °C	B	-	3298	-	K
Thermistor power dissipation		Pth	-	-	0.2	mW

Current vs. voltage characteristics of TE-cooler



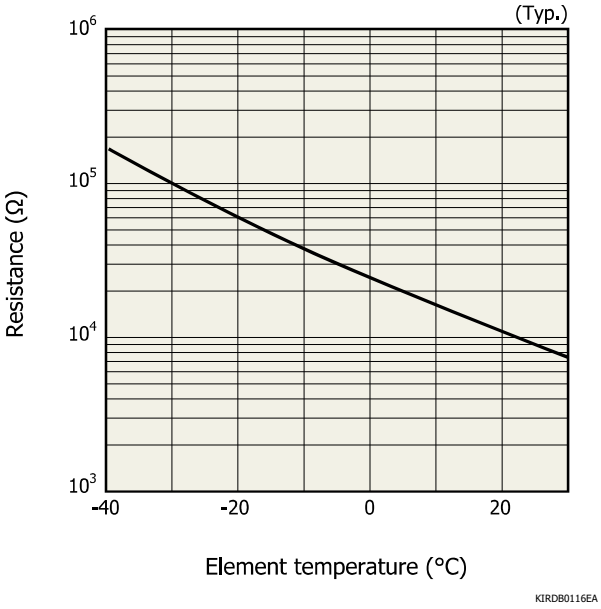
KIRDB0115EB

Cooling characteristics of TE-cooler

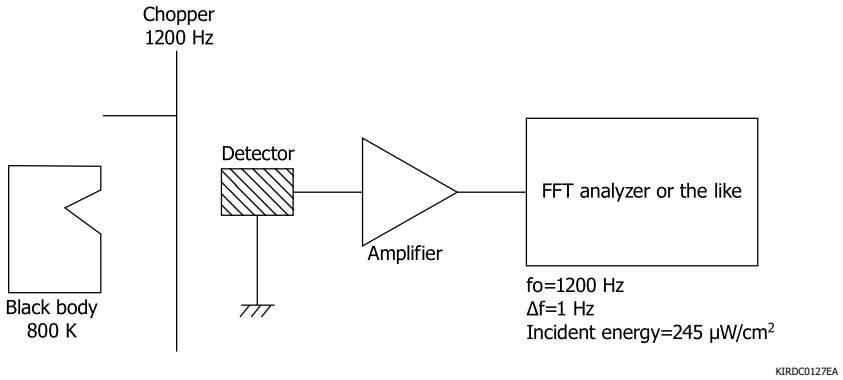


KIRDB0181EA

Thermistor temperature characteristics

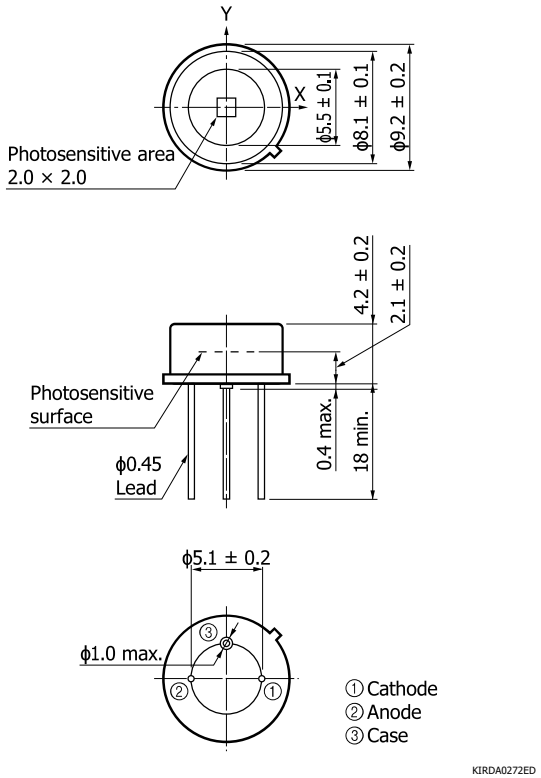


Block diagram for characteristic measurement

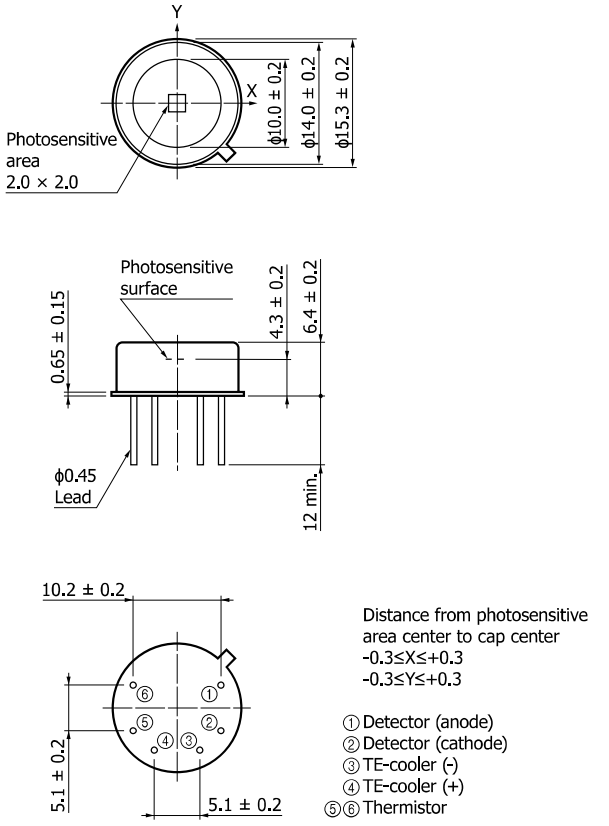


Dimensional outlines (unit: mm)

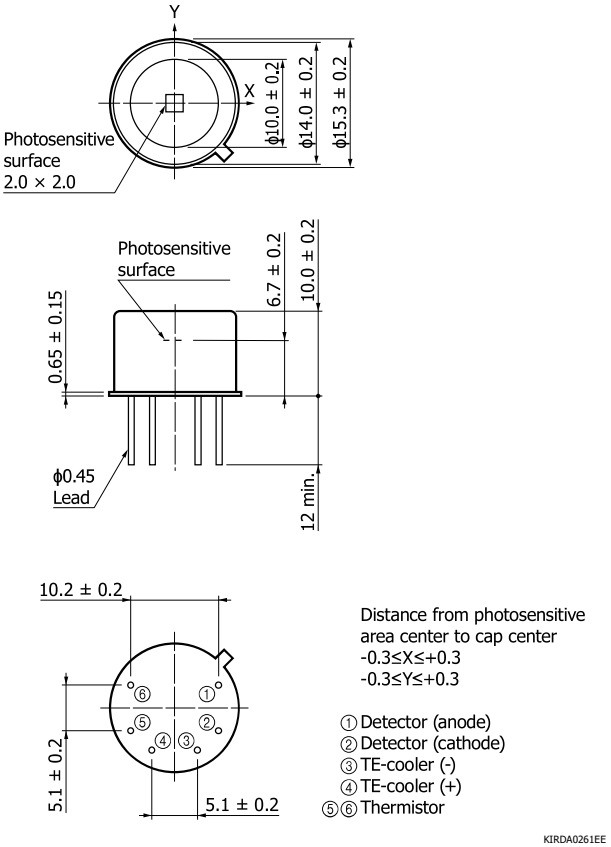
P13243-022MS



P13243-122MS



P13243-222MS

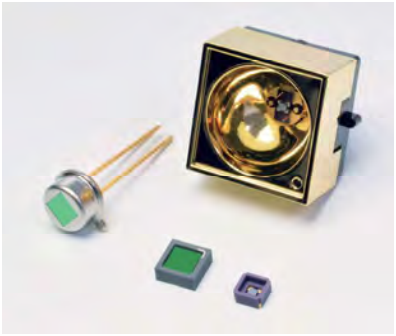


Recommended soldering conditions

· Solder temperature: 260 °C (10 s or less, once)
Solder the leads at a point at least 1 mm away from the package body.
Note: When you set soldering conditions, check that problems do not occur in the product by testing out the condition in advance.

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/CN, L15894-0390C/CN, L15895-0430C/CN	Ceramic
L15893-0330MA, L15894-0390MA, L15895-0430MA	TO-46
L15893-0330ML, L15894-0390ML, L15895-0430ML	TO-46 with reflector

Related information

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

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

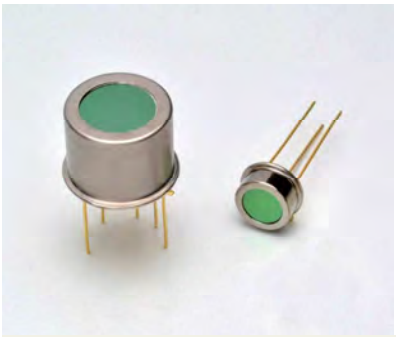
■ Technical note
· Compound semiconductor photosensors

HAMAMATSU www.hamamatsu.com

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

InAsSb photovoltaic detectors

P13894 series



High-speed response and high sensitivity infra-red detectors (up to 10 µm band)

The P13894 series are photovoltaic type detectors that have achieved high sensitivity in the spectral range up to 10 µm band. 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. The easily handled non-cooled type and the TE-cooled type capable of stable high S/N measurement are available.

Features

- **High sensitivity**
- **High-speed response**
- **High shunt resistance**
- **Non-cooled (P13894-011MA)**
- **RoHS compliant (lead, mercury, cadmium free)**

Applications

- **Gas detection (SOx, NOx, NH_3, O3, etc.)**
- **Radiation thermometers**
- **CO_2 laser monitor**
- **Mid infrared spectroscopy**

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	P13894-011MA	P13894-211MA	Unit
Window material	Ge with AR coating	Ge with AR coating	-
Package	TO-5	TO-8	-
Cooling	Non-cooled	Two-stage TE-cooled	-
Photosensitive area	1 × 1		mm
Field of view (FOV)	102	113	degrees

Absolute maximum ratings

Parameter	Symbol	Condition	P13894-011MA	P13894-211MA	Unit
Reverse voltage	V_R		1		V
Operating temperature	Topr	No dew condensation*1	-40 to +60		°C
Storage temperature	Tstg	No dew condensation*1	-40 to +60		°C

*1: 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.

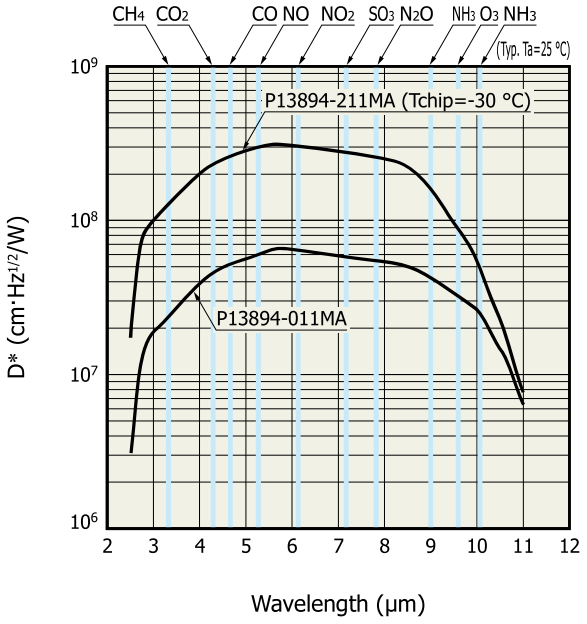
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical and optical characteristics (Ta=25 °C)

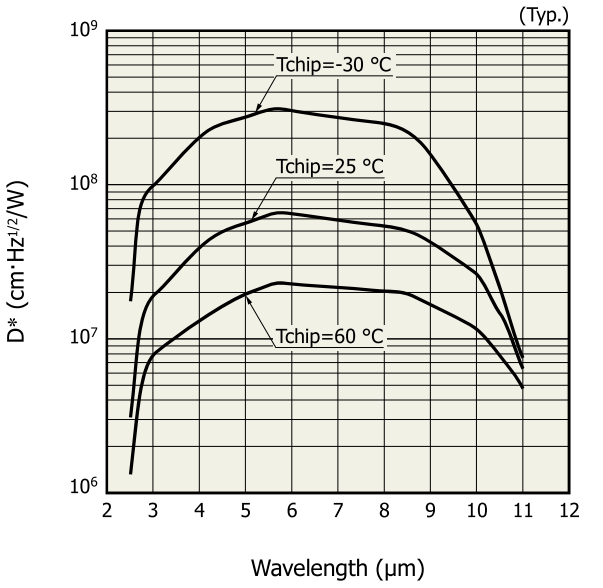
Parameter	Symbol	Condition	P13894-011MA			P13894-211MA			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Chip temperature	Tchip			25			-30		°C
Peak sensitivity wavelength	λp		-	5.6	-	-	5.6	-	µm
Cutoff wavelength	λc		9.7	11.0	-	8.9	10.2	-	µm
Photosensitivity	S	λ=λp*2	1.3	1.9	-	2.8	3.8	-	mA/W
Shunt resistance	Rsh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

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

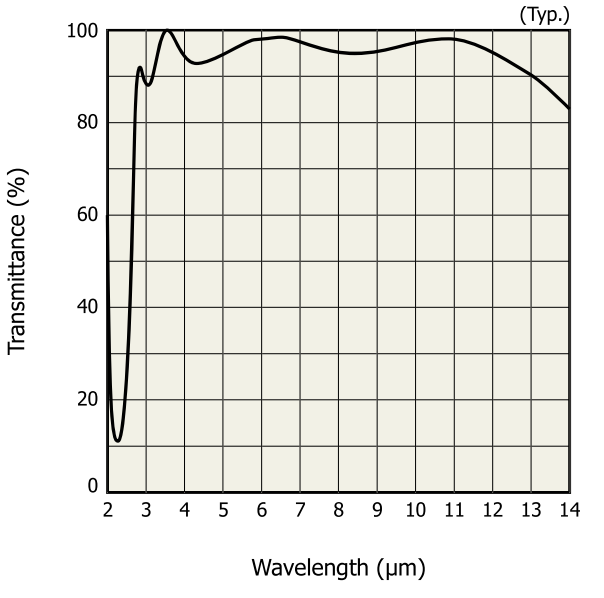
Spectral response (D*)



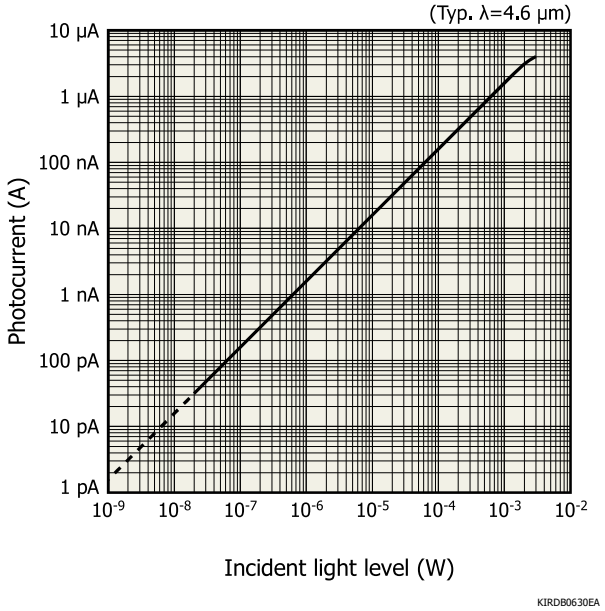
Sensitivity temperature characteristics



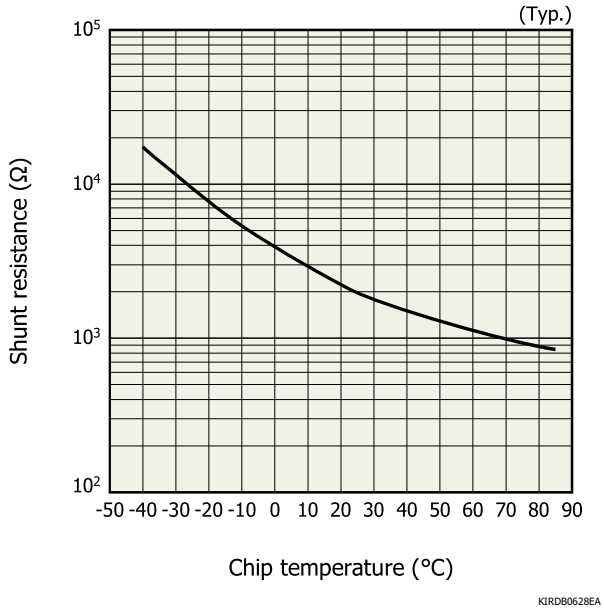
Spectral transmittance of window material



Linearity



Shunt resistance vs. chip temperature

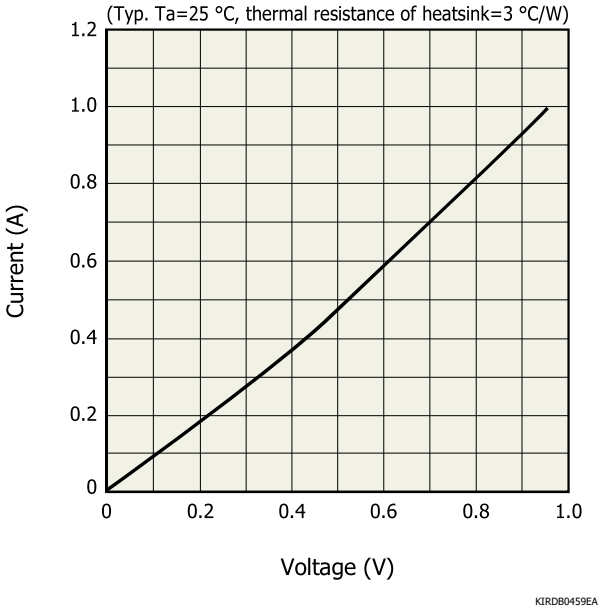


Specifications of two-stage TE-cooler (Ta=25 °C)

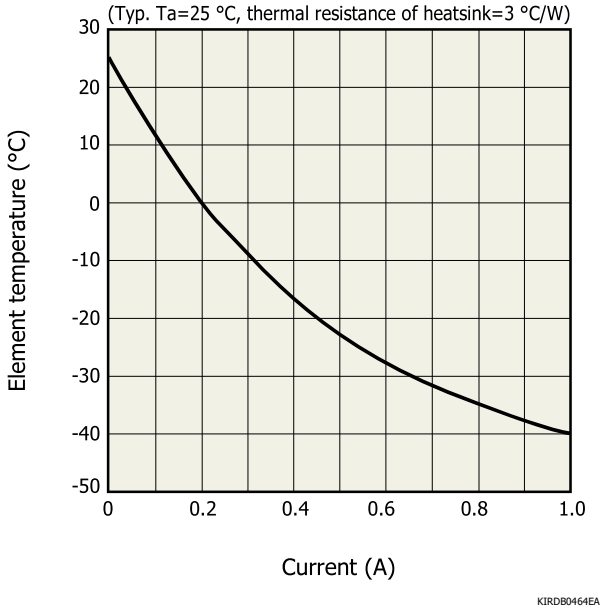
Parameter	Symbol	Min.	Typ.	Max.	Unit
TE-cooler allowable current	I_{TE} max	-	-	1.0	A
TE-cooler allowable voltage	V_{TE} max	-	-	1.2	V
Thermistor resistance	Rth	8.1	9.0	9.9	kΩ
Thermistor B constant*5	B	-	3298	-	K
Thermistor power dissipation	Pth	-	-	0.2	mW

*5: T_1=25 °C, T_2=-30 °C

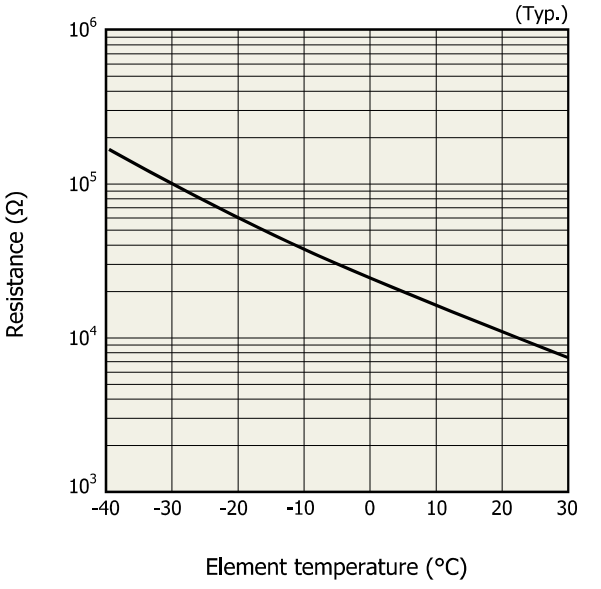
Current vs. voltage characteristics of TE-cooler



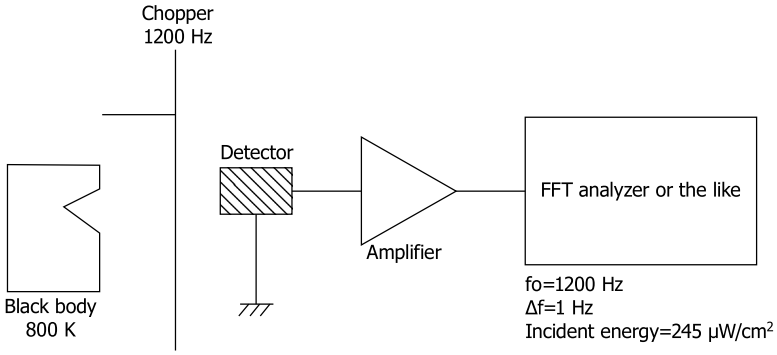
Cooling characteristics of TE-cooler



Thermistor temperature characteristics



Block diagram for characteristic measurement



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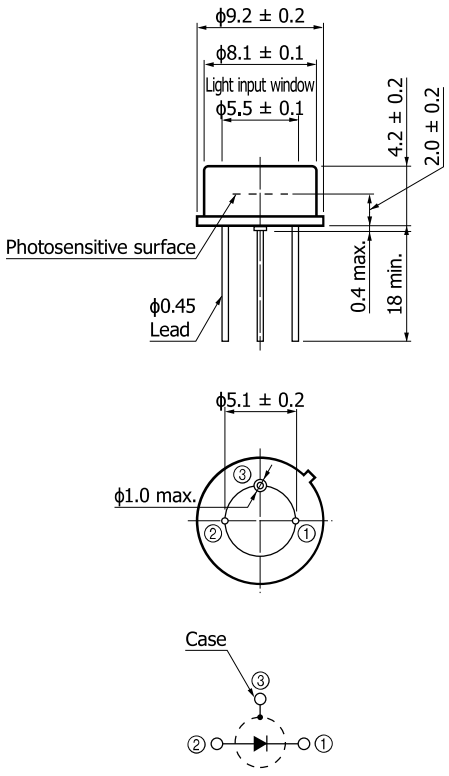
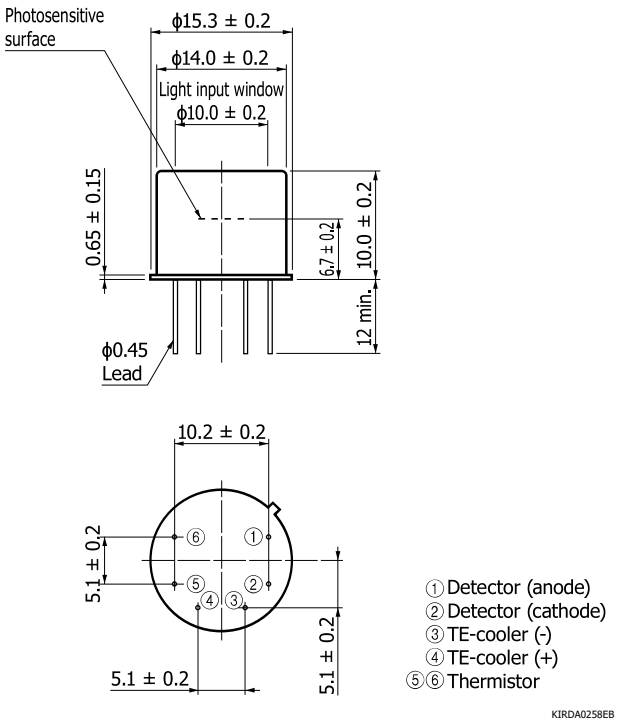
Dimensional outlines (unit: mm)

P13894-011MA



KIRDA0257EB

P13894-211MA



KIRDA0258EB

Recommended soldering conditions

Soldering temperature: 260°C (once, within 10 s)
Solder the lead more than 1mm away from the root.
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
· Safety consideration
· Compound opto-semiconductors (photosensors, light emitters)

■ Technical note
· Compound semiconductor photosensors

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

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 (CH_4, CO_2, CO, etc.)**
- **Radiation thermometers**
- **Flame detection (CO_2 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				Ceramic		86
P16612-011CN			None			86
P16849-013CN	2					86

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

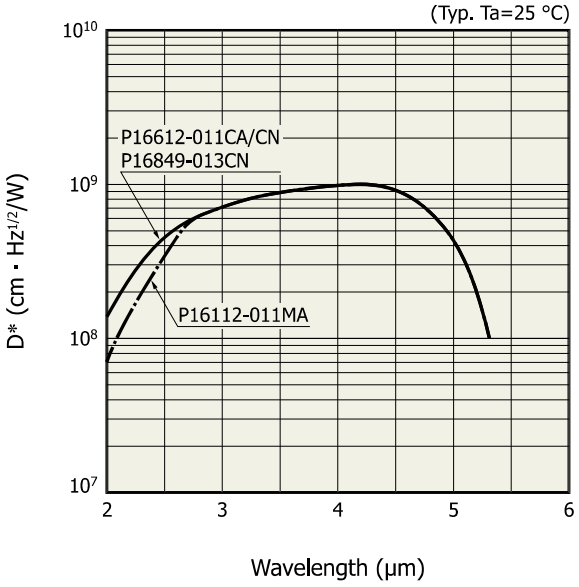
Type no.	Reverse voltage V_R (V)	Operating temperature*1 Topr (°C)	Storage temperature*1 Tstg (°C)	Incident light level (W/mm²)	Soldering temperature Tsol (°C)
P16112-011MA	1	-40 to +85	-40 to +85	1	-
P16612-011CA					240 (once)*2
P16612-011CN					
P16849-013CN					

*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 λp (μm)	Cutoff wavelength λc (μm)	Photosensitivity S λ=λp (mA/W)	Shunt resistance Rsh VR=10 mV (kΩ)	Detectivity D* (λp, 1200, 1) Min. (cm·Hz$^{1/2}$/W)	Detectivity D* (λp, 1200, 1) Typ. (cm·Hz$^{1/2}$/W)	Noise equivalent power NEP λ=λp Typ. (W/Hz$^{1/2}$)	Noise equivalent power NEP λ=λp Max. (W/Hz$^{1/2}$)	Rise time tr VR=0 V RL=50 Ω 10 to 90% (ns)	Terminal capacitance Ct VR=0 V f=1 MHz (pF)
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										
P16612-011CN										
P16849-013CN										

Spectral response (D*)



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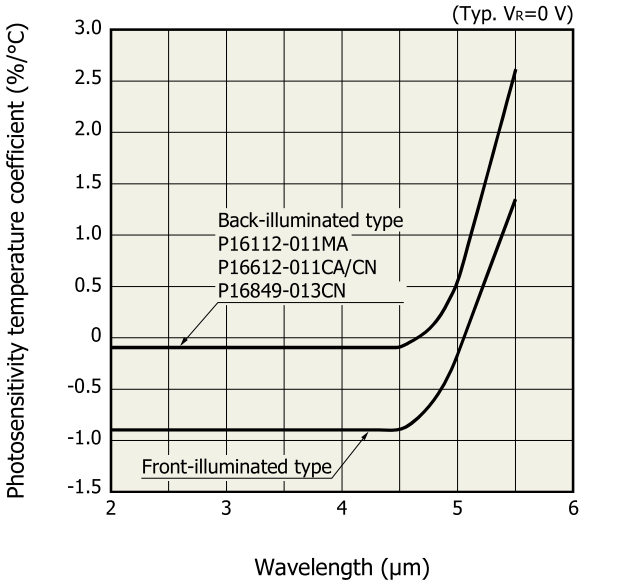
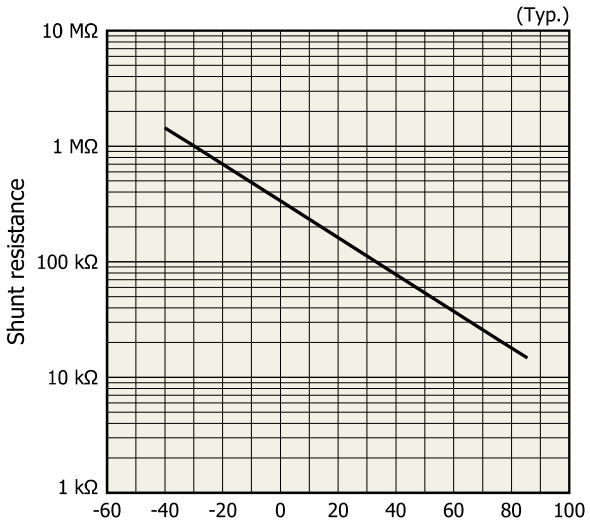
Photosensitivity temperature characteristics



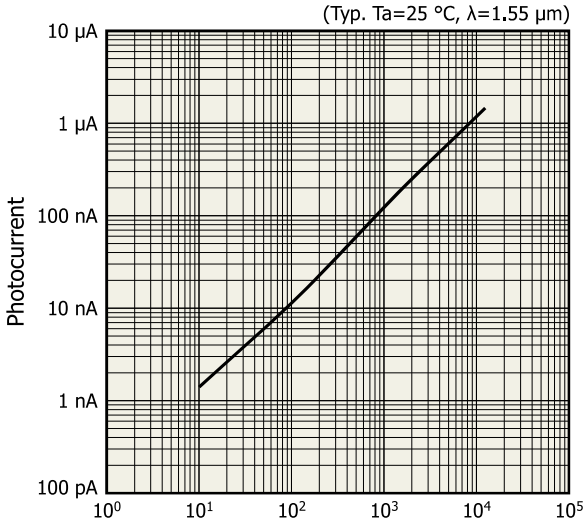
KIRDB0716EB

Shunt resistance vs. chip temperature



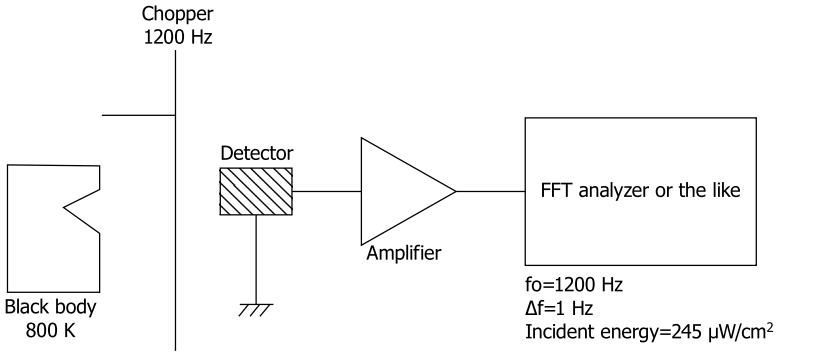
KIRDB0717EA

Linearity



KIRDB0718EA

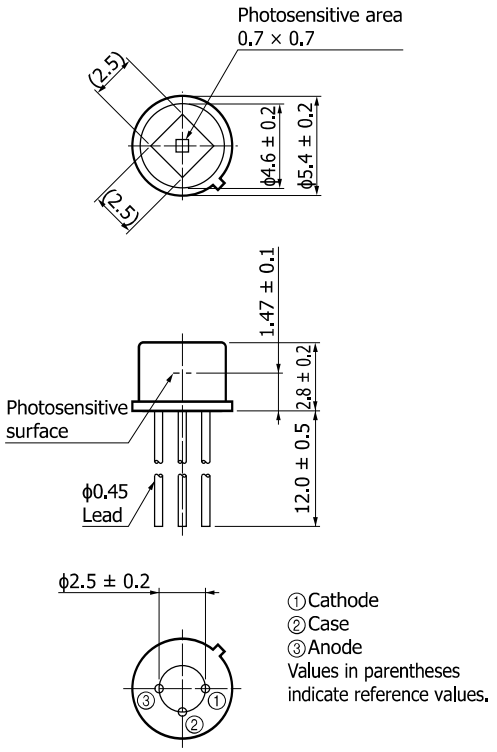
Block diagram for characteristic measurement



KIRDC0127EA

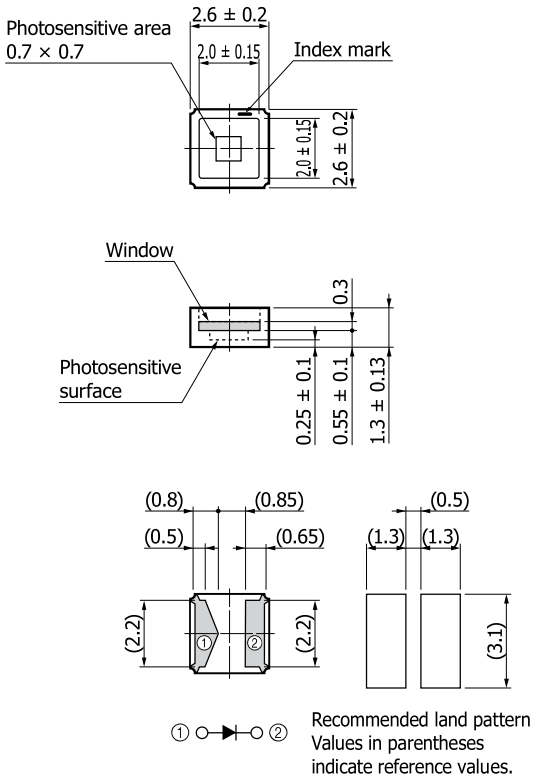
Dimensional outline (unit: mm)

P16112-011MA



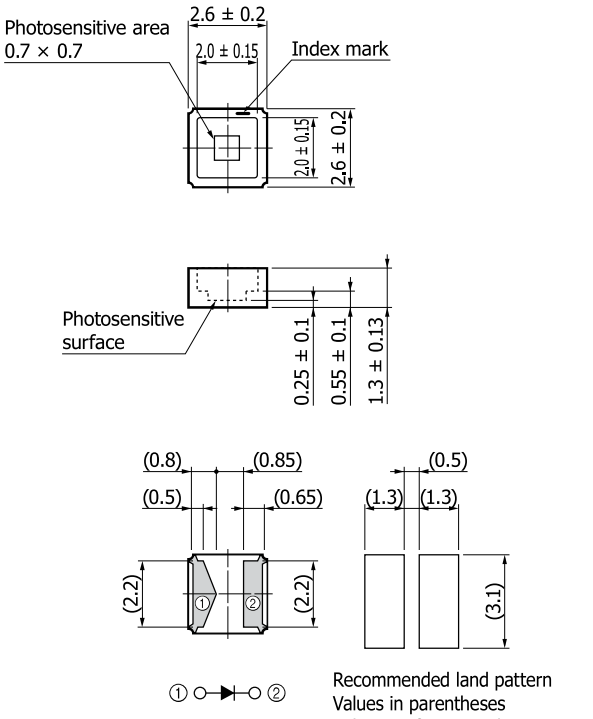
KIRDA0284EA

P16612-011CA



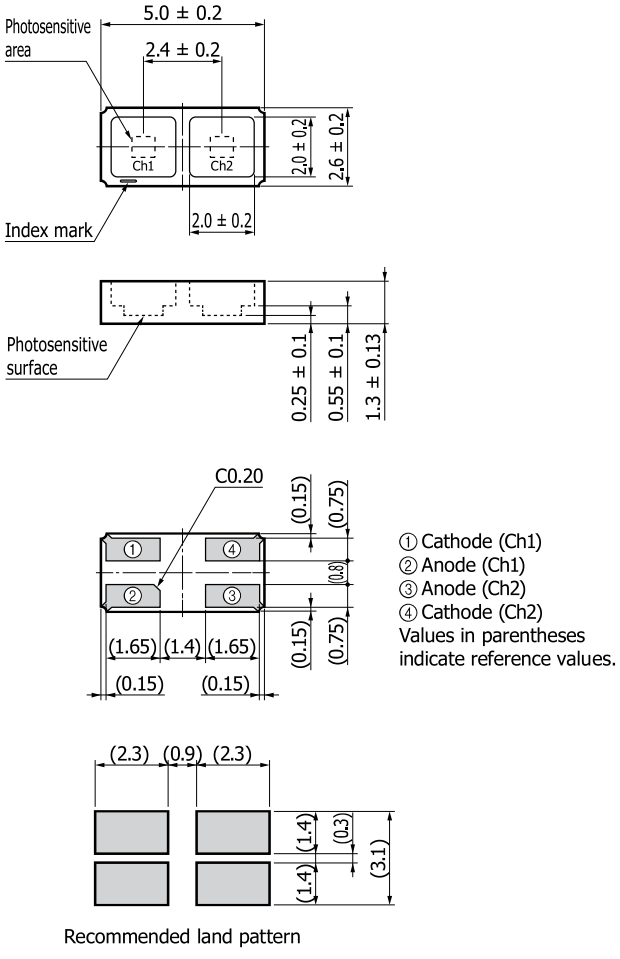
KIRDA0281EA

P16612-011CN



KIRDA0285EB

P16849-013CN



KIRDA0286EA

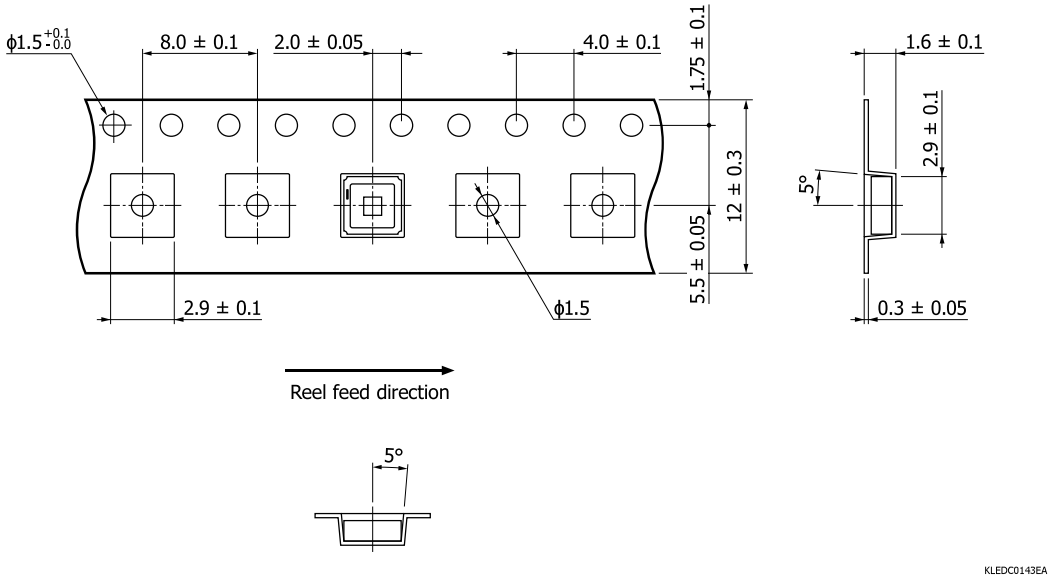
Standard packing specifications

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)



■ Packing quantity
500 pcs/reel

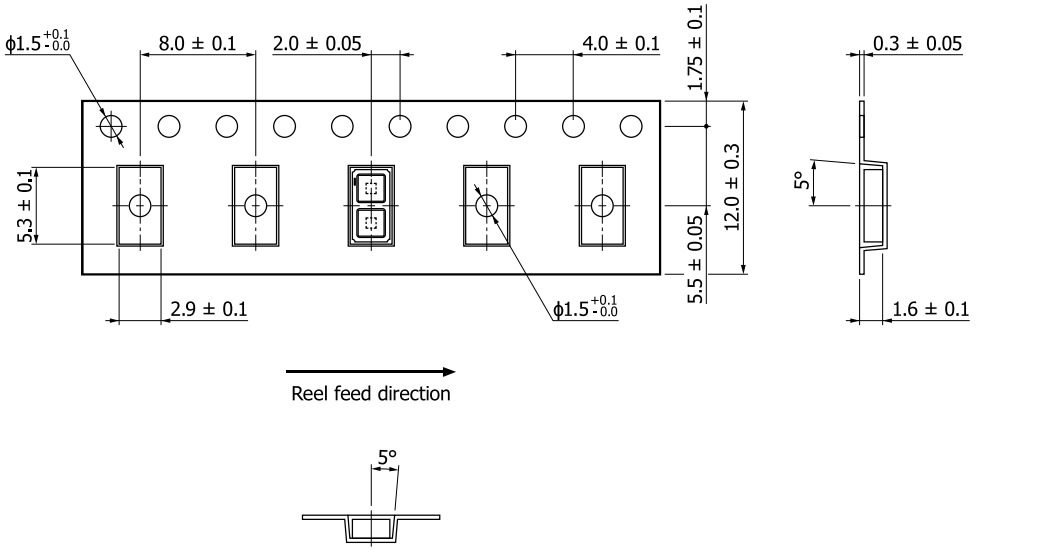
■ Packing state
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

P16849-013CN

■ 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)



■ Packing quantity
100 pcs/reel

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

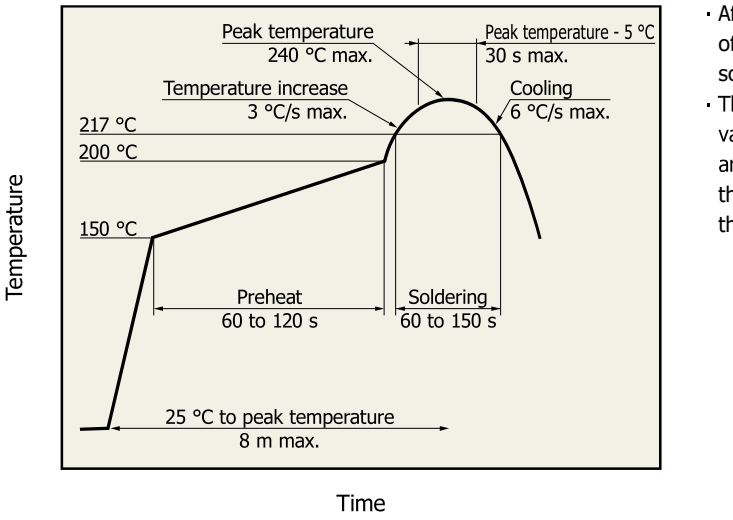
Recommended soldering conditions

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.

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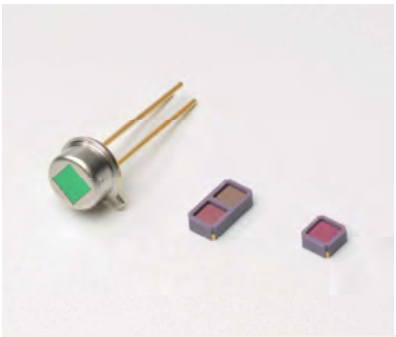
HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Chuo-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184
U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218
Germany: HAMAMATSU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

NEW

InAsSb photovoltaic detectors



With band-pass filter | P16112/P16612/P16849 series

Back-illuminated type 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 material. By using a back-illuminated structure, we greatly improved the sensitivity temperature coefficient compared to the front-illuminated type. 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. A two-element type that can detect two wavelength 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 (CH_4, CO_2)**
- **Flame monitors (CO_2 resonance radiation)**

Option (sold separately)

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

Structure

Type no.	Number of elements	Photosensitive area (mm)	Window material*1	Package	Cooling	Field of view FOV (degrees)
P16112-033MF	1	0.7 × 0.7	BPF (3.3 µm)	TO-46	Non-cooled	87
P16112-039MF			BPF (3.9 µm)			
P16112-043MF			BPF (4.26 µm)			
P16112-045MF			BPF (4.45 µm)			
P16612-033CF			BPF (3.3 µm)	Ceramic		86
P16612-039CF			BPF (3.9 µm)			
P16612-043CF			BPF (4.26 µm)			
P16612-045CF			BPF (4.45 µm)			
P16849-011CF	2		BPF (3.3 µm)			
			BPF (3.9 µm)			
P16849-012CF			BPF (4.26 µm)			
			BPF (3.9 µm)			

*1: BPF: Band-pass filter. For windowless and AR coating types, refer to the P16612-011CN datasheet.

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

Type no.	Reverse voltage V_R (V)	Operating temperature*2 Topr (°C)	Storage temperature*2 Tstg (°C)	Incident light level (W/mm²)	Soldering temperature Tsol (°C)
P16112-033MF	1	-40 to +85	-40 to +85	1	-
P16112-039MF					
P16112-043MF					
P16112-045MF					
P16612-033CF					240 (once)*3
P16612-039CF					
P16612-043CF					
P16612-045CF					
P16849-011CF					
P16849-012CF					

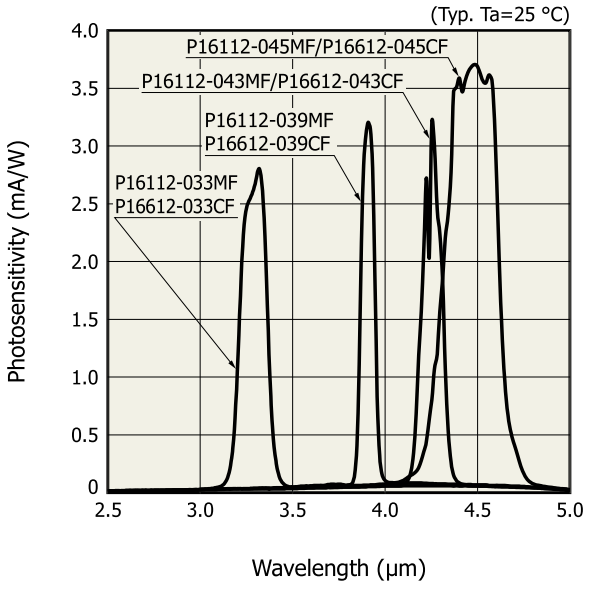
*2: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation may cause deterioration in characteristics and reliability.
*3: Reflow soldering, JEDEC J-STD-020 MSL 2, see P.8
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, unless otherwise noted)

Type no.	Center wavelength CWL			Spectral response half width FWHM		Photosensitivity S λ=CWL	Shunt resistance Rsh V_R=10 mV	Detectivity D* (CWL, 1200, 1)		Noise equivalent power NEP λ=λp		Rise time tr*4	Terminal capacitance Ct*5
	Min. (nm)	Typ. (nm)	Max. (nm)	Typ. (nm)	Max. (nm)	(mA/W)	(kΩ)	Min. (cm·Hz$^{1/2}$/W)	Typ. (cm·Hz$^{1/2}$/W)	Typ. (W/Hz$^{1/2}$)	Max. (W/Hz$^{1/2}$)	(ns)	(pF)
P16112-033MF	3270	3300	3330	160	180	2.8	180	3.2×10^{8}	6.5×10^{8}	1.1×10^{-10}	2.2×10^{-10}	15	0.5
P16112-039MF	3820	3900	3980	90	110	3.2		3.7×10^{8}	7.4×10^{8}	9.5×10^{-11}	1.9×10^{-10}		
P16112-043MF	4217	4260	4303	140	160	3.2		3.7×10^{8}	7.4×10^{8}	9.5×10^{-11}	1.9×10^{-10}		
P16112-045MF	4400	4450	4500	350	400	3.7		4.3×10^{8}	8.6×10^{8}	8.2×10^{-11}	1.6×10^{-10}		
P16612-033CF	3270	3300	3330	160	180	2.8		3.2×10^{8}	6.5×10^{8}	1.1×10^{-10}	2.2×10^{-10}		
P16612-039CF	3820	3900	3980	90	110	3.2		3.7×10^{8}	7.4×10^{8}	9.5×10^{-11}	1.9×10^{-10}		
P16612-043CF	4217	4260	4303	140	160	3.2		3.7×10^{8}	7.4×10^{8}	9.5×10^{-11}	1.9×10^{-10}		
P16612-045CF	4400	4450	4500	350	400	3.7		4.3×10^{8}	8.6×10^{8}	8.2×10^{-11}	1.6×10^{-10}		
P16849-011CF	3270	3300	3330	160	180	2.8		3.2×10^{8}	6.5×10^{8}	1.1×10^{-10}	2.2×10^{-10}		
	3820	3900	3980	90	110	3.2		3.7×10^{8}	7.4×10^{8}	9.5×10^{-11}	1.9×10^{-10}		
P16849-012CF	4217	4260	4303	140	160	3.2		3.7×10^{8}	7.4×10^{8}	9.5×10^{-11}	1.9×10^{-10}		
	3820	3900	3980	90	110	3.2		3.7×10^{8}	7.4×10^{8}	9.5×10^{-11}	1.9×10^{-10}		

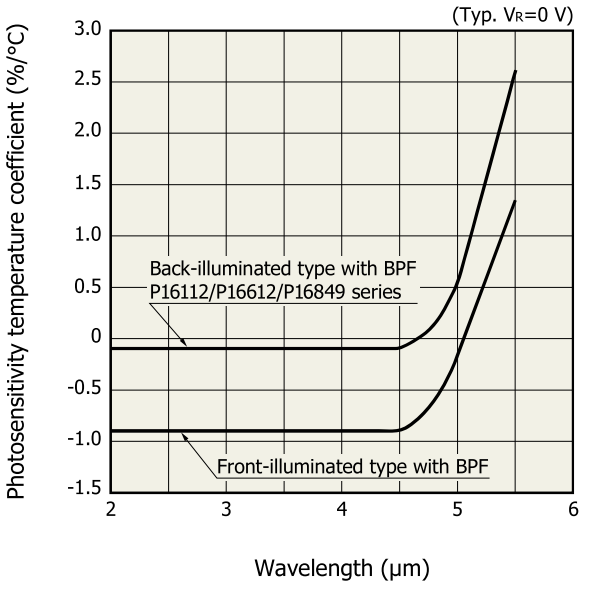
*4: V_R=0 V, R_L=50 Ω, 10 to 90%
*5: V_R=0 V, f=1 MHz

Spectral response



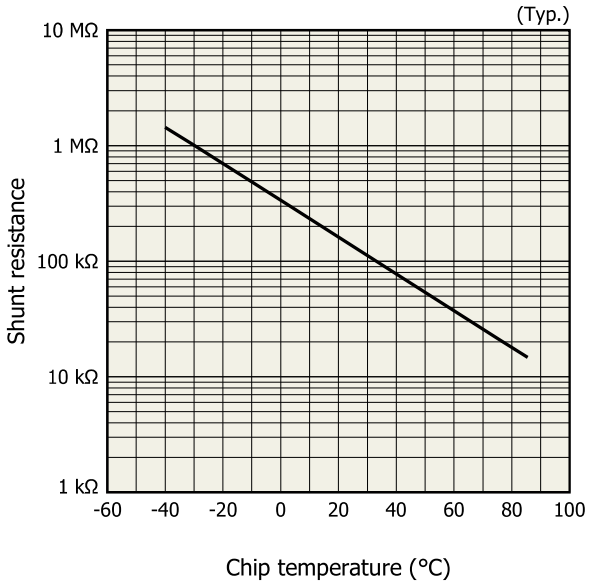
KIRDB0732EC

Photosensitivity temperature characteristics



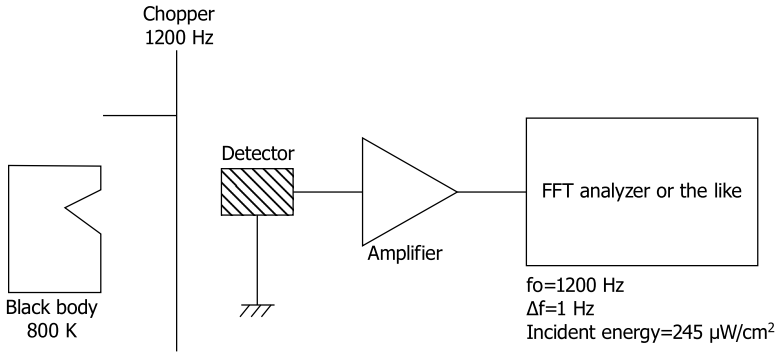
KIRDB0729EB

Shunt resistance vs. chip temperature



KIRDB0717EA

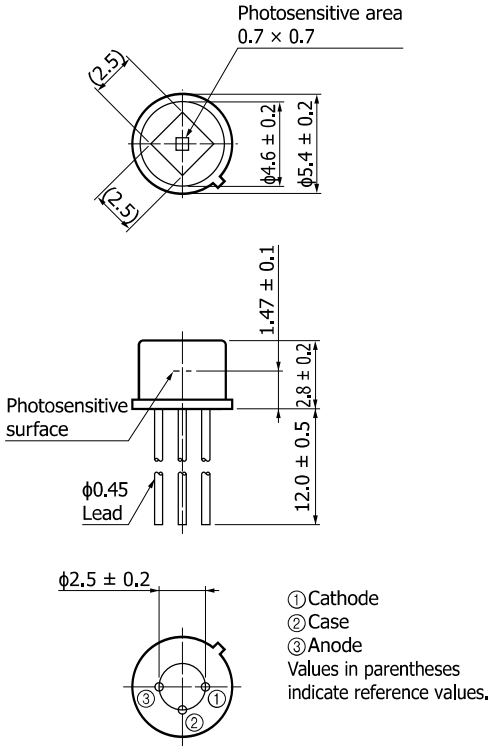
Measurement circuit example



KIRDC0127EA

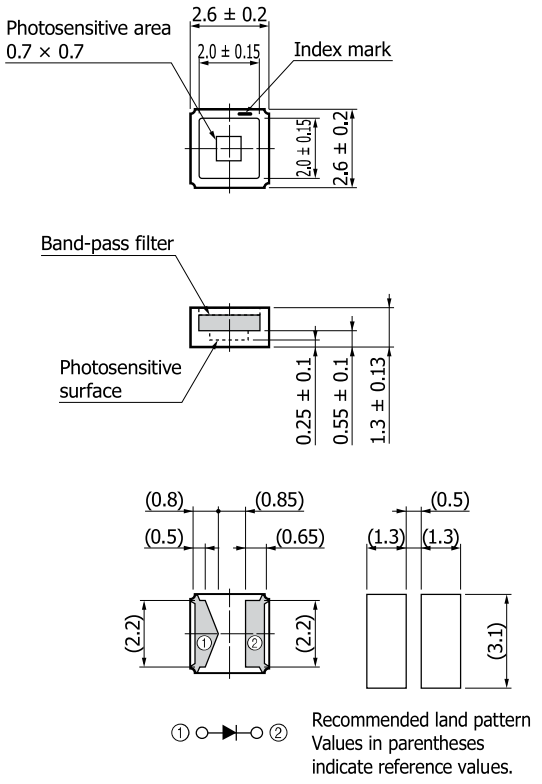
Dimensional outlines (unit: mm)

P16112-033MF/-039MF/-043MF/-045MF



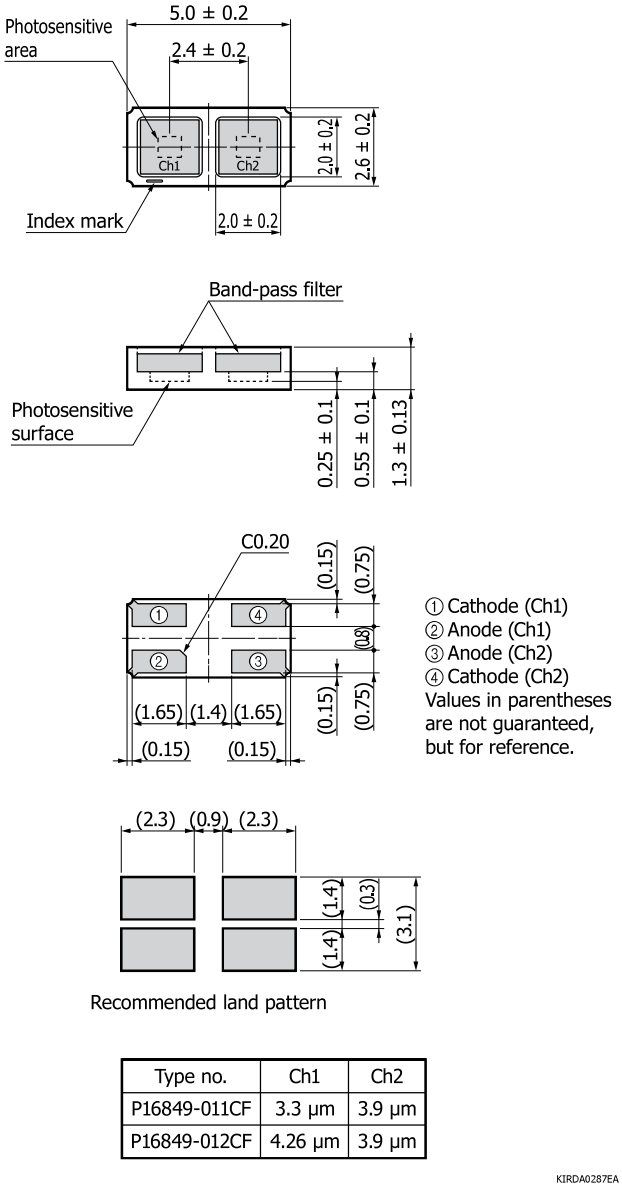
KIRDA0284EA

P16612-033CF/-039CF/-043CF/-045CF



KIRDA0288EA

P16849-011CF/-012CF



Recommended land pattern

Type no.	Ch1	Ch2
P16849-011CF	3.3 µm	3.9 µm
P16849-012CF	4.26 µm	3.9 µm

KIRDA0287EA

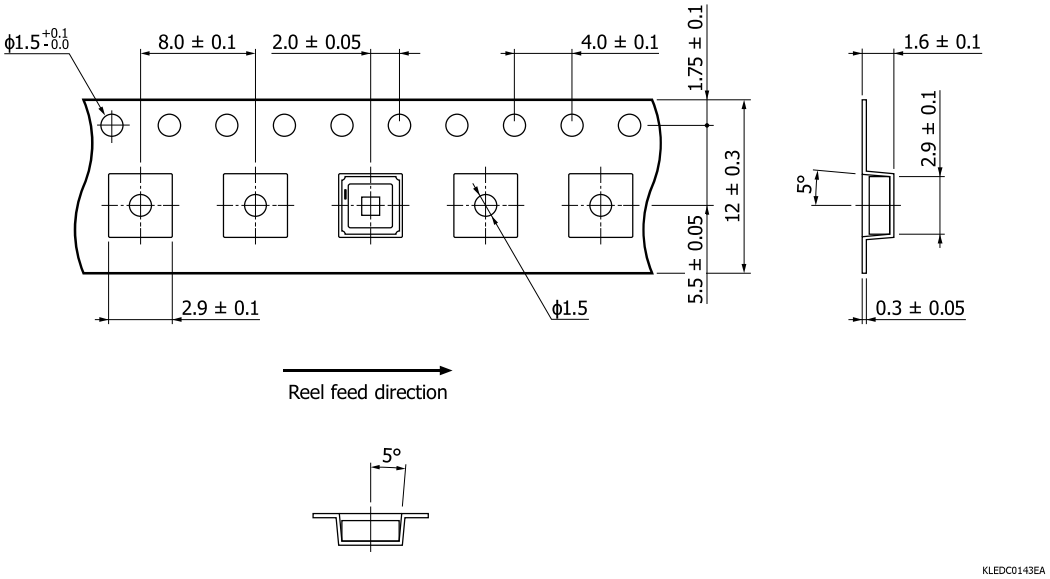
Standard packing specifications

P16612-033CF/-039CF/-043CF/-045CF

■ 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)



■ Packing quantity
500 pcs/reel

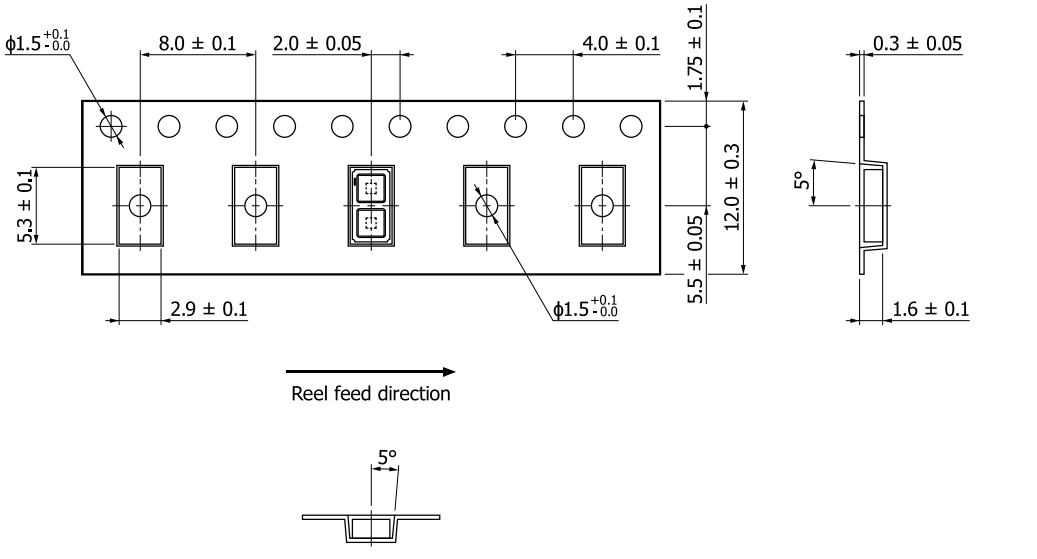
■ Packing state
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

P16849-011CF/-012CF

■ 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)



■ Packing quantity
100 pcs/reel

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

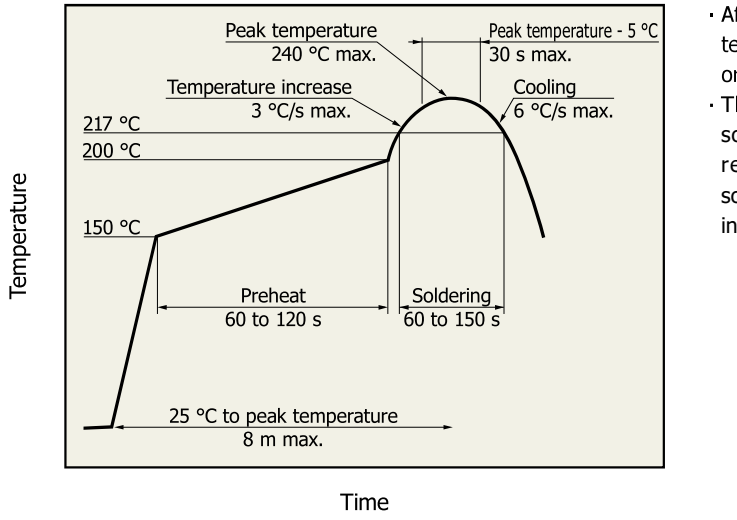
Recommended soldering conditions

P16112-033MF/-039MF/-043MF/-045MF

- Solder temperature: 260 °C (10 s or less, once)
  Solder the leads at a point at least 1 mm away from the package body.

Note: When you set soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

P16612-033CF/-039CF/-043CF/-045CF, P16849-011CF/-012CF



- 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 products

Evaluation kit M16953 for InAsSb photovoltaic detector

The M16953 is an evaluation amplifier for gas measurement used in combination with Hamamatsu's InAsSb photovoltaic devices with band-pass filters (TO-46 package). These can detect infrared light transmitted through a band-pass filter simply by connecting a power supply ±2.5 V.

Specifications

- **Applicable devices: InAsSb photovoltaic detectors with band-pass filter*6**
- **Gain: 10^7 V/A**
- **Frequency characteristics: DC to 80 kHz**
- **Recommended drive voltage: ±2.5 V**

*6: InAsSb photovoltaic devices with band-pass filter sold separately

Evaluation kit M16615 for mid infrared LED

The M16615 is a driver for mid infrared LED (TO-46 package). The LED can be pulse-driven simply by connecting a power supply (+15 V). This is used in combination with the evaluation kit M16953 series for InAsSb photovoltaic detector.

Specifications

- **Applicable devices: Mid infrared LED*7**
- **Output current: 400 mA**
- **Output pulse: 10 µs**
- **Output cycle: 1000 µs**
- **Recommended drive voltage: +15 V**

*7: Mid infrared LED sold separately

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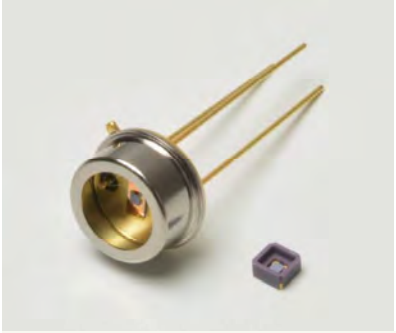
HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184
U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218
Germany: HAMAMATSU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

Cat. No. KIRD1150E06 Oct. 2023 DN

InAsSb photovoltaic detectors



P16113-011MN P16613-011CN

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

The P16113-011MN and P16613-011CN are infrared detectors 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. These products are an environmentally friendly infrared detector 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 (P16613-011CN)**
- **Compatible with lead-free solder reflow (P16613-011CN)**
- **RoHS compliant (lead, mercury, cadmium free)**

Applications

- **Gas detection (SOx, NOx, etc.)**
- **Radiation thermometers**
- **Mid infrared spectroscopy**

Option (sold separately)

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

Structure

Parameter	P16113-011MN	P16613-011CN	Unit
Window material	None		-
Package	TO-5	Ceramic	-
Photosensitive area	0.7 × 0.7		mm
Field of view	101	86	degrees

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

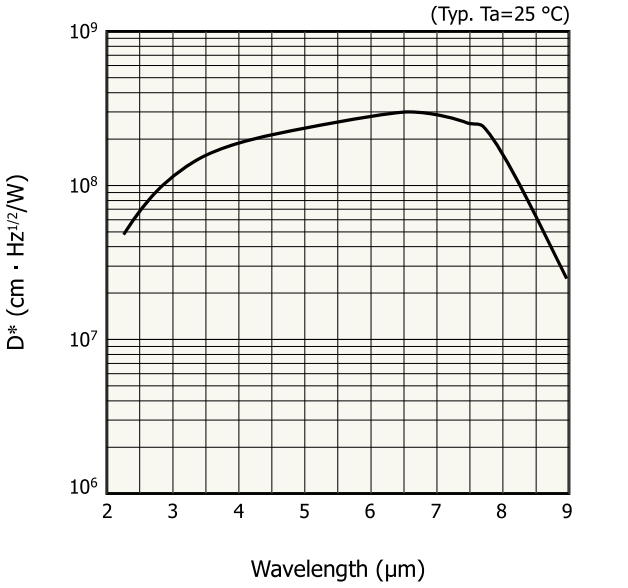
Parameter	Symbol	Value	Unit
Reverse voltage	V_R	1	V
Operating temperature*1	Topr	-40 to +85	°C
Storage temperature*1	Tstg	-40 to +85	°C
Incident light level	Pin	1	W/mm^2
Soldering temperature	Tsol	240 (once)*2	°C

*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: P16613-011CN Reflow soldering, JEDEC J-STD-020 MLS 2, see P.6
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)

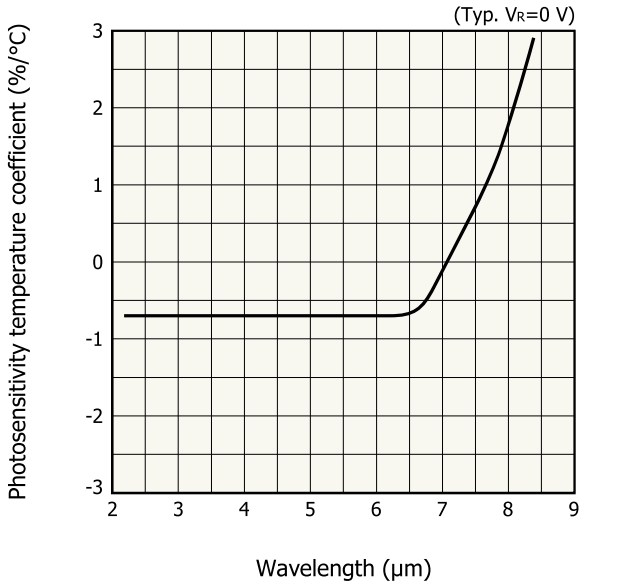
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Peak sensitivity wavelength	λp		-	6.5	-	µm
Cutoff wavelength	λc		8.0	8.3	-	µm
Photosensitivity	S	λ=λp	5.3	6.1	-	mA/W
Shunt resistance	Rsh	V_R=10 mV	4.9	8.3	-	kΩ
Terminal capacitance	Ct	V_R=0 V, f=1 MHz	-	0.8	-	pF
Detectivity	D*	(λp, 1200, 1)	2.0×10^{8}	3.0×10^{8}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

Spectral response (D*)



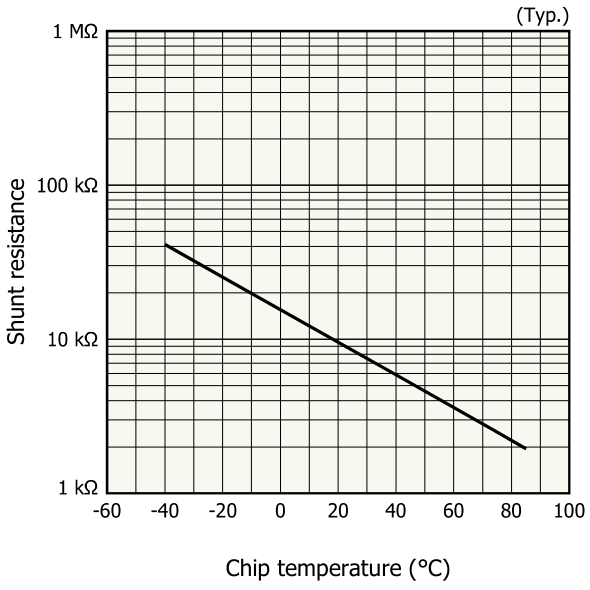
KIRDB0720EA

Photosensitivity temperature characteristics



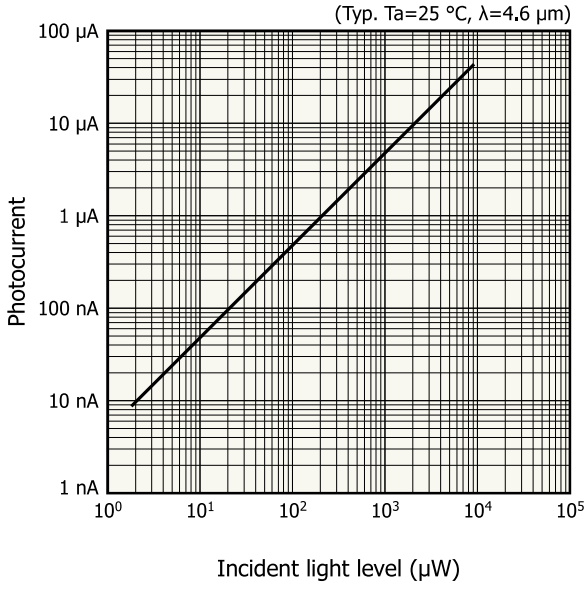
KIRDB0721EA

Shunt resistance vs. chip temperature



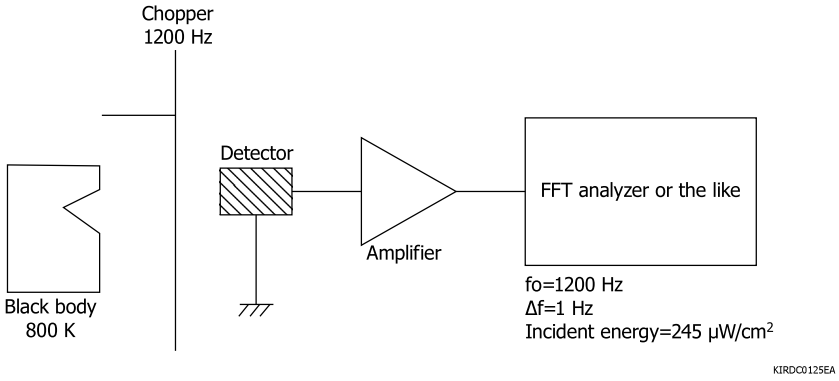
KIRDB0722EA

Linearity



KIRDB0723EA

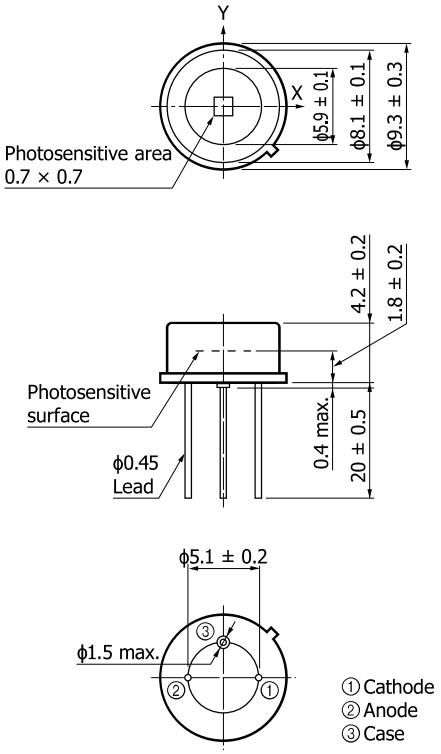
Block diagram for characteristic measurement



KIRDC0125EA

Dimensional outline (unit: mm)

P16113-011MN



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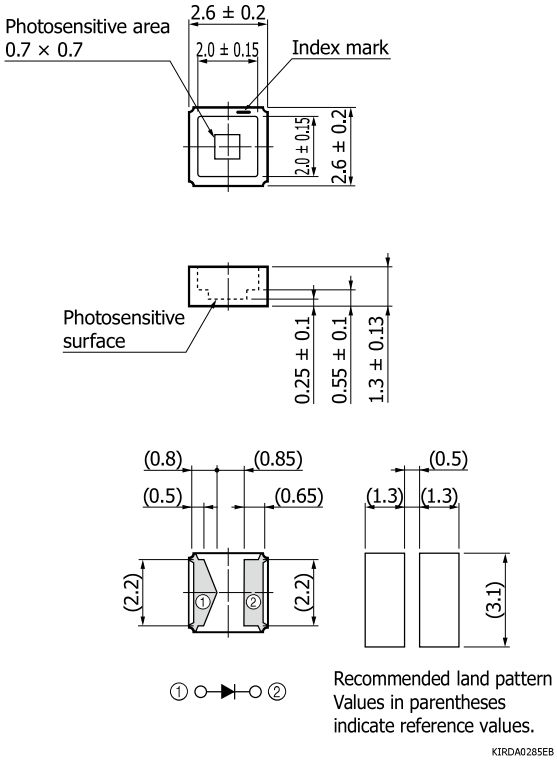
P16613-011CN



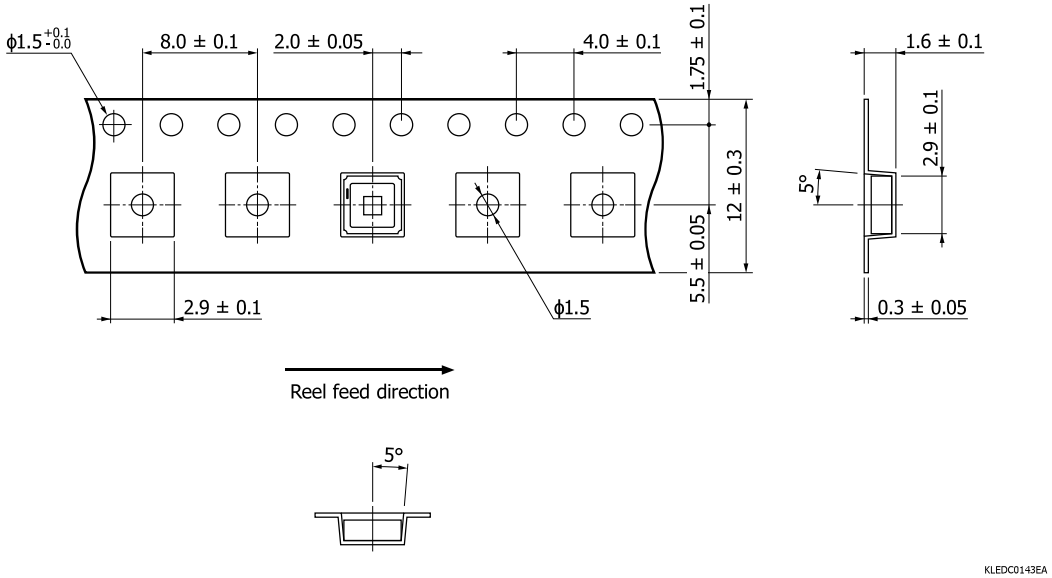
KIRDA0285EB

Standard packing specifications (P16613-011CN)

■ 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)



■ Packing quantity
100 pcs/reel

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

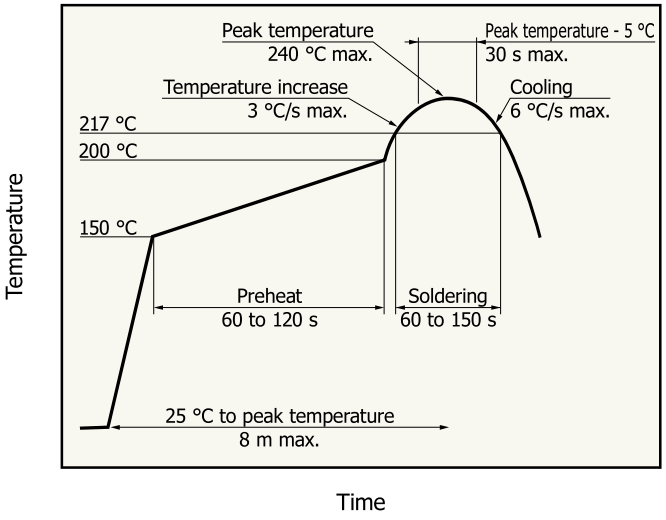
Recommended soldering conditions

P16113-011MN

- 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.

P16613-011CN



KSPDB0418EA

- 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

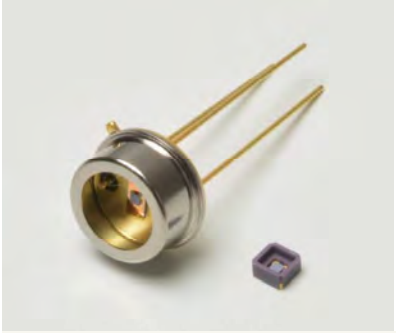
■ Precautions
- Disclaimer
- Safety consideration
- Surface mount type products
- Unsealed products
- Compound opto-semiconductors (photosensors, light emitters)

■ Technical note
- Compound semiconductor photosensors

HAMAMATSU www.hamamatsu.com

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

InAsSb photovoltaic detectors



P16114-011MN P16614-011CN

Infrared detector with high photosensitivity (up to 10 µm band)

The P16114-011MN and P16614-011CN are an infrared detector that have high sensitivity in the spectral band up to 10 µm. This high sensitivity has been achieved due to Hamamatsu unique crystal growth technology and process technology. By using a back-illuminated structure, the photosensitivity has been improved compared to the front-illuminated type. These products are an environmentally friendly infrared detector 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 (P16614-011CN)**
- **Compatible with lead-free solder reflow (P16614-011CN)**
- **RoHS compliant (lead, mercury, cadmium free)**

Applications

- **Gas detection (SOx, NOx, NH_3, O_3, etc.)**
- **Radiation thermometers**
- **CO_2 laser monitor**
- **Mid infrared spectroscopy**

Option (sold separately)

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

Structure

Parameter	P16114-011MN	P16614-011CN	Unit
Window material	None		-
Package	TO-5	Ceramic	-
Photosensitive area	0.7 × 0.7		mm
Field of view	101	86	degrees

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

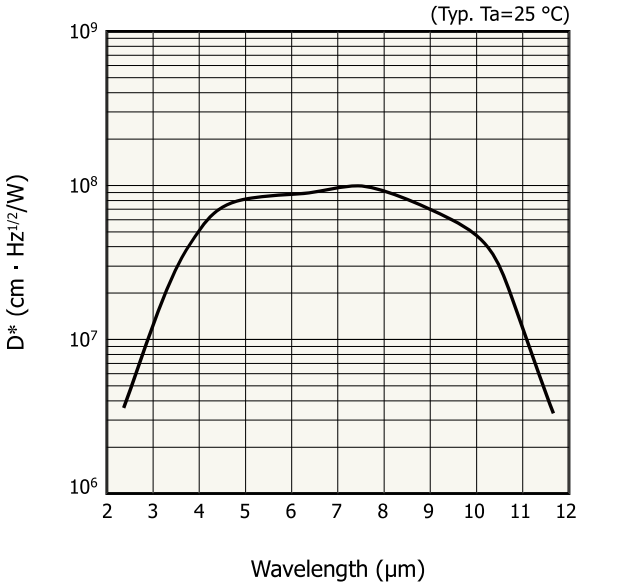
Parameter	Symbol	Value	Unit
Reverse voltage	V_R	1	V
Operating temperature*1	Topr	-40 to +85	°C
Storage temperature*1	Tstg	-40 to +85	°C
Incident light level	Pin	1	W/mm^2
Soldering temperature	Tsol	240 (once)*2	°C

*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: P16614-011CN Reflow soldering, JEDEC J-STD-020 MLS 2, see P.6
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	λp		-	7.4	-	µm
Cutoff wavelength	λc		9.7	11.0	-	µm
Photosensitivity	S	λ=λp	3.4	5.0	-	mA/W
Shunt resistance	Rsh	V_R=10 mV	0.65	1.3	-	kΩ
Terminal capacitance	Ct	V_R=0 V, f=1 MHz	-	1.2	-	pF
Detectivity	D*	(λp, 1200, 1)	4.7×10^7	1.0×10^8	-	cm·Hz$^{1/2}$/W
Noise equivalent power	NEP	λ=λp	-	7.1×10^{-10}	9.0×10^{-10}	W/Hz$^{1/2}$
Rise time	tr	V_R=0 V, R_L=50 Ω, 10 to 90%	-	3	10	ns

Spectral response (D*)



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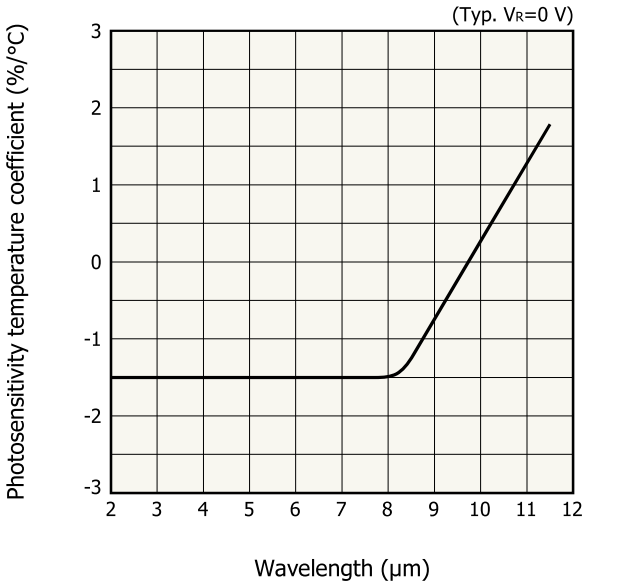
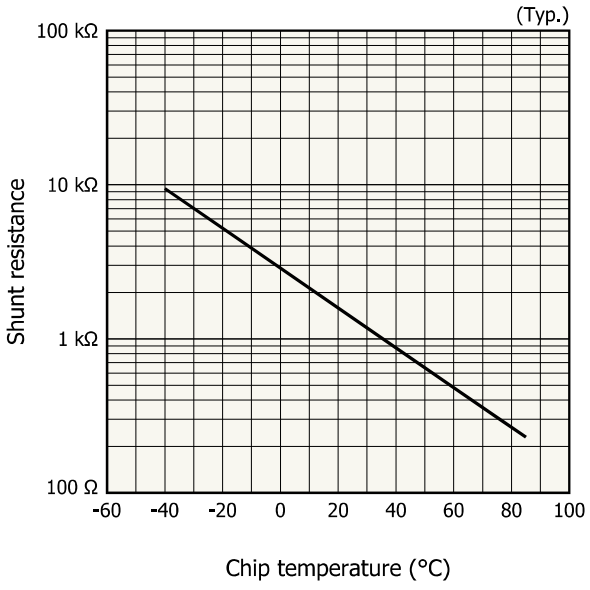
Photosensitivity temperature characteristics

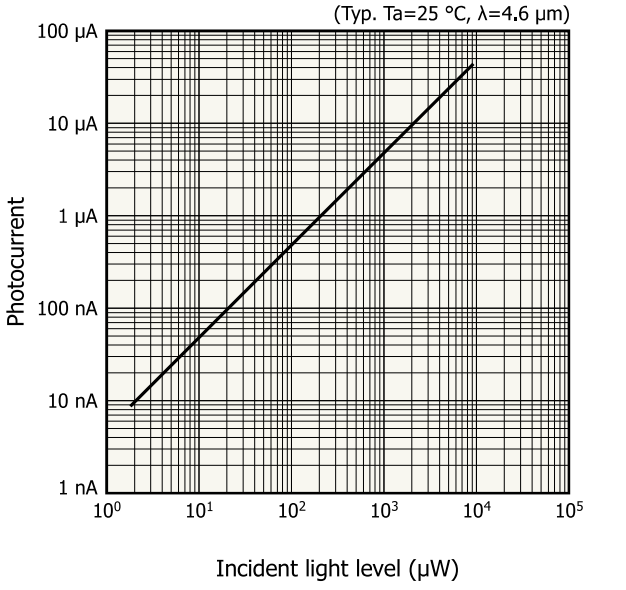


KIRDB0725EA

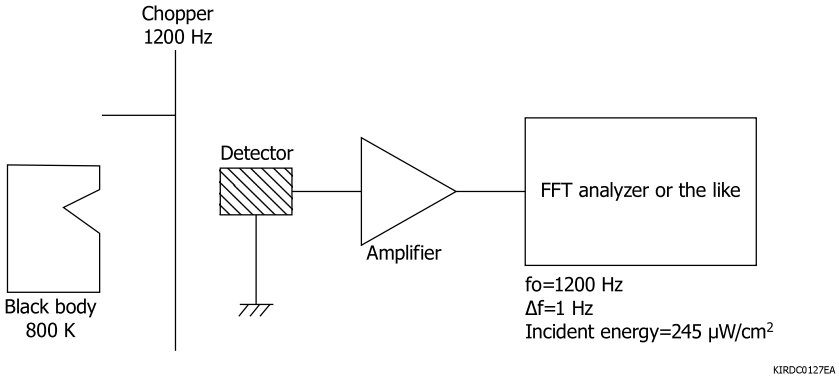
Shunt resistance vs. chip temperature



Linearity

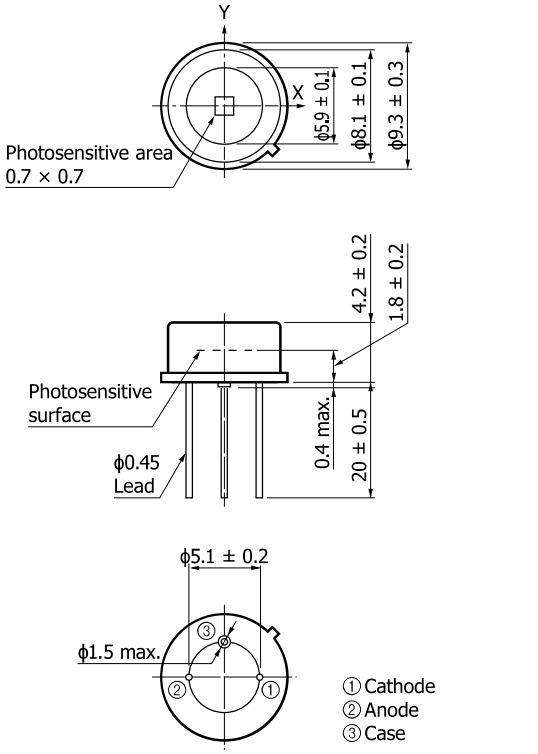


Block diagram for characteristic measurement



Dimensional outline (unit: mm)

P16114-011MN



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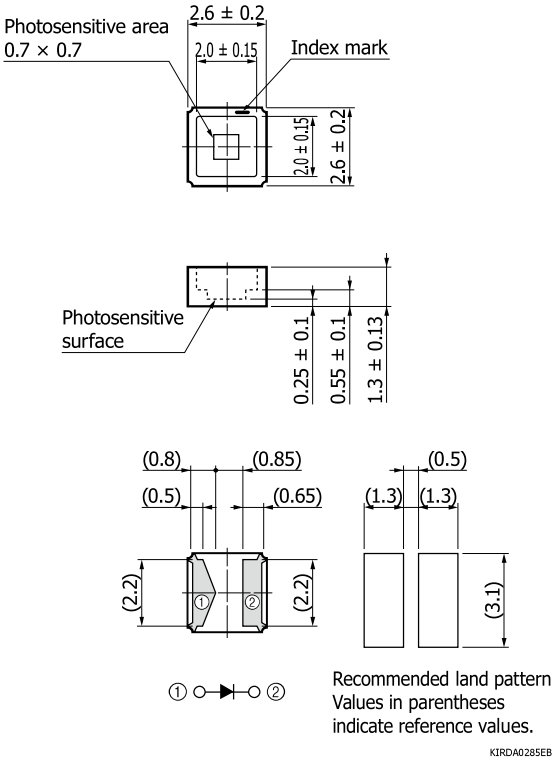
P16614-011CN



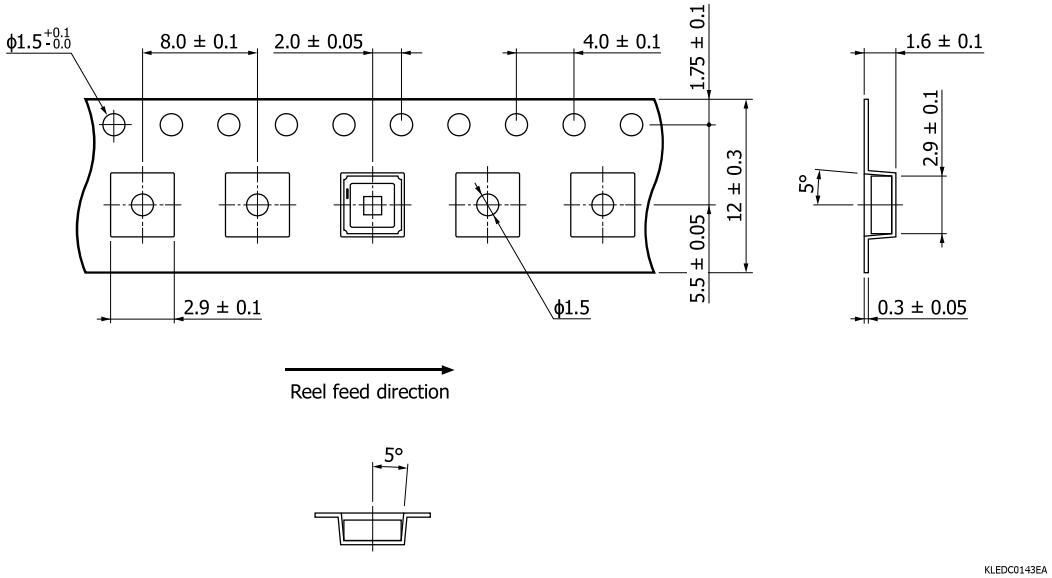
KIRDA0285EB

Standard packing specifications (P16614-011CN)

■ 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)



■ Packing quantity
100 pcs/reel

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

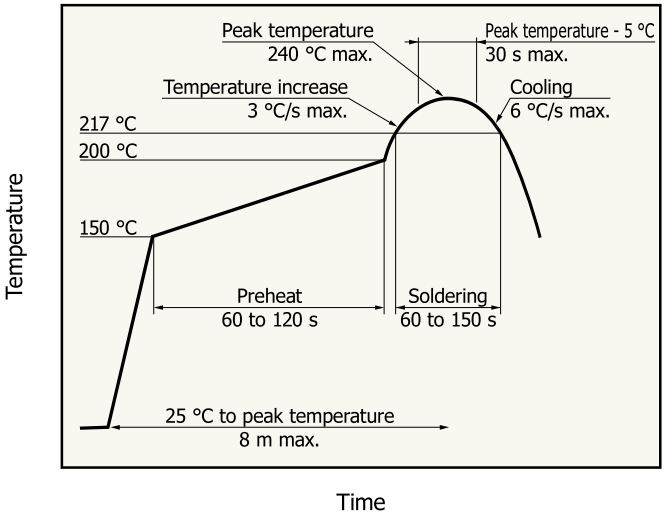
Recommended soldering conditions

P16114-011MN

- 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.

P16614-011CN



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- After unpacking, store it in an environment at a temperature 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
- Safety consideration
- Surface mount type products
- Unsealed products
- Compound opto-semiconductors (photosensors, light emitters)

■ Technical note
- Compound semiconductor photosensors

HAMAMATSU www.hamamatsu.com

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

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 simply 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			Supply capacitance (mA)	Incident light level*2 (nW)	External input voltage (V)	Operating temperature*3 Topr (°C)	Storage temperature*3 Tstg (°C)
			Min. (V)	Typ. (V)	Max. (V)					
G7754-01	InGaAs (G12183-010 chip)	ϕ1	±12.0	±15.0	±17.5	±23	10	±18	0 to +40	-20 to +50
G7754-03	InGaAs (G12183-030 chip)	ϕ3					40			
P7751-01	InSb (P5968-060)	ϕ0.6				±30	60			
P7751-02	InSb (P5968-200)	ϕ2					0.1 μW			
C15780-401	Type Ⅱ superlattice (P15409-901)	ϕ0.1	±14.5	±15.0	±15.5	+45, -30	14 μW			

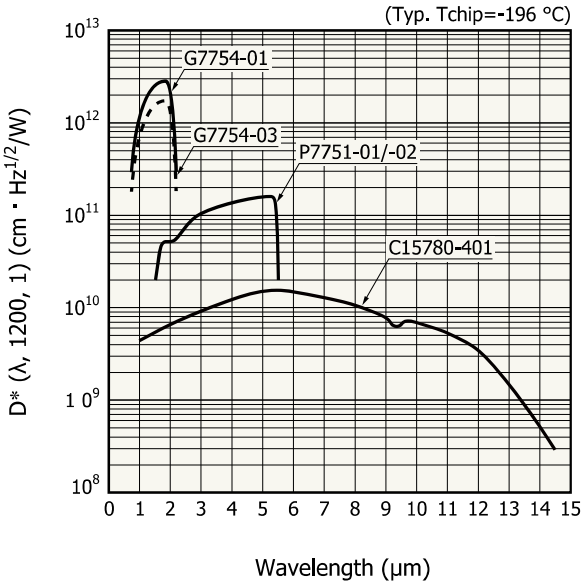
*1: Use only an analog power supply.
*2: The value at which the output voltage of each module is maximized when light with the maximum sensitivity wavelength λp enters the device. This value does not cause immediate failure.
However, if light that destroys the device (1 W/cm^2 for all elements) enters the device, it may cause a drop in product quality.
*3: 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 characteristic and reliability.
Note: Cooling 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)

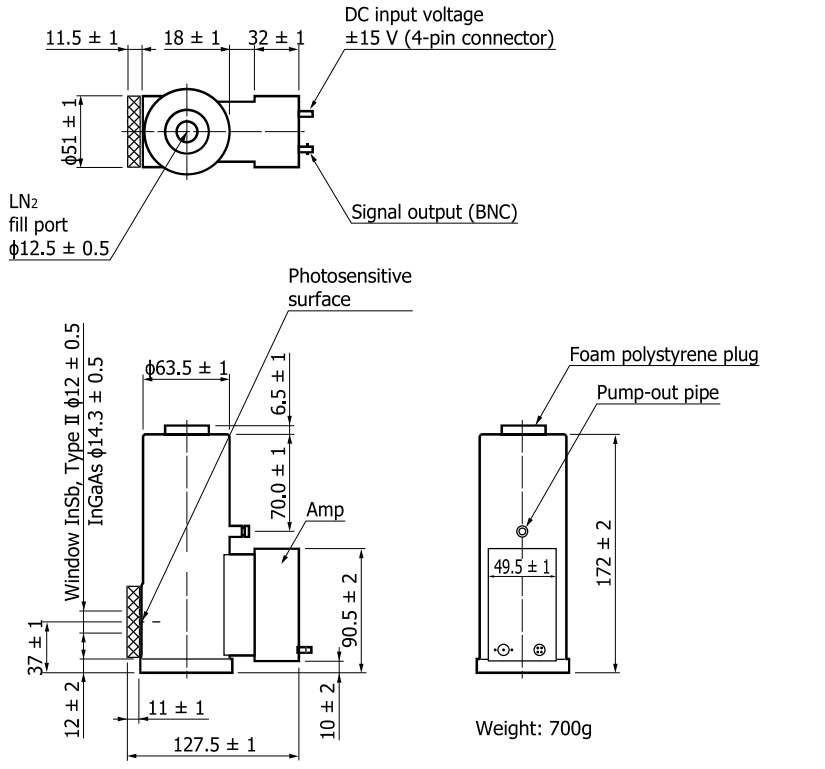
Type No.	Measurement condition: Element temperature Tchip (°C)	Peak sensitivity wavelength λp (μm)	Cutoff wavelength λc (μm)	Photo-sensitivity S λ=λp *4 (V/W)	Noise equivalent power NEP λ=λp (W/Hz$^{1/2}$)	Cutoff frequency fc (Hz)	Output impedance (Ω)	Maximum output voltage RL=1 kΩ (V)	Maximum current consumption*5 (mA)
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*6		5.3	5.5	3×10^{8}	3×10^{-13}	5 to 10000		±10	±20
P7751-02*6				1.5×10^{8}	1×10^{-12}	5 to 12000		±10	±20
C15780-401*6		5.4	14.5	2×10^{6}	5.5×10^{-12}	7 to 100000		±14	+30, -20

*4: f=100 Hz (G7754-01, G7754-03), f=1.2 kHz (P7751-01, P7751-02, C15780-401)
*5: Vs=±15 V
*6: FOV=60°

Spectral response

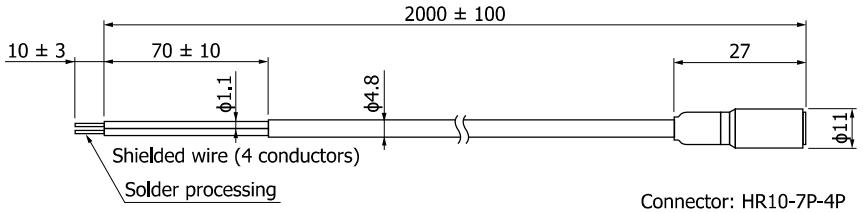


Dimensional outline (unit: mm)

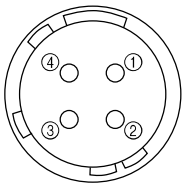


KIRDA0010EE

Cable (for DC power supply) A4372-02



Connector: HR10-7P-4P
(made by Hirose Electric)



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

Tolerance unless otherwise noted: ±1

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
· Safety consideration
· Precautions / Compound opto-semiconductors (photosensors, light emitters)

■ Catalogs
· Selection guide / Infrared detectors
· Technical note / Compound semiconductor photosensors

HAMAMATSU www.hamamatsu.com

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

HAMAMATSU
PHOTON IS OUR BUSINESS

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	Topr	-40 to +60	°C
Storage temperature*1	Tstg	-55 to +60	°C

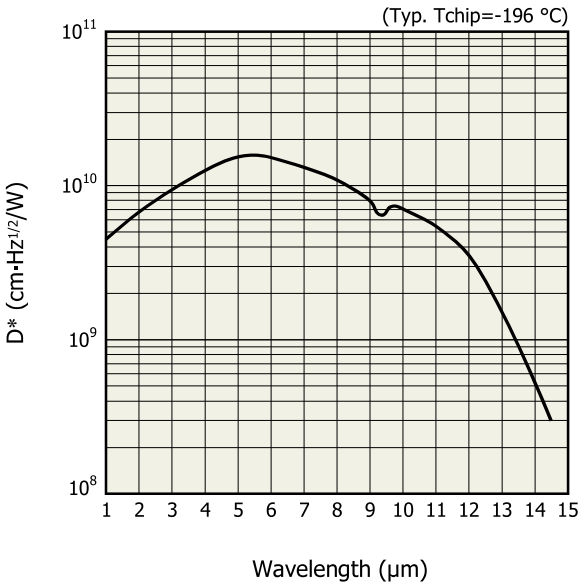
*1: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
Note: Exceeding the absolute 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	λp		-	5.4	-	µm
Cutoff wavelength*2	λc		-	14.5	-	µm
Photosensitivity	S	λ=λp	-	2.6	-	A/W
Shunt resistance	Rsh	VR=10 mV	-	2.5	-	kΩ
Terminal capacitance	Ct	VR=0 V, f=1 MHz	-	50	-	pF
Detectivity	D*	(λp, 1200, 1)	5.0×10^{9}	1.6×10^{10}	-	cm·Hz$^{1/2}$/W
Noise equivalent power	NEP	λ=λp	-	5.5×10^{-12}	1.8×10^{-11}	W/Hz$^{1/2}$
Rise time	tr	VR=0 V, RL=50 Ω, 0 to 63%	-	150	-	ns

*2: Wavelength at which signal/noise=1

Spectral response (D*)



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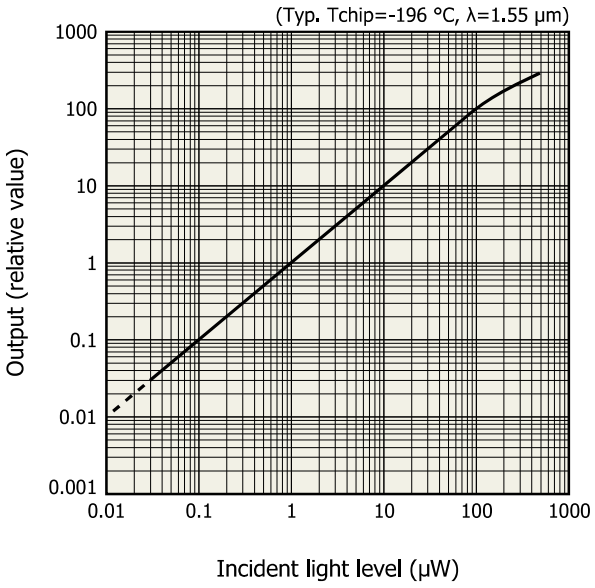
Linearity



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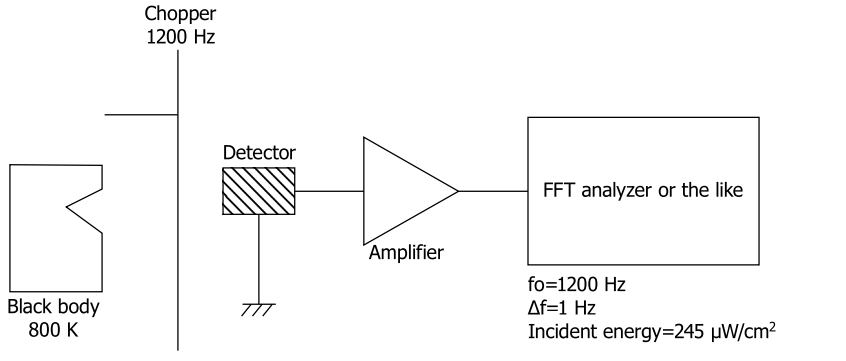
Block diagram for characteristics measurement



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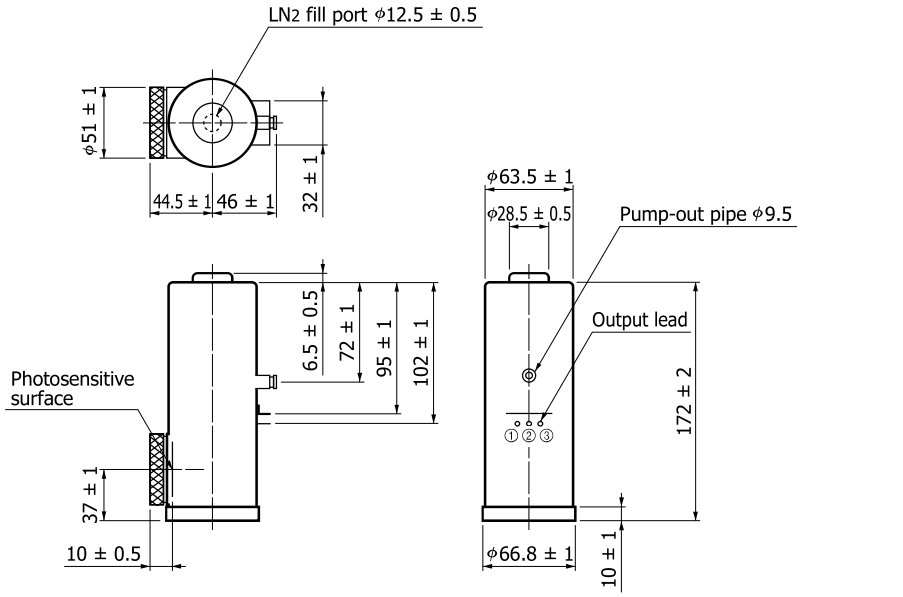
Dimensional outline (unit: mm)



Related information

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

■ Precaution
・Disclaimer

■ Technical information
・Compound semiconductor photosensors / Technical note

HAMAMATSU
www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184
U.S.A.: Hamamatsu Corporation: 360 Foothill Road, Bridgewater, N.J. 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218, E-mail: usa@hamamatsu.com
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8, E-mail: info@hamamatsu.de
France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10, E-mail: infos@hamamatsu.fr
United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777, E-mail: info@hamamatsu.co.uk
North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01, E-mail: info@hamamatsu.se
Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41, E-mail: info@hamamatsu.it
China: Hamamatsu Photonics (China) Co., Ltd.: 1201 Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R.China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866, E-mail: hpc@hamamatsu.com.cn
Taiwan: Hamamatsu Photonics Taiwan Co., Ltd.: 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

Cat. No. KIRD1137E02 Dec. 2021 DN

Line Up

Product name	Spectral response range (μm) 0 5 10 15 20 25	Features	Main applications
InAs photovoltaic detector	1 to 3.8 μm	· Covers a spectral response range close to PbS but offers higher response speed	· Gas measurement · Infrared measurement · FTIR
InSb photovoltaic detector	1 to 5.5 μm	· High sensitivity in the 3 to 5 μm band makes it suitable for analysis of gases such as CO_2, SOx.	· FTIR · Gas measurement · Radiation thermometers · Flame detection
InAsSb photovoltaic detector	1 to 11 μm	· High-speed response, high sensitivity, and high reliability infrared detectors in the 5 μm, 8 μm, or 10 μm band · Covers a spectral response range (5 μm band) close to PbSe but offers higher response speed	· Gas measurement · FTIR · Radiation thermometers · Laser monitors
Type II superlattice infrared detector	1 to 14.5 μm	· This sensor has expanded sensitivity up to the 14 μm band without using mercury or cadmium restricted by RoHS directive.	· FTIR · Gas measurement · Radiation thermometers