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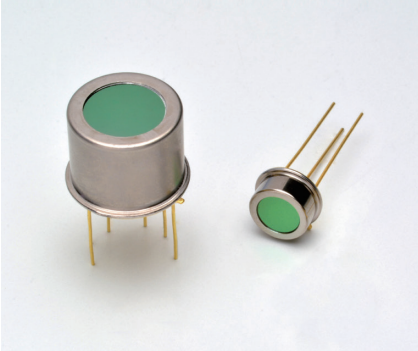
InAsSb photovoltaic detectors



P13894 series

High-speed response and high sensitivity infrared 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.

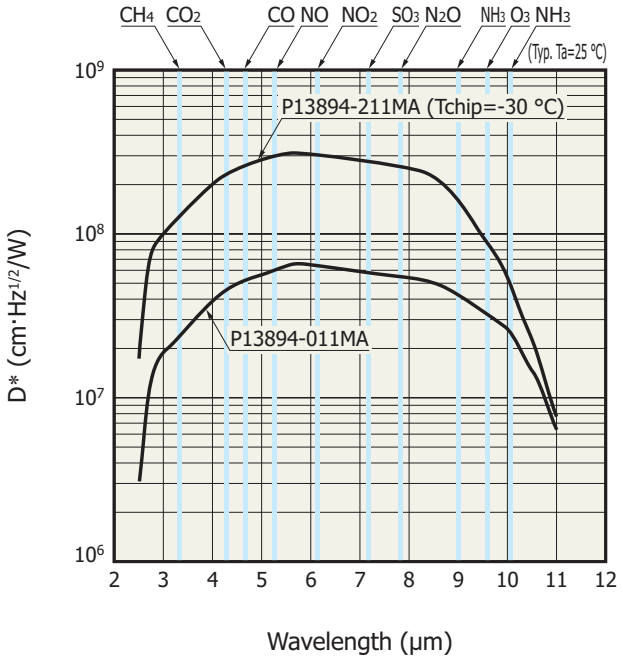
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical and optical characteristics (Ta=25 °C)

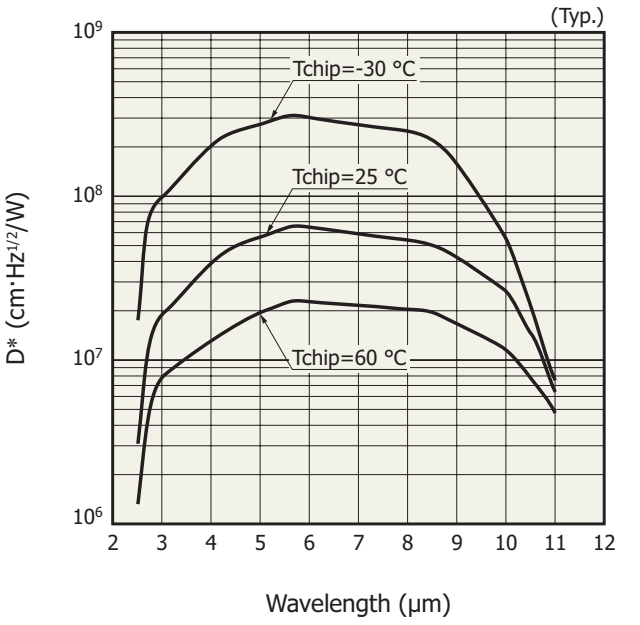
Parameter	Symbol	Condition	P13894-011MA			P13894-211MA			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Chip temperature	Tchip			25			-30		°C
Peak sensitivity wavelength	λp		-	5.6	-	-	5.6	-	μm
Cutoff wavelength	λc		9.7	11.0	-	8.9	10.2	-	μm
Photosensitivity	S	λ=λp*2	1.3	1.9	-	2.8	3.8	-	mA/W
Shunt resistance	Rsh	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.

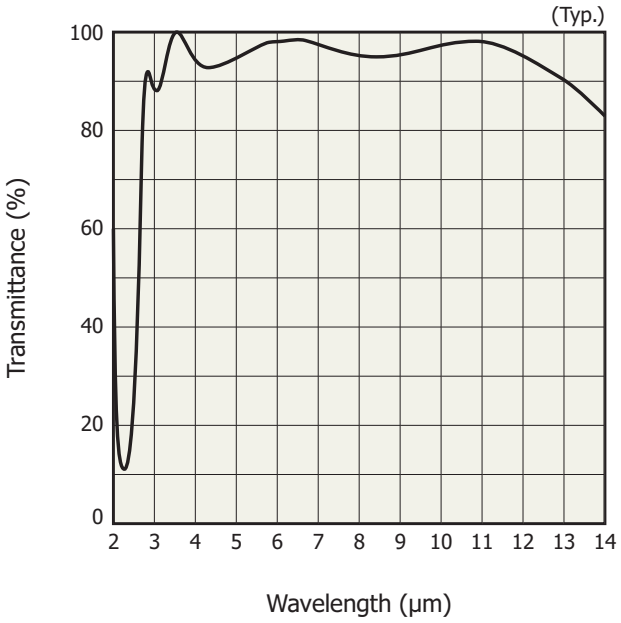
Spectral response (D*)



Sensitivity temperature characteristics



Spectral transmittance of window material



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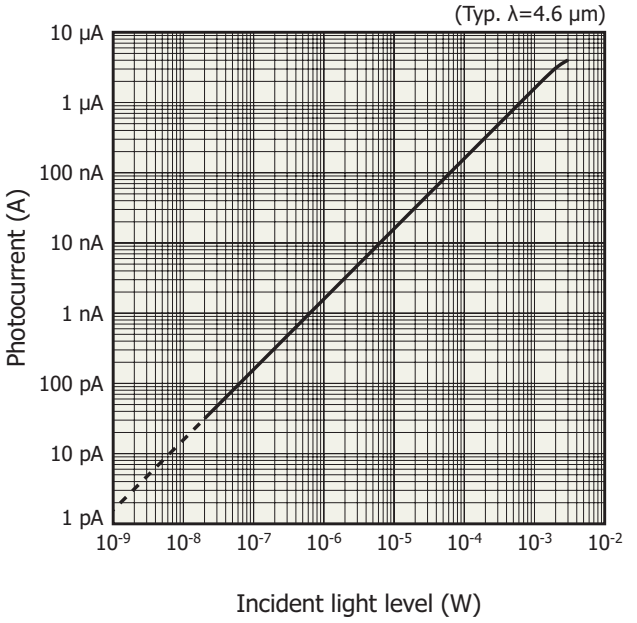
Linearity



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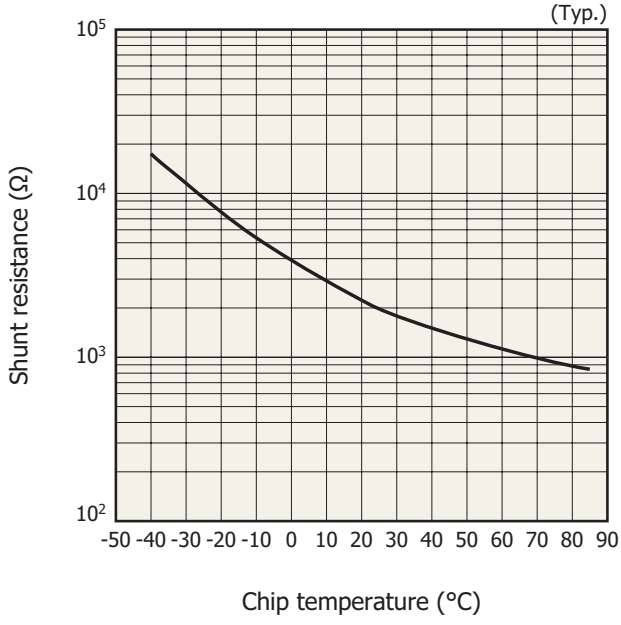
Shunt resistance vs. chip temperature



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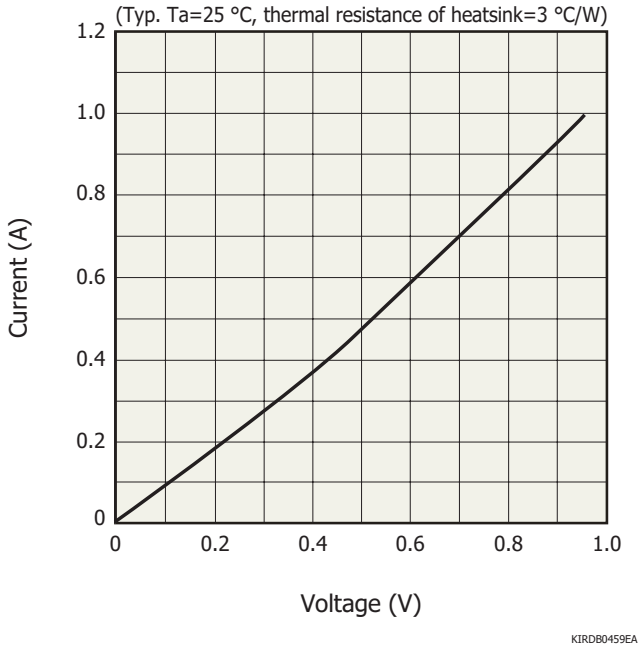
Specifications of two-stage TE-cooler (Ta=25 °C)

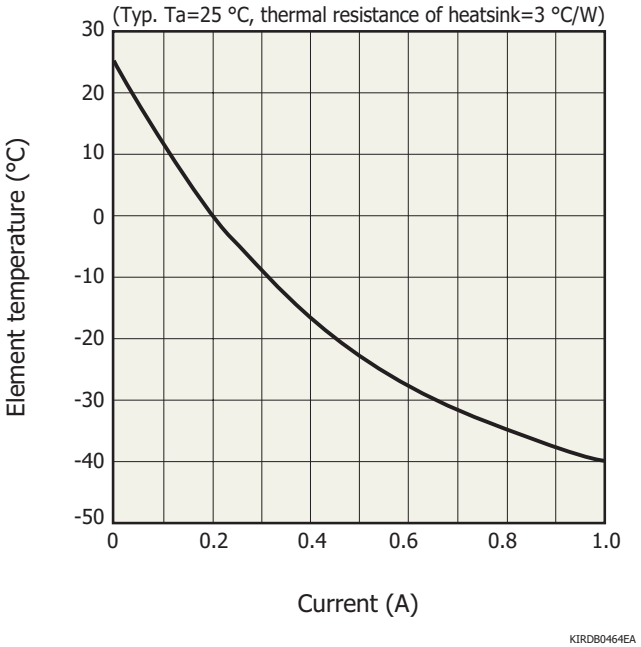
Parameter	Symbol	Min.	Typ.	Max.	Unit
TE-cooler allowable current	I_{TE} max	-	-	1.0	A
TE-cooler allowable voltage	V_{TE} max	-	-	1.2	V
Thermistor resistance	Rth	8.1	9.0	9.9	kΩ
Thermistor B constant*5	B	3232	3298	3364	K
Thermistor power dissipation	Pth	-	-	0.2	mW

*5: T_1=25 °C, T_2=-30 °C

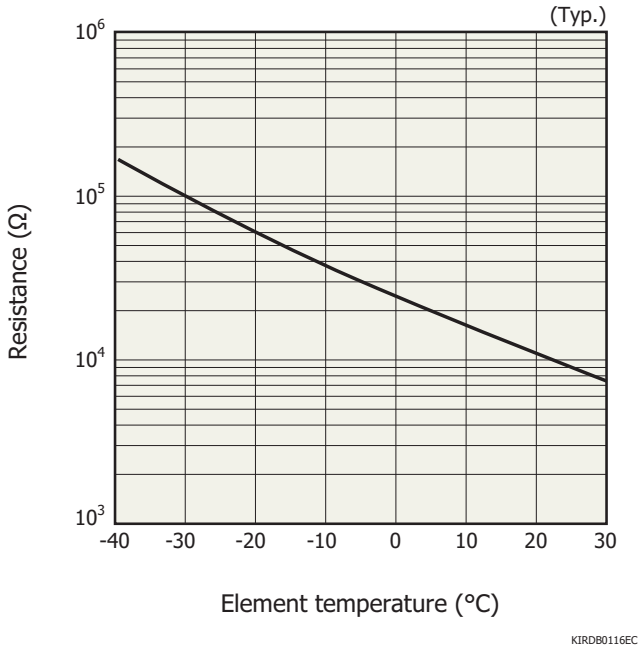
Current vs. voltage characteristics of TE-cooler



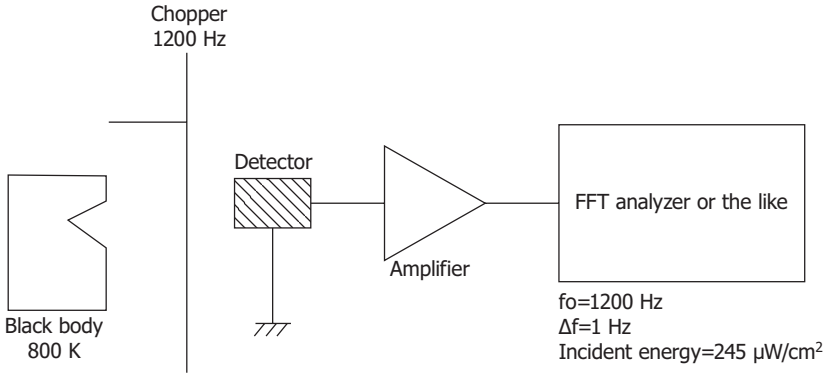
Cooling characteristics of TE-cooler



Thermistor temperature characteristics



Block diagram for characteristic measurement



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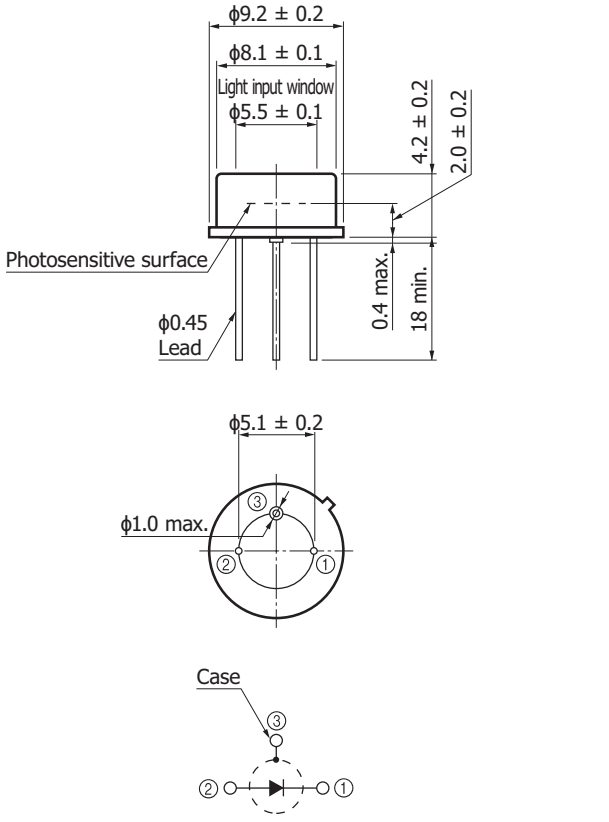
Dimensional outlines (unit: mm)

P13894-011MA



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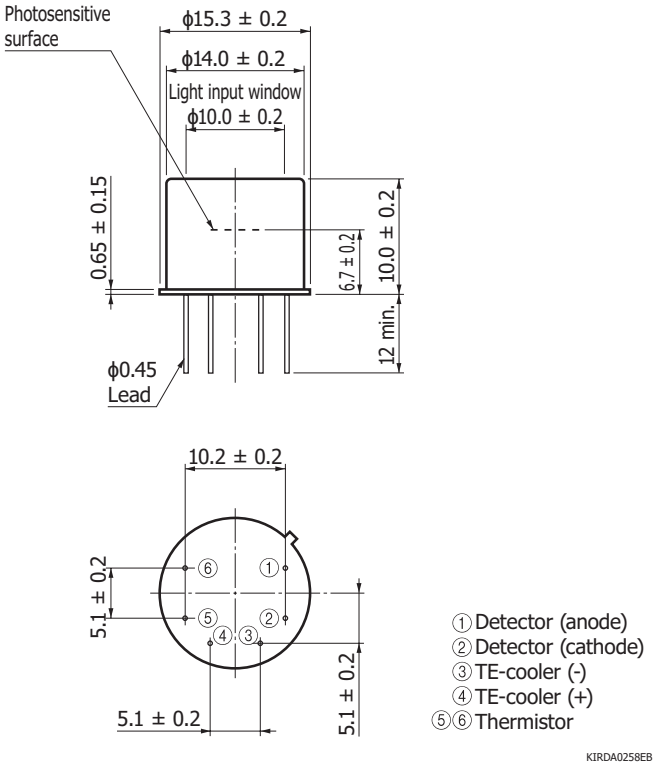
P13894-211MA



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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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