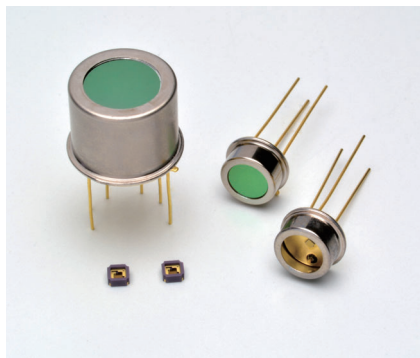


InAsSb photovoltaic detectors



P13894 series

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

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

Features

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

Applications

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

Options (sold separately)

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

Structure

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

Absolute maximum ratings

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

*1: When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

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

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

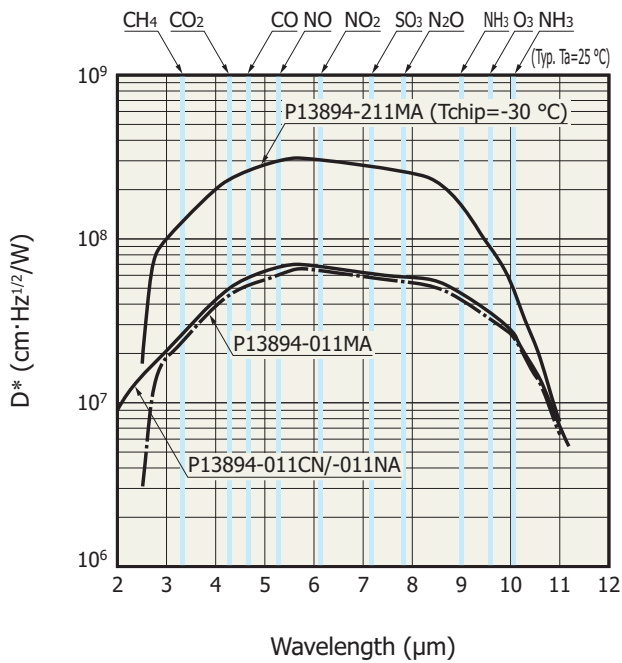
Electrical and optical characteristics (Ta=25 °C)

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

*3: Uniform irradiation on the entire photosensitive area

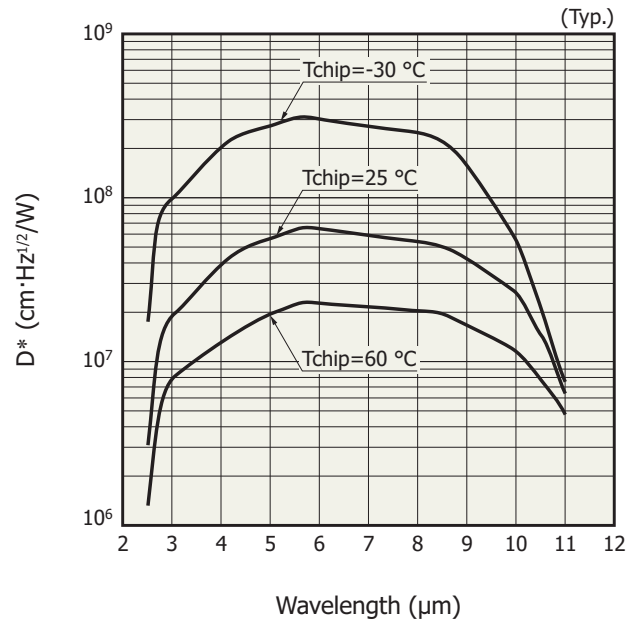
Note: Uniform irradiation must be applied to the entire photosensitive area during use.

Spectral response (D*)



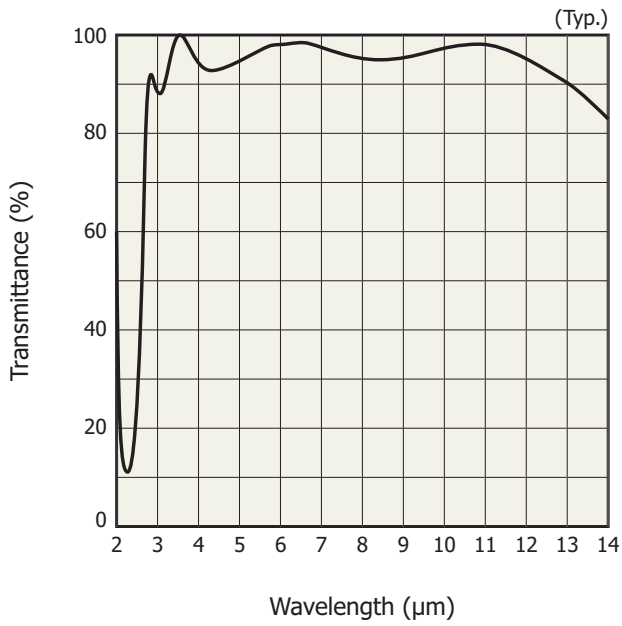
KIRD0632EB

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



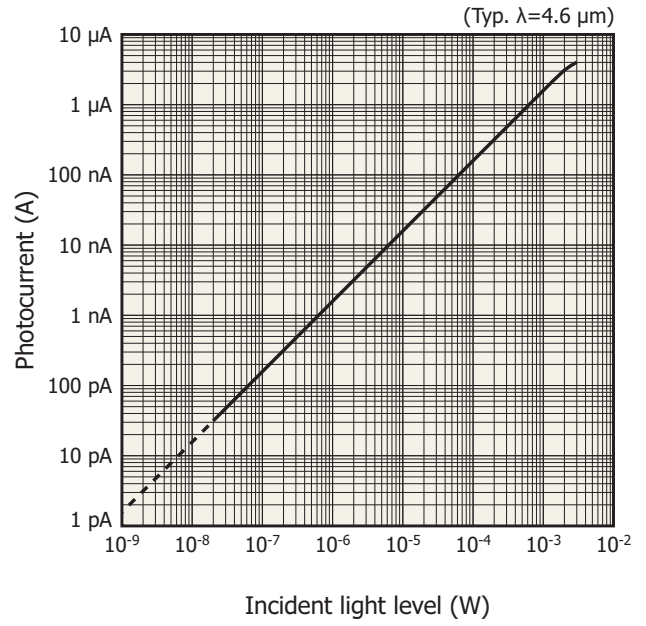
KIRD0633EA

Spectral transmittance of window material



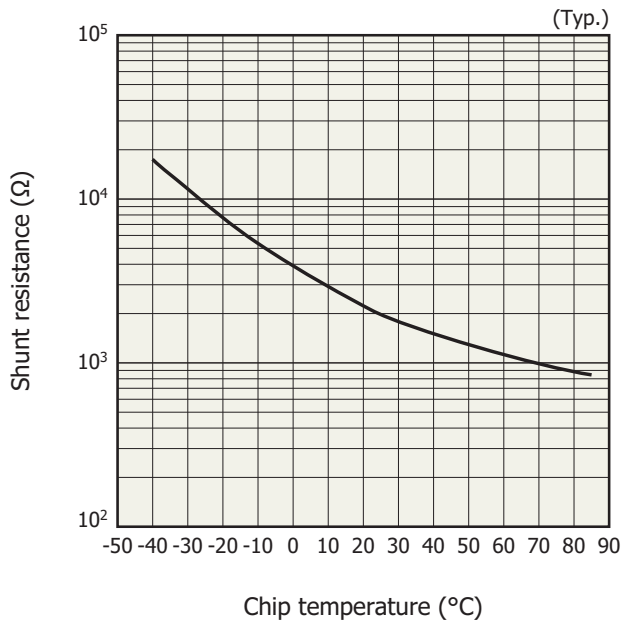
KIRDB0629EA

Linearity (P13894-011CN/-011NA)



KIRDB0630EA

Shunt resistance vs. chip temperature

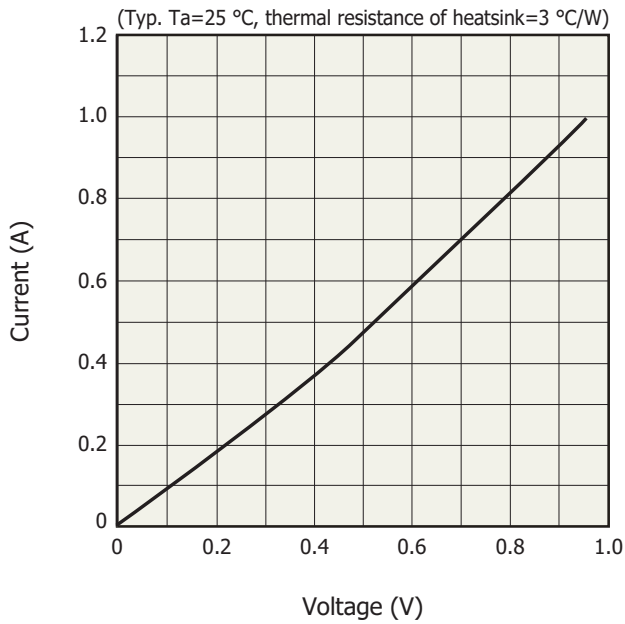


KIRDB0628EA

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

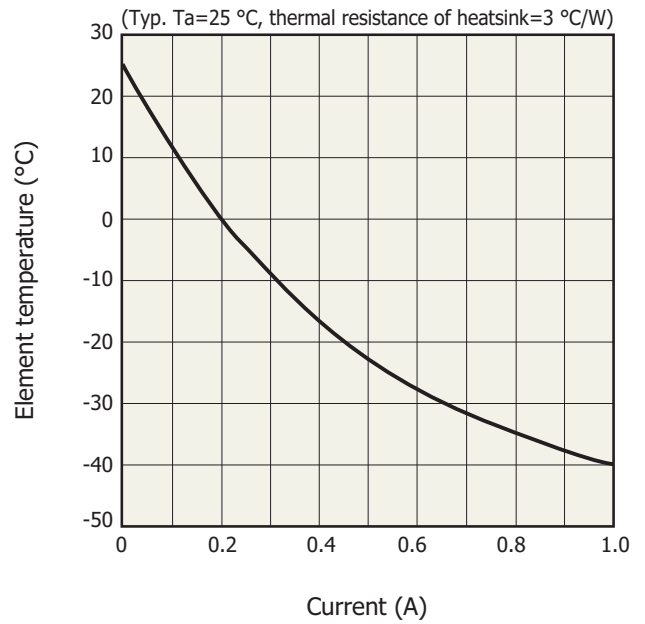
Parameter	Symbol	Min.	Typ.	Max.	Unit
Allowable current	Ic	-	-	1.0	A
Allowable voltage	Vc	-	-	0.95	V
Thermistor resistance	Rth	8.1	9.0	9.9	kΩ
Thermistor power dissipation	Pth	-	-	0.2	mW

▣ Current vs. voltage characteristics of TE-cooler



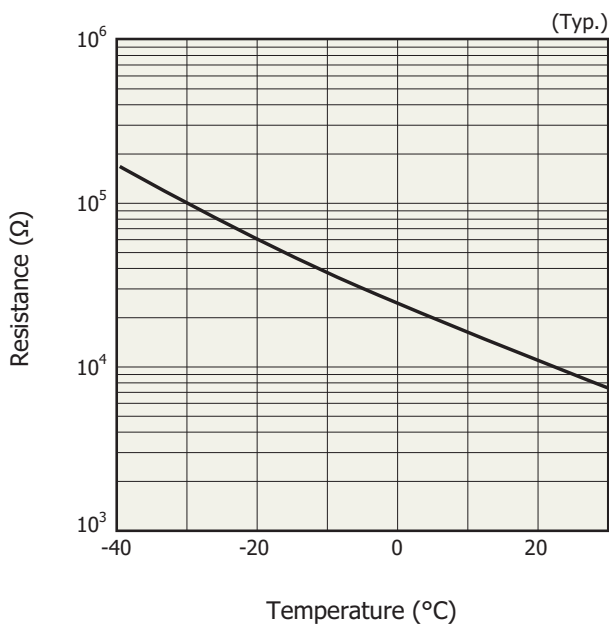
KIRDB0459EA

▣ Cooling characteristics of TE-cooler



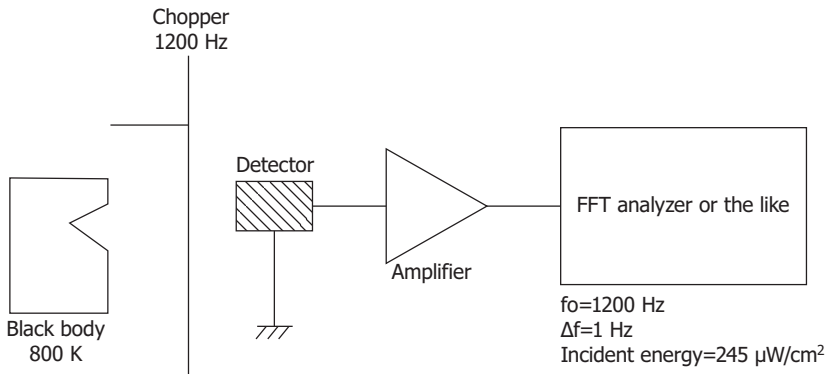
KIRDB0464EA

▣ Thermistor temperature characteristics



KIRDB0116EB

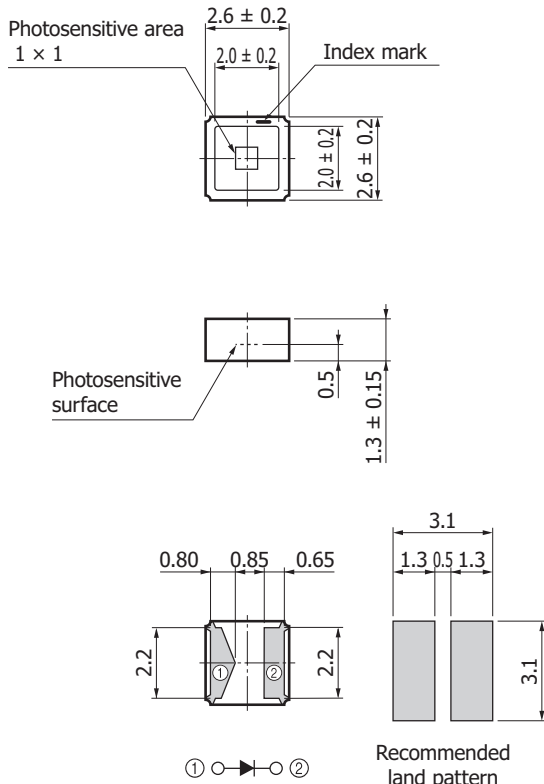
Measurement circuit example



KIRDC0127EA

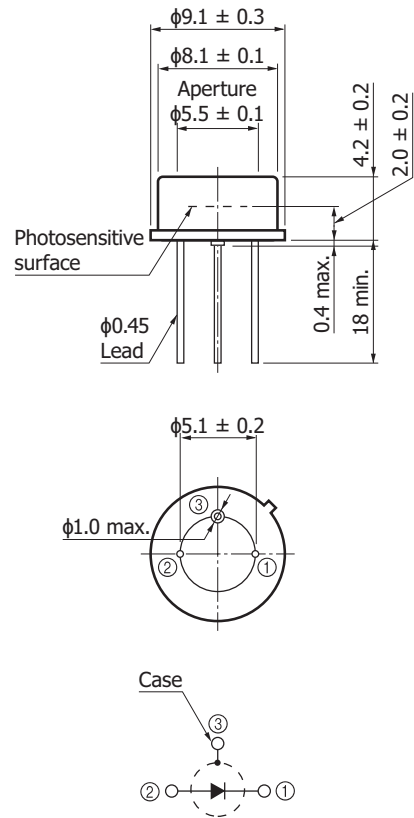
Dimensional outline (unit: mm)

P13894-011CN



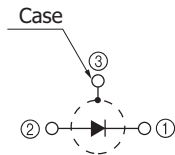
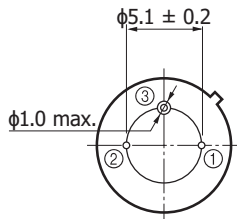
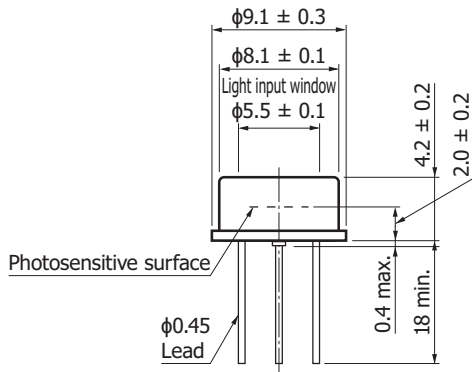
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P13894-011NA



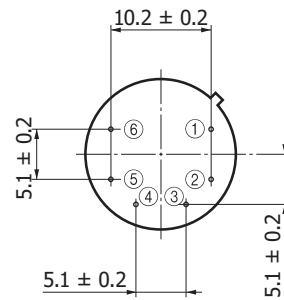
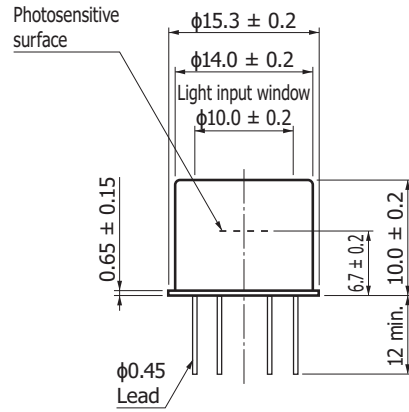
KIRDA0256EB

P13894-011MA



KIRDA0257EA

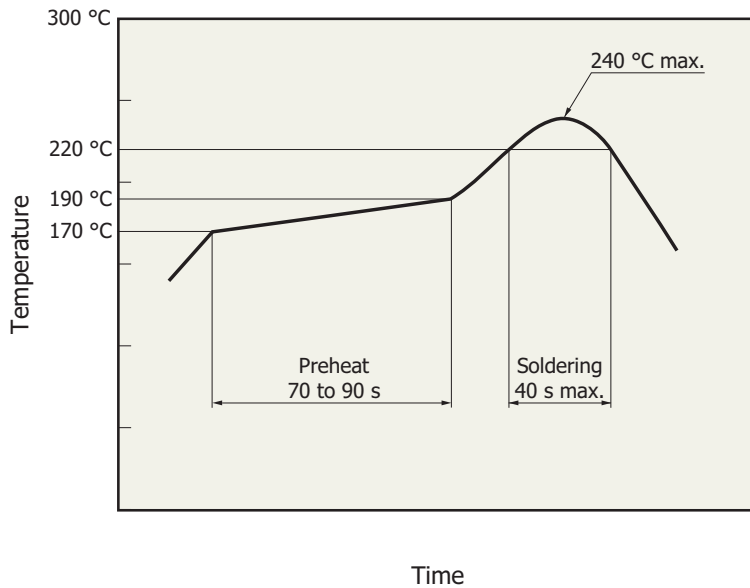
P13894-211MA



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

KIRDA0258EB

Recommended reflow soldering conditions



KIRD0648EB

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

Related information

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

- Precautions
- Disclaimer

Information described in this material is current as of September 2019.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

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