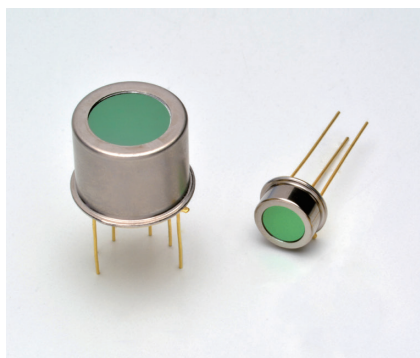


InAsSb photovoltaic detectors



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 (SO_x, NO_x, NH₃, O₃, etc.)
- Radiation thermometers
- CO₂ 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 | VR | | 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.

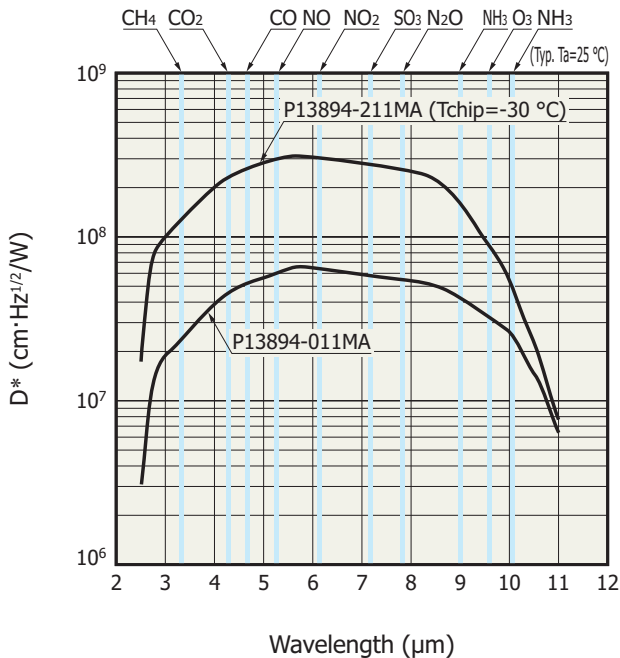
Electrical and optical characteristics (Ta=25 °C)

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

*2: Uniform irradiation on the entire photosensitive area

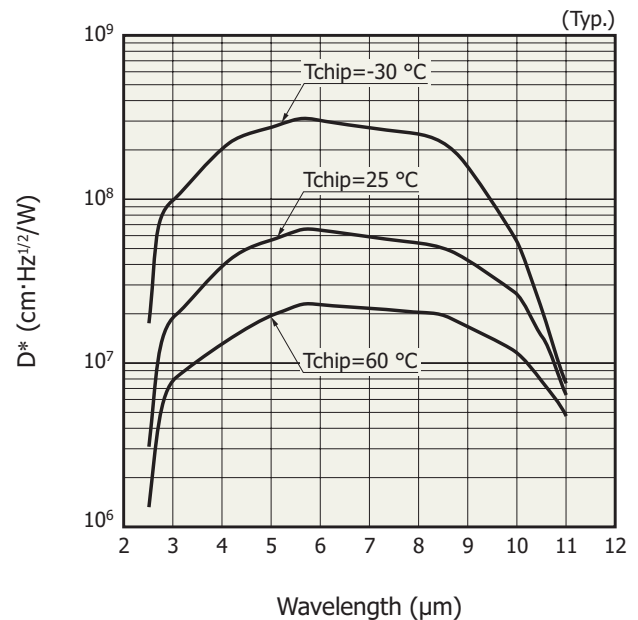
Note: Uniform irradiation must be applied to the entire photosensitive area during use.

Spectral response (D^*)



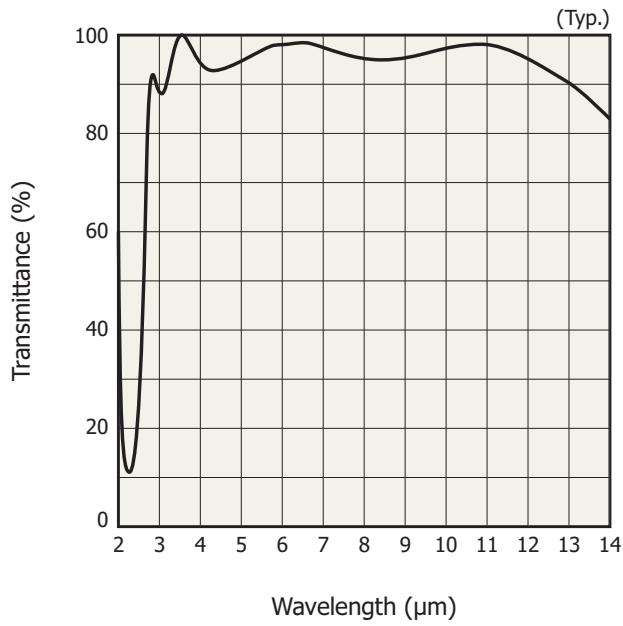
KIRD0632EC

Sensitivity temperature characteristics

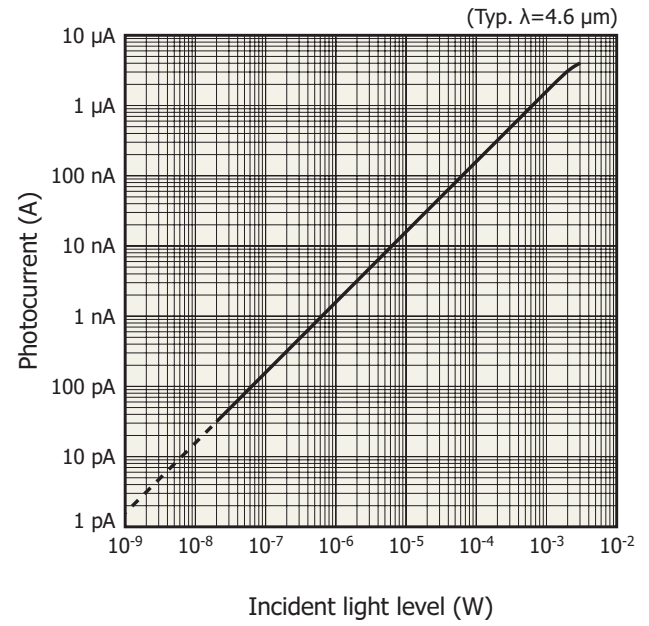


KIRD0633EA

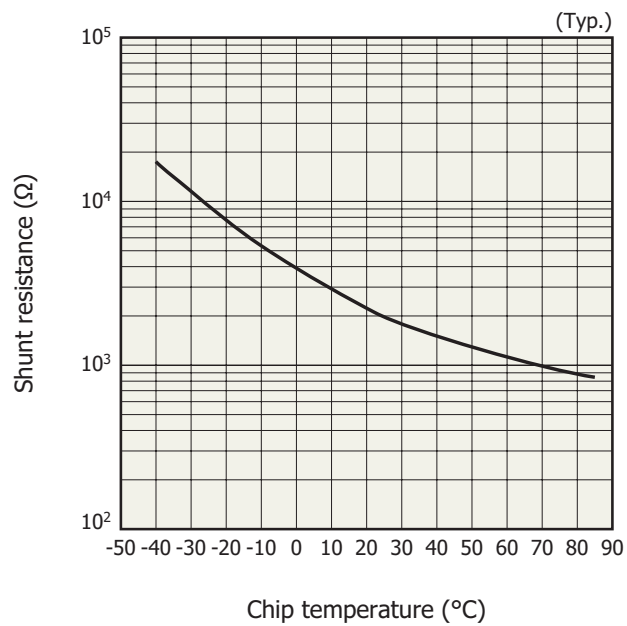
Spectral transmittance of window material



Linearity



Shunt resistance vs. chip temperature

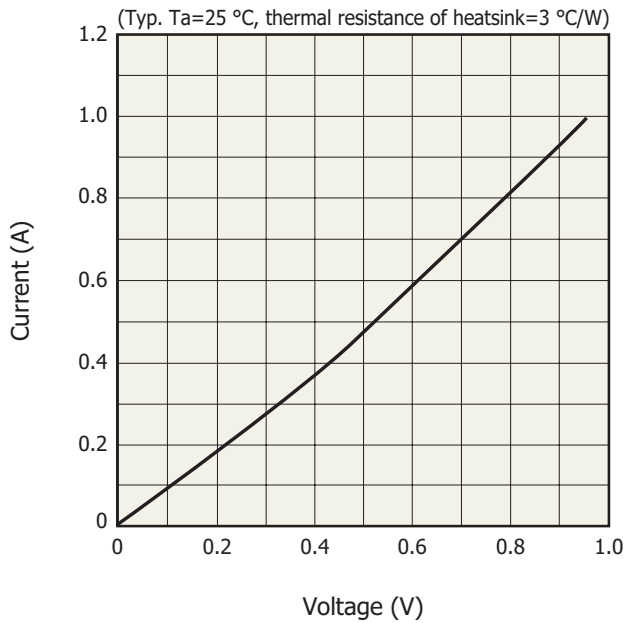


Specifications of two-stage TE-cooler (Ta=25 °C)

| 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 |

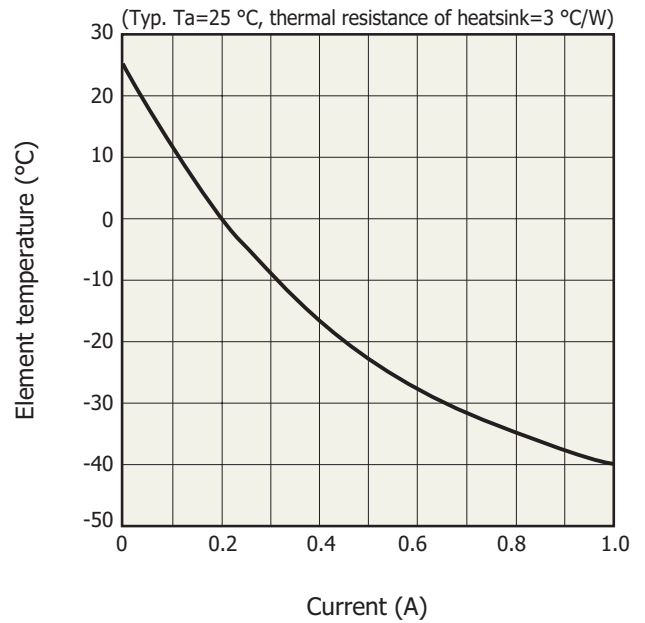
*5: T1=25 °C, T2=-30 °C

Current vs. voltage characteristics of TE-cooler



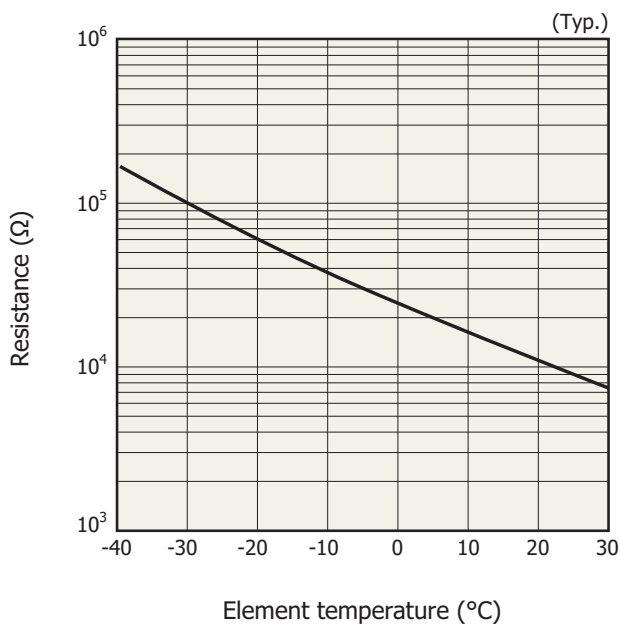
KIRDB0459EA

Cooling characteristics of TE-cooler



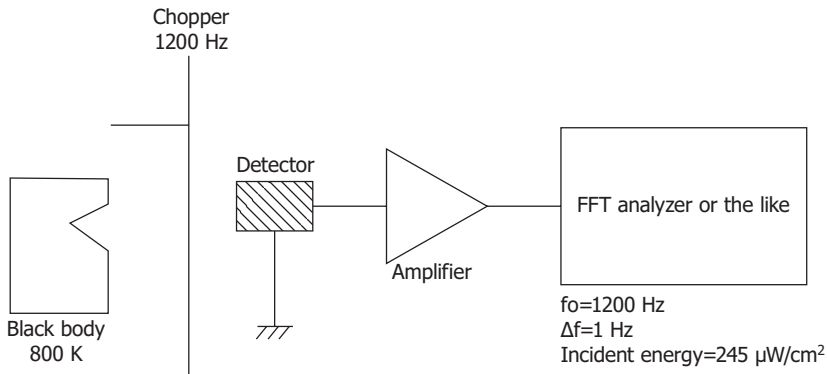
KIRDB0464EA

Thermistor temperature characteristics



KIRDB0116EC

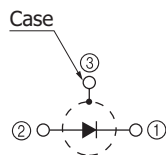
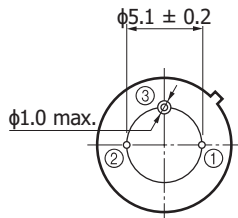
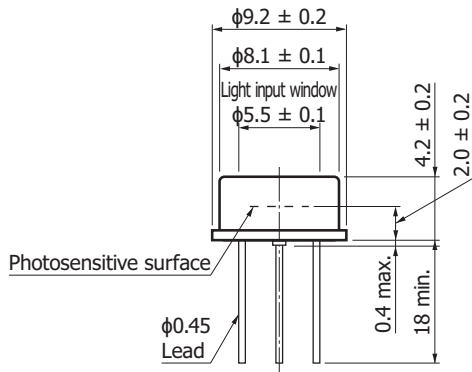
Block diagram for characteristic measurement



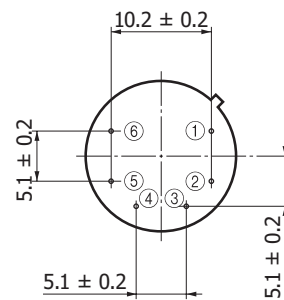
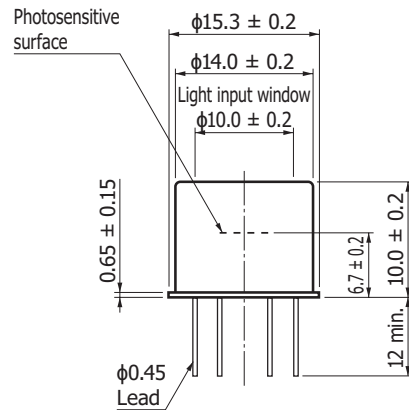
KIRDC0127EA

Dimensional outlines (unit: mm)

P13894-011MA



P13894-211MA



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

KIRDA0258EB

KIRDA0257EB

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

Information described in this material is current as of October 2023.

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

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