HAMAMATSU

PbSe photoconductive detectors

P9696 series P3207-07

Infrared detectors with fast response and high sensitivity in 5 µm wavelength band

Compared to other detectors used in the same wavelength regions, PbSe photoconductive detectors have faster response and can operate at room temperature, making them widely used in gas analyzers, etc. Cooling these detectors increases the sensitivity and improves the S/N. So cooled type PbSe photoconductive detectors are widely used in high-precision photometry such as for analytical instruments.

Features

- **High-speed response**
- **Room temperature type and TE-cooled type available**
- **Lower temperature detection limit: approx. 50 °C**
- **With bandpass filter: P3207-07**

Applications

- **Gas analyzer (CH_4, CO, CO_2)**
- **Radiation thermometer**
- **Flame detector**
- **Film thickness gauge**

Accessories (options)

- **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 PbS/PbSe photoconductive detector** **C3757-02**
- **Infrared detector module with preamp** **Non-cooled type P4245** **Cooled type P4639**

Specifications/Absolute maximum ratings

Type No.	Dimensional outline	Package	Cooling	Active area (mm)	Absolute maximum ratings				
					Thermistor power dissipation (mW)	TE-cooler current consumption (A)	Supply *1 voltage Vs (V)	Operating temperature Topr (°C)	Storage temperature Tstg (°C)
P9696-02	①	TO-5	Non-cooled	2 × 2	-	-	100	-30 to +50	-55 to +60
P9696-03				3 × 3					
P3207-07	②	TO-5 (with filter)		2 × 2					
P9696-102	③	TO-8	One-stage TE-cooled	2 × 2	0.2	1.5			
P9696-103				3 × 3					
P9696-202	④		Two-stage TE-cooled	2 × 2		1.0			
P9696-203				3 × 3					

*1: Voltage applied to a PbSe detector through a load resistor

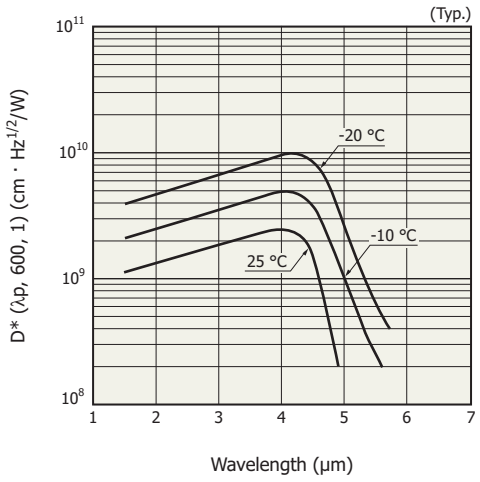
Electrical and optical characteristics (Typ. unless otherwise noted)

Type No.	Measurement condition Element temperature T (°C)	Peak sensitivity wavelength λp (μm)	Cut-off wavelength λc (μm)	Photo sensitivity S *3 λ=λp Vs=15 V Min. (V/W)	Photo sensitivity S *3 λ=λp Vs=15 V Typ. (V/W)	D* (500, 600, 1) Min. (cm · Hz$^{1/2}$/W)	D* (500, 600, 1) Typ. (cm · Hz$^{1/2}$/W)	D* (λp, 600, 1) (cm · Hz$^{1/2}$/W)	Rise time tr 0 to 63 % Max. (μs)	Dark resistance Rd (MΩ)
P9696-02	25	4.0	4.8	1.5×10^3	3.0×10^3	1×10^8	2.5×10^8	2.5×10^9	10	0.1 to 3
P9696-03				6.7×10^2	1.3×10^3					
P3207-07 *2		4.3		1.4×10^3	1.8×10^3	-	-	2×10^9		
P9696-102	-10	4.1	5.1	5.6×10^3	7.5×10^3	2.5×10^8	5×10^8	5×10^9	20	0.5 to 10
P9696-103				2.5×10^3	3.3×10^3					
P9696-202	-20	4.2	5.2	6.7×10^3	1×10^4	5×10^8	1×10^9	1×10^{10}		
P9696-203				3.0×10^3	4.7×10^3					

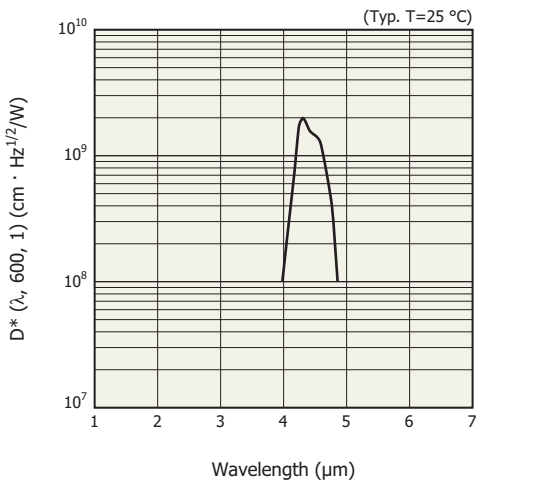
*2: Half width 400 nm
*3: Chopping frequency=600 Hz, load resistance=nearly equal to detector dark resistance

Spectral response

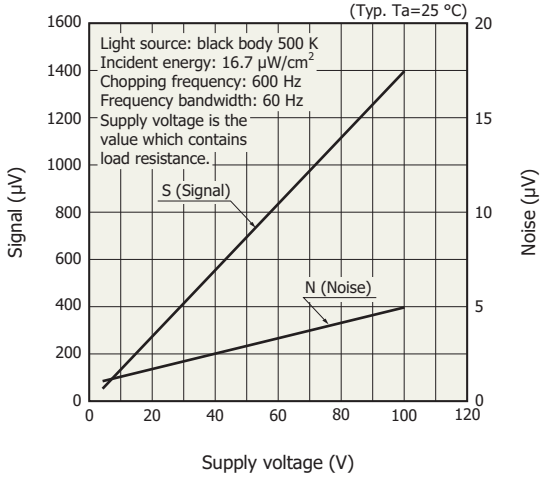
P9696 series



P3207-07



S/N vs. supply voltage (P9696-02)



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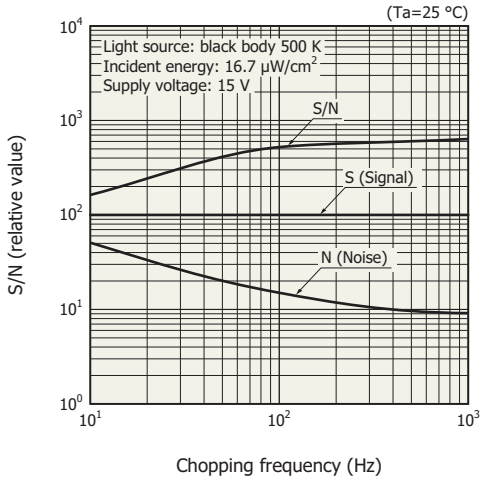
S/N vs. chopping frequency



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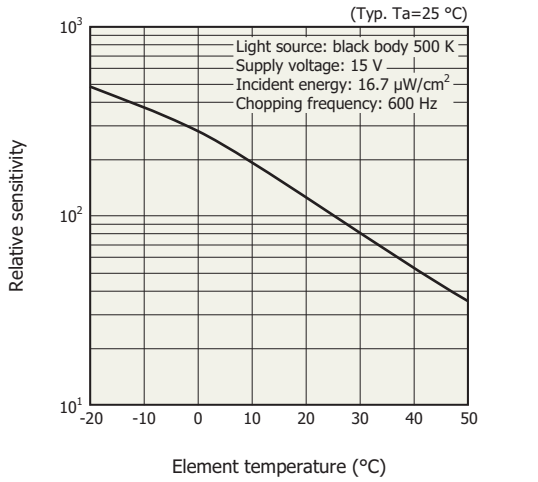
Increasing the chopping frequency reduces the 1/f noise and results in an S/N improvement. The S/N can also be improved by narrowing the noise bandwidth using a lock-in amplifier.

Photo sensitivity vs. element temperature



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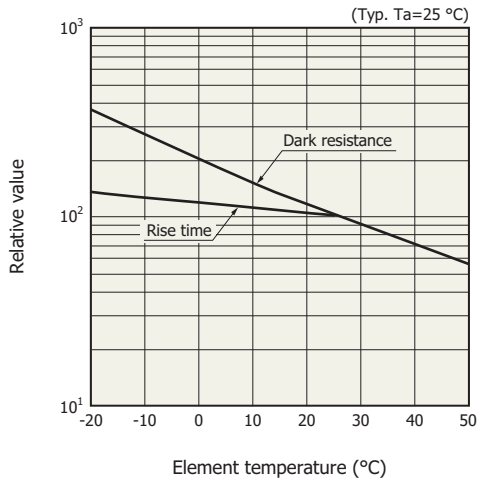
Cooling the device enhances its sensitivity, but the sensitivity also depends on the load resistance in the circuit.

Dark resistance, rise time vs. element temperature



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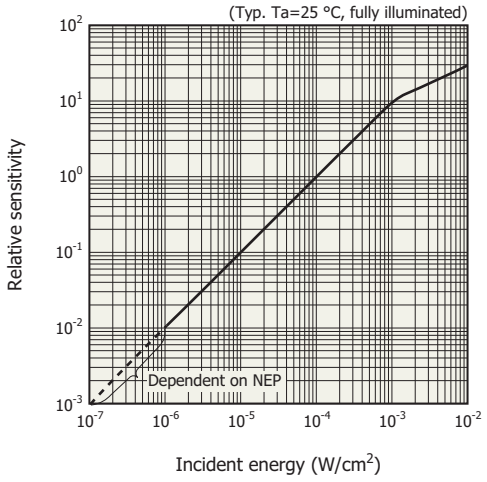
Linearity



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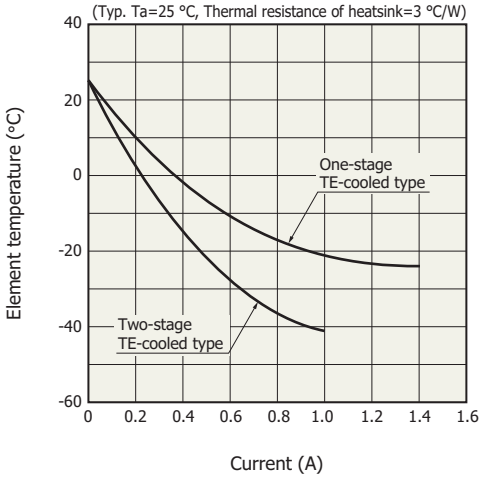
By making the incident light spot smaller than the active area, the upper limit of the linearity becomes lower.

Cooling characteristics of TE-cooler



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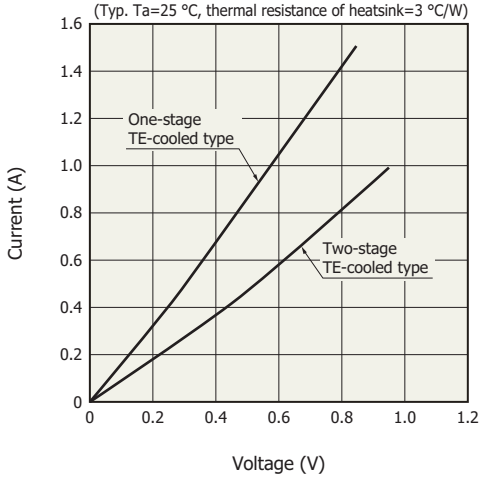
Current vs. voltage characteristics of TE-cooler



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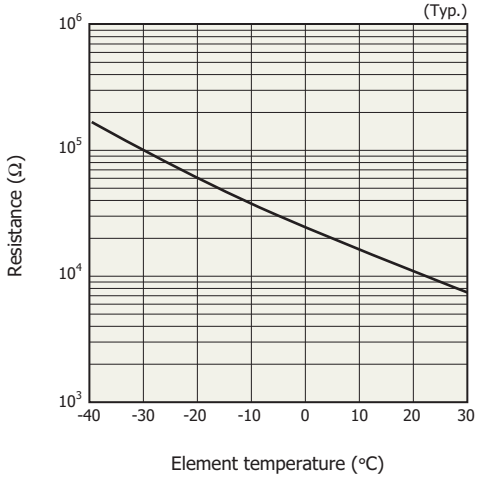
Thermistor temperature characteristic



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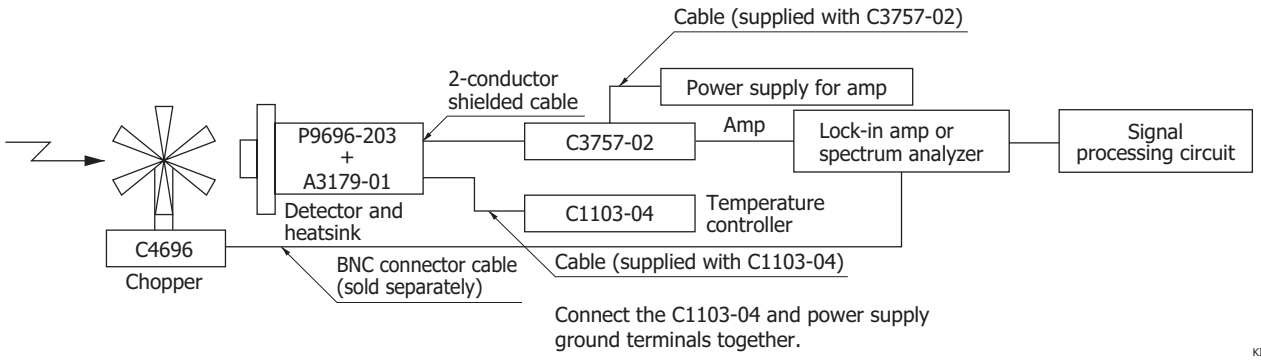
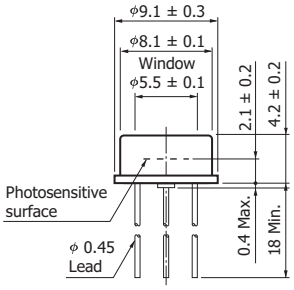
Connection example (P9696-203)

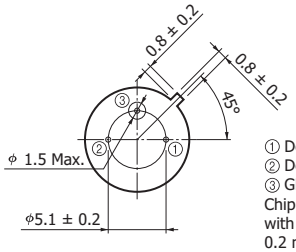


KIRDC0093EA

Dimensional outlines (unit: mm)

① P9696-02/-03

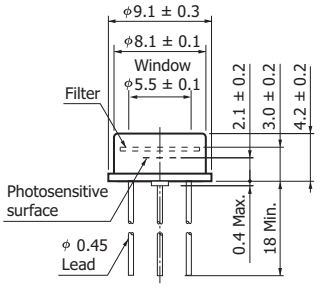


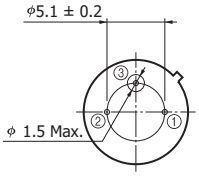


① Detector
② Detector
③ GND
Chip position accuracy
with respect to the cap center
0.2 mm Max.

KIRDA0183EB

② P3207-07





① Detector
② Detector
③ GND
Chip position accuracy
with respect to the cap center
0.2 mm Max.

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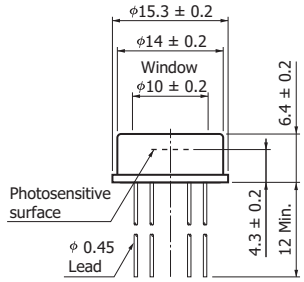
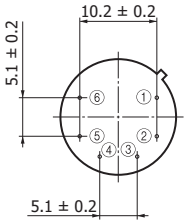
③ P9696-102/-103

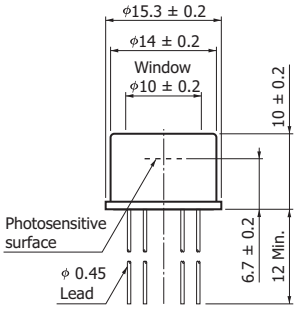


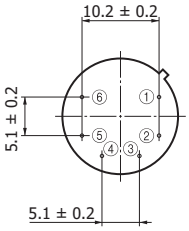


① Detector
② Detector
③ TE-cooler (-)
④ TE-cooler (+)
⑤⑥ Thermistor
Chip position accuracy
with respect to the cap center
0.3 mm Max.

KIRDA0128EB

④ P9696-202/-203





①Detector
②Detector
③TE-cooler (-)
④TE-cooler (+)
⑤⑥Thermistor
Chip position accuracy
with respect to the cap center
0.3 mm Max.

KIRDA0125EB

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