

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 (CH₄, CO, CO₂)
- 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 T _{opr} (°C)	Storage temperature T _{stg} (°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	100	-30 to +50	-55 to +60
P9696-103			3 × 3	1.0					
P9696-202	④		Two-stage TE-cooled	2 × 2		1.0			
P9696-203			3 × 3	1.0					

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

Electrical and optical characteristics (Typ. unless otherwise noted)

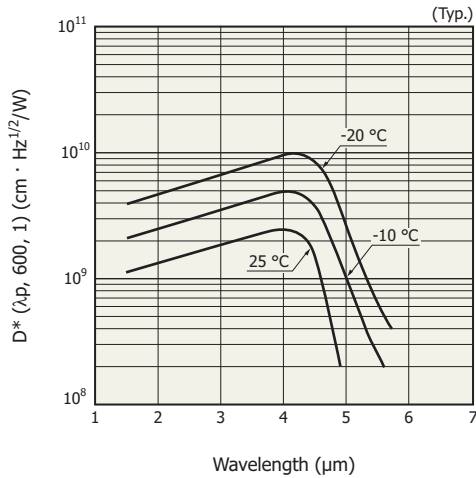
Type No.	Measurement condition	Peak sensitivity wavelength λ_p (μm)	Cut-off wavelength λ_c (μm)	Photo sensitivity S^{*3} $\lambda = \lambda_p$ $V_s = 15\text{ V}$		D^* (500, 600, 1)		D^* (λ_p , 600, 1) ($\text{cm} \cdot \text{Hz}^{1/2}/\text{W}$)	Rise time t_r 0 to 63 % Max. (μs)	Dark resistance R_d ($\text{M}\Omega$)
	Element temperature T ($^{\circ}\text{C}$)			Min. (V/W)	Typ. (V/W)	Min. ($\text{cm} \cdot \text{Hz}^{1/2}/\text{W}$)	Typ. ($\text{cm} \cdot \text{Hz}^{1/2}/\text{W}$)			
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

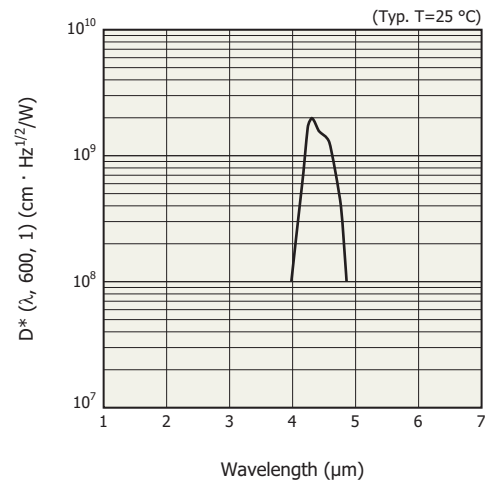
Spectral response

P9696 series



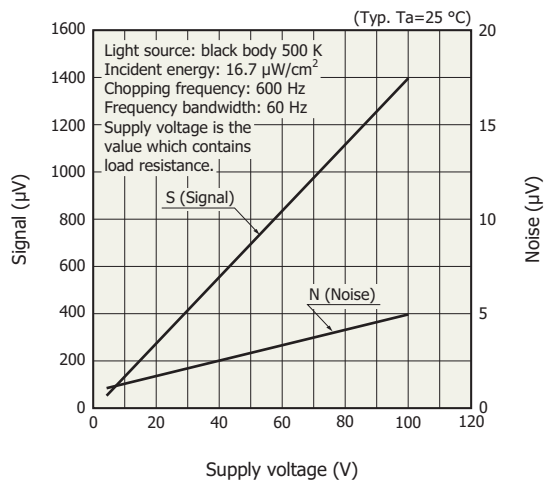
KIRDB0342EB

P3207-07



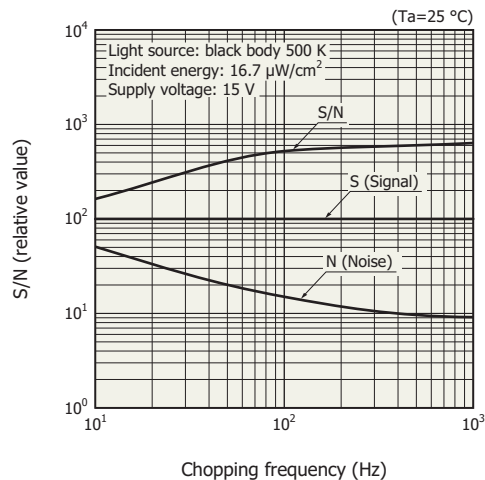
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S/N vs. supply voltage (P9696-02)



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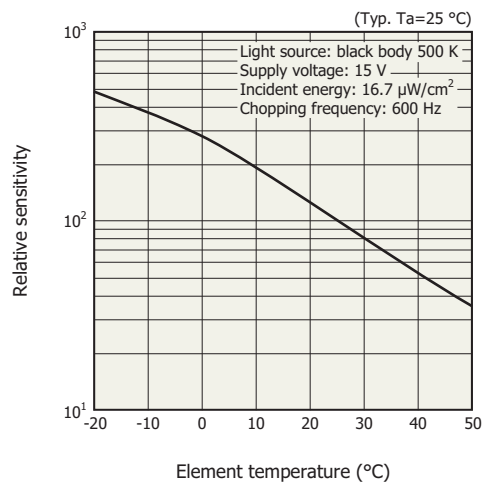
S/N vs. chopping frequency



KIRDB0441EA

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.

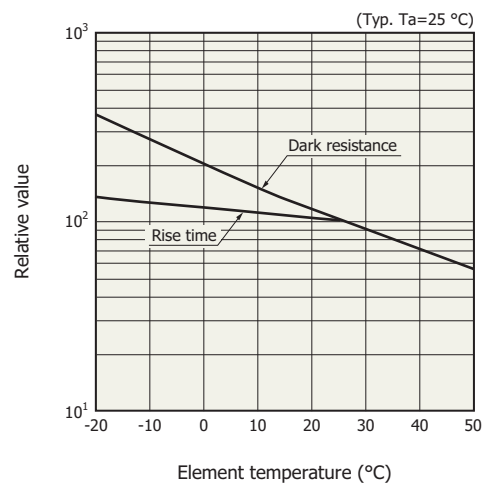
Photo sensitivity vs. element temperature



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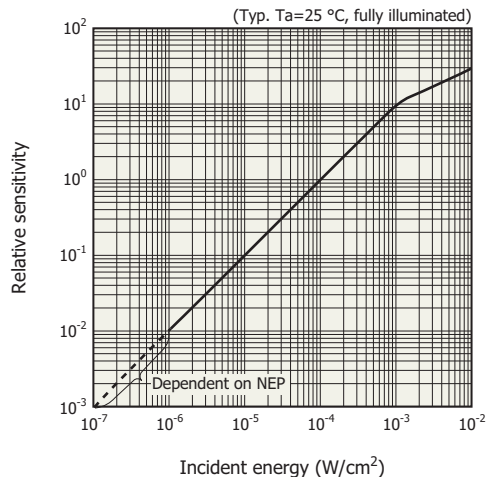
Cooling the device enhances its sensitivity, but the sensitivity also depends on the load resistance in the circuit.

Dark resistance, rise time vs. element temperature



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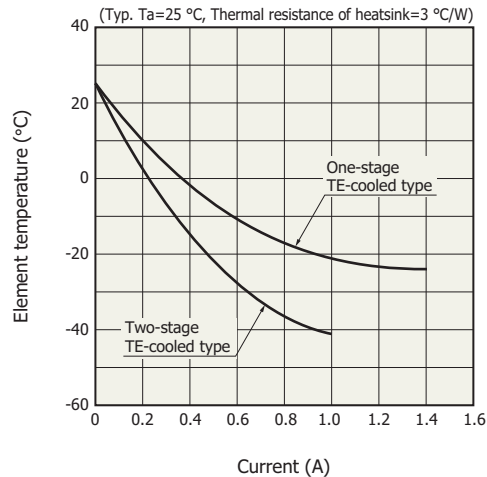
Linearity



KIRDB0056EA

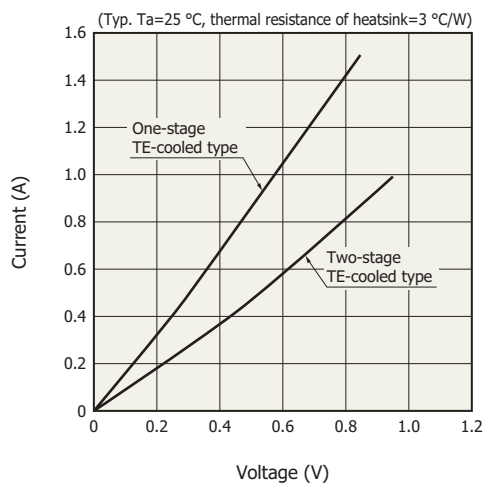
By making the incident light spot smaller than the active area, the upper limit of the linearity becomes lower.

Cooling characteristics of TE-cooler



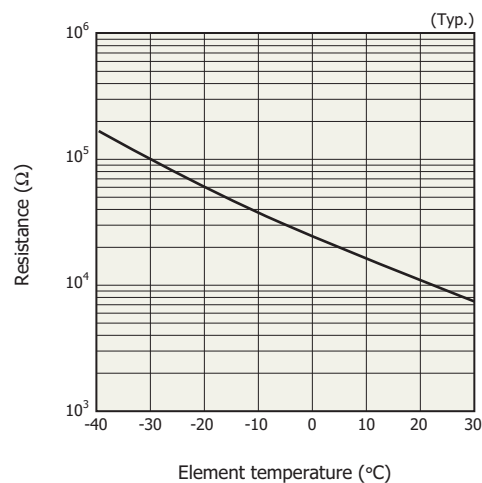
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Current vs. voltage characteristics of TE-cooler



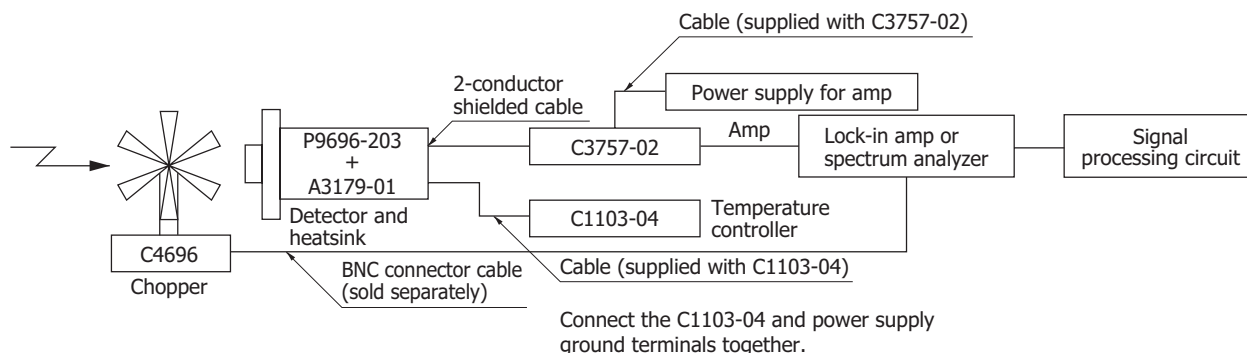
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Thermistor temperature characteristic



KIRDB0116EA

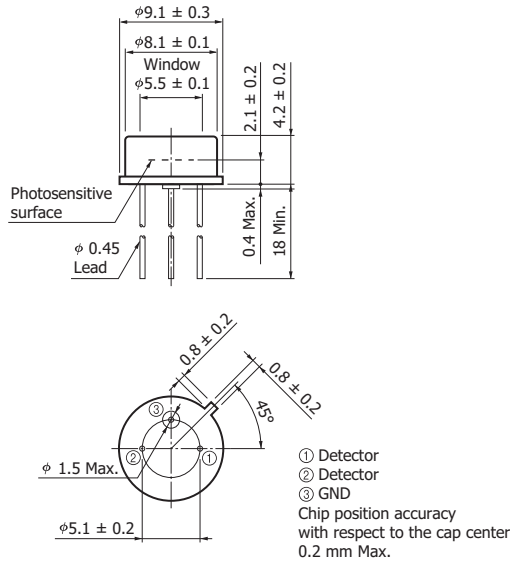
Connection example (P9696-203)



KIRDC0093EA

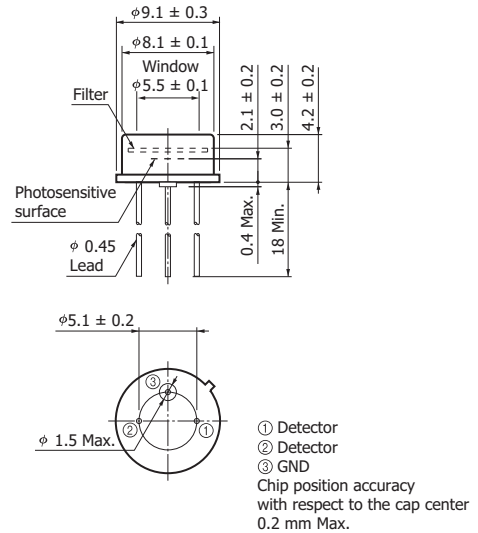
Dimensional outlines (unit: mm)

① P9696-02/-03



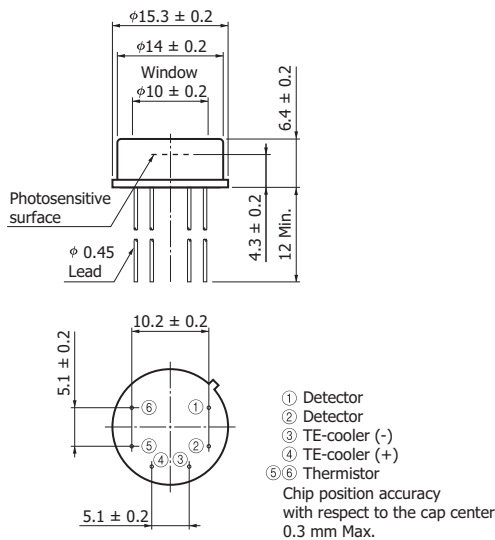
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② P3207-07



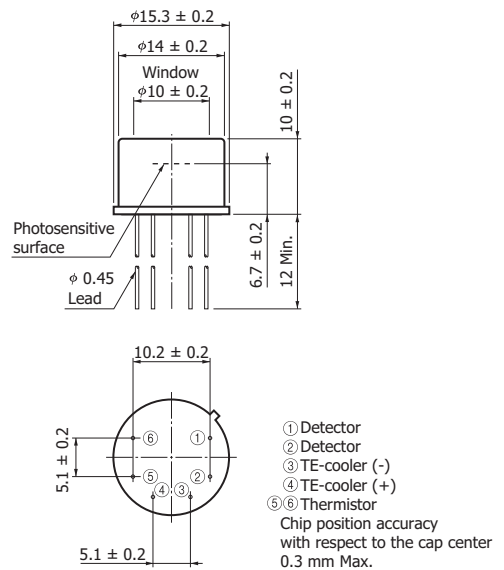
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③ P9696-102/-103



KIRDA0128EB

④ P9696-202/-203



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