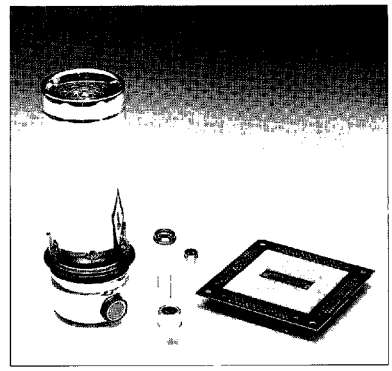
# PbS Photoconductive Cells

## Easy-to-Use Photoconductive Detectors with High Responsivity Over 3 μm

PbS cells make use of the photoconductive effect by which the electrical resistance decreases with application of infrared radiation



### Operates at Room Temperature

Since PbS cells operate stably at room temperature, they are used in a wide range of applications such as radiation thermometers and flame monitors. (Cooled types are also available for precision photometry.)

### High Responsivity

**Lower Temperature Detection Limit**: Approx. 100℃

### Noncooled Types

These devices can stably operate at room temperature, making them easy to use in diverse fields.

### Multielement Types

Multielement types are provided as standard items, including a 256-element linear array (P4248-256) that achieves high resolution.

### Cooled Types

Thermoelectrically-cooled devices and glass dewar devices are available. Cooling a PbS cells enhances the responsivity and improves the S/N ratio, thus cooled types are widely used in precision photometry for applications such as in analytical instruments.

### ● SPECIFICATIONS (Common)

| | |
|---|---|
| Peak wavelength | 2.2 μm (element temperature 25℃) |
| Cutoff Wavelength | 2.9 μm (element temperature 25℃) |
| Window Material | Borosilicate glass |
| | Sapphire glass (P2682 series, P5168) |
| Thermistor Allowable Dissipation | 0.2 mW |
| Peltier Element Allowable Current | 1.5 A (one-stage TE-cooled types) |
| | 1 A (two-stage TE-cooled types) |
| Maximum Supply Voltage | 100 V |

| | |
|---|---|
| Operating Temperature | −30 to +50℃ |
| Storage Temperature | −55 to +50℃ |

### ● ACCESSORIES (Optional)

Heatsink for one-stage TE-cooled types : A3179
Heatsink for two-stage TE-cooled types : A3179-01
Temperature controller for TE-cooled types : C1103-04
Preamplifier for PbS/PbSe cells : C3757-02
Housing for glass dewar devices : A3262-02

(Typical data unless otherwise specified)

| Type No. | Outline No. (P.32–34) | Package | Active Area (mm) | Element Temperature (℃) | Photo Sensitivity S at λp Vs=15V (V/W) | Photo Sensitivity S Ⓐ Min. (μV) | Photo Sensitivity S Ⓐ Typ. (μV) | Noise Ⓑ N Typ. (μV) | Noise Ⓑ N Max. (μV) | D*(500, 600, 1) Min. (cm•Hz^1/2/W) | D*(500, 600, 1) Typ. (cm•Hz^1/2/W) | D* (λp,600,1) Typ. (cm•Hz^1/2/W) | Rise Time tr 0 to 63% (μs) | Dark Resistance Rd (MΩ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Noncooled Types** | | | | | | | | | | | | | | |
| P394A | ⑯ | 2-pin TO-5 | 2×5 | 25 | 5×10^4 | 100 | 250 | 2 | 4 | 5×10^8 | 1×10^9 | 1×10^11 | 50 to 200 | 0.1 to 1.5 |
| P3258-02 | | 2-pin TO-5 | 2×2 | 25 | 5×10^4 | 100 | 250 | 2 | 4 | 5×10^8 | 1×10^9 | 1×10^11 | 50 to 200 | 0.5 to 2.5 |
| P3258-03 | | 2-pin TO-5 | 3×3 | 25 | 5×10^4 | 100 | 250 | 2 | 4 | 5×10^8 | 1×10^9 | 1×10^11 | 50 to 200 | 0.5 to 2.5 |
| P3226-02 | ⑰ | 2-pin TO-5 | 1.5×1.5Ⓒ | 25 | 1.5×10^5 | 1500 | 2000 | 2 | 4 | 5×10^8 | 1×10^9 | 1×10^11 | 50 to 200 | 0.3 to 2 |
| P397 | ⑱ | 2-pin TO-8 | 4×5 | 25 | 3×10^4 | 100 | 250 | 2 | 4 | 2×10^8 | 5×10^8 | 5×10^10 | 50 to 200 | 0.3 to 2 |
| **Multielement Types** | | | | | | | | | | | | | | |
| New P4248-256 | ⑲ | Ceramic Pin-grid array | 0.08×0.2 (256 element) | 25 | 1×10^7 | 80 | 150 | 20 | 40 | 5×10^8 | 1×10^9 | 1×10^11 | 50 to 200 | 0.5 to 4 |
| P3210-16 | ㉑ | 4-pin DIP | 1×1 (16 element) | 25 | 4×10^5 | 100 | 200 | 4 | 8 | 5×10^8 | 1×10^9 | 1×10^11 | 50 to 200 | 0.5 to 2.5 |
| **One-stage Thermoelectrically-cooled Types** | | | | | | | | | | | | | | |
| P2532 | ⑧ | 6-pin TO-8 | 1×3 | −10 | 6×10^5 | 300 | 750 | 4 | 8 | 1×10^9 | 2×10^9 | 2×10^11 | 200 to 600 | 0.3 to 5 |
| P2532-01 | | 6-pin TO-8 | 4×5 | −10 | 9×10^4 | 300 | 750 | 4 | 8 | 5×10^8 | 1×10^9 | 1×10^11 | 200 to 600 | 0.5 to 10 |
| **Two-stage Thermoelectrically-cooled Types** | | | | | | | | | | | | | | |
| P2682 | ⑩ | 6-pin TO-8 | 1×3 | −20 | 1×10^6 | 600 | 1500 | 5 | 10 | 2×10^9 | 4×10^9 | 4×10^11 | 200 to 600 | 1 to 10 |
| P2682-01 | | 6-pin TO-8 | 4×5 | −20 | 2×10^5 | 600 | 1500 | 5 | 10 | 8×10^8 | 2×10^9 | 2×10^11 | 200 to 600 | 1 to 10 |
| **Glass Dewar Types** | | | | | | | | | | | | | | |
| New P5168Ⓓ | ⑪ | Glass dewar | 2×10 | −77 | 3×10^6 | 10000 | 20000 | 3 | 6 | 1×10^10 | 2×10^10 | 1×10^12 | 2 to 10(ms) | 0.5 to 10 |

Ⓐ Light source : 500 K blackbody
Chopping frequency 600 Hz
Supply Voltage 15 V
Load resistance Nearly equal to the element dark resistance
Incident energy 4.8 μW/cm²

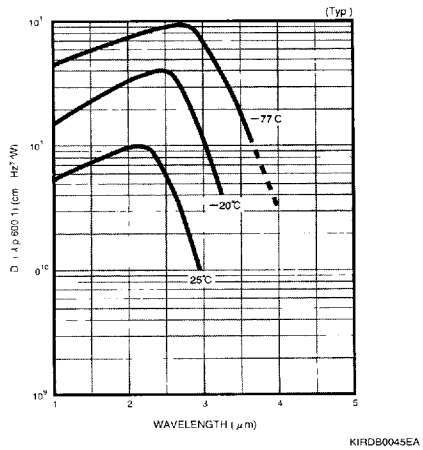
Ⓑ Chopping frequency 600 Hz
Noise bandwidth 60 Hz
Load resistance Nearly equal to the element dark resistance

Ⓒ Lens window

Ⓓ Chopping frequency : 100 Hz
Noise bandwidth : 10 Hz

# Spectral Response 1.0 to 3.6 $\mu$ m

## ● Spectral Response

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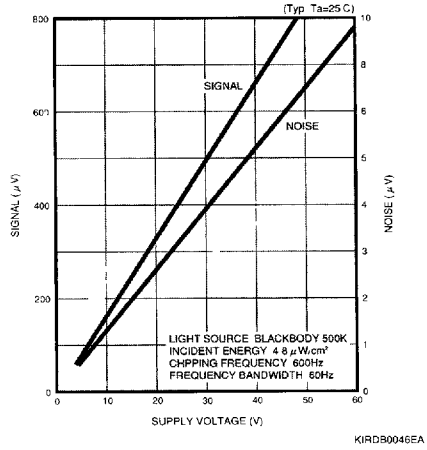
## ● S/N Ratio vs. Supply Voltage

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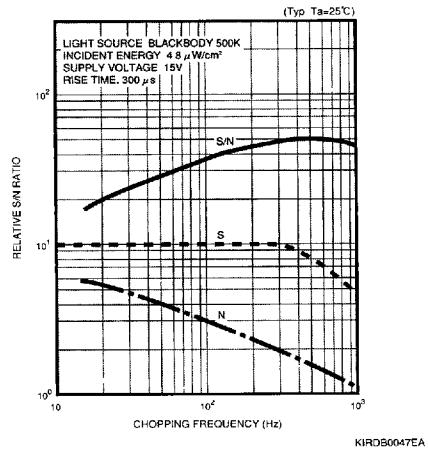
If a voltage higher than 60V is applied, the noise increases exponentially, degrading the S/N ratio. The device should be operated at 60V or less.

## ● S/N Ratio vs. Chopping Frequency

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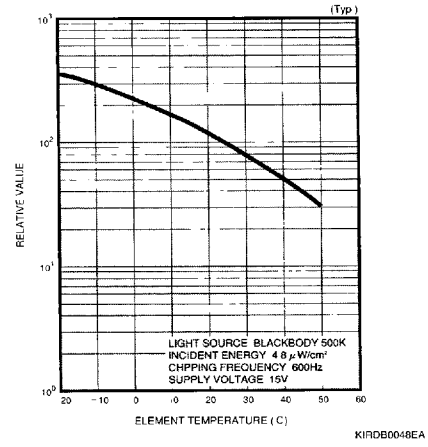
Increasing the chopping frequency reduces the 1/f noise and results in an improved S/N ratio. The S/N ratio can also be improved by narrowing the noise bandwidth using a lock-in amplifier.

## ● Responsivity vs. Temperature

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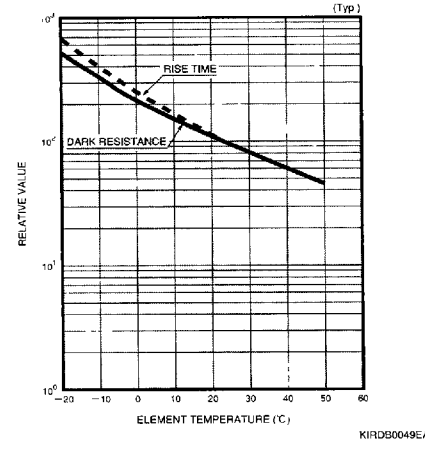
Cooling the device enhances its responsivity. But the responsivity also depends on the load resistance in the circuit.

## ● Dark Resistance, Rise Time vs. Temperature

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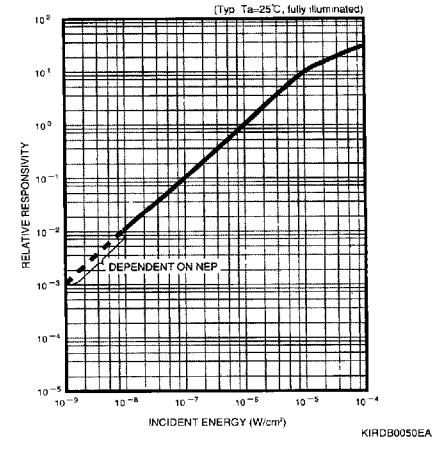
## ● Linearity

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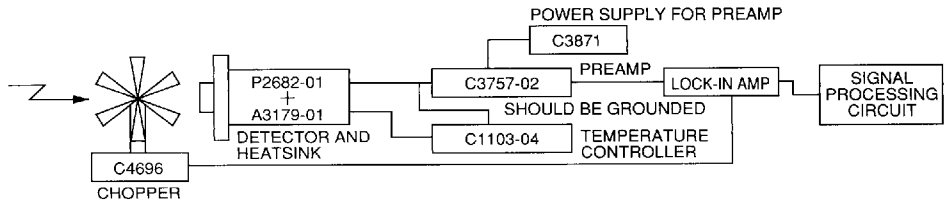
When making the incident light spot is smaller than the active area, the upper limit of the linearity becomes lower.

## ● Connection Example

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