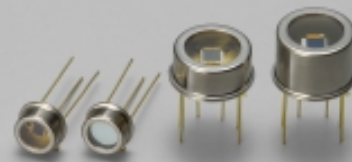


# PbSe photoconductive detector P791/P2038/P2680 series, P3207-05

Detection capability up 5  $\mu\text{m}$  range (TE-cooled type)



Hamamatsu provides various types of PbSe photoconductive cells including room temperature operation types and thermoelectrically cooled types. Cooled type PbSe photoconductive cells offer higher sensitivity and improved S/N, and are widely used in precision photometry such as in analytical instruments.

## Features

- High-speed response
- Room temperature operation  
Compared to other types of detectors used in the same wavelength range, PbSe cells have higher response speed and can also operate at room temperature, making them useful in a wide range of applications such as gas analyzers, etc.
- Lower temperature detection limit: 50 °C approx.

## Applications

- Radiation thermometer
- Flame detector
- Gas analyzer
- Film thickness gauge

## Accessories (Optional)

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

## ■ Specification / Absolute maximum ratings

| Type No. | Dimensional outline | Package | Cooling             | Active area<br>(mm) | Thermistor resistance<br>(k $\Omega$ ) | Absolute maximum ratings             |                                      |                       |                                                |                                              |
|----------|---------------------|---------|---------------------|---------------------|----------------------------------------|--------------------------------------|--------------------------------------|-----------------------|------------------------------------------------|----------------------------------------------|
|          |                     |         |                     |                     |                                        | Thermistor power dissipation<br>(mW) | TE-cooler current dissipation<br>(A) | Supply voltage<br>(V) | Operating temperature<br>T <sub>opr</sub> (°C) | Storage temperature<br>T <sub>stg</sub> (°C) |
| P791-11  | ①                   | TO-5    | Non-cooled          | 2 × 2               | -                                      | -                                    | -                                    | 100                   | -30 to +50                                     | -55 to +60                                   |
| P791-13  |                     |         |                     | 3 × 3               |                                        |                                      |                                      |                       |                                                |                                              |
| P3207-05 | ②                   |         |                     | 2 × 2               |                                        |                                      |                                      |                       |                                                |                                              |
| P2038-02 | ③                   | TO-8    | One-stage TE-cooled | 2 × 2               | 9                                      | 0.2                                  | 1.5                                  | 100                   | -30 to +50                                     | -55 to +60                                   |
| P2038-03 |                     |         | Two-stage TE-cooled | 3 × 3               |                                        |                                      | 1.0                                  |                       |                                                |                                              |
| P2680-02 | ④                   |         |                     | 2 × 2               |                                        |                                      |                                      |                       |                                                |                                              |
| P2680-03 |                     |         |                     | 3 × 3               |                                        |                                      |                                      |                       |                                                |                                              |

## ■ Electrical and optical characteristics (Typ. unless otherwise noted)

| Type No.    | Measurement condition<br>Element temperature<br>T | Peak sensitivity wavelength<br>$\lambda_p$ | Cut-off wavelength<br>$\lambda_c$ | Photo sensitivity<br>S <sup>*2</sup><br>$\lambda = \lambda_p$<br>V <sub>s</sub> = 15 V |                       | D*<br>(500, 600, 1)               |                                   | D*<br>( $\lambda_p$ , 600, 1) | Rise time<br>t <sub>r</sub><br>0 to 63 % | Dark resistance<br>R <sub>d</sub> |
|-------------|---------------------------------------------------|--------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------|-----------------------|-----------------------------------|-----------------------------------|-------------------------------|------------------------------------------|-----------------------------------|
|             | (°C)                                              | ( $\mu\text{m}$ )                          | ( $\mu\text{m}$ )                 | Min.<br>(V/W)                                                                          | Typ.<br>(V/W)         | Min.<br>(cm·Hz <sup>1/2</sup> /W) | Typ.<br>(cm·Hz <sup>1/2</sup> /W) | (cm·Hz <sup>1/2</sup> /W)     | Max.<br>( $\mu\text{s}$ )                | (M $\Omega$ )                     |
| P791-11     | 25                                                | 4.0                                        | 4.8                               | 7 × 10 <sup>2</sup>                                                                    | 1 × 10 <sup>3</sup>   | 5 × 10 <sup>7</sup>               | 1 × 10 <sup>8</sup>               | 1 × 10 <sup>9</sup>           | 3                                        | 0.3 to 1.5                        |
| P791-13     |                                                   |                                            |                                   | 3 × 10 <sup>2</sup>                                                                    | 5 × 10 <sup>2</sup>   |                                   |                                   |                               |                                          |                                   |
| P3207-05 *1 |                                                   | 4.3                                        |                                   | 7 × 10 <sup>2</sup>                                                                    | 1 × 10 <sup>3</sup>   | -                                 | -                                 | 8 × 10 <sup>8</sup>           |                                          |                                   |
| P2038-02    | -10                                               | 4.1                                        | 5.1                               | 2.2 × 10 <sup>3</sup>                                                                  | 3 × 10 <sup>3</sup>   | 1 × 10 <sup>8</sup>               | 3 × 10 <sup>8</sup>               | 3 × 10 <sup>9</sup>           | 5                                        | 1.7 to 7.0                        |
| P2038-03    |                                                   |                                            |                                   | 1 × 10 <sup>3</sup>                                                                    | 1.3 × 10 <sup>3</sup> |                                   |                                   |                               |                                          |                                   |
| P2680-02    | -20                                               | 4.2                                        | 5.2                               | 2.7 × 10 <sup>3</sup>                                                                  | 4 × 10 <sup>3</sup>   | 2 × 10 <sup>8</sup>               | 4 × 10 <sup>8</sup>               | 4 × 10 <sup>9</sup>           |                                          | 1.8 to 8.0                        |
| P2680-03    |                                                   |                                            |                                   | 1.2 × 10 <sup>3</sup>                                                                  | 2 × 10 <sup>3</sup>   |                                   |                                   |                               |                                          |                                   |

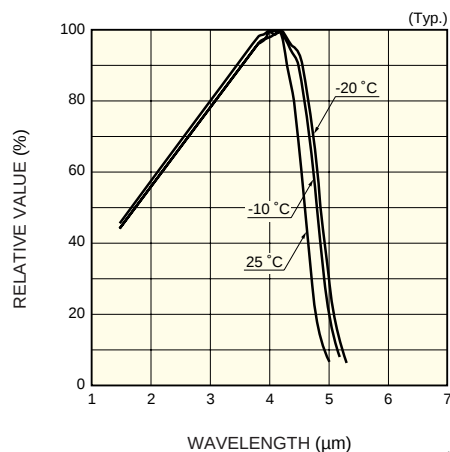
\*1: Half width 400 nm

\*2: Chopping frequency: 600 Hz, load resistance: nearly equal to detector element dark resistance

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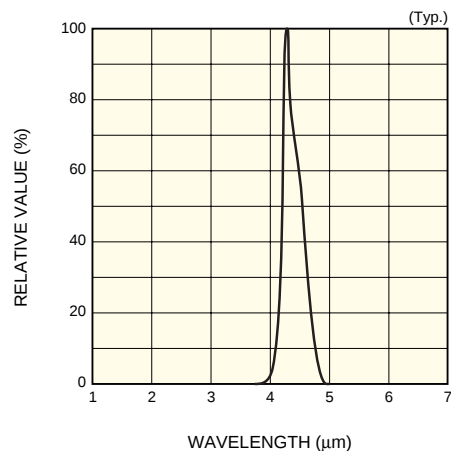
## Spectral response

P791/P2038/P2680 series



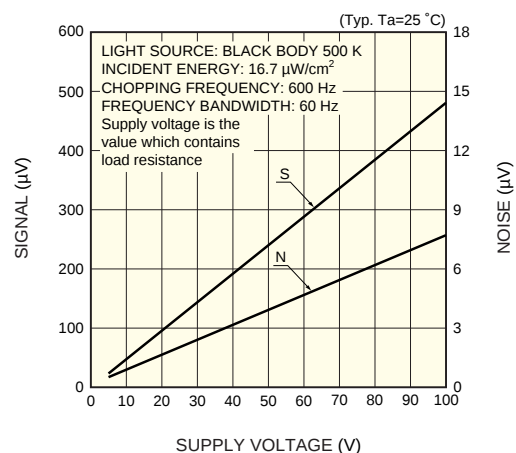
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P3207-05



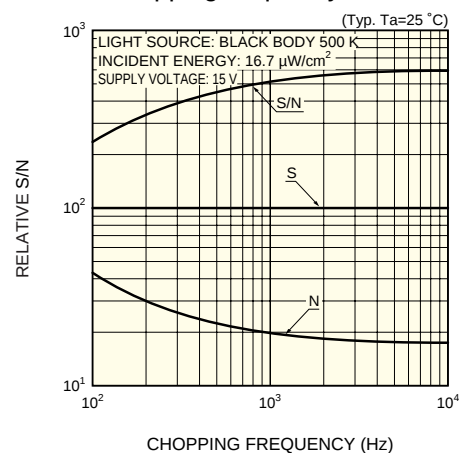
KIRDB0281EA

## S/N vs. supply voltage



KIRDB0052EC

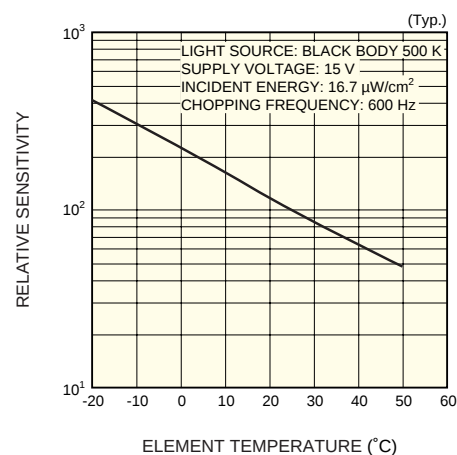
## S/N vs. chopping frequency



KIRDB0053EB

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.

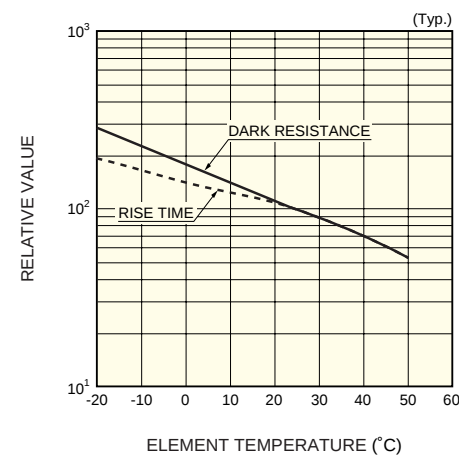
## Photo sensitivity temperature characteristic



KIRDB0054EB

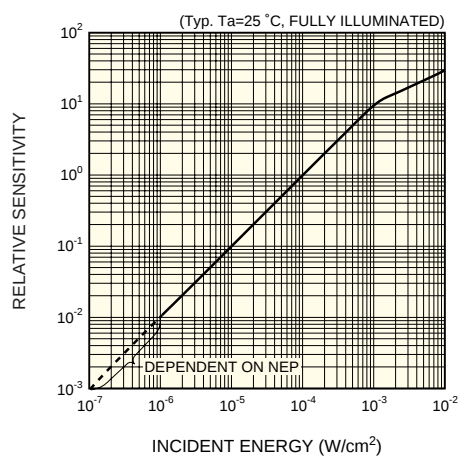
Cooling the device enhances its sensitivity, but the sensitivity also depends on the load resistance in the circuit.

## Dark resistance, rise time temperature characteristics



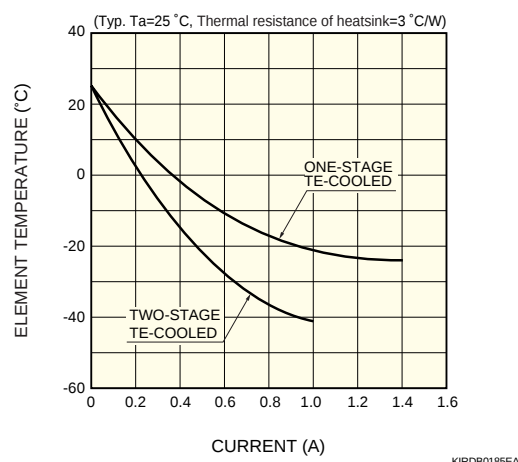
KIRDB0055EB

## Photo sensitivity linearity

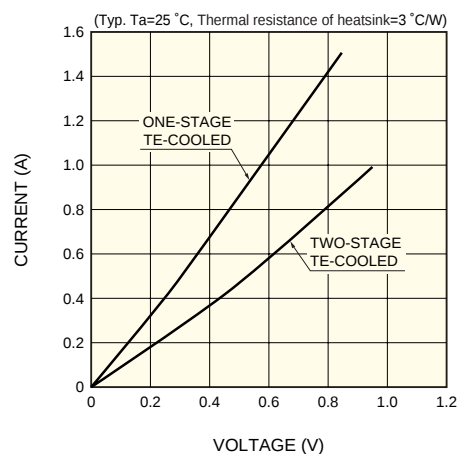


By making the incident light spot smaller than the active area, the upper limit of the linearity becomes lower.

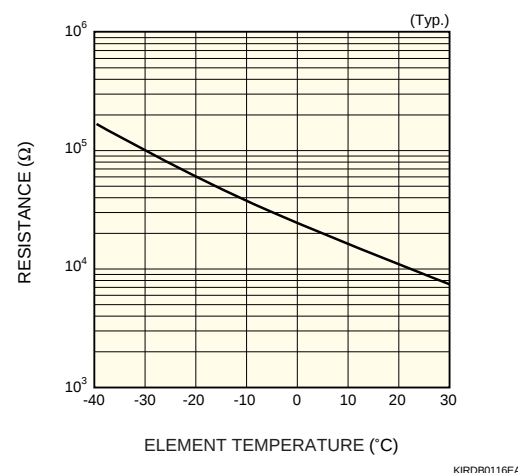
## Cooling characteristics of TE-cooler



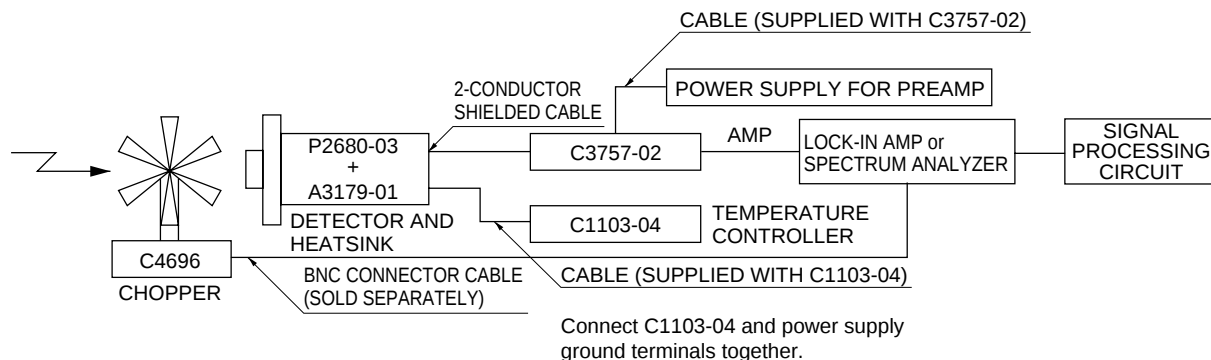
## Current vs. voltage characteristics of the TE-cooler



## Thermistor temperature characteristic

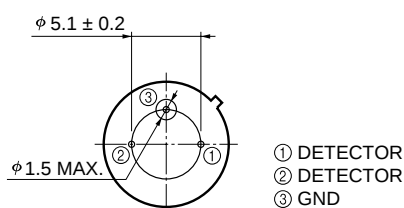
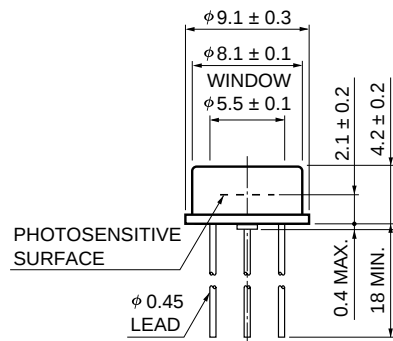


## Connection example (P2680-03)



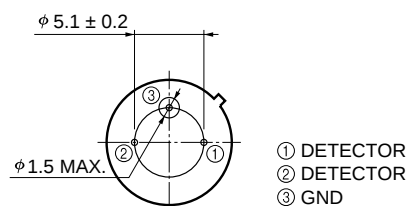
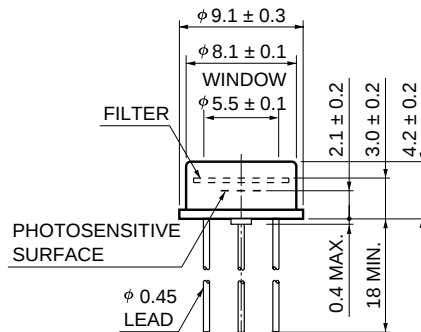
## ■ Dimensional outlines (unit: mm)

① P791-11/-13



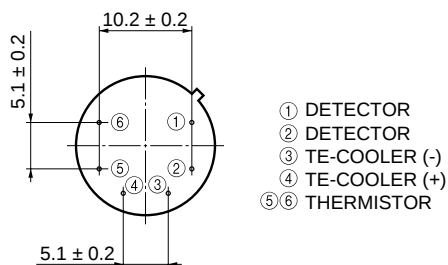
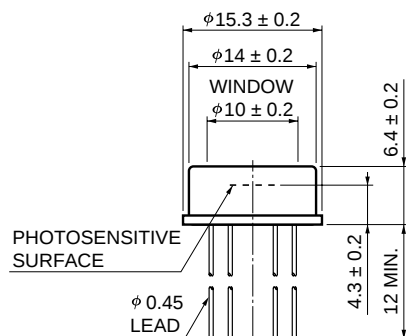
KIRDA0056EC

② P3207-05



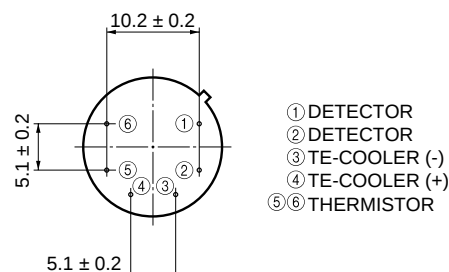
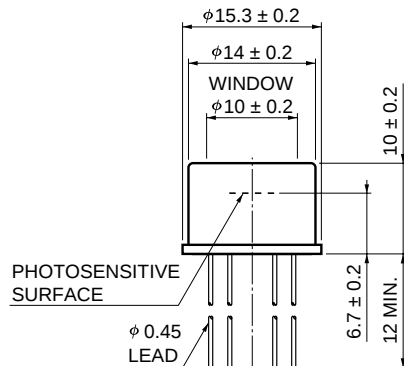
KIRDA0118EA

③ P2038-02/-03



KIRDA0128EA

④ P2680-02/-03



KIRDA0125EA

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