

COBP PHOTO REFLECTOR with RED & IR LED

■ GENERAL DISCRIPTION

The NJL5501R is the compact surface mount type photo reflector, which is built in a RED LED, Infrared LED and a high sensitive detector. This product is suit for the application for Bio monitor as pulse rate, SpO₂.

■ FEATURES

- Peak wavelength : λ_p 660±3nm (RED) , 940±10nm (Infrared)
- High output current : 1000 to 4300μA typ (RED), 145 to 580μA typ (Infrared)
- Miniature, thin package: 1.9x2.6x0.8mm

■ APPLICATION

- Bio monitor as pulse rate, SpO₂

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|------------------------------|--------|------------|------|
| Emitter | | | |
| Forward Current (Continuous) | IF RED | 30 | mA |
| | IF IR | 30 | mA |
| Reverse Voltage (Continuous) | VR RED | 5 | V |
| | VR IR | 5 | V |
| Power Dissipation *1 | PD | 65 | mW |
| Detector | | | |
| Collector-Emitter Voltage | VCEO | 16 | V |
| Emitter-Collector Voltage | VECO | 6 | V |
| Collector Current | IC | 10 | mA |
| Collector Power Dissipation | PC | 25 | mW |
| Coupled | | | |
| Total Power Dissipation | Ptot | 85 | mW |
| Operating Temperature | ToPr | -20 to +85 | °C |
| Storage Temperature | Tstg | -30 to +85 | °C |
| Reflow Soldering Temperature | Tsol | 260 peak | °C |

*1 Prohibits that "RED LED" and "IR LED" turn on at the same time.

■ ELECTRO-OPTICAL CHARACTERISTICS (Ta=25°C)

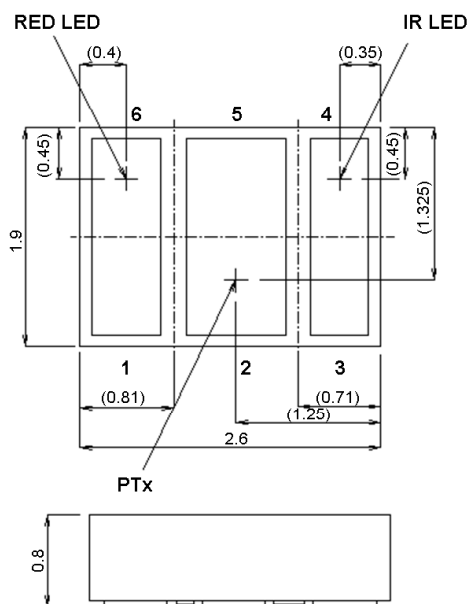
| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---------------------------|--------------------------|-----------------------------------|------|-----|------|------|
| Emitter | | | | | | |
| Forward Voltage | VF RED | IF=4mA | 1.7 | — | 2.1 | V |
| | VF IR | IF=4mA | 1.0 | — | 1.35 | V |
| Reverse Current | IR RED | VR=5V | — | — | 5 | μA |
| | IR IR | VR=5V | — | — | 5 | μA |
| Peak Wavelength *1 | $\lambda_{p\text{ RED}}$ | IF=20mA | 657 | 660 | 663 | nm |
| | $\lambda_{p\text{ IR}}$ | IF=20mA | 930 | 940 | 950 | nm |
| Detector | | | | | | |
| Dark Current | ICEO | VCE=10V | — | — | 0.2 | μA |
| Collector-Emitter Voltage | VCEO | IC=100μA | 16 | — | — | V |
| Coupled | | | | | | |
| Output Current *2 | IO RED | IF=4mA, VCE=2V, d=0.7mm | 1000 | — | 4300 | μA |
| | IO IR | IF=4mA, VCE=2V, d=0.7mm | 145 | — | 580 | μA |
| Operating Dark Current *3 | ICEOD RED | IF=4mA, VCE=2V | — | — | 5 | μA |
| | ICEOD IR | IF=4mA, VCE=2V | — | — | 1 | μA |
| Response Time(Rise/Fall) | Tr, Tf | IO=100μA, VCE=2V, d=0.7mm, RL=1kΩ | — | 20 | — | μs |

*1 This is represented as Emission wavelength range of LED. The emission wavelength verification test has not confirmed in the manufacturing process.

*2 Please refer to "Output Current Test Condition".

*3 ICEOD may increase according to the periphery situation of the surface mounted condition.

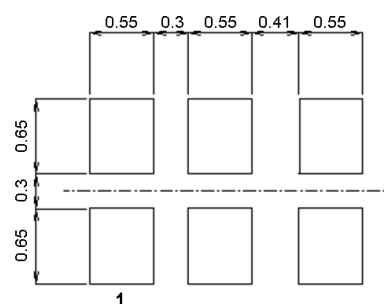
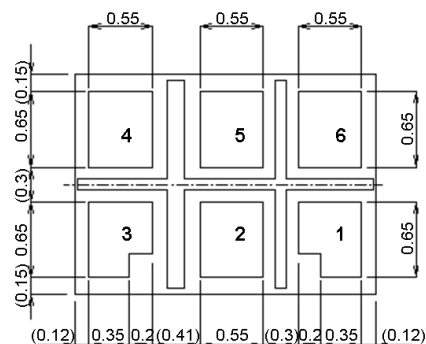
■ OUTLINE unit:mm



1. Cathode for RED LED
2. Collector
3. Anode for Infrared LED
4. Cathode for Infrared LED
5. Emitter
6. Anode for RED LED

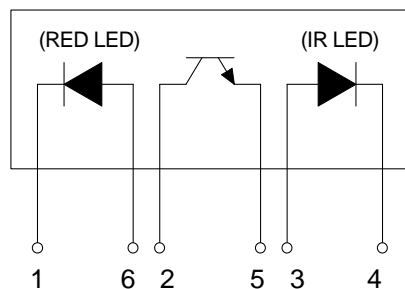
Unspecified tolerance : $\pm 0.1\text{mm}$

Dimensions in parenthesis are shown for reference.



Example of solder pads dimensions

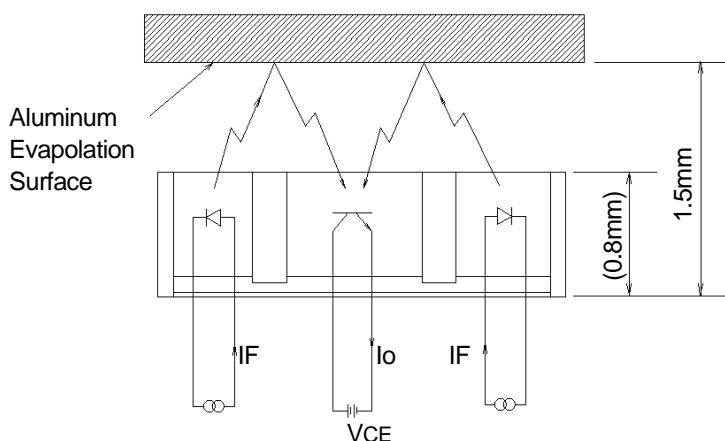
■ BLOCK DIAGRAM



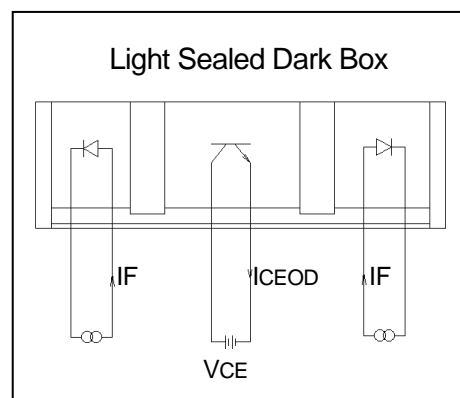
1. Cathode for RED LED
6. Anode for RED LED
2. Collector
5. Emitter
3. Anode for Infrared LED
4. Cathode for Infrared LED

■ OUTPUT CURRENT TEST CONDITION

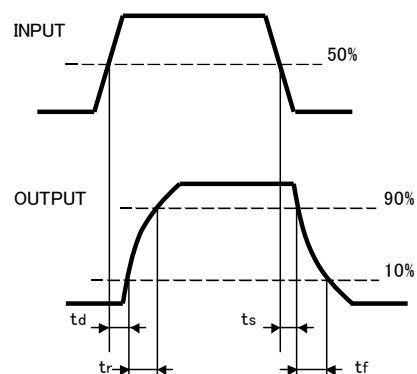
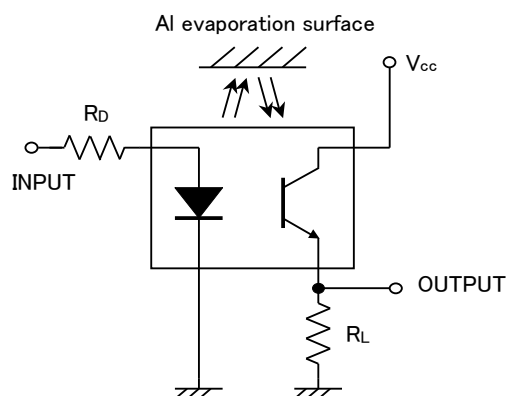
The signal from LED is reflected at the aluminum surface.



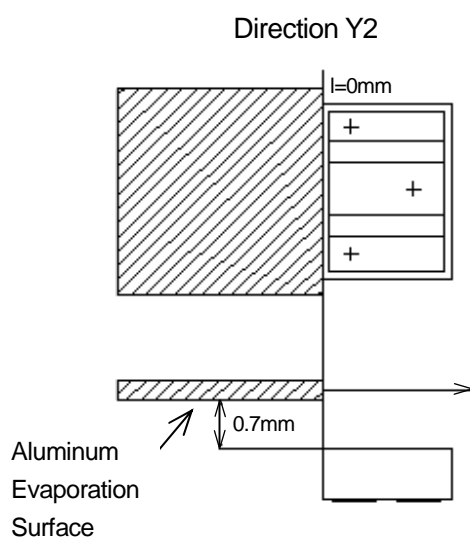
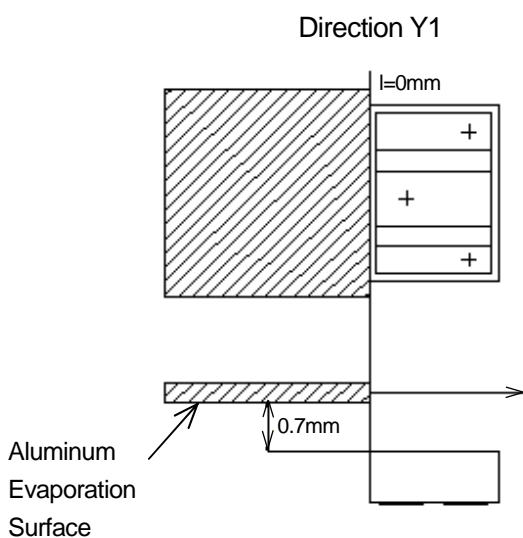
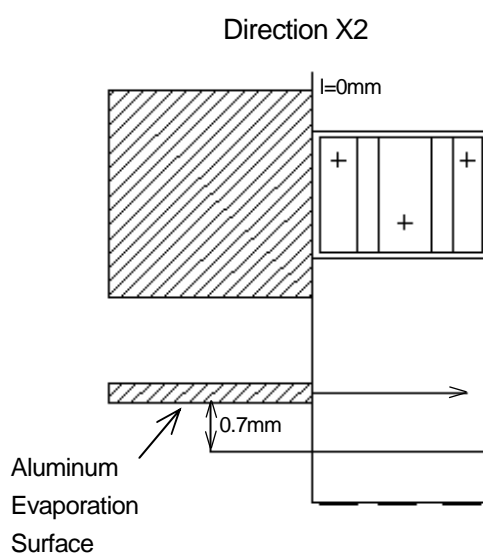
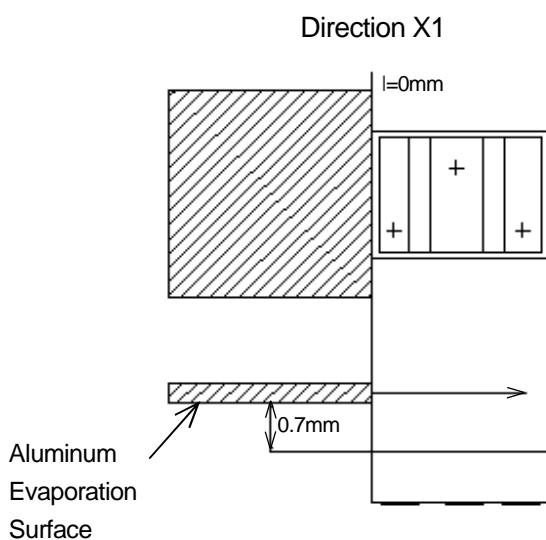
■ DARK CURRENT TEST CONDITION



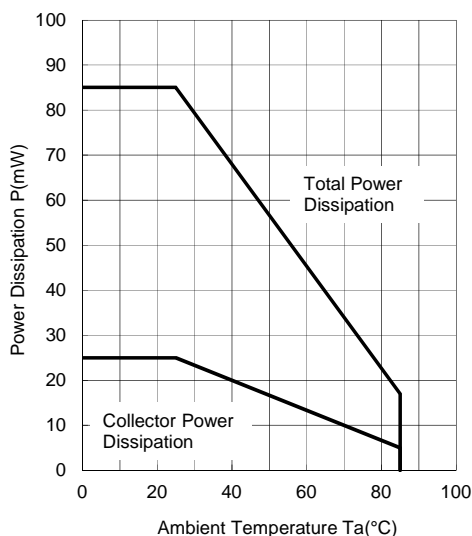
■ RESPONSE TIME TEST CONDITION



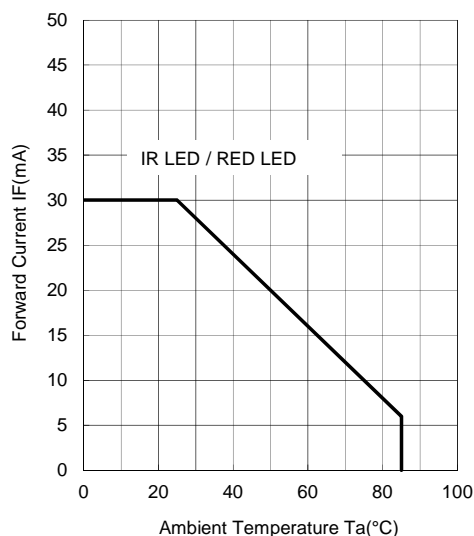
■ EDGE RESPONSE TEST CONDITION



Power Dissipation vs. Temperature

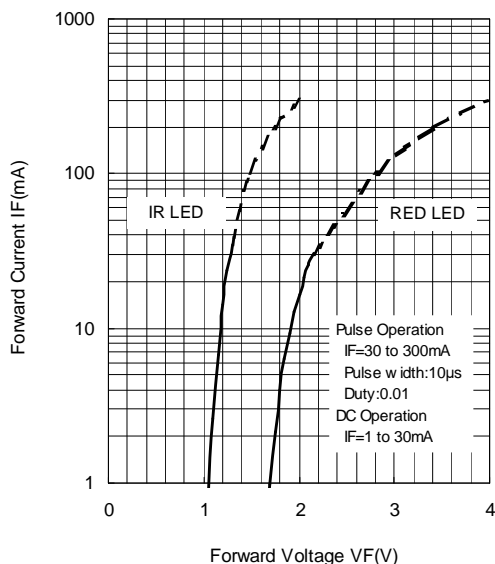


Forward Current vs. Temperature
RED LED & IR LED

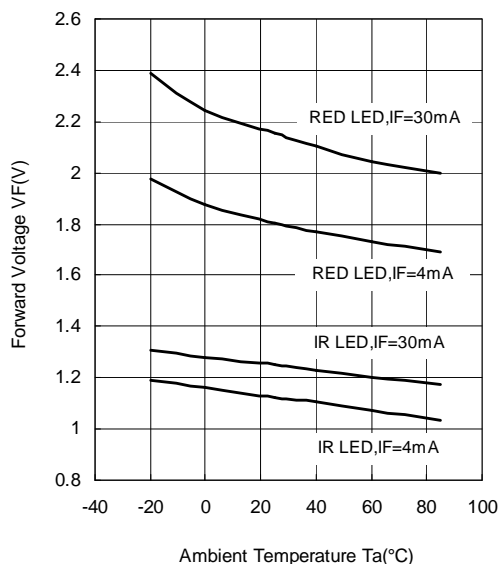


TYPICAL CHARACTERISTICS

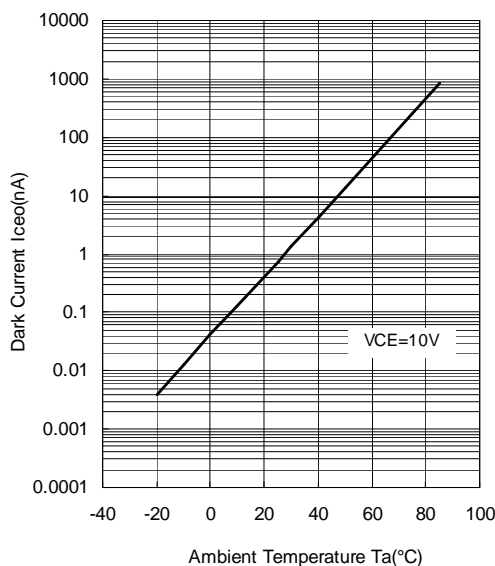
Forward Voltage vs. Forward Current
RED LED & IR LED



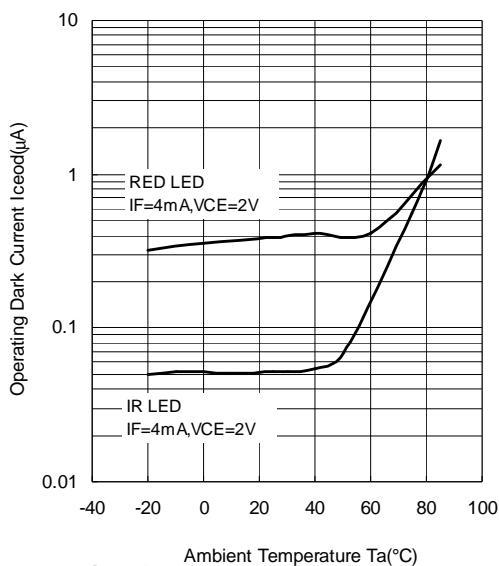
Forward Voltage vs. Temperature
RED LED & IR LED



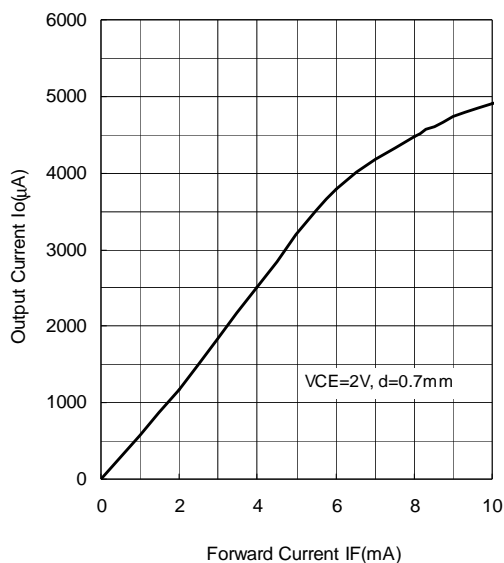
Dark Current vs. Temperature



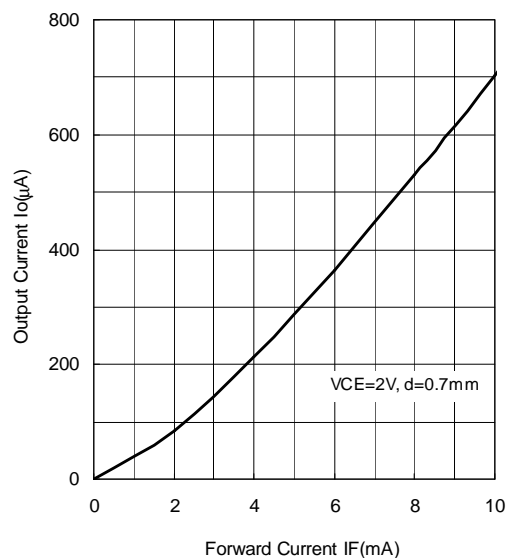
Operating Dark Current vs. Temperature
RED LED & IR LED



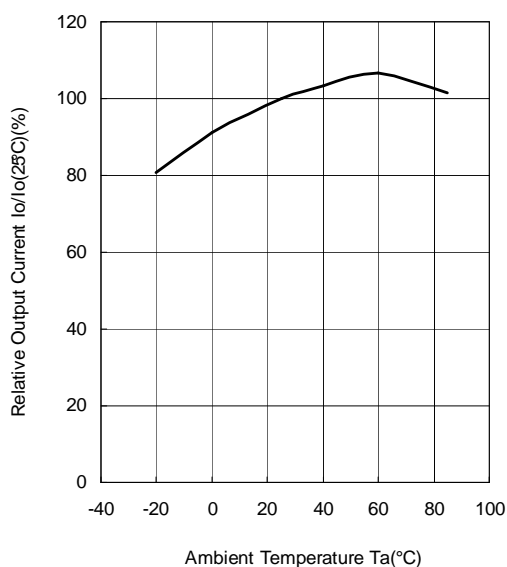
Output Current vs. Forward Current
RED LED (Ta=25°C)



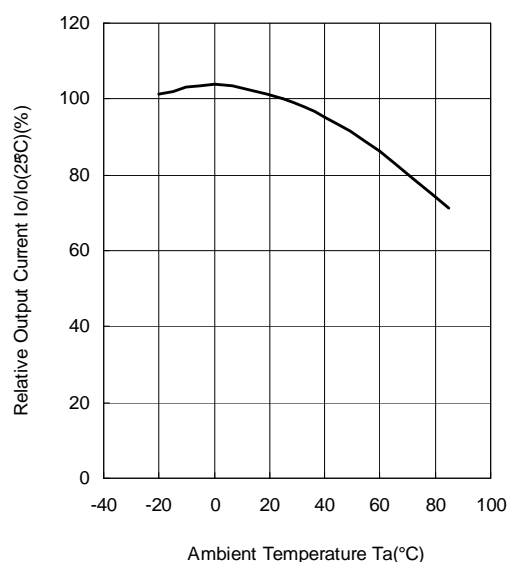
Output Current vs. Forward Current
IR LED (Ta=25°C)



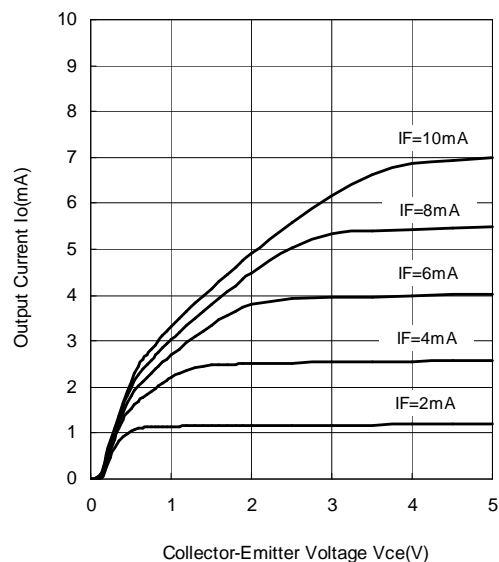
Output Current vs. Temperature
RED LED



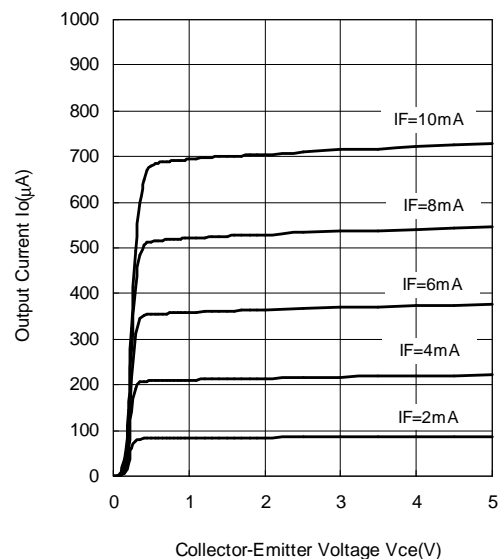
Output Current vs. Temperature
IR LED



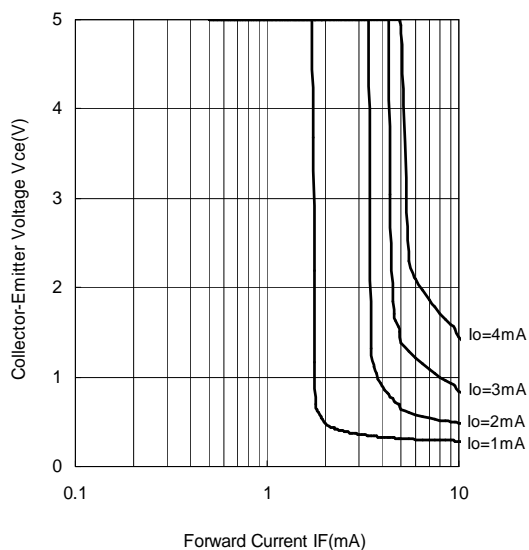
Output Characteristics (Ta=25°C)
RED LED



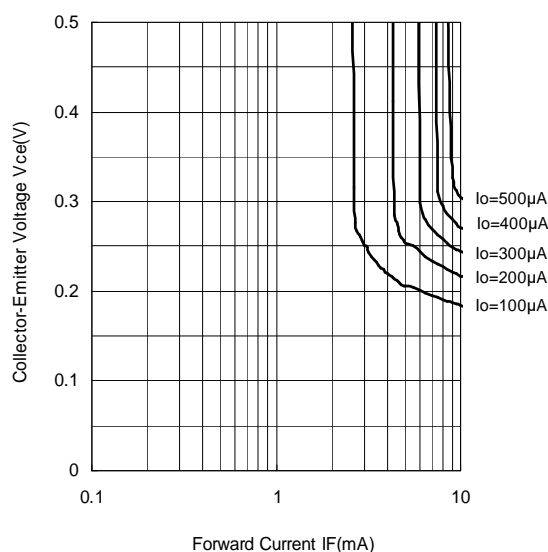
Output Characteristics (Ta=25°C)
IR LED



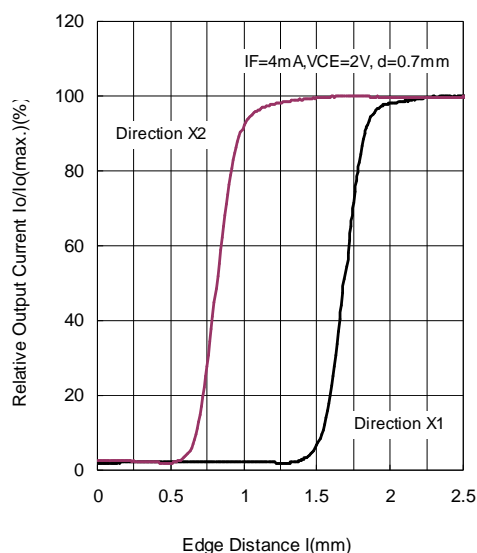
Vce Saturation (Ta=25°C)
RED LED



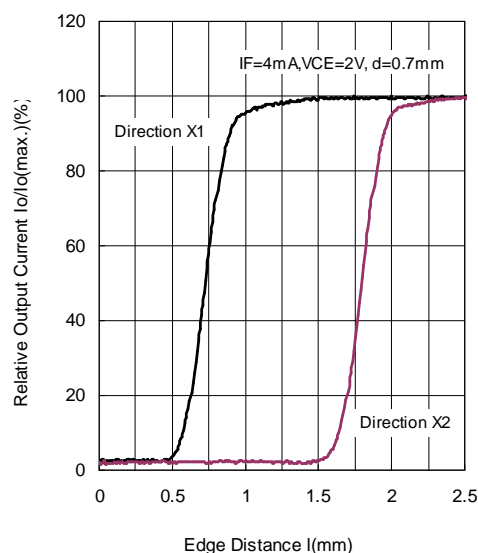
Vce Saturation (Ta=25°C)
IR LED



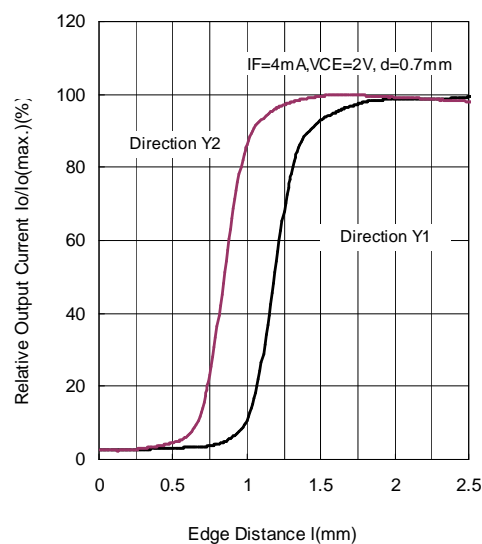
Output Current vs. Edge Distance
RED LED(Ta=25°C)



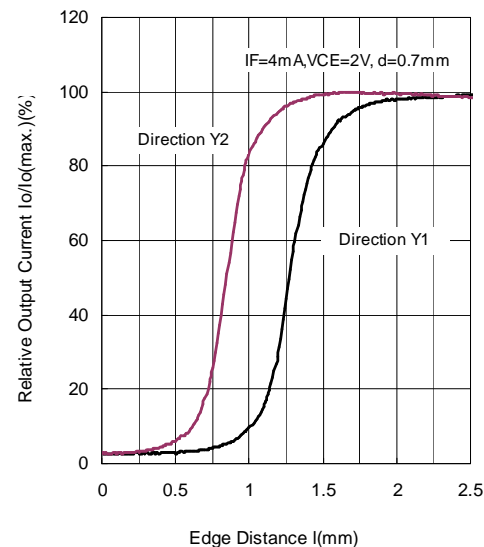
Output Current vs. Edge Distance
IR LED(Ta=25°C)



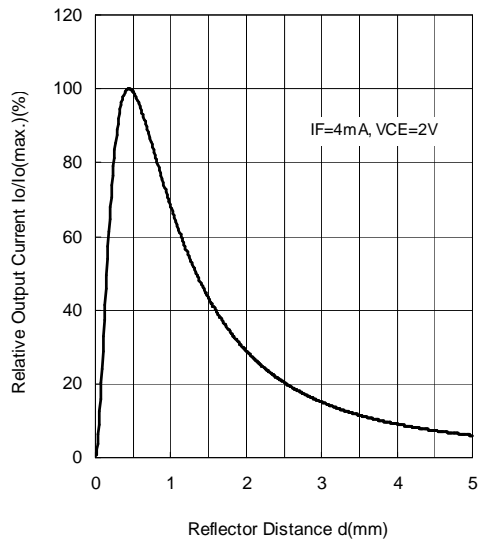
Output Current vs. Edge Distance
RED LED(Ta=25°C)



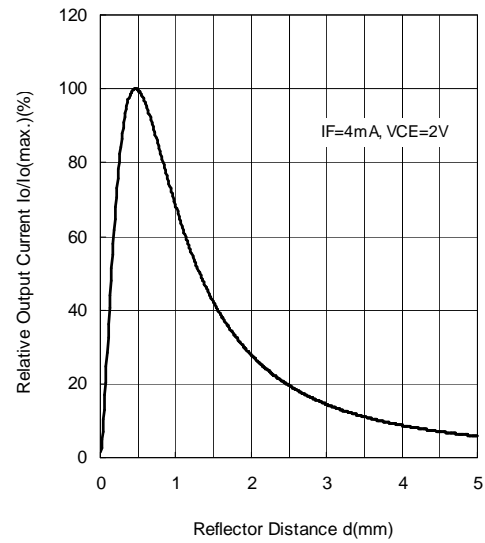
Output Current vs. Edge Distance
IR LED(Ta=25°C)



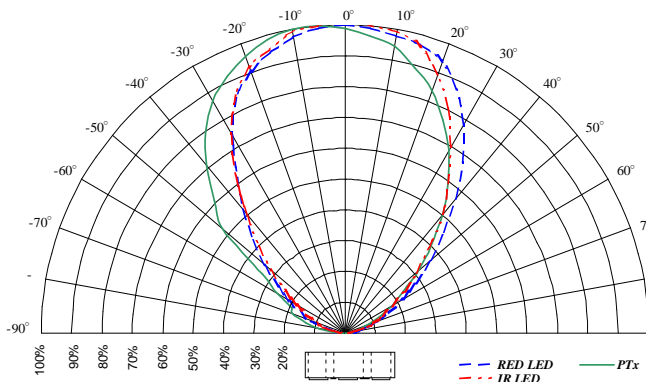
Output Current vs. Distance
RED LED(Ta=25°C)



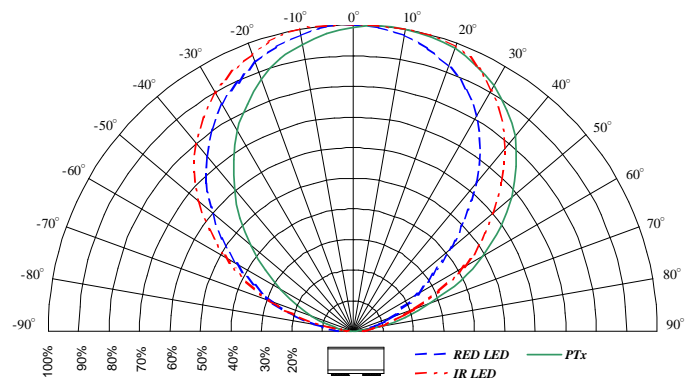
Output Current vs. Distance
IR LED(Ta=25°C)



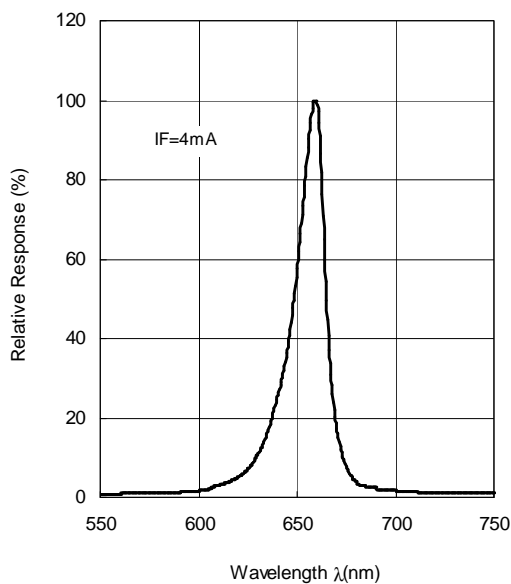
Directivity at Package direction X



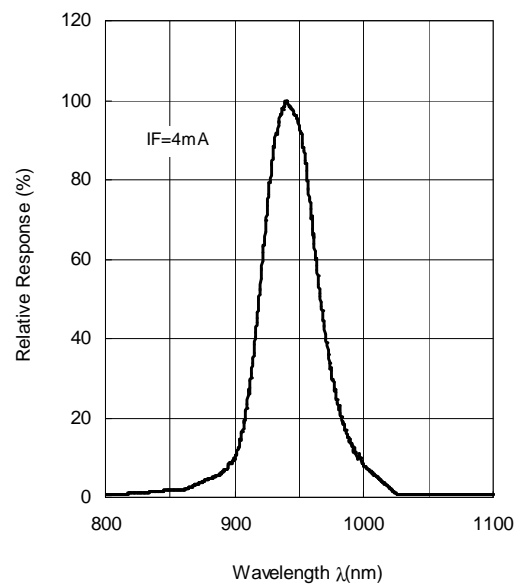
Directivity at Package direction Y

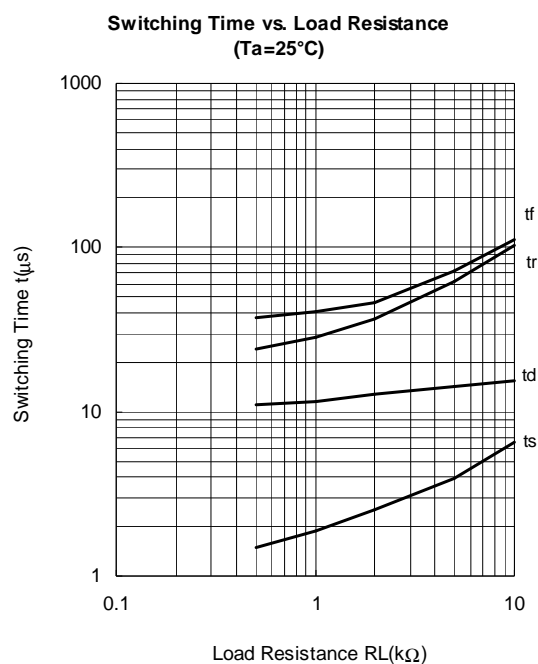


Spectral Response (Ta=25°C)
Emitter RED LED



Spectral Response (Ta=25°C)
Emitter IR LED





Remark: Please be aware that all data in the graph are only reference and are not any guarantee.

■ MOUNTING METHOD

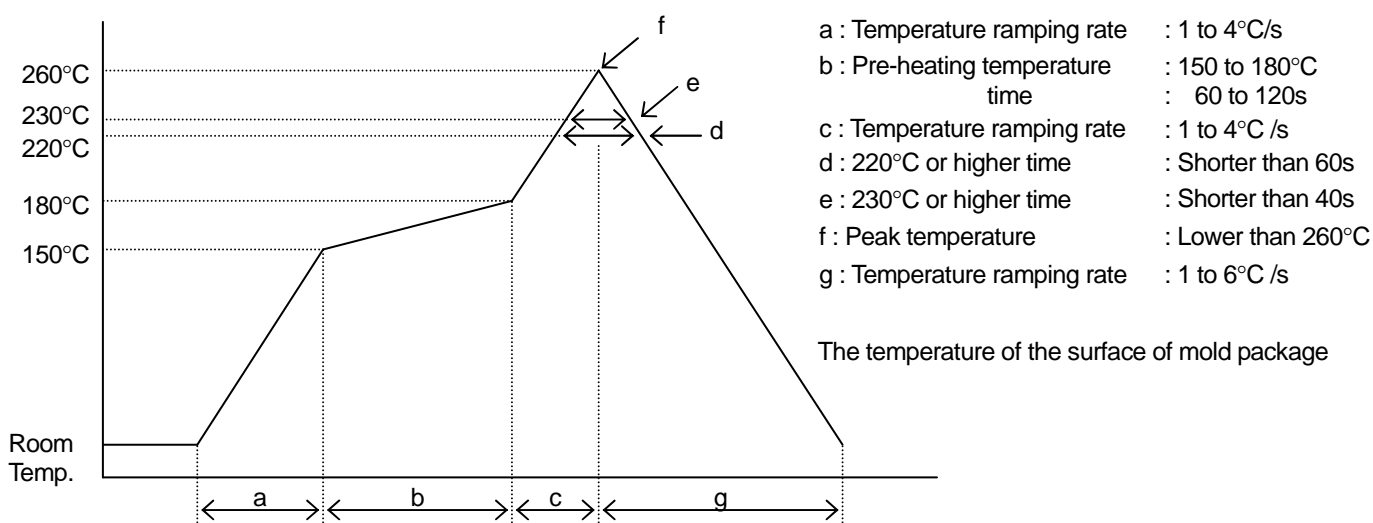
NOTE

Mounting was evaluated with the following profiles in our company, so there was no problem.
However, confirm mounting by the condition of your company beforehand.

Mounting: Twice soldering is allowed.

■ INFRARED REFLOW SOLDERING METHOD

Recommended reflow soldering procedure



(NOTE1) Using reflow furnace with short wave infrared radiation heater such as halogen lamp

Regarding temperature profile, please refer to those for reflow furnace.

In this case the resin surface temperature may become higher than lead terminals due to endothermic ally of black colored mold resin. Therefore, please avoid from direct exposure to mold resin.

(NOTE2) Other method

Such other methods of soldering as dipping the device into melted solder and vapor phase method (VPS) are not appropriate because the body of device will be heated rapidly. Therefore, these are not recommended to apply.

(NOTE3) The resin gets softened right after soldering, so, the following care has to be taken

Not to contact the lens surface to anything.

Not to dip the device into water or any solvents.

■ FLOW SOLDERING METHOD

Flow soldering is not possible.

■ IRON SOLDERING METHOD

Iron soldering is not possible.

■ CLEANING

Avoid washing the device after soldering by reflow method.

■ IC STORAGE CONDITIONS AND ITS DURATION

(1) Temperature and humidity ranges

| | | |
|--------------|--------------|--------------|
| Pack Sealing | Temperature: | 5 to 40 [°C] |
| | Humidity: | 40 to 80 [%] |
| Pack Opening | Temperature: | 5 to 30 [°C] |
| | Humidity: | 40 to 70 [%] |

After opening the bag, solder products within 48h.

Avoid a dry environment below 40% because the products are easily damageable by the electrical discharge.

Store the products in the place where it does not create dew with the products due to a sudden change in temperature.

(2) When baking, place the reel vertically to avoid load to the side.

(3) Do not store the devices in corrosive-gas atmosphere.

(4) Do not store the devices in a dusty place.

(5) Do not expose the devices to direct rays of the sun.

(6) Do not allow external forces or loads to be applied to IC's.

(7) BE careful because affixed label on the reel might be peeled off when baking.

■ BAKING

In case of keeping expect above condition be sure to apply baking. (Heat-resistant tape)

Baking method: Ta=60°C, 48 to 72h, Three times baking is allowed

■ STORAGE DURATION

Within a year after delivering this device.

For the products stored longer than a year, confirm their terminals and solderability before they are used.

■ APPLICATION NOTES

(1) Attention in handling

Treat not to touch the light receiving and light emitting part.

Avoid to adhering the dust and any other foreign materials on the light receiving and light emitting part when using.

Never apply reverse voltage (VEC) of over 6V to the photo transistor when measuring the characteristics or adjusting the system. If applied, it causes to lower the sensitivity.

When LED has operated by voltage, it should be connected the resistor of current adjustment. Avoid to applying direct voltage to LED, because there is possibility that LED is destroyed.

When mounting, special care has to be taken on the mounting position and tilting of the device because it is very important to place the device to the optimum position to the object.

(2) Attention in designing

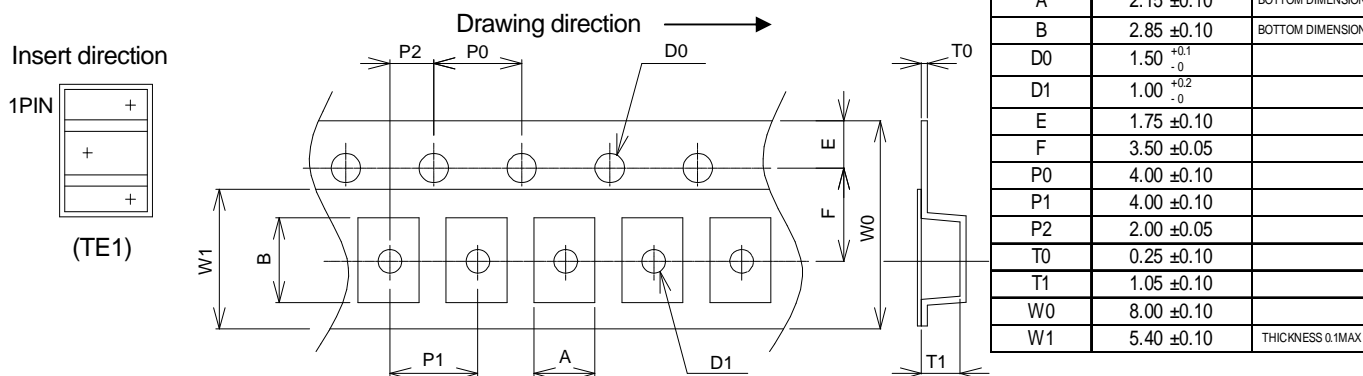
Avoid the entering ambient light into light receiving part for avoid the malfunction by ambient light. Furthermore, there is possibility of malfunction when there are the other mounted parts by near this product peripheral.

There will be changing characteristics by detection object. Refer to this datasheet and evaluate by actual detection object.

When LED has been applied continuous power on long period of time, the output current is dropped. If it uses by always applying power to LED, have to consider the circuit designing of including output current decrease.

PACKING SPECIFICATION

PACKING DIMENTIONS UNIT : mm



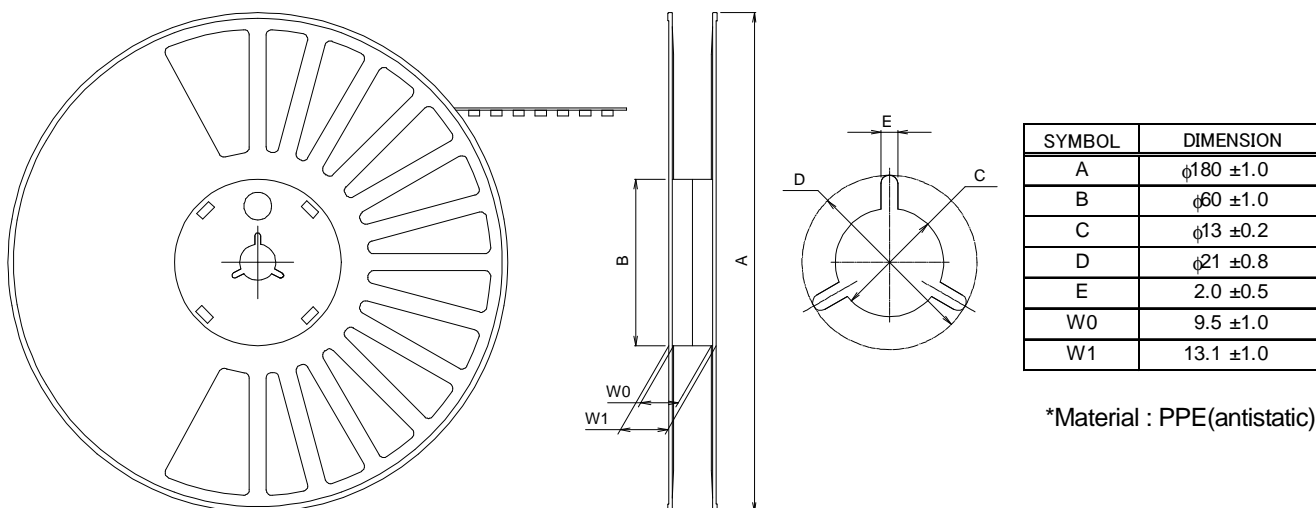
* Carrier tape material : Polycarbonate(antistatic)
Cover tape material : Polyester(antistatic)

Taping Strength

Pull up the cover tape from the carrier tape, and when the opening angle comes around 10 to 15 , and the peeling-off strength is to be within the power of 20 to 70g.

Packaging

- The taped products are to be rolled up on the taping reel as on the drawing.
- Rolling up specification
 - Start rolling : Carrier tape open space more than 20 Pieces.
 - End of rolling : Carrier tape open space more than 20 Pieces, and 2 round of reel space at the cover tape only.
- Taping quantity : 2,000 Pieces
- Seal off after putting each reels in a damp proof bag with silica gel.



*Material : PPE(antistatic)

[CAUTION]

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