

Biomonitoring Sensor with Two Green LEDs & Optical filtered PD

FEATURES

- Light sensitivity range: Visible light range
- Peak wavelength of LED: λ_p 525nm
- Miniature package: 3.15 X 4.7 X 0.8mm
- Pb free solder re-flowing permitted: 260°C, 2times
- Pb free, Halogen free
- Conformity to RoHS directive

APPLICATION

- Pulse rate (Heart rate) of Wearable Devices
(In-Ear phone, Smart watch, Fitness Tracker etc.)
- Mobile Devices

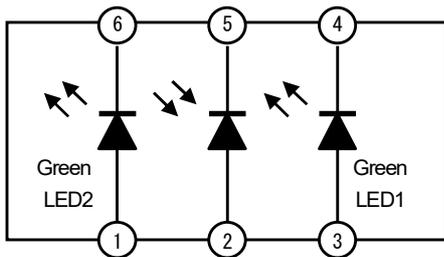
GENERAL DESCRIPTION

The NJL5312R is a sensor that reduces the affect of scattering from reflection light at cover material by ingenuity of the package structure.

This sensor is a highly integrated Photo-sensor, which combined two high brightness Green LEDs and a high sensitivity Si photo diode with visible light band-pass filter.

NJL5312R is a sensor for pulse rate (heart rate) measurement which shows one of fitness application that targeted the fitness tracker like Smart watch/Band/Bracelet.

EQUIVALENT CIRCUIT - BLOCK DIAGRAM

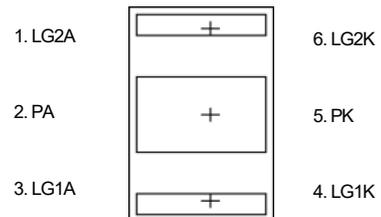


1. LG2A
2. PA
3. LG1A
4. LG1K
5. PK
6. LG2K

PIN CONFIGURATION

PIN NO.	SYMBOL	DESCRIPTION
1	LG2A	Anode for GREEN LED2
2	PA	Anode for PD
3	LG1A	Anode for GREEN LED1
4	LG1K	Cathode for GREEN LED1
5	PK	Cathode for PD
6	LG2K	Cathode for GREEN LED2

(Top View)



ORDERING INFORMATION

PART NUMBER	PACKAGE OUTLINE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ(pcs)
NJL5312R	COBP	✓	✓	Au	No marking	22	3,000

■ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Emitter			
Forward Current (Continuous) *1	IF	15	mA
Reverse Voltage (Continuous)	VR	5	V
Power Dissipation *1	PD	65	mW
Detector			
Reverse Voltage	VR	35	V
Power Dissipation	PD	20	mW
Coupled			
Total Power Dissipation	P _{tot}	85	mW
Operating Temperature Range	T _{opr}	-20 to +70	°C
Storage Temperature Range	T _{stg}	-30 to +85	°C
Reflow Soldering Temperature	T _{sol}	260	°C

*1 This is current value of each 1pcs LED.

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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Emitter						
DC Forward Voltage	V _F	IF=10mA	—	3	3.5	V
Pulse Forward Voltage*1	V _{FP}	IFP=100mA	—	3.5	—	V
Reverse Current	I _R	VR=5V	—	—	10	μA
Peak Wavelength	λ _P	IF=10mA	—	525	—	nm
Detector						
Dark Current	I _D	VR=10V, Without incident light	—	1	5	nA
Forward Voltage	V _F	IF=1mA, Without incident light	—	—	1	V
Terminal Capacitance	C _t	VR=0V, f=1MHz	—	160	—	pF
		VR=2.5V, f=1MHz	—	70	—	pF
Peak Wavelength	λ _P	VR=0V	—	580	—	nm
Coupled						
Output Current *2	I _O	IF=4mA*4, VR=2.5V, d=2.0mm*5	2.1	—	11	μA
Operating Dark Current *3	I _{LD}	IF=4mA*4, VR=2.5V, Without reflective plate	—	30	200	nA
Response Time(Rise/Fall)	tr,tf	VR=0V, RL=1kΩ	—	850	—	ns
		VR=2.5V, RL=1kΩ	—	300	—	ns

*1 Pulse duty 0.5% (Pulse width 100μs, Period 20ms)

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

*3 I_{LD} may increase according to the periphery situation of the surface mounted condition.

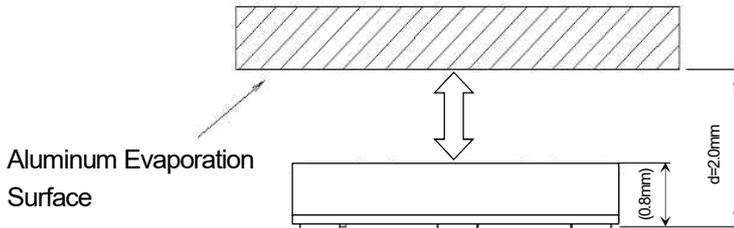
*4 Total current of each LED (IF=2mA/pcs).

*5 Distance from the package undersurface to the aluminum evaporation surface.

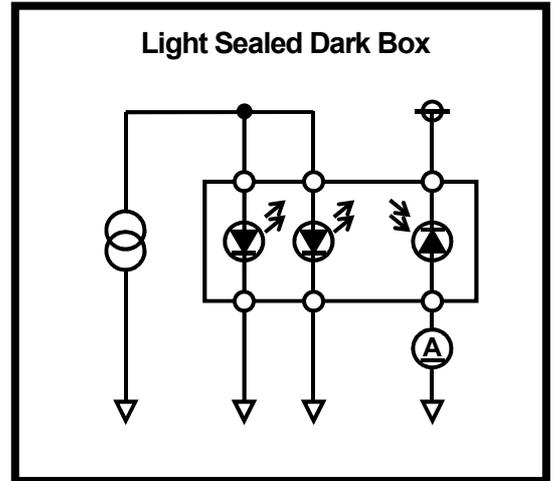
Note: In the Electro-Optical characteristics table, items that are showed only the typical value are not tested in manufacturing process.

■ OUTPUT CURRENT TEST CONDITION

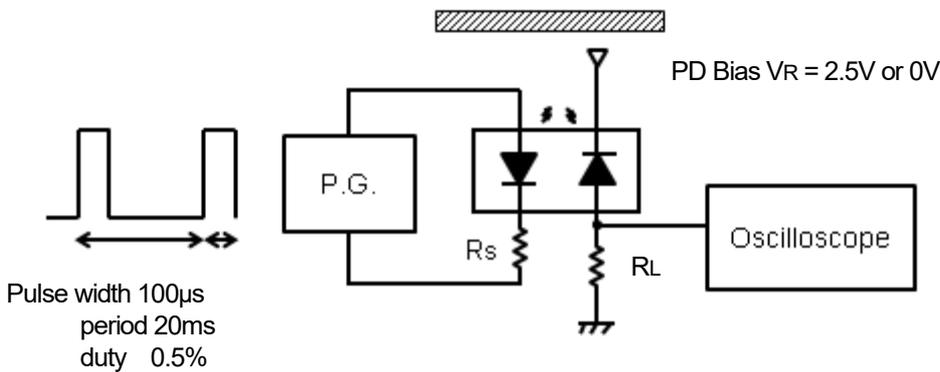
The signal from LED is reflected at the aluminum surface.



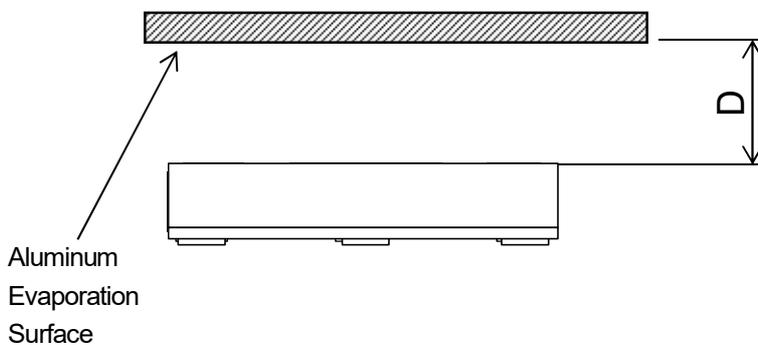
■ DARK CURRENT TEST CONDITION



■ RESPONSE TEST CONDITION

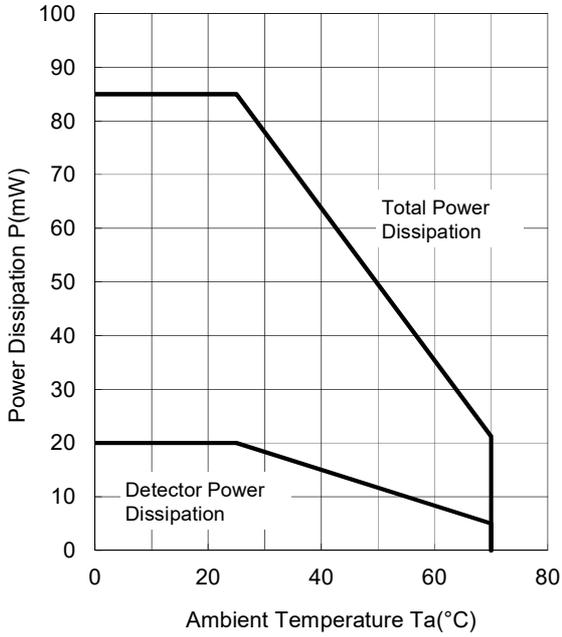


■ OUTPUT CURRENT vs. DISTANCE TIME TEST CONDITION

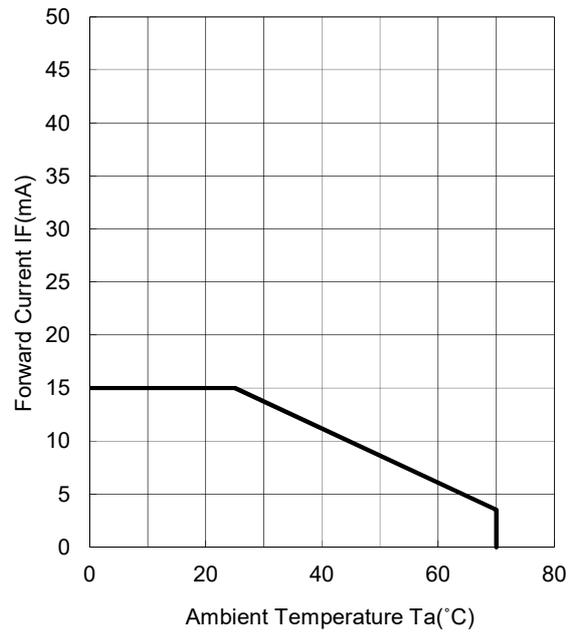


■POWER DISSIPATION vs. AMBIENT TEMPERATURE

Power Dissipation vs. Temperature

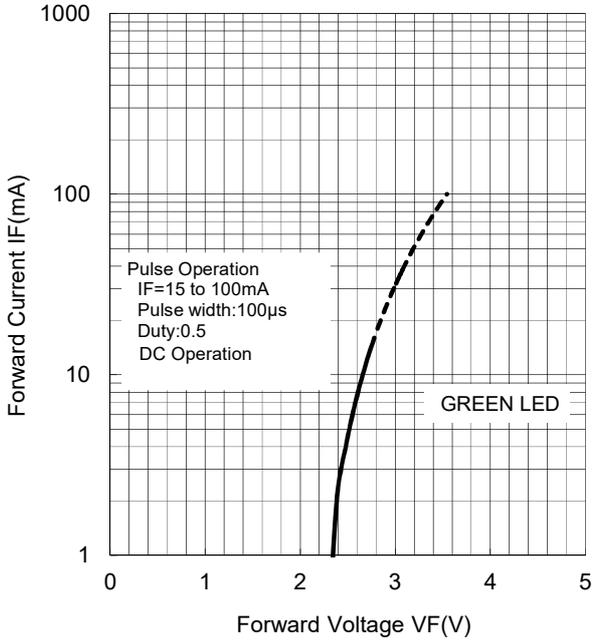


Forward Current vs. Temperature
GREEN LED

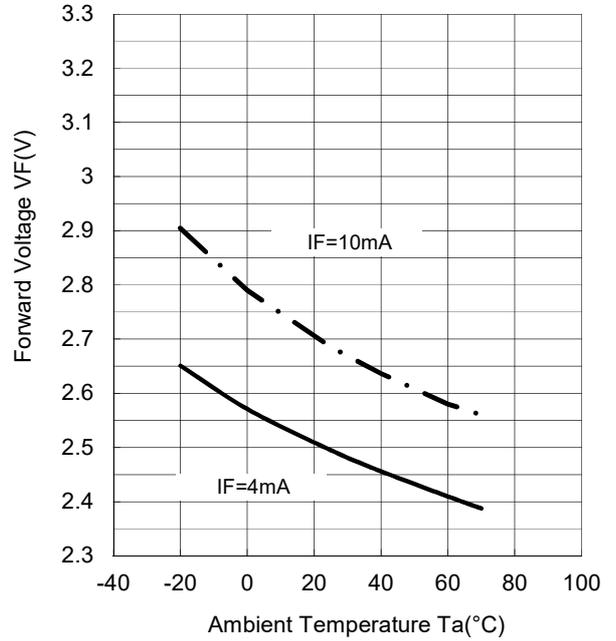


■ TYPICAL CHARACTERISTICS RELATED GREEN EMITTER

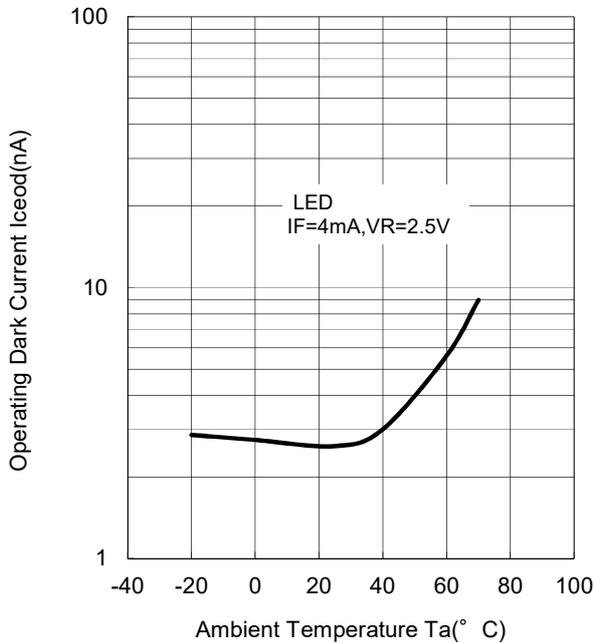
**Forward Voltage vs. Forward Current
GREEN LED**



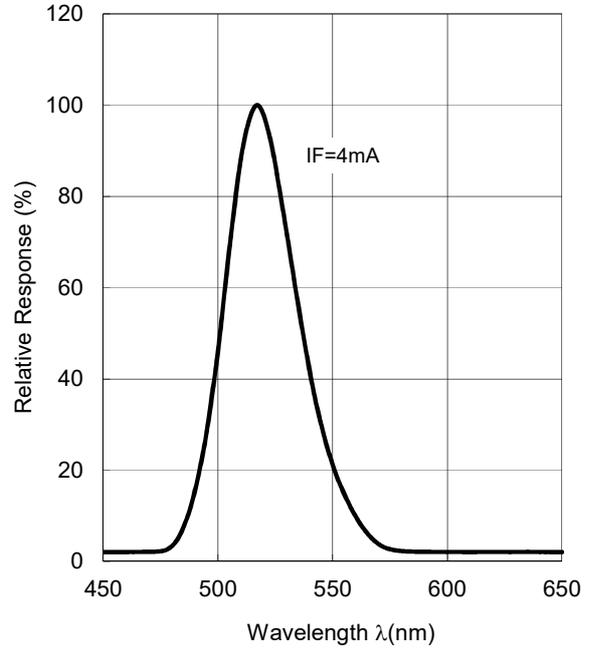
**Forward Voltage vs. Temperature
GREEN LED**



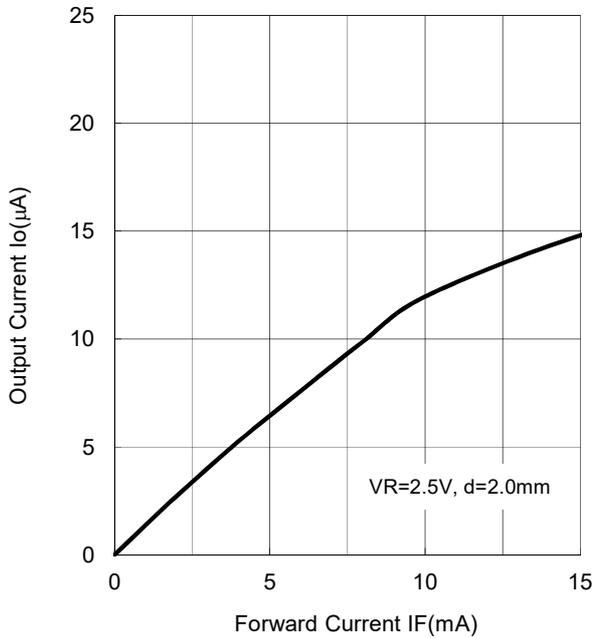
Operating Dark Current vs. Temperature LED



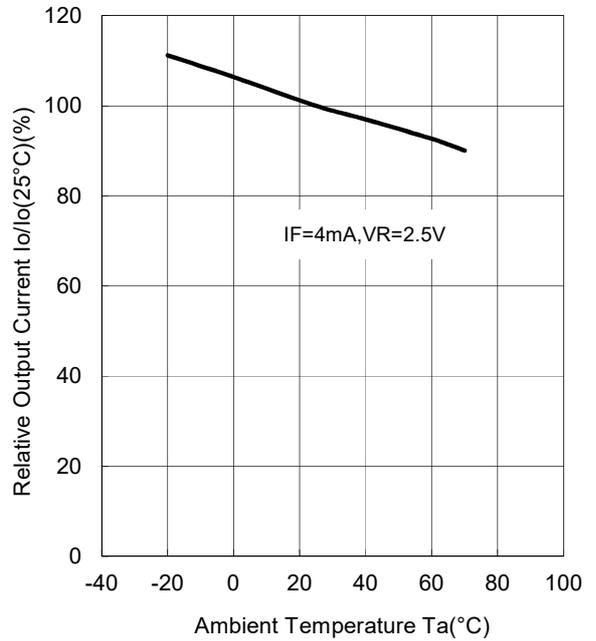
**Spectral Response ($T_a = 25^\circ\text{C}$)
Emitter GREEN LED**



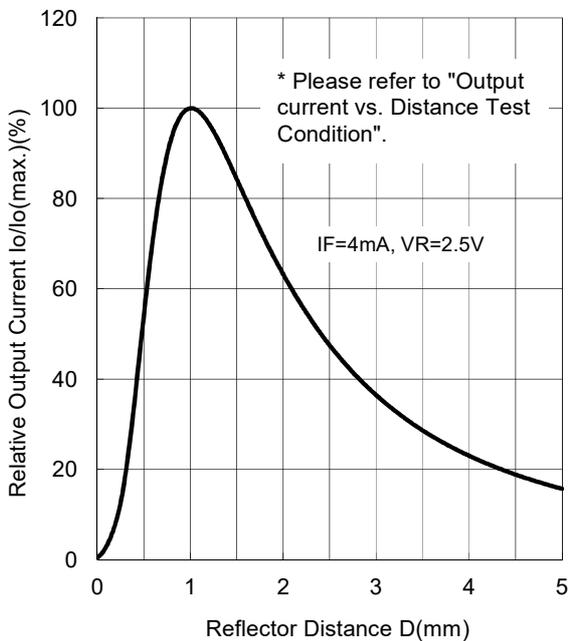
Output Current vs. Forward Current
($T_a=25^\circ\text{C}$)



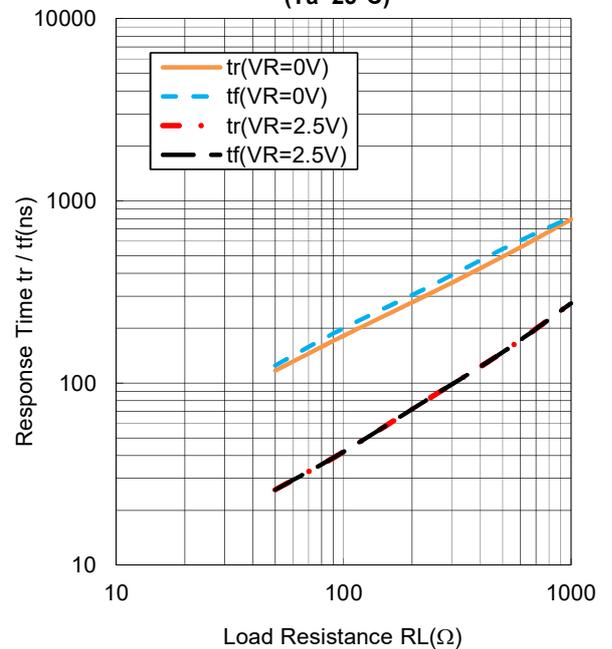
Output Current vs. Temperature



Output Current vs. Distance
($T_a=25^\circ\text{C}$)

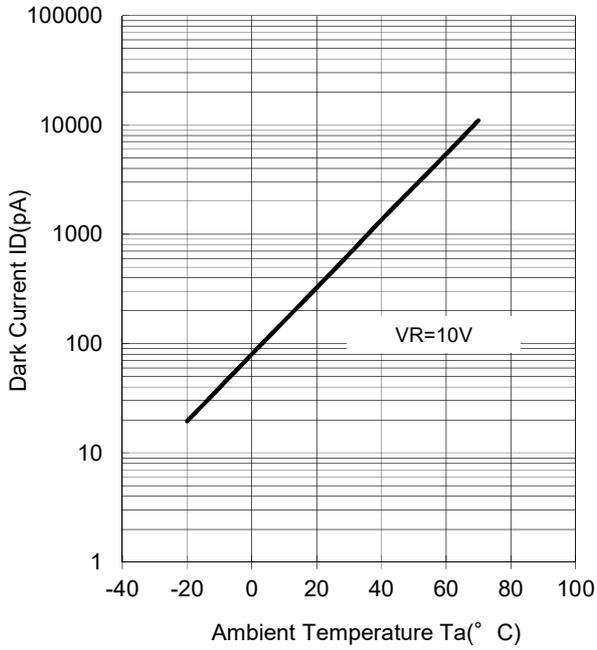


Response Time(Rise/Fall) vs. Load Resistance
($T_a=25^\circ\text{C}$)

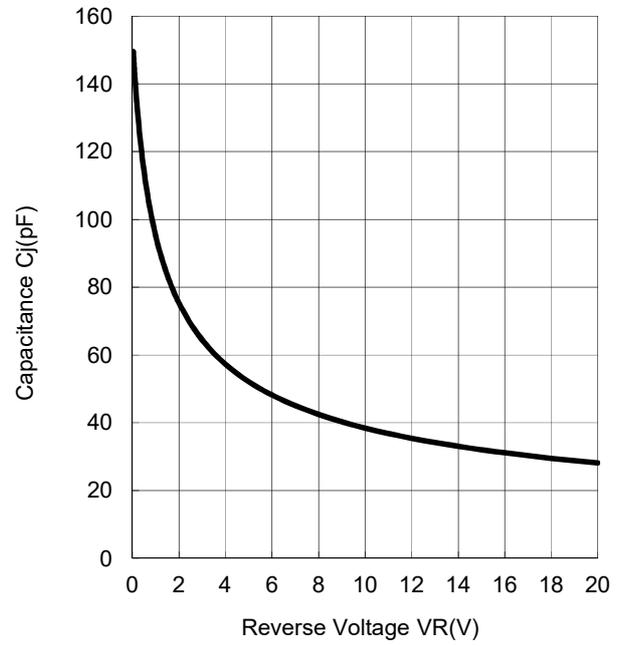


■ TYPICAL CHARACTERISTICS RELATED DETECTOR

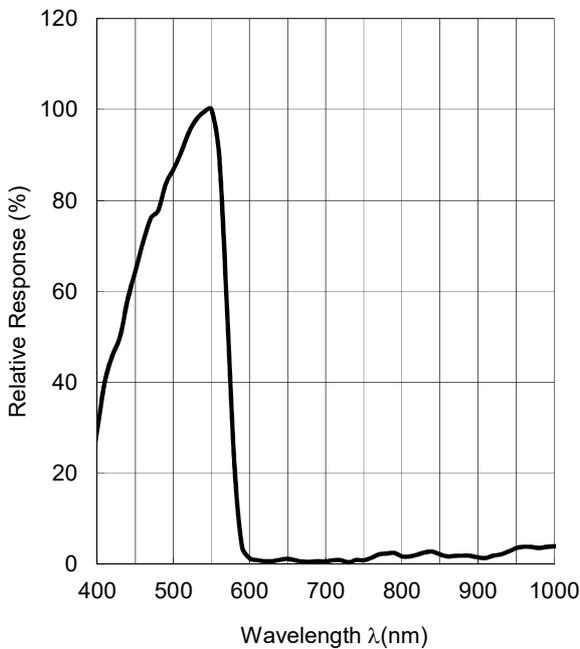
Dark Current vs. Temperature



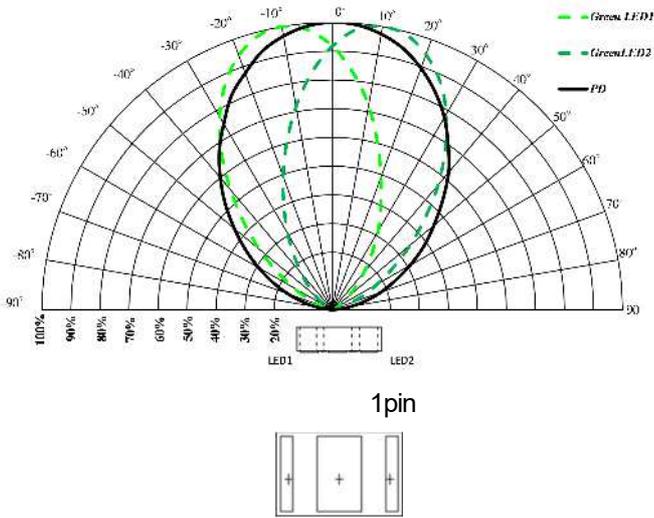
Capacitance vs. Reverse Voltage (Ta=25°C)



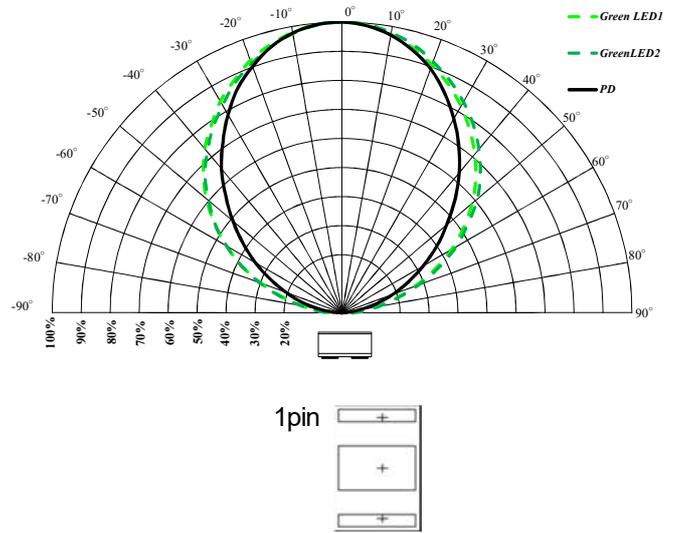
Spectral Response (Ta=25°C) Detector



Directivity at Package direction X



Directivity at Package direction Y



■APPLICATION NOTE

(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.

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.

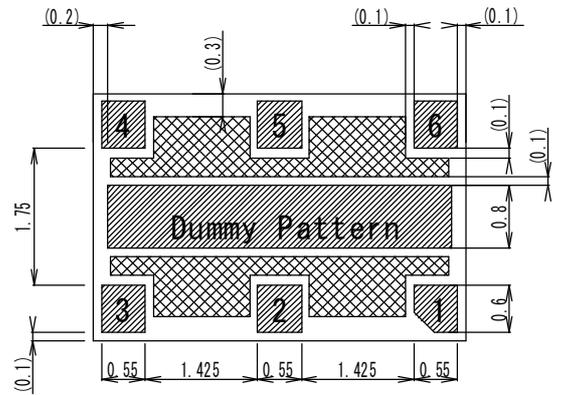
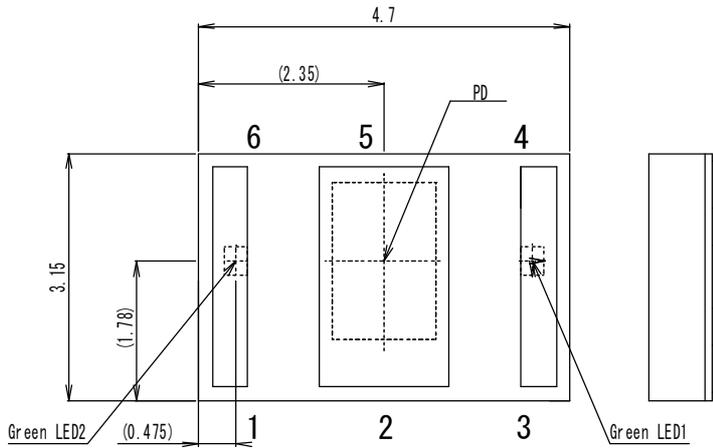
(2) Attention in designing

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.

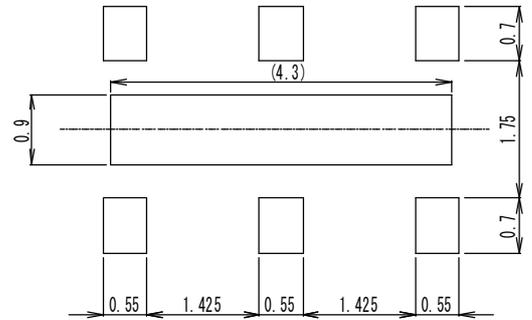
When LED has been applied continuous power on long period of time, the output current is dropped. If it uses by always applying power to LED, have to consider the circuit designing of including output current decrease.

PACKAGE OUTLINE



- 1. LG2A
- 2. PA
- 3. LG1A
- 4. LG1K
- 5. PK
- 6. LG2K

Foot Pattern

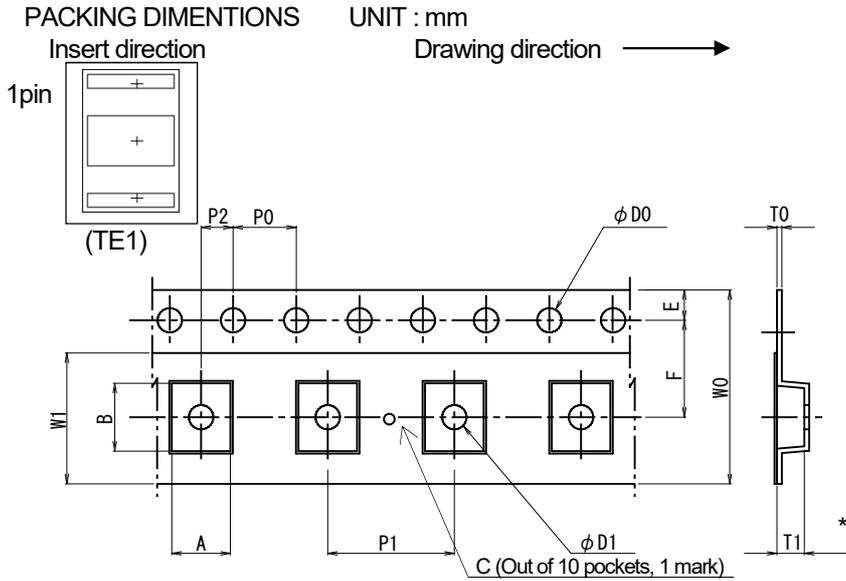


Unspecified tolerance : $\pm 0.1\text{mm}$

Dimensions in parenthesis are shown for reference.

*: Dummy pattern should be floating or soldering to PCB.

PACKING SPECIFICATION



SYMBOL	DIMENSION	REMARKS
A	3.5 ±0.10	BOTTOM DIMENSION
B	5.05 ±0.10	BOTTOM DIMENSION
D0	φ1.50 ^{+0.1} ₋₀	
D1	φ1.55 ±0.05	
E	1.75 ±0.10	
F	5.50 ±0.05	
P0	4.00 ±0.10	
P1	8.00 ±0.10	
P2	2.00 ±0.05	
T0	0.20 ±0.05	
T1	1.32 ±0.10	
W0	12.00 ^{+0.3} _{-0.1}	
W1	9.3 ±0.10	THICKNESS 0.1MAX
C	φ1.0 (Depth 0.05)	Count mark

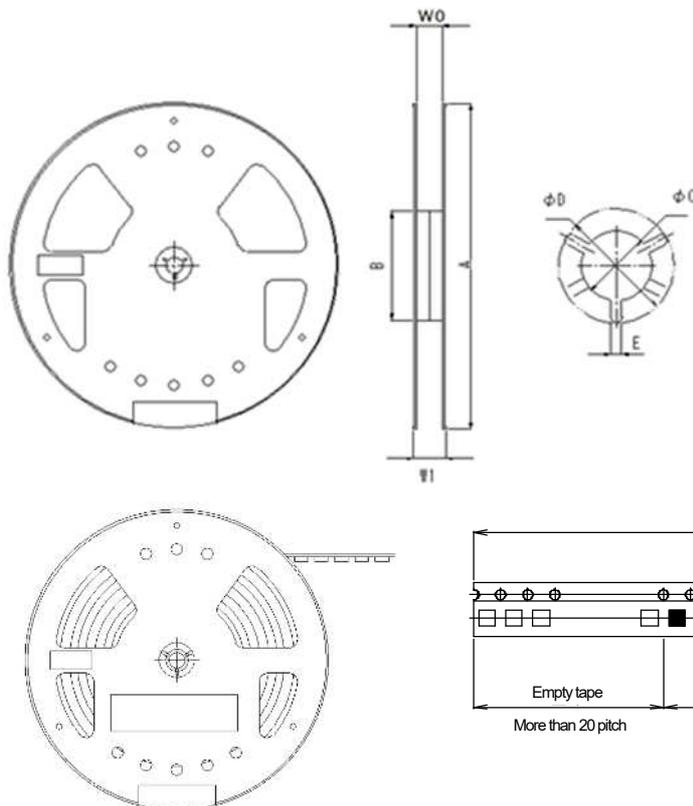
* Carrier tape material : Polycarbonate(antistatic)
Cover tape material : PP(antistatic)

Taping Strength

There is a peel strength in the range of 0.2 to 0.7N when was peeled at a rate of 300mm per minute in opening angle 165 to 180° between the carrier tape and the cover tape.

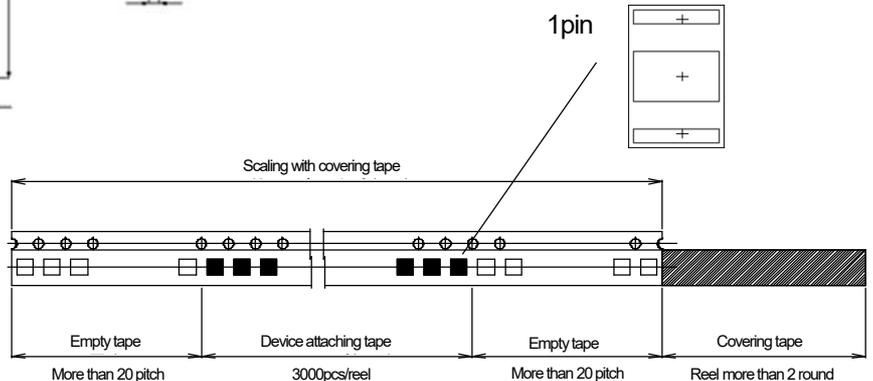
Packaging

- 1) The taped products are to be rolled up on the taping reel as on the drawing.
- 2) Rolling up specification
 - 2-1) Start rolling : Carrier tape open space more than 20 Pieces.
 - 2-2) End of rolling : Carrier tape open space more than 20 Pieces, and 2 round of reel space at the cover tape only.
- 3) Taping quantity : 3,000 Pieces
- 4) Seal off after putting each reels in a damp proof bag with silica gel.



SYMBOL	DIMENSION
A	φ254 ±2.0
B	φ100 ±1.0
C	φ13 ±0.2
D	φ21 ±0.8
E	2.0 ±0.5
W0	13.4 ±1.0
W1	18.4 ±1.0

* Reel material : PS(antistatic)



■ RECOMMENDED MOUNTING METHOD

NOTE

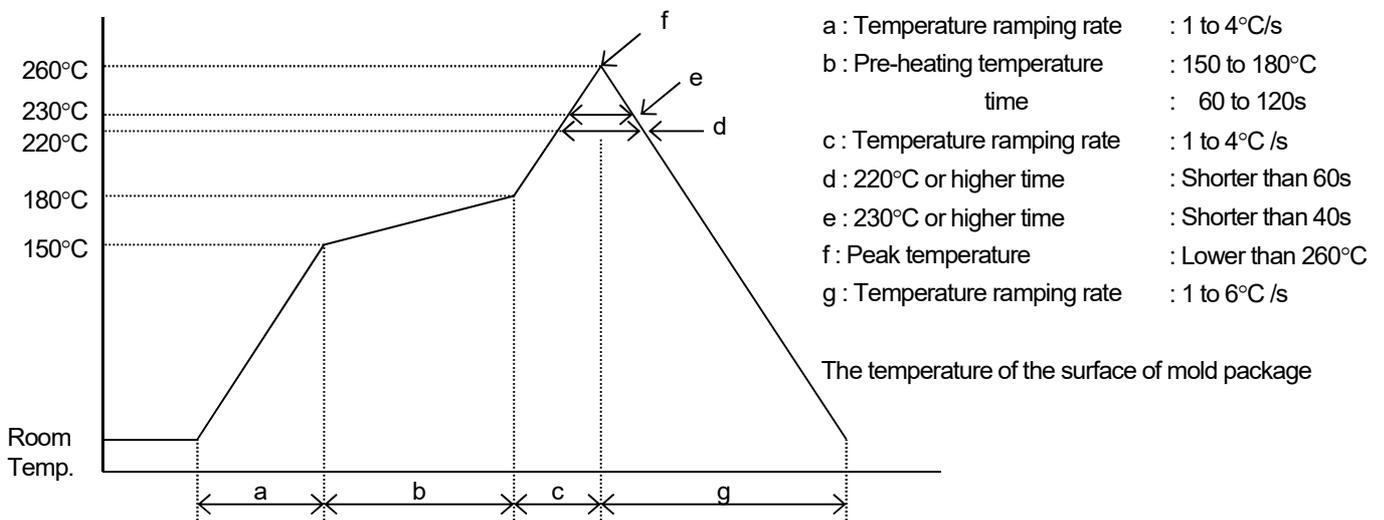
Mounting was evaluated with the following profiles in our company, so there was no problem.
However, confirm mounting by the condition of your company beforehand.

The exposure of device under higher temperature many affect to the reliability of the products, it is recommended to complete soldering in the shortest time possible.

Mounting: Two Times 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 fo 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.

■ FLOE 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.

(8) The product is recommended to do the baking before using for the stability of the quality.

■ BAKING

In case of keeping expect above condition be sure to apply baking.

Baking method: Ta=60°C, 48 to 72h, One time 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.

■ MOISTURE SENSITIVITY LEVELS

JEDEC : Level 5

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Various Safety devices

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