LED Manual

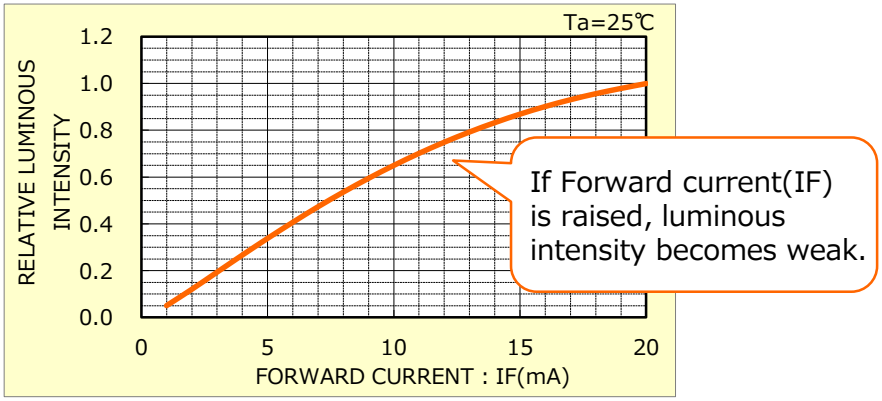
Rev.003
Jan. 9, 2018

Characteristics data ①

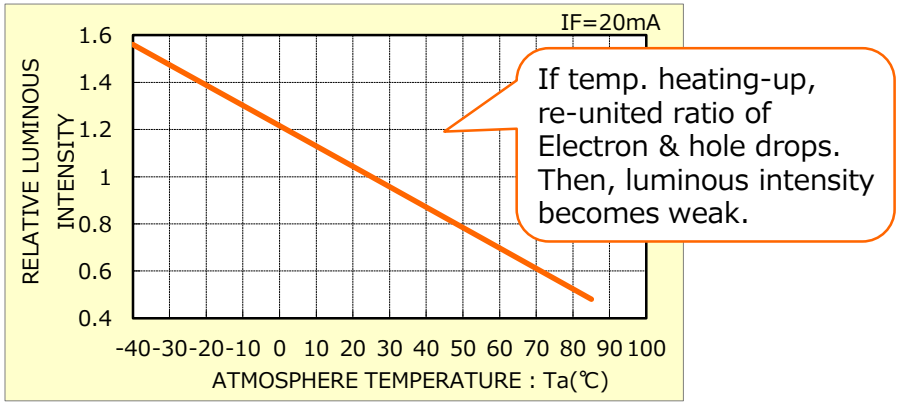
(Relative luminous intensity x IF, Relative luminous intensity x Ta, IF x VR, Derating)

Rohm LED specification includes following data

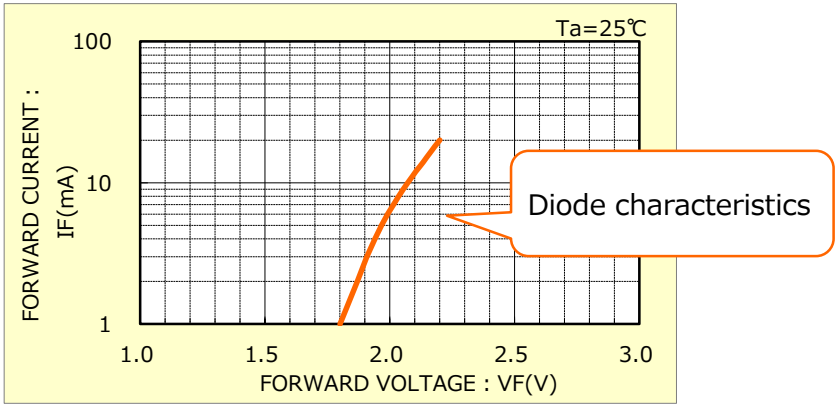
<Relative luminous intensity x IF>



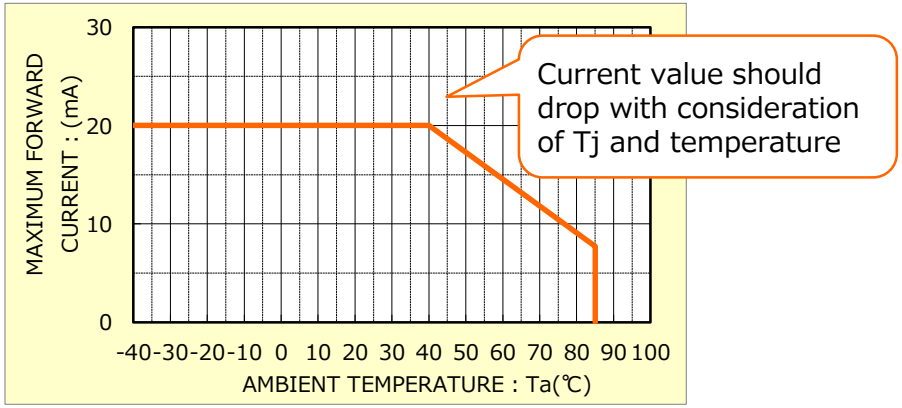
<Relative luminous intensity x Ta>



<IF x VR>



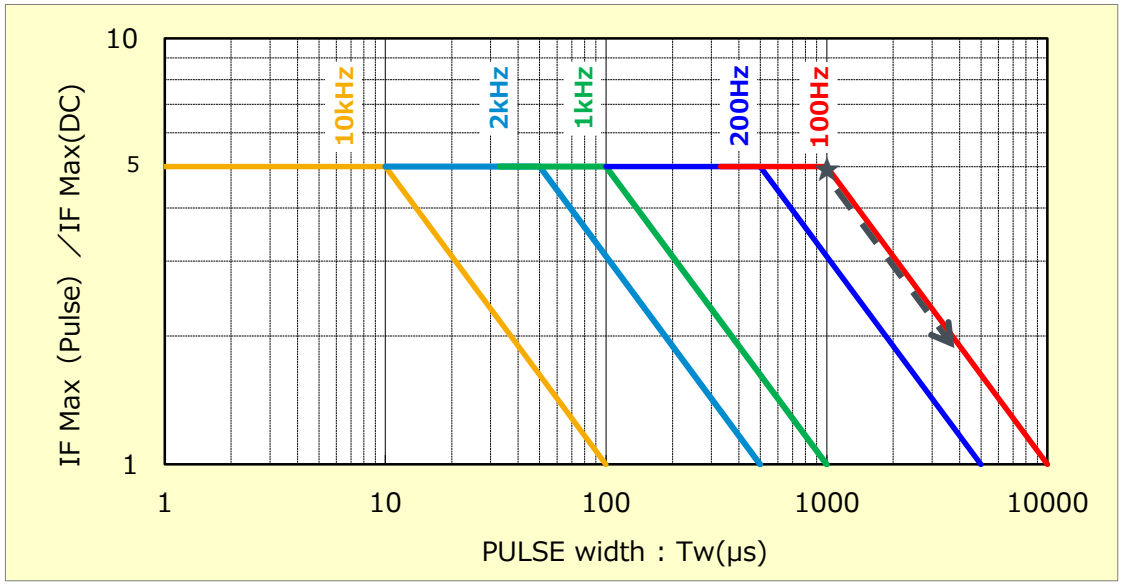
<Derating>

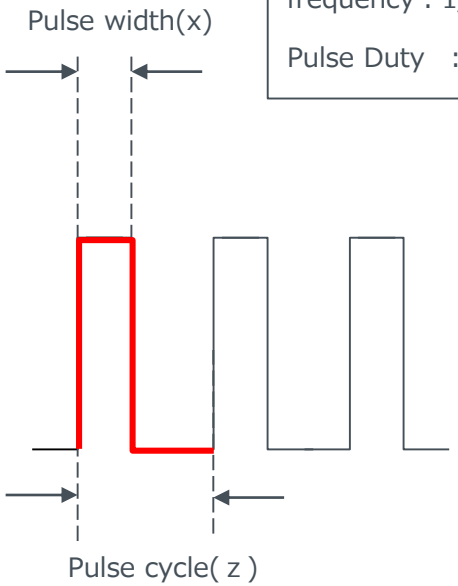


Characteristics data ②

(Max peak current-Pulse width characteristics)

<Max peak current–Pulse width characteristics>(Chart 1)





frequency : 1/z

Pulse Duty : x/z

LED lighting time : x (sec.)
Frequency : y (Hz)
Pulse cycle : z (sec.)
Pulse Duty : A

①1÷y = z
②x÷（1÷y） = A

(Ex.) LED lighting time : 1000μsec.
Frequency :100Hz

→ Pulse cycle＝1/100＝0.01sec.＝10000μsec.
Pulse Duty＝1000/10000＝1/10 （Chart 1 ★）
→IF Max(Pulse) is 5 times bigger than IF Max(DC).

IF Max(in case of Pulse duty10%) is 5 times bigger than IF Max(DC).

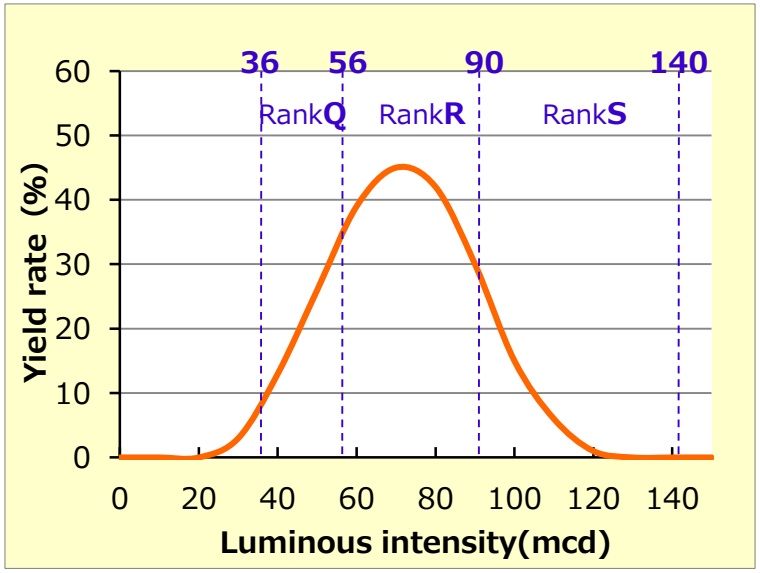
Depending on the Pulse frequency and Duty used, IF Max(DC) limit is changed.
To prevent the LED lights flickering, we recommend to use over 100Hz.

Luminous intensity criteria sample
(Current control luminous intensity sample)

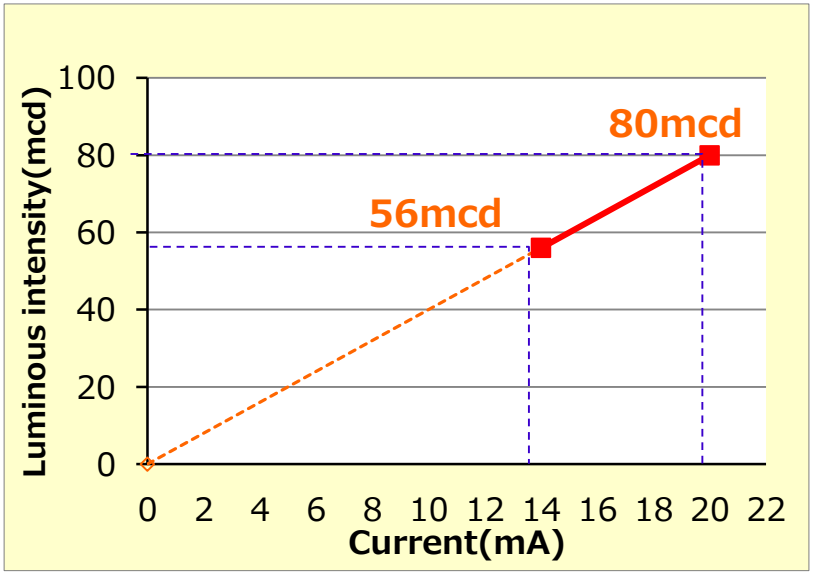
Distribution of LED Luminous intensity rank is as Chart 1.
Therefore, when check the criteria samples of upper and lower limits of luminous rank, we submit the current controlled samples.
(You can have current controlled sample faster than actual limit sample.)

Ex.) See Chart 2　　By using 80mcd@20mA, lower limit sample of rank R(56mcd) is available with IF=20mA x 0.7 times condition.

<Chart 1>



<Chart 2>

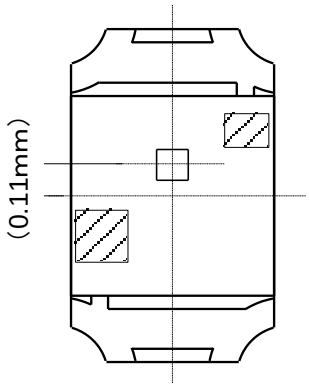


Location of Chip

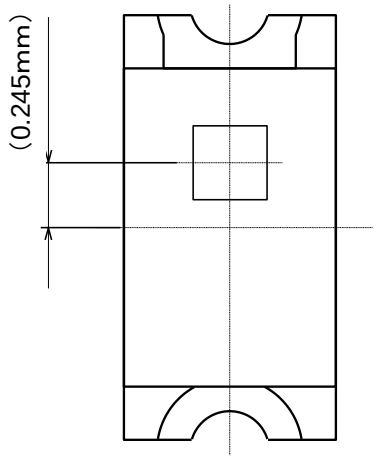
- **Because LED needs the space for DB and WB, chip won't always at the center of PKG.**

【E.g.】

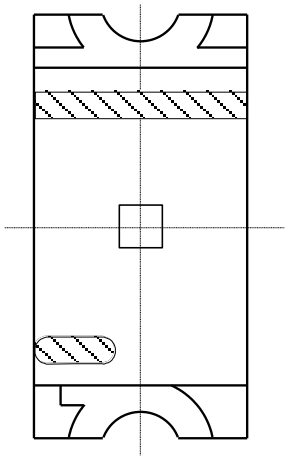
PICOLED®
SML-P1* (R)series



EXCELED™
SML-D1* series

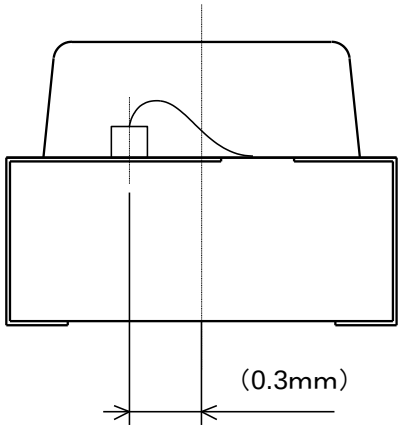


SML-E1* series



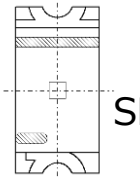
center

Side-view LED
SML-A1* series



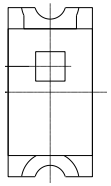
Location of Chip, Viewing angle

[Location of Chip(Ex.)]



SML-E1＊series

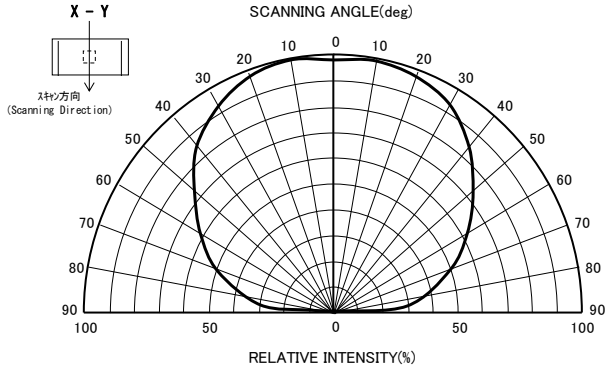
Location of Chip is at the center of PKG.

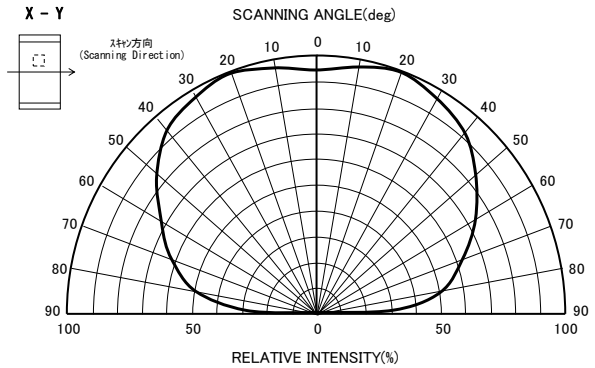


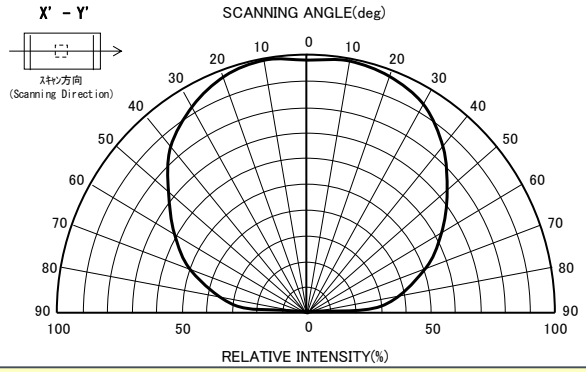
EXCELED™
SML-D1＊series

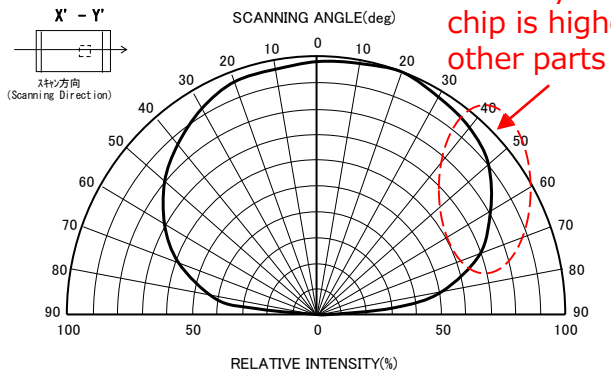
Location of Chip isn't at the center of PKG.

[Viewing angle]









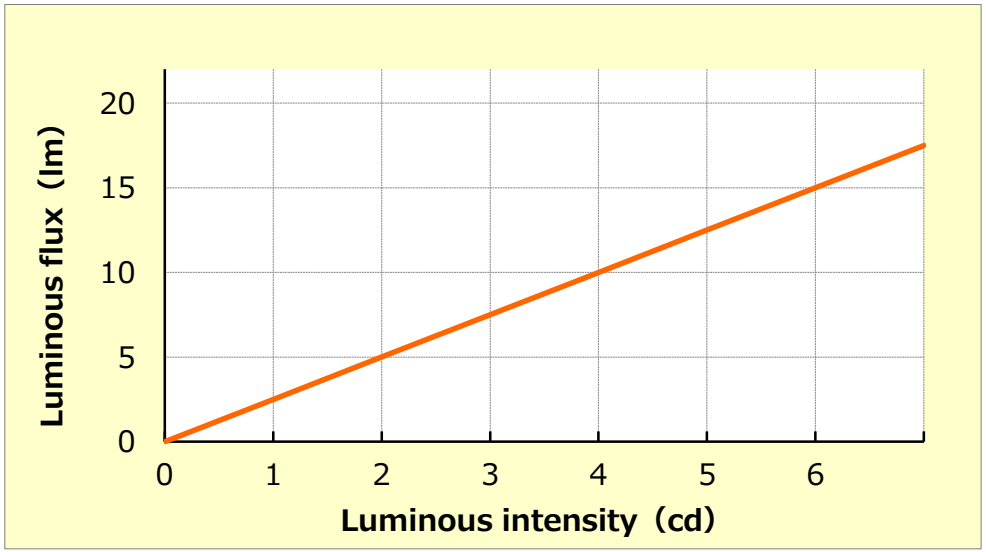
- Because LED needs the space for DB and WB, chip won't always at the center of PKG.
- If the optical properties are important, please check the Viewing angle.

About Luminous intensity and Luminous flux

Luminous intensity :In photometry, a measure of the wavelength–weighted power emitted by a light source in a particular direction per unit solid angle. Unit is candela(cd).

Luminous flux : Brightness of whole light, emitted from light source. Unit is lumen(lm)

Ex. SMLK1/K2 series



Rth (Thermal resistance)

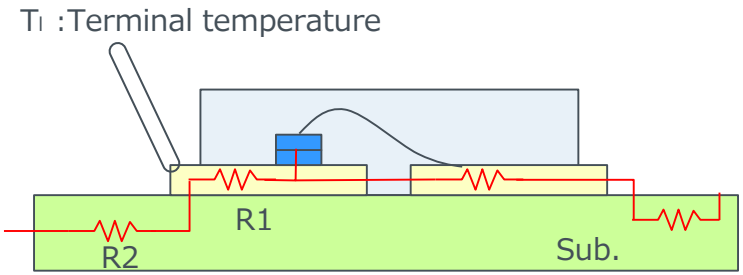
2 kinds of Rth exist.

Junction to case(terminal) : Rth.(j-C)

Junction to ambient : Rth.(j-a)

Heat-dissipation of surface mount device is thru PCB.Therefore, value of Rth(j-C) is measured TI and calculated in Rohm PCB condition.

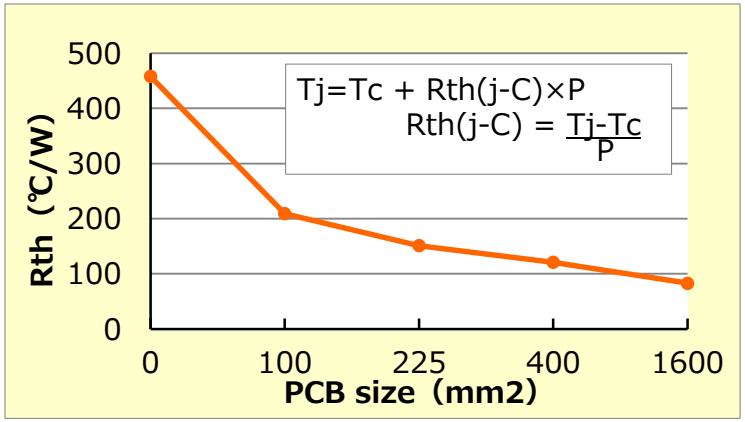
Terminal temperature is measured on LED mounted side.



R1 = Rth(j-C)
R1+R2 = Rth(j-C)+Rth(c-a)
= Rth(j-a)

Ex) SML-D1 series
<PCB :FR4, single side PCB t=0.8mm, Cu thickness 0.035mm>

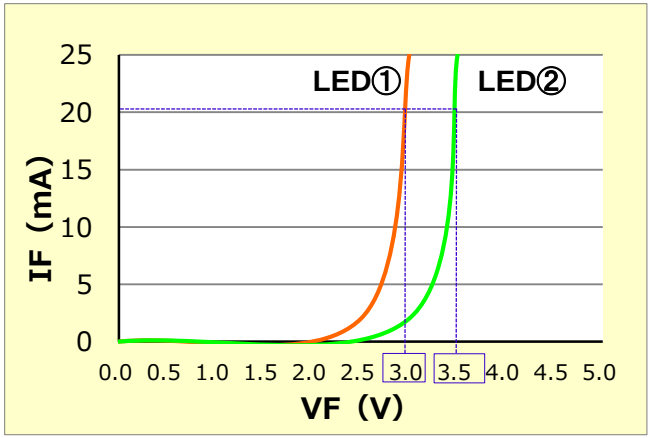
[P=IF × VF = 20mA×2.0V]



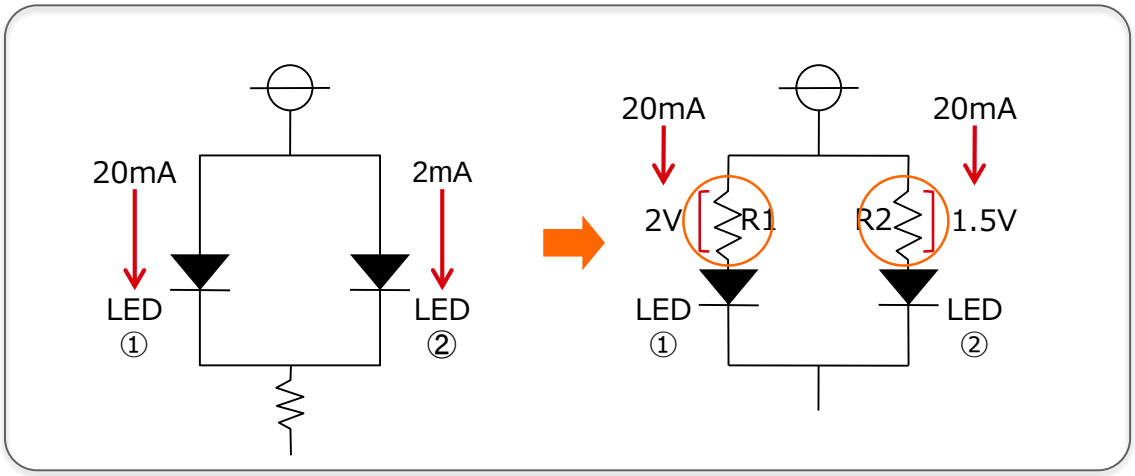
PCB size (mm)	Rth (j-a) (℃/W)	Rth (j-C) (℃/W)
Single Device	458	—
10 × 10	209	101
15 × 15	151	74
20 × 20	121	57
40 × 40	83	51
50 × 50	70	50

LED operation circuit

Non-uniform luminous intensity is created by difference of current value, caused by VF tolerance. This is often happed if LEDs are operated in parallel circuit.



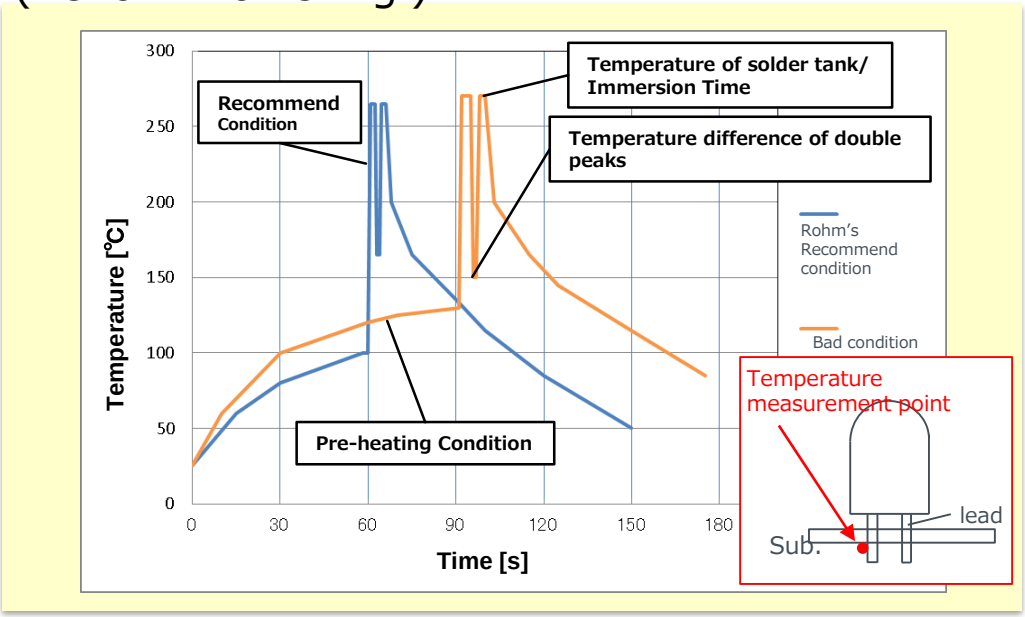
Therefore, 1 resistor per LED can reduce difference of current value to have uniform luminous intensity.



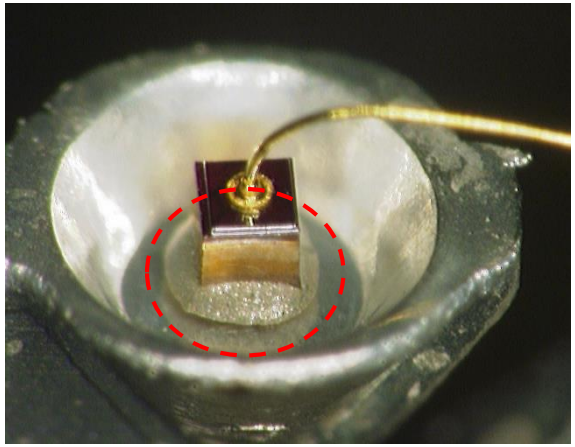
Flow Temperature Profile

According to reflow profile conditions, it may cause the breakage of die bonding for the LED of lead inserted type (Lamp LED) .

(Reflow Profile E.g.)



Break of Die Bonding E.g.
(Resin Decapsluated)

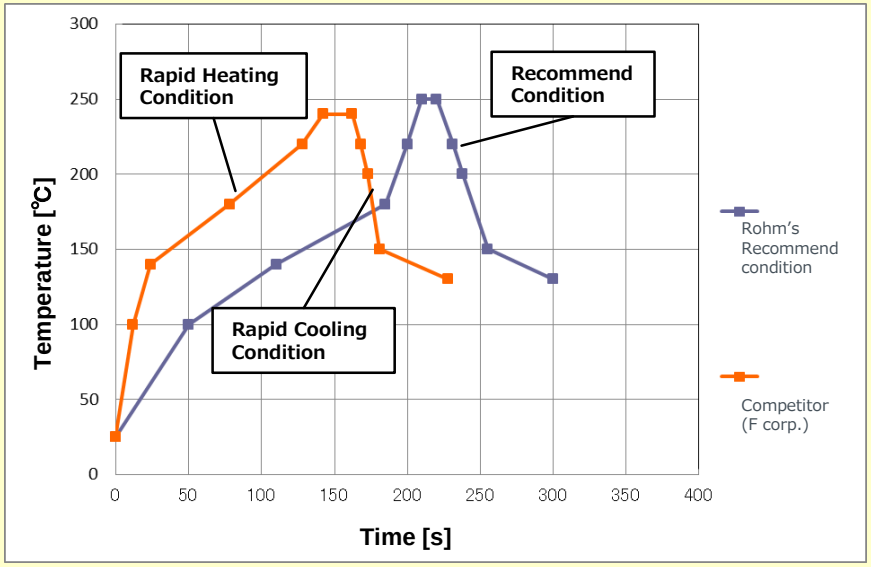


If the flow soldering condition is strict, it may cause the delamination of Ag-paste and frame due to over heat stress around the lead frame and die bonding.
Make sure you use it in the following conditions: pre-heat in the temperature less than 100℃ within 60 sec.; Immerse in solder tank in the temperature less than 265℃ within 5 sec(double peaks means the time from the beginning of 1st time to the end of 2nd time); Temperature difference of double peaks should be within 100℃.

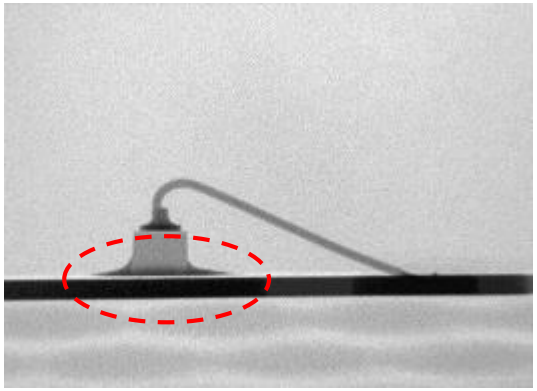
Reflow Temperature Profile

According to reflow profile conditions, it may cause the breakage of die bonding.

(Reflow Profile E.g.)



Break of Die Bonding E.g.(X-ray)



If the peak temperature is too high (excessive), it may cause delamination between Ag paste and circuit board due to warpage of printed wiring circuit board or expansion of resin. And if the temperature gradient of temperature rising/falling is large, it can also cause delamination, so please use it in 1～3℃/sec.

Reliability Data (Blue ,White LED)

- The Electro-optical Characteristics is recognized as Derating Data, which is not Reliability Relation. Please check Reliability Data.

- The Reliability Data is below(Fig.1).
  This Data is measured at our test condition, therefore please do Reliability test yourselves at your using condition which are Assembly and Application.

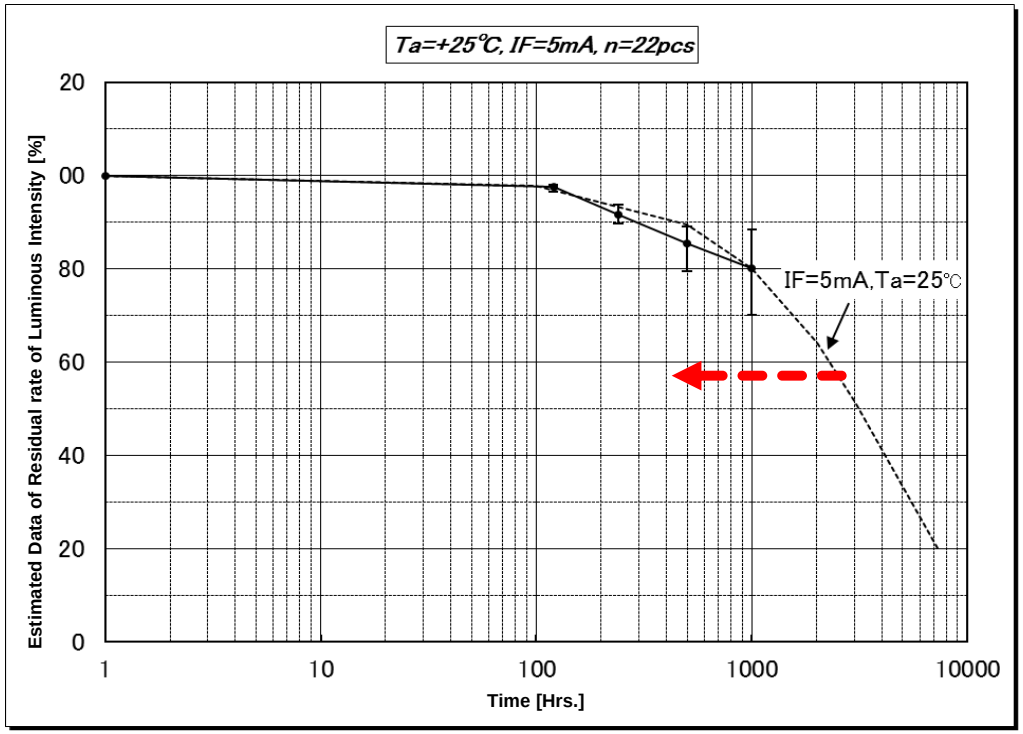


FIG. Estimated Data of Residual rate of Luminous Intensity

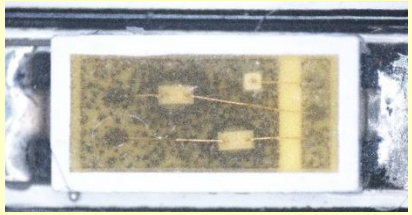
Fig.1 Reliability Data

Reliability Data is shifted to Red Arrow due to using condition (High Atmosphere temperature , High Current condition) within the range of Derating.

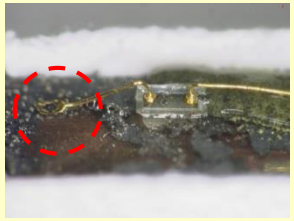
Sulfuration

Sulfur corrodes Ag and it may cause a failure.

Sulfuration E.g.

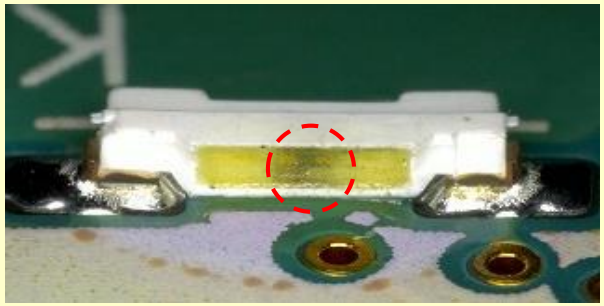


Resin Decapsulation



The Ag pattern in the LED case is corroded and color changed into black→wire delamination

Acceleration Tested Device



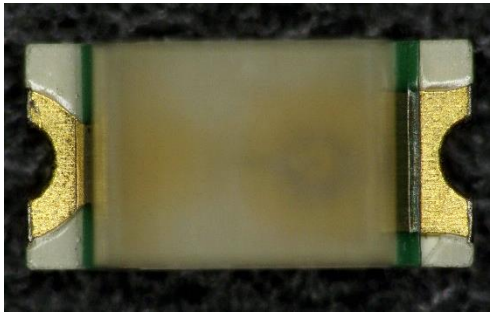
The Ag of frame is corroded and its color changed into black
→Low luminous intensity due to low light absorption

Acceleration Tested Device

The sulfuration and corrosion of used Ag will cause the delamination of wire, furtherly result in Not Lighted and Low Luminous Intensity due to Low Light Absorption.

Mechanical Strength

Comparison of the mechanical strength of LED and Transistor Diode.



LED

Transistor Diode

Comparison of main physical characteristic value of resins

	LED Resin	Tr･Di Resin
Specific Gravity	1.26	1.80
Scleroscope Hardness	90	81
Bending Strength[MPa]	112	151
Flexural Modulus[GPa]	3.1	15.0

We compared the mechanical strength of LED with transparent resin used and transistor diode with filer resin used, the LED is weak generally. So please do assess the mounting conditions.

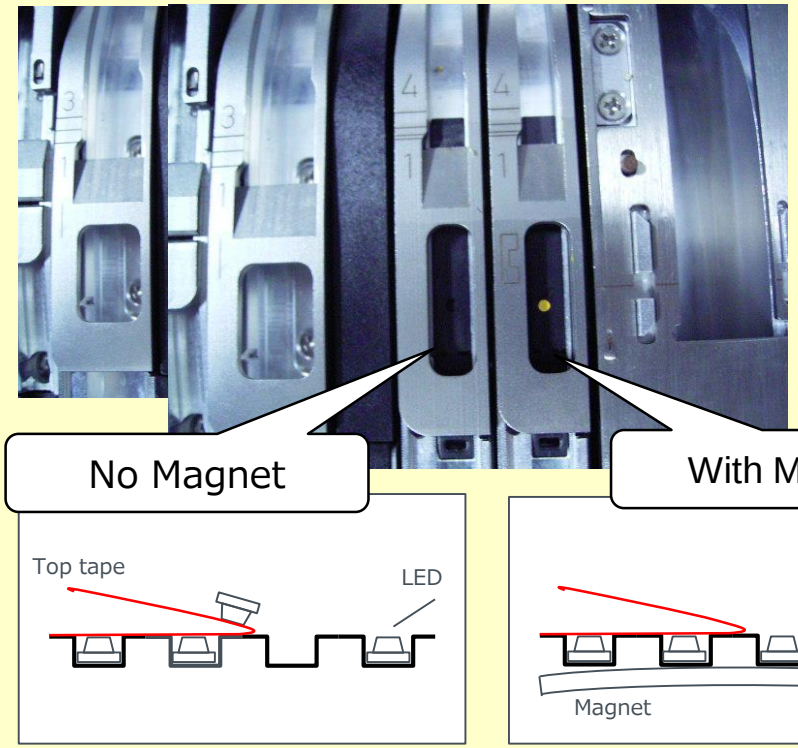
Failure of Pick-up

We recommend use a magnet as the countermeasure for failure of pick-up especially for small products.

Product pasted on tape due to static electricity.

Magnet (E.g.)

Magnet is used on the mounting machine for picking-up(E.g.)

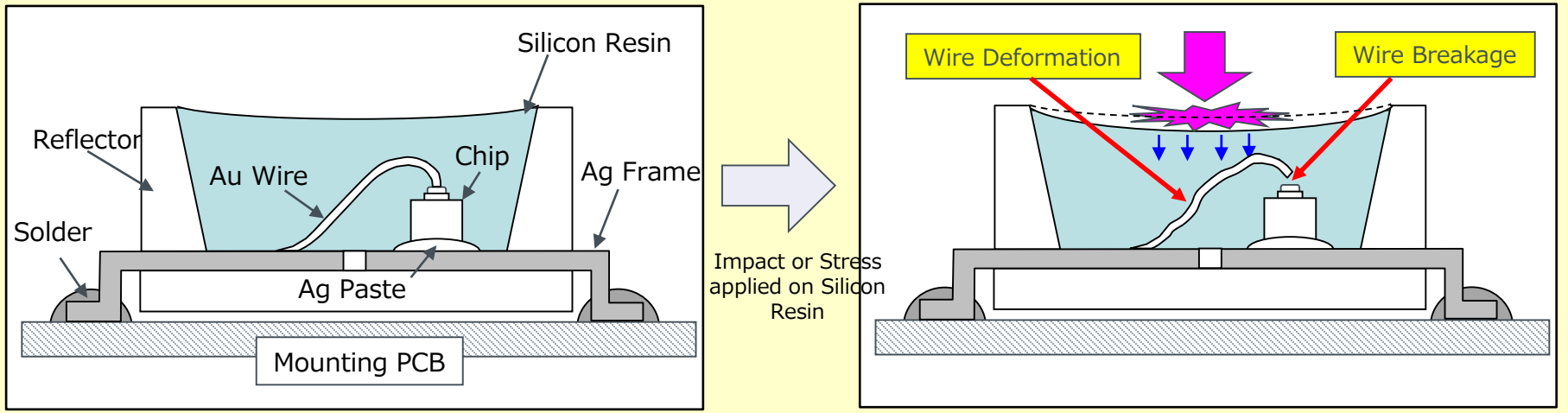


For super small products, it may paste on tape due to static electricity because of the operational environment. In the case, it can solve the problem by installing a magnet on the mounting machine.

Cautions of Silicon Resin Sealed Products

As for high reliability products, the reflector type is sealed by silicon resin.
Therefore the sealing part is soft, it will damage the internal wire if touch it directly.

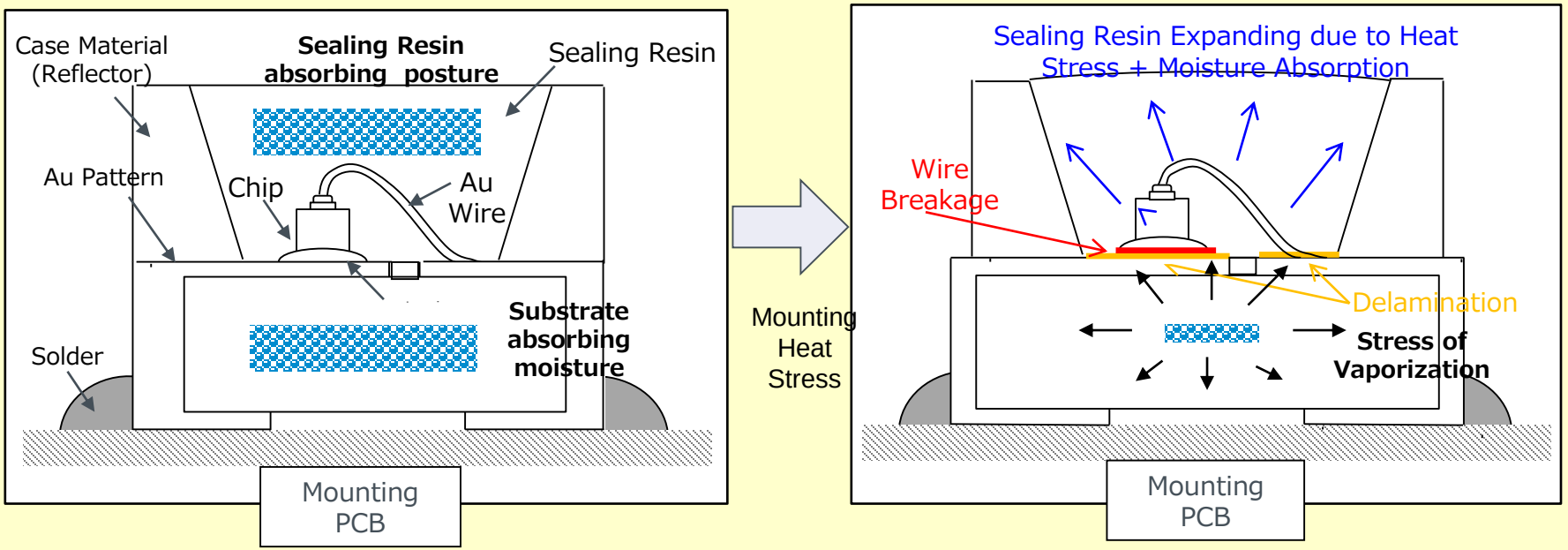
【 Mechanism of Wire Breakage due to Stress on Resin Parts】



When it is mounting, please have the adsorption collet touching with reflector.
After it is mounted, please be care to handle with the part of sealing.

Not Lighted on due to Moisture Absorption

【Mechanism of Wire Bonding Breakage caused by Moisture Absorption of Product 】



When the product is absorbing the moisture, the vaporized stream (by the heat of reflow)will go out, its stress will lift up the sealing resin from the bottom and result in breakage of wire bonding.

Storage Conditions / Packing

◇Storage Conditions (Sample)

■Molding Package type

Classification	Temperature	Humidity	Expiration Date	Remark
①Before using	5～30℃	30～70%RH	Within 1 year from Receiving	Storage with waterproof package
②After opening package	5～30℃	Below 70%RH	Within 168h	Please storing in the airtight container with our desiccant (silica gel)

■Reflector Package type (Permeability of the water high, because sealing resin touches air)

Classification	Temperature	Humidity	Expiration Date	Remark
①Before using	5～30℃	30～70%RH	Within 1 year from Receiving	Storage with waterproof package
②After opening package	5～30℃	Below 70%RH	Within 72h	Please storing in the airtight container with our desiccant (silica gel)

■Bake the product in case of below:

①The expiration date is passed.
②The color of indicator (silica gel) turned from blue to colorless or from green to pink.
(Even if the product is within the expiration date.)

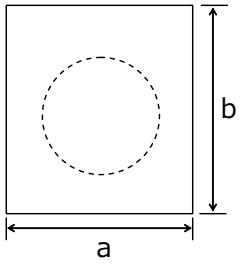
※The details, please identify specifications

・Baking Conditions

Temperature	Time	Humidity
60±3℃	12～24h	Below 20%RH
Remark	・Bake products in reel. ・Reel and embossed tape are easy to be deformed when baking, so please try not to apply stress on it. ・Recommend bake once.	

◇About Packing

Packing
○○○pcs are packed in one reel.
①One reel is packed in aluminum bag.
②The size of aluminum bag is ○○○(a)×○○○(b)mm.
③Aluminum bag is sealed by pressured for all directions.



Into the aluminum pack, and sealed, prevent moisture absorption.

RGB Chromaticity Classification of Mixed Lighting LED

◇Chromaticity Classification of Mixed Lighting

SMLVN6RGB

MSL0104RGB

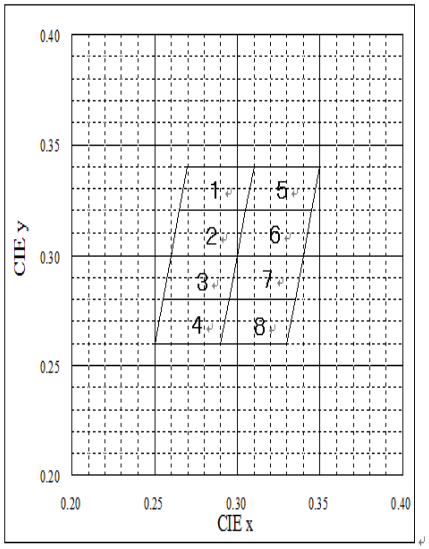
MSL0402RGB

When the RGB LED is white, in order to control the chromatic aberration of same set, we clarify the chromaticity when applied determined current for every product.

SMLVN6RGB　R 12mA, G 15mA,B 12mA
MSL0104RGB　R　8mA, G 14mA, B 18mA
MSL0402RGB　R 20mA, G 20mA, B 10mA

SMLVN6RGB　Chromaticity Classification

7. 色 度 分 類 （Ta＝25℃, IF＝12mA(赤), 同時点灯
IF＝15mA(緑)
IF＝12mA(青)）



Chromaticity sorting is the value of mixed lighting when applying determined current on products.
The RGB LED is different from the white LED made by blue chip + fluorescent agent, it can change the color by applying by determined currents or time setting of pulse lighting on.