



## **Features**

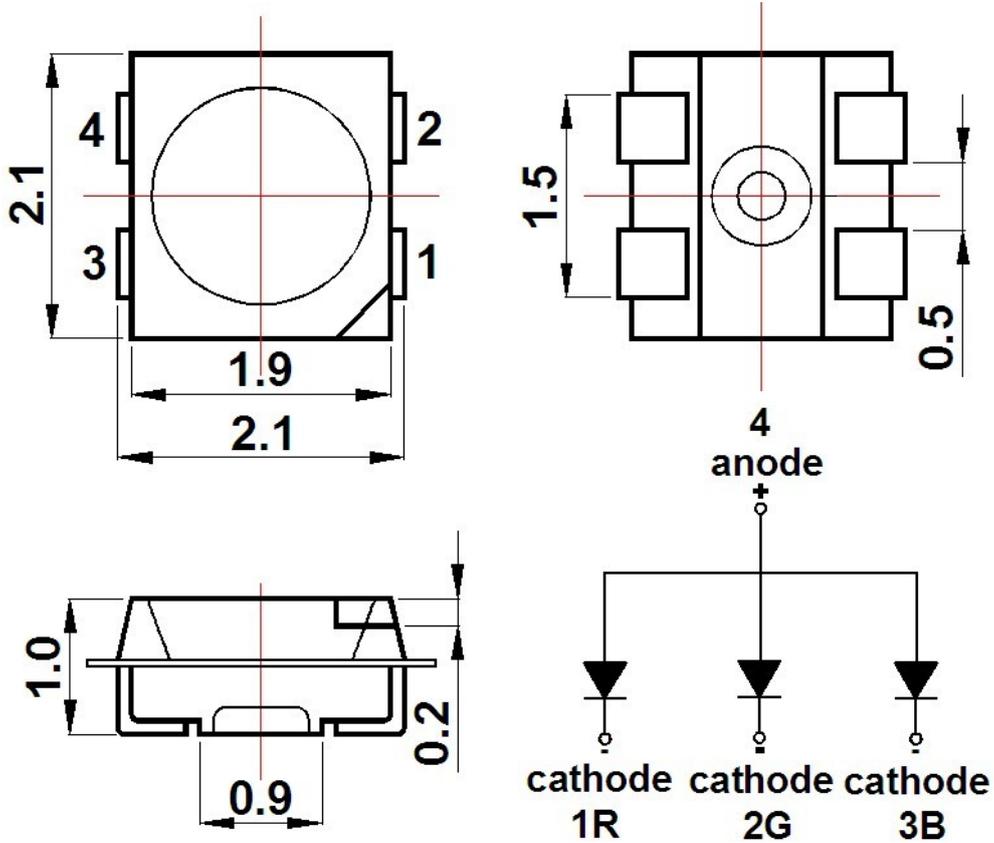
- **Top view Tri-Color LED ( 2.1 x 2.1 x 1.0 mm )**
- **High luminous Intensity**
- **Low Power Dissipation**
- **Base on AlGaInP (Red) / InGaN (Green\Blue) technology**
- **Viewing angle : Lambertian Emitter ( 105° )**
- **Reflow soldering**
- **Good Reliability**
- **Long Life**
- **ESD protection**
- **The product itself will remain within RoHS compliant version**

## **Typical Applications**

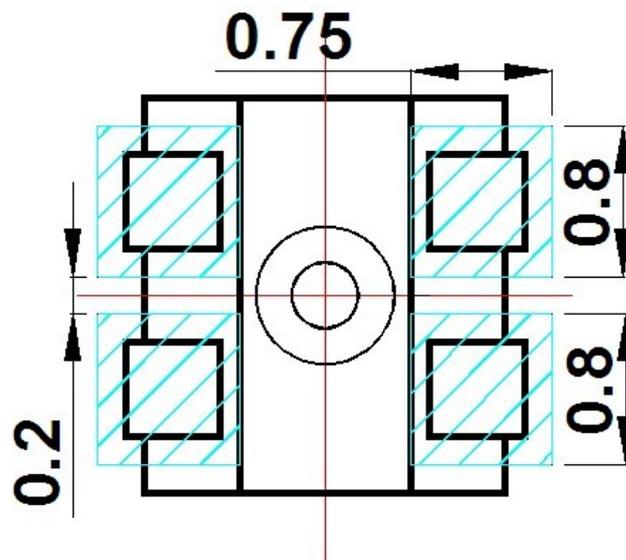
- **Indoor and outdoor displays (e.g. displays for traffic; light writing displays)**
- **LED chips can be controlled seperately to display various colors including white**
- **Full color displays, RGB-Displays**
- **General use**



Package Outline Dimensions



Recommended soldering pad design



Notes:

All dimensions in mm tolerance is  $\pm 0.05\text{mm}$  unless otherwise noted.



## Absolute Maximum Ratings

Items	Symbol	Absolute maximum Rating		Unit
		Red	Green/Blue	
Power Dissipation	$P_D$	80	100	mW
Forward Current(DC)	$I_F$	30	25	mA
Peak Forward Current*	$I_{FP}$	100	80	mA
Operation Temperature	$T_{opr}$	-30~ +85		°C
Storage Temperature	$T_{stg}$	-40 ~ +100		°C
Soldering temperature	$T_{sld}$	Reflow soldering : 260°C for 10 sec. Hand soldering : 350°C for 3 sec.		

\*Pulse width  $\leq 0.1$ msec duty  $\leq 1/10$

## Typical Electrical & Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	Red	$V_F$	20ma	1.8-2.5			V
	Green		15ma	2.8-3.5			
	Blue		10ma	2.8-3.5			
Dominant Wavelength	Red	WD	20ma	620	---	630	nm
	Green		15ma	520	---	530	
	Blue		10ma	465	---	475	
Luminous Intensity	Red	$I_V$	20ma		115		mcd
	Green		15ma		290		
	Blue		10ma		40		
Reverse Current	Red/Green/Blue	$I_R$	$V_R = 5V \times 3$	---	---	1/1/1	$\mu A$
50% Power Angle		$2\theta_{\frac{1}{2}}$	$I_F = 20mA \times 3$	---	105	---	Deg



## Typical Electrical/ Optical Characteristics Curves

(Ta=25°C Unless Otherwise Noted)

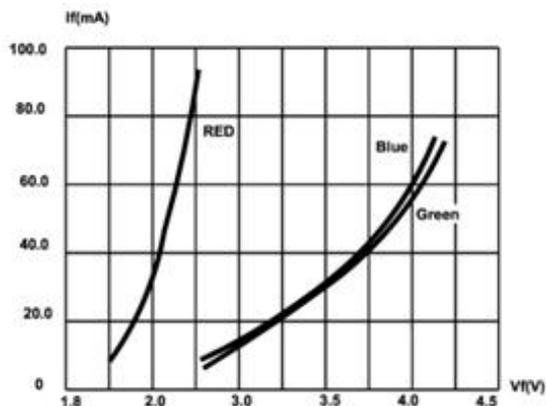


Fig.1 Forward Current vs. Forward Voltage

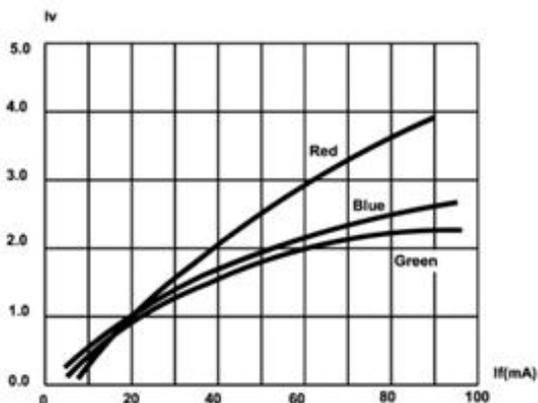


Fig.2 Relative Luminous Intensity vs. Forward Current

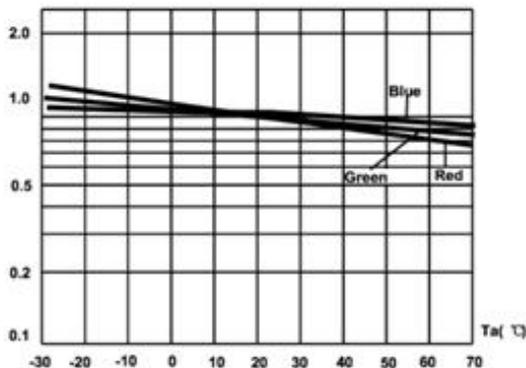


Fig.5 Relative Luminous Intensity vs. Ambient Temperature

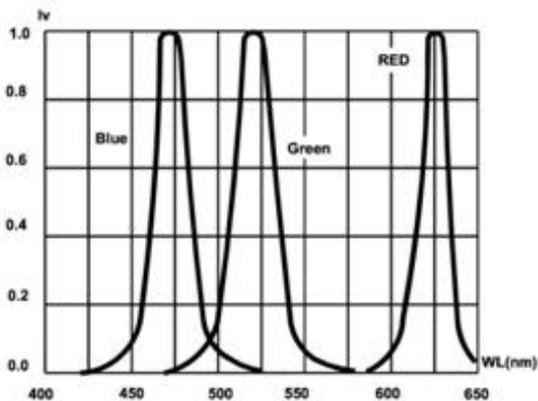


Fig.4 Relative Luminous Intensity vs. Wavelength

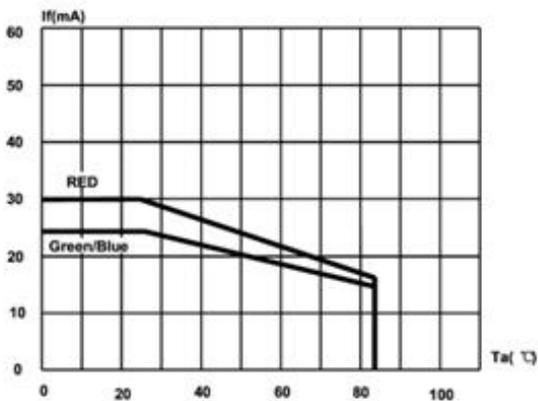
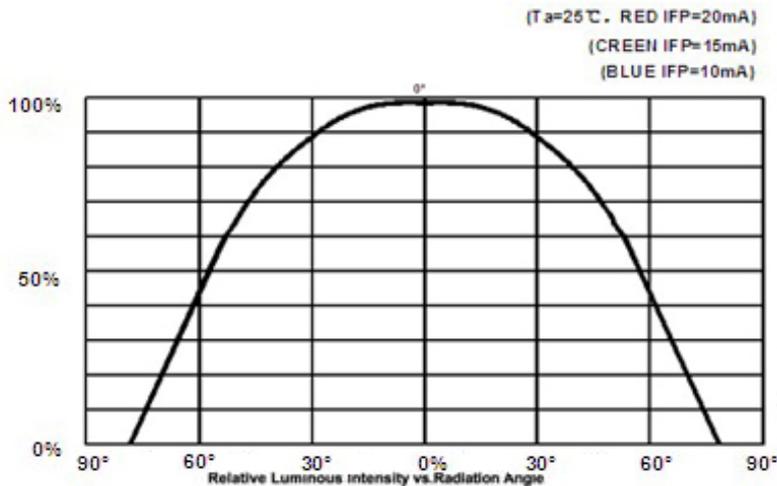


Fig.6 Maximum Forward Current vs. Ambient Temperature





## Reliability

### 1. Test Items And Results

Test Item	Test Conditions	Note	Number of Damaged
Reflow Soldering	T <sub>sld</sub> =260°C , 10 sec (pre treatment 30°C,70%,168hrs)	3 time	0/100
High Temperature Storage	T <sub>A</sub> =100°C	1000 Hrs	0/100
Low Temperature Storage	T <sub>A</sub> =-40°C	1000 Hrs	0/100
Temperature Humidity Storage	T <sub>A</sub> =85°C , RH=90%RH	1000 Hrs	0/100
Thermal Shock Test	-40°C ~ 100°C 15min 15 min	300 Cycles	0/100
Temperature Cycling Test	- 4 0 °C ~ 2 5 °C ~ 8 5 °C ~ 2 5 °C 30min 5min 30min 5min	160 Cycles	0/100
Operating Life Test	T <sub>A</sub> =25°C I <sub>F</sub> =20mA	1000 Hrs	0/100

### 2. Criteria for Judging The Damage

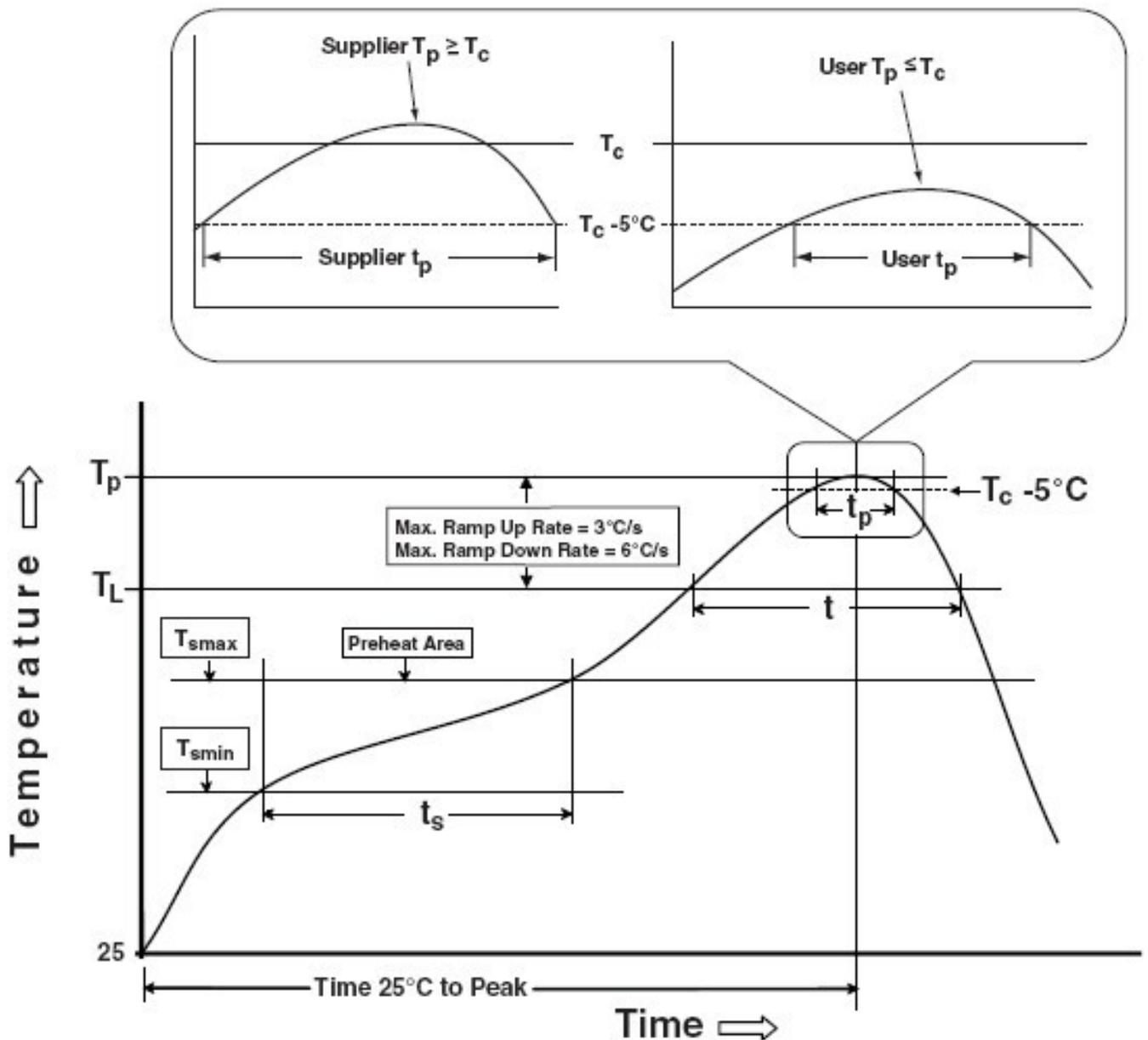
Item	Symbol	Test Conditions	Criteria for Judgment	
			Min.	Max.
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =20mA	---	Initial Data ×1.1
Luminous Intensity	I <sub>V</sub>	I <sub>F</sub> =20 mA	Initial Data × 0.8	---
Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5V	---	≦ 1μA



### Recommend Reflow Soldering Profile

#### Soldering reflow

1. Soldering of the SMD LEDs should conform to the soldering condition in the individual specifications.
2. SMD LEDs are designed for reflow soldering.
3. In the reflow soldering, too high temperature and too large temperature gradient such as rapid heating/cooling may cause electrical & optical failures and damages of the devices.
4. HB can't guarantee the LEDs after they have been assembled using the solder dipping method.





Reflow Soldering			Hand Soldering	
Profile Feature	Lead Solder	Lead-free Solder	Temperature Soldering time	350 °C max. 3 seconds max. (one time only)
Pre-heat temperature ( $T_{smin}$ to $T_{smax}$ )	120~150 °C	180~200 °C		
Pre-heat time ( $T_{smin}$ to $T_{smax}$ )	60-120 seconds	60-120 seconds		
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max.	3 °C/second max.		
Liquidous temperature ( $T_L$ )	183 °C	217 °C		
Time at liquidous ( $T_L$ )	60-150 seconds	60-150 seconds		
Peak package body temperature( $T_p$ )*	235~240 °C max.	255~260 °C max.		
Classification temperature( $T_c$ )	240 °C	260 °C		
Time( $T_p$ )**within 5°C of the specified classification temperature( $T_c$ )	20**seconds	30**seconds		
Average ramp-dawn rate ( $T_p$ to $T_{smax}$ )	6 °C/second max.	6 °C/second max.		
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.		

#### Note:

- \* Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.
- \*\* Tolerance for time at peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

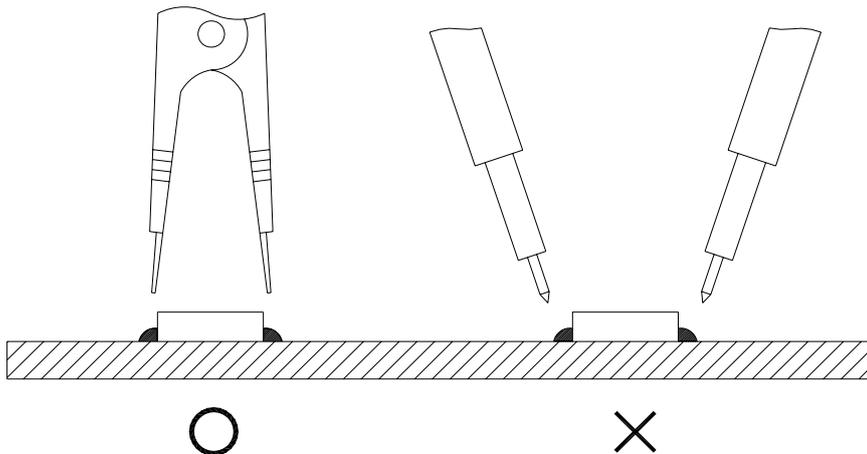


#### Soldering iron

1. When hand soldering, keep the temperature of the iron under 350°C, and at that temperature keep the time under 3 sec.
2. The hand soldering should be done only one time.
3. The basic spec is  $\leq 3\text{sec}$ , when the temperature of 350°C, do not contact and put dress on the resin.
4. The temperature of the iron should be controllable.

#### Rework

1. Customer must finish rework within 3 sec under 350°C.
2. The head of iron cannot touch the resin.
3. Twin-head type is preferred.
4. The temperature of the iron should be controllable.



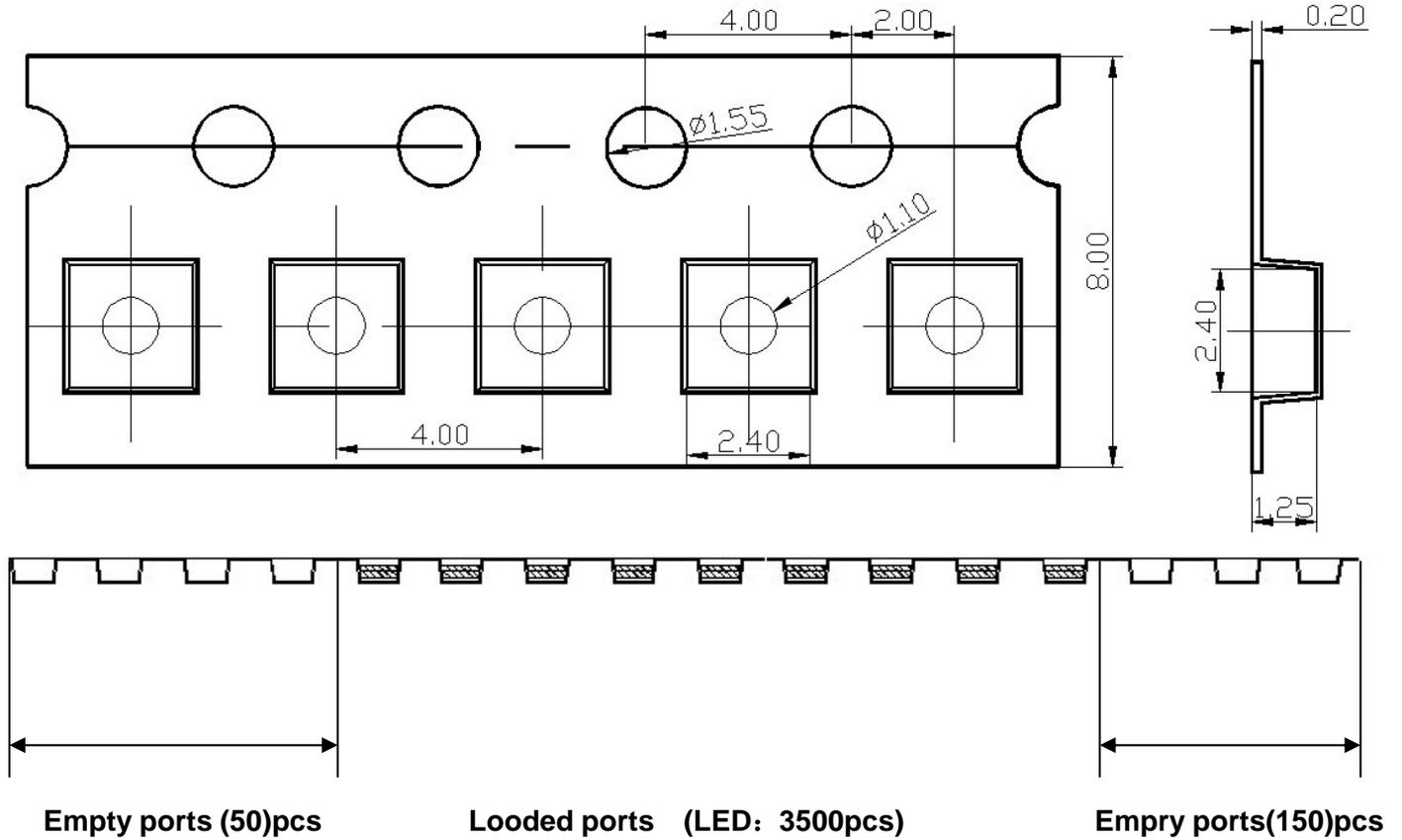
#### Notes:

1. There is possibility that the brightness of LEDs is decreased, which is influenced by heat or ambient atmosphere during reflow. It is recommended to use the Nitrogen reflow method use the nitrogen reflow method.
2. After LEDs have been soldered, repair should not be done. As repair is Unavoidable , a twin-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will be damaged by repairing or not.
3. Reflow soldering should not be done more than two times.

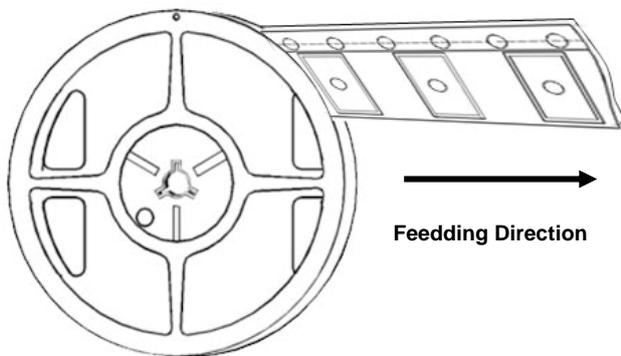


### Packing Specifications

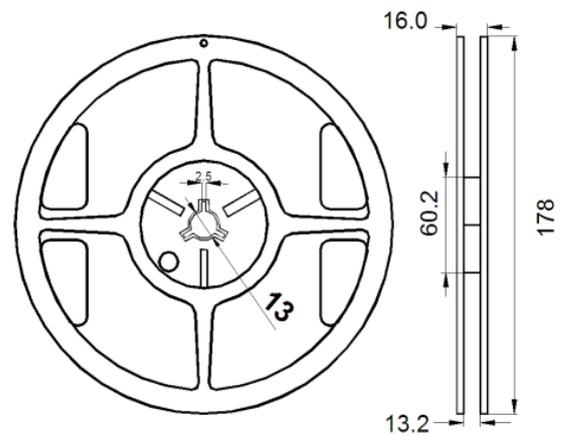
#### 1. Reel Dimensions and Carrier Tape Dimensions: Loaded Quantity 3500pcs Per Reel .



Feeding Direction



Dimensions of Reel

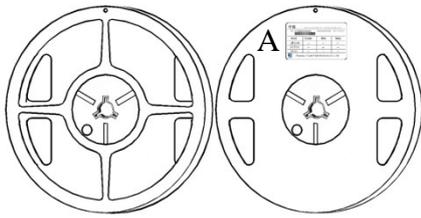


#### Notes:

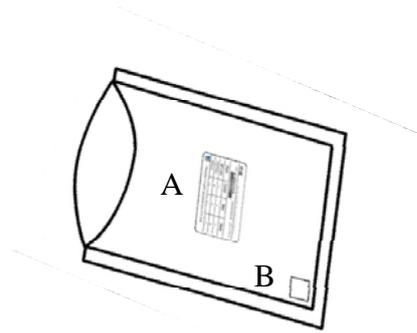
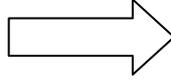
The tolerance unless mentioned is  $\pm 0.1$ , unit=mm.



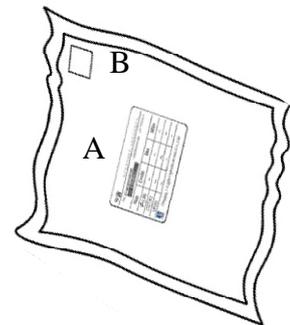
2. Moisture Resistant Packaging



Reel



Aluminum moisture-proof bag



Aluminum moisture-proof bag

P/N: \_\_\_\_\_

Rank: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Qty: \_\_\_\_\_ pcs QC: \_\_\_\_\_

Date: \_\_\_\_\_

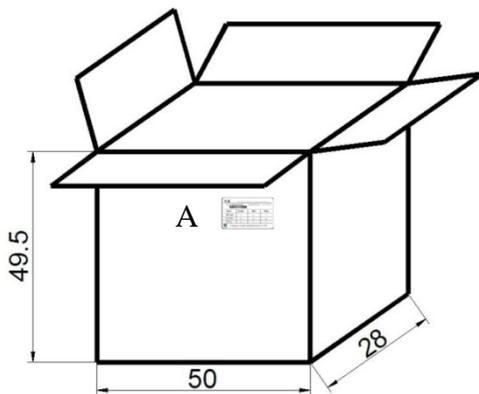
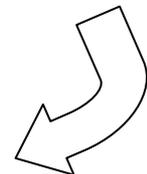
Lot No: \_\_\_\_\_



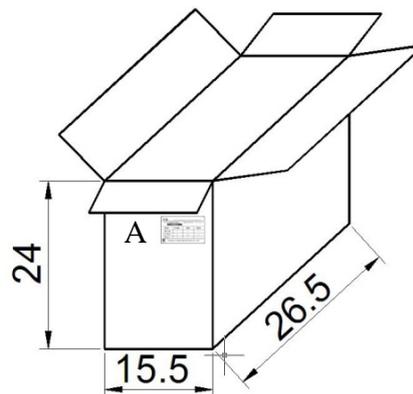
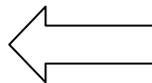
6 935056 310053 >

A: Label

B: Desiccant



Outer box



Inner box

Note:

The tolerance unless mentioned is  $\pm 0.1$ , unit=cm.