

## APPROVAL SHEET

AOT MODEL NAME	1616 4 面
AOT PART NUMBER	TBD
CUSTOMER NAME	General Customer
DATE	2021 / May.
VERSION	01

MAKER			CUSTOMER			
Prepared	Checked	Approved				
<b>Chris Huang</b>						



Solid-State Light. Done Right.

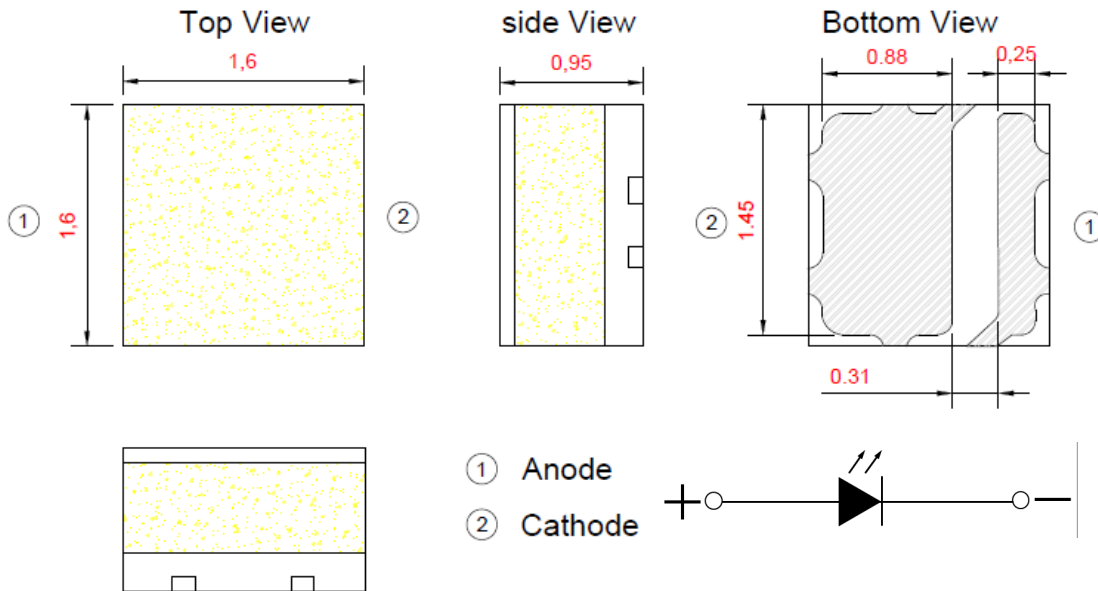
**Revision Note**

Date	Revision	Page	Version
2021-05-26	Initiate Document	18	01

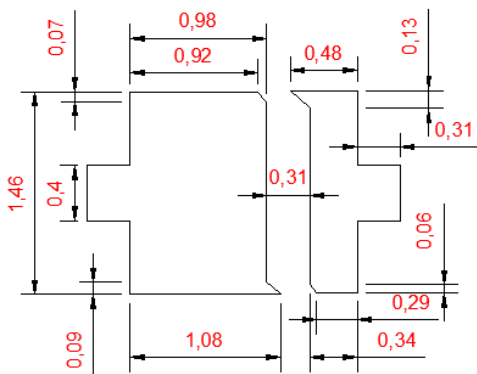
## Package Outline

Model name: 1616

Unit: mm, Tolerance:  $\pm 0.2$  mm



## Recommended Soldering Pad Pattern



Item	Materials
Package	Heat-Resistant Polymer
Encapsulating Material	Silicone(with phosphor)
Electrode	Ag Plating Copper Alloy

- Single blue chip.
- High brightness SMD.
- Compact package outline (LxWxH) of 1.6 mm x 1.6 mm x 0.95 mm.
- Compatible with reflow soldering.
- Complies with RoHS Directive.

## Optical/Electronic Characteristics (T<sub>s</sub>=25°C)

AOT Reading Standards						
Item	Symbol	Condition	Min	Typ.	Max	Unit
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 30mA	2.6	2.8	3.0	V
Luminous Flux	φ <sub>v</sub>	I <sub>F</sub> = 30mA	5.5	6.8	8.0	lm
Thermal Resistance	R <sub>thj-sp</sub>	I <sub>F</sub> = 30mA	-	20		°C/W
Viewing Angle	2θ <sub>1/2</sub>	I <sub>F</sub> = 30mA		170		°

\* Tolerance of measurements of the Forward Voltage is ± 0.1 V.

\* Tolerance of measurements of the Luminous Flux is ± 7%.

\*2θ 1/2 is the off-axis where the luminous intensity is 1/2 of the peak intensity

\*R<sub>th j-sp</sub> is the thermal resistance from LED junction to Solder point on MCPCB with electrical power.

## Absolute Maximum Ratings (T<sub>s</sub>=25°C)

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I <sub>F</sub>	110	mA
*Pulse Forward Current	I <sub>FP</sub>	180	mA
Power Dissipation	P <sub>D</sub>	330	mW
Reverse Voltage	V <sub>R</sub>	5	V
Operating Temperature	T <sub>opr</sub>	-40~+105 (I <sub>F</sub> =100mA)	°C
Storage Temperature	T <sub>stg</sub>	-40~+105	°C
Soldering Temperature	T <sub>sld</sub>	Reflow Soldering : 260°C or 260°C for 10sec	
Junction Temperature	T <sub>j</sub>	120	°C

\* I<sub>FP</sub> Conditions : Pulse Width ≤10msec, and duty ≤1/10

\* Max condition is not guarantee for life time

\* T<sub>s</sub>(max)=70°C

\* LED's properties might be different from suggested values like above and below tables if operation condition will be exceeded our parameter. Care is to be taken that power dissipation does not exceed the absolute maximum rating of the product.

## Group Definition of Forward Voltage

Rank	Condition	V <sub>F</sub> (V)
Z1	T <sub>s</sub> =25°C I <sub>F</sub> =30mA	2.6 ~ 2.7
A1		2.7 ~ 2.8
B1		2.8 ~ 2.9
C1		2.9 ~ 3.0

## Group Definition of Brightness

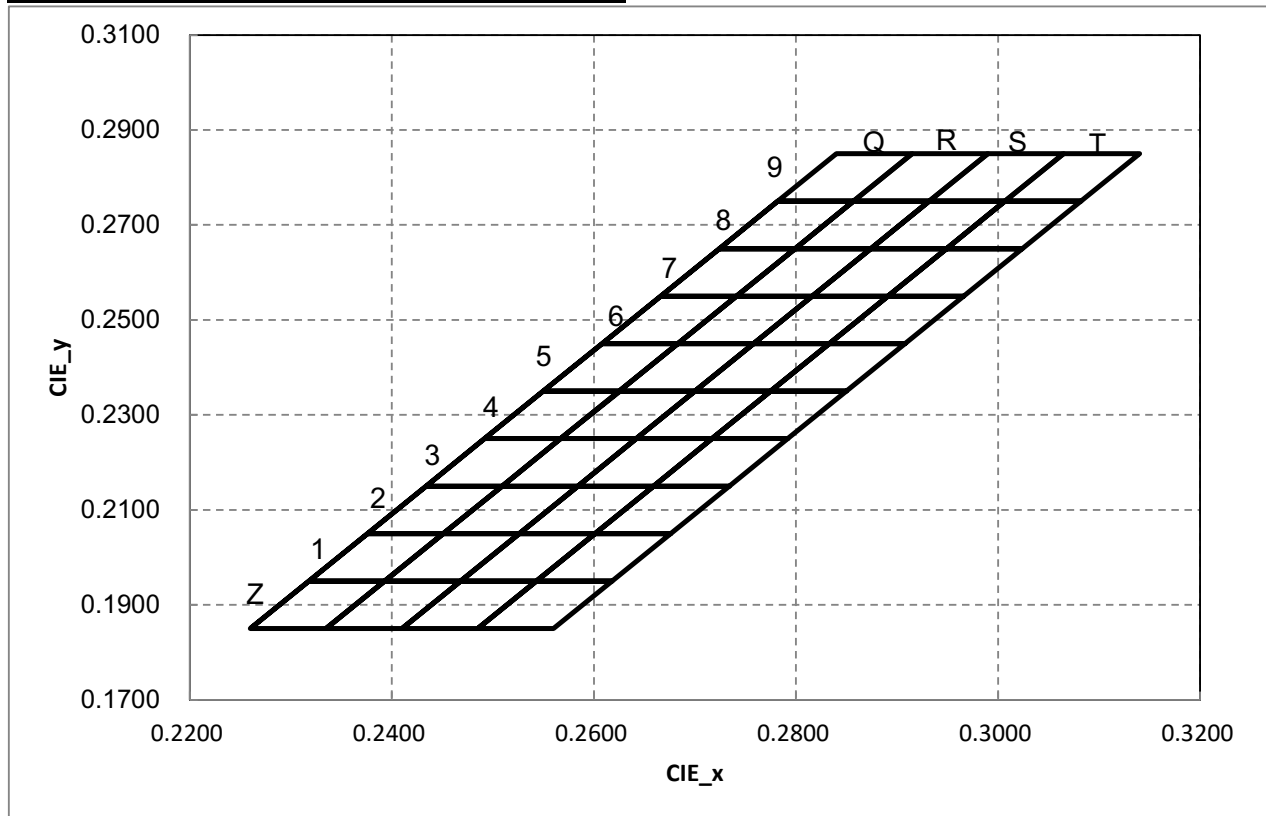
Rank	Condition	AOT Luminous Flux(lm)
B3	T <sub>s</sub> =25°C I <sub>F</sub> =30mA	5.5 ~ 6.0
B4		6.0 ~ 6.5
B5		6.5 ~ 7.0
B6		7.0 ~ 7.5
B7		7.5 ~ 8.0

\*A shipment shall consist of LEDs in a combination of above ranks.

The percentage of each rank in the shipment shall be determined by AOT.

\*The ranking information of LEDs can be found on the reel label.

## Group Definition of Chromaticity Coordinate



## Color Rank

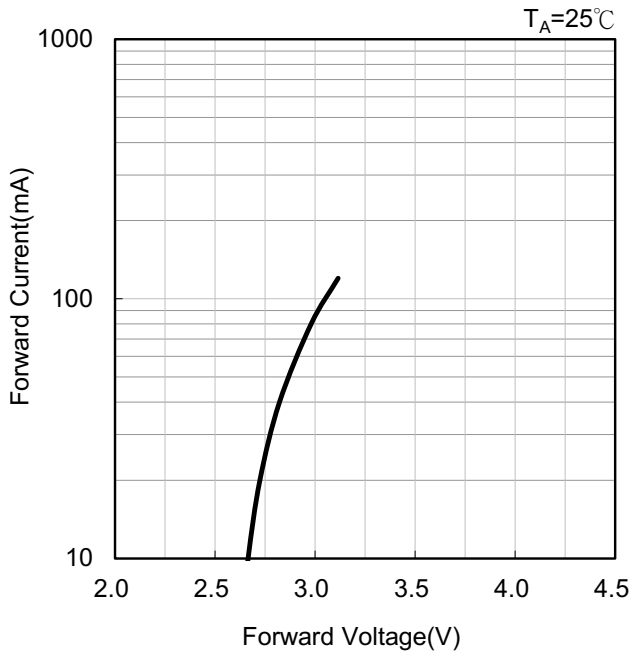
Rank	x	y	Rank	x	y	Rank	x	y
Q9	0.2782	0.275	Q8	0.2724	0.265	Q7	0.2666	0.255
	0.284	0.285		0.2782	0.275		0.2724	0.265
	0.2915	0.285		0.2857	0.275		0.2799	0.265
	0.2857	0.275		0.2799	0.265		0.2741	0.255
Q6	0.2608	0.245	Q5	0.255	0.235	Q4	0.2492	0.225
	0.2666	0.255		0.2608	0.245		0.255	0.235
	0.2741	0.255		0.2683	0.245		0.2625	0.235
	0.2683	0.245		0.2625	0.235		0.2567	0.225
Q3	0.2434	0.215	Q2	0.2376	0.205	Q1	0.2318	0.195
	0.2492	0.225		0.2434	0.215		0.2376	0.205
	0.2567	0.225		0.2509	0.215		0.2451	0.205
	0.2509	0.215		0.2451	0.205		0.2393	0.195
QZ	0.226	0.185	R9	0.2857	0.275	R8	0.2799	0.265
	0.2318	0.195		0.2915	0.285		0.2857	0.275
	0.2393	0.195		0.299	0.285		0.2932	0.275
	0.2335	0.185		0.2932	0.275		0.2874	0.265
R7	0.2741	0.255	R6	0.2683	0.245	R5	0.2625	0.235

	0.2799	0.265		0.2741	0.255		0.2683	0.245
	0.2874	0.265		0.2816	0.255		0.2758	0.245
	0.2816	0.255		0.2758	0.245		0.27	0.235
R4	0.2567	0.225	R3	0.2509	0.215	R2	0.2451	0.205
	0.2626	0.235		0.2567	0.225		0.2509	0.215
	0.27	0.235		0.2642	0.225		0.2584	0.215
	0.2642	0.225		0.2584	0.215		0.2526	0.205
R1	0.2393	0.195	RZ	0.2335	0.185	S9	0.2932	0.275
	0.2451	0.205		0.2393	0.195		0.299	0.285
	0.2526	0.205		0.2468	0.195		0.3065	0.285
	0.2468	0.195		0.241	0.185		0.3007	0.275
S8	0.2874	0.265	S7	0.2816	0.255	S6	0.2758	0.245
	0.2932	0.275		0.2874	0.265		0.2816	0.255
	0.3007	0.275		0.2949	0.265		0.2891	0.255
	0.2949	0.265		0.2891	0.255		0.2833	0.245
S5	0.27	0.235	S4	0.2642	0.225	S3	0.2584	0.215
	0.2758	0.245		0.27	0.235		0.2642	0.225
	0.2833	0.245		0.2775	0.235		0.2717	0.225
	0.2775	0.235		0.2717	0.225		0.2659	0.215
S2	0.2526	0.205	S1	0.2468	0.195	SZ	0.241	0.185
	0.2584	0.215		0.2526	0.205		0.2468	0.195
	0.2659	0.215		0.2601	0.205		0.2543	0.195
	0.2601	0.205		0.2543	0.195		0.2485	0.185
T9	0.3007	0.275	T8	0.2949	0.265	T7	0.2891	0.255
	0.3065	0.285		0.3007	0.275		0.2949	0.265
	0.314	0.285		0.3082	0.275		0.3024	0.265
	0.3082	0.275		0.3024	0.265		0.2966	0.255
T6	0.2833	0.245	T5	0.2775	0.235	T4	0.2717	0.225
	0.2891	0.255		0.2833	0.245		0.2775	0.235
	0.2966	0.255		0.2908	0.245		0.285	0.235
	0.2908	0.245		0.285	0.235		0.2792	0.225
T3	0.2659	0.215	T2	0.2601	0.205	T1	0.2543	0.195
	0.2717	0.225		0.2659	0.215		0.2601	0.205
	0.2792	0.225		0.2734	0.215		0.2676	0.205
	0.2734	0.215		0.2676	0.205		0.2618	0.195
TZ	0.2485	0.185						
	0.2543	0.195						
	0.2618	0.195						
	0.256	0.185						

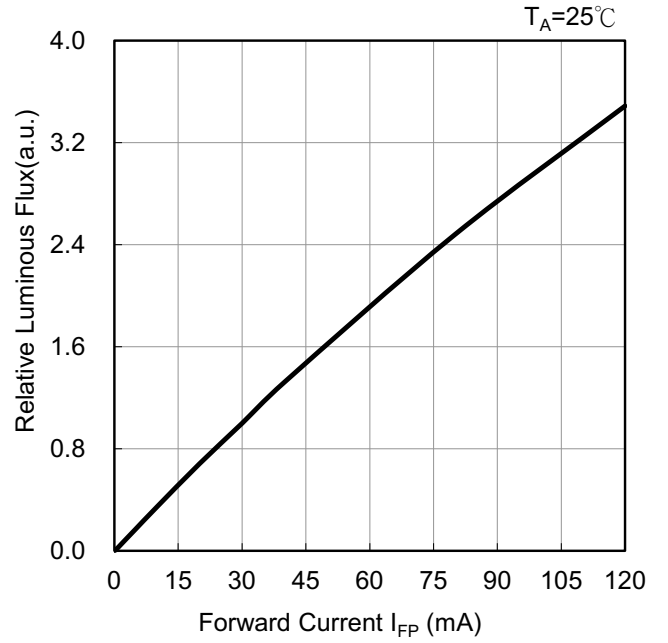
Note: Chromaticity coordinate groups are measured with an accuracy of  $\pm 0.005$ .

## Optical and electrical characteristics

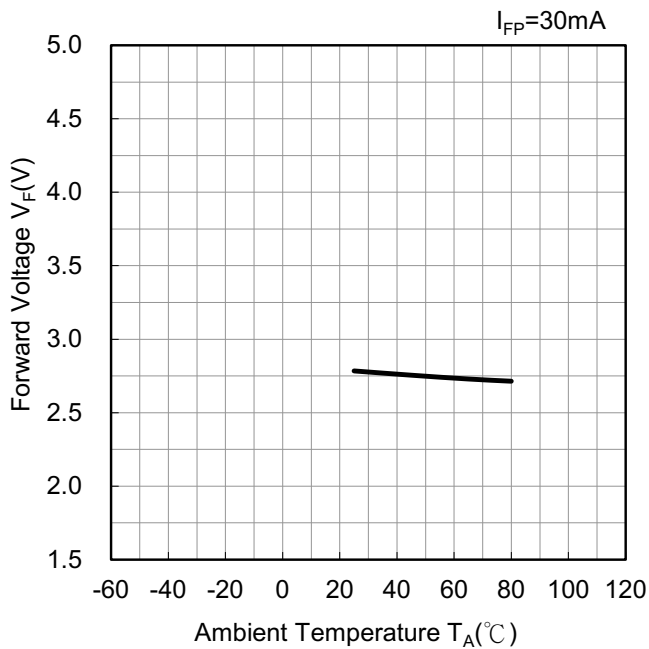
Forward Voltage vs. Forward Current



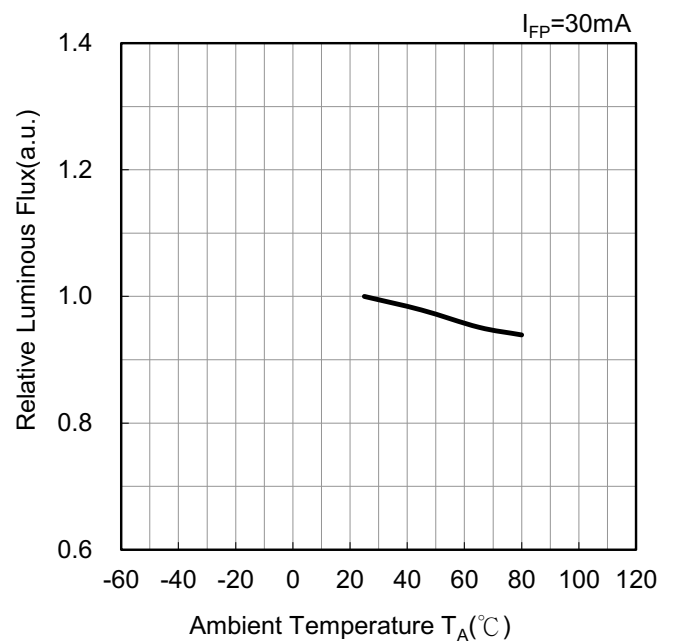
Forward Current vs. Relative Luminous Flux



Ambient Temperature vs. Forward Voltage

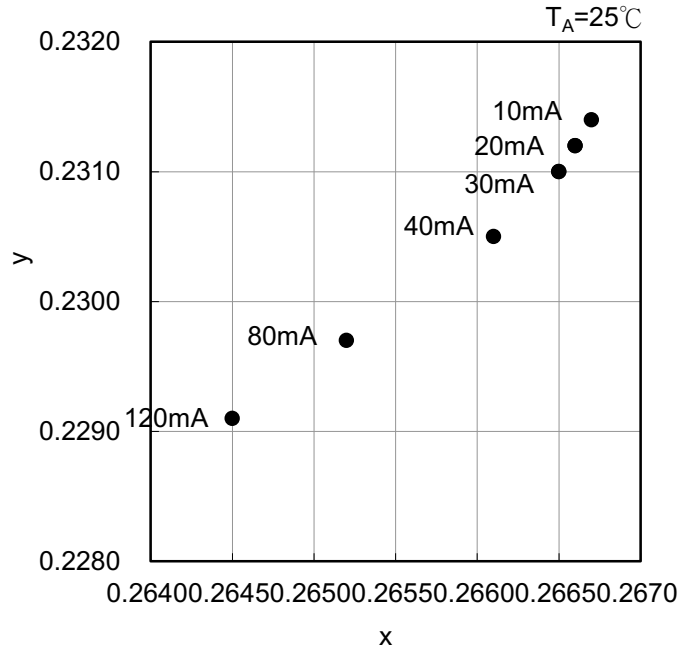


Ambient Temperature vs. Relative Luminous

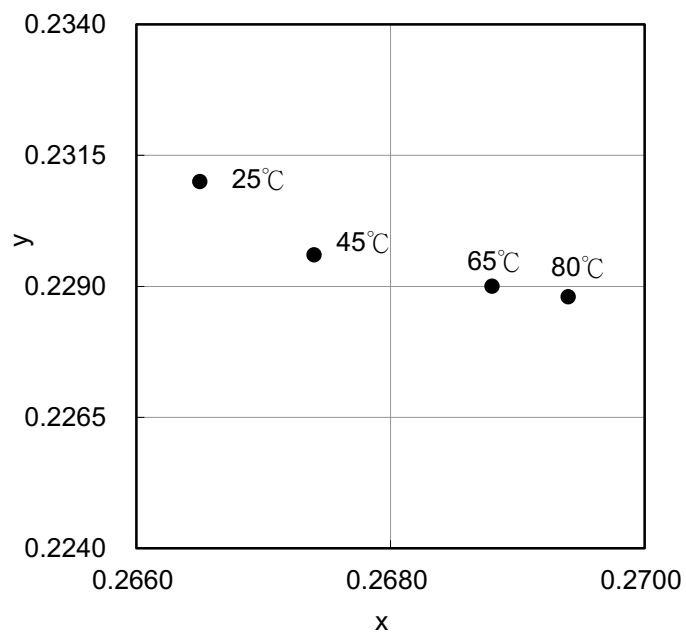




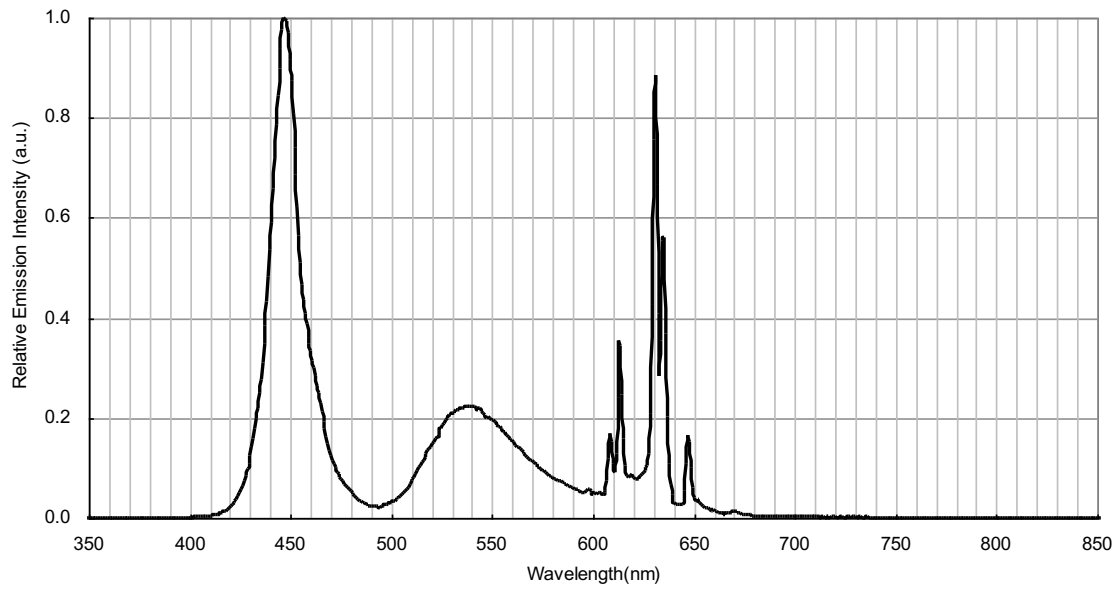
## Forward Current vs. Chromaticity Coordinate



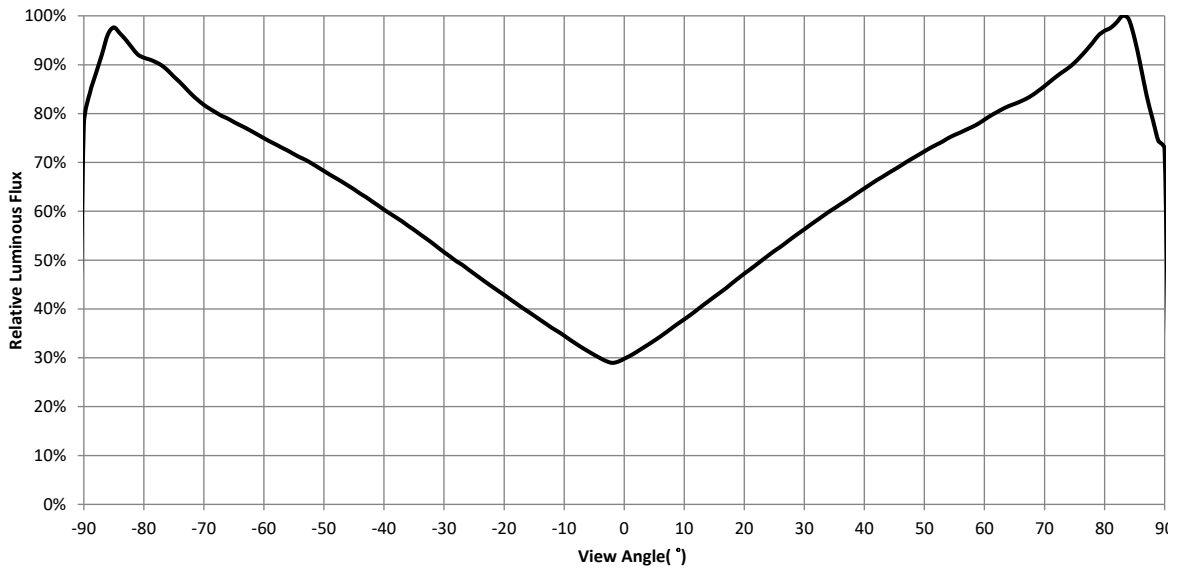
## Ambient Temperature vs. Chromaticity Coordinate



## Spectrum( $T_A=25^\circ\text{C}$ , $I_{FP}=30\text{mA}$ )



## Radiation Pattern( $T_A=25^\circ\text{C}$ , $I_{FP}=30\text{mA}$ )



## Recommended Reflow Soldering Conditions

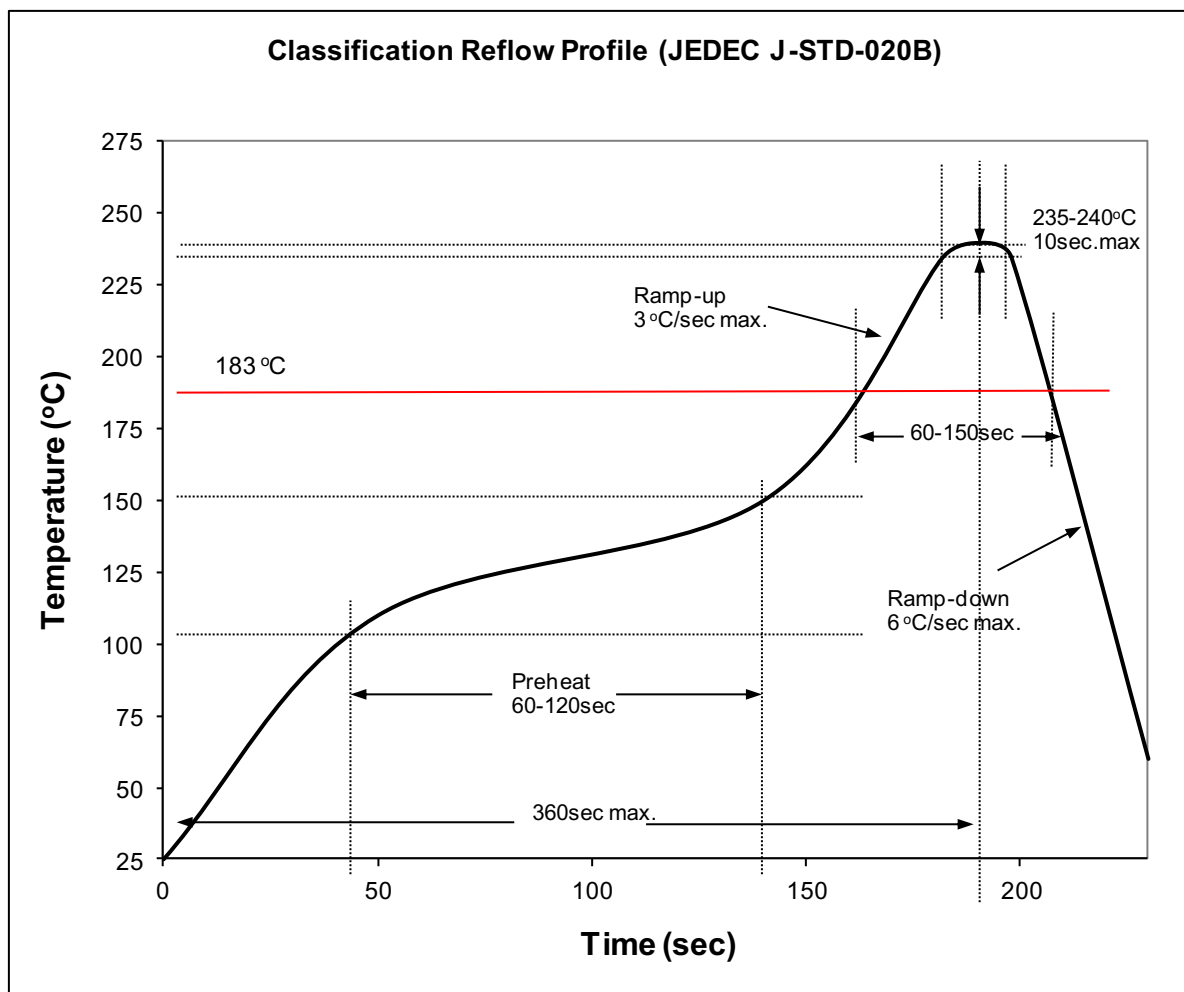
### Surface Mounting Condition

In automatic mounting of the SMD LEDs on printed circuit boards, any bending, expanding and pulling forces or shock against the SMD LEDs should be kept min. to prevent them from electrical failures and mechanical damages of the devices.

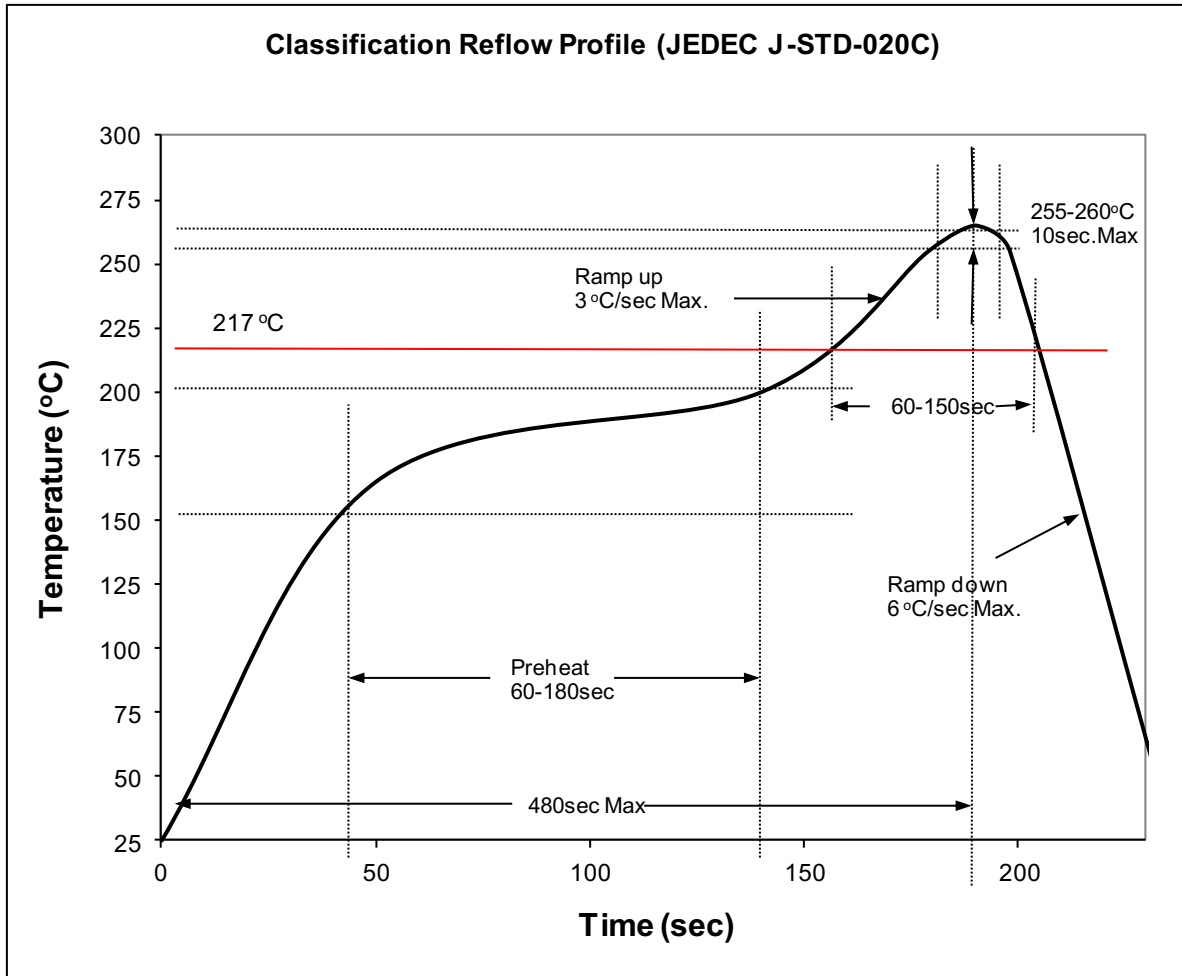
### Soldering Reflow

- Soldering of the SMD LEDs should conform to the soldering condition in the individual specifications.
- SMD LEDs are designed for Reflow Soldering.
- 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.
- AOT cannot guarantee the LEDs after they have been assembled using the solder dipping method.

### 1) Lead Solder



## 2) Lead-Free Solder



## 3) Manual Soldering Conditions

### - Lead Solder

Max. 300 °C for Max. 3sec, and only one time.

### - Lead-free Solder

Max. 350 °C for Max. 3sec, and only one time.

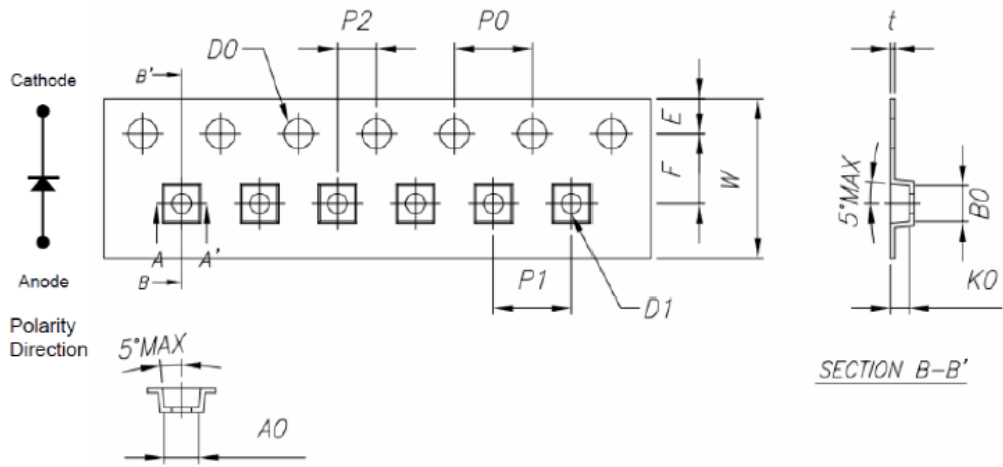
- There is possibility that the brightness of LEDs is decreased, which is influenced by heat or ambient atmosphere during reflow. It is recommended to use the nitrogen reflow method.

- After LEDs have been soldered, repair should not be done. As repair is unavoidable, a double-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will be damaged by repairing or not.

- Reflow soldering should not be done more than two times.

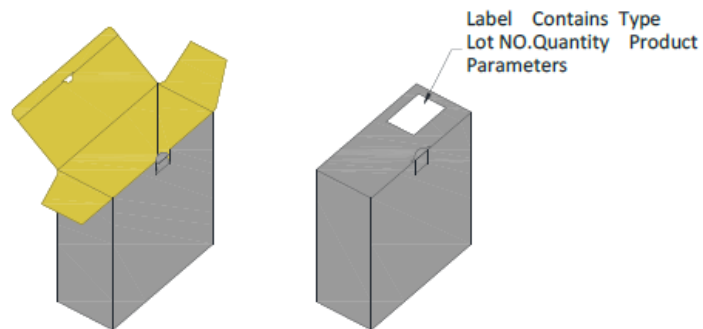
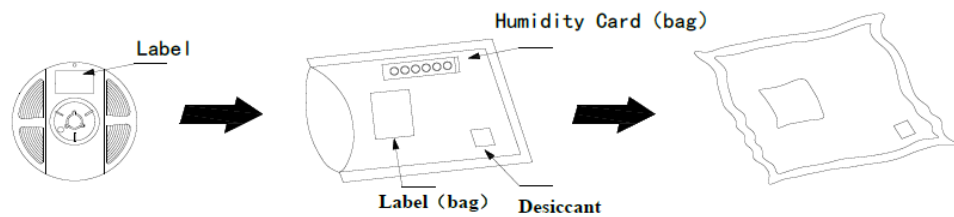
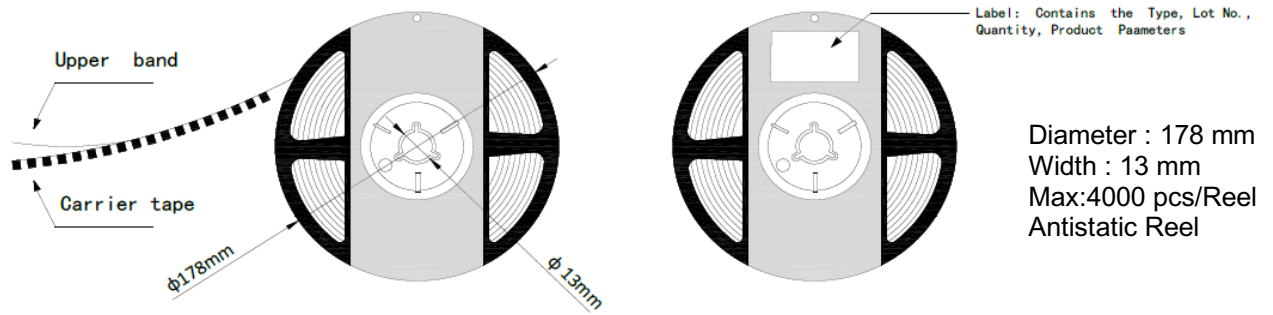
## Dimensions (Unit :mm)

Tape

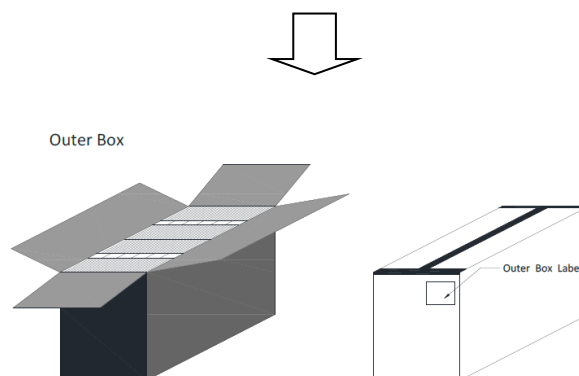


Item	Spec.	Tolerance(mm)	Item	Spec.	Tolerance(mm)
<b>W</b>	8	±0.1	<b>A0</b>	1.85	±0.05
<b>E</b>	1.75	±0.1	<b>B0</b>	1.85	±0.05
<b>D0</b>	1.55	±0.05	<b>K0</b>	1.2	±0.05
<b>P0</b>	4	±0.1	<b>α</b>	Max 6°	

## Packing Formation



\* Capacity 10 reels per box.



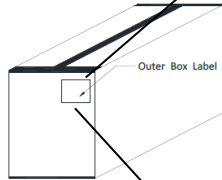
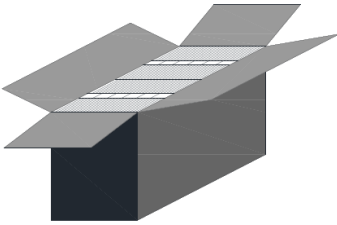
\* Capacity 30 or 60 reels per box.

\*Cumulative Tolerance : Cumulative tolerance / 10 pitches to be  $\pm 0.2\text{mm}$

\*Package : P/N, Manufacturing data Code No and Quantity to be indicated on a damp proof Package.

## Package Outlook

Outer Box



\* Capacity 30 or 60 reels per box.

 Solid-State Light. Done Right. Advanced Optoelectronic Technology Inc.	
Customer	
PO No.	
Part No.	
Quantity	
Packing Date	
Carton No.	
Ship No.	
QC Check	
備註	

## Reel Label Definition

SMD LED Part Number : XXXXX-XXXX Brightness : A CIE : B VF : C Quantity : nn ea Serial No : SM0yymmddxxxx Cust. PN. : XXXXX-XXXX	SAP. No.    
---	--------------------------

A : Iv value.  
 B : CIE value noted  
 C : Vf value.  
 nn : Quantity of LED

SM0yymmddxxx : yy : year, mm : month, dd : day, xxxx : reel no.

\*Reel Label to fill in practice data of all LED characteristic

## Reliability Test

No.	Test Item	Standard Test Method	Test Conditions	Note	Number of Damaged
1	Room Temp. Life Test	Internal Ref.	$T_A=25^{\circ}\text{C}, I_F=30\text{mA}$	1000 hr	0/20
2	High Temp. Operation	JESD22-A108	$T_A=85^{\circ}\text{C}, I_F=30\text{mA}$	1000 hr	0/20
3	Low Temp. Operation	JESD22-A108	$T_A=-40^{\circ}\text{C}, I_F=30\text{mA}$	1000 hr	0/20
4	Thermal Shock Test	JESD22-A106	$-40^{\circ}\text{C}\sim 100^{\circ}\text{C}$ (30min ~ 30min)	300 cycles	0/20
5	High Temp. Storage	JESD22-A103	$T_A=100^{\circ}\text{C}$	1000 hr	0/20
6	High Temp. and High Humidity Operation	JESD22-A119	$60^{\circ}\text{C} 90\%\text{RH}, I_F=30\text{mA}$	1000 hr	0/20
7	Reflow Test	Internal Ref.	Reflow $260^{\circ}\text{C}$ → HTOL $140^{\circ}\text{C}$ 2min	2 cycles	0/500

## Criteria for Judging Damage

Item	Symbol	Test Conditions	Criteria for Judgement	
			Min.	Max.
Forward Voltage	$V_F$	$I_F = 30\text{mA}$	-	*U.S.L×1.1
Luminous Flux	$\phi_V$	$I_F = 30\text{mA}$	*L.S.L×0.9	-

\* U.S.L: Upper Standard Level

\* L.S.L: Lower Standard Level



## **Cautions**

### (1) Moisture Proof Package

The moisture proof package should be used to prevent moisture in the package as the moisture may Cause damage to optical characteristics of the LEDs.

The aluminum bag with zipper is used for moisture proof package. And, the moisture absorbent Material, Silica gel, is inserted into aluminum bag.

### (2) Storage:

Storage Conditions

Before opening the package:

The LEDs should be kept at 30°C or less than 90%RH or less. The LEDs should be used within a year. When storing the LEDs, moisture proof packaging with absorbent material is recommended.

After opening the package:

After open the package, the LED should be kept at 30°C, 60%RH or less. The LED should be soldered within 168 hours (7 days) after opening the package. If unused LEDs remain, it should be stored in moisture proof condition.

### (3) Heat Generation

Thermal design of the end products is of paramount importance. The heat generation must be taken into design consideration when using the LED. The coefficient of the temperature increase per input electric power is affected by the thermal resistance of the circuit board and density of LED placement on the board, as well as other components.

### (4) Static Electricity

Static electricity or surge voltage damages the LEDs. All equipment and machinery must be properly grounded. It is recommended to use a wristband or anti-electrostatic glove when handling the LEDs. When inspecting the final products in which LEDs were assembled, it is recommended to check whether the assembled LEDs are damaged by static electricity or not. It is easy to find static-damaged LEDs by a light-on test or a Vf test at a lower current. (Below 1mA is recommended).

Criteria:  $V_F > 1.9V$  at  $I_F = 1\mu A$

### (5) Cleaning

Use isopropyl alcohol as a solvent for cleaning the LEDs. The other solvent may dissolve the LEDs package and the epoxy.

Ultrasonic cleaning should not be done.

### (6) Electrostatic Discharge (ESD)

The products are sensitive to static electricity or surge voltage, An ESD event may damage its die or reduce its reliability performance. When handling the products, measures against electro static discharge, including the followings, are strongly recommended.

Eliminating the charge;

Wrist strap, ESD footwear and garments, ESD floors

Grounding the equipment and tools at workstation

ESD table / shelf mat (conductive materials)

Proper grounding techniques are required for all devices, equipment and machinery used in the assembly of the products, Also note that surge protection should be considered in the design of customer products.

If tools or equipment contain insulating materials, such as glass or plastic, proper measures against electro static discharge, including the followings are strongly recommended.

Dissipating the charge with conductive materials

Preventing the charge generation with moisture

Neutralizing the charge with ionizer

(7) Others

When using the LEDs, it must care that the reverse voltage will not exceed the absolute maximum rating.

The LED light is enough to injure human eyes, so it should avoid looking at LED light directly.

---

## **NOTE.**

---

All the information published is considered to be reliable. However, AOT does not assume any liability arising out of the application or use of any product described herein.

AOT reserves the right to make changes at any time without notice to any products in order to improve reliability, function or design.

AOT products are not authorized for use as critical components in life support devices or systems without the express written approval from the managing director of AOT.