Solid-State Light. Done Right.

APPROVAL SHEET

AOT MODEL NAME	4020M
AOT PART NUMBER	4020M-W3MT
CUSTOMER NAME	General Customer
DATE	2021/Oct.
VERSION	1

MAKER			CUSTOMER			
Prepared	Checked	Approved				

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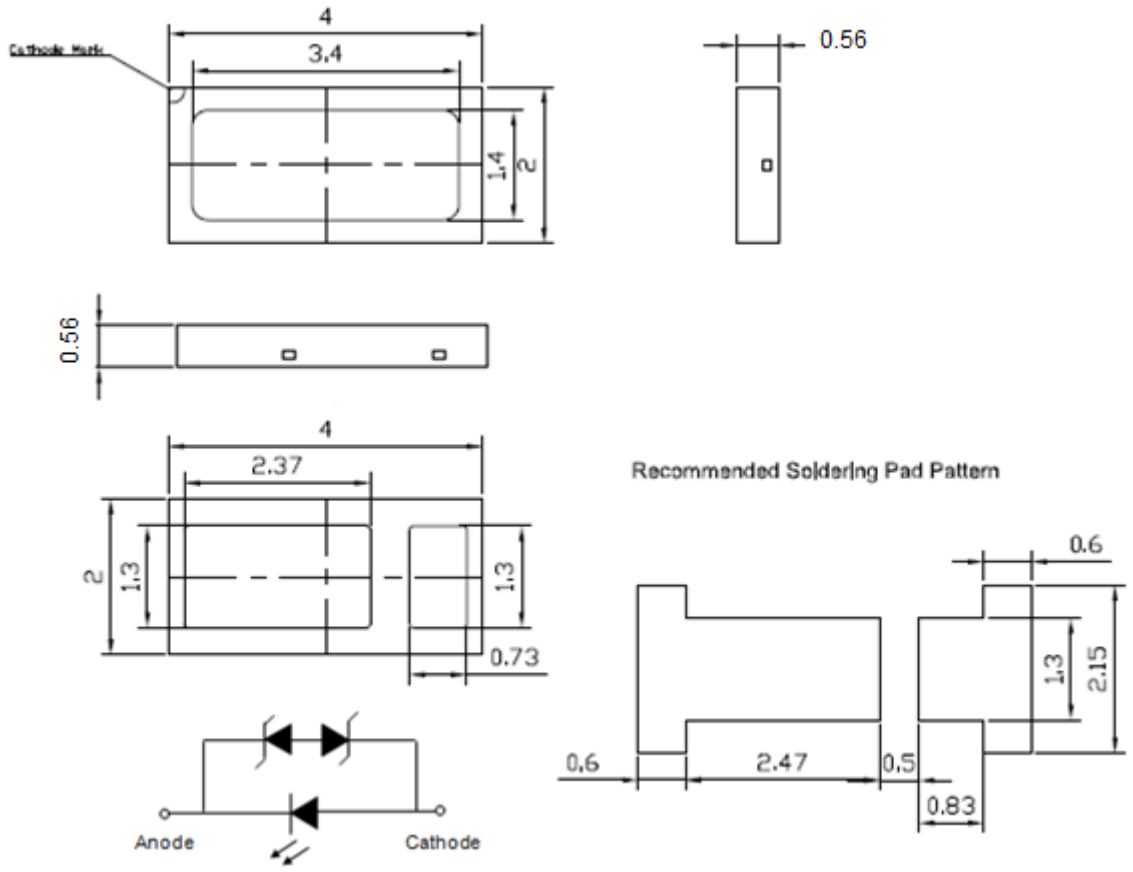
Revision Note

Date	Revision	Page	Version
2021-10-15	Initiate Document	18	01

Package Outline

Model name: 4020M-W3MT

Unit: mm, Tolerance: ± 0.2 mm



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 4.0 mm x 2.0 mm x 0.56 mm.
- Compatible with reflow soldering.
- Complies with RoHS Directive.
- 4020M Type product.

Optical/Electronic Characteristics (T_A=25°C)

AOT Reading Standards						
Item	**Symbol**	**Condition**	**Min**	**Typ.**	**Max**	**Unit**
Forward Voltage	V_F	I_F = 150mA	2.8	-	3.3	V
Luminous Flux	Φ_V	I_F = 150mA	50	-	60	lm

* Tolerance of measurements of the Forward Voltage is ± 0.05 V.

* Tolerance of measurements of the Luminous Flux is ± 5%.

Absolute Maximum Ratings (T_A=25°C)

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	280	mA
*Pulse Forward Current	I_{FP}	550	mA
Power Dissipation	P_D	924	mW
Operating Temperature	T_{opr}	-40~+85	°C
Storage Temperature	T_{stg}	-40~+100	°C
Soldering Temperature	T_{sld}	Reflow Soldering : 260°C for 10sec	
Junction Temperature	T_j	125	°C
Forward Voltage at Low Current	V_{F2}	>1.9 (@1 μA)	V

* I_{FP} Conditions: Pulse Width ≤10msec, and duty ≤1/10

* Max condition is not guarantee for life time

Group Definition of Forward Voltage

Rank	Condition	V_F(V)
S3	T_A=25°C I_F=150mA	2.8 ~ 2.9
S4		2.9 ~ 3.0
S5		3.0 ~ 3.1
S6		3.1 ~ 3.2
S7		3.2 ~ 3.3

Group Definition of Brightness

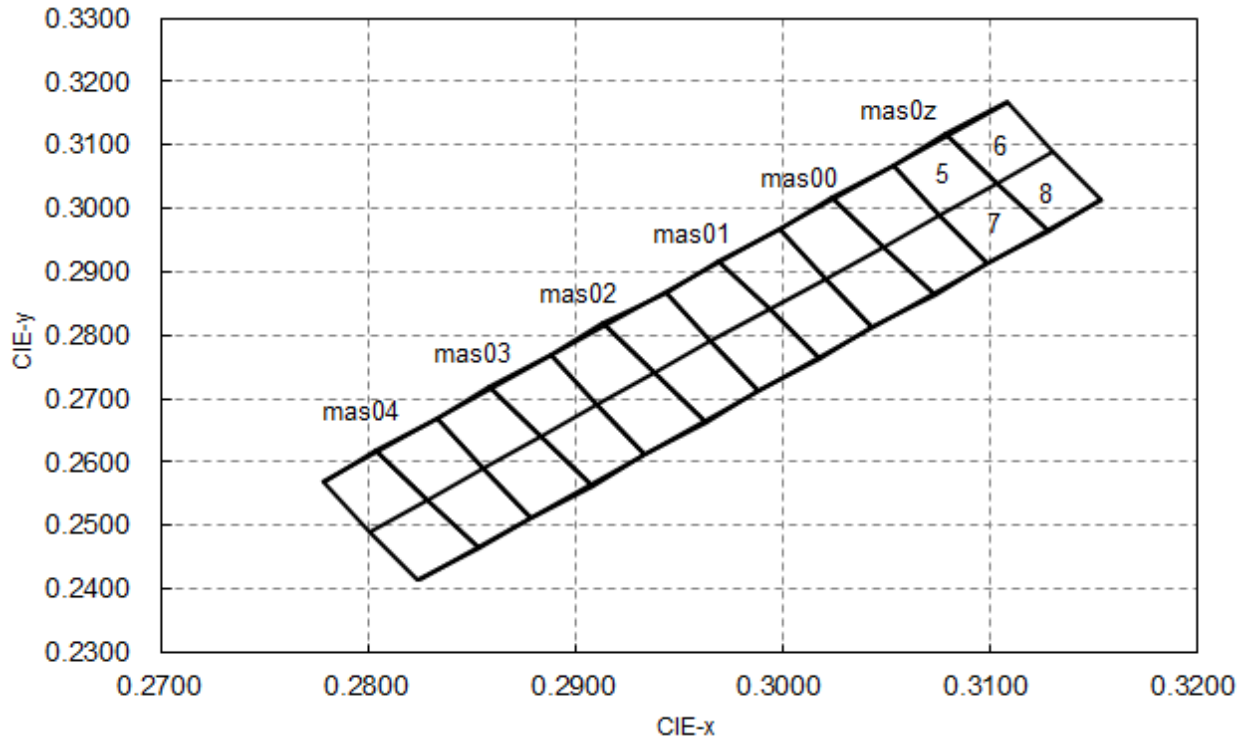
Rank	Condition	AOT Luminous Flux(lm)
T50	T_A=25°C I_F=150mA	50 ~ 52
T52		52 ~ 54
T54		54 ~ 56
T56		56 ~ 58
T58		58 ~ 60

* 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

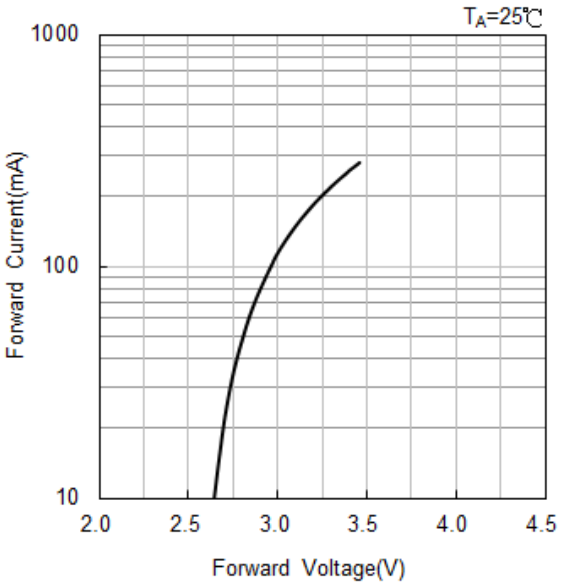
Rank	x	y	Rank	x	y	Rank	x	y
mas0z5	0.3053	0.3068	mas005	0.2998	0.2968	mas015	0.2943	0.2868
	0.3078	0.3118		0.3023	0.3018		0.2968	0.2918
	0.3103	0.3040		0.3048	0.2940		0.2993	0.2840
	0.3075	0.2990		0.3020	0.2890		0.2965	0.2790
mas0z6	0.3078	0.3118	mas006	0.3023	0.3018	mas016	0.2968	0.2918
	0.3108	0.3168		0.3053	0.3068		0.2998	0.2968
	0.3130	0.3090		0.3075	0.2990		0.3020	0.2890
	0.3103	0.3040		0.3048	0.2940		0.2993	0.2840
mas0z7	0.3075	0.2990	mas007	0.3020	0.2890	mas017	0.2965	0.2790
	0.3103	0.3040		0.3048	0.2940		0.2993	0.2840
	0.3128	0.2963		0.3073	0.2863		0.3018	0.2763
	0.3098	0.2913		0.3043	0.2813		0.2988	0.2713
mas0z8	0.3103	0.3040	mas008	0.3048	0.2940	mas018	0.2993	0.2840
	0.3130	0.3090		0.3075	0.2990		0.3020	0.2890
	0.3153	0.3013		0.3098	0.2913		0.3043	0.2813
	0.3128	0.2963		0.3073	0.2863		0.3018	0.2763

Rank	x	y	Rank	x	y	Rank	x	y
mas025	0.2888	0.2768	mas035	0.2833	0.2668	mas045	0.2778	0.2568
	0.2913	0.2818		0.2858	0.2718		0.2803	0.2618
	0.2938	0.2740		0.2883	0.2640		0.2828	0.2540
	0.2910	0.2690		0.2855	0.2590		0.2800	0.2490
mas026	0.2913	0.2818	mas036	0.2858	0.2718	mas046	0.2803	0.2618
	0.2943	0.2868		0.2888	0.2768		0.2833	0.2668
	0.2965	0.2790		0.2910	0.2690		0.2855	0.2590
	0.2938	0.2740		0.2883	0.2640		0.2828	0.2540
mas027	0.2910	0.2690	mas037	0.2855	0.2590	mas047	0.2800	0.2490
	0.2938	0.2740		0.2883	0.2640		0.2828	0.2540
	0.2963	0.2663		0.2908	0.2563		0.2853	0.2463
	0.2933	0.2613		0.2878	0.2513		0.2823	0.2413
mas028	0.2938	0.2740	mas038	0.2883	0.2640	mas048	0.2828	0.2540
	0.2965	0.2790		0.2910	0.2690		0.2855	0.2590
	0.2988	0.2713		0.2933	0.2613		0.2878	0.2513
	0.2963	0.2663		0.2908	0.2563		0.2853	0.2463

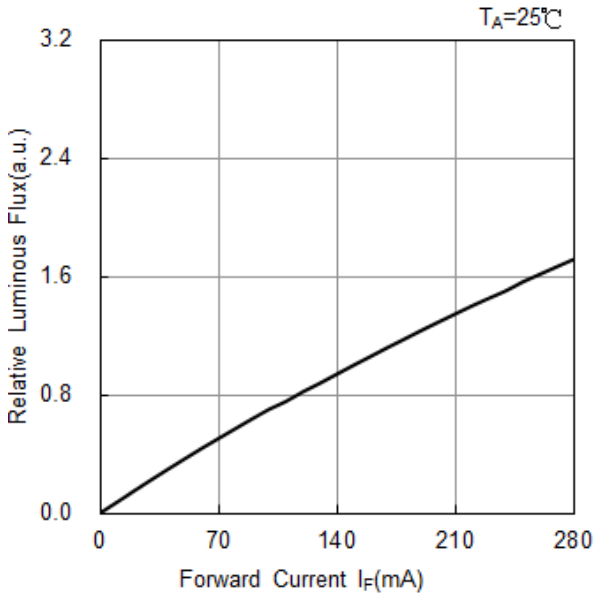
Note: Chromaticity coordinate groups are measured with an accuracy of ±0.005.

Optical and electrical characteristics

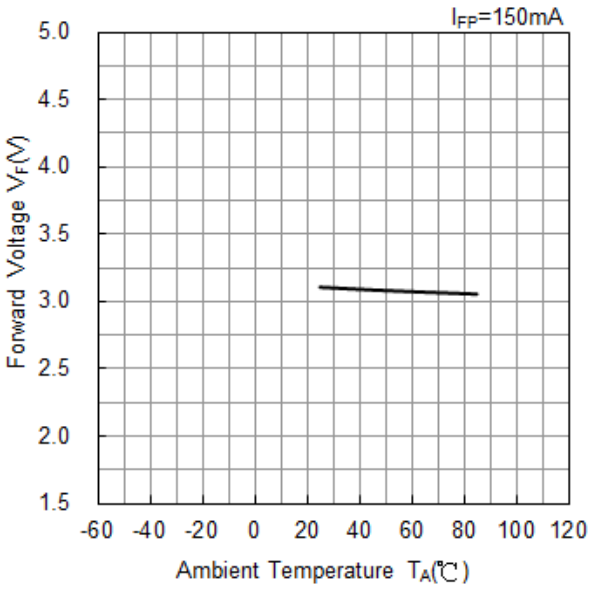
Forward Voltage vs. Forward Current



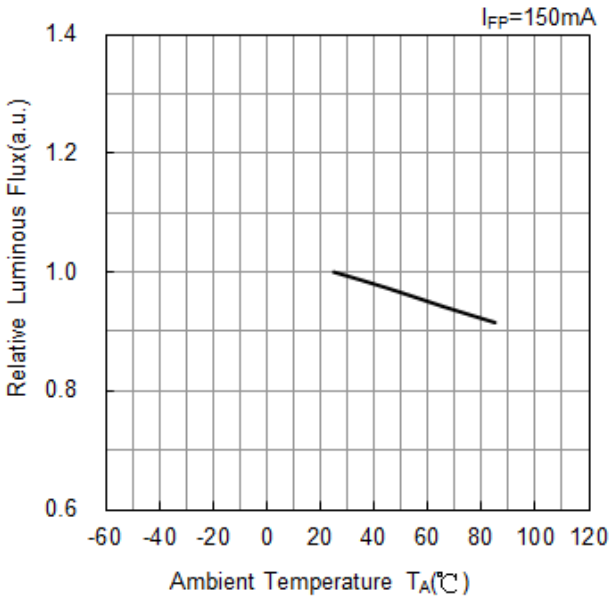
Forward Current vs. Relative Luminous Flux



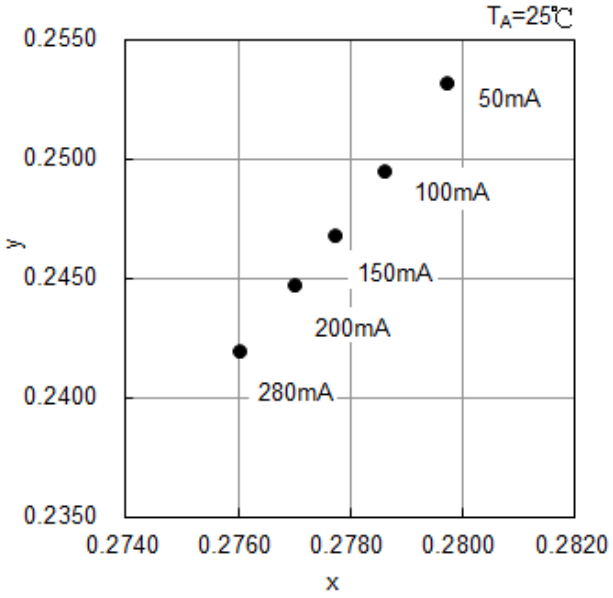
Ambient Temperature vs. Forward Voltage



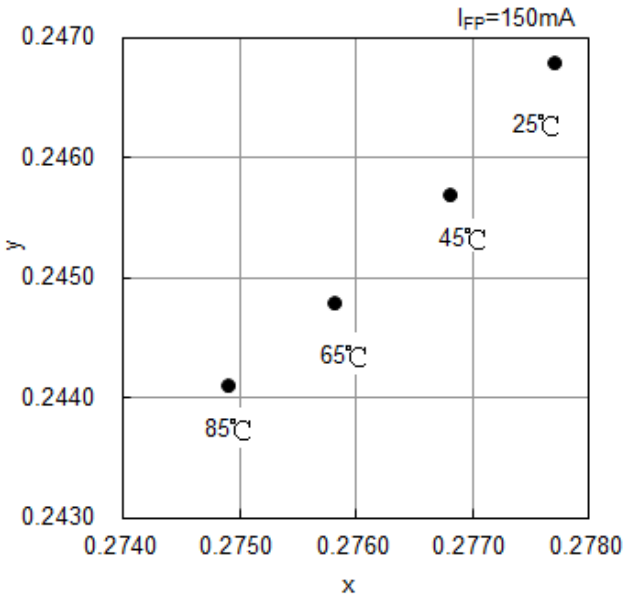
Ambient Temperature vs. Relative Luminous



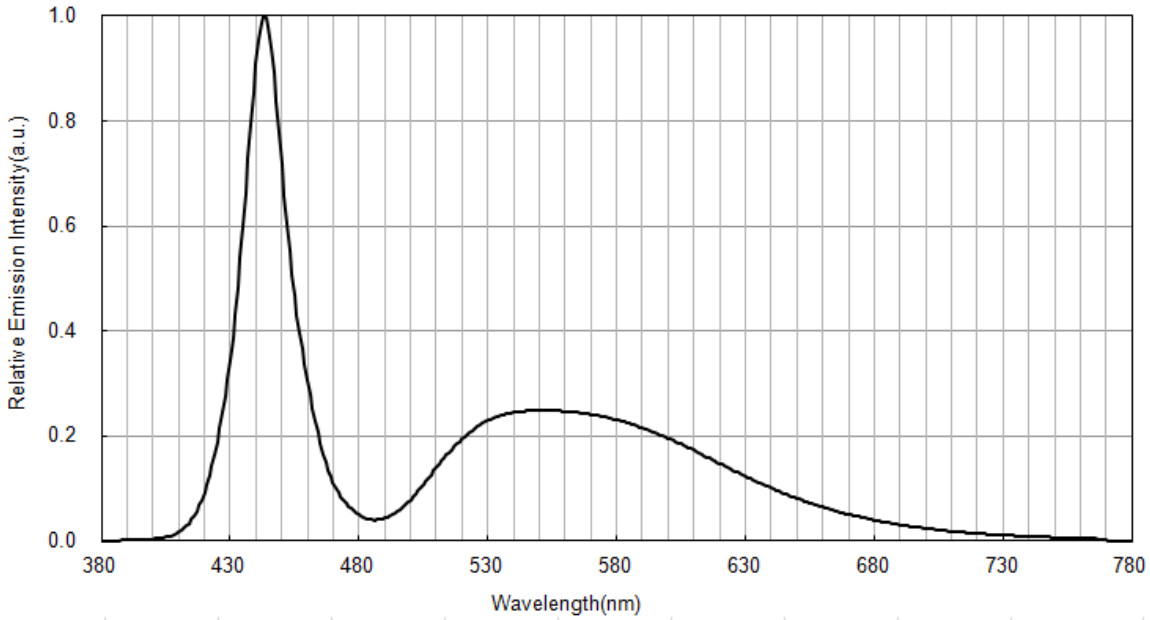
Forward Current vs.Chromaticity Coordinate



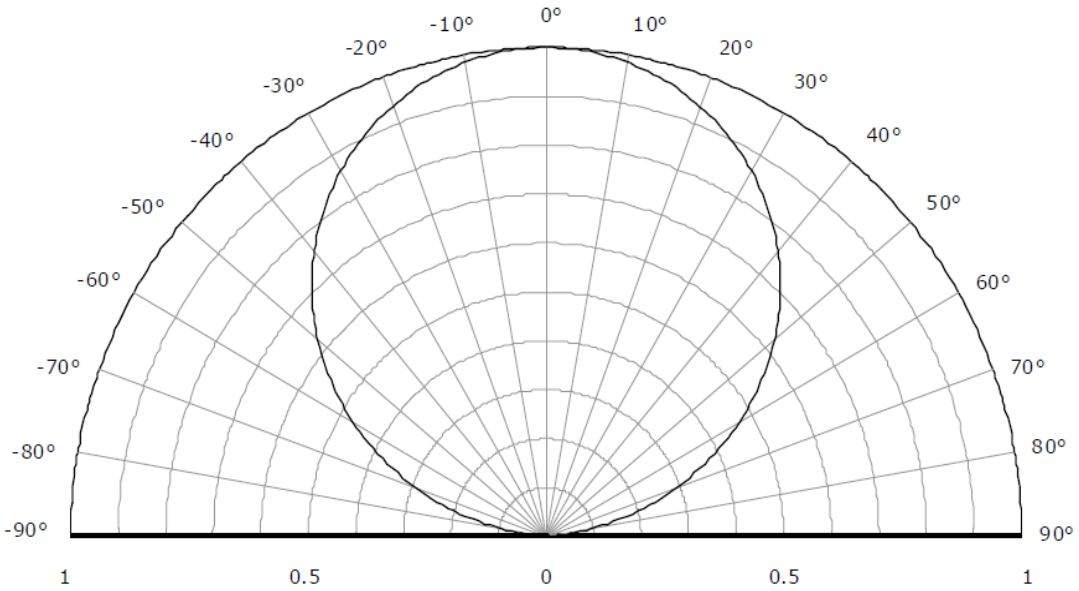
Ambient Temperature vs. Chromaticity Coordinate



Spectrum(T_A=25℃,I_{FP}=150mA)



Radiation Pattern(T_A=25℃,I_{FP}=150mA)



Recommended Reflow Soldering Conditions

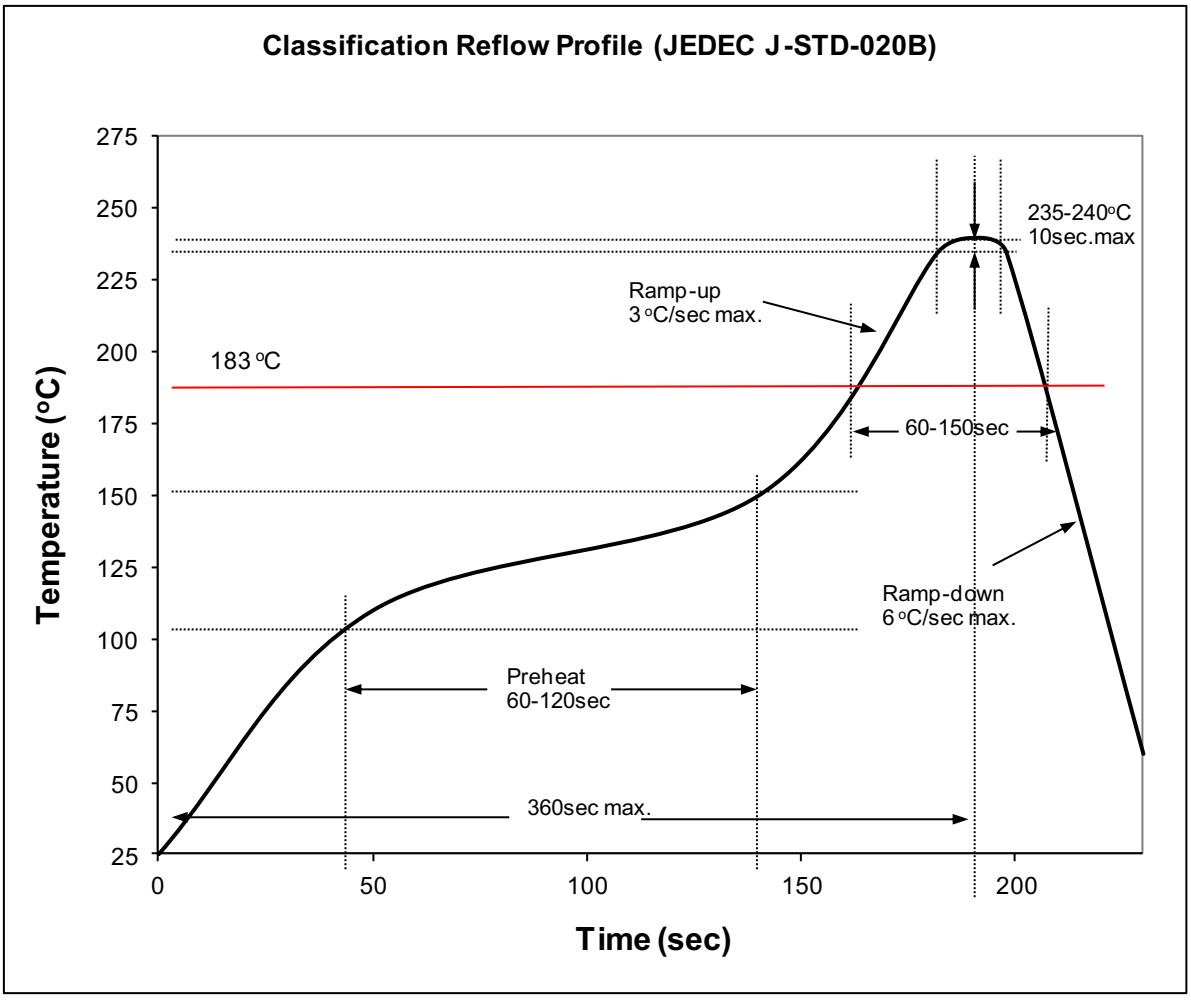
Surface Mounting Condition

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.

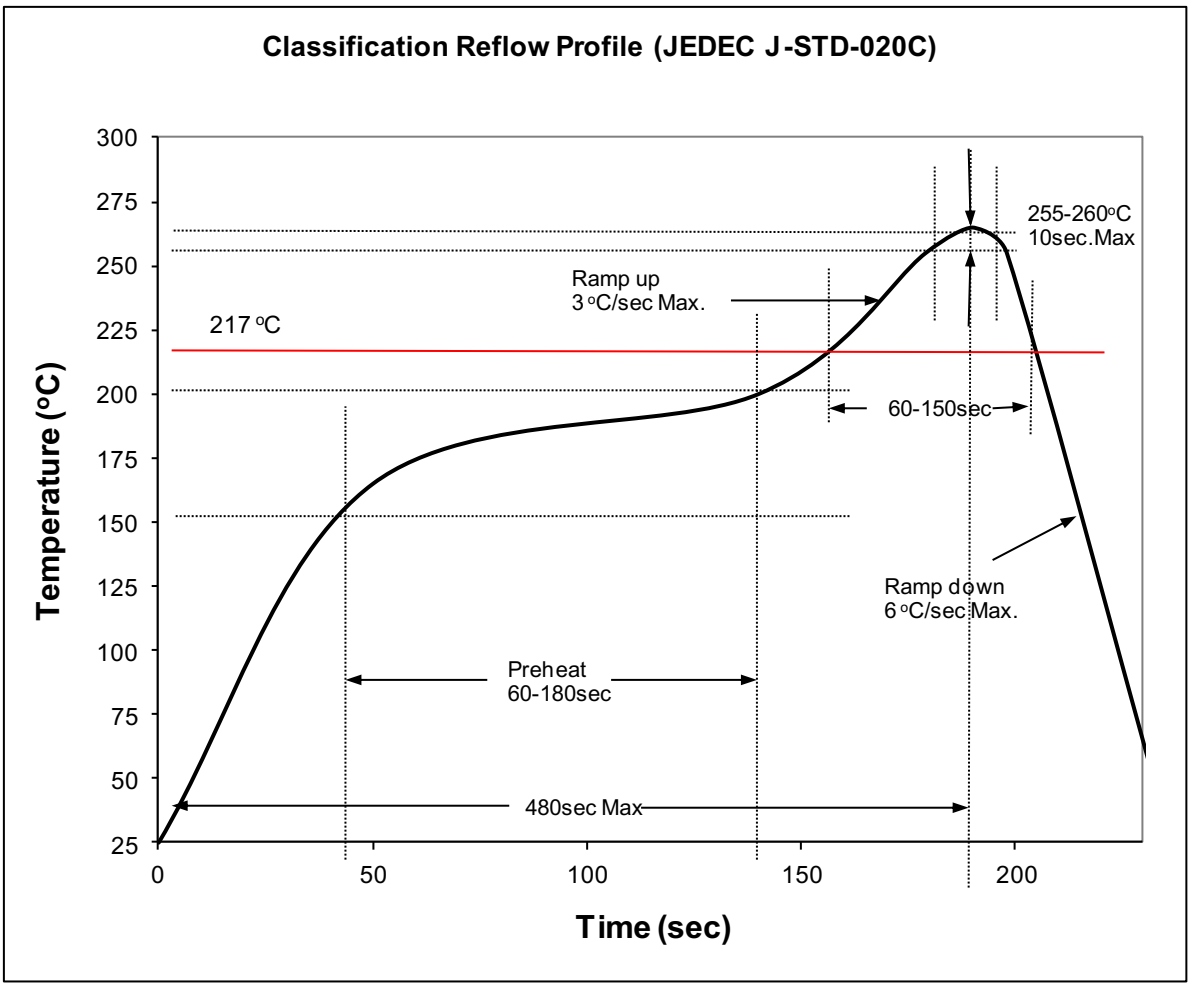
Soldering Reflow

-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

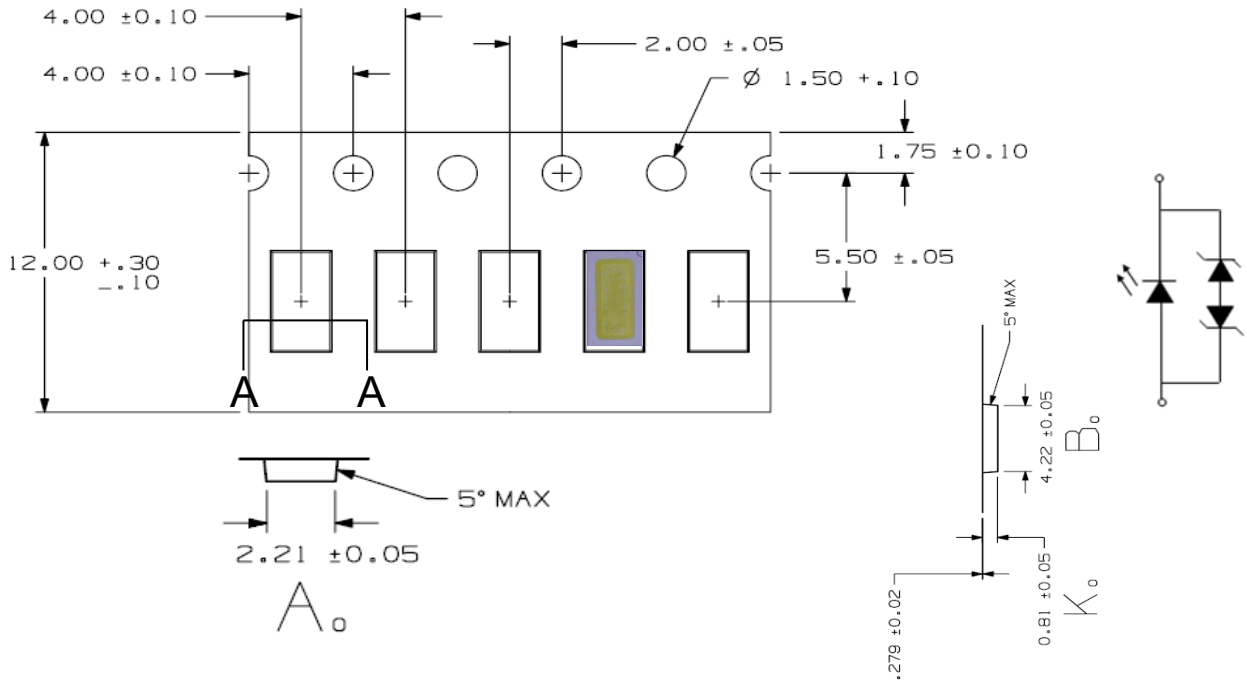
  Max. 300 °C for Max. 3sec, and only one time.

- Lead-free Solder

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

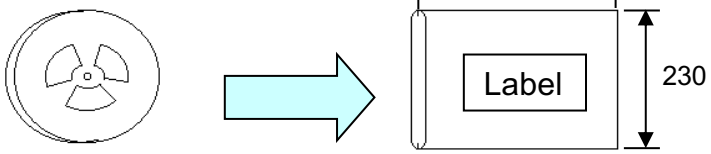
- There is possibility that the brightness of LEDs is decreased, which is influenced by heat or ambient atmosphere during reflow. It is recommended to use the nitrogen reflow method.
- After LEDs have been soldered, repair should not be done. As repair is unavoidable, a double-head soldering iron should 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.

Taping and Orientation Quantity: 3,500 pcs/reel



Item	Spec.	Tolerance(mm)	Item	Spec.	Tolerance(mm)
W	12.00	+0.30,-0.10	P2	2.00	±0.05
E	1.75	±0.10	t	0.23	±0.05
F	5.50	±0.05	A0	2.21	±0.05
D0	1.50	±0.10	B0	4.22	±0.05
D1	1.00	±0.10	K0	0.81	±0.05
P0	4.00	±0.05	α	Max 5°	

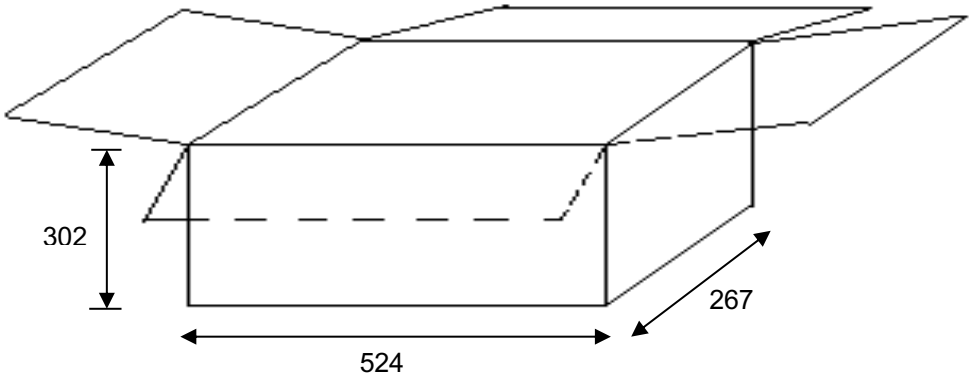
Packing Formation



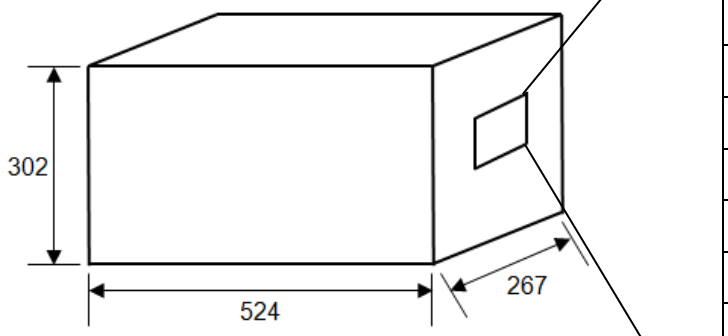
Diameter : 178 mm
Width : 8 mm
3,500 pcs/Reel
Antistatic Reel

MBB Bag
+5g drying agent
+Humidity card
1 Reel / Bag

50 Bags /1 Carton
⇒ 175,000 pcs/ 1Carton



Package Outlook



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

Solid-State Light. Done Right.

Reel Label Definition

SAP. No.

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

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 °C,I_F=150mA	1000 hr	0/20
2	High Temp. Operation	JESD22-A108	T_A=65°C,I_F=150mA	1000 hr	0/20
3	High Temp. Operation	JESD22-A108	T_A=85°C,I_F=150mA	1000 hr	0/20
4	High Temp. Storage	JESD22-A103	T_A=100°C	1000 hr	0/20
5	Low Temp. Operation	JESD22-A108	T_A=-40°C,I_F=150mA	1000 hr	0/20
6	High Temp. and High Humidity Operation	JESD22-A119	60°C 90%RH,I_F=150mA	1000 hr	0/20
7	Temperature and humidity cycle test	IEC68-2-38	25°C ~65°C ~-10°C,90% RH 24hr per cycle	10 cycle	0/20
8	Thermal Cycling Test	JESD22-A106	-40°C ~ 100°C ,30min Transform time 5min	300 cycles	0/50

Criteria for Judging Damage

Item	Symbol	Test Conditions	Criteria for Judgement	
			Min.	Max.
Forward Voltage	V_F	I_F =150mA	-	*U.S.L×1.1
Luminous Flux	ϕ_V	I_F =150mA	*L.S.L×0.7	-

* U.S.L: Upper Standard Level

* L.S.L: Lower Standard Level

Thermal Test Condition

Light Bar Thermal Test Condition				
PKG Model	PCB Temperature(°C)	Test Current(mA)	Test Time(s)	Judgment
4020C-W3ME	120±10	150±1	10	No LED OFF

※ SMT must be done Thermal Test Condition

※ PCB Temperature must reach 110°C for 5 seconds

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 handing 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 μA

(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.

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