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DATA SHEET

PART NO.: L-T650WDT

REV: C / 1

CUSTOMER'S APPROVAL : \_\_\_\_\_

DCC : \_\_\_\_\_

DRAWING NO. : DS-7B-06-0001

DATE : 2019-07-15

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# SURFACE MOUNT DEVICE LED

Part No. : L-T650WDT

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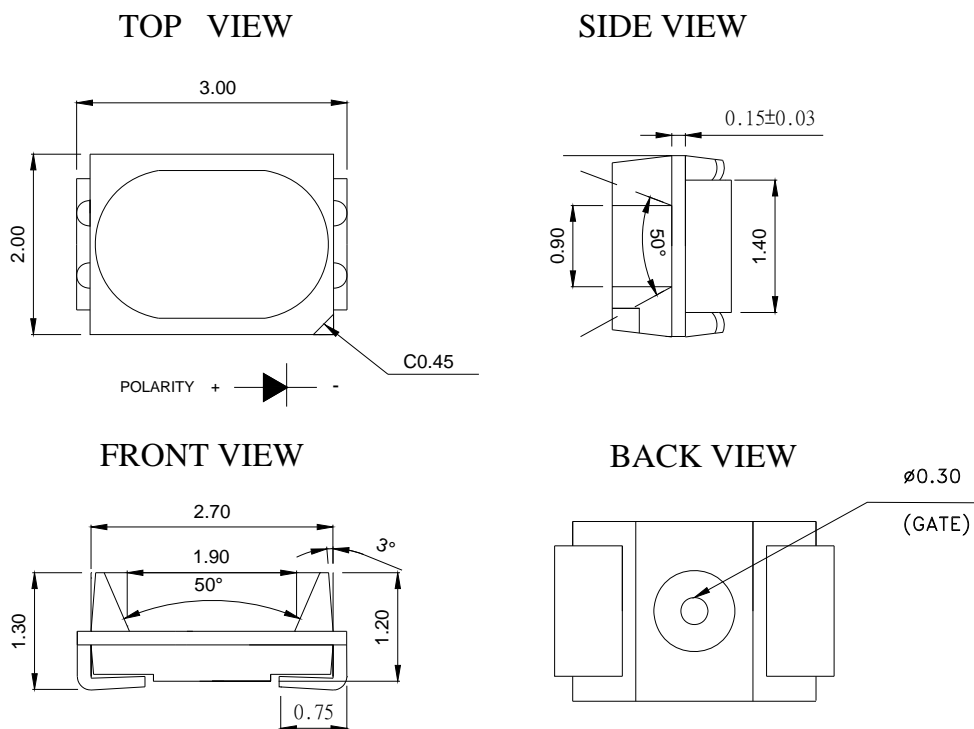
## ● Features

- \* Top view, Wide view angle, White color PLCC 2 package SMD LED .
- \* EIA STD package, packing in 8mm tape on 7" diameter reels (ANSI/EIA-481-B-2001).
- \* Compatible with automatic Pick & Place equipment.
- \* Compatible with IR Reflow soldering and TTW soldering.
- \* Pb free product and acceptable lead-free process!
- \* Meet RoHS Green Product.

## ● Application

- \* Backlighting (LCD, Switches, keys, displays, illuminated advertising)
- \* Emergency lighting / Signal and symbol luminaries.

## ● Package Outline Dimensions



### Notes:

1. All dimensions are in millimeters.
2. Tolerance is  $\pm 0.10\text{mm}$  (.004") unless otherwise noted.



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● **Chip Materials**

- \* Dice Material : InGaN
- \* Light Color : White
- \* Lens Color : Light Yellow Diffused.

● **Absolute Maximum Ratings(Ta=25°C)**

Symbol	Parameter	Rating	Unit
PD	Power Dissipation	75	mW
IPF	Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	100	mA
IF	Continuous Forward Current	20	mA
VR	Reverse Voltage	5	V
ESD	Electrostatic Discharge Threshold (HBM) <sup>Note A</sup>	1000	V
Topr	Operating Temperature Range	-40 ~ + 85	°C
Tstg	Storage Temperature Range	-40 ~ + 85	°C

Note A :

HBM : Human Body Model. Seller gives no other assurances regarding the ability of to withstand ESD.

● **Electro-Optical Characteristics (Ta=25°C)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	IV	2200	2350	3050	mcd	IF=20mA
Viewing Angle	2 θ 1/2		120		Deg	Note 2
CIE Chromaticity	x		0.31			IF=20mA
CIE Chromaticity	y		0.32			
Forward Voltage	VF		3.20	3.50	V	IF = 20mA
Reverse Current	IR			10	μ A	VR = 5V



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**Notes:**

1. Luminous intensity is measured with a light sensor and filter combination that proximates the CIE eye-response curve.
2.  $\theta_{1/2}$  is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
3. Caution in ESD :  
Static Electricity and surge damages the LED. It is recommended use a wrist band or anti-electrostatic glove when handling the LED. All devices, equipment and machinery must be properly grounded.
4. Major standard testing equipment by “Instrument System” Model : CAS140B Compact Array Spectrometer and “KEITHLEY” Source Meter Model : 2400.

● **Typical Electro-Optical Characteristics Curves**

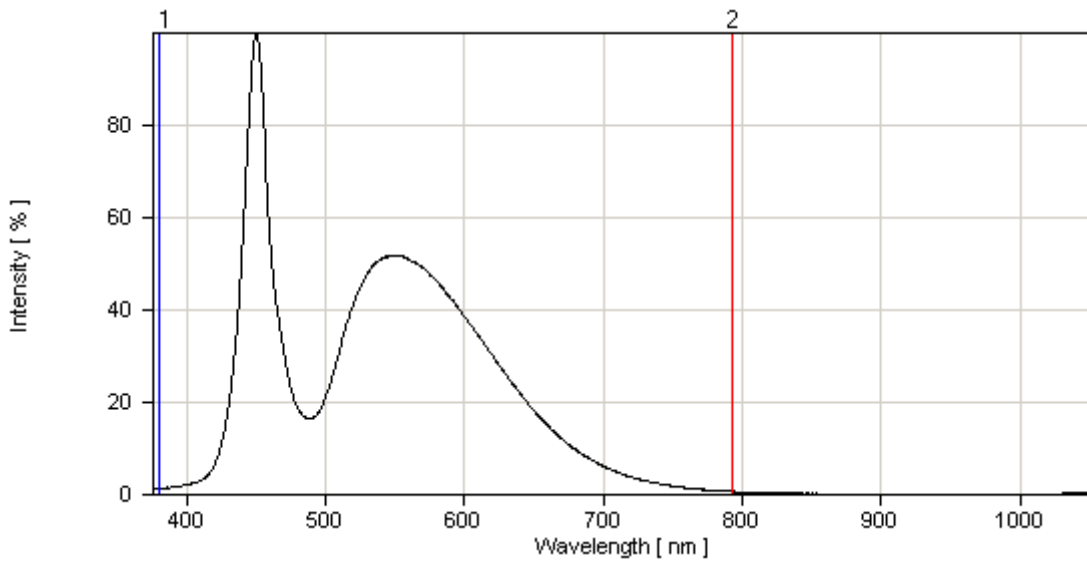


Fig.1 Relative Intensity vs. Wavelength



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## ● Typical Electro-Optical Characteristics Curves

(25°C Ambient Temperature Unless Otherwise Noted)

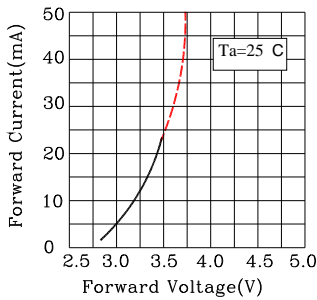


Fig.1 Forward Current vs. Forward Voltage

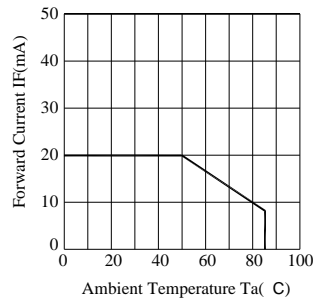


Fig.2 Forward Current Derating Curve

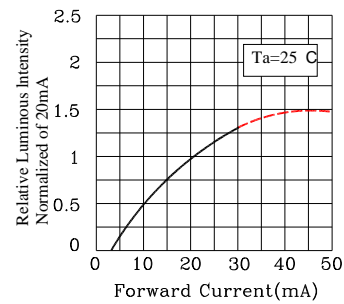


Fig.3 Relative Luminous Intensity vs. Forward Current

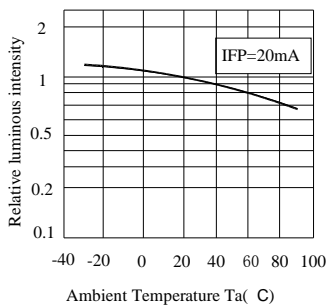


Fig.4 Luminous Intensity vs. Ambient Temperature

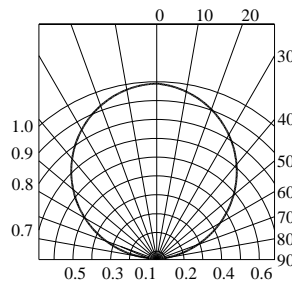


Fig.5 Spatial Distribution

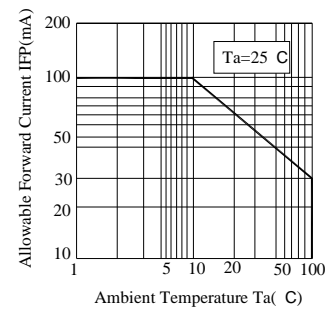


Fig.6 Forward Current Derating Curve

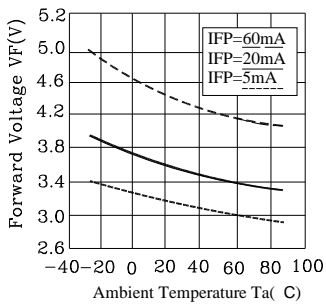


Fig.7 Ambient Temperature vs. Forward Voltage

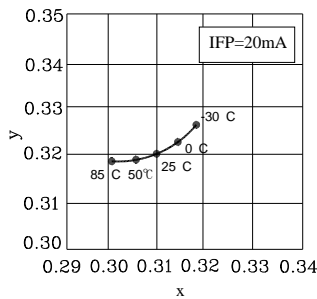


Fig.8 Ambient Temperature vs. Chromaticity Coordinate

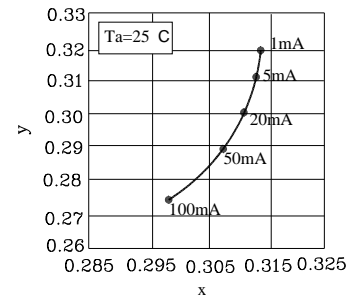


Fig.9 Forward Current vs. Chromaticity Coordinate



**SURFACE MOUNT DEVICE LED**

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● Bin Code List

Luminous Intensity(IV),Unit:mcd@20mA			Forward Voltage(VF), Unit:V@20mA		
Iv bin code(sub code-2)			Unit:V@20mA		
Bin Code	MIN	Max	Bin Code	MIN	Max
H163	2200	2250	13	2.80	2.90
H164	2250	2300	14	2.90	3.00
H165	2300	2400	15	3.00	3.10
H171	2400	2500	16	3.10	3.20
H172	2500	2600	17	3.20	3.30
H173	2600	2750	18	3.30	3.40
H174	2750	2900	19	3.40	3.50
H175	2900	3050			

Tolerance of each bin are  $\pm 10\%$

Tolerance of each bin are  $\pm 0.1V$ .



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Color Rank (CIE chromaticity x , y) @ 20mA

Rank a31				
x	0.270	0.264	0.275	0.279
y	0.260	0.267	0.281	0.276
Rank a32				
x	0.279	0.275	0.287	0.290
y	0.276	0.281	0.295	0.288
Rank a33				
x	0.288	0.279	0.290	0.296
y	0.264	0.276	0.288	0.276
Rank a34				
x	0.280	0.270	0.279	0.288
y	0.250	0.260	0.276	0.264

Rank b61				
x	0.308	0.307	0.318	0.319
y	0.308	0.315	0.326	0.318
Rank b62				
x	0.319	0.318	0.330	0.330
y	0.318	0.326	0.339	0.330
Rank b63				
x	0.320	0.319	0.330	0.330
y	0.305	0.318	0.330	0.318
Rank b64				
x	0.311	0.308	0.319	0.320
y	0.294	0.308	0.318	0.305

Rank b51				
x	0.290	0.287	0.300	0.302
y	0.288	0.295	0.308	0.302
Rank b52				
x	0.302	0.300	0.307	0.308
y	0.302	0.308	0.315	0.308
Rank b53				
x	0.306	0.302	0.308	0.311
y	0.288	0.302	0.308	0.294
Rank b54				
x	0.296	0.290	0.302	0.306
y	0.276	0.288	0.302	0.288

Rank b73				
x	0.299	0.296	0.306	0.308
y	0.268	0.276	0.288	0.279
Rank b74				
x	0.291	0.288	0.296	0.299
y	0.257	0.264	0.276	0.268
Rank b83				
x	0.313	0.311	0.320	0.321
y	0.285	0.294	0.305	0.294
Rank b84				
x	0.308	0.306	0.311	0.313
y	0.279	0.288	0.294	0.285

\* Measurement of Color coordinates : +/- 0.01



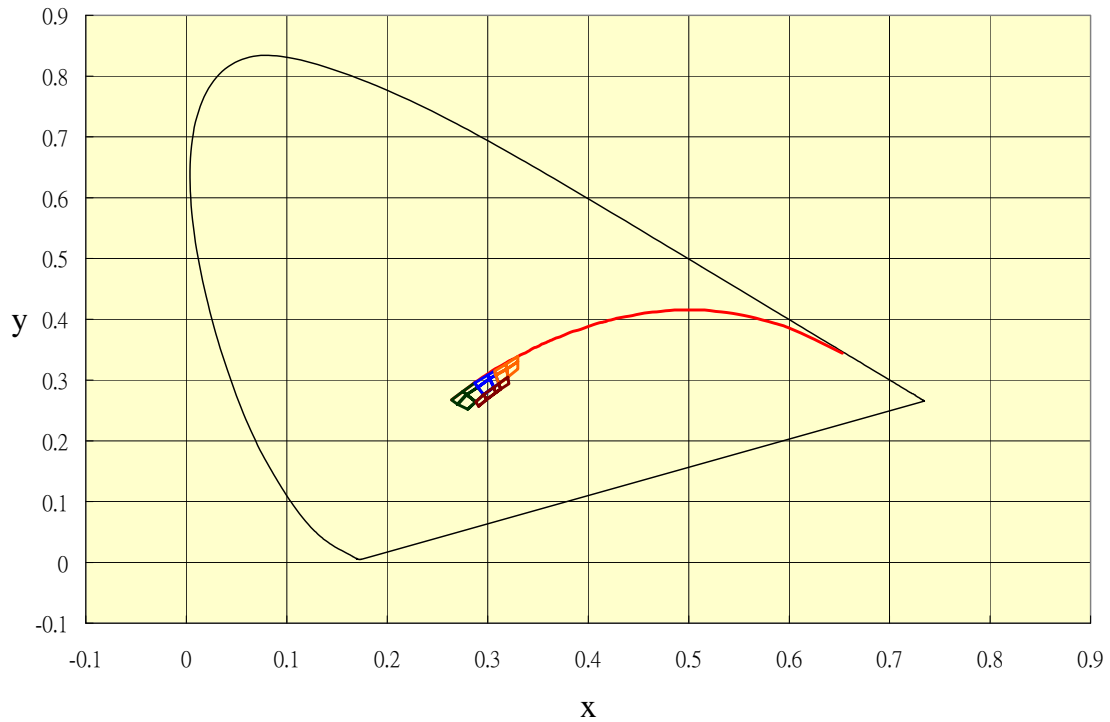
# SURFACE MOUNT DEVICE LED

Part No. : L-T650WDT

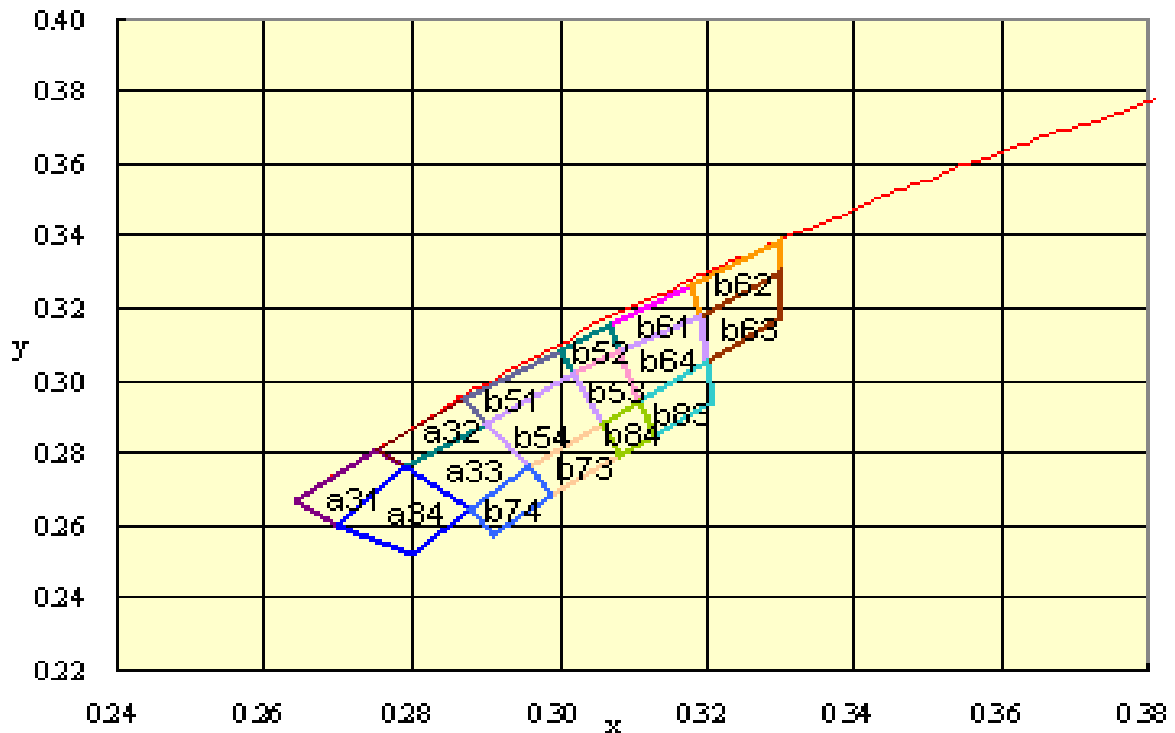
REV: C / 1

- C.I.E Chromaticity Diagram

### C.I.E. 1931 Chromaticity Diagram



### C.I.E. Chromaticity Diagram







# SURFACE MOUNT DEVICE LED

Part No. : L-T650WDT

REV: C / 1

## ● Label Explanation



CUS. PART NO: To be denominated.

CUSTOMER: To be denominated.

PART NO: Refer to P17

IV--- Luminous Intensity Code

VF--- Forward Voltage Code

CIE--- Color Rank Code

LOT NO:   E     L     P     9     4     0001    
          A    B    C    D    E    F

A---E: For series number

B---L: Local    F: Foreign

C---P: PLCC SMD

D---Year

E---Month

F---SPEC.

PACKING QUANTITY OF BAG :

3000pcs for T670 series

3000pcs for T650 series

3000pcs for S020 series

DATE CODE:   2009     04     01    
                  G    H    I

G--- Year

H--- Month

I --- Day

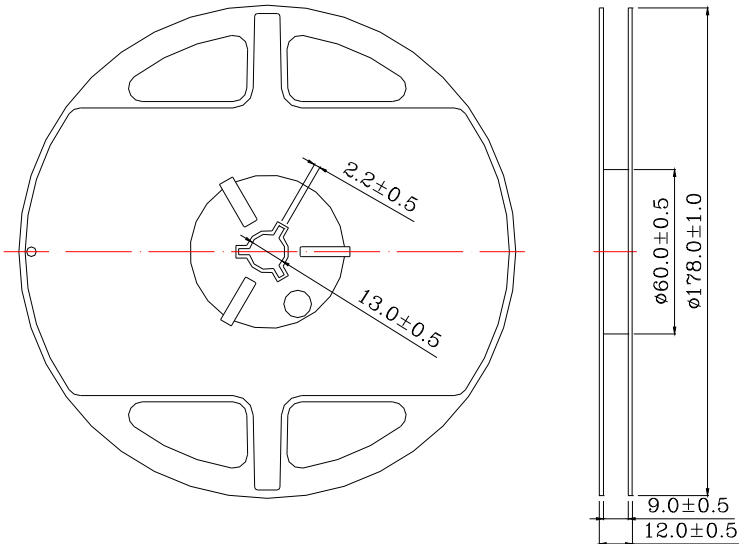


# SURFACE MOUNT DEVICE LED

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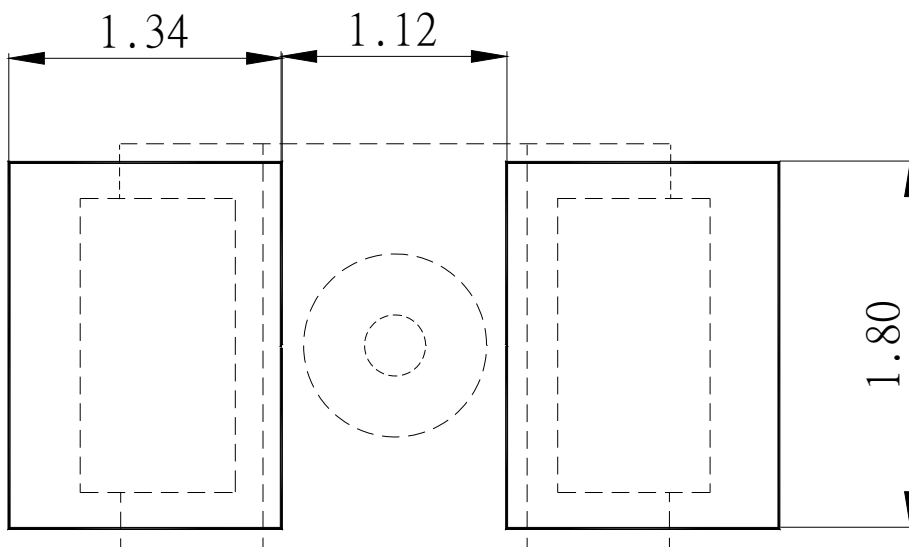
## ● Reel Dimensions



### Notes:

1. Taping Quantity : 3000pcs max
2. The tolerances unless noted is  $\pm 0.1\text{mm}$ , Angle  $\pm 0.5^\circ$  , Unit: mm.

## ● Suggest Soldering Pad Dimensions



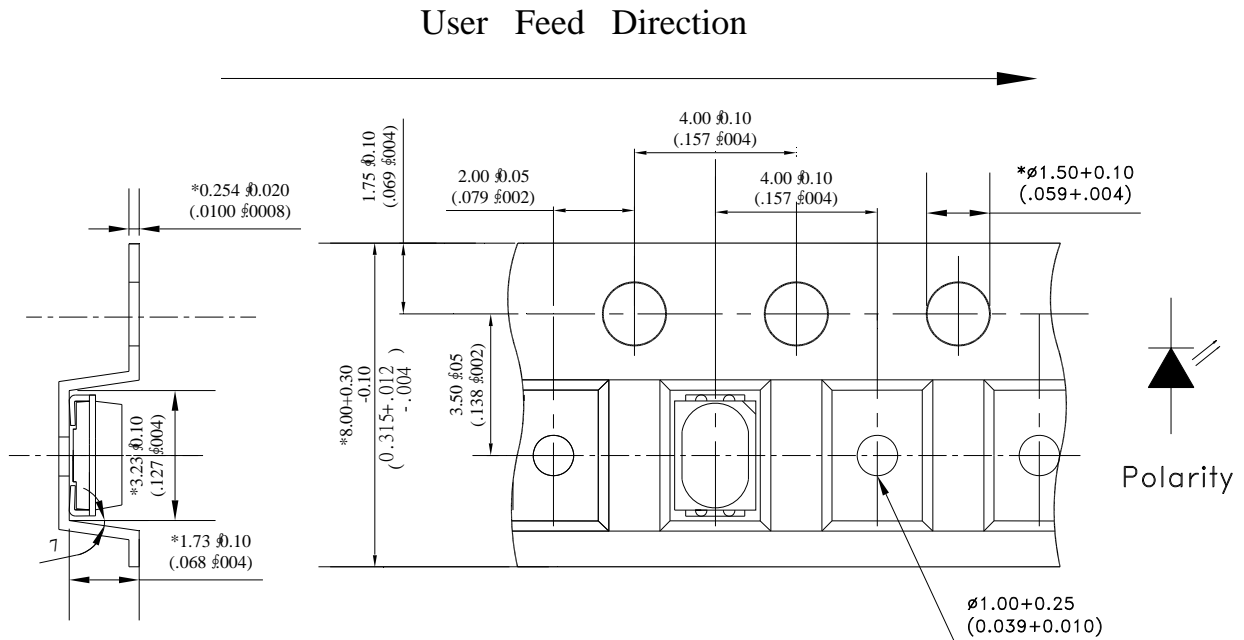


# SURFACE MOUNT DEVICE LED

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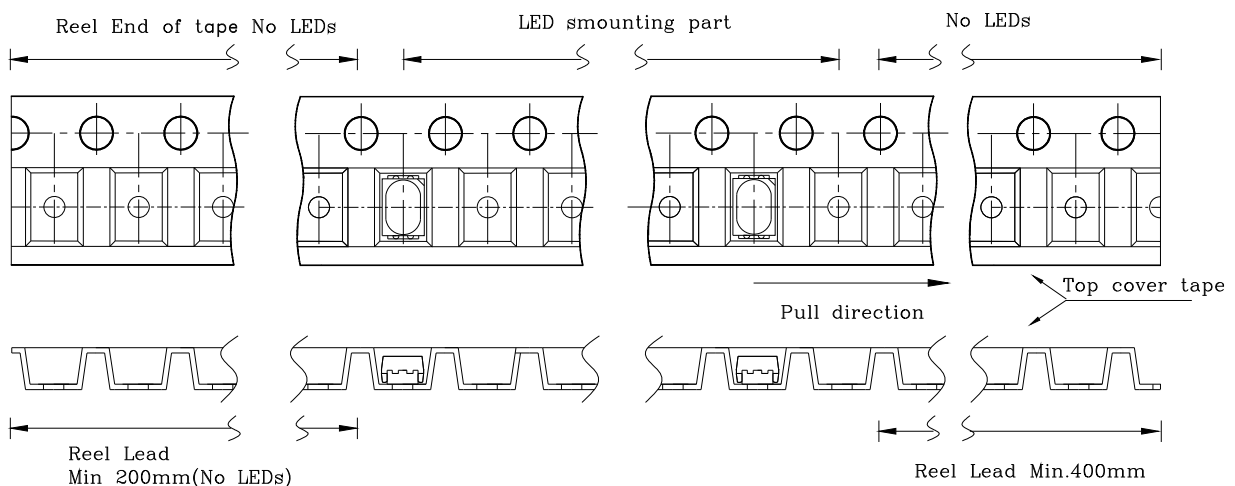
REV: C / 1

## ● Package Dimensions Of Tape And Reel

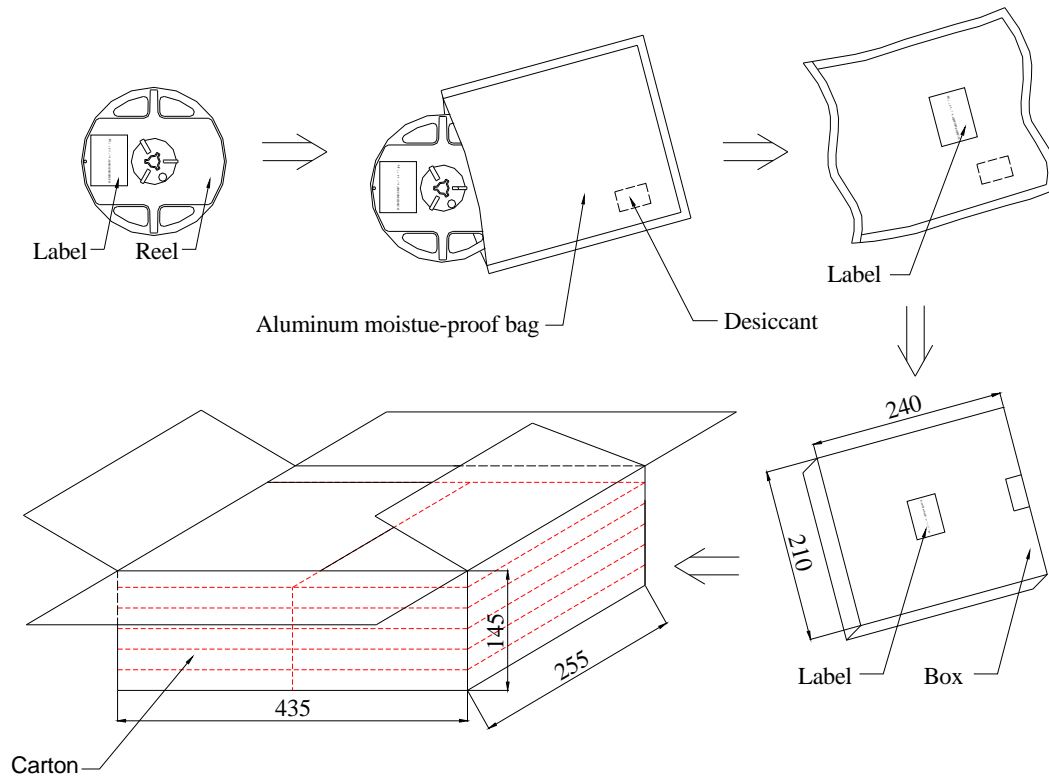


Notes: All dimensions are in millimeters.

## ● Packaging Of Electronic Components On Continuous Tapes



● Moisture Resistant Packaging



Notes : One reel in a bag, one bag in a inner box, ten inner boxes in a carton. Unit : mm.

● Cleaning

- \* If cleaning is required , use the following solutions for less than 1 minute and less than 40°C .
- \* Appropriate chemicals: isopropyl alcohol. (When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not.)
- \* Effect of ultrasonic cleaning on the LED resin body differs depending on such factors as ultrasonic power and the assembled condition. Before cleaning, a pre-test should be confirm whether any damage to the LEDS will occur.



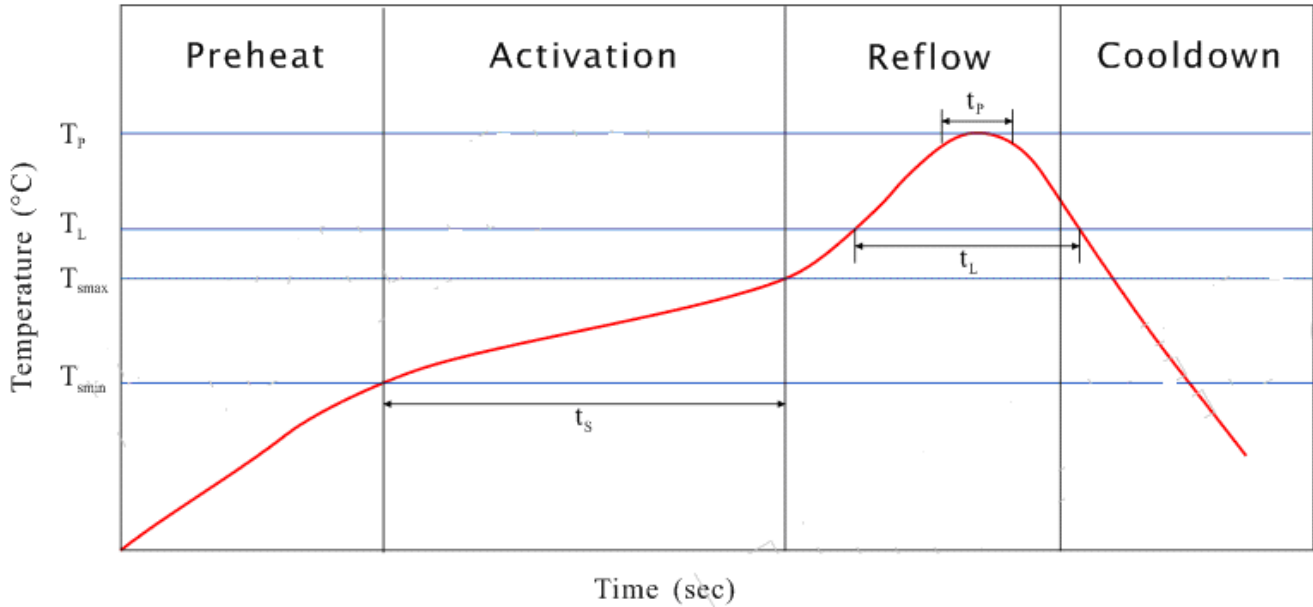
# SURFACE MOUNT DEVICE LED

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● Suggest Sn/Pb IR Reflow Soldering Profile Condition:

Reference Reflow Profile  
参考回流焊曲线图



Profile Feature	Sn99Ag0.3Cu0.7	Sn64Bi35Ag1
Preheat ramp-up rate	1 ~ 3 °C/second	1 ~ 3 °C/second
Temperature min (T <sub>smin</sub> )	120 °C	110 °C
Temperature max (T <sub>smax</sub> )	200 °C	160 °C
Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )	90-120 seconds	60-130 seconds
Average ramp-up rate (T <sub>smin</sub> to T <sub>smax</sub> )	2 °C/second max.	2 °C/second max.
Liquidous temperature (T <sub>L</sub> )	217 °C	178 °C
Time at liquidous (t <sub>L</sub> )	60 - 90 second	60 - 90 second
Peak temperature (T <sub>p</sub> )	245 °C	210 °C
Time within 5 °C of the T <sub>p</sub> (t <sub>p</sub> )	20s	20s
Average ramp-down rate (T <sub>p</sub> to T <sub>smax</sub> )	4 °C/second max.	4 °C/second max.



SURFACE MOUNT DEVICE LED

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● CAUTIONS

\* Reflow soldering should not be done more than one time.

回流焊次数不得超过 1 次。

\* Precautions should be taken to avoid the strong pressure on the encapsulated part.

LED 封装部分须避免受到外部的强力挤压。

\* After soldering, do not warp the circuit board.

焊接完成后，不得弯曲线路板。

\* If using the high temperature soldering material, it will cause damage to the LED.

一旦使用高温焊料，可能会影响 LED 的可靠性。

\* Recommend to use a convection type reflow machine with more than eight zones.

推荐使用 8 温区以上的回流焊焊接设备。

\* The preset temperature and actual temperature will have some difference in the reflow soldering machine.

回流焊设备内实际温度和设置温度会存在一定程度的偏差。

\* Reflow soldering equipment temperature suggested to be set as blow:

回流焊设备温度设置可参考以下：

Solder	1	2	3	4	5	6	7	8	键速
Sn64Bi35Ag1 (中温)	110	150	160	170	190	205	210	180	70-75 cm/min
Sn99Ag0.3Cu0.7 (高温)	130	170	185	195	210	235	245	210	70-75 cm/min

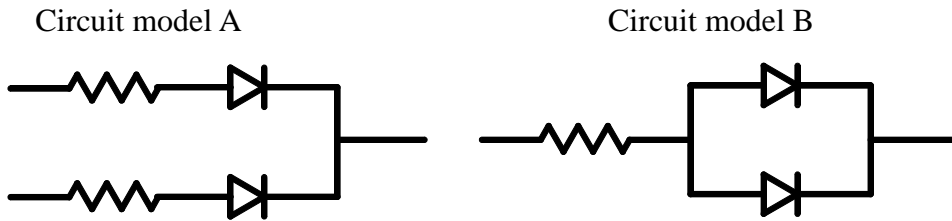


## SURFACE MOUNT DEVICE LED

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### 5. Drive Method



(A) Recommended circuit.

(B) The difference of brightness between LED`s could be found due to the Vf-If characteristics of LED.

### 6. Reliability

#### 1、 Criteria For Judging The Damage

Item	Symbol	Test Conditions	Criteria for Judgement	
			MIN.	Max.
Forward Voltage	VF	IF=20mA	-	U.S.L.*) × 1.1
Reverse Current	IR	VR=5V	-	U.S.L.*) × 2.0
Luminous Intensity	IV	IF=20mA	L.S.L**) × 0.7	-

\*) U.S.L.: Upper Standard Level

\*\*) L.S.L: Lower Standard Level



## SURFACE MOUNT DEVICE LED

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## 2、 Test Items And Results

Test Item	Reference Standard	Test Condition	Note	Number of Damaged
Resistance to Soldering Heat (Reflow Soldering)	JEITA ED-4701300 301	Tsld=260°C,10sec. (Pre treatment 30°C,70%,168hrs)	2times	0/50
Solder ability (Reflow Soldering)	JEITA ED-4701300 303	Tsld=215°C,3sec. (Lead Solder)	1time over 95%	0/50
Thermal Shock	JEITA ED-4701300 307	-40°C ~ 100°C 30min. 30min.	100cycles	0/50
Temperature Cycle	JEITA ED-4701100 105	-40°C ~ 25°C~100°C~25°C 30min. 5min. 30min. 5min	100cycles	0/50
High Temperature Storage	JEITA ED-4701200-201	Ta=100°C	1000hrs.	0/50
Temperature Humidity Storage	JEITA ED-4701100 103	Ta=60°C,RH=90%	1000hrs.	0/50
Low Temperature Storage	JEITA ED-4701200 202	Ta=-40°C	1000hrs.	0/50
Steady State Operating Life Condition		Ta=25°C,IF=20mA	1000hrs.	0/50
Steady State Operating Life of High Temperature		Ta=85°C,IF=5mA	500hrs.	0/50
Steady State Operating Life of High Humidity Heat		Ta=60°C,RH=90%,IF=15mA	500hrs.	0/50
Steady State Operating Life of Low Temperature		Ta=-30°C,IF=20mA	500hrs.	0/50
Vibration	JEITA ED-4701400 403	100~2000~100HzSweep 4min.200m/s <sup>2</sup> 3direction,4cycles	48min	0/50
Substrate Bending	JEITA ED-4702	3mm,5±1sec	1time	0/50
Stick	JEITA ED-4702	5N,10±1sec	1time	0/50

## 7.Others:

The appearance and specifications of the product may be modified for improvement without notice.





# SURFACE MOUNT DEVICE LED

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● PART NO. SYSTEM :

L - T 650 X X T - X X X X

XXXX : Special specification for customer

T : Taping for 7 inch reel  
TC : Taping for 13 inch reel

Lens color  
C : Water Clear  
W : White Diffused  
T : Color Transparent  
D : Color Diffused

KY : 9mil AlInGap 590nm Super Yellow  
KR : 9mil AlInGap 630 nm Super Red  
TE : 14mil AlInGap 624 nm Super Red  
TY: 14mil AlInGap590 nm Super Yellow  
LB : InGaN ITO rough 470nm Blue  
LG : InGaN ITO rough520nm Green  
W : InGaN + YAG White color

0 : Single chip  
1/2 : Super thin single chip  
5/6 : Dual chip  
F : Three chip(Full color)

650 : 3020 1.3T TYPE  
670 : 3528 1.9T TYPE  
020 : 3812 0.6T TYPE

C : PCB Top View Type  
T : PLCC Top View Type  
S : Side View Type