

Product Specification

Model No: CSST-ULAHR54XX-C0X

Descriptions:	
■ Product Type	: PLCC4
■ Package Size	: 3.6 x 3.1x 3.5mm
■ Emitting Color	: Red
■ Feature	: With Lens 30°



CUSTOMER APPROVED SIGNATURES	APPROVED BY	CHECKED BY	PREPARED BY
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Spec. No.	PS-ST-ULHR54XX-C0X
Rev.	F

■ **Feature**

1. High luminous intensity using AllnGaP dice Technology
2. High reliability package due to Epoxy encapsulation
3. Narrow viewing angle at 30 ° .
4. RoHS compliant.
5. Pb free.
6. Can prevent sulfide
7. Water-Resistant(IPX7)

■ **Device Selection Guide**

Part No.	Chip Material	Color	
		Emitted	Resin
CSST-ULHR54XX-C0X	AllnGaP	Red	Water Clear

■ **Applications**

1. Traffic lights
2. Backlighting (LCD, switches, keys, displays, illuminated advertising)
3. Interior and exterior automotive lighting (e.g. dashboard backlighting and brake lights).
4. Substitution of micro incandescent lamps
5. Marker lights (e.g. steps, exit ways, etc.)
6. Signal and symbol luminaire

■ Absolute Maximum Ratings

Ta = 25 °C

Parameter	Symbol	Rating	Unit
Power Dissipation	Pd	210	mW
Forward Current(DC)	If	60	mA
Peak Forward Current (Duty Cycle 1/10,1KHz) *1	Ifp	80	mA
Reverse Voltage*2	Vr	5	V
ESD Sensitivity	ESD	1000	V
LED Junction Temperature*3	Tj	125	°C
Operating Temperature.	Topr	-40~ +100	°C
Storage Temperature.	Tstg	-40 ~ +100	°C
Soldering Temperature.(Reflow Soldering)	Tsol	260°C for 10 sec	
Soldering Temperature.(Hand Soldering)	Tsol	350°C for 3 sec	

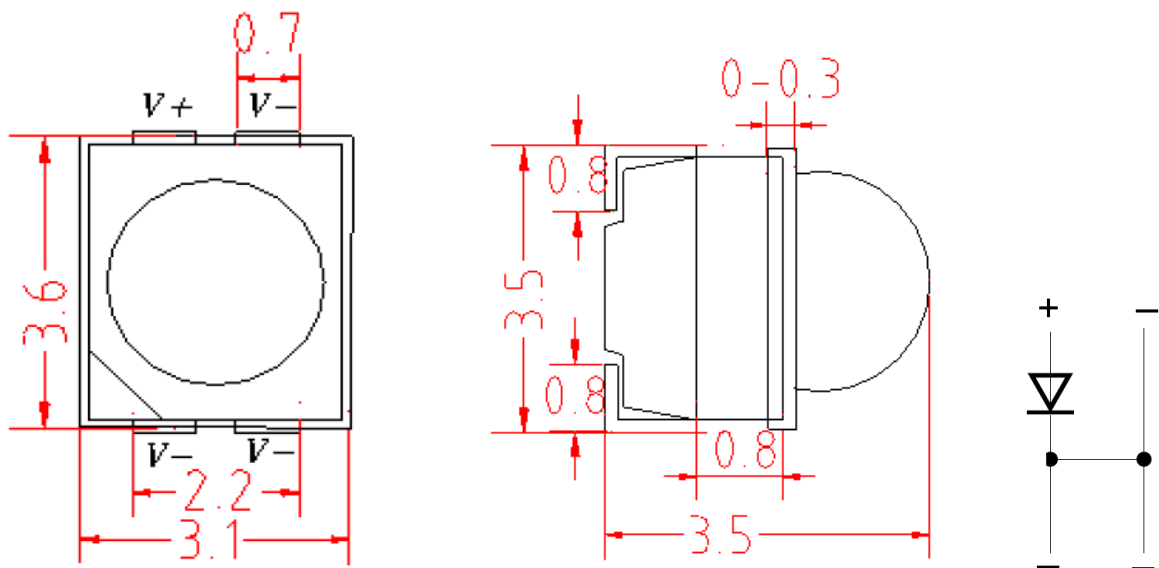
Notes:

1. Pulse width \leq 0.1 msec, duty \leq 1/10
2. The device can not operated under continuous reverse voltage.
3. Proper current rating must be observed to maintain junction temperature below the maximum at all the time.

■ Electrical / Optical Characteristics

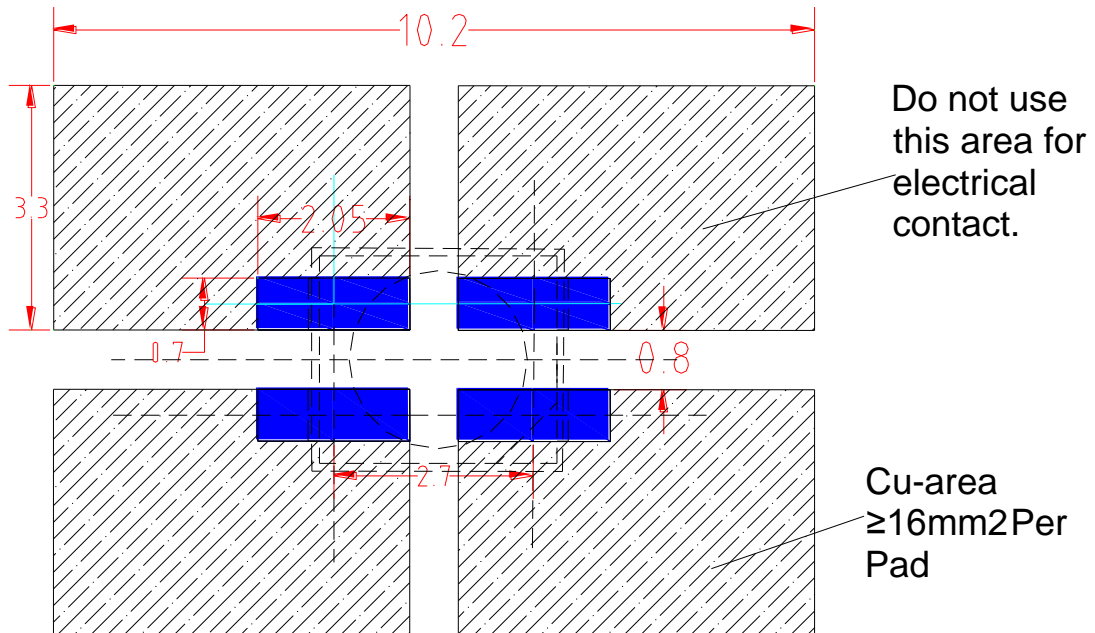
Parameter	Symbol	Min	Typ	Max	Unit	Condition
Forward Voltage	V_f		2.6		V	$I_f = 50\text{mA}$
Luminous Intensity	I_v		11000		mcd	$I_f = 50\text{mA}$
Dominant Wavelength	λ_d		621		nm	$I_f = 50\text{mA}$
Viewing Angle	$2\theta_{1/2}$		30		Deg	$I_f = 50\text{mA}$
Reverse Current	I_r			10	μA	$V_r = 5\text{V}$
ESD Sensitivity	HBM			1000	V	MIL-STD-833G

■ Package Outline Dimensions



Notice: Tolerance of measurement of Dimension: $\pm 0.2\text{mm}$

■ Recommended Soldering Pad Pattern



■ Luminous Intensity Rank Limits ($I_f = 50\text{mA}$)

unit: mcd

Luminous Intensity	35	36	37	38
Part No.				
CSST-ULAHR54XX-C0X	6600-8600	8600-11200	11200-14600	14600-19000

Notice: Tolerance of measurement of Luminous Intensity: $\pm 12\%$

■ Forward Voltage Rank Limits (IF =50mA)

Vf Rank				
Bin Code	Min	Max	Unit	Condition
V2A	2.1	2.4	V	If=50mA
V2B	2.4	2.7		
V2C	2.7	3.0		
V3A	3.0	3.3		

Notice: Tolerance of measurement of Forward Voltage: $\pm 0.1V$

■ Dominant Wavelength Rank Limits--

Wavelength Rank				
Bin Code	Min	Max	Unit	Condition
A5	615	620	nm	If=50mA
R1	620	625		
R2	625	630		

Notice: Tolerance of measurement of Dominant Wavelength: $\pm 1nm$

■ Electrical / Optical Characteristics Curves (Ta = 25°C Unless Otherwise Noted)

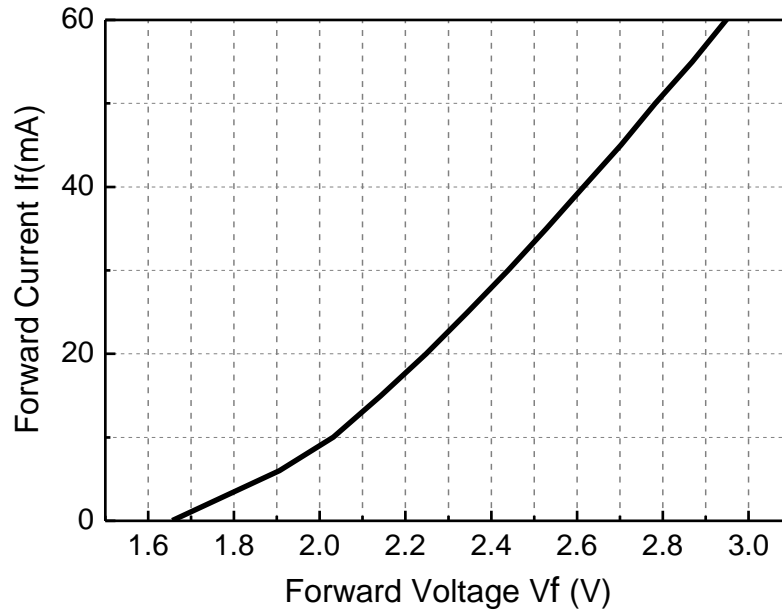


Figure1. Forward Current VS. Forward Voltage

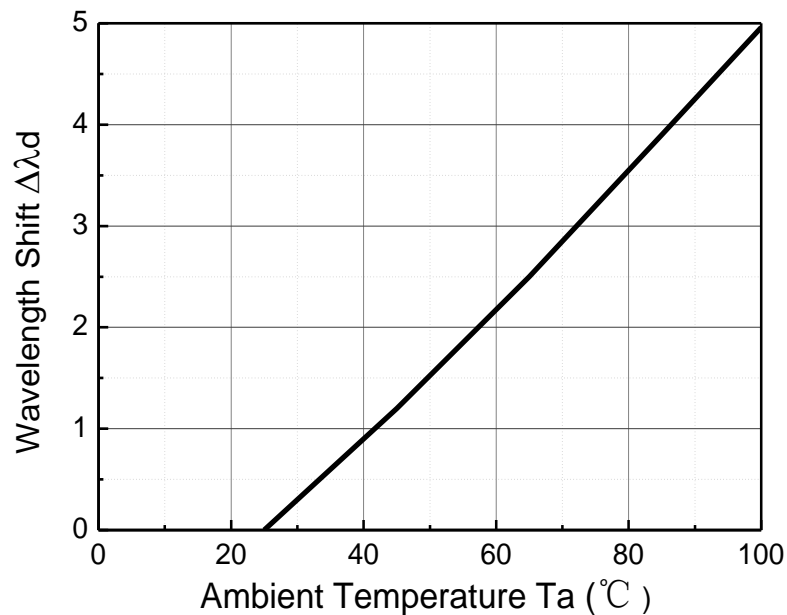


Figure2. Wavelength Shift VS. Ambient Temperature

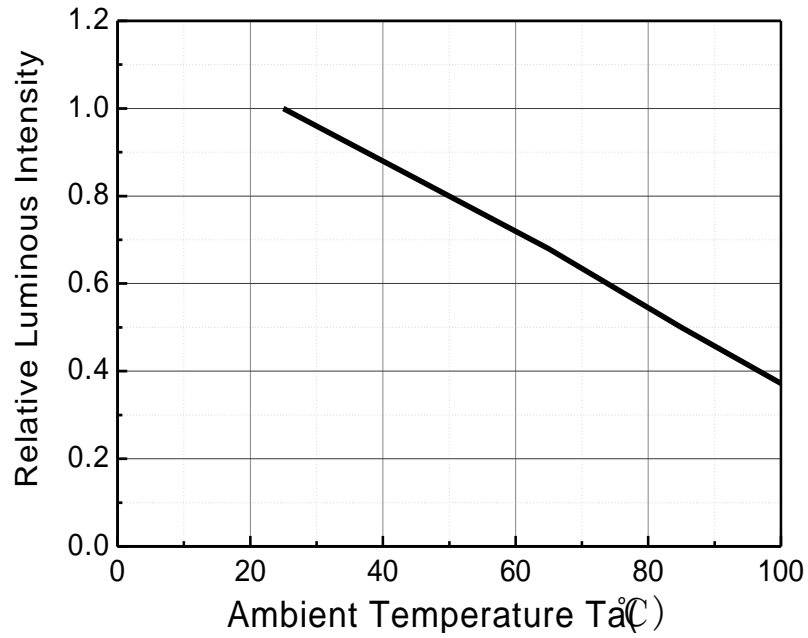


Figure3. Relative Luminous Intensity VS. Ambient Temperature

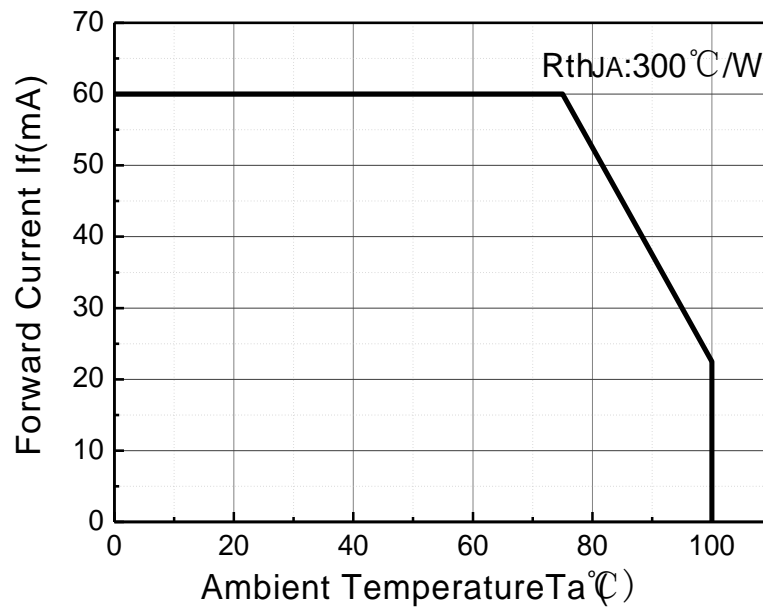


Figure4. Forward Current VS. Ambient Temperature

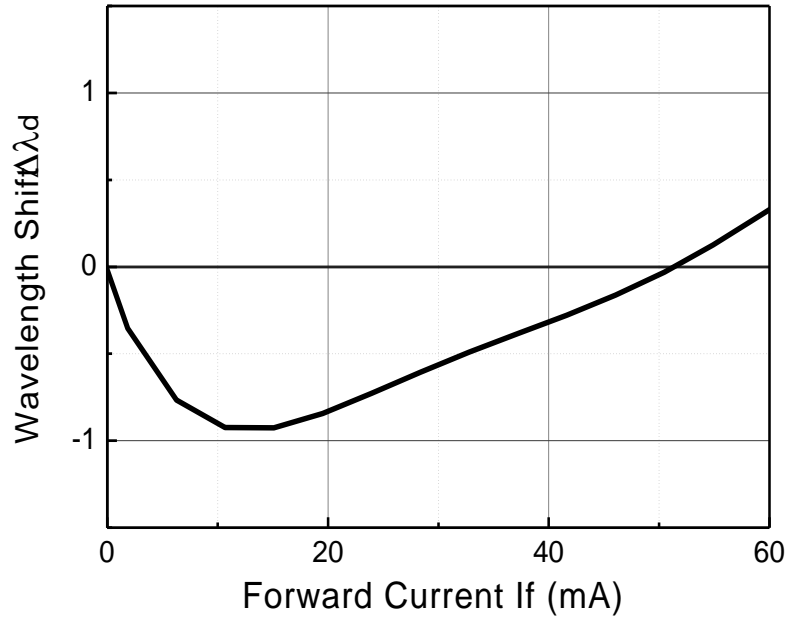


Figure5. Wavelength Shift VS. Forward Current

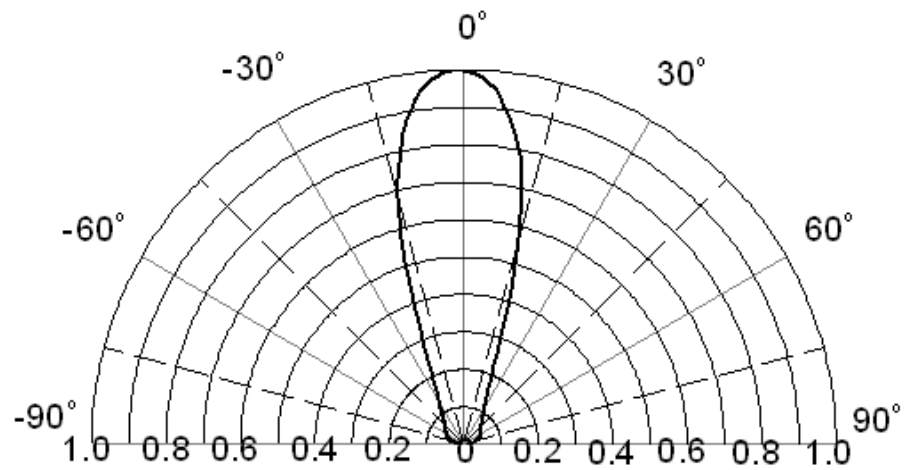


Figure6. Relative Luminosity VS. View Angle

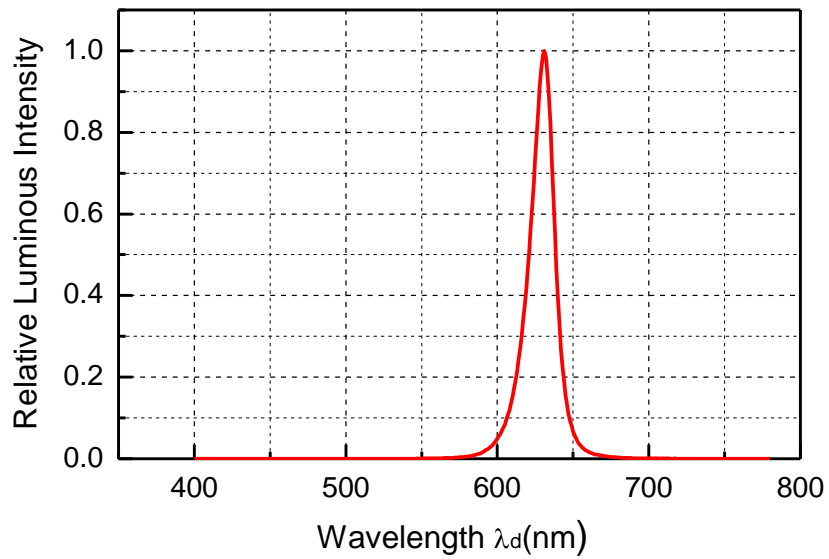


Figure7. Spectral Power Distribution VS. Wavelength

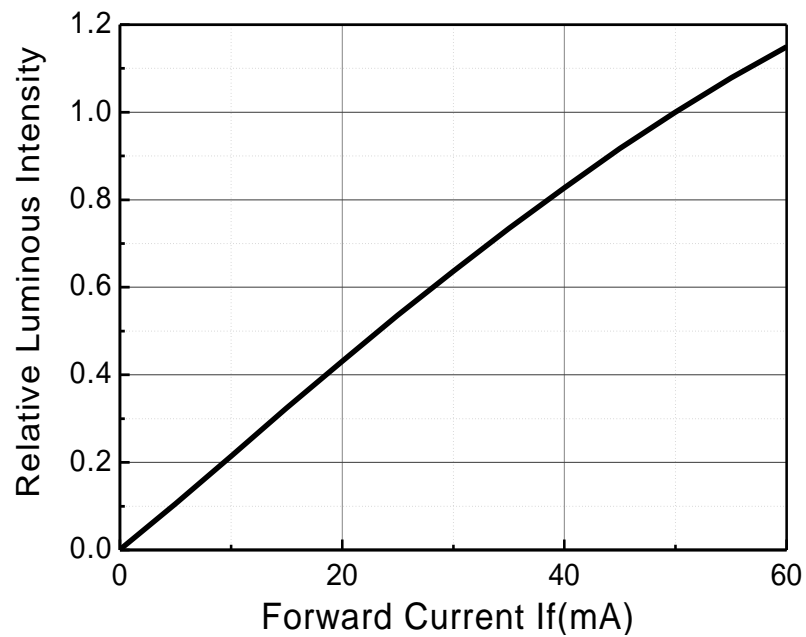
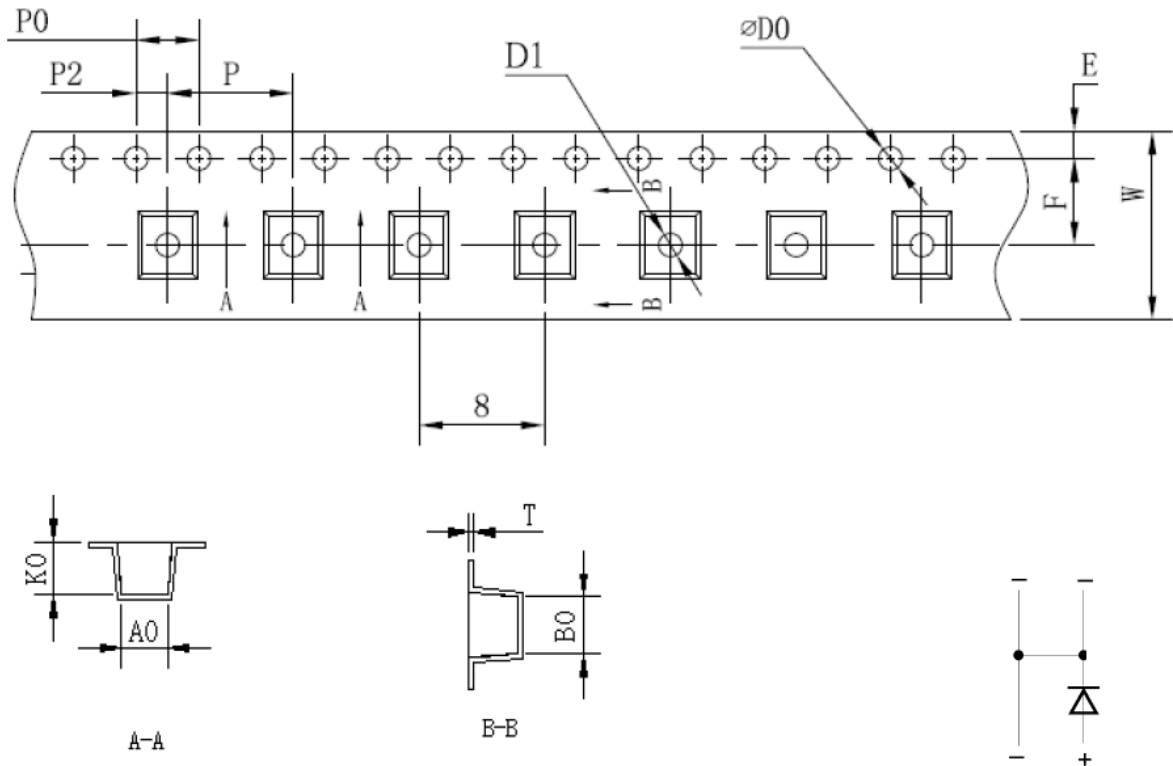


Figure8. Relative Luminous Intensity VS. Forward Current

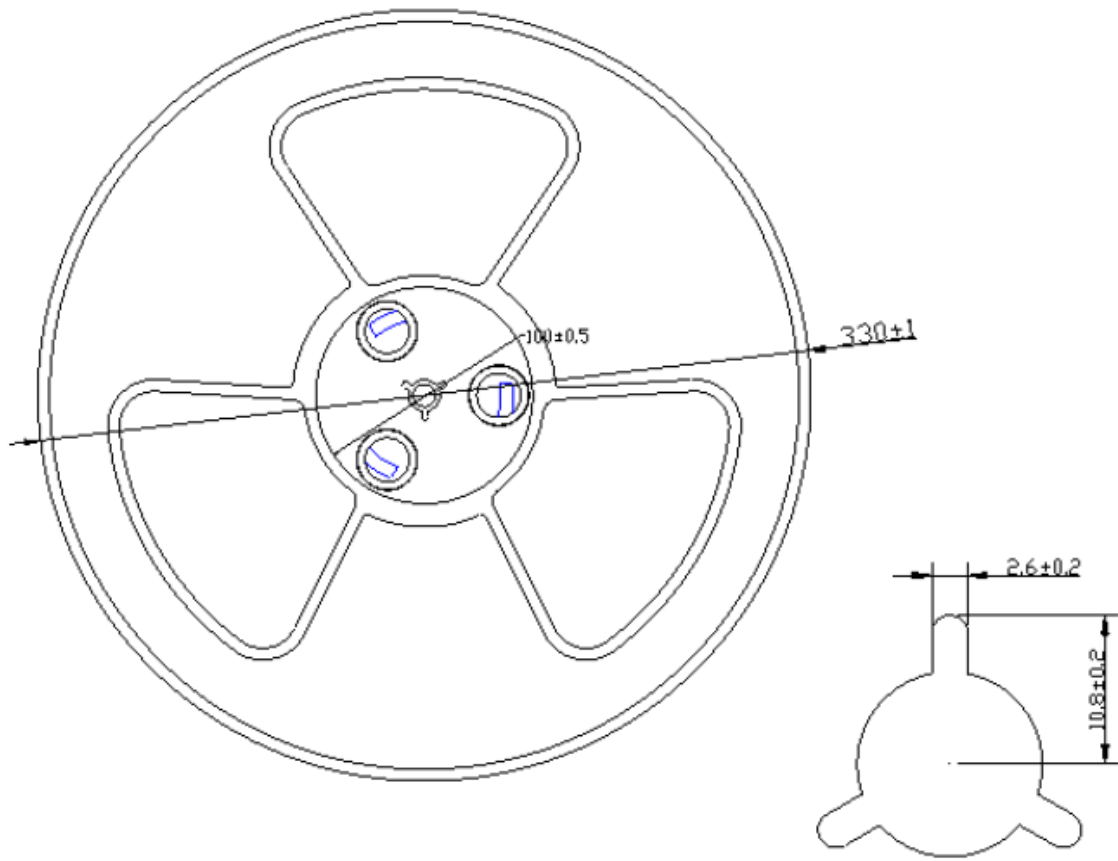
■ Packing & Label Specifications

1. Tape Dimension



Symbol	A0	B0	K0	P0	P	P2	T
Spec	3.2±0.1	3.7±0.1	3.45±0.1	4.0±0.1	8.0±0.1	2.00±0.1	0.3±0.05
Symbol	E	F	D0	D1	W		
Spec	1.75±0.10	5.50±0.05	1.5±0.1	1.5±0.1	12±0.1		

2. Reel Dimension

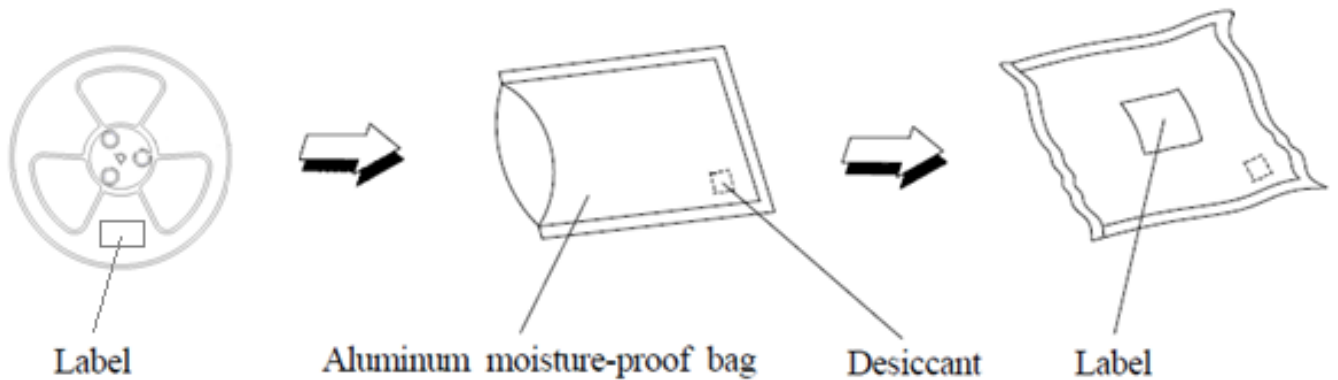


Unit: mm

Notice: (1) Quantity: 2000 PCS/Reel

(2) Tolerance unless mentioned is ±0.2mm

3. Packing Model



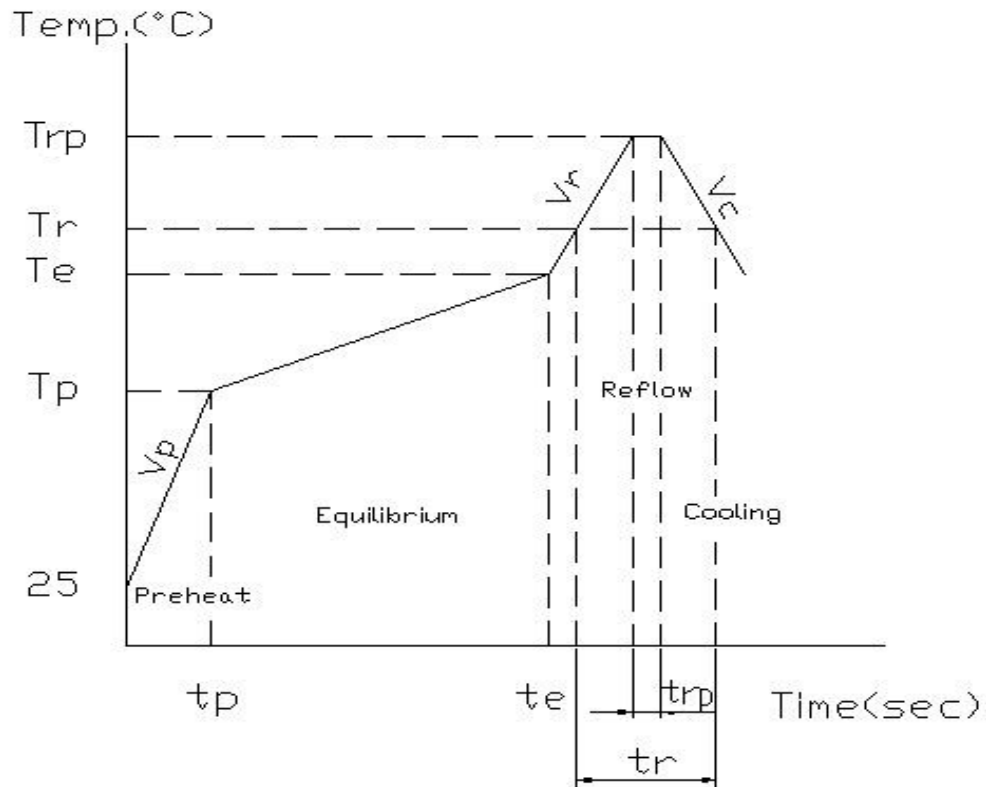
4. Packing Amount

Package Name	Package Dimension		Distribution of the layer or box		Total Mount		Note
	Size	Unit	Amount	Unit	Amount	Unit	
Reel	330	mm	1	Reel	2000	Pcs	
Inner Box	405*385*95	mm	5	Reel	10000	Pcs	
Outer Box	395*395*410	mm	4	Inner Box	40000	Pcs	

■ Soldering Characteristics-

IR-reflow Condition (Pb free)

Area	Title	Symbol	Min	Max	Unit
(1)Preheat	Ramp-up rate	Vp	1	5	°C/sec
	temperature	Tp	150	-	°C
	time	tp	-	-	sec
(2)Equilibrium	Ramp-up rate	Ve	-	-	°C/sec
	temperature	Te	150	200	°C
	Time	te	60	120	sec
(3)Reflow	Ramp-up rate	Vr	1	5	°C/sec
	temperature	Tr	220	-	°C
	Time	tr	-	60	sec
	Peak temperature	Trp	-	260	°C
	Peak time	trp	-	10	sec
(4)Cooling	Ramp-down rate	Vc	3	6	°C/sec



Hand Soldering (Iron Condition)

Soldering Iron:30W Max

Temperature 350°C Max (iron tip 260°C Max)

Soldering Time:3 Seconds Max(Once)

■ **JEDEC Information –**

JEDEC is used to determine what classification level should be used for initial reliability qualification. Once identified, the LEDs can be properly packaged, stored and handled to avoid subsequent thermal and mechanical damage during the assembly solder attachment and/or repair operation. PLCC 3528 series are certified at level 3.

Characteristics for PLCC 3528 series

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Equivalent	
	Time	Condition	Time(hours)	Condition	Time(hours)	Condition
3	168 hours	≤30°C/60%RH	192+5/-0	30°C/60%RH	40+1/-0	60°C/60%RH

Notes:

The standard soak time includes a default value of 24 hours for semiconductor manufacturer’s exposure time (MET) between bake and bag, and includes maximum time allowed out of the bag at the distributor’s facility

■ Reliability Test Program/ Reliability Test Item

NO.	Test Item	Test Conditions	Test	Failure	Units
			Duration	Criteria	Failed/Tested
1	Resistance to Soldering Heat	T.max: 260°C, 10sec,reflows Pretreatment 60°C/60% 40hrs	3times	#1	0/10
2	Solderability (Reflow Soldering)	T.max=245°C,5sec	1time	#3	0/10
3	Temperature Cycle	-40°C ~ 100°C 15min 15min	1000cycles	#1	0/26
4	High Temperature Forward Bias	Ta=75°C, IF=60mA	1000hrs.	#2	0/26
5	High Temperature High Humidity Bias	Ta=85°C RH=85% IF=45mA 30min on/30min off	1000hrs.	#2	0/26
6	Power and Temperature Cycle	-40°C ~ 100°C 15min 15min IF=22mA 5min on/5min off	1000cycles	#2	0/26

Failure Criteria

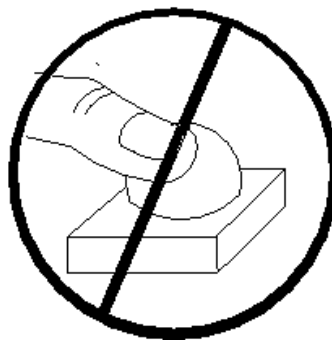
Criteria #	Items	Conditions	Failure Criteria
#1	Forward Voltage(VF)	IF=50mA	>U.S.L.X1.1
	Luminous Intensity(IV)	IF=50mA	<L.S.L.X0.7
#2	Forward Voltage(VF)	IF=50mA	>U.S.L.X1.1
	Luminous Intensity(IV)	IF=50mA	<L.S.L.X0.5
#3	Solderability		Less than 95% solder coverage

U.S.L.: Upper Specification limit L.S.L.: Lower Specification Limit

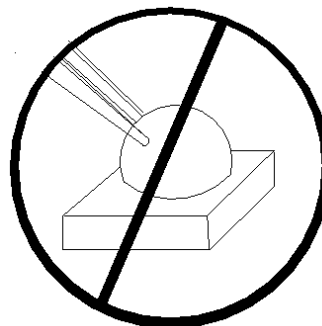
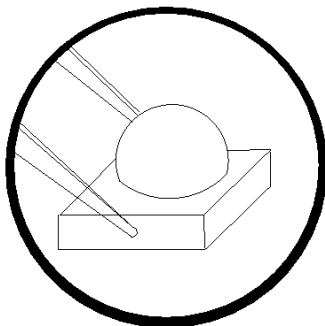
■ **Handling of Epoxy Resin LEDs**

● **Handling Indications**

- i. When handling the product, do not touch it directly with bare hands as it may contaminate the surface and affect on optical characteristics. In the worst cases, excessive force to the product might result in catastrophic failure due to package damage and/or wire breakage.



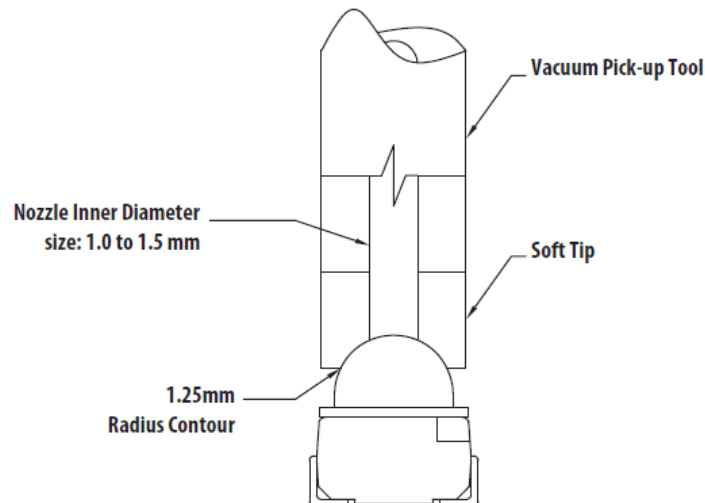
- ii. When handling the product with tweezers, LEDs should only be handled from the side and make sure that excessive force is not applied to the resin portion of the product. Failure to comply can cause the resin portion of the product to be cut, chipped, delaminated and/or deformed, and wire to be broken, and thus resulting in catastrophic failure.



Pick and place

Recommended conditions: Outer nozzle > $\Phi 2.5\text{mm}$

Avoid direct contact to the encapsulant with picking up nozzle. Failure to comply might result in pick and place processes or damage to encapsulant. In the worst cases, catastrophic failure of the LEDs due to wire deformation and/or breakage.



■ Storage

● Storage Conditions

A. Before opening the package:

The LEDs should be kept at $\cong 40^{\circ}\text{C}$ and $\cong 90\%\text{RH}$. The LEDs should be used within a year. When storing the LEDs, moisture proof packaging with absorbent material is recommended.

B. After opening the package:

The LEDs should be kept at $\cong 30^{\circ}\text{C}$ and $\cong 60\%\text{RH}$. The LEDs should be soldered within 168 hours after opening the package. If unused LEDs remain, they should be stored in moisture proof packages, such as sealed containers with packages of moisture absorbent material. It is also recommended to return the LEDs to the original moisture proof bag and to reseal the moisture proof bag again.

- If the moisture absorbent material has faded away or the LEDs have exceeded the storage time, baking treatment should be performed using the following conditions.

Baking treatment: more than 24 hours at $65 \pm 5^{\circ}\text{C}$

- This product has silver plated metal parts that are inside and/or outside the package body. The silver plating becomes tarnished when being exposed to an environment which contains corrosive gases. Any LED with tarnished leads may lead to poor solderability and deterioration of optical characteristics. Please do not expose the LEDs to corrosive atmosphere during storage.
- After assembly and during use, silver plating can be affected by the corrosive gases emitted by components and materials in close proximity of the LEDs within an end product, and the gases

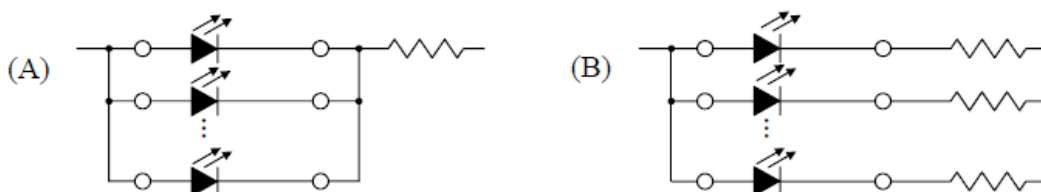
entering into the product from the external atmosphere. The above should be taken into consideration when designing.

■ Moisture Proof Package

- When moisture is absorbed into the SMT package it may vaporize and expand during soldering. There is a possibility that this can cause exfoliation of the contacts and damage to the optical characteristics of the LEDs. For this reason, the moisture proof package is used to keep moisture to a minimum in the package.
- The moisture proof package is made of an aluminum moisture proof bag. A package of a moisture absorbent material is inserted into the aluminum moisture proof bag. The Epoxy I changes its color from blue to red as it absorbs moisture.
- Please avoid rapid transitions in ambient temperature, especially in high humidity environments where condensation can occur.

■ Recommended circuit

- In designing a circuit, the current through each LED must not exceed the absolute maximum rating specified for each LED. It is recommended to use Circuit B which regulates the current flowing through each LED. In the meanwhile, when driving LEDs with a constant voltage in Circuit A, the current through the LEDs may vary due to the variation in forward voltage (VF) of the LEDs. In the worst case, some LED may be subjected to stresses in excess of the absolute maximum rating.



- This product should be operated in forward bias. A driving circuit must be designed so that the product is not subjected to either forward or reverse voltage while it is off. In particular, if a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

■ Heat Generation –

- Thermal design of the end product is of paramount importance. Please consider the heat generation of the LED when making the system design. The coefficient of 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. It is necessary to avoid intense heat generation and operate within the maximum ratings given in this specification.

- The operating current should be decided after considering the ambient maximum temperature of LEDs.

■ **Static Electricity**

- Static electricity or surge voltage damages the LEDs. It is recommended that a wrist band or an anti-electrostatic glove be used when handling the LEDs.
- All devices, equipment and machinery must be properly grounded. It is recommended that precautions be taken against surge voltage to the equipment that mounts 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).
- Damaged LEDs will show some unusual characteristics such as the leak current remarkably increases, the forward voltage becomes lower, or the LEDs do not light at the low current.

Criteria: (VF > 2.0V at IF=0.5mA)

■ **Cleaning –**

- It is recommended that isopropyl alcohol be used as a solvent for cleaning the LEDs. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not. Freon solvents should not be used to clean the LEDs because of worldwide regulations.
- Do not clean the LEDs by the ultrasonic. When it is absolutely necessary, the influence of ultrasonic cleaning on the LEDs depends on factors such as ultrasonic power and the assembled condition. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

■ Change story –

REV.	Date	Change Description
A	2016.12.16	Original Version
B	2017.12.07	Change Package Outline Dimensions Change Tape Dimension
C	2018.09.12	Change Forward Voltage Rank Limits
D	2019.08.30	Change Absolute Maximum Ratings Change Soldering Characteristics
E	2019.12.24	Change Feature Change Reliability Test Program/ Reliability Test Item
F	2023.03.15	Change address