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# LED SPECIFICATION

**PART NO. : EOL-K5RTDD0-TK**

PART DESCRIPTION:

4 Ø 105°/45° Red LED Lamp

EOI			CUSTOMER APPROVED
ACTION	NAME	DATE	
PREPARED	<i>Cathy Huang</i>	<i>2006/4/27</i>	
CHECKED	<i>Amy Lin</i>	<i>2006/4/27</i>	
APPROVED	<i>Ader Wu</i>	<i>2006/4/27</i>	

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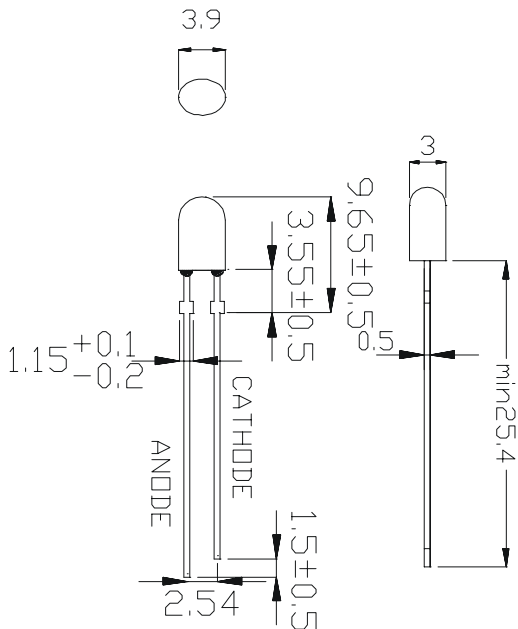
## Features

- ◆ Oval Shape Package
- ◆ Wide Viewing Angle:  
major axis 105°  
minor axis 45°
- ◆ High brightness AlInGaP LED
- ◆ UV Resistant Epoxy
- ◆ Pb free & RoHS Compliant Product

## Applications

- ◆ Indoor/Outdoor Applications
- ◆ Full Color Signs
- ◆ Variable Message Signs

## Package Dimension

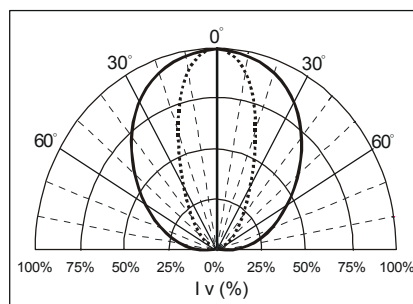


### Notes:

1. All dimensions are in millimeter.
2. Tolerance is  $\pm 0.20$ mm unless otherwise noted.
3. Protruded resin under flange is 1.5mm max.
4. Lead spacing is measured where the leads emerge from the package.

Lens Color	Beam Color	Lead Frame Material	Stand Off	Flange
Red Diffused	Red	Copper base	Yes	No

## Beam Pattern



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## Absolute Maximum Ratings at $T_A=25^\circ\text{C}$

Parameter	Symbol	MAX.	Unit
Average Forward Current <sup>[a] [c]</sup>	$I_F$	30	mA
Peak Forward Current <sup>[b]</sup>	$I_{\text{peak}}$	100	mA
Reverse Voltage	$V_R$	5	V
Power Dissipation	$P_D$	78	mW
Current Linearity vs. Ambient Temperature	$TC_I$	- 0.5	mA/ $^\circ\text{C}$
LED Junction Temperature	$T_J$	125	$^\circ\text{C}$
Operating Temperature Range <sup>[c]</sup>	$T_{\text{OPR}}$	-40 $^\circ\text{C}$ ~ +85 $^\circ\text{C}$	
Storage Temperature Range	$T_{\text{STO}}$	-40 $^\circ\text{C}$ ~ +100 $^\circ\text{C}$	
Lead Soldering Condition [4mm(.157") away from epoxy]	$T_{\text{SOL}}$	260 $^\circ\text{C}$ / 5 seconds	

**Note:** [a] Design of heat dissipation should be considered.

[b] Duty Ratio=1/10, Pulse Width=0.1ms.

[c]The allowable operating current at different operation temperature, please take reference from Fig. 4 page 4.

## Electrical and Optical Characteristics at $T_A=25^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	$I_V$	470	700	---	mcd	$I_F=20\text{mA}$
Viewing Angle	$2\theta_{1/2}$	---	105/45	---	Deg	$I_F=20\text{mA}$
Dominant Wavelength	$\lambda_D$	620	628	640	nm	$I_F=20\text{mA}$
Spectral Half Width	$\Delta\lambda$	---	25	---	nm	$I_F=20\text{mA}$
Forward Voltage	$V_F$	1.8	2.0	2.6	V	$I_F=20\text{mA}$
Reverse Current	$I_R$	---	---	10	$\mu\text{A}$	$V_R=5\text{V}$

## Rank Combination

Dominant Wavelength $\lambda_D$ (nm) @ $I_F=20\text{mA}$			Luminous Intensity $I_V$ (mcd) @ $I_F=20\text{mA}$			Forward Voltage $V_F$ (v) @ $I_F=20\text{mA}$		
Code	min	max	Code	min	max	Code	min	max
RB	620	625	6P	470	660	G	1.8	2.0
R7	625	630	6Q	660	920	H	2.0	2.2
RH	630	640	6R*	920	1285	J	2.2	2.4
-	-	-	-	-	-	6	2.4	2.6

### **Note:**

- All of rank combinations which include luminous intensity, dominant wavelength, and forward voltage will be included in every shipment.
- Measurement Uncertainty of the Luminous Intensity:  $\pm 15\%$
- Measurement Uncertainty of the Dominant Wavelength:  $\pm 1\text{nm}$
- Measurement Uncertainty of the Voltage:  $\pm 0.05\text{V}$
- [\*] Bin with less distribution.

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## Typical Electrical / Optical Characteristics Curves

(25°C Ambient Temperature Unless Otherwise Noted)

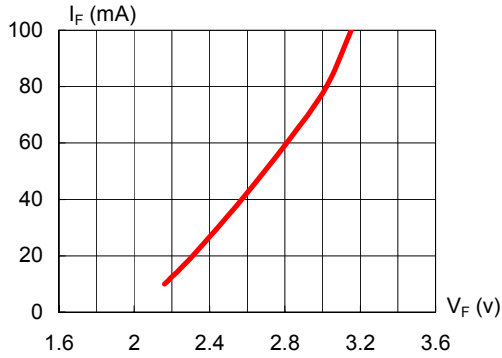


Fig.1 Forward Current vs. Forward Voltage

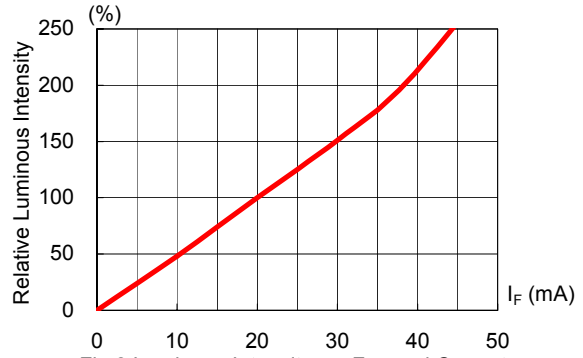


Fig.2 Luminous Intensity vs. Forward Current

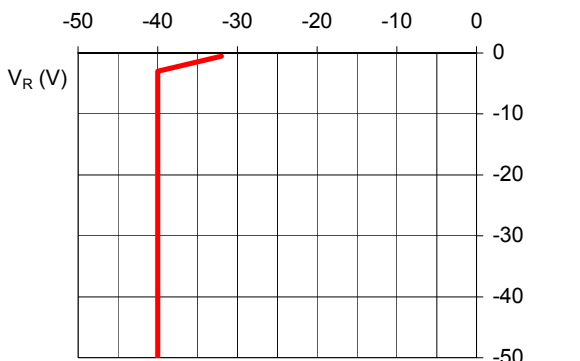


Fig.3 Reverse Current vs. Reverse Voltage

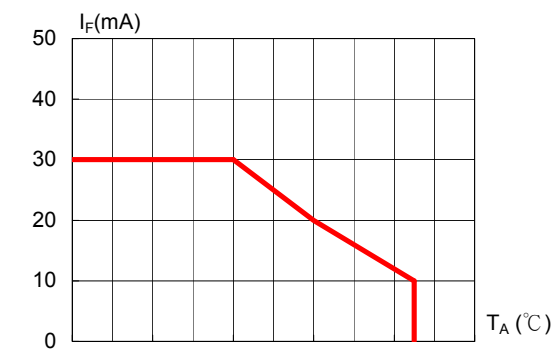


Fig.4 Allowable Forward Current vs. Ambient Temperature

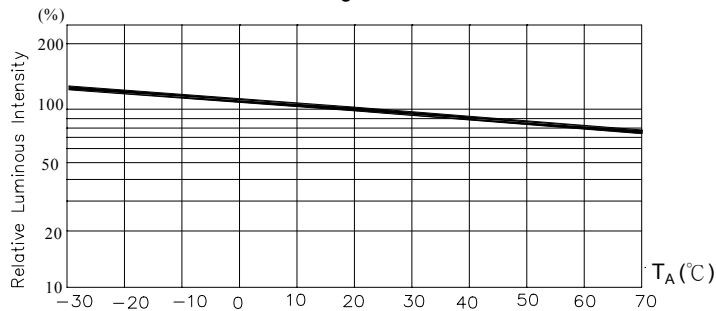


Fig.5 Luminous Intensity at  $I_F = 20mA$  vs. Ambient Temperature

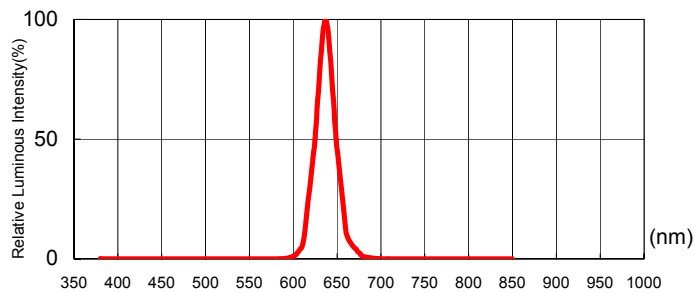


Fig.6. Relative Luminous Intensity vs. Wavelength

**Note: The data shown above are typical curves. Every LED component may have some variations of characteristics.**

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## Reliability Test

EOI'S LED lamps are checked by reliability test based on MIL standards.

### 1. Test Conditions, Acceptable Criteria & Results:

Classification	Test Item	Standard Test Method	Test Conditions	Duration	Unit	Acc / Rej Criteria	Result
Life Test	Operation Life Test (OLT)	MIL-STD-750D Method 1026.3	$T_A=25^{\circ}\text{C}$ , $I_F=30\text{mA}$ *	1000 Hrs	100	0 / 1	Pass
Environment Test	High Temperature Storage (HTS)	MIL-STD-750D Method 1032.1	$T_A=100^{\circ}\text{C}$	1000 Hrs	100	0 / 1	Pass
	Low Temperature Storage (LTS)	MIL-STD-750D Method 1032.1	$T_A=-40^{\circ}\text{C}$	1000 Hrs	100	0 / 1	Pass
	Temp. & Humidity with Bias (THB)	MIL-STD-750D Method 103B	$T_A=85^{\circ}\text{C}$ , Rh=85% $I_F=20\text{mA}$ **	500 Hrs	100	0 / 1	Pass
	Thermal Shock Test (TST)	MIL-STD-750D Method 1056.1	$0^{\circ}\text{C} \sim 100^{\circ}\text{C}$ 2min            2min	100 cycles	100	0 / 1	Pass
	Temperature Cycling Test (TCT)	MIL-STD-750D Method 1051.5	$-40^{\circ}\text{C} \sim 25^{\circ}\text{C} \sim 100^{\circ}\text{C} \sim 25^{\circ}\text{C}$ 30min 5min 30min 5min	100 cycles	100	0 / 1	Pass
Mechanical Test	Solderability	MIL-STD-750D Method 2026.4	$235\pm 5^{\circ}\text{C}$ , 5 sec	1 time	20	0 / 1	Pass
	Resistance to Soldering Heat	MIL-STD-750D Method 2031.1	$260\pm 5^{\circ}\text{C}$ , 10 sec	1 time	20	0 / 1	Pass
	Lead Integrity	MIL-STD-750D Method 2036.3	Load 2.5N (0.25kgf) $0^{\circ} \sim 90^{\circ} \sim 0^{\circ}$ , bend	3 times	20	0 / 1	Pass

Remark : (\*)  $I_F=30\text{mA}$  for AllInGaP chip ;  $I_F=20\text{mA}$  for InGaN chip

(\*\*)  $I_F=20\text{mA}$  for AllInGaP chip ;  $I_F=10\text{mA}$  for InGaN chip

### 2. Failure Criteria ( $T_A=25^{\circ}\text{C}$ ):

Test Item	Symbol	Test Conditions	Criteria for Judgment	
			Min.	Max.
Luminous Intensity	$I_V$	$I_F=20\text{mA}$	LSL $\times 0.7$ **	
Voltage (Forward)	$V_F$	$I_F=20\text{mA}$		USL $\times 1.1$ *

(\*) USL : Upper Standard Level , (\*\*) LSL : Lower Standard Level

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## Bulk Package

<b>eoi</b> EXCELLENCE OPTO. INC.		
PART NO.		
LOT NO.		QC:
Code		
DATE		
QUANTITY		pcs
<small>H-Z XXXXXX-XXXXXX</small>		

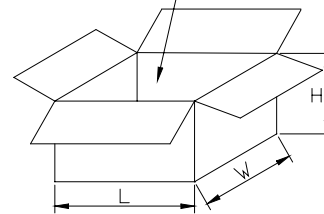
label

Anti-static/anti-corrosion bag	
H	: 200mm
L	: 180mm
PCS/BAG	
3.0/4.0/5.0mm	: 500pcs
>7.5mm	: 400pcs



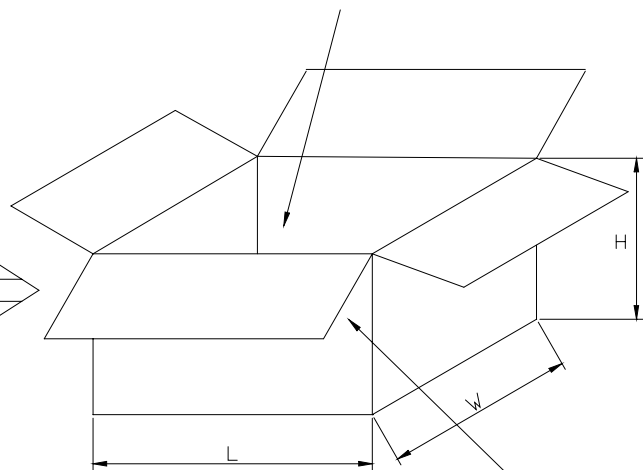
Bag

Corrugated paper box(3 layers)	
H	: 140mm
L	: 350mm
W	: 260mm
PCS/INNER BOX	
3.0/4.0/5.0mm	: 5,000pcs
>7.5mm	: 4,000pcs



Inner Box

Corrugated paper box(5 layers)	
H	: 320mm
L	: 380mm
W	: 280mm
PCS/OUTER BOX	
3.0/4.0/5.0mm	: 10,000pcs
>7.5mm	: 8,000pcs



Outer Box

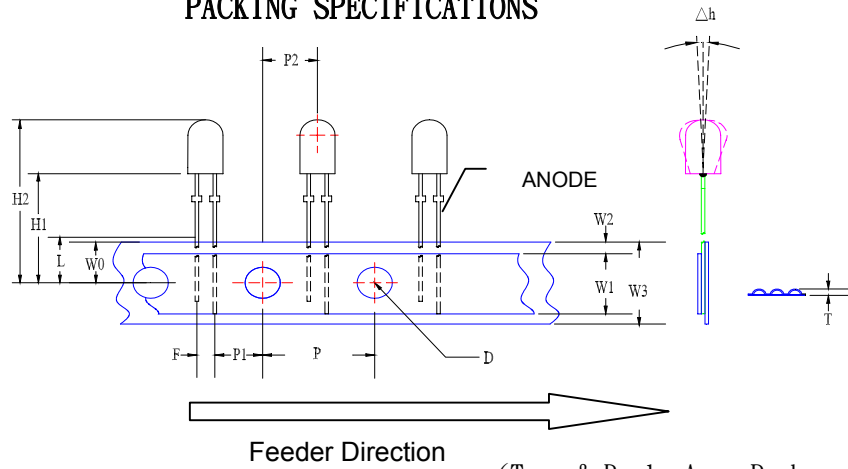
label

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## Taping Package

(TT-0001)

### PACKING SPECIFICATIONS



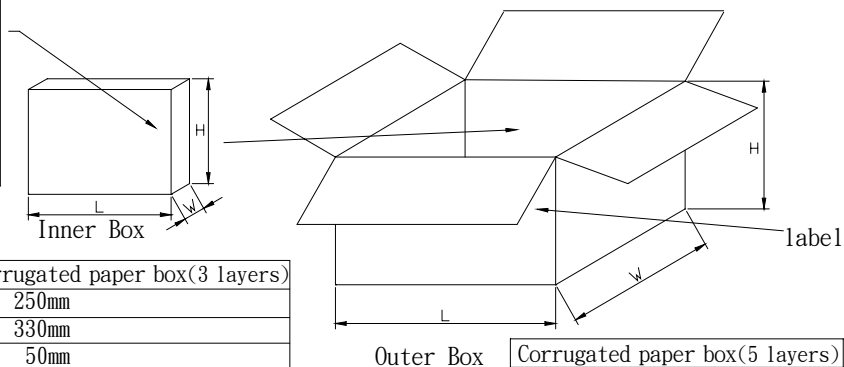
(Tape & Reel, Ammo Pack are available)

(Maximum 10 inner boxes in one outer box)

ITEM	SYMBOL	SPECIFICATION			
		MINIMUM		MAXIMUM	
		MM	INCH	MM	INCH
• Tape Feed Hole Diameter	<b>D</b>	3.8	0.149	4.2	0.165
• Component Lead Pitch	<b>F</b>	2.34	0.092	2.74	0.108
• Front To Rear Deflection	$\Delta h$	--	--	2.0	0.078
• Feed Hole To Bottom Of Component	<b>H1</b>	19.0	0.709	21.0	0.787
• Feed Hole To Overall Component Height	<b>H2</b>	--	--	32.00	1.260
• Lead Length After Component Height	<b>L</b>	W0		11.0	0.433
• Feed Hole Pitch	<b>P</b>	12.4	0.488	13.0	0.511
• Lead Location	<b>P1</b>	4.4	0.173	5.8	0.228
• Center Of Component Location	<b>P2</b>	5.05	0.198	7.65	0.301
• Total Tape Thickness	<b>T</b>	--	--	1.4	0.056
• Feed Hole Location	<b>W0</b>	8.5	0.334	9.50	0.374
• Adhesive Tape Width	<b>W1</b>	12.0	0.472	14.0	0.551
• Adhesive Tape Position	<b>W2</b>	--	--	4.0	0.157
• Tape Width	<b>W3</b>	17.5	0.689	19.0	0.748

<b>EOI</b> EXCELLENCE OPTO. INC.	
PART NO.	
LOT NO.	QC:
Code	
DATE	
QUANTITY	pcs
H=3 XXXXXX-XXXXXX	

label



Corrugated paper box(3 layers)	
H :	250mm
L :	330mm
W :	50mm
PCS/INNER BOX	
3/4mm	:2,500pcs
5.0mm	:2,000pcs
> 7.5mm	:1,000pcs

Outer Box

Corrugated paper box(5 layers)	
H :	290mm
L :	520mm
W :	360mm
PCS/OUTER BOX	
3/4mm	:25,000pcs
5.0mm	:20,000pcs
> 7.5mm	:10,000pcs

Note: Several standard types of taping package are available.  
Please contact with our salesman to get detail information.

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## Precaution of Application

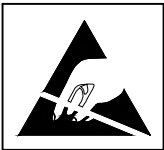
### 1. Circuit layout

Due to the forward voltage of LED will vary with temperature and its driving current, the current- limited protective circuit should be considered in the LED circuit design.

When LEDs are arrayed as parallel circuit, different inherent resistance of LED will cause unbalance current. The unbalanced driving current which exists in every parallel circuit may make LED to be driven at different power. Therefore, the LED driven at higher power may be damaged by over driving current, and the LED driven at lower power may be dimmer than the others.

To solve this situation, a suitable resistor is recommended to put in series with each LED circuit. The resistor will limit and balance the driving current which flow through every parallel circuits.

### 2. Electric Static Discharge (ESD) Protection



ESD protection for GaP and AlGaAs chips are still necessary even though they are safety in low static-electric discharge. Material in AlInGaP, GaN, or/and InGaN chips are STATIC SENSITIVE device. ESD protection shall be considered and taken in the initial design stage.

If manual work/process is needed, please ensure the device is well protected from ESD within all the process.

### 3. Lead Forming

The leads should not be bent at the point of 3mm or below 3mm from the base of the epoxy bulb while forming the leads.

Do not apply any bending stress to the base of the lead, and don't cause any stress after mounting the LED lamp on PCB. The stress to the base may damage the LED's characteristics, or cause deterioration of the epoxy resin. This will hurt and degrade the LEDs.



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### 4. Storage

It's recommended to store the products in the following conditions:

Humidity (Hum.) : 60%RH Max.

Temperature ( $T_A$ ) : 5°C ~ 30°C ( 41°F ~ 86°F )

Shelf life in sealed bag: 12 month at  $T_A < 25^\circ\text{C}$  ~ 30°C and Hum.<30%RH.

After the package is opened, the products should be used within 72 hours.

Or they should be kept at Hum.  $\leq 20\%$ RH in zip-locked sealed bags.

Although the leads of LED lamp is plated with pure tin to protect leads from corrosion, devices should be subjected to wave soldering, or equivalent process as soon as possible, after the bag is opened.

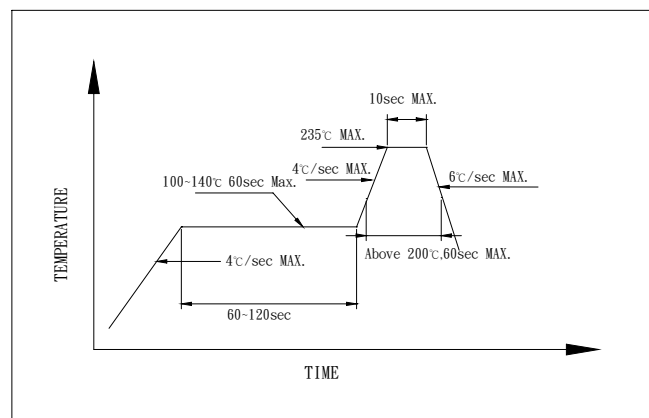
Please avoid rapid transitions in ambient temperature, especially in high humidity environment where condensation can occur.

### 5. Soldering

Soldering heat may damage the LED. Careful attention should be paid during soldering process.

Solder the LEDs no close than 3mm form the base of the epoxy bulb.

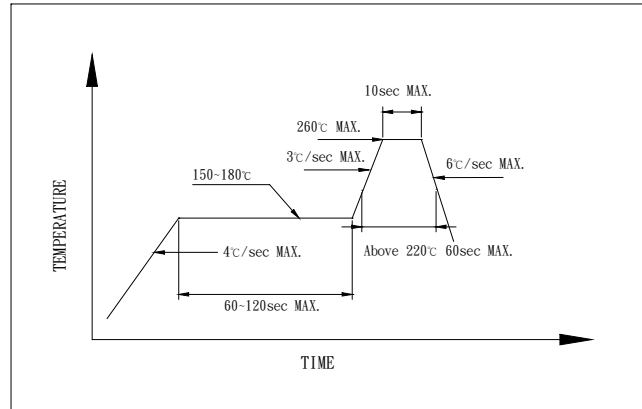
Recommended SnPb reflow soldering profile:



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Recommended Pb free reflow soldering profile:



Never take next process until the component is cooled down to room temperature after soldering. It's banned to load any stress on the resin during soldering. If it's necessary to clamp the LED bulbs to help soldering, it is important to minimize the mechanical stress on the LEDs.

The manual soldering process is not recommended for quality consideration. When it is absolutely necessary, the LEDs may be mounted in this fashion but the user will assume responsibility for any problems.

### 6. Cleaning

An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended to clean the LED bulbs, after soldering process. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

### 7. Others

The light output of LED might injure human eyes, directly look at the LED without protection is prohibited.

LED lamp is very sensitive to heat. Thermal design of the end product will decide the performance of LED lamps. It's necessary to avoid intense heat generation and operate within the maximum ratings given in this specification.

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## Terms and Conditions

1. EOI warrants all sold LEDs which conform to the specifications approved by the customers.
2. Any LED supplied by EOI is found not conform to the specifications that both parties agreed upon, customer should claim within 90days of receipt. EOI will repair or replace the LEDs at EOI's option.
3. EOI will not hold any responsibility for the failed LEDs, which are caused by mishandling or misusing the LEDs exceeding the operating conditions that EOI suggested.
4. EOI's LED products are designed and manufactured for general electronic equipment (such as household appliances, communication equipment, office equipment, electronic instrumentation and so on). If customer's application requires exceptional quality or reliability, which might concern human safety, it is recommended to consult with EOI in advance.
5. All the information published is considered to be reliable. However, EOI does not assume any liability arising out of the application or use of any product described herein. EOI's liability for defective LED lamps shall only be limited to replacement, in no event shall EOI be liable for consequential damages or loss.
6. EOI and customer shall both confirm the specifications herein, and all quality related matters will base on the specifications both parties agreed upon.
7. Any modification of the design or manufacturing process taken place, which will affect the characteristics, performance or reliability of LED, customer's approval will be required.
8. This specification approval sheet is an agreement of shipment specification. Please sign it back and keep the copies in two parties. If customers don't sign it back, it is regarded as completely agree with the terms and conditions and also approve of this approval sheet.

## Company Information

### Headquarters

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