LED SPECIFICATION

PART NO. : EOS-RGB603A00

PART DESCRIPTION:

Full Color Top LED Series

(Red,Green,Blue Color)

EOI			CUSTOMER APPROVED
ACTION	NAME	DATE	
PREPARED	Peggy Liang	**2009/1/23**	
CHECKED	Cathy Huang	**2009/1/23**	
APPROVED	Ader Wu	**2009/1/23**	

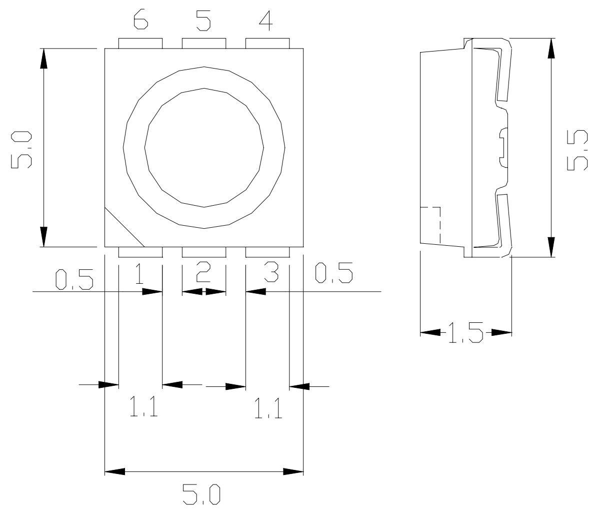
Features

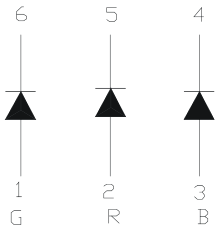
- ◆ Super-luminosity chip LED
- ◆ PLCC-6 SMT Package
- ◆ Built-in Red,Green,and Blue chip
- ◆ Good heat dissipation
- ◆ Pb free & RoHS compliant product
- ◆ Class 1 ESD sensitive

Applications

- ◆ Flashlight for digital camera of cellular
- ◆ Information boards
- ◆ Amusement equipment
- ◆ Full color application
- ◆ General Use

Package Dimensions

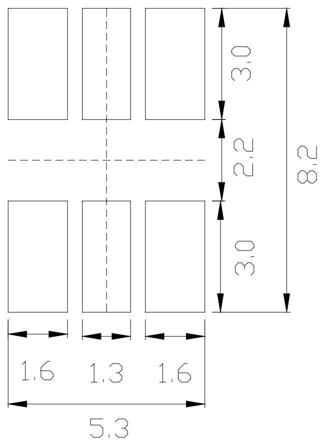




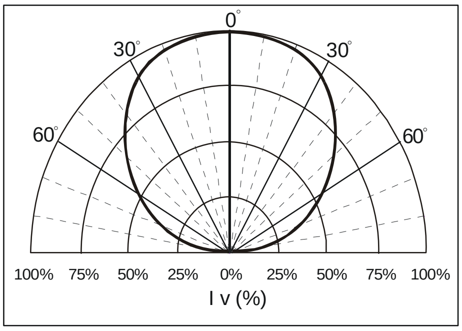
Note:

- ● All dimensions are in millimeter.
- ● Tolerance is ±0.20mm unless otherwise note.
- ● Specifications are subject to be changed without notice.

Recommended Soldering Pad



Beam Pattern



Absolute Maximum Ratings at T_A=25℃

Parameter	Symbol	MAX.			Unit
		Red	Green	Blue	
Average Forward Current[a] [c]	I_F	30	20	20	mA
Peak Forward Current[b]	I_{peak}	100	50	50	mA
Reverse Voltage	V_R	5	5	5	V
Power Dissipation	P_D	82.5	91	91	mW
Current Linearity vs. Ambient Temperature	TC_I	-0.33	-0.29	-0.29	mA/℃
LED Junction Temperature	T_J	125	125	125	℃
Operating Temperature Range[c]	T_{OPR}	-40℃ ~ +85℃			
Storage Temperature Range	T_{STO}	-40℃ ~ +100℃			
Lead Soldering Condition [4mm(.157”) away from epoxy]	T_{SOL}	260℃ / 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 5.

Device Selection Guide

(Electrical and Optical Characteristics at T_A =25℃)

Parameter	Symbol	Color	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	Iv	Red	140	270	---	mcd	I_F=20mA
		Green	450	690	---		
		Blue	90	200	---		
Viewing Angle	$2\theta_{1/2}$	Red	---	120	---	deg	I_F=20mA
		Green	---	120	---		
		Blue	---	120	---		
Dominant Wavelength	λd	Red	620	623	635	nm	I_F=20mA
		Green	520	525	536		
		Blue	464	470	480		
Spectral Half width	$\triangle\lambda$	Red	---	25	---	nm	I_F=20mA
		Green	---	25	---		
		Blue	---	25	---		
Forward Voltage	V_F	Red	1.25	2.2	2.75	V	I_F=20mA
		Green	3.05	3.4	3.65		
		Blue	3.05	3.4	3.65		
Reverse Current	I_R	Red	---	---	10	μA	V_R=5V
		Green	---	---	10		
		Blue	---	---	10		

Rank Combinations

CODE	Dominant Wavelength λ D(nm)		Luminous Intensity IV(mcd)		Forward Voltage VF(V)	
	Min	Max	Min	Max	Min	Max
001	520	536	450	715	3.05	3 65
	620	635	140	224	1.25	2 75
	464	480	90	140	3.05	3 65
002	520	536	715	1125	3.05	3 65
	620	635	140	224	1.25	2 75
	464	480	90	140	3.05	3 65
003	520	536	450	715	3.05	3 65
	620	635	224	355	1.25	2 75
	464	480	90	140	3.05	3 65
004	520	536	715	1125	3.05	3 65
	620	635	224	355	1.25	2 75
	464	480	90	140	3.05	3 65
005	520	536	450	715	3.05	3 65
	620	635	355	560	1.25	2 75
	464	480	90	140	3.05	3 65
006	520	536	715	1125	3.05	3 65
	620	635	355	560	1.25	2 75
	464	480	90	140	3.05	3 65
007	520	536	450	715	3.05	3 65
	620	635	140	224	1.25	2 75
	464	480	140	224	3.05	3 65
008	520	536	715	1125	3.05	3 65
	620	635	140	224	1.25	2 75
	464	480	140	224	3.05	3 65
009	520	536	450	715	3.05	3 65
	620	635	224	355	1.25	2 75
	464	480	140	224	3.05	3 65

CODE	Dominant Wavelength λ D(nm)		Luminous Intensity IV(mcd)		Forward Voltage VF(V)	
	Min	Max	Min	Max	Min	Max
010	520	536	715	1125	3.05	3 65
	620	635	224	355	1.25	2 75
	464	480	140	224	3.05	3 65
011	520	536	450	715	3.05	3 65
	620	635	355	560	1.25	2 75
	464	480	140	224	3.05	3 65
012	520	536	450	715	3.05	3 65
	620	635	355	560	1.25	2 75
	464	480	140	224	3.05	3 65
013	520	536	450	715	3.05	3 65
	620	635	140	224	1.25	2 75
	464	480	224	355	3.05	3 65
014	520	536	715	1125	3.05	3 65
	620	635	140	224	1.25	2 75
	464	480	224	355	3.05	3 65
015	520	536	450	715	3.05	3 65
	620	635	224	355	1.25	2 75
	464	480	224	355	3.05	3 65
016	520	536	715	1125	3.05	3 65
	620	635	224	355	1.25	2 75
	464	480	224	355	3.05	3 65
017	520	536	450	715	3.05	3 65
	620	635	355	560	1.25	2 75
	464	480	224	355	3.05	3 65
018	520	536	715	1125	3.05	3 65
	620	635	355	560	1.25	2 75
	464	480	224	355	3.05	3 65

Note:

1. All of rank combinations which include luminous intensity, dominant wavelength, and forward voltage will be included in every shipment.
2. Measurement Uncertainty of the Luminous Intensity: ±15%.
3. Measurement Uncertainty of the Dominant Wavelength: ±1nm.
4. Measurement Uncertainty of the Voltage: ±0.05V.

Typical Electrical / Optical Characteristics Curves

(25℃ Ambient Temperature Unless Otherwise Noted)

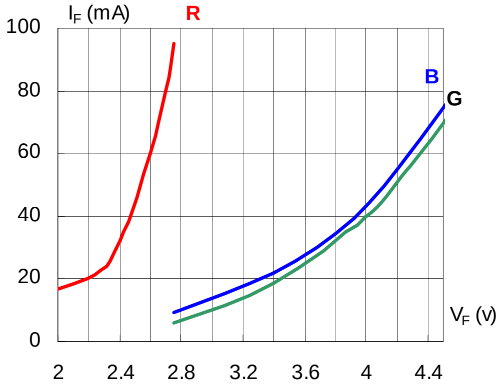


Fig.1 Forward Current vs. Forward Voltage

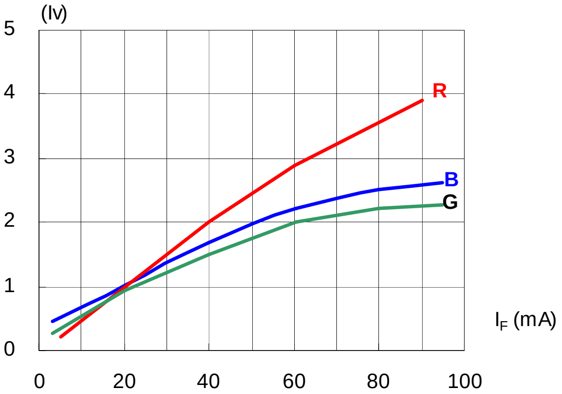


Fig.2 Luminous Intensity vs. Forward Current

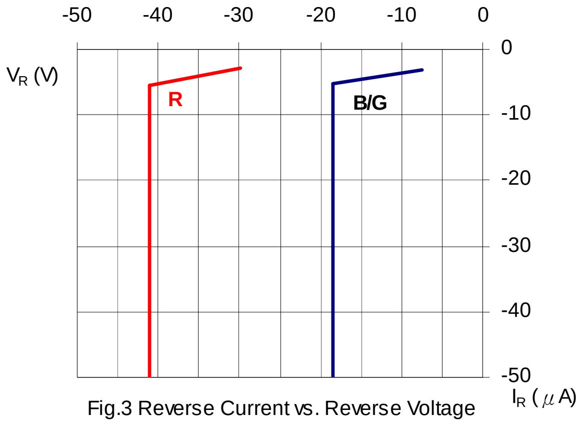


Fig.3 Reverse Current vs. Reverse Voltage

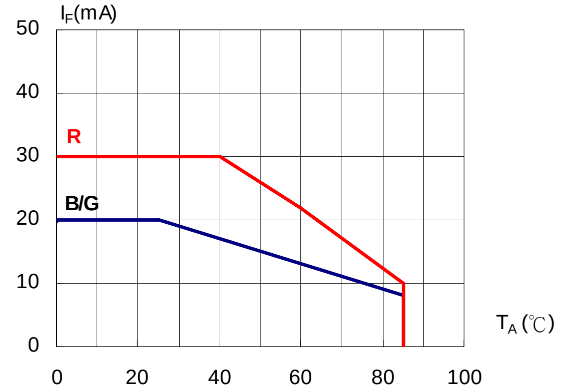


Fig.4 Allowable Forward Current vs. Ambient Temperature

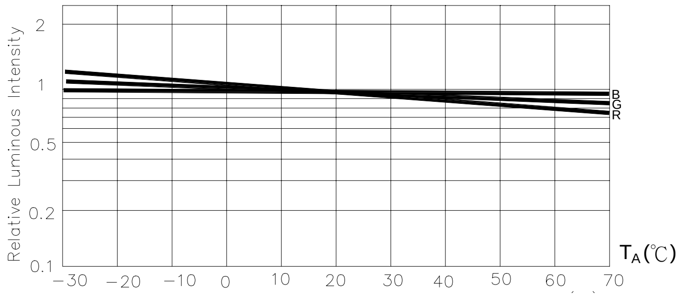


Fig.5 Luminous Intensity at I_F =20mA vs. Ambient Temperature

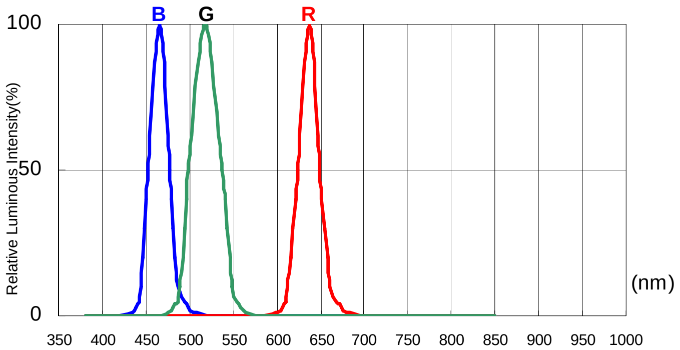


Fig 6. Relative Luminous Intensity vs. Wavelength

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

Reliability Test

EOI'S LED components 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	MIL-STD-750D Method 1026.3	T_A=25℃; I_F=30mA*	1000hrs	50pcs	0/1	pass
Environment Test	High Temperature Storage	MIL-STD-750D Method 1032.1	T_A=100℃	1000hrs	50pcs	0/1	pass
	Low Temperature Storage	MIL-STD-750D Method 1032.1	T_A=-40℃	1000hrs	50pcs	0/1	pass
	Temp&Humidity with Bias	MIL-STD-750D Method 103B	T_A=85℃; Rh=85% I_F=20mA	1000hrs	50pcs	0/1	pass
	Thermal Shock	MIL-STD-750D Method 1056.1	-10℃(1min) ~100℃(1min)	20cycles	50pcs	0/1	pass
	Temperature Cycling Test	MIL-STD-750D Method 1051.5	-40℃(30min)~25℃(5min) ~100 ℃ (30min)~25 ℃ (5min)	100cycles	50pcs	0/1	pass
Mechanical Test	Solderability	MIL-STD-750D Method 2026.4	235±5℃;3sec	1time	50pcs	0/1	pass
	Resistance to Soldering Heat	MIL-STD-750D Method 2031.1	260℃;5sec	1time	50pcs	0/1	pass

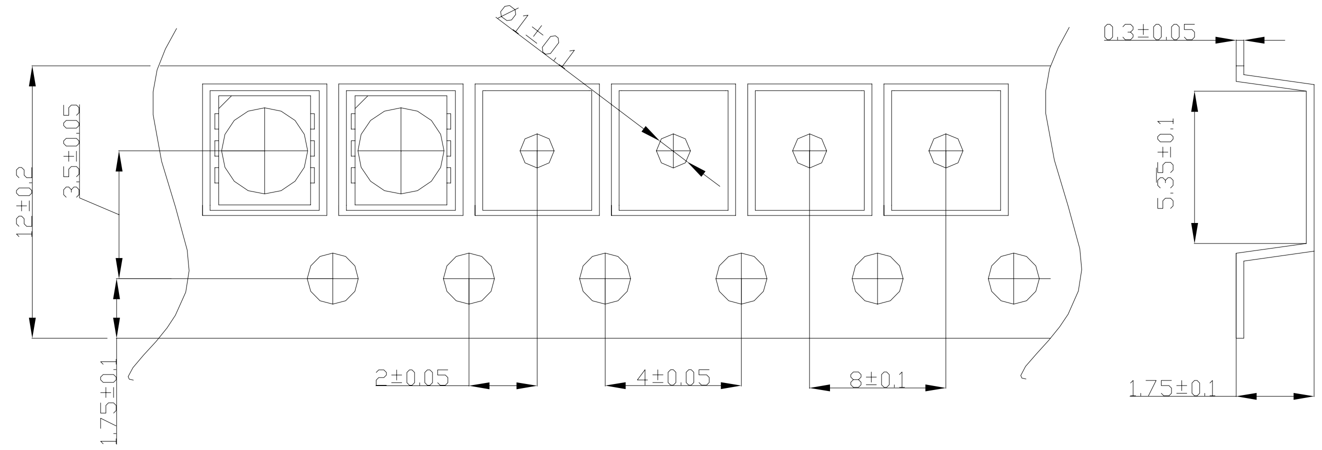
Remark：(*) I_F =30mA for AlInGaP chip；I_F =20mA for InGaN chip

2. Failure Criteria (T_A =25℃):

Test Item		Test Conditions	Criteria for Judgment	
			Min.	Max.
Luminous Intensity	I_V	I_F =20 mA	LSL×0.5 **	
Forward Voltage	V_F	I_F =20 mA		USL×1.1 *

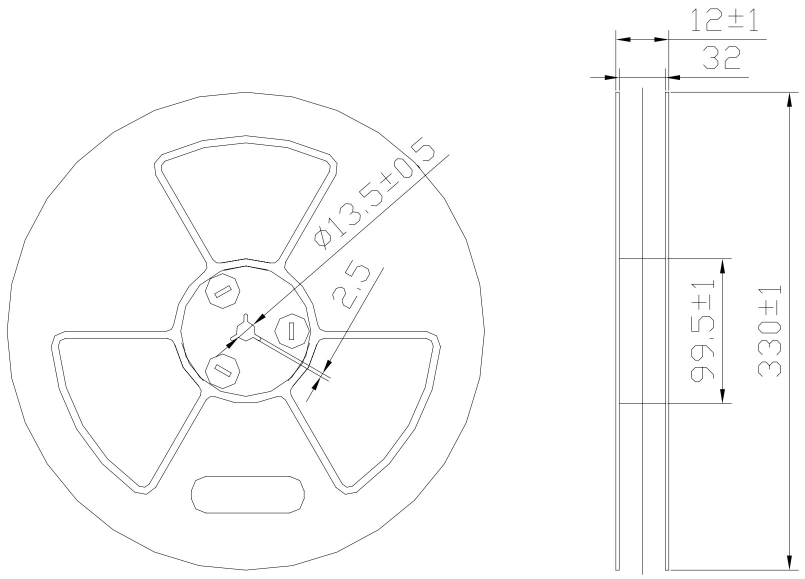
(*) USL : Upper Standard Level， (**) LSL : Lower Standard Level

Taping Dimension



1.Polarity referring onto the cathode mark/line is reversed on the UR/HR(N-side up chips).
2.The carrier tape and components loading specifications meet the EIA 481-1a Standard.
3.2,500 pieces per reel is standard loading quantity.

Reel Dimension



Unit:mm

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 flows through every parallel circuits.

2. Electric Static Discharge (ESD) Protection

All kinds of LED materials, such as GaP, AlGaAs, AllnGaP, GaN, or InGaN chips, are STATIC SENSITIVE device. ESD protection or surge voltages shall be considered and taken care in the initial design stage, and whole production process.

The following protection is recommended:

(1) A wrist band or an anti-electrostatic glove shall be used when handling the LEDs

(2) All devices, equipment and machinery must be properly grounded

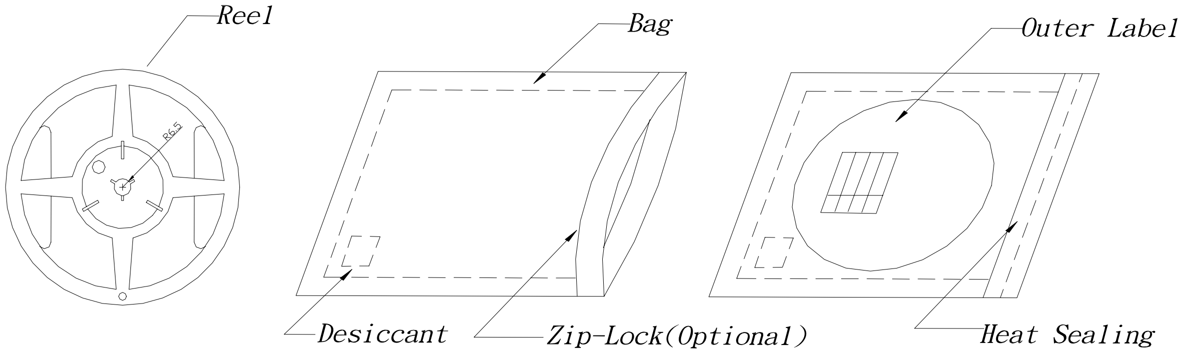
If LED is damaged by ESD or surge voltage, damaged LED may show some unusual characteristics. It may appear leakage current, and LED does not emit at low current.
And when using microscope to inspect damaged LED chip at low driving current, it may have some black dots within the emitting area.

3: Dry Pack

SMD / PLCC device is a MOISTURE SENSITIVE device. Please keep LED from absorbing moisture at any time during transportation or storage. Every reel is packaged in the aluminum moisture barrier anti-static bag (Specific bag material will depend upon customer’s requirement or option), and the bag is well sealed before shipment.

Silica gel material, which can absorb moisture, is also packed together with LED in package bag. And humidity indicator card act as an indicator, which informs users the condition of humidity within SMD package bag by change of color.

The package is the following:



4: Pick and Place

The following items should be paid attention in assembly process:

(1) It should be avoided to load stress on the resin during pick and place process, especially at high temperature.

(2) Avoid rubbing or scraping the resin by any object, and avoid leaving fingerprints on the lens.

(3) Electric-static may cause damage to the component. Please confirm that the equipment is grounding well.

(4) Some parts of PLCC series are using silicone material as encapsulation material. Silicone material is easily contaminated by particles. However a small amount of particles on the LEDs will not affect the the brightness of the LEDs, and also the lifetime. Therefore, a small amount of particles on the surface of lens of LEDs can be ignored.

5: Storage

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

(1) Shelf life in sealed bag: 12 months at T_A<40℃ and Hum.<30%RH.(Base on aluminum laminated moisture barrier bag.)

(2) After the package bag is opened and kept in the following environment, the LED products should be used completely as soon as possible:

Humidity (Hum.) : 60%RH Max.

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

Assembly duration : within 72 hours, after bag is opened.

If the some of LED are not used, they need to be kept at Hum.≦10%RH in zip-locked sealed bags.

And if the duration exceeds 72 hours, re-baking process is required to keep LED from moisture.

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

6: Baking

It’s recommended to bake before soldering . The conditions are suggested as followings:

(1) 60±3℃×(48~72hrs) and Hum. <1%RH for taped reel type

(2) 110±3℃×(2~3hrs) for bulk type

7: Manual Soldering using Soldering Iron

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.

The the following conditions are recommended :

(1) Soldering material : SN60 (60% tin and 40% lead) solder or solder with silver content is recommended.

(2) Temperature of the iron : lower than 300° C

(3) Soldering time : maximum 3 seconds

(4) Operation cautions:

- Please avoid overheating of LED component in any process. Overheating may damange the LED package.
- Please don’t place any stress on the lens of LED, especially at high temperature

8: Reflow Soldering

To prevent LED from cracking in reflow process, it’s better to bake LED components before reflow soldering. After the package sealing bag is opened, please use the LED device as soon as possible to keep LED from moisture.

It’s banned to load any stress on the resin during soldering. Please never take next process until the component is cooled down to room temperature after reflow. And, the manual soldering process is not recommended for quality consideration.

To ensure the performance of LED device, it is recommended to set up a reflow profile at lower temperature.

Recommended soldering paste specifications:

Contains : Sn 63%, Pb 37%(Melting temperature : 178~192℃)

The recommended reflow soldering profile (measure point is near the bottom of the LED package) is following:

Figure 1:

Recommended Sn-Pb IR-Reflow Soldering Profile

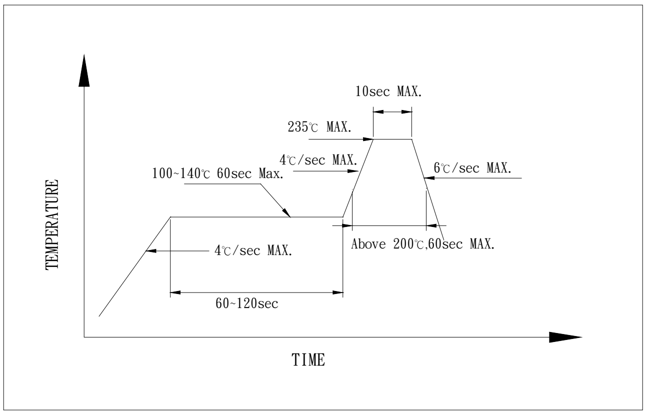
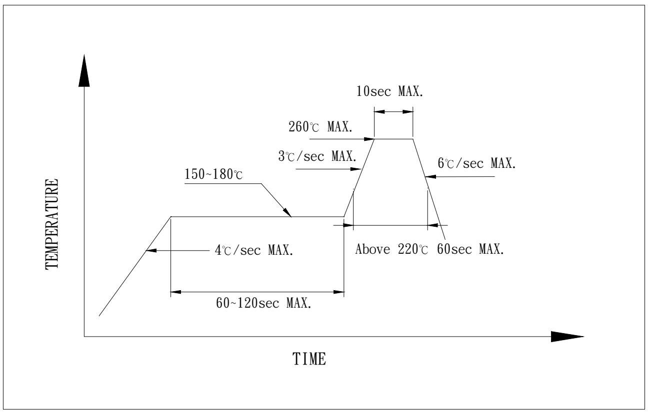


Figure 2:

Recommended Pb-free Soldering Profile



The soldering paste should be coated to the necessary area of soldering pads by the screen-printing or with the dispenser. In the case of the screen-printing, it is recommended to have the thickness of 0.2mm (0.0079 inch) to 0.3mm (0.0118 inch). The optimal thickness should be verified by pre-test, and will be different from every different layout of leads of LED.

Repairing should not be done after the LEDs have been soldered. When repairing is necessary, a double-head soldering iron should be used if the LED needs to be removed. Please refer to the recommendations for manual soldering using soldering iron if additional rework is needed.

9: Cleaning

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

It is not recommended to use unspecified chemical liquids as cleaning material for cleaning the LED. It's also not recommended to use ultrasonic power to clean the LED device. The chemical and ultrasonic power could harm the LED devices.

10: Application

(1) The strong light from LEDs may injure human eyes. Precautions should be taken to prevent looking directly at the LEDs with unaided eyes.

(2) In order to get maximum light output during the duration of LED's long life, designer should consider how to make excellent thermal dissipation when making the whole system design. It's recommended to avoid intense heat generation and to operate within the maximum ratings given in this approval sheets.

(3) Every piece of LED will be sorted and LEDs with the same binning grade will be taped into the same reel or put into the same bag. It is recommended to use the same bin-grade LED to assembly the unit module. This will ensure the LED unit module with good uniformity of brightness, hue, and so on.

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

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SYSTEM CERTIFICATION ISO TS 16949 SGS
SYSTEM CERTIFICATION ISO 9001:2000 SGS
TAF Testing Laboratory
RoHS Pb