Spec No.	Date	Page	Ver.
A-TS-023-00	2006/4/21	1/12	B-00

LED SPECIFICATION

PART NO. : EOS-RGB603A00

PART DESCRIPTION:

Full Color Top LED

(Red,Green,Blue Color)

EOI			CUSTOMER APPROVED
ACTION	NAME	DATE	
PREPARED	*Peggy Liang*	**2006/4/21**	
CHECKED	*Cathy Huang*	**2006/4/21**	
APPROVED	*Ader Wu*	**2006/4/21**	

PART NO. : EOS-RGB603A00

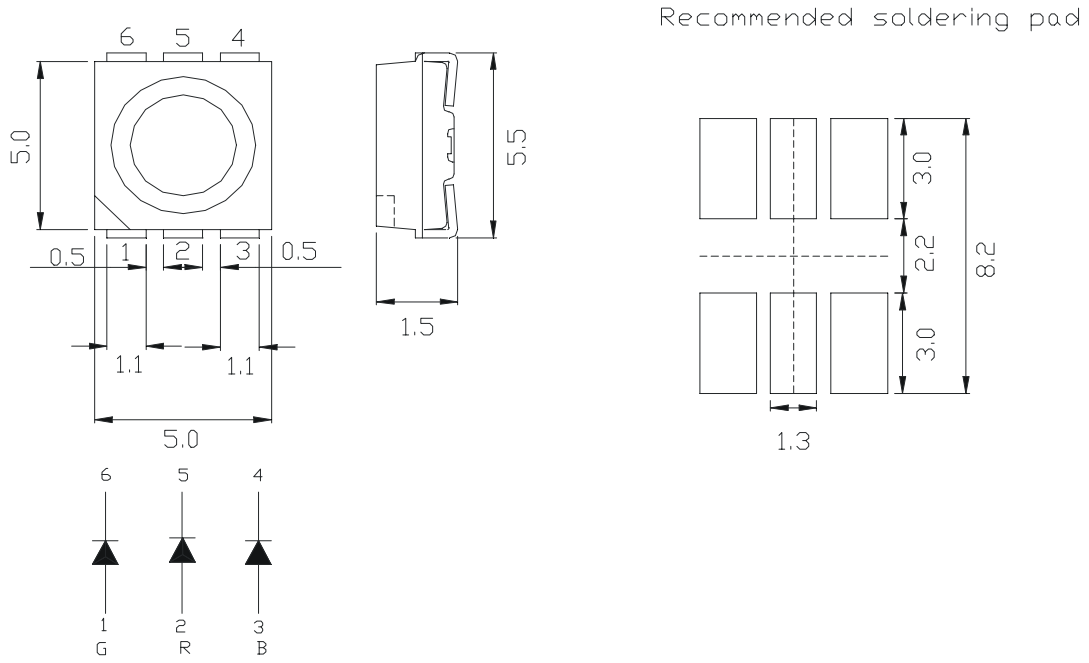
Features

- 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

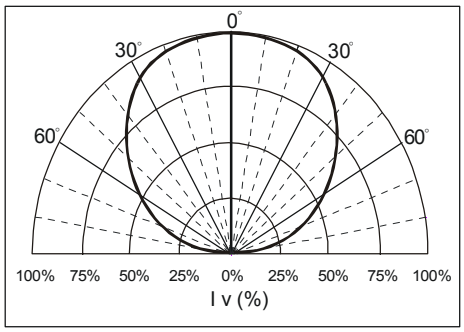
Package Dimension



Note:

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

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] tp≦10 μs, Duty Cycle=0.005.
[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℃

Parameter	Symbol	Color	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	Iv	Red	140	270	560	mcd	I_F=20mA
		Green	450	690	1125		
		Blue	90	180	355		
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	△λ	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	4.55		
		Blue	3.05	3.4	4.55		
Reverse Current	I_R	Red	---	---	10	μA	V_R=5V
		Green	---	---	10		
		Blue	---	---	10		

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Rank Combinations

CODE	Dominant Wavelength λd(nm)		Luminous Intensity Iv(mcd)		Forward Voltage Vf(v)	
	Min	Max	Min	Max	Min	Max
001	520	536	450	715	3.05	4.55
	620	635	140	224	1.25	2.75
	464	480	90	140	3.05	4.55
002	520	536	715	1125	3.05	4.55
	620	635	140	224	1.25	2.75
	464	480	90	140	3.05	4.55
003	520	536	450	715	3.05	4.55
	620	635	224	355	1.25	2.75
	464	480	90	140	3.05	4.55
004	520	536	450	715	3.05	4.55
	620	635	224	355	1.25	2.75
	464	480	90	140	3.05	4.55
005	520	536	450	715	3.05	4.55
	620	635	355	560	1.25	2.75
	464	480	90	140	3.05	4.55
006	520	536	450	715	3.05	4.55
	620	635	355	560	1.25	2.75
	464	480	90	140	3.05	4.55
007	520	536	450	715	3.05	4.55
	620	635	140	224	1.25	2.75
	464	480	140	224	3.05	4.55
008	520	536	715	1125	3.05	4.55
	620	635	140	224	1.25	2.75
	464	480	140	224	3.05	4.55
009	520	536	450	715	3.05	4.55
	620	635	224	355	1.25	2.75
	464	480	140	224	3.05	4.55

CODE	Dominant Wavelength λd(nm)		Luminous Intensity Iv(mcd)		Forward Voltage Vf(v)	
	Min	Max	Min	Max	Min	Max
010	520	536	450	715	3.05	4.55
	620	635	224	355	1.25	2.75
	464	480	140	224	3.05	4.55
011	520	536	450	715	3.05	4.55
	620	635	355	560	1.25	2.75
	464	480	140	224	3.05	4.55
012	520	536	450	715	3.05	4.55
	620	635	355	560	1.25	2.75
	464	480	140	224	3.05	4.55
013	520	536	450	715	3.05	4.55
	620	635	140	224	1.25	2.75
	464	480	224	355	3.05	4.55
014	520	536	715	1125	3.05	4.55
	620	635	140	224	1.25	2.75
	464	480	224	355	3.05	4.55
015	520	536	450	715	3.05	4.55
	620	635	224	355	1.25	2.75
	464	480	224	355	3.05	4.55
016	520	536	450	715	3.05	4.55
	620	635	224	355	1.25	2.75
	464	480	224	355	3.05	4.55
017	520	536	450	715	3.05	4.55
	620	635	355	560	1.25	2.75
	464	480	224	355	3.05	4.55
018	520	536	450	715	3.05	4.55
	620	635	355	560	1.25	2.75
	464	480	224	355	3.05	4.55

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)

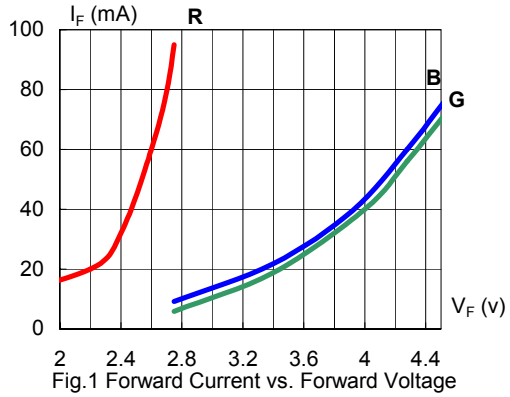

Fig.1 Forward Current vs. Forward Voltage

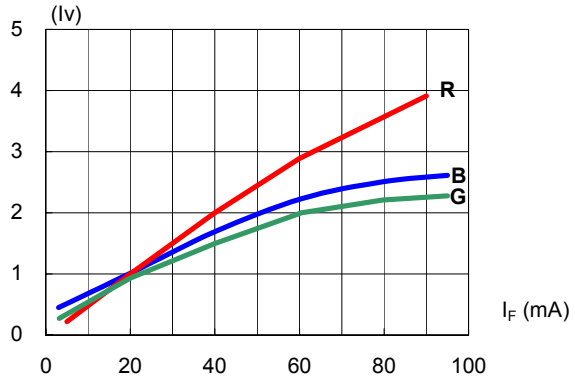

Fig.2 Luminous Intensity vs. Forward Current

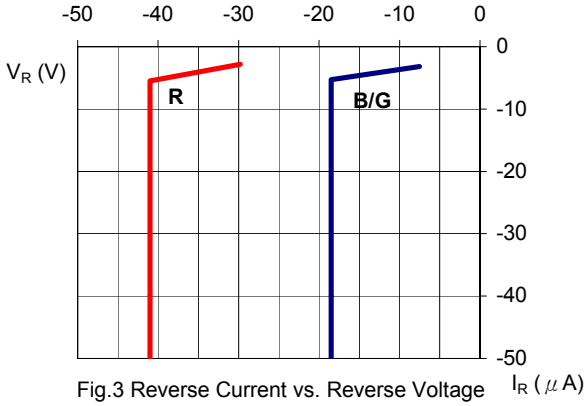

Fig.3 Reverse Current vs. Reverse Voltage

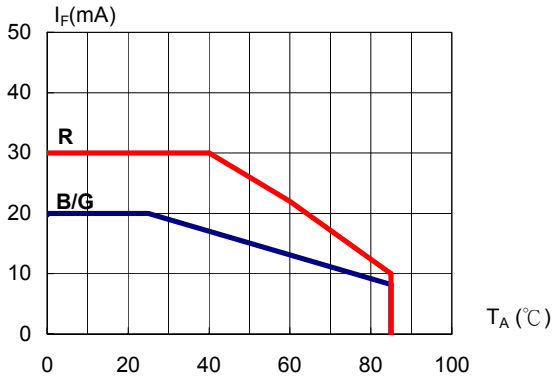

Fig.4 Allowable Forward Current vs. Ambient Temperature

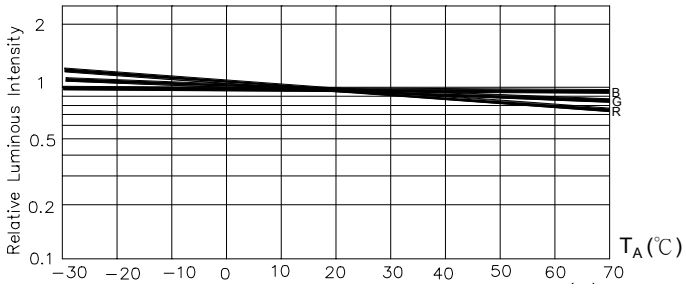

Fig.5 Luminous Intensity at I_F =20mA vs. Ambient Temperature

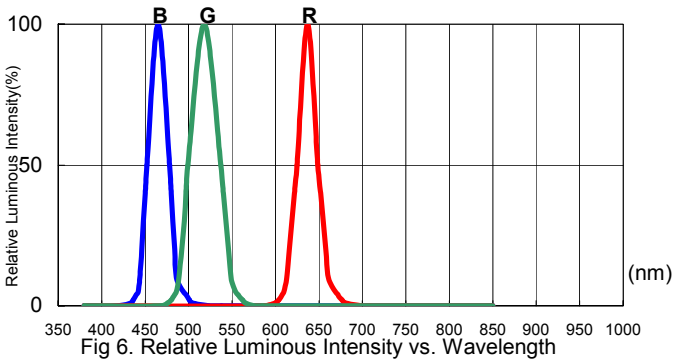

Fig 6. Relative Luminous Intensity vs. Wavelength

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 **	
Voltage (Forward)	V_F	I_F =20 mA		USL×1.1 *

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

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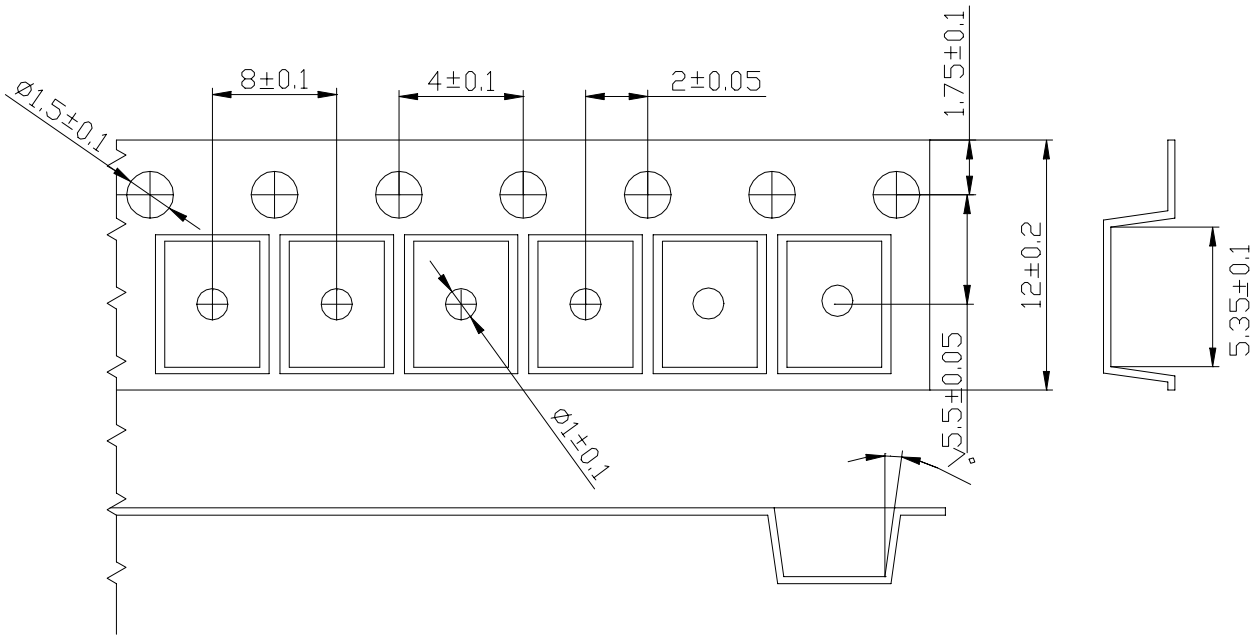
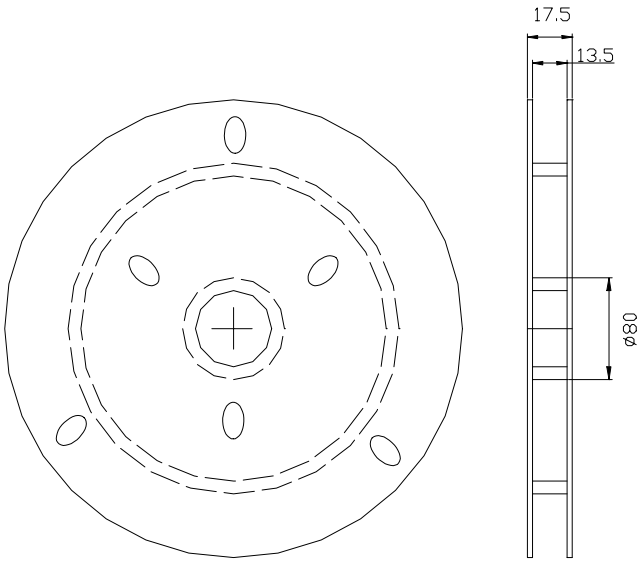
Taping Dimension



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

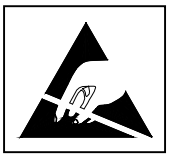
1. Circuit layout

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 drived 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



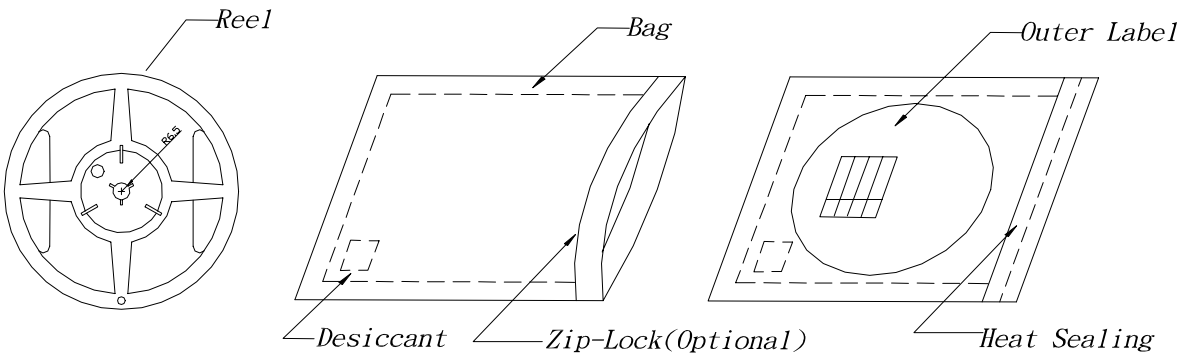
ESD protection for GaP and AlGaAs chips are still necessary even though they are safety in low static-electric discharge. Material in AllnGaP, GaN, or/and InGaN chips are STATIC SENSITIVE device. ESD protection shall be considered and taken in the initial design stage.

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

3: Dry Pack

This SMD type optical device, is a MOISTURE SENSITIVE device. Please avoid absorbing moisture at any time during transportation or storage. Every reel will be packaged in the moisture barrier anti-static bag to protect LED from the damage caused from moisture and static-electricity. And the bag is well sealed before shipment.

The package is the following:



4: Cautions of Pick and Place

(a) It should be avoided to load stress on the resin during high temperature.

(b) Avoid rubbing or scraping the resin by any object.

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

(d) 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.

5: Storage

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

Humidity (Hum.) : 60%RH Max.

Temperature (T_A) : 5℃ ~ 30℃ (41℉ ~ 86℉)

Shelf life in sealed bag: 12 month at T_A<25℃ ~ 30℃ and Hum.<30%RH.

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

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

Devices should be subjected to soldering process as soon as possible, after the bag is opened. This will protect LED from the damage of moisture and the corrosion of pads or leads.

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:

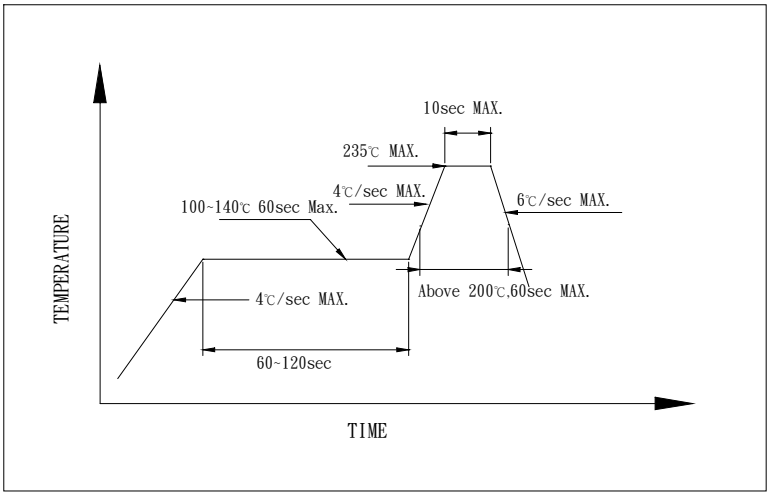
(1) 60±3℃×(6~12hrs) and <5%RH, taped reel type

(2) 100±3℃×(45min~1hrs), bulk type

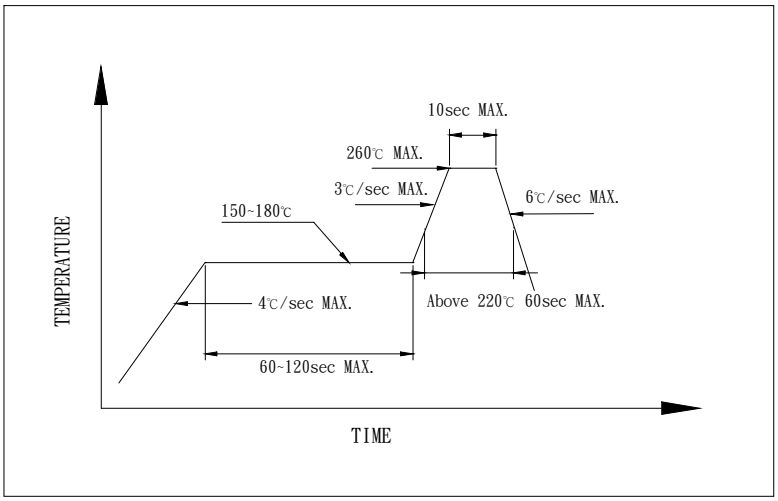
7: Reflow Soldering

To prevent cracking in reflow process, please bake this SMD components before reflow soldering. Never take next process until the component is cooled down to room temperature after reflow. It's banned to load any stress on the resin during soldering. And, the manual soldering process is not recommended for quality consideration.

Recommended SnPb reflow soldering profile:



Recommended Pb free reflow soldering profile:



8: Cleaning

The conditions of cleaning after soldering:

An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.

Temperatures Time: <50℃×30sec, or <30℃×3min

Ultra sonic cleaning: <15W/bath; Bath volume: 1 liter max.

Baking after cleaning: 100℃ max, <3min

9: Rework

(a) Please finish rework within 5 sec. under 245℃.

(b) Please avoid overheating of LED component in reworking process. Overheating may damage the LED package.

PART NO. : EOS-RGB603A00

Terms and Condition

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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