

S50RGBX-XX SPECIFICATION CHIP-ON-TOP SMD TYPE LED

Document No.: SPC/ S50RGBX-XX

Model No.: S50RGBX-XX

Description: 5.5x5.0x1.6mm Top SMD Type 4-chips 0.4 Watt Power
RGBW Flash Color LED

Material: InGaN or AlInGaP Chip Inside

Rev. No.: 04

Date: 2017-08-19

Formal Specification



SPECIFICATION OF CHIP ON TOP SMD TYPE LED

Chip on Top SMD LED Light Source

Model: S50RGBX-XX

These SMD LEDs are packaged in the industry standard CLPP6 package. These high-reliability and high-brightness LEDs are designed to work in a wide range of environmental conditions and are ideally suited for use in illumination applications. Their wide viewing angle makes these LEDs ideally suited for channel letter, or general backlighting and illumination applications. The flat top emitting surface makes it easy for these LEDs to mate with light pipes. All components are produced by packing high-performance LED chips and silicon resin with proprietary phosphors.

1. Features and Benefits

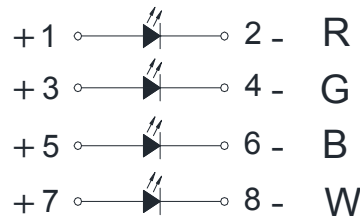
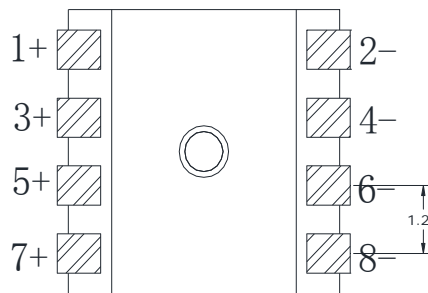
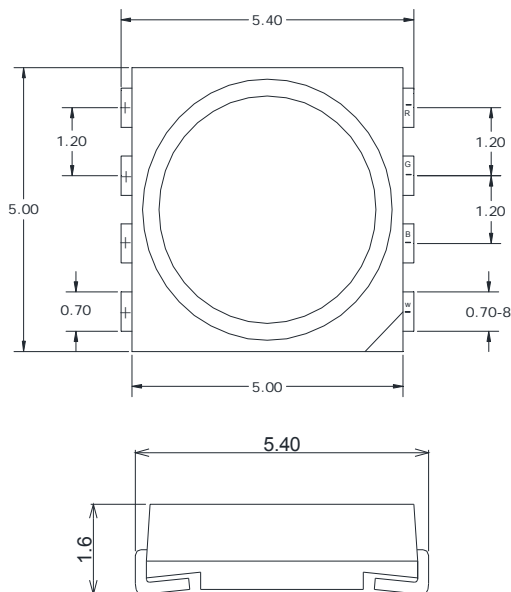
- . Ideal for LED lighting application to avoid multi-shadows
- . Higher heat conductivity for better thermal management
- . Provide variable and innovative array LED layout designs and combinations
- . Reduce the initial development cost and time
- . High lumen-performance per dollar cost
- . Lead free reflow solder compatible with RoHS compliant

2. Applications

- . Light Strip
- . Channel Letter
- . Backlight

3. Dimensions and Materials

- . Dimensions: **5.5 mm x 5.0 mm x 1.6 mm**
- . Packages: **Top SMD**
- . Capsulated Resin: **Silicone Resin with Aluminate Phosphor**
- . Electrodes: **Ag Plating**
- . Chips: **Total 4 chips packed in a cavity**



Notes:

1. All dimensions are in millimeters.
2. Tolerance is ± 0.1 mm unless otherwise noted

3. General Information

S50 RGBX - XX

S50: 5.5x5.0x1.6mm

RGBX:

R 620-630NM

G 515-530NM

B 460-470NM

X: W White Color

Y 585-595nm

XX: BW Blue White 5700-7500K

NW Natural White 3800-4500K

WS Warm Sunlight 2700-3200K

GW GOLD White 2400-2700K

Note : Typical CRI for White (2400 K – 7500 K CCT) is 80.

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4. Absolute Maximum Ratings

(Thermal Pad Temperature @25°C)

ITEM		SYMBOL	ABSOLUTE MAXIMUM RATING	UNIT
Power Dissipation	White	Pd	0.072	W
	Red/Amber		0.048	
	Green		0.072	
	Blue		0.072	
D.C Forward Current		If	20	mA
Pulse Forward Current (*1)		I _{fp}	100	mA
Thermal Resistance , Junction-Case (*2)		R _{θj-c}	230	°C/W
Reverse Voltage		V _r	5	V
Operating Temperature		T _{opr}	- 20~+65	°C
Storage Temperature		T _{stg}	- 40~+100	°C
Soldering Temperature (Reflow) (*3)		T _{sld}	max.240 < 5sec	°C

*1: I_{fp} conditions: 1/10 Duty Cycle & 0.1ms for pulse width.

*2: R_{th} test condition: Mounted on PC Board FR 4 (pad size ≥ 40mm²)

*3: Reflow method: 1.2mm MCPCB from body for 5 seconds not exceeding the recommended maximum temperature.

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5. Electrical/Optical Characteristics

. Forward Voltage

(Thermal Pad Temperature @25°C)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
White	Vf	If=20 mA	2.8	3.3	3.6	V
YELLOW		If=20 mA	1.8	2.0	2.4	V
Red		If=20 mA	1.8	2.0	2.4	V
Green		If=20 mA	2.8	3.3	3.6	V
Blue		If=20 mA	2.8	3.3	3.6	V

. Reverse Current

(Thermal Pad Temperature @25°C)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
White	IR	VR=5 V	--	--	5	μA
Yellow		VR=5 V	--	--	5	μA
Red		VR=5 V	--	--	5	μA
Green		VR=5 V	--	--	5	μA
Blue		VR=5 V	--	--	5	μA

. Luminous Flux

(Thermal Pad Temperature @25°C)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
White	Φv	If=20 mA	5.0	6.0	--	lm
Yellow		If=20 mA	1.0	2.0	--	lm
Red		If=20 mA	1.0	2.0	--	lm
Green		If=20 mA	3.0	4.0	--	lm
Blue		If=20 mA	1.0	2.0	--	lm

. Color Temperature or Dominate Wavelength

(Thermal Pad Temperature @25°C)

Color	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Yellow	λd	If=20 mA	--	590	--	nm
Red		If=20 mA	--	625	--	nm
Green		If=20 mA	--	520	--	nm
Blue		If=20 mA	--	465	--	nm

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. Bin Code List For Reference

(Thermal Pad Temperature @25°C)

Item	Bin Code		SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNIT
Forward Voltage	RED	A2	Vf	If=20 mA	1.8	2.0	V
		A3			2.0	2.2	
		A4			2.2	2.4	
		A5			2.4	2.6	
	BLUE GREEN	B2	Vf	If=20 mA	2.8	3.0	
		B3			3.0	3.2	
		B4			3.2	3.4	
		B5			3.4	3.6	

Note: Measurement tolerance of the forward voltage: $\pm 0.1V$

6. Hue Bin Specification for Yellow 、 Red 、 Green 、 Blue

Name	Code	λ_d MIN (nm)	λ_d MAX (nm)
YELLOW	YL1	585	590
	YL2	590	595
RED	HR1	620	625
	HR2	625	630
BLUE	BL5	460	465
	BL6	465	470
GREEN	PG2	515	520
	PG3	520	525
	PG4	525	530

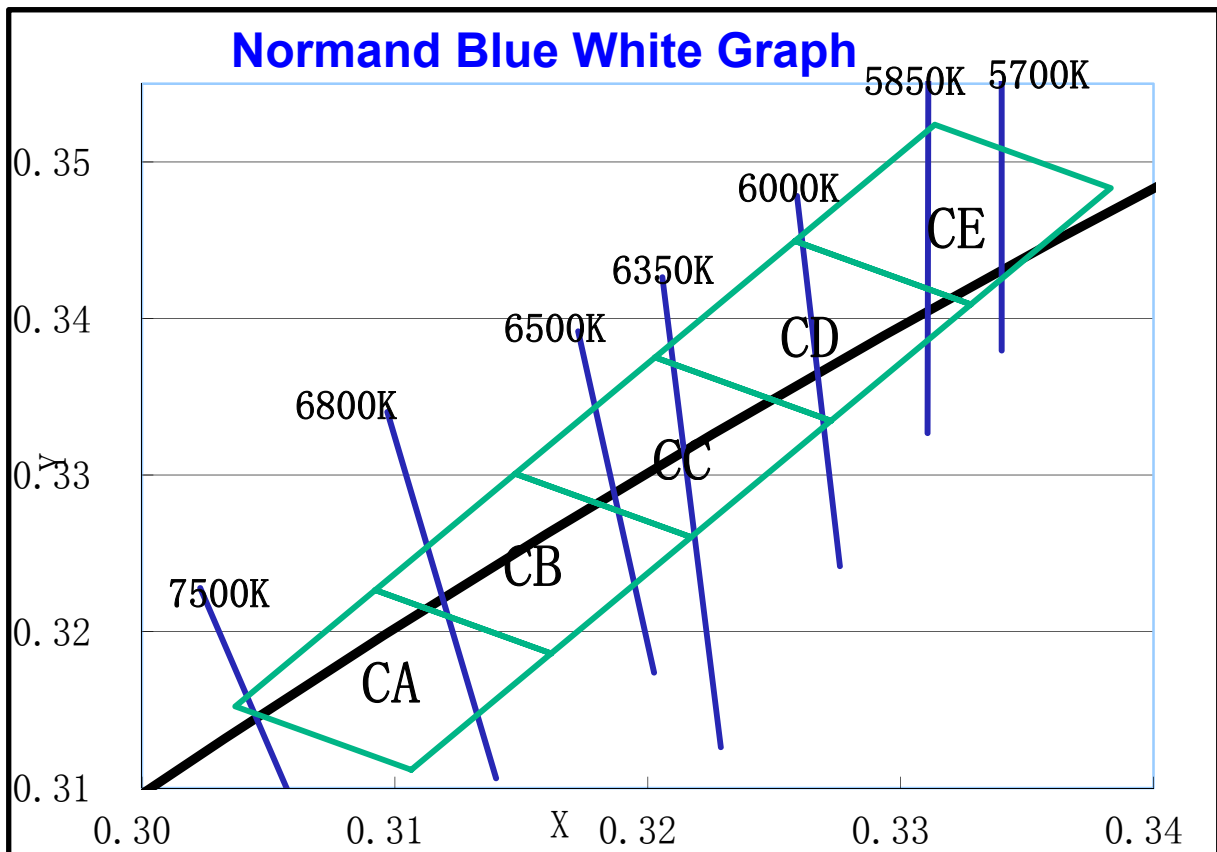
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7. White Color Temperature Ranks & CIE Color Rank (Refer to CIE 1931 chromaticity diagram)

CIE chromaticity coordinates (ANSI Cool White)

CA	X1	Y1	X2	Y2	X3	Y3	X4	Y4
CA	0.305649	0.30617	0.29869	0.31022	0.30422	0.31765	0.31118	0.3136
CB	0.311181	0.3136	0.30422	0.31765	0.30975	0.32508	0.31671	0.32103
CC	0.316713	0.32103	0.30975	0.32508	0.31529	0.33252	0.32225	0.32847
CD	0.322245	0.32847	0.31529	0.33252	0.32082	0.33995	0.32778	0.3359
CE	0.327777	0.3359	0.32082	0.33995	0.32635	0.34738	0.33331	0.34333

ANSI Blue White Color bin structures

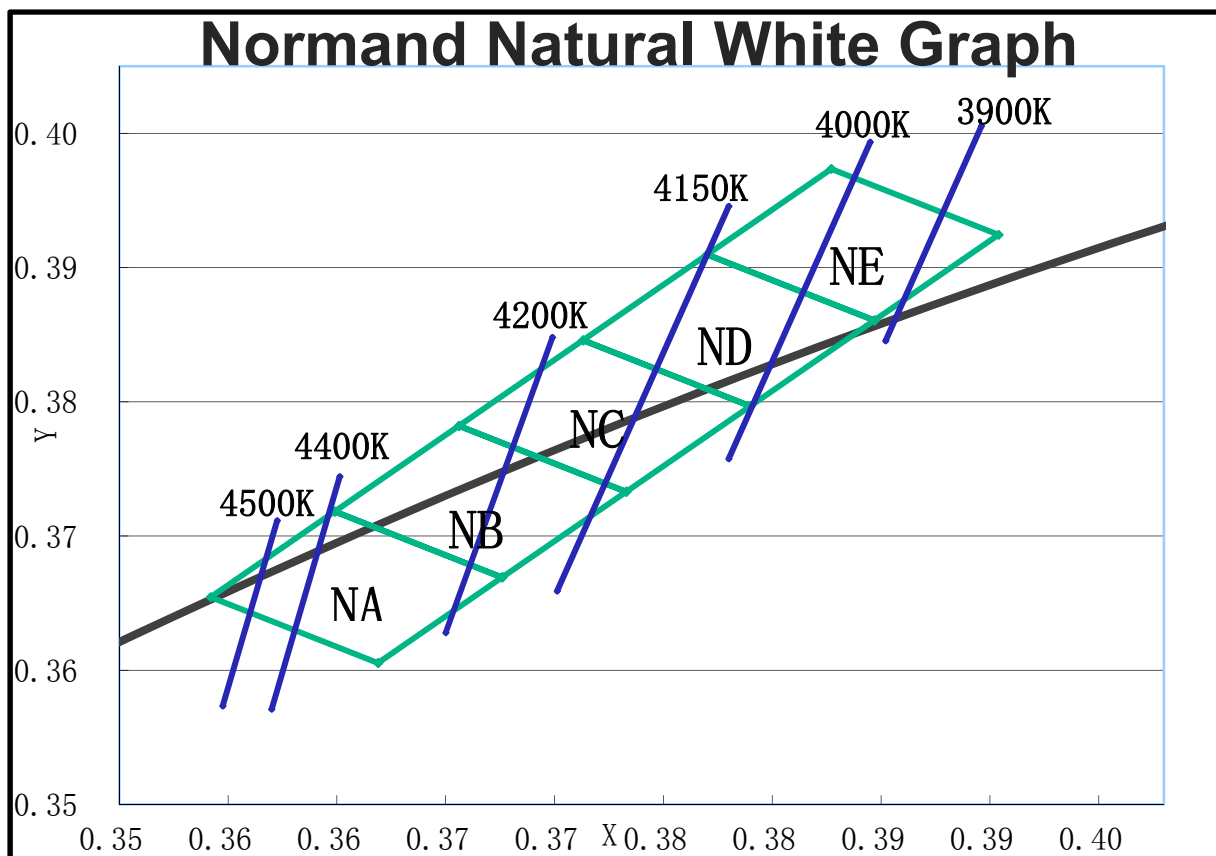


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CIE chromaticity coordinates (ANSI Natural white)

CA	X1	Y1	X2	Y2	X3	Y3	X4	Y4
NA	0.3662	0.3541	0.3578	0.3594	0.3623	0.3666	0.3707	0.3612
NB	0.3707	0.3612	0.3623	0.3666	0.3669	0.3737	0.3753	0.3683
NC	0.3753	0.3683	0.3669	0.3737	0.3714	0.3808	0.3798	0.3754
ND	0.3798	0.3754	0.3714	0.3808	0.3759	0.3879	0.3844	0.3825
NE	0.3844	0.3825	0.3759	0.3879	0.3805	0.3950	0.3889	0.3897

ANSI Natural White Color bin structures

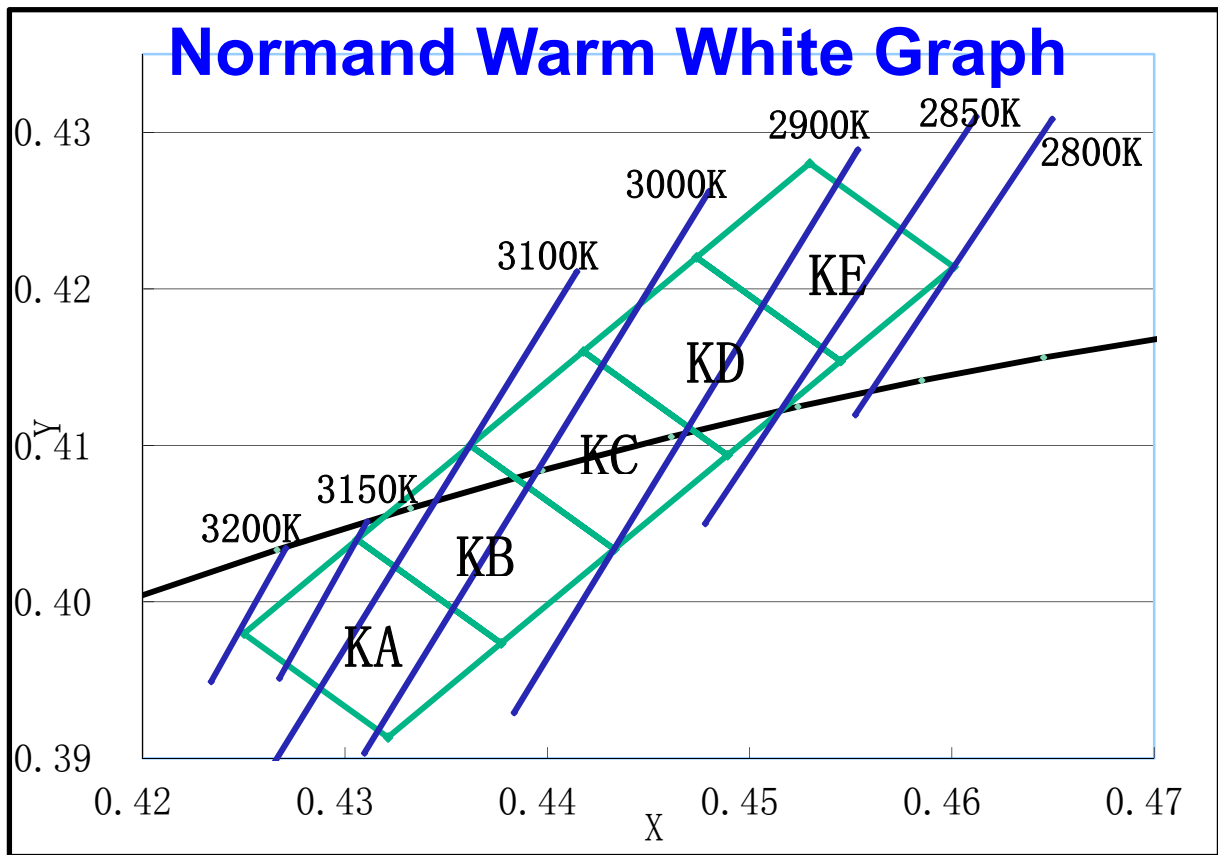


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CIE chromaticity coordinates (ANSI Warm White)

CA	X1	Y1	X2	Y2	X3	Y3	X4	Y4
KA	0.427	0.386	0.420	0.393	0.426	0.399	0.433	0.392
KB	0.433	0.392	0.426	0.399	0.431	0.405	0.438	0.398
KC	0.438	0.398	0.431	0.405	0.437	0.411	0.444	0.404
KD	0.444	0.404	0.437	0.411	0.442	0.417	0.449	0.410
KE	0.449	0.410	0.442	0.417	0.448	0.423	0.455	0.416

ANSI Warm White Color bin structures

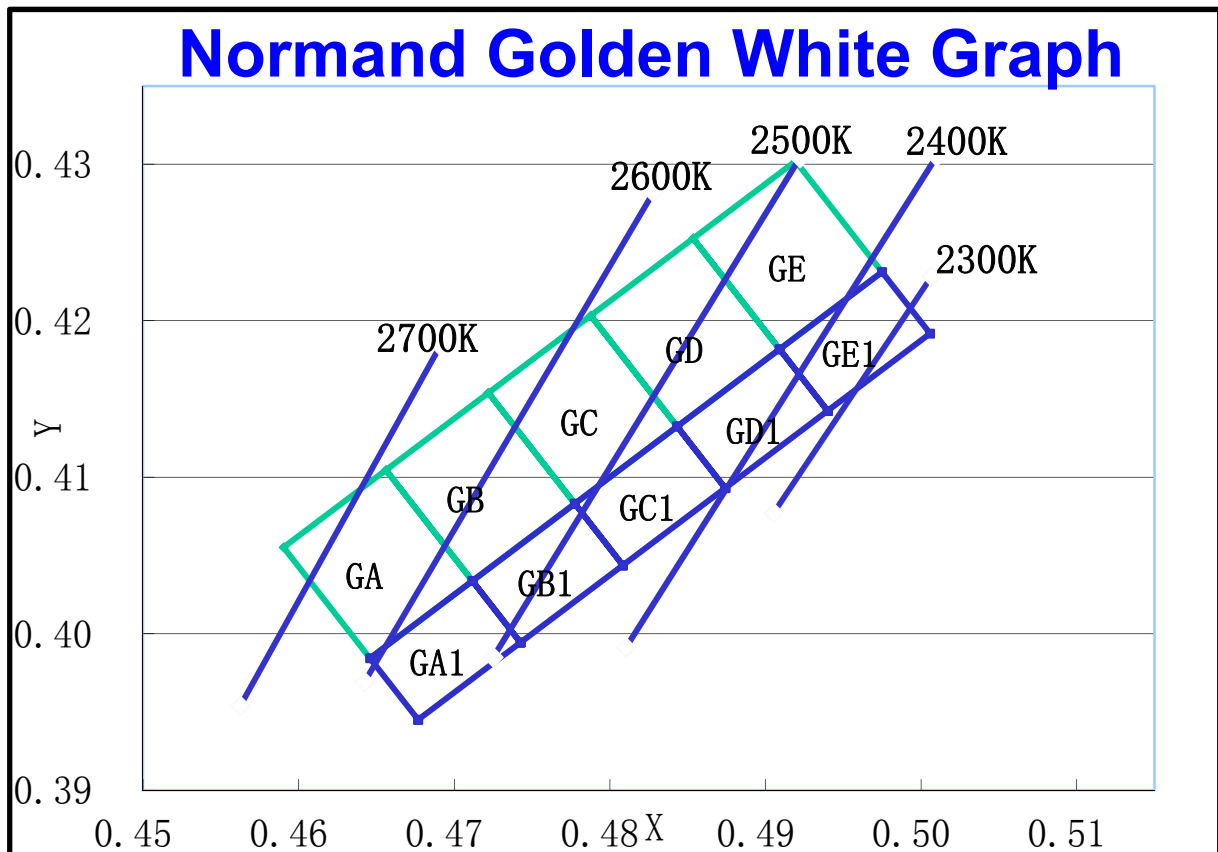


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CIE chromaticity coordinates (ANSI Warm Lighting)

CA	X1	Y1	X2	Y2	X3	Y3	X4	Y4
GA	0.459741	0.3982	0.4548	0.4045	0.4613	0.4096	0.4662	0.4033
GB	0.466212	0.4033	0.4613	0.4096	0.4677	0.4147	0.4727	0.4084
GC	0.472682	0.4084	0.4677	0.4147	0.4742	0.4198	0.4792	0.4135
GD	0.479152	0.4135	0.4742	0.4198	0.4807	0.4248	0.4856	0.4185
GE	0.485622	0.4185	0.4807	0.4248	0.4872	0.4299	0.4921	0.4236
GA1	0.462676	0.3945	0.4597	0.3982	0.4662	0.4033	0.4693	0.3994
GB1	0.469255	0.3994	0.4662	0.4033	0.4727	0.4084	0.4758	0.4044
GC1	0.475835	0.4044	0.4727	0.4084	0.4792	0.4135	0.4824	0.4093
GD1	0.482415	0.4093	0.4792	0.4135	0.4856	0.4185	0.489	0.4142
GE1	0.488995	0.4142	0.4856	0.4185	0.4921	0.4236	0.4956	0.4192

ANSI Warm Lighting Color bin structures

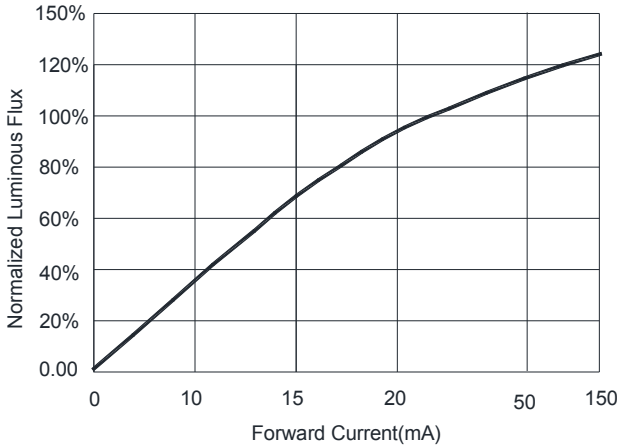


- Color coordinates measurement allowance is ± 0.005
- To order specify color temperature ranks, please contact OPSCO Lighting Holdings LTD. for further information.
- Thermal Pad Temperature @25°C @ 20mA

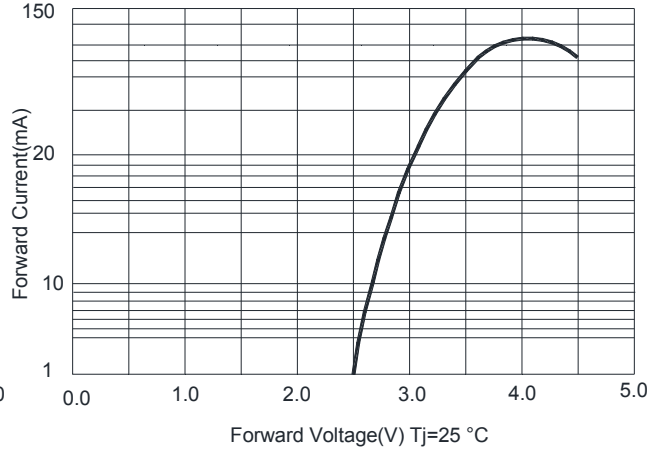
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8. 1 Optical-Electrical Characteristic Graphs (InGaN)

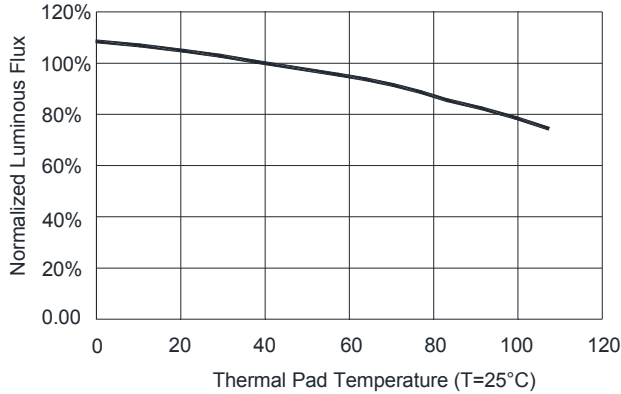
Typical Relative Luminous Flux vs. Forward Current



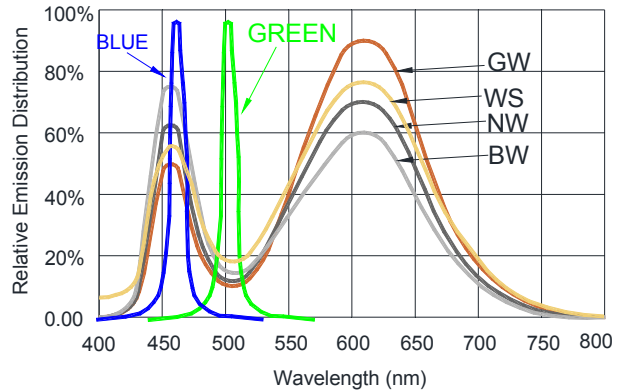
Forward Voltage vs. Forward Current



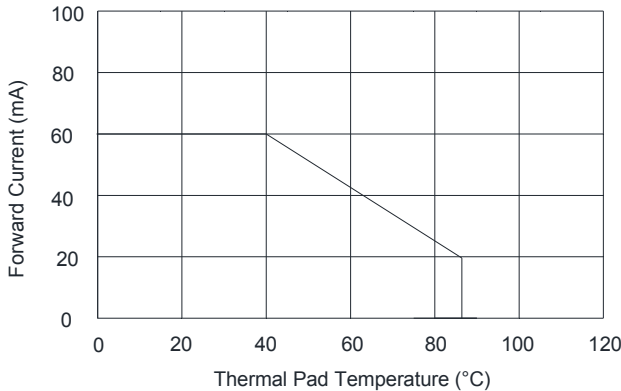
Thermal Pad Temperature vs. Relative Light Output



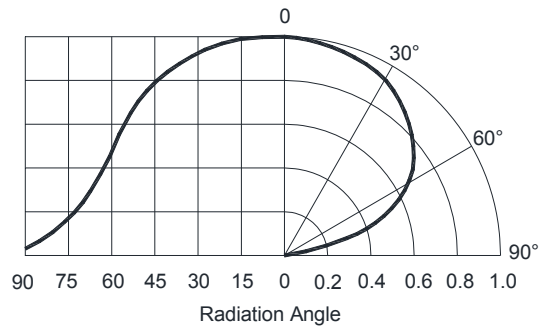
Wavelength Characteristics



Thermal Pad Temperature vs. Forward Current

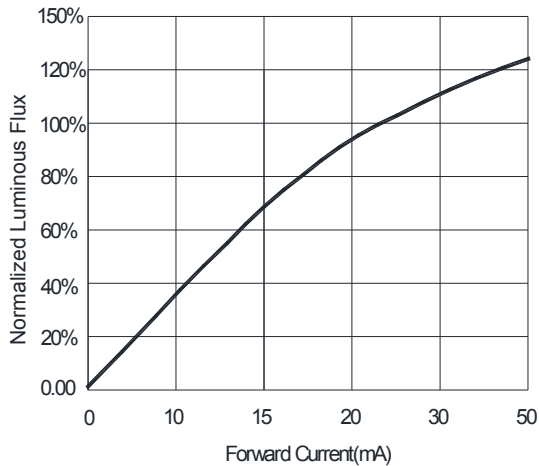


Typical Radiation Pattern 120°

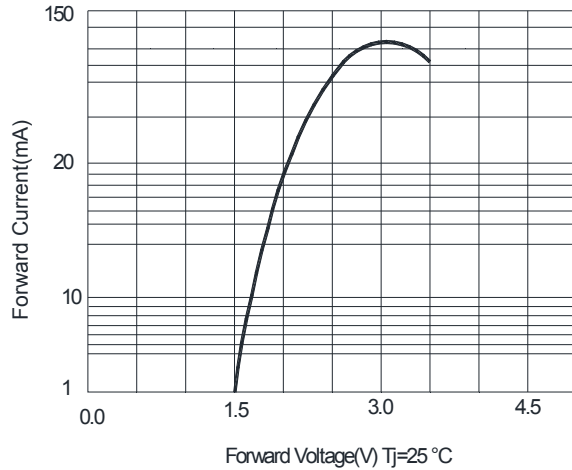


8.2 Optical-Electrical Characteristic Graphs (AlInGaP)

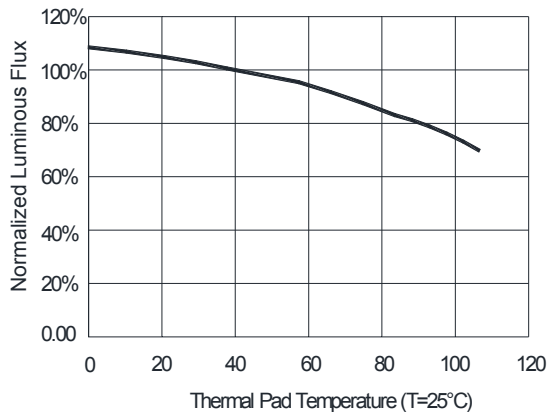
Typical Relative Luminous Flux vs. Forward Current



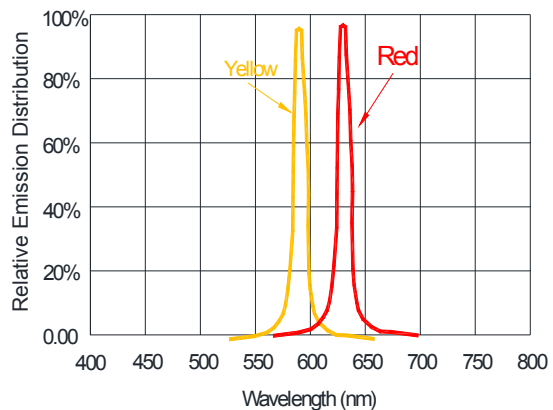
Forward Voltage vs. Forward Current



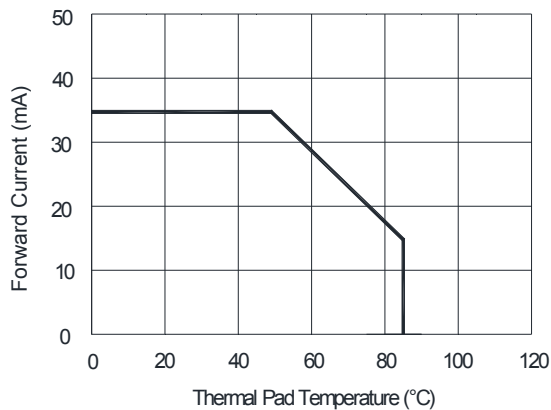
Thermal Pad Temperature vs. Relative Light Output



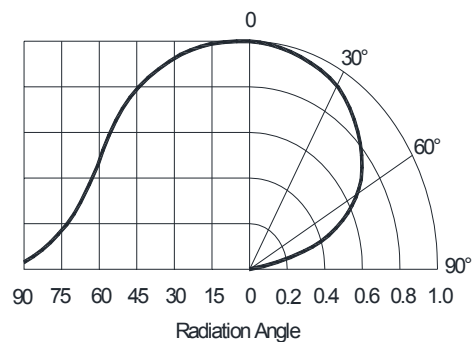
Wavelength Characteristics



Thermal Pad Temperature vs. Forward Current



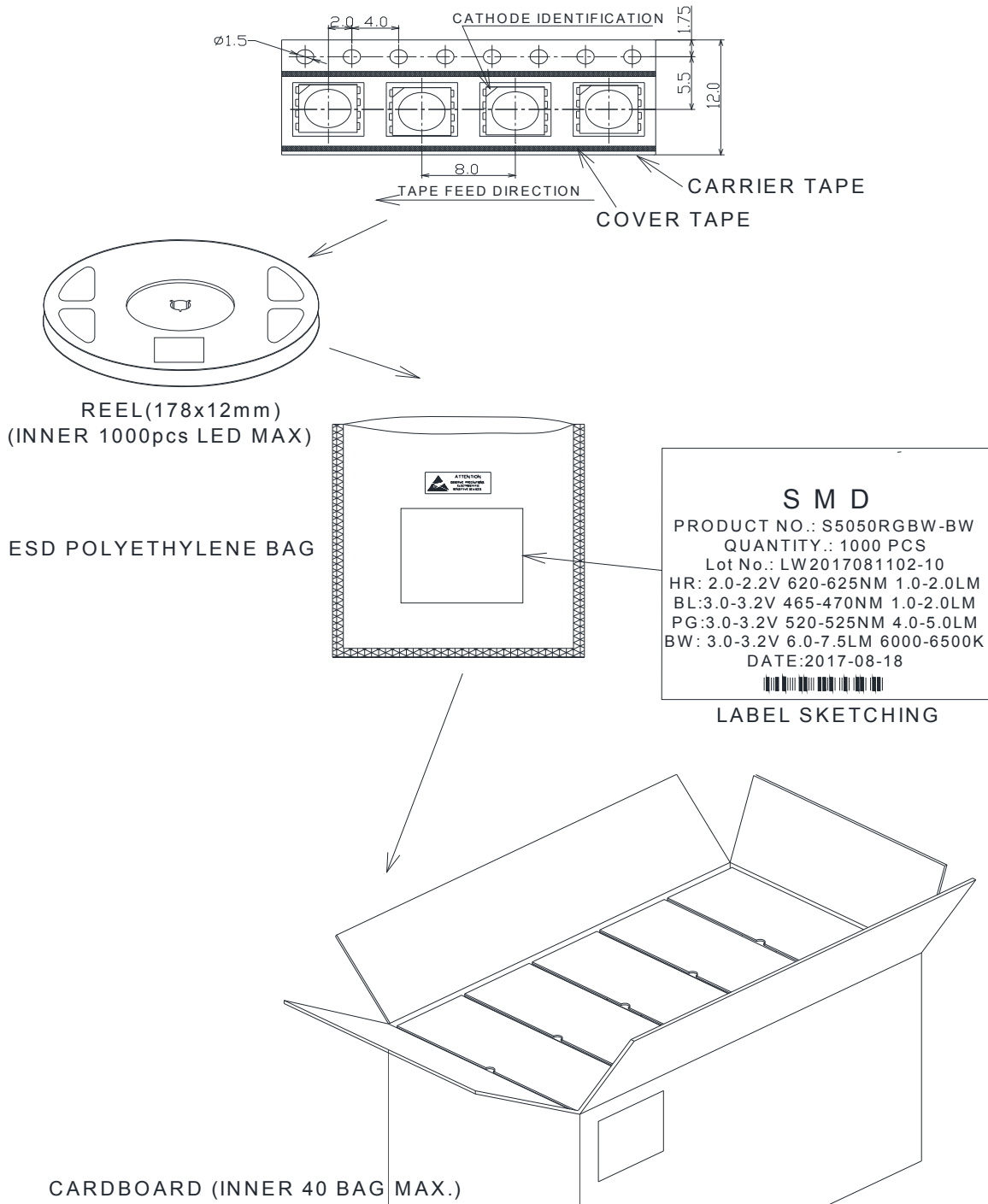
Typical Radiation Pattern 120°



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9. Packaging Standard:

S5050RGBW-BW



The reel pack is applied in SMD LED. The LEDs are packed in cardboard boxes after packaging in normal or anti-electrostatic bags. cardboard boxes will be used to protect the LEDs from mechanical shocks during transportation. The boxes are not water resistant and therefore must be kept away from water and moisture.

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The Purposes of making Normand's customers and users to have a clear understanding on the ways how to use the LED.

2. Description

Generally, The LED can be used the same way as other general purposed semiconductors. When using Normand's TOP SMD LED, the following precautions must be taken to protect the LED.

3. Cautions

3.1. Dust & Cleaning

This emitter has a silicone surface, There are many benefits to the silicone surface in terms of optical properties and improved reliability. However, silicone is a softer material and prone to attract dust. While a minimal amount of dust and debris on the LED will not cause significant reduction in illumination, steps should be taken to keep the emitter free of dust.

These include keeping the LEDs in the manufacturer's package prior to assembly and storing assemblies in an enclosed area after installing the emitters.

Surface condition of this device may change when organic solvents such as trichloroethylene or acetone were applied.

Avoid using organic solvent, it is recommended that isopropyl 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.

Do not clean the LEDs by the ultrasonic. When it is absolutely necessary, the influence as ultrasonic cleaning on the LEDs depends on factors such as ultrasonic power. Baking time and assembled condition. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

3.2. Shipment and storage

TOP SMD LED is a humidity sensor, the LED packaging in the aluminum bag is to avoid the LED in the transport and storage of moisture absorption, in the bag with a desiccant to absorb the moisture inside the bag. If the LED absorbs water vapor, then in the LED over reflow, in the high temperature state, into which the rapid expansion of gas vaporization and produce a greater internal stress, so that the material crack, layered or damaged bonding wire, Resulting in product failure.

TOP SMD LED with a moisture-proof anti-static aluminum foil bag packaging, handling should avoid the process of squeezing, piercing the case of bags, and do the necessary anti-static protective measures; promise products on the line before the leak or broken, Please stop the use of direct use of the product; , Resulting in product failure;

Such as before the material has been found to prevent moisture-proof aluminum foil bags have been opened, damaged, perforated can be returned to the original re-dehumidification, must not be on-line use;

The humidity level of this product is LEVEL5a.

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Chart 1: Definition of material's MSL prescribed by IPC/JEDECJ-STD-020

Moisture proof	Workshop lifespan after open the packaging	
	Time	condition
LEVEL1	unlimited	≤30°C/85 % RH
LEVEL2	1 year	≤30°C/60 % RH
LEVEL2a	4 Weeks	≤30°C/60 % RH
LEVEL3	168 Hours	≤30°C/60 % RH
LEVEL4	72 Hours	≤30°C/60 % RH
LEVEL5	48 Hours	≤30°C/60 % RH
LEVEL5a	24 Hours	≤30°C/60 % RH
LEVEL6	Take off and use immediately	≤30°C/60 % RH

3.3. Storage before unsealing

In order to avoid the moisture barrier caused by the reliability of the failure problem, need to do LED products SMT pre-storage and moisture-proof measures;

If the moisture-proof bag is not open, the TOP SMD element will be stored for less than 2 months at <30 ° C / 60% RH; (Note: The label date is the same and the packing is not leaked. Discoloration under the premise of use; for different moisture-proof grade materials or packaging to save the time there is a certain difference, the specific preservation time to the specification book or packaging tips prevail); recommended in the unassembled do not open the moisture before the bag;

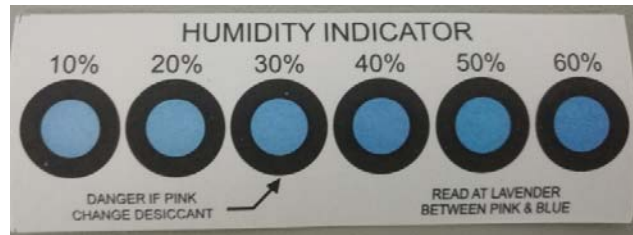
3.4. Control after the packing bag is opened

After opening the moisture-proof bag, please read the moisture-proof bag inside the humidity indicator card in the moisture-proof beads into pink to confirm moisture in the moisture bag is too much, according to the color of the ball to determine whether the bag material on-line operation; And the material after opening the package should be strictly controlled in the table 1 as specified by the maximum temperature and humidity and operating time allowed, as long as the material exposed in the environment described in Table 1, the need to accumulate its use in the workshop time. Open the bag and paste the material on the PCB board, should be completed within 0.5H welding work, do not recommend the material attached to the PCB, a long time stay in the workshop does not carry out SMT work; Caused by adverse water within the lead;

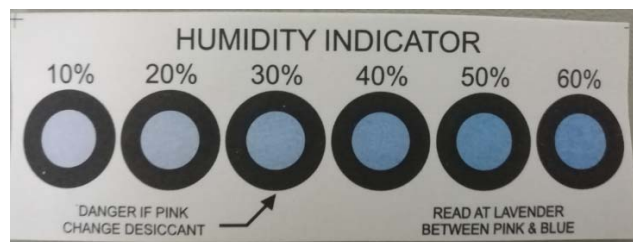
3.5. Definition of humidity card

Open the package after the TOP SMD LED bag inside the humidity card color instructions are as follows:

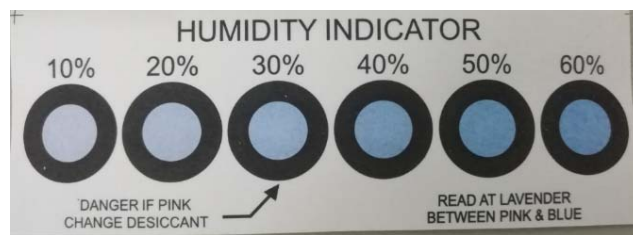
- A. If the moisture card 10% of the moisture-proof beads into pink, other files for the blue, this situation, LED can be used directly;
- B. If the humidity card moisture-proof beads 10%, 20% at all become pink, in fact, the file is blue, this situation, the need for low-temperature components dehumidification;
- C. If the humidity card moisture-proof beads 10%, 20%, 30% more than three are turned pink, in this case, the customer needs to return the material to our company for high humidity dehumidification, re-packaging before use;



Humidity indicator DO not change color



Humidity indicator tums pink in 10% 20%



Humidity indicator tums pink in 10% 20% 30%

3.6. Unwanted material moisture-proof storage and moisture-proof control of finished material

If a roll of SMDs is not used at once and the plant temperature and humidity are within the defined conditions ($<30^{\circ}\text{C}$ / 60% RH), the exposure time of the element in the air does not exceed 2H, the remaining material should be carried out together with the desiccant Vacuum sealed, otherwise, the material must be low-wet baking dehumidification; dehumidified material can be re-packaged to re-start the calculation time;

Perform moisture control on SMDs components that have been assembled

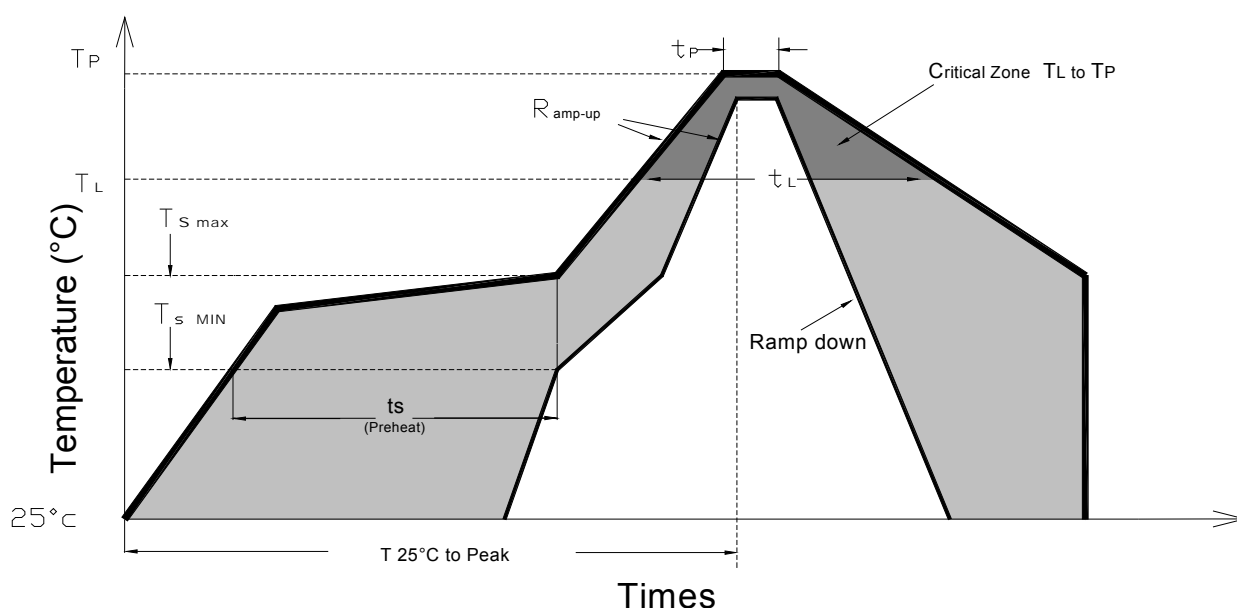
- After the components have been assembled to the PCB board no longer need to go through the high temperature process or reflow process, it will not be special treatment;
- Do not need to do the necessary dehumidification work before making the appropriate protection process, bake in $70^{\circ}\text{C} \pm 5^{\circ}\text{C}$ oven baking for less than 12 hours, To remove the product in the detection and aging process exposed to moisture in the air to avoid the product in the protective treatment, the package in the material surface of the moisture will slowly invade the product, will cause product failure;
- For products that require secondary SMT process or high temperature, they should be subjected to the necessary moisture treatment before secondary welding, after exposure to ($<30^{\circ}\text{C}$ / 60% RH) , The maximum length of not more than 2H, Connaught second high temperature process separated by a long time, then a welding material must be necessary dehumidification work ($70^{\circ}\text{C} \pm 5^{\circ}\text{C}$ oven baking no less than 12 hours), and then pumping Vacuum storage; or the first product stored in the oven or with a desiccant container, the second high-temperature process before doing dehumidification work ($70^{\circ}\text{C} \pm 5^{\circ}\text{C}$ in the oven baking no less than 12 hours) , To ensure that products in the high temperature before the process is not damp;

Low-temperature baking conditions: $70^{\circ}\text{C} \pm 5^{\circ}\text{C}$ baking not less than 12 hours high temperature baking conditions: $130^{\circ}\text{C} \pm 5^{\circ}\text{C}$ baking not less than 6 hours (lamp beads must be split into particles)

3.7. Reflow Soldering Characteristics

In testing, Normand has found S50 LEDs to be compatible with JEDEC J-STD-020C, using the parameters listed below. As a general guideline Normand recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.

Note that this general guideline is offered as a starting point and may require adjustment for certain PCB designs and Configurations of reflow soldering equipment.

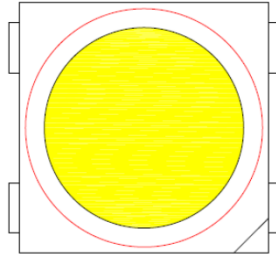


Profile Feature	Lead-Based Solder	Lead-Free Solder
Average Ramp-Up Rate ($T_{s \max}$ to T_p)	3°C/second max.	3°C/second max.
Preheat: Temperature Min ($T_{s \min}$)	100°C	150°C
Preheat: Temperature Min ($T_{s \max}$)	150°C	200°C
Preheat: Time ($t_{s \min}$ to $t_{s \max}$)	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature (T_L)	183 °C	217 °C
Time Maintained Above: Time (t_L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T_p)	215 °C	240 °C
Time Within 5°C of Actual Peak Temperature (t_p)	<10 seconds	<10 seconds
Ramp-Down Rate	6°C/second max.	6°C/second max.
Time 25 °C to Peak Temperature	<6 minutes max.	<6 minutes max.

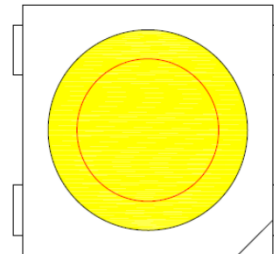
Note: All temperatures refer to topside of the package, measured on the package body surface.

3.8 General design requirements :

. SMT nozzle requirements: (red circle refers to the nozzle diameter)



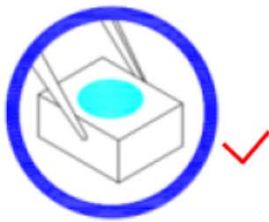
OK (nozzle diameter is greater than the light bulb area)



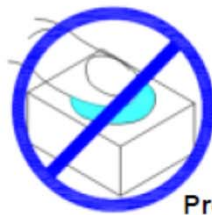
NG (nozzle diameter is less than the light beads light area)

. Material to take way: with tweezers folder material, can not press the colloid or sharp objects to touch the colloid, the material can not be stacked;

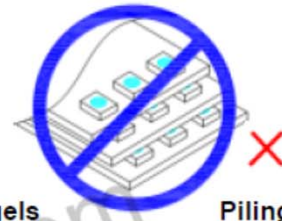
a. Correct handling



b. Wrong handling and wrong display after assembling



Pressing gels



Piling up material

. Products in the PCB layout design, for the soft sheet, and 0.5T below the plate, the pad direction should be perpendicular to the direction of PCB extension to reduce the PCB board bending stress generated in the LED pin, resulting in LED products Due to stress acting tensile failure;

3.9 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 components. It is necessary to avoid in tense heat generation and operate within the maximum rating given in this specification. The operating current should be decided after considering the ambient maximum temperature of LEDs

The maximum working humidity of the product is not easy to exceed 40 ° C (≤ 40 ° C, refers to the product pin at the operating temperature)

4.0. Electrostatic Discharge & Surge Current

Electrostatic discharge (ESD) or surge current (EOS) may damage LED.

Precautions such as ESD wrist strap, ESD shoe strap or antistatic gloves must be worn whenever handling of LED.

All devices, equipment and machinery must be properly grounded.

It is recommended to perform electrical test to screen out ESD failures at final inspection.

It is important to eliminate the possibility of surge current during circuitry design.

4.1. Other

Can not take any responsibility for any trouble that are caused by using the LEDs at conditions exceeding our specifications.

These LEDs are designed and manufactured for standard applications such as electric home appliances, communication equipment, office equipment, electronic equipment and so on.

It is recommended to consult us in advance if user's application requires any particular quality or reliability which concerns human life. Examples would be medical equipment, aerospace applications, traffic signals, safety system equipment and so on.

Care must be taken to ensure that the reverse voltage will not exceed the absolute maximum rating when using the LEDs with matrix drive.

The LED light output is strong enough to injure human eyes. Precautions must be taken to prevent looking directly at the LEDs with unaided eyes for more than a few seconds.

The formal specification must be exchanged and signed by both parties before large volume purchase begins.

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

