

## 3528七彩（白面共阴）贴片式发光二极管



### 特点 (characteristic) :

- \* 外观尺寸 (L/W/H) :3.5\*2.8\*1.9 mm  
Appearance dimension (L / w / h): 3.5 x 2.8 x 1.9 mm
- \* 发光角度: 120度  
Wide viewing angle : 120°
- \* 发光颜色及胶体: 红绿蓝/透明胶体  
Luminous color and colloid: Red green and blue / transparent colloid
- \* 室内和室外显示器  
Indoor and outdoor displays
- \* 各种颜色和镜头类型可供选择  
Various colors and lens types available
- \* 包装: 2000个/卷  
Package : 2000PCS/reel
- \* 环保产品, 符合ROHS要求  
Environmental protection products meet ROHS requirements
- \* EIA规范标准包装  
EIA standard packaging
- \* 适用于自动贴片机  
Suitable for automatic mounter
- \* 低功耗, 宽视角  
Low power consumption ; wide viewing angle

### 应用领域 (product application) :

- \* 医用设备: 内窥镜、血氧仪  
Medical equipment: endoscope、oximeter
- \* 汽车电子: 背光按键灯、指示灯  
Automotive electronics: backlight key light、indicator light
- \* 工业产品: 电子仪表盘、工业设备  
Industrial products: electronic instrument panel、industrial equipment
- \* 智能家居: 白色家电、数码管LED  
Smart home: white appliances, nixie tube LED
- \* 通讯产品: 手机按键灯、路由器、电视盒  
Communication products: mobile phone button lamp, router



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电性参数

◆Electrical Characteristics

极限参数 (温度=25℃):

参数名称 Parameter	红色 Red	绿色 Green	蓝色 Blue	单位 Units
正向工作电流 Forward working current	25	25	25	mA
正向峰值电流 Pulse forward current	80	140	140	mA
功率消耗 Power Dissipation	75	135	135	mW
反向电压 Reverse voltage	5	5	5	V
储存环境温度 Storage ambient temperature	-40°C To +85°C			°C

注: 1/10占空比, 0.1ms脉冲宽度。Note: 1/10 Duty Cycle, 0.1ms Pulse Width

光电参数 (温度=25℃):

Electro-Optical Characteristics (Temperature=25°C):

符号 Symbol	参数 Parameter	装置 Device	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Units	试验条件 Test Conditions
$\lambda_{peak}$	峰值波长 Peak Wavelength	Hyper Red Green Blue	/	620 520 466	/	nm	IF=20mA
$\lambda_D$	主导波长 Dominant Wavelength	Hyper Red Green Blue	620 518 466	620 520 468	625 525 470	nm	IF=20mA
$\Delta\lambda_{1/2}$	谱线半宽 Spectral Line Half-width	Hyper Red Green Blue	/	20 38 25	/	nm	IF=20mA
C	电容 Capacitance	Hyper Red Green Blue	/	25 40 110	/	pF	VF=0V;f=1MHz
VF	正向电压 Forward Voltage	Hyper Red Green Blue	2.0 3.0 2.9	2.0 3.2 3.1	2.2 3.3 3.3	V	IF=20mA
IR	反向电流 Reverse Current	Hyper Red Green Blue	/	/	7	uA	VR = 7V

选择指南 Selection Guide

零件号Part No.	掷骰子Dice	镜头类型 LensType	亮度Iv (mcd) @ 20mA		发光角度Viewing Angle 2 θ 1/2
			最小值Min.	最大值Max.	
3528RGB	RED(InGaN)	WATER CLEAR	300	500	120°
	Green (InGaN)		700	1000	
	Blue (InGaN)		200	300	

注: 2 θ 1/2是与光学中心线的角度, 其中发光强度为光学中心线值的1/2。

Note: 2 θ 1/2 is the angle from optical centerline where the luminous intensity is 1/2 the optical centerline value.

亮度分档:

Brightness grading:

代码 Code	最小值 Minimum value	最大值 Maximum	单位 Company	测试条件 Test conditions
P46	350	400	mcd	IF=20mA
S12	1300	1500		

电压分档:

Voltage grading:

代码 Code	最小值 Minimum value	最大值 Maximum	单位 Company	测试条件 Test conditions
A04	2.0	2.2	V	IF=20mA
U05	3.0	3.3		
U05	3.0	3.3		
A09	3.0	3.2		

波长分档:

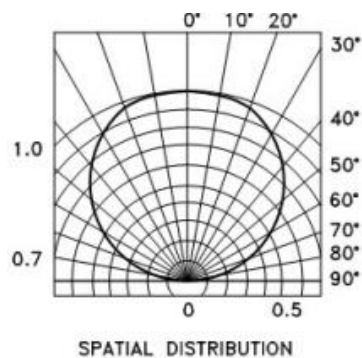
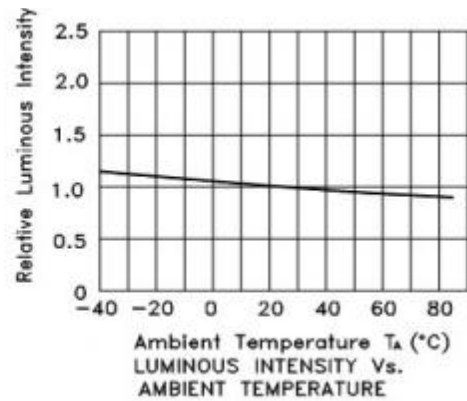
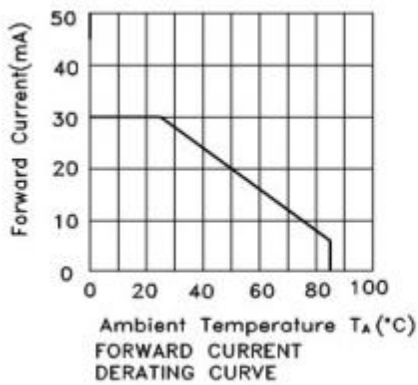
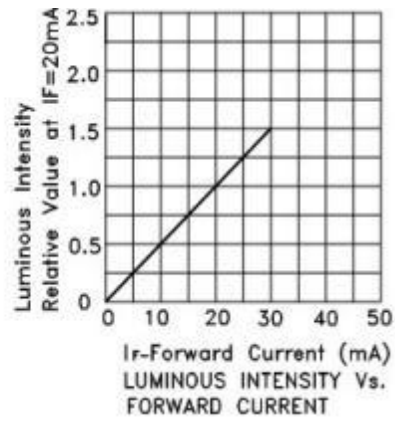
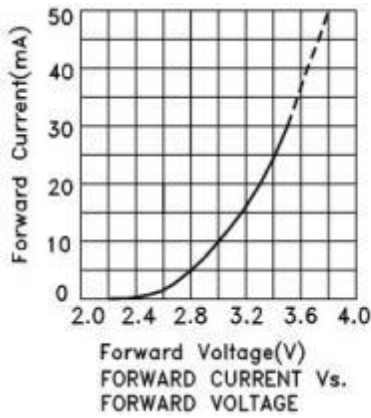
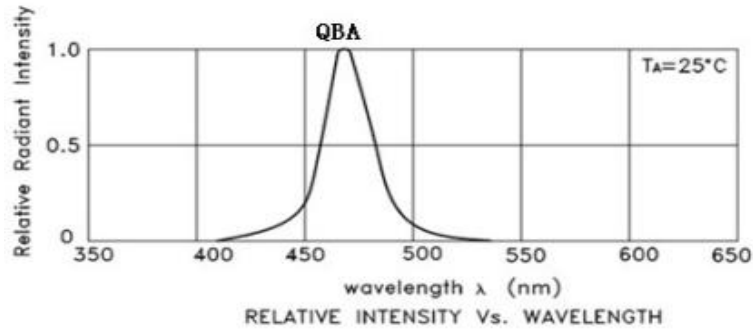
Wavelength division:

代码 Code	最小值 Minimum value	最大值 Maximum	单位 Company	测试条件 Test conditions
HR02	620	625	nm	IF=20mA
HG24	520	525		
TB17	466	470		

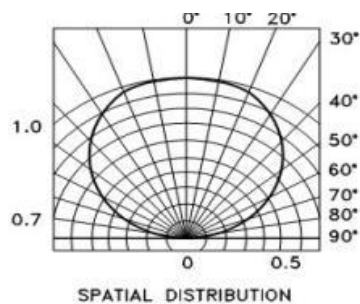
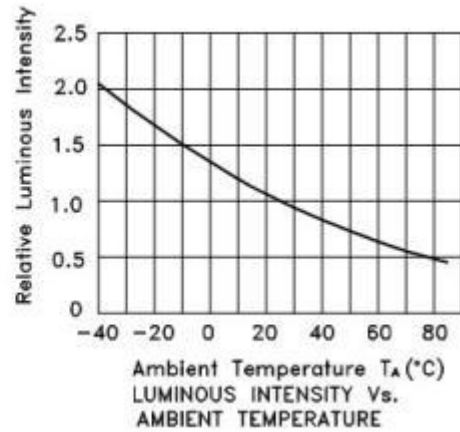
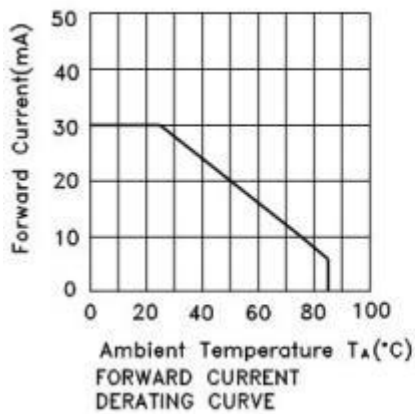
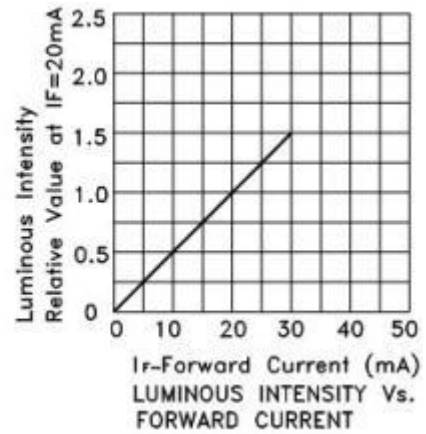
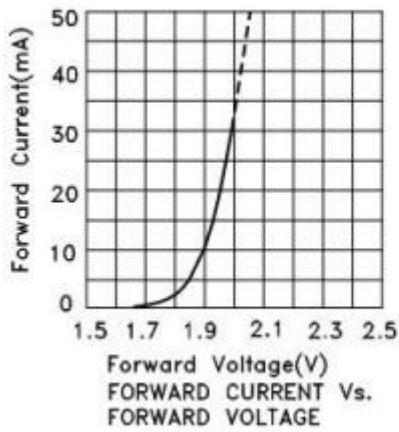
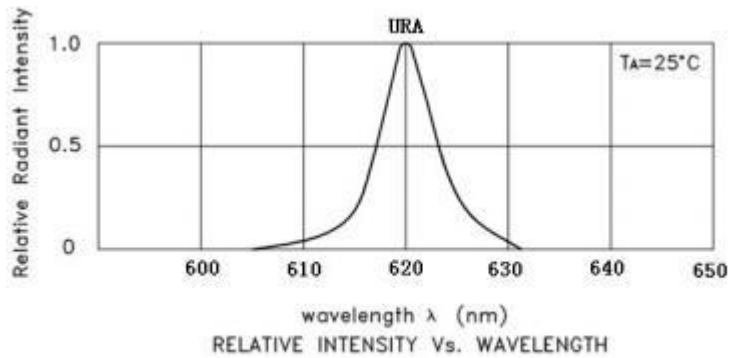
典型特性曲线

Typical Characteristics Curves

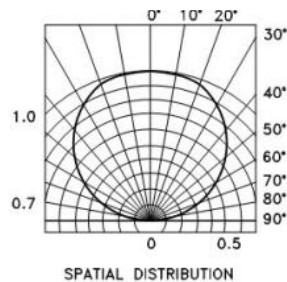
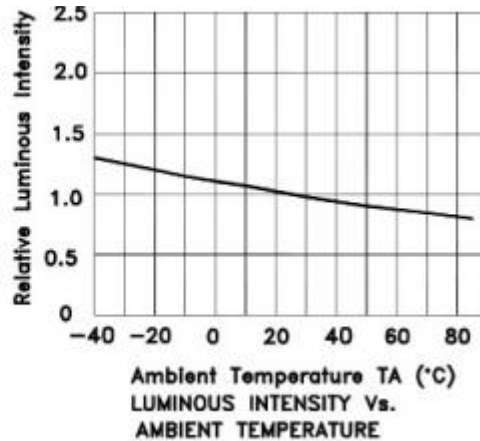
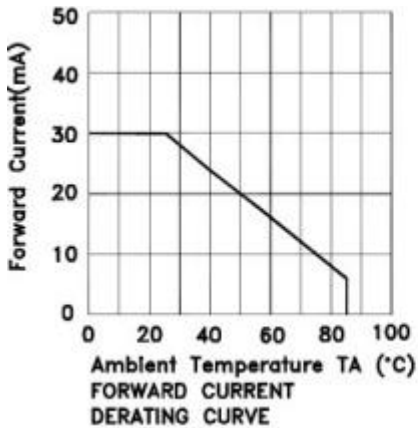
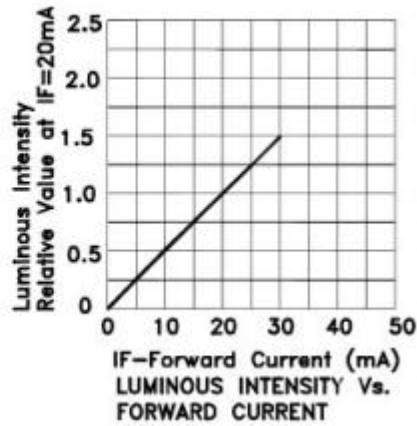
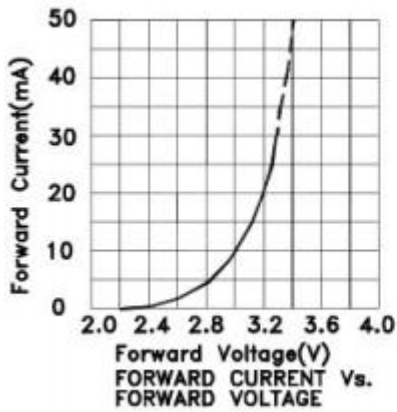
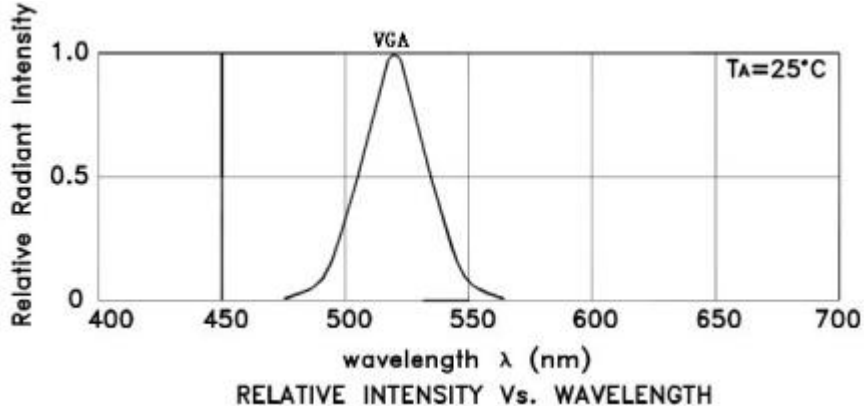
Blue 蓝



Red 红



Green 绿



## 可靠性试验

### Reliability Test Items And Conditions

类别 Type	测试项目 Test item	源科参照标准 YK. Standard	测试条件 Test Conditions	备注 Note	数量 Quantity	不良数量 Number of Damaged
Environmental Sequence	高低温循环 Temperature Cycle	JIS C 7021 (1977)A-4	-25°C 30min ↑↓5min 80°C 30min	100 cycle	22	0
	热冲击 Thermal Shock	MIL-SLD-107D	-25°C 15min ↑↓5min 80°C 15min	50 cycle	22	0
	高湿度热循环 High Humidity Heat Cycle	JIS C 7021 (1977)A-5	30°C (<=> 65°C 90%RH 24hrs/1cycle	10 cycle	22	0
	高温存储 High Temperature Storage	JIS C 7021 (1977)B-10	T <sub>a</sub> =80°C	1000hrs	22	0
	高温高湿存储 Humidity Heat Storage	JIS C 7021 (1977)B-11	T <sub>a</sub> =60°C RH=90%	1000hrs	22	0
	低温存储 Low Temperature Storage	JIS C 7021 (1977)B-12	T <sub>a</sub> =-30°C	1000hrs	22	0
Operation Sequence	常温寿命测试 Normal temperature life test	JIS C 7035 (1985)	T <sub>a</sub> =25°C I <sub>F</sub> =20mA	1000hrs	22	0
	高温高湿寿命测试 High Humidity Heat Life Test	Ⓢ	60°C RH=90% I <sub>F</sub> =20mA	500hrs	22	0
	低温寿命测试 Low Temperature Life Test	Ⓢ	T <sub>a</sub> =-25°C I <sub>F</sub> =20mA	1000hrs	22	0

#### \*1 失效判断标准 Criteria For Judging Damage

测试项目 Test item	符号 Symbol	测试条件 Test Conditions	判定标准 Judgment criteria
正向电压 Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =I <sub>FT</sub>	初始值±10% Initial Data±10%
反向电流 Reverse Current	I <sub>R</sub>	V <sub>R</sub> =5V	I <sub>R</sub> ≤ 10μA
光强 Luminous Intensity	I <sub>V</sub>	I <sub>F</sub> =I <sub>FT</sub>	平均I <sub>V</sub> 衰减 ≤ 30%，单个平均I <sub>V</sub> 衰减 ≤ 50% Average I <sub>V</sub> degradation ≤ 30% Single LED I <sub>V</sub> degradation ≤ 50%
耐焊接热 Resistance to Soldering Heat	--	--	材料无内部裂痕、无材料间爆裂、剥离、无死灯 Material without internal cracks, no material between stripped, no deaded light.

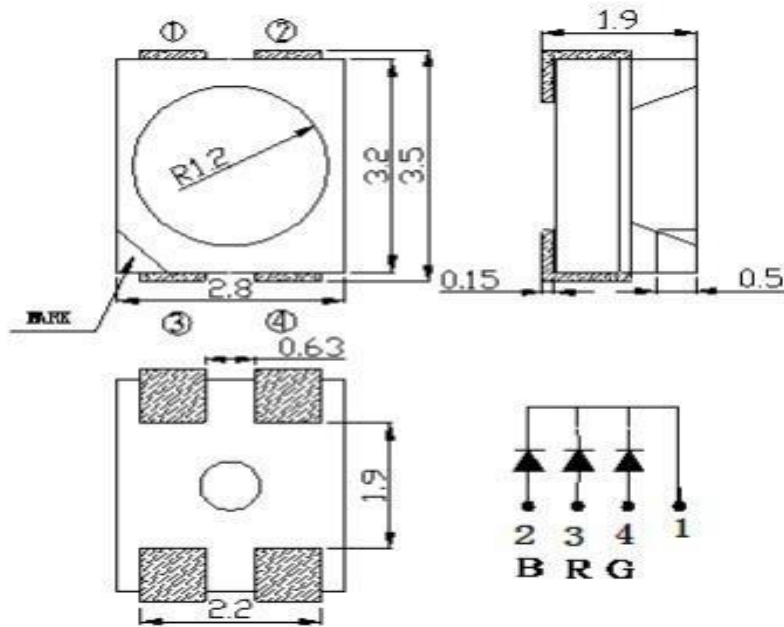
\*数据工作表中所示的技术信息仅限于典型特征和电路实例引用的产品.它既不构成工业特性的保证,也不构成任何许可的授权

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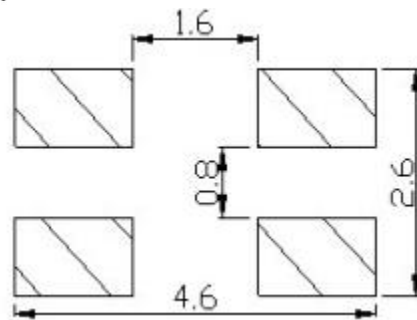
## 外形尺寸

### Outline Dimension



### 推荐焊盘图:

#### Suggest Soldering Pad Dimensions:



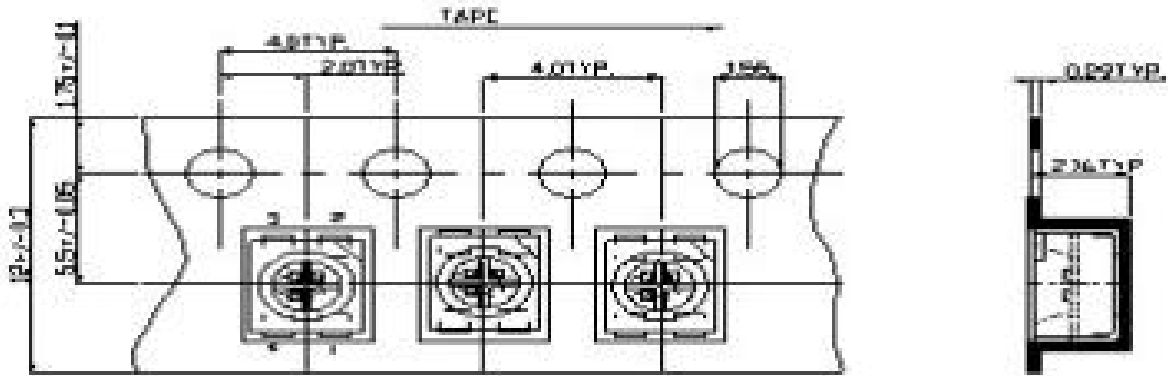
### 备注 (Note) :

1. 单位: mm  
Unit: mm
2. 公差: 如无特别标注则为 $\pm 0.10\text{mm}$   
Tolerance:  $\pm 0.10\text{mm}$  unless otherwise specified

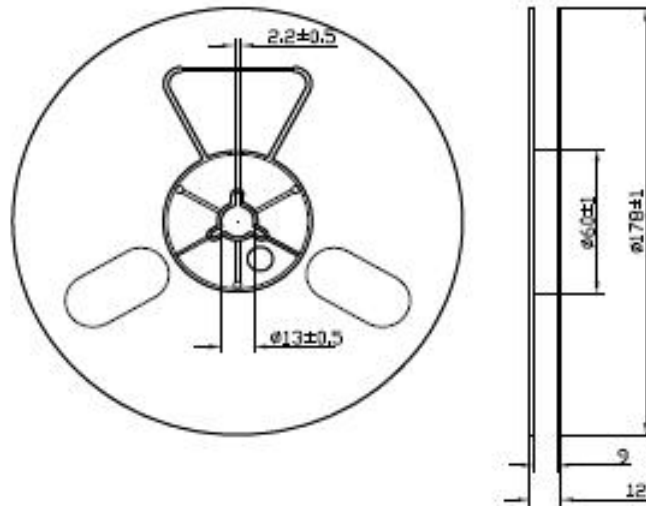
## 包装 (1)

### Packaging (1)

编带包装 Fabric with packaging



卷轴尺寸 Scroll size



## 包装 (2)

### Packaging (2)

#### ◇ 防潮防静电包装 Moisture Proof and Anti-Electrostatic Foil Bag



#### ◇ 外包装箱 Cardboard Box



Capacity 5 or 10 reels per box (内箱容量: 50或100卷)

#### ◇ 标签说明: Label Explanation

- LOT NO: 批次信息
- PART NO: 产品型号
- BIN CODE: 产品名称
- WL: 波长范围
- IV: 光强范围
- VF: 电压范围



## 焊接指导（1）

### Guideline for Soldering (1)

#### 1. 使用烙铁人手焊接

##### Hand Soldering

推荐使用功率低于 20W 的烙铁，焊接时烙铁的温度必须保持在 300℃ 以下，且每个电极只能进行一次焊接，每次焊接的持续时间不得超过 3 秒。

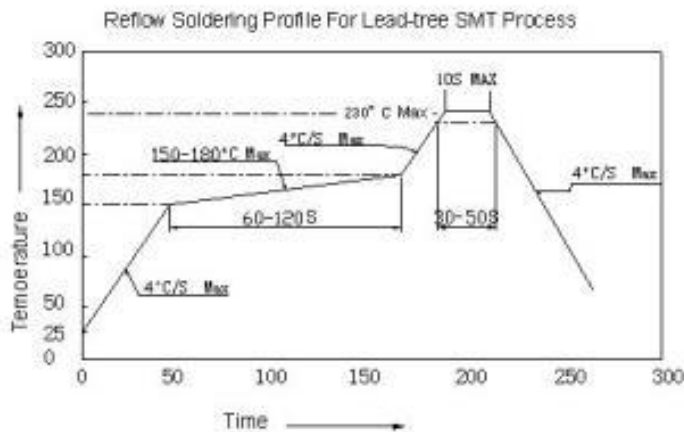
人手焊接过程中的不慎操作易引起 LED 产品的损坏，应当小心谨慎。

A soldering iron of less than 20W is recommended to be used in Hand Soldering. Please keep the temperature of the soldering iron under 300°C while soldering. Each terminal of the LED is to go for less than 3 second and for one time only.

Be careful because the damage of the product is often started at the time of the hand soldering.

#### 2. 回流焊接： 推荐使用以下无铅回流焊接温度图进行。

**Reflow Soldering:** Use the conditions shown in the under Figure of Pb-Free Reflow Soldering.



**NOTES:**

1. We recommend the reflow temperature 245° c(±5) The maximum soldering temperature should be limited to 260° c
2. Don't cause stress too the epoxy resin while it is exposed to high temperature.
3. Number of reflow process shall be 2 time or less.

- 回流焊接最多只能进行两次。

Reflow soldering should not be done more than two times.

- 在回流焊接升温过程中，请不要对 LED 施加任何压力。

Stress on the LEDs should be avoided during heating in soldering process.

- 在焊接完成后，待产品温度下降到室温之后，再进行其他处理。

After soldering, do not deal with the product before its temperature drop down to room temperature.

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## 焊接指导 (2)

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### Guideline for Soldering (2)

#### 3. 清洗:

##### Cleaning

在焊接后推荐使用酒精进行清洗，在温度不高于 30°C 的条件下持续 3 分钟，不高于 50°C 的条件下持续 30 秒。使用其他类似溶剂清洗前，请先确认使用的溶剂不会对 LED 的封装和环氧树脂部分造成损伤。

超声波清洗也是有效的方法，一般最大功率不应超过 300W，否则可能对 LED 造成损伤。请根据具体的情况预先测试清洗条件是否会对 LED 造成损伤。

It is recommended that alcohol be used as a solvent for cleaning after soldering. Cleaning is to go under 30°C for 3 minutes or 50°C for 30 seconds. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not.

Ultrasonic cleaning is also an effective way for cleaning. But the influence of Ultrasonic cleaning on LED depends on factors such as ultrasonic power. Generally, the ultrasonic power should not be higher than 300W. Before cleaning, a pretest should be done to confirm whether any damage to LEDs will occur.

- \* **注意:** 此一般指导原则并不适用于所有 PCB 设计和焊接设备的配置。具体工艺受到诸多因素的影响，请根据特定的PCB设计和焊接设备来确定焊接方案。
- \* **Note:** This general guideline may not apply to all PCB designs and configurations of all soldering equipment. The technics in practise is influenced by many factors, it should be specialized base on the PCB designs and configurations of the soldering equipment..

## 使用注意事项（1）

### Precautions (1)

#### 1. 贮存:

##### Storage

- 本产品使用密封防潮抗静电袋包装，并附有干燥剂，未开封的产品有一年的保存时间。

Moisture proof and anti-electrostatic package with moisture absorbent material is used, to keep moisture to a minimum.

- 开封前，产品须存放在温度不高于 30℃，湿度不高于 60%RH 的环境中。

Before opening the package, the product should be kept at 30℃ or less and humidity less than 60% RH, and be used within a year.

- 开封后，产品须存放在温度不高于 30℃，湿度不高于 10%RH 的环境中，且应该在 168 小时（7 天）内使用完。建议工作环境为温度不高于 30℃，湿度不高于 60%RH。

After opening the package, the product should be stored at 30℃ or less and humidity less than 10%RH, and be soldered within 168 hours (7 days). It is recommended that the product be operated at the workshop condition of 30℃ or less and humidity less than 60%RH.

- 对于尚未焊接的 LED，如果吸湿剂或包装失效，或者产品没有符合以上有效存储条件，烘焙可以起到一定的性能恢复效果。烘焙条件：(60±5)℃，持续 24 小时。

If the moisture absorbent material has fade away or the LEDs have exceeded the storage time, baking treatment should be performed based on the following condition: (60±5)℃ for 24 hours.

#### 2. 静电:

##### Static Electricity

静电和电涌会导致产品特性发生改变，例如正向电压降低等，如果情况严重甚至会损毁产品。所以在使用时必须采取有效的防静电措施。

所有相关的设备和机器都应该正确接地，同时必须采取其他防止静电和电涌的措施。

使用防静电手环，防静电垫子，防静电工作服、工作鞋、手套，防静电容器，都是有效的防止静电和电涌的措施。

Static electricity or surge voltage damages the LEDs. Damaged LEDs will show some unusual characteristic such as the forward voltage becomes lower, or the LEDs do not light at the low current. even not light.

All devices, equipment and machinery must be properly grounded. At the same time, it is recommended that wrist bands or anti-electrostatic gloves, anti-electrostatic containers be used when dealing with the LEDs.

## 使用注意事项 (2)

### Precautions (2)

#### 3. 设计建议:

##### Design Consideration

设计电路时，通过 LED 的电流不能超过规定的最大值，同时，还需使用保护电阻，否则，微小的电压变化将会引起较大的电流变化，可能导致产品损毁。

建议使用以下 (A) 电路，该电路能够很好的调节通过每个 LED 的电流；不推荐使用 (B) 电路，该电路在持续的电压驱动下，LED 的正向电压 ( $V_F$ ) 发生变化，电流会随之而发生变化，可能使某些 LED 承受高于规定的电流值。

In designing a circuit, the current through each LED must not exceed the absolute maximum rating specified for each LED. In the meanwhile, resistors for protection should be applied, otherwise slight voltage shift will cause big current change, burn out may happen.

It is recommended to use Circuit A which regulates the current flowing through each LED rather than Circuit B. When driving LEDs with a constant voltage in Circuit B, the current through the LEDs may vary due to the variation in Forward Voltage ( $V_F$ ) of the LEDs. In the worst case, some LED may be subjected to stresses in excess of the Absolute Maximum Rating.



LED 的特性容易因为自身的发热和环境的温度的改变而发生改变。温度的升高会降低 LED 的发光效率、影响发光颜色等，所以在设计时应充分考虑散热的问题。

Thermal Design is paramount importance because heat generation may result in the Characteristics decline, such as brightness decreased, Color changed and so on. Please consider the heat generation of the LEDs when making the system design.

## 使用注意事项 (3)

### Precautions (3)

#### 4. 其他事项:

##### Others

直接用手拿取产品不但会污染封装树脂表面, 也可能由于静电等因素导致产品性能的改变。过度的压力也可能直接影响封装内部的管芯和金线, 因此请勿对产品施加过度压力, 特别当产品处于高温状态下, 例如在回流焊接过程中。

When handling the product, touching the encapsulant with bare hands will not only contaminate its surface, but also affect on its optical characteristics. Excessive force to the encapsulant might result in catastrophic failure of the LEDs due to die breakage or wire deformation. For this reason, please do not put excessive stress on LEDs, especially when the LEDs are heated such as during Reflow Soldering.



LED 的环氧树脂封装部分相当脆弱, 请勿用坚硬、尖锐的物体刮、擦封装树脂部分。在用镊子夹取的时候也应当小心注意。

The epoxy resin of encapsulant is fragile, so please avoid scratch or friction over the epoxy resin surface. While handling the product with tweezers, do not hold by the epoxy resin, be careful.

#### 5. 眼睛保护忠告:

##### Safety Advice For Human Eyes

LED 发光时, 请勿直视发光光源, 特别是对于一些光强较高的 LED, 强光可能伤害你的眼睛。

Viewing direct to the light emitting center of the LEDs, especially those of great Luminous Intensity, will cause great hazard to human eyes. Please be careful.



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