



# 伟鸿泰科技（深圳）有限公司

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## SMD

## PPA4020RGB-IC89CU4-HT

|                          |                         |                          |                            |
|--------------------------|-------------------------|--------------------------|----------------------------|
| <b>编制</b><br>Prepared by | <b>审核</b><br>Checked by | <b>核准</b><br>Approved by | <b>市场部</b><br>Market Dept. |
| 胡志强                      |                         |                          |                            |

|                                      |                         |                                      |
|--------------------------------------|-------------------------|--------------------------------------|
| <b>客户确认</b><br>Customer Confirmation |                         | <b>客户反馈意见</b><br>Customer Suggestion |
| <b>确认</b><br>Confirmed by            | <b>审核</b><br>Checked by |                                      |
|                                      |                         |                                      |

| 版本号  | 状态 | 修改内容概要 | 修订日期     | 修订人 | 批准人 |
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| V1.0 | N  | 新建     | 20250305 | 胡志强 | 汪娟  |
|      |    |        |          |     |     |

注：初始版本号V1.0；每次修订批准后，版本号顺序加“0.1”；  
状态包括：N--新建，A--增加，M--修改，D--删除。

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## 4020-幻彩-贴片式发光二极管

### 主要特点

- OUTR/G/B端口默认输出电流11mA。
- 芯片支持VDD-GND防反接功能。
- OUTR/G/B输出灰度等级：256级。
- 采用单线归零码SID数据协议。
- 同一帧显示数据同步刷新。
- 数据串行级联传输，抗干扰能力强。
- 数据发送速率：800Kbps。

### 产品特征

- 封装尺寸：4.0(长) × 2.0 (宽) × 1.65(高) mm  
Package Size : 4.0(L) × 2.0(W) × 1.65(T) mm
- 采用硅胶封装  
Silicone Packed
- 适应多种工作环境  
Suitable for different working environment
- 超长寿命：30000 小时  
Super long lifetime : 30000HRs
- 防紫外线  
Anti UV
- 可供白光(2300K- 25000K)  
White colors are available in(2300K- 25000K)
- 宽角度 (2θ 1/2 = 120 °)  
Wide viewing angle (2θ 1/2 = 120 °)

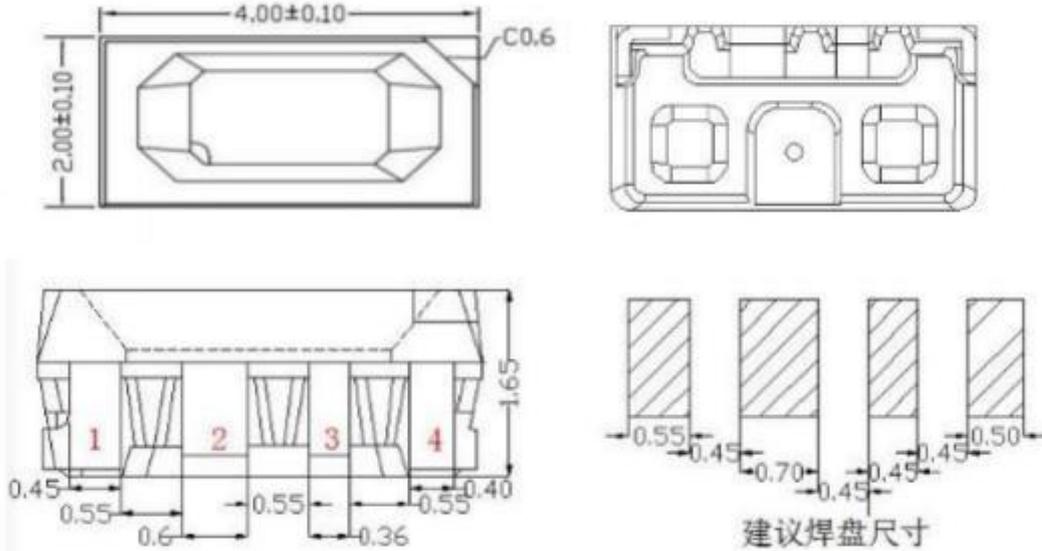
### 产品应用

- LED全彩发光字灯串，LED全彩模组，LED幻彩软硬灯条，LED护栏管，LED外观/情景照明  
Full color LED string light, LED full color module, LED super hard and soft lights,  
LED guardrail tube, LED appearance /scene lighting
- LED 点光源, LED 像素屏, LED 异形屏各种 电子产品, 电器设备跑马灯  
LED point source, LED pixel screen, LED screen with a variety of electronic products,  
electrical equipment etc.

# SMD-PPA4020RGB-IC89CU4-HT

## 4020-幻彩-贴片式发光二极管

### 产品尺寸



### 引脚功能

| NO. | Symbol | Function description |
|-----|--------|----------------------|
| 1   | DIN    | 信号输入                 |
| 2   | VDD    | 电源                   |
| 3   | DOUT   | 信号输出                 |
| 4   | GND    | 接地                   |

Notes:

1. The above indicated unit is mm.

以上标示单位为毫米

2. All dimensions in mm tolerance is  $\pm 0.1$  mm unless otherwise noted.

除非另有说明，所有尺寸的公差为 $\pm 0.1$ 毫米

# SMD-PPA4020RGB-IC89CU4-HT

## 4020-幻彩-贴片式发光二极管

### 最大额定值 (TA = 25°C)

| Parameter参数                | Symbol 符号 | Rat 额定值                  | Unit/单位 |
|----------------------------|-----------|--------------------------|---------|
| 输入范围 Input range           | VIN       | 3.5 ~ 12                 | V       |
| 逻辑输入电压 Logic input voltage | VI 1      | -0.5 ~ VDD+5.5           | V       |
| 工作温度 Operating Temperature | Top       | -40 ~ +85°C              | °C      |
| 储存温度 Storage Temperature   | Tstg      | -40 ~ +85°C              | °C      |
| ESD 耐压 ESD pressure        | VESD      | 2K                       | V       |
| 焊接温度 Soldering Temperature | Tsol      | Max. 245°C for 5 sec Max |         |

### 电气参数 (TA = -20°C ~ 70°C VDD = 3.5 ~ 5.5V VSS = 0V)

| Parameter参数                                    | 符号 Symbol | 最小 Min | 典型 Typical | 最大 Max | 单位 Unit | 测试条件 Testcondition |
|--|-----------|--------|------------|--------|---------|--------------------|
| 芯片内部电源电压<br>Chip internal power supply voltage | VDD       | 3.5    | 5          | 12     | V       | --                 |
| R/G/B 端口耐压<br>Port pressure                    | BVout     | --     |            | 14     | v       | --                 |
| R/G/ B输出驱动电流<br>R/G/ B Output drive current    | Io        | --     | --         | 11     | mA      | DOUT 接地, 最大驱动电流    |
| 信号输入翻转阈值<br>The signal input flip threshold    | VI H      | 3.1VDD | --         | --     | V       | VDD = 5.0V         |
|  | VIL       | --     | --         | 1.5VDD |         |                    |
| PWN 频率<br>PWN Frequency                        | FPWM      | --     | 4.5        | --     | KHZ     | --                 |
| 静态功耗<br>Static power consumption               | IDD       | --     | 0.3        | --     | mA      | --                 |

# SMD-PPA4020RGB-IC89CU4-HT

## 4020-幻彩-贴片式发光二极管

### 动态参数

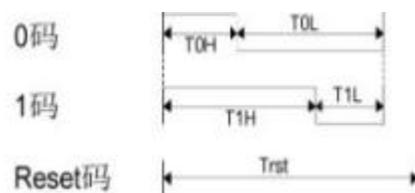
| Parameter参数                       | 符号<br>Symbol | 最小<br>Min | 典型<br>Typical | 最大<br>Max | 单位<br>Unit | 测试条件<br>Testcondition |
|-----------------------------------|--------------|-----------|---------------|-----------|------------|-----------------------|
| 数据传输速度<br>Data transmission speed | fD IN        | --        | 800           | --        | KHZ        | 占空比67%<br>(数据 1)      |
| DOUT 传输延迟<br>Transmission delay   | TPLH         | --        | 160           | --        | ns         | D IN→ DOUT            |
|                                   | TPHL         | --        | 160           | --        | ns         |                       |

|      |               |  |                  |  |                  |
|------|---------------|--|------------------|--|------------------|
| T0H  | 0 码,高电平时间     |  | 0.3 $\mu$ s      |  | $\pm 0.05 \mu$ s |
| T1H  | 1 码,高电平时间     |  | 0.9 $\mu$ s      |  | $\pm 0.05 \mu$ s |
| T0L  | 0 码,低电平时间     |  | 0.9 $\mu$ s      |  | $\pm 0.05 \mu$ s |
| T1L  | 1 码,低电平时间     |  | 0.3 $\mu$ s      |  | $\pm 0.05 \mu$ s |
| Trst | Reset 码,低电平时间 |  | $\geq 200 \mu$ s |  |                  |

#### 参 数 parameters

| 颜色<br>Color | 波长<br>wavelength( nm) | 发光强度<br>Luminous intensity(mcd) | 工作电压<br>working voltage(V) |
|-------------|-----------------------|---------------------------------|----------------------------|
| 红色 ( Red)   | 620-630               | 400-600                         | 1.8-2.2                    |
| 绿色 ( Green) | 520-530               | 800-1000                        | 2.8-3.4                    |
| 蓝色 ( Blue)  | 460-470               | 300-400                         | 2.8-3.4                    |

时序波形图 Timing waveform ( Ta = 25°C ) :



# SMD-PPA4020RGB-IC89CU4-HT

## 4020-幻彩-贴片式发光二极管

数据传输方式 Data transmission mode (Ta = 25°C) :

● 系统拓扑图:

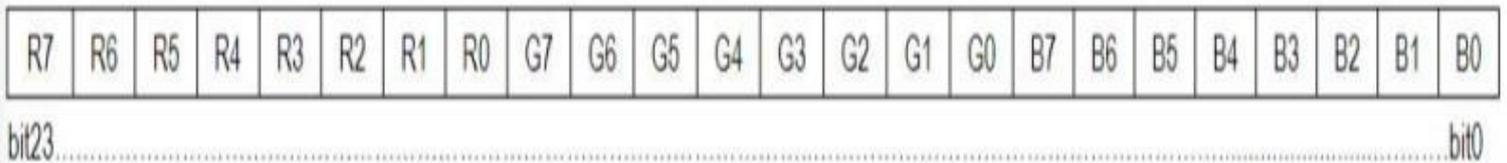


● 各芯片输入数据流 (以3颗芯片为例):



### 数据结构

● 24bit 灰度数据结构: 高位在前, 按照 RGB 的顺序发送



### 可靠性实验

The reliability of products shall be satisfied with items listed below.

Confidence level:90%

LTPD:10 %

| NO. | Items/项目                               | Test Condition<br>测试标准                 | Test Hours/Cycles<br>测试时间 | Sample Size<br>数量 | Ac/Re |
|-----|--|--|---------------------------|-------------------|-------|
| 1   | Reflow Soldering<br>回流焊                | Temp:260°C ± 5°C<br>Min. 5 sec.        | 5 Min.                    | 20 PCS            | 0/1   |
| 2   | Temperature Cycle<br>冷热循环测试            | H:+100°C 15min ∫<br>5min L:-40°C 15min | 300 Cycles                | 20 PCS            | 0/1   |
| 3   | Thermal Shock<br>高低温测试                 | H:+100°C 5min ∫<br>10sec L:-10°C 5min  | 300 Cycles                | 20 PCS            | 0/1   |
| 4   | High Temperature Storage<br>高温存储       | Temp.: 100°C                           | 1000 Hrs                  | 20 PCS            | 0/1   |
| 5   | Low Temperature Storage<br>低温存储        | Temp.: -40°C                           | 1000 Hrs                  | 20 PCS            | 0/1   |
| 6   | DC Operating Life<br>常温老化测试            | IF = 11mA                              | 1000 Hrs                  | 20 PCS            | 0/1   |
| 7   | High Temperature High Humidity<br>高温高湿 | 85°C/85% RH                            | 1000 Hrs                  | 20 PCS            | 0/1   |

### 判定标准 To determine the standard

| Item<br>项目               | Marked<br>单位 | Test Conditions<br>测试标准 | To determine the standard<br>判定标准  |
|--------------------------|--------------|-------------------------|--|
| Forward Voltage<br>正向电压  | Vf           | If= 11mA                | Initial  |
| Reverse Current<br>反向电流  | Ir           | If= 11mA                | ≤10μA  |
| Luminous Intensity<br>光强 | Iv           | VR = 5V                 | Single stars decay ≤ 50%, and<br>the The average attenuation ≤ 30%<br>单星衰减 ≤ 50%<br>平均衰减 ≤ 30% |
| Weldability<br>焊接可靠性     | /            | If=11mA                 | Immersion tin an area of more than 95 %<br>锡膏覆盖焊盘比例小于95%                                       |
| Vibration Test<br>振动测试   | /            | If=11mA                 | Light and significant damage did not die<br>LED没有发生损伤或无法点亮                                     |
| Drop test<br>跌落测试        | /            | If=11mA                 | Light and significant damage did not die<br>LED没有发生损伤或无法点亮                                     |

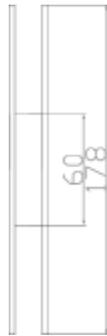
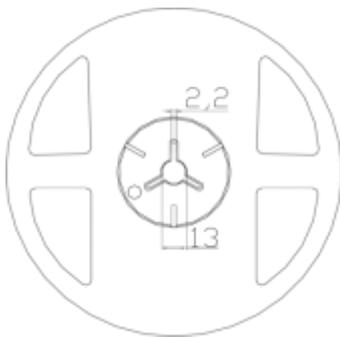
# SMD-PPA4020RGB-IC89CU4-HT

## 4020-幻彩-贴片式发光二极管

### 标签说明 Label explanation

- Iv: 光强度说明 Luminous Intensity Rank
- Bin:色坐标说明 Chromaticity Coordinates Rank
- VF: 正向电压说明 Forward Voltage Rank.
- QTY : 包装数量说明 Packing quantity

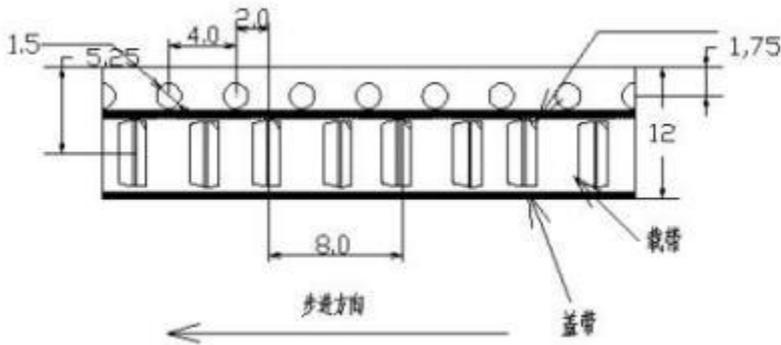
### 盘封装尺寸 Reel Dimensions



Unit = mm

Note: The tolerances unless mentioned is  $\pm 0.1$  mm

### 载体尺寸 Carrier Tape Dimensions



Note: 每卷装载数量2000个  
Loaded quantity 2000 PCS per reel.

Unit = mm

### 防潮包装 Moisture Resistant Packaging



# SMD-PPA4020RGB-IC89CU4-HT

## 4020-幻彩-贴片式发光二极管

### 1. 储存及使用 (Storage and use)

1.1 建议未拆封前储存条件：小于30°C/60%RH下，保存期限为一年。

Recommended storage conditions before opening packaging: < 30 °C / < 60% RH, retention period of one year.

1.2 拆封后先除湿处理 (75°C ± 5°C/12H) 后再进行使用。在室温 < 30°C，湿度60%RH以下，建议在4H内完成回流焊作业，12H内完成封装作业；对于超时未使用完产品，请再次除湿后使用。发光二极管吸湿后回流焊高温会导致硅胶与PPA分层，元器件失效。

After unpacking, it shall be dehumidified (75°C ± 5°C/12h) before use. When the room temperature is below 30 °C and the humidity is below 60% RH, it is recommended to complete the reflow operation within 4 H and the packaging operation within 12H. For products that have not been used up after overtime, please dehumidify them again and use them. After the light-emitting diode absorbs moisture, the high temperature of reflow soldering will lead to the delamination of silica gel and PPA, and the components will fail.

1.3 建议除湿不超过3卷/擦，保证效果。

It is recommended that dehumidification should not exceed 3 rolls/stack to ensure the effect.

1.4 使用操作示意图 ( Operating diagram)

|  |   |
|--|---|
| <p>使用镊子或合适的工具，沿侧表面夹取元件。<br/>Use forceps or other appropriate tools grip along the side surface of component.</p>   |   |
| <p>不可直接用手或尖锐金属压胶体表面，它可能会损坏内部电路<br/>Do not press the colloidal surface directly with hands or sharp metal, it may damage the internal circuit</p>   |  |
| <p>不要将焊接好的发光二极管堆叠放置，会导致发光二极管划伤及胶体受损造成死灯。<br/>Do not stack soldered LED, it may cause scratching of LED and silicone damage leading to dead LED .</p>   |  |
| <p>不可接触和使用天那水、三氯乙烯、丙酮、硫化物、钠离子及酸、碱、盐等物质，这样会造成镀银层氧化及荧光粉硫化。致使发光二极管发光颜色变淡、亮度变暗等现象发生。<br/>Do not make contact with thinner, Trichloroethylene, acetone, sulfide, sodium ion and acid, alkali, Salt and other substances. These materials will cause oxidation of silver plating and vulcanization of phosphor leading to color fading and reduction of brightness conditions.</p> |  |

## 4020-幻彩-贴片式发光二极管

### 2. 生产注意事项 ( Production precautions)

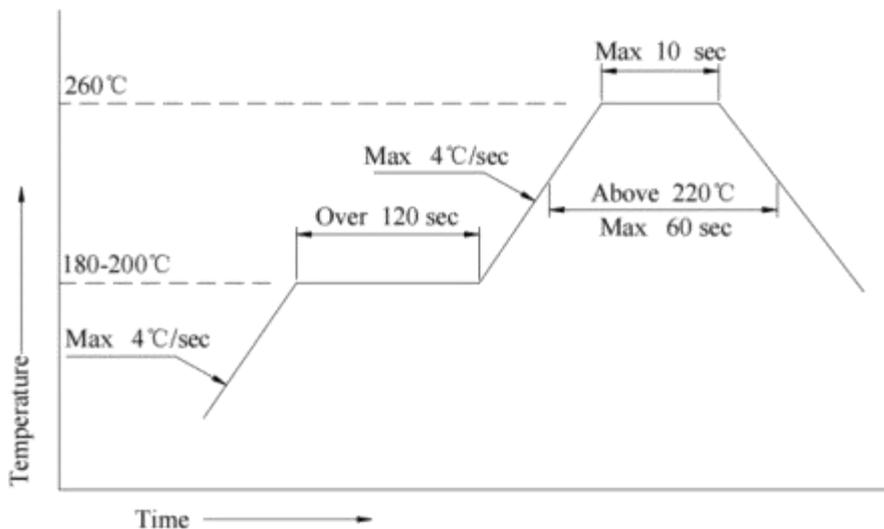
**2.1** 封装发光二极管的材料是硅性质，因此发光二极管的表面柔软而有弹性。虽然有机硅的特点能降低热应力，但是更容易受到机械外力的破坏，在表面上施加压力将会影响发光二极管的可靠性。在这样的情况下，装配使用有机硅封装的发光二极管产品时必须遵守相应的处理措施，避免任何的施加给发光二极管的任何部分，所以在使用时请采用气动吸咀。否则会导致发光二极管损坏和可靠性降低影响其寿命。

Packaged LED material is silicone nature, therefore, LED has is a soft and flexible surface. Although characteristics of silicone is to reduce thermal stress, but it is more susceptible to mechanical damage to the external forces applied on the surface. Pressure affects the reliability of light emitting diodes. In such circumstances, the assembly of organic silicon encapsulated LED products must comply with the appropriate measures to deal with. Avoid any pressure applied to any part of the LED and use pneumatic nozzle. Otherwise it may lead to reduction in reliability, and impact of its life to the LED.

**2.2** 温度控制 . 产品灯脚温度需控制在65℃以下。

The temperature control. Product light foot temperature under 65 °C which shall be controlled.

**2.3** 回流焊说明 (Reflow soldering instructions)



**2.3.1** 回流焊建议使用免清洗助焊剂，并依照回流焊曲线进行焊接，焊接次数不建议2次。

No-cleaning flux is recommended for reflow soldering, and soldering should be carried out according to the reflow soldering curve, and two times of soldering is not recommended.

**2.3.2** 焊接时，不要在加热过程中对其施加压力。

When soldering, do not exert pressure during heating process.

**2.4** 烙铁焊接 ( Soldering)

**2.4.1** 当手动焊接时，建议采用20W的防静电烙铁，焊头的温度必须控制在360℃以下/3秒，焊接次数为1次

When manual soldering iron is used, it is recommended to use 20W anti-electro static soldering iron, soldering temperature must be kept below 360 °C / 3 seconds, 1 Time soldering only.

**2.4.2** 不可在同一单元板上焊接不同BIN的材料，否则会导致LED色差。

Do not mix different BIN materials on the same board, otherwise it will cause LED color Variation.

## 4020-幻彩-贴片式发光二极管

### 3. 设计建议 Design Consideration

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.

### 4. 静电 (Static electricity)

对于整个工序（生产、测试、包装等）所有与LED直接接触的员工都要做好防止和消除静电措施，主要有：

All employees have direct contact with LED for all processes (production, testing, packaging, etc.) must perform all preventive and eliminating static electricity measures.



1、车间铺设防静电地板并做好接地，工作台采用防静电工作台，带电产品接触低阻值的金属表面时，由于急放电引发产品故障的可能性是很高的，故要求工作台及与产品相接触之处使用表面电阻为 $10^6$ - $10^9\Omega$  的桌垫。

Workshop floors to use of the anti-static flooring and grounding, anti-static workbench, when charged material is in contact with low resistance metal surface, due to acute discharge, possibility of product failure is very high, so the requirements of the bench and any contact with the products should have surface resistance of  $10^6$ - $10^9\Omega$  table mats.

2、生产机台如：锡炉、回流焊、SMT设备、电烙铁，以及检测设备均需接地良好，接地交流阻抗小于 $1.0\Omega$ 。在容易产生静电的环境与设备上，还必须安装离子风扇、作业过程中，操作员穿防静电服、带防静电手环、手套等，取放时尽可能接触产品的绝缘部分。

Production machines such as: tin furnace, reflow soldering, SMT equipment, electric soldering iron, and testing equipment need to be grounded, grounded AC impedance less than  $1.0\Omega$ . Prone to static electricity environment and equipment must be installed ion fan. During working process, operators to wear anti-static clothing, wrist strap, gloves, and etc., When handling, hold the insulated part of the product as much as possible.

3、盛装LED使用防静电元件盒，包装则采用防静电材料。

For packaging of LED, anti-static component boxes, packaging materials should be use.

4、请保持环境湿度在60%RH以下，以免空气过于干燥产生静电。

Keep ambient humidity below 60% RH to avoid air being too dry to generate static electricity.

5、静电接地需与电源零线、防雷地线分开，接地措施应完全防止静电产生，必须用粗的铜线引入泥土内，在铜线末端系上大铁块，埋入地表1米以下，各接地线均需与主线连接在一起。

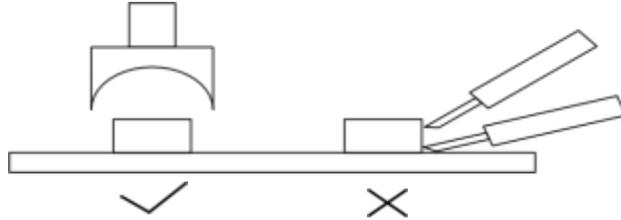
Grounding should be connected to the neutral input line. It should be separated from the lightning grounding. Grounding should be done with anti-static. Heavy gauge copper cable should be connected to a large piece of metal and buried at least 1 meter deep into the ground. All ground cables must be connected together with the main cable.

## 4020-幻彩-贴片式发光二极管

### 5.修复 (Repair)

当修复发光二极管时，应事先确认发光二极管是否会被破坏，修复过程中应避免接触胶体表面，烙铁不能碰触到 LED 灯珠，双焊头烙铁应使用如下图的方式作业。

When repairing light-emitting diodes, it is advised to confirm the light emitting diode will be damaged, the repair process should avoid contact with the colloid surface, The head of iron can not touch the LEDs, use of soldering iron should be according to following diagram.



### 6.清洗 (Clean)

在焊接后推荐使用纯酒精清洗，清洗擦拭或浸渍不要超过1分钟。使用其它类似溶剂清洗前，请确保溶剂不会对发光二极管封装造成损伤。

Recommend the use of pure alcohol to clean, wash and wipe or dipping no more than 1 minutes after soldering. When different solvents are used for cleaning, make sure that solvents do not damage the light emitting diode packaging.

### 7.灌封 (Potting)

1、使用硅酮胶（玻璃胶）灌封时推荐采用中性、醇型类灌封胶。

The use of silicone rubber (plastic glass) for potting, it is recommended the use of alcoholic encapsulating Material.

2、灌封胶若使用脱肟型中性灌封胶，请确保灌封胶固化过程中的通风良好，在未完成固化过程中不可、进行密封组装发光二极管元件。这样会造成镀银层氧化及发光颜色变淡。

When deoximation neutral potting material is used, make sure that the potting curing process in well-ventilated. Do not perform sealing assembly of Light Emitting Diodes before potting is completely cured and setting process is completed. This will result in the silver layer oxidation and luminous color fades, light degradation and even dead LED.

3、禁止使用醋酸型（酸性）硅酮胶进行灌封。

Prohibit the use of acetic acid type (acidic) silicone rubber potting materials.

4、使用正常灌封胶时建议进行少量灌封试验，常温点亮测试168H确认无异常后再批量作业。

It is recommended that small quantity samples are made for potting test, Room temperature light test of 168H confirming no abnormality before mass products.

5、更改任何一种灌封材料时，请先作试样确认是否对我公司产品造成侵蚀反应。将灌封材料取5-10g和发光二极管10-20pcs于100ml的器皿内密封放置168H后确认产品是否有异常。

When there is change in potting material, please make samples to confirm whether there is erosion reaction. Take 5-10 grams of potting material and 10-20 pcs in a 100 ml sealed containers for 168 H confirm whether there is abnormality.