

## 5050幻彩透明（四脚）贴片式发光二极管



### 特点 (characteristic) :

- \* 外观尺寸 (L/W/H) :5.0\*5.0\* 1.6mm  
Appearance dimension (L / w / h): 5.0x 5.0x 1.6mm
- \* 发光颜色及胶体: 高亮度RGB/透明胶体  
Luminous color and colloid: high brightness RGB / transparent colloid
- \* 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
- \* 适用于回流焊制程  
Suitable for reflow soldering process

### 应用领域(product application) :

- \* LED全彩发光字灯串, LED全彩模组  
LED full-color luminous character string, LED full-color module
- \* LED全彩软灯条硬灯条  
LED full-color soft light strip hard light strip
- \* 电器设备跑马灯  
Electric equipment marquee
- \* 智能音箱, 风扇  
Smart speaker, fan
- \* 显示屏, 像素屏, 点光源, LED异形屏  
Display screen, pixel screen, point light source, LED special-shaped screen
- \* 各种电子产品  
Various electronic products



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产品概述: Product overview:

XL-5050 是单线传输的三通道 LED 驱动控制芯片, 采用单极性归零码协议

XL-5050 is a single wire transmission three channel LED driver and control chip, which adopts unipolar zero return code protocol

XL-5050 内部包含电源钳位模块、信号解码模块、振荡模块、数据再生模块、输出电流驱动模块等。其中数据再生模块在接受本芯片的数据后, 自动将级联输出的数据整形转发, 保证数据串联传输过程不衰减。

XL-5050 internally includes power clamp module, signal decoding module, oscillation module, data regeneration module and output current Drive module, etc. The data regeneration module

automatically reshapes and forwards the cascaded output data after receiving the data of this chip to ensure The data is not attenuated during serial transmission.

XL-5050 内置输出电流设置模块, OUT/RGB 端口默认输出电流12MA

XL-5050 built-in output current setting module, the default output current of OUT/RGB port is 12MA

XL-5050 是一个集控制电 与发光电 于一体的智能外控 LED 光源. 其外路路行跟常规 SMD5050LED 灯珠相同, 每个元件即为一个像素点.

XL-5050 built-in output current setting module, the default output current of OUT/RGB port is 12MA

XL-5050 is an intelligent external LED light source integrating control electricity and luminous electricity Its outer road

The line is the same as the conventional SMD5050 LED lamp bead, and each element is a pixel

XL-5050 芯片采用单线通讯方式, 采用归零码的方式发送信号. 芯片在上电复位后, 接受 DIN 打来的数据, 接受够 24Bit 后, DOUT 端开始转发数据, 为下一个芯片提供输入数据. 在转发之前 DOUT 口一直拉低, 此时芯片不接受新的数据. 芯片 OUTR, OUTG, OUTB 三个 PWM 输出口根据接受到的 24Bit数据, 发出相应的不同占空比的信号, 该信号周期在 4MS. 如果 DIN 端输入信号为 RESET 信号, 芯片将接受到的数据送显示, 芯片将在该信号结束后重新接受新的数据, 在接受完开始的 24Bit 数据后通过 DOUT 端口转发数据, 芯片在没有接受到 RESET 信号前OUTR, OUTG, OUTB 原输出保持不边, 当接受到 80us 以上的低电平 RESET 码后, 芯片将接受到 24Bit PWM 数据脉宽输出到 OUTR, OUTG, OUTB 上.

XL-5050 chip adopts single line communication mode, and sends signals by returning to zero code

After the electrical reset, accept the data from DIN. After receiving enough 24Bit, the DOUT starts to transmit the data, Provides input data for the next chip. The DOUT port is always pulled down

before forwarding, and the chip is not connected at this timeReceive new data. Chip OUTR, OUTG, OUTB three PWM output ports according to the received 24BitData, send out corresponding signals with

different duty cycles, and the signal cycle is 4MS. If DIN inputThe signal is RESET signal, the chip will send the received data to display, and the chip will reset after the signal endsReceive new

data, and forward the data through the DOUT port after receiving the beginning 24Bit data, Before the chip receives the RESET signal, the original output of OUTR, OUTG, OUTB remains out of alignment.

WhenAfter receiving low-level RESET code above 80us, the chip will receive 24Bit PWM data pulse widthOutput to OUTR, OUTG, OUTB.

XL-5050 芯片采用自动整形转发技术，使得该芯片的级联个数不受信号传送的限制，仅仅受限刷屏速度要求。例如我们设计一个 1024 级联，它的刷屏时间  $1024 \times 0.4 \times 2 = 0.8192\text{ms}$ （芯片的数据延迟时间为  $0.4 \mu\text{s}$ ），不会有任何闪烁的现象。

XL-5050 chip adopts automatic shaping and forwarding technology, so that the number of cascades of the chip is not affected by signal transmission limited, only limited screen speed requirements. For example, we design a 1024 cascade, whose screen time is  $1024 \times 0.4 \times 2 = 0.8192\text{ms}$  (the data delay time of the chip is  $0.4 \mu\text{s}$ ), without any flicker.

特性说明: Characteristic description

1. 电源输入电压: 3.5-7.5V

Power input voltage: 3.5-7.5V

2. OUT R/G/B 恒流值: 12mA

3. Top SMD 内部集成高质量外控单线串行级联恒流 IC

Top SMD is internally integrated with high-quality external control single wire serial cascade constant current IC

4. 控制电 与芯片集成在 SMD 5050 元器件中，构成一个完整的外控像素点，色温效果均匀且一致性 路高

The control circuit and chip are integrated in the SMD 5050 components to form a complete externally controlled pixel, with uniform color temperature effect and high consistency

5. 内置数据整形电，任何一个像素点收到信号后经过波形整形再输出，保证线 波形畸变会加路路不累

Built in data shaping power, any pixel receives the signal and then outputs it after waveform shaping to ensure that the line waveform distortion will not add to the circuit

6. 默认上电不亮灯

Default power on does not light up

7. 灰度调节电路 (256 级灰度可调)

Gray scale adjusting circuit (256 level gray scale adjustable)

8. 数据整形: 接收完本单元数据自动将后续数据整形输出

Data shaping: after receiving the data of this unit, the subsequent data will be automatically shaped and output

9. 内置高精度和高稳定性振荡器

Built in high precision and high stability oscillator

10. 单线数据传输，可无限级联

Single line data transmission, which can be cascaded infinitely

11. 数据协议兼容性高

High data protocol compatibility

12. 数据发送速率: 800Kbps

Data transmission rate: 800Kbps

## 电性参数

## Electrical Characteristics

光电参数 (Ta=25°C) ;  
photoelectric parameters (Ta=25°C)

参数 parameter	符号 Symbol	最小值 Min.	代表值 Typ.	最大值 Max.	单位 Unit
输入电压 input voltage	Vin	3.5	5	7.5	V
RGB 输出端口耐压 RGB output port withstand voltage	Vds	---	---	7.5	V
RGB 输出电流 RGB output current	Iol1	---	12	---	MA
高电平输入电压 High level input voltage	Vih	0.7VDD	---	---	V
低电平输入 Low level input	Vil	---	---	0.3	V
PWM 频率 PWM frequency	Fpwm	---	4	---	KHZ
静态功耗 Static power consumption	LDD	---	0.3	---	MA

开光说明 (如无特殊说明, TA=25°C,)

参数 parameter	符号 Symbol	最小值 Min.	代表值 Typ.	最大值 Max.	单位 Unit	测试条件 Test conditions
数据传输速率 Data transmission rate	FDIN	---	800	1100	kHz	---
传输延迟时间 Transmission delay time	tPLZ	---	---	500	ns	---

## 最大绝对额定值 (Ta=25℃)

Maximum absolute rating (TA = 25 °C)

参数 parameter	符号 Symbol	最大额定值 Maximum rating	单位 Units
逻辑电源电压 Logic supply voltage	Vin	3.0~7.5	V
RGB 输出端口耐压 RGB output port withstand voltage	Vds	7.5	V
逻辑输入电压 Logic input voltage	V1	-0.5~5.5	V
RGB 输出电流 RGB output current	Lol1	12	MA
工作温度 working temperature	Topt	-40~80	°C
储存温度 Storage temperature	Tstg	-40~80	°C
ESD 耐压 ESD withstand voltage	Vesd	5K	V

**亮度分档:**

**Brightness grading**

颜色 Color	代码 Code	最小值 Min.	最大值 Max.	单位 Unit	测试条件 Test conditions
红Red	K07	200	400	mcd	IF=20mA
	R13	300	500		
绿Green	K30	800	1000		
	Z03	1300	1800		
蓝Blue	K07	200	400		
	R14	500	700		

**电压分档:**

**Voltage grading**

颜色 Color	代码 Code	最小值 Min.	最大值 Max.	单位 Unit	测试条件 Test conditions
红Red	N20	2.0	2.4	V	IF=20mA
绿Green	N22	2.8	3.2		
蓝Blue	N22	2.8	3.2		

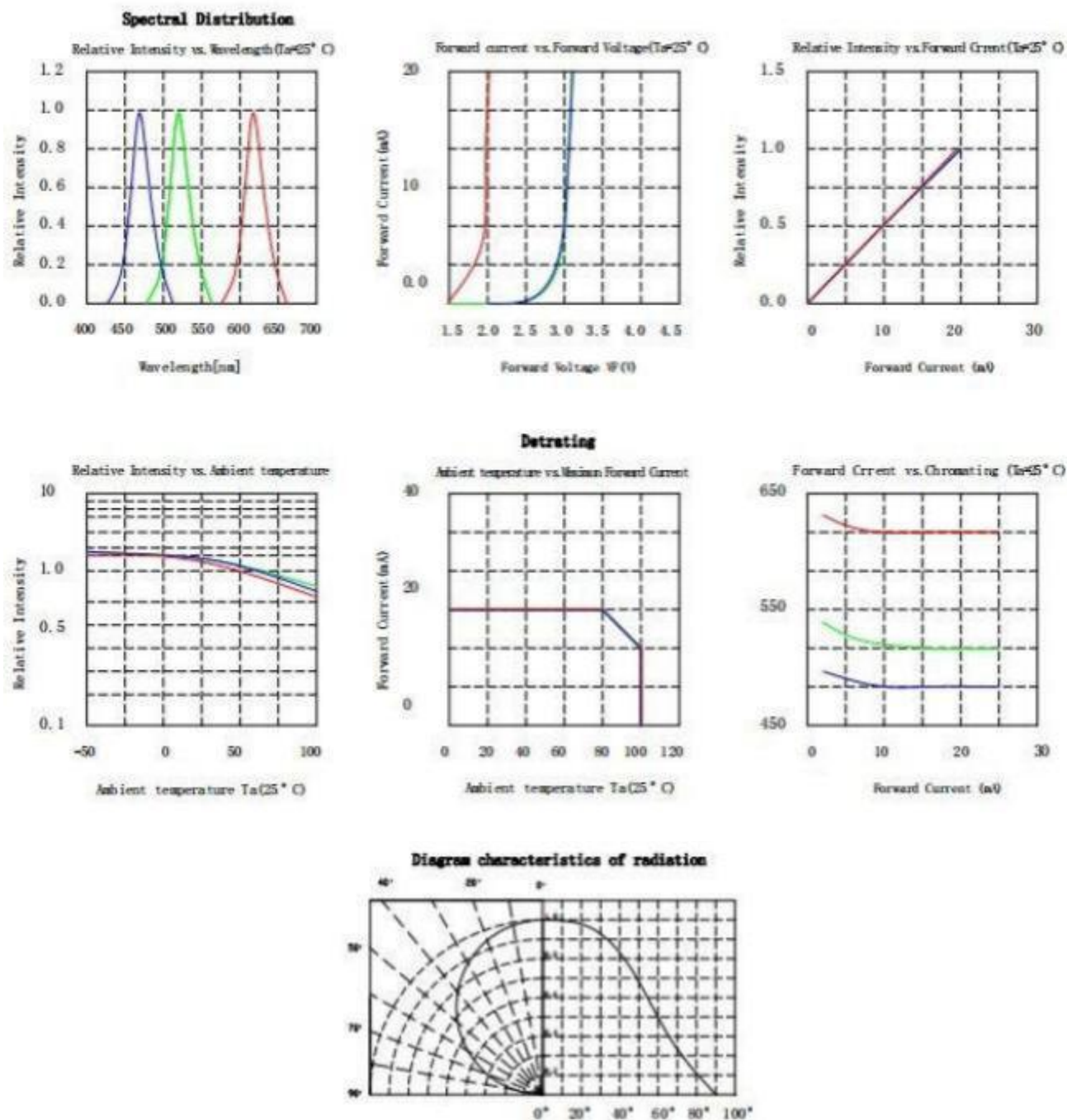
**色温分档:**

**Color temperature grading**

颜色 Color	代码 Code	最小值 Min.	最大值 Max.	单位 Unit	测试条件 Test conditions
红Red	RO	620	625	nm	IF=20mA
	HR56	620	635		
绿Green	G13	525	530		
	HG53	520	530		
蓝Blue	PB12	465	470		
	HB35	465	475		

典型特性曲线

Typical Characteristics Curves

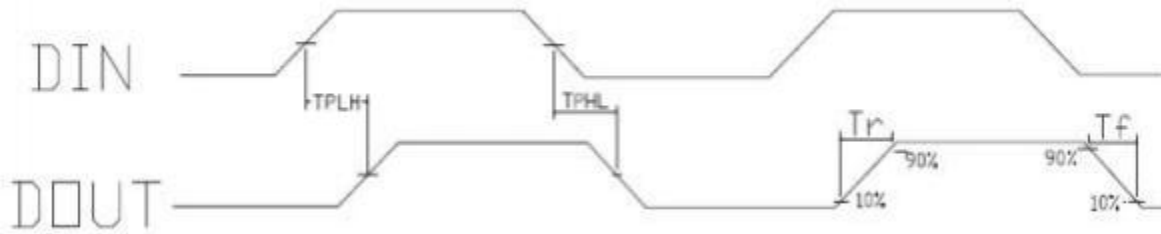




## 动态参数(Ta=25°C)

Dynamic parameters (Ta=25 °C)

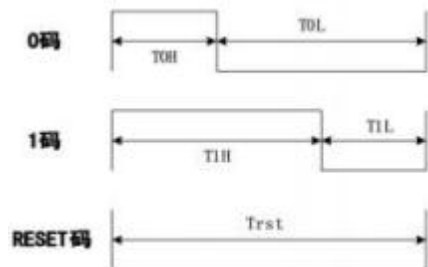
颜色 Color	符号 Symbol	最小值 Min.	典型值 Typical value	最大值 Max.	单位 Unit	测试条件 Test conditions
数据传输速度 Data transmission speed	fDIN	---	800	---	KHZ	占空比 67% (数据 1) Duty cycle 67% (data1)
DOUT 传输延迟 DOUT transmission delay	TPLH	---	---	500	ns	DIN→DOUT
	TPHL	---	---	500	ns	
Iout上升时间 Iout rise time	Tr	---	100	---	ns	VDS=1.5V



### 时序波形图 :Time sequence oscillogram

#### 1. 输入码型:

Input code type:



## 2. 码型时间: Code type time

时序表名称 Timeline name	最小值 Min.	典型值 Typical value	最大值 Max.	单位 Unit
T	0.89	---	---	μs
TOH	0.2	0.295	0.35	μs
TOL	0.55	0.595	1.2	μs
T1H	0.55	0.595	1.2	μs
T1L	0.2	0.295	0.35	μs
TRST	80	---	---	μs

注 1: 写程序时, 码元周期最低要求为 0.9us;

Note 1: When writing the program, the minimum code cycle is 0.9us;

2: 0 码、1 码的高电平时间需按照上表的规定范围, 0 码、1 码的低电平时间要求小于 15us;

2: The high level time of code 0 and code 1 shall be within the range specified in the table above, and the low level time of code 0 and code 1 shall be less than 15us;

## 3. 协议数据格式: Protocol Data Format

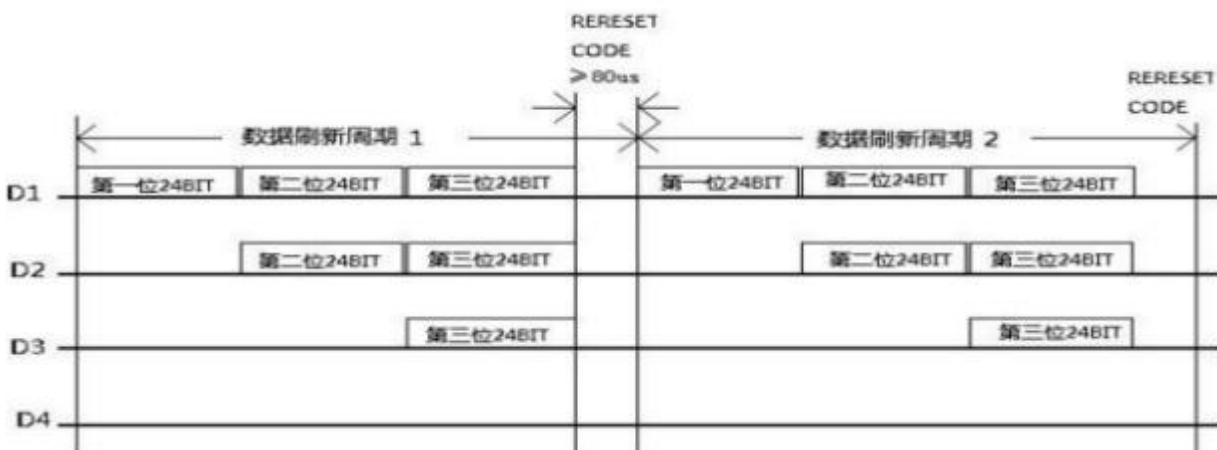
Trst+ 第一颗芯片 24bits 数据+第二颗芯片 24bits 数据+ .....+第 N 颗芯片 24bits 数据

+Trst 24bit 灰度数据结构: 高位



## 数据传输方法

Data transmission method

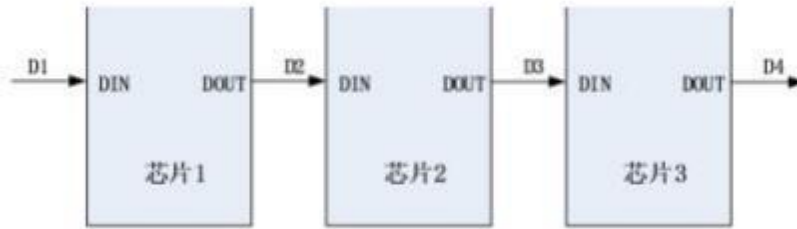


注: 其中 D1 为 MCU 端发送的数据, D2、D3、D4 为级联电路自动整形转发的数据。

Note: D1 is the data sent by MCU, D2, D3 and D4 are the data automatically shaped and forwarded by cascade circuit.

**连接方式：**

Connection mode:



电容常规接 104 贴片电容

注：红色为线路跟焊盘 电容起滤波作用，贴片根据灯珠缺口位置贴。

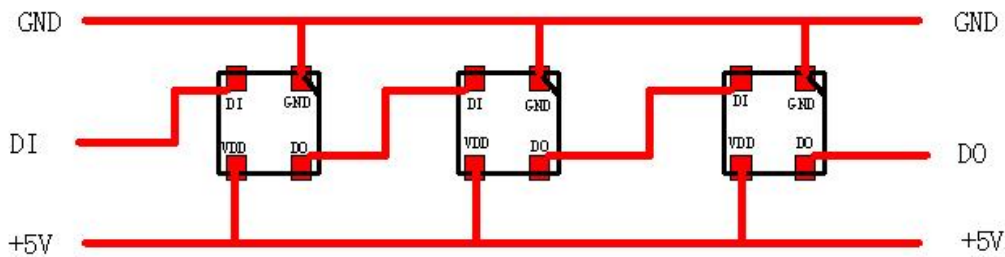
如果线路需要更改根据脚位调整。

Connection mode: capacitor connected to 104 chip capacitor

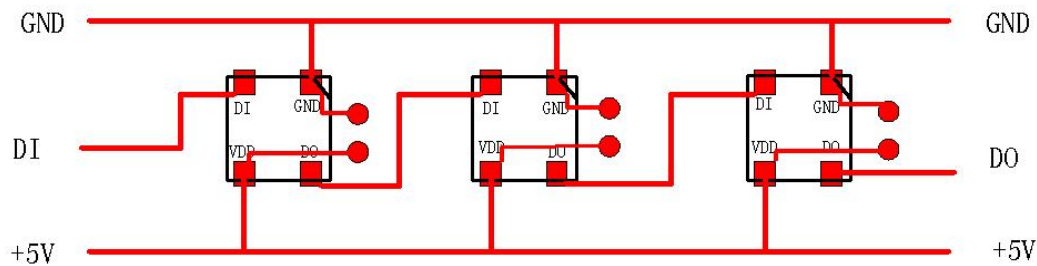
Note: The red color indicates that the circuit and the pad capacitor play a filtering role, and the patch is pasted according to the position of the lamp bead gap.

If the line needs to be changed, adjust according to the foot position.

参考线路图1：（无电容电阻）



参考线路图2：（加电容）



## 可靠性试验

### Reliability Test Items And Conditions

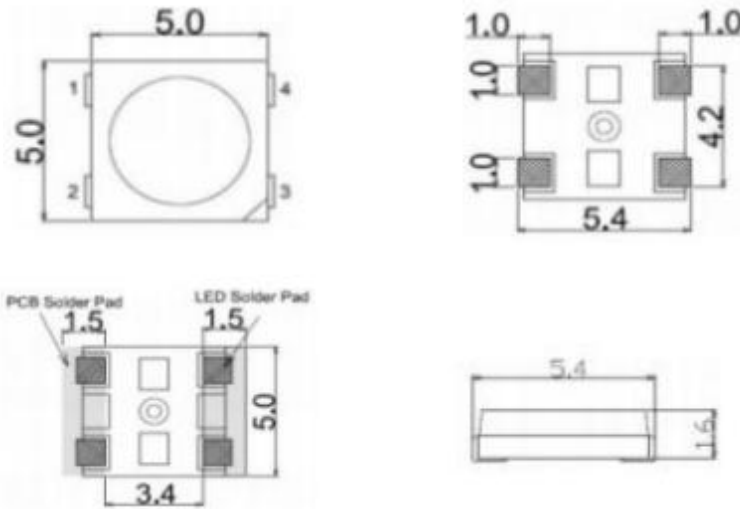
类型 type	测试项目 Test items	参考标准 Reference standard	测试条件 Test conditions	注释 notes	失效 LED 数量 (PCS) Number of failed LEDs Quantity (PCS)
环境顺序 Environmental order	回流焊耐热测试 Reflow soldering heat resistance test	JESD22-B106	Tsld(回流焊温度)=260℃, 10sec	2次 2 times	0/22
	温度循环 Temperature cycle	JESD22-A104	-40℃ 30min ↑↓ 5min 100℃ 30min	100周期 100 cycles	0/22
	冷热冲击 Thermal Shock	JESD22-A106	-40℃ 15min ↑↓ 5min 100℃ 15min	100周期 100 cycles	0/22
	高温储存 High temperature storage	JESD22-A103	Ta=100℃	1000小时 1000 hours	0/22
	低温储存 Low temperature storage	JESD22-A119	Ta=-40℃	1000小时 1000 hours	0/22
	间断点亮测试 Intermittent lighting test	JESD22-A105	On 5min -40℃ > 15min ↑↓<15min Off 5min 100℃ > 15min	1000周期 1000 cycles	0/22
操作顺序 Operation sequence	老化寿命测试 Aging life test	JESD22-A108	Ta=25℃ IF=5V	1000小时 1000 hours	0/22
	高温高湿老化测试 High temperature and humidity aging test	JESD22-A101	60℃ RH=90% IF=5V	1000小时 1000 hours	0/22

### 失效标准 Test criteria

项目 project	符号 Symbol	测试条件 Test conditions	失效标准 Failure criteria	
			最小 minimum	最大 maximum
发光强度 Luminous intensity	IV	DC=5V, 规格典型 电流 DC=5V, typical specification electric current	初始数据 X0.7 Initial data X0.7	---
耐焊接热 Resistance to welding heat	---	DC=5V, 规格典型 电流 DC=5V, typical specification electric current	无死灯或 明显损坏 No dead light or Obvious damage	---

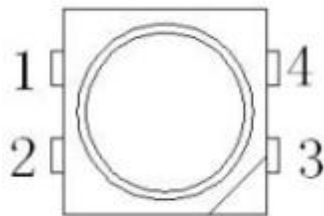
## 外形尺寸

### Outline Dimension



LED引脚示意图:

LED pin diagram:



- 备注: 1. 以上尺寸单位均为mm  
 Remarks: All dimensions are in millimeters.  
 2. 未特别标注公差尺寸公差均为±0.25mm  
 Tolerance is ±0.25mm unless otherwise noted

LED引脚功能:

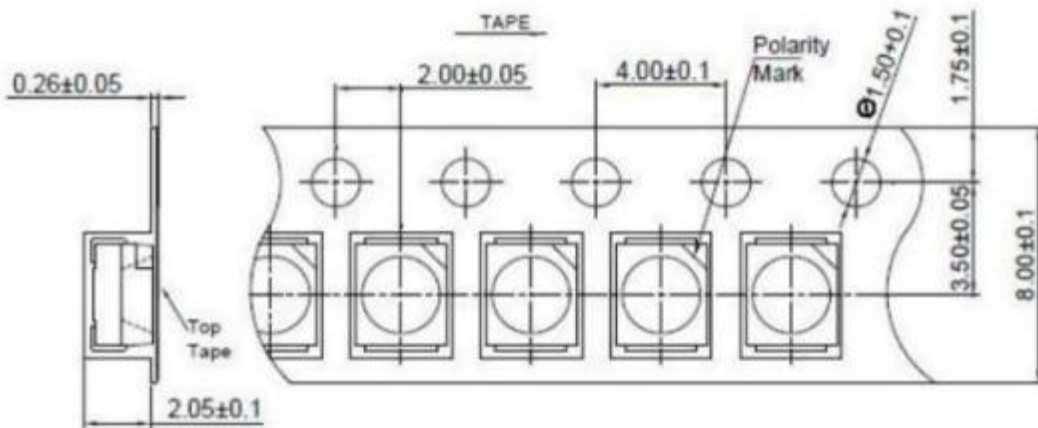
LED pin function:

引脚序号 Pin No	符号 Symbol	管脚名 Pin name	功能描述 Function description
1	VDD	电源Power Supply	供电管脚正极Positive pole of power supply pin
2	DOU	数据输出data output	信号数据输出Signal data output
3	GND	地land	接地Grounding
4	DIN	数据输入data input	信号数据输入Signal data input

包装( 1)

Packaging (1)

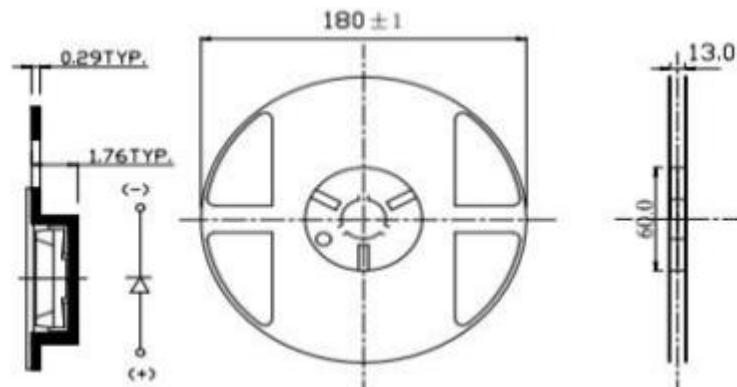
载带 Carrier Tape



单位: mm, 未注公差: ±0.1mm

All dimensions in mm, tolerances unless mentioned is ±0.1 mm.

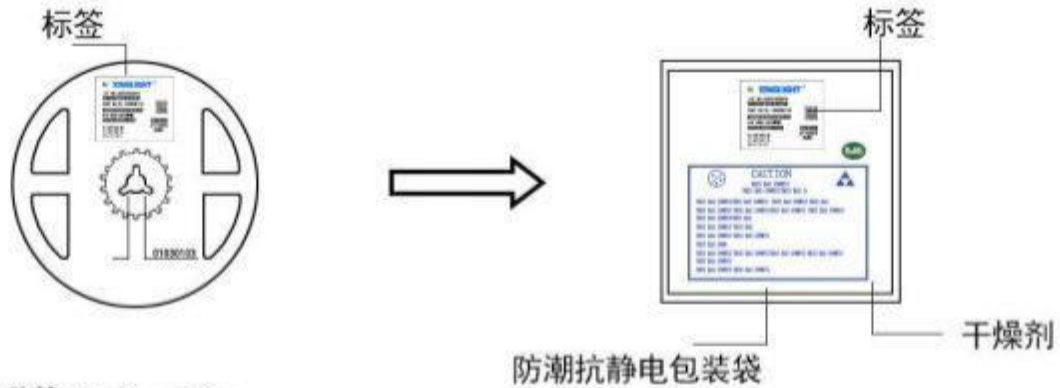
◇ 带盘 Reel Dimension



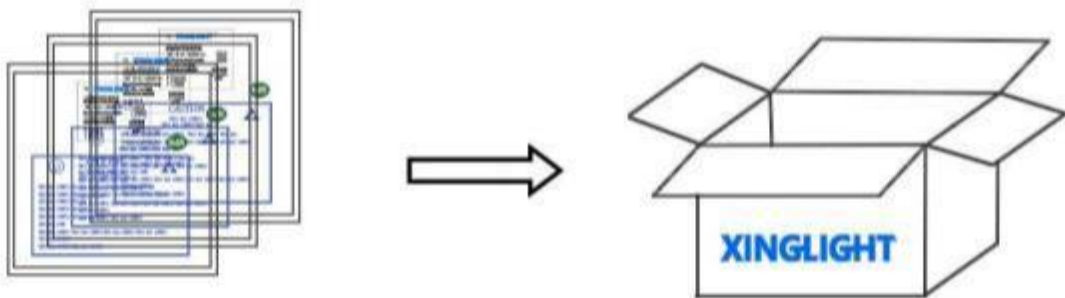
## 包装(2)

### 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)

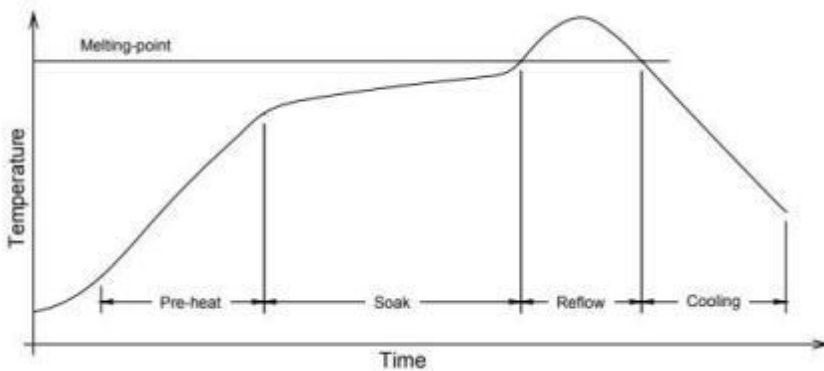
**Guideline for Soldering (1)**

1. 使用烙铁人手焊接

- a. 手工焊接时， 要保持电烙铁温度在 315 摄氏度以下， 并且焊接时间小于 3 秒
  - a. During manual welding, the temperature of the soldering iron should be kept below 315 degrees Celsius and the welding time should be less than 3 seconds.
  - b. 在开包装之前， 请先检查包装袋有无漏气， 如果有漏气现象， 请重新烘烤后再使用。
    - b. Before opening the package, please check whether there is any air leakage in the packaging bag. If there is any air leakage, please bake again before using it.
  - c. 电烙铁不可接触胶体， 首选双头型电烙铁
    - c. The soldering iron should not contact the colloid, and the double-headed soldering iron is preferred.

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.



(上图仅供参考)

焊接剂 : 有铅锡	焊接剂 : 无铅锡
温度上升斜率 = 4°C/s 最大	温度上升斜率 = 4°C/s 最大
预热温度 = 100°C ~150°C	预热温度 = 150°C ~200°C
预热时间 = 100s 最大	预热时间 = 100s 最大.
温度下降斜率为 6°C/s 最大	温度下降斜率为 6°C/s 最大
峰值温度 = 230°C 最大	峰值温度 = 250°C 最大
在峰值温度±5°C时间不能超过 10s	在峰值温度±5°C时间不能超过 10s
超过 183°C的温度的时间不能超过 80s.	超过 217°C 的温度的时间不能超过 80s.



## 焊接指导(2)

### Guideline for Soldering (2)

A. 建议焊盘散热设计：参考外观图中的焊盘设计。

Suggested pad heat dissipation design: refer to the pad design in the external drawing.

B. 焊接完成后不要对焊接面进行修改, 如果要修改, 请以同批次同等级良品替换所取下的 LED.

Do not modify the welding surface after welding. If you want to modify it, please replace the removed LED with the same batch of good products of the same grade.

C. 回流焊应该在一个时间完成, 不能分多次进行, 且过程中不能压挤产品.

Reflow welding should be completed in one time, not in multiple times, and the product should not be squeezed in the process.

D. 焊接完成的产品, 需冷却至常温才可以包装.

The welded products need to be cooled to normal temperature before being packaged.

### 3. 清洗：

#### Cleaning

A. 不要使用不明化学液体清洗 SMD LED: 不明的化学液体可能会损坏 SMD LED。当必要清洗时, 用棉签沾酒精对 SMD LED 进行清洗, 在正常的室温下清洗少于 1 分钟并且自然干燥 15 分钟, 然后才开始使用。

Do not clean SMD LED with unknown chemical liquid: unknown chemical liquid may damage SMD LED. When cleaning is necessary, clean SMD LED with cotton swab dipped in alcohol, clean it at normal room temperature for less than 1 minute and dry it naturally for 15 minutes before starting to use.

B. 不可使用具有溶解性的溶液清洁 LED, 可使用一此异丙基的溶液, 在使用任何清洁溶液之前都应确认是否会对 LED 有溶解作用。

Do not use a solvent to clean the LED, but use an isopropyl solution. Before using any cleaning solution, you should check whether it will dissolve the LED.

C. 请不要用超声波的方法清洁 LED, 如果产品必须使用超声波, 那么就要评估影响 LED 的一些参数, 如超声波功率, 烘烤的时间和装配的条件等, 在清洁之前必须试运行, 确认是否会影响到 LED.

Please do not use ultrasonic to clean the LED. If the product must use ultrasonic, then some parameters affecting the LED, such as ultrasonic power, baking time and assembly conditions, should be evaluated. Before cleaning, it must be put into trial operation to confirm whether it will affect the LED.

### 4. 焊锡丝及锡膏的选择：

#### Selection of solder wire and solder paste:

不用含硫化物或溴化物的焊锡丝及锡膏, 因为硫化物或溴化物会与支架表面电镀的银层进行化学反应, 导致银层变黑, led 灯珠衰减就变大。

Selection of solder wire and solder paste: do not use solder wire and solder paste containing sulfide or bromide, because sulfide or bromide will chemically react with the silver layer plated on the surface of the support, causing the silver layer to become black, and the attenuation of led lamp beads will become larger.

\* 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. 材料防潮管控

A. 一卷材料未一次性用完，且车间温湿度在限定之条件（ $<30^{\circ}\text{C}/60\%RH$ ）内，元件在空气中暴露时间未超出2h，则余下材料应与干燥剂一起进行真空密封保存，否则，材料必须低温烘烤除湿；除湿后的材料重新包装可重新开始计算时间；对已完成装配的元件进行防潮控制。

B. 对已装配到PCB板后的元件不需在经过高温工序或回流焊工艺，则将不作特殊处理；

C. 对需要做灌胶、滴胶或包胶防护处理的产品，建议产品在做相应防护工艺前做好必要的除湿工作，在 $65^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 的烤箱中烘烤不少于12小时，以剔除产品在检测、老化过程中暴露在空气中吸收的水分，以避免产品在做防护处理后，包在材料表面的湿气会慢慢侵入产品，会造成产品失效；

A. If a roll of material is not used up at once, and the workshop temperature and humidity are within the limited conditions ( $<30^{\circ}\text{C}/60\% RH$ ), and the exposure time of the component in the air does not exceed 2 hours, the remaining material should be vacuum sealed and stored together with the desiccant. Otherwise, the material must be baked and dehumidified at low temperature; The repackaging of materials after dehumidification can restart the calculation of time; Perform moisture-proof control on the assembled components

B. For components that have been assembled onto the PCB board and do not need to undergo high-temperature processes or reflow soldering processes, no special treatment will be carried out;

C. For products that require glue filling, dripping, or wrapping protection treatment, it is recommended that necessary dehumidification work be done before the corresponding protection process is carried out. The products should be baked in an oven at  $65^{\circ}\text{C} \pm 5^{\circ}\text{C}$  for no less than 12 hours to eliminate the water absorbed by the products exposed to the air during testing and aging, in order to avoid the moisture wrapped on the material surface from slowly invading the products after protective treatment, which may cause product failure;

#### 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)

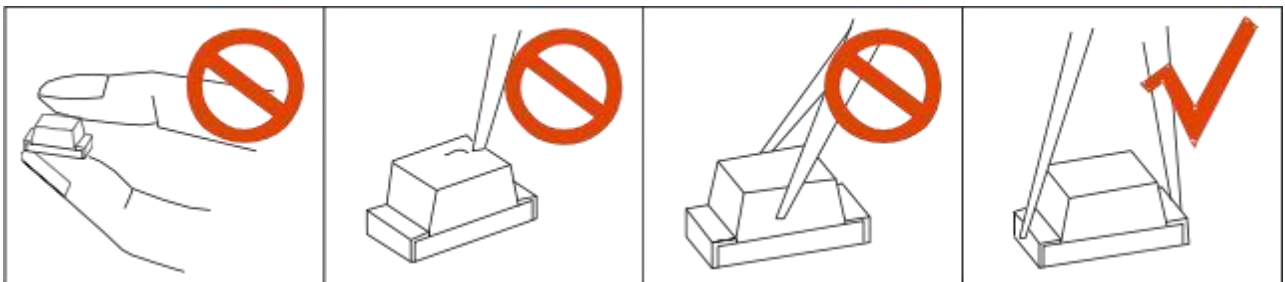
### Precautions (3)

#### 3. 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.