深圳腾杰光电科技有限公司
SHEN ZHEN TENG JIE OPTOELECTRONIC TECHNOLOGY CO., LTD

环保　高节能　防静电　高亮度　散热强　16949认证

产 品 承 认 书

客户名称		供应商产品名称	1204RGB 幻彩-1.5T
客户物料编号		供应商产品料号	MRGBXXXXXXXX
产品规格		版本号	AO

供应商确认			
拟定	审核	批准	日期
胡德美	文思	罗泽永	2023-9-8

客户确认			
采购	工程	品管	日期

深圳市光明新区公明镇楼村世峰科技园 F 栋 5 楼
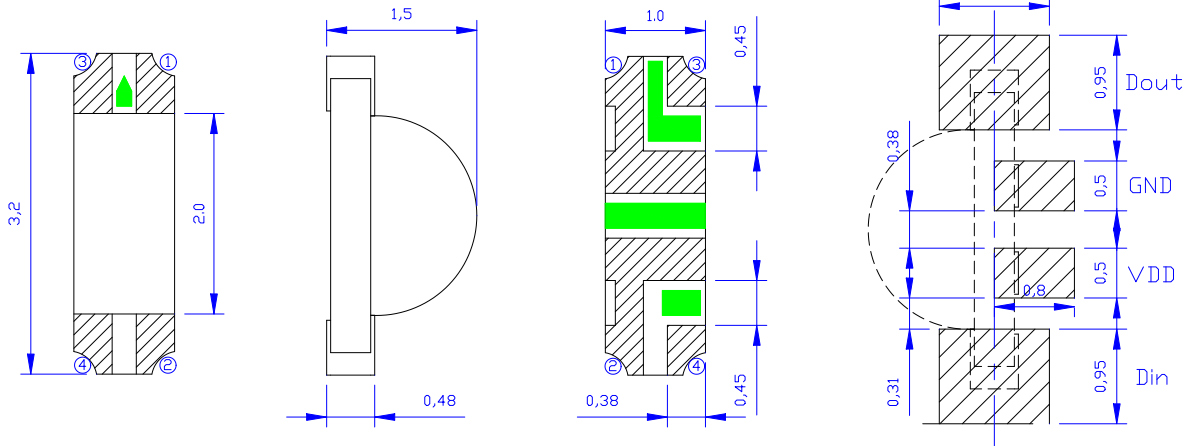
Tel.: 86-755-29694811

Fax: 86-755-29536086

Http://www.tengjie-led.com, http://www.led818.com

E-mail: led@tengjie-led.com

■Applications

Indoor signage display applications

Flat backlight for LCD. Switch and symbol

Indicator and backlighting for all consumer electronics

Special application

■Package Dimensions

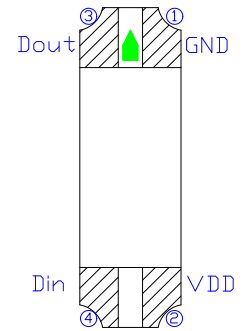PAD Lay Out PCB

Notes:

1. All dimensions are in millimeters.

2. Tolerance is ±0.10mm unless otherwise noted.

■Pin function description

Pin number	Pin function	Function description
1	GND	Systematically(系统地)
2	VDD	Power source(电源)
3	Dout	Data cascading forward output(数据级联转发输出)
4	Din	Data entry(数据输入)

■Absolute Maximum Ratings (Ta = 25℃)

Parameter	Symbol	Limiting value	Unit
Logic supply voltage(逻辑电源电压)	VDD	−0.5～+6.5	V
Din port voltage(Din 端口电压)	Vin	−0.5～VDD+0.5	V
Operating ambient temperature(工作环境温度)	Topr	-30 ~ +60	℃
Storage ambient temperature(存储环境温度)	Tstg	-40 ~ +90	℃
Lead Soldering Temperature(焊接条件)	Tsol	260℃ for 3 Seconds	

Note: For these grades in the above table, IC and LED chips may cause permanent damage to the device and reduce the reliability of the device under long-term use conditions.We do not recommend that IC and LED chips exceed these limit parameters under any other conditions;All voltage values are tested relative to the system..

■ Recommended working conditions (Ta = 25℃) 推荐工作条件

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Supply voltage(电源电压)	VDD	3.0	4.0	5.0	V	
DIN port voltage(DIN 端口电压)	Vin	--	4.0	5.0	V	VDD=5V
DO port voltage(DO 端口电压)	Vdo	--	4.0	5.0	V	VDD=5V

■ Electrical characteristic (Ta = 25℃ VDD=4.5～5.5V) 电气特性

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
High level input voltage(高电平输入电压)	Vih	3.0	--	VDD	3.0	VDD=5.0V
Low level input voltage(低电平输入电压)	Vil	0	0.8	1.5	0	VDD=5.0V
High level output current(高电平输出电流)	Ioh	--	2	--	--	VDD=5.0V, Vdo=4.9V
Low level output current(低电平输出电流)	Iol	--	2 0	--	--	VDD=5.0V, Vdo=0.8V
Input current(输入电流)	Iin	--	315	--	--	DIN 接 VDD
Static current(静态电流)	IDD	0.6	0.73	0.95	0.6	VDD=5.0V, GND=0V, 其他端口悬空
OUT output current(OUT 输出电流)	Iout	--	5	--	--	R,G,B=ON,Vout=3V
OUT Output leakage current(OUT 输出漏电流)	Iolkg	--	--	0.01	--	R, G, B=OFF, Vout=3V
Constant current error between channels(通道间恒流误差)	ΔIol0	--	--	±3	--	R,G,B=ON,Vout=5V
Constant current error between chips(芯片间恒流误差)	ΔIol1	--	--	±5	--	R,G,B=ON,Vout=5V

■ Switching characteristic (Ta = 25℃ VDD=4.5～5.5V) 开关特性

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Data rate(数据速率)	Fin	--	800	--	kHz	
OUT PWM output frequency(OUT PWM 输出频率)	Fout	--	2.6	--	KHz	R，G，B
Transmission delay time(传输延迟时间)	Tpzl	--	300	--	ns	DIN→DO
Input capacitance(输入电容)	Ci	--	--	15	pF	

■ Timing characteristic 时序特性

0码

T0L

T0H

1码

T1H

T1L

RESET 码

Treset
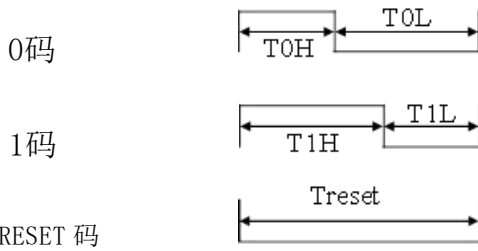
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Enter code 0, high time (输入 0 码，高电平时间)	T0H	--	300	--	ns	
Enter code 1, high time (输入 1 码，高电平时间)	T1H	--	600	--	ns	
Enter code 0, low time (输入 0 码，低电平时间)	T0L	--	600	--	ns	VDD=5.0V
Enter code 1, low time (输入 1 码，低电平时间)	T1L	--	300	--	ns	GND=0V
0 yard or 1 yard period (0 码或 1 码周期)	T0/T1	--	1250	--	ns	
Reset code: low level time (Reset 码，低电平时间)	Treset	200	--	--	µs	

(1) The 0 code or 1 code period is in the range of 1.25us (frequency 800kHz) to 2.5µs (frequency 400KHz), the chip can work normally, but the 0 code and 1 code high level time must comply with the corresponding value range in the table above;

0 码或 1 码周期在 1.25us（频率 800kHz）至 2.5µs（频率 400KHz）范围内，芯片均可正常工作，但是 0 码和 1 码高电平时间必须符合上表中相应数值范围；

(2) When there is no need to reset, the low level time between bytes should not exceed 50µs, otherwise the LED may reset, and receive data again after reset, and the correct data transmission cannot be achieved.

不需复位时，字节之间的低电平时间不要超过 50μs，否则 LED 可能复位，复位后又重新接收数据，无法实现数据正确传送.
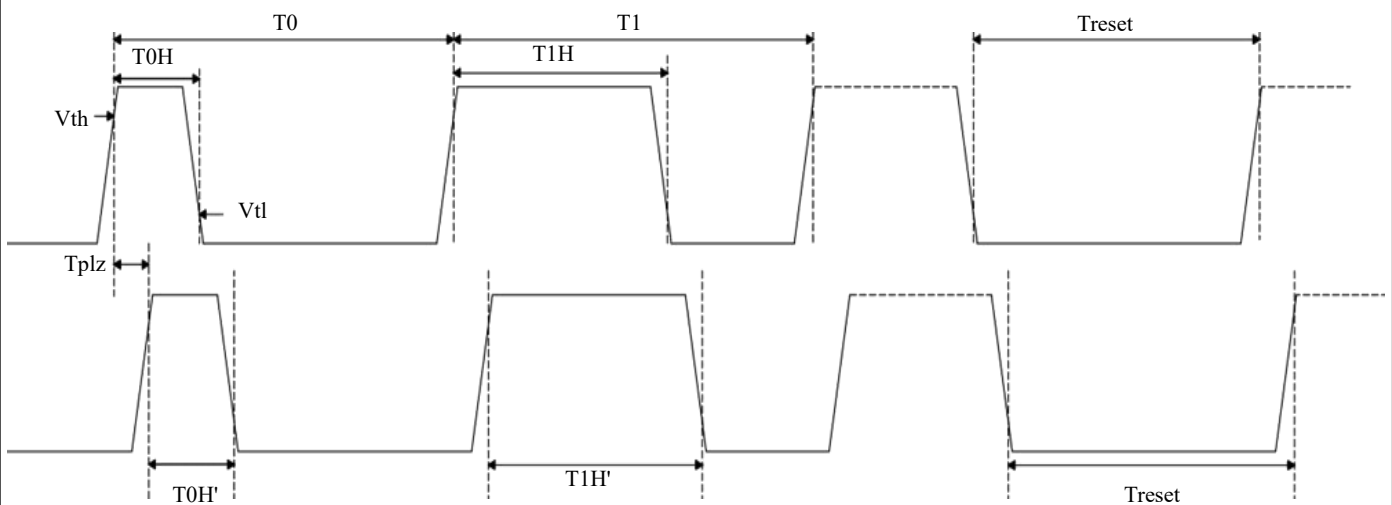
■ RGB LED photoelectric parameters

colour	Wavelength(nm)	Light Intensity(mcd)	Voltage(V)	Test Condition
Red	620-630	100-200	1.6-2.0	IF=5mA
Green	515-530	250-450	2.6-3.0	IF=5mA
Blue	460-470	150-250	2.6-3.0	IF=5mA

Notes:

1. Tolerance of measurement of luminous intensity : ±15%
2. Tolerance of measurement of dominant wavelength : ±1.0nm
3. Tolerance of measurement of forward voltage : ±0.1V

■ Function description 功能说明

LED uses a single line communication mode, using the return to zero code to send signals. After the LED is powered on and reset, it receives the data sent by the Din end, and after receiving 24 bits, the Dout port begins to forward the data continued to be sent by the Din end, providing input data for the next cascade LED. The Dout interface remains low until the data is forwarded. If Din inputs the RESET signal, it will output the corresponding PWM duty cycle according to the received 24-bit data after successful reset, and the LED will wait to receive the new data again. After receiving the initial 24-bit data, the data will be forwarded through the DO port. Before the LED receives the RESET signal, the original output of R, G and B of the LED remains unchanged.
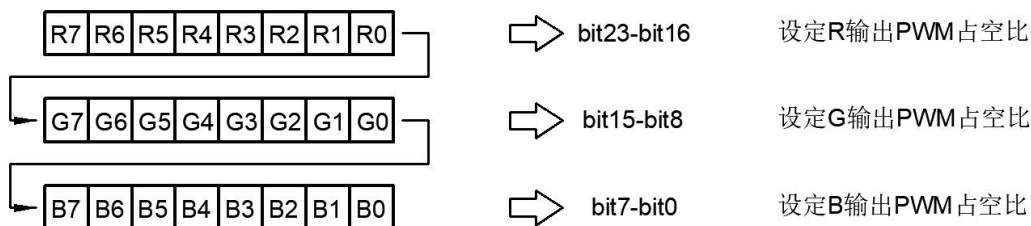
LED built-in IC adopts automatic shaping and forwarding technology, the signal does not distortion attenuation, so that the number of LED cascades is not limited by signal transmission, only limited by the requirements of screen speed.

LED 采用单线通讯方式，采用归零码的方式发送信号。LED 在上电复位以后，接受 Din 端送来的数据，接收完 24bit 后，Dout 端口开始转发 Din 端继续发来的数据，为下个级联 LED 提供输入数据。在转发数据之前，Dout 口一直为低电平。如果 Din 输入 RESET 复位信号，将在复位成功后根据接收到 24bit 数据输出相对应 PWM 占空比，且 LED 重新等待接受新的数据，在接收完开始的 24bit 数据后，通过 DO 口转发数据，LED 在没有接受到 RESET 信号前，LED 的 R、G、B 原输出保持不变。

LED 内置 IC 采用自动整形转发技术，信号不会失真衰减，使得 LED 的级联个数不受信号传送的限制，仅受限于刷屏速度的要求。

■ Data structure 数据结构

The PWM data structure received by the LED is as follows(LED 接收的 PWM 数据结构如下):

| R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | ⟹ bit23-bit16 设定R输出PWM占空比

| G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | ⟹ bit15-bit8 设定G输出PWM占空比

| B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | ⟹ bit7-bit0 设定B输出PWM占空比

A set of 24-bit data controls a chip, in which every 8 data controls a constant current output.

The PMW duty cycle is continuously adjustable from 0 to 255, when 0 is turned off, 255 is the highest brightness. 24bit data is sent from the high level, and the data is sent in RGB order. Each 24-bit data can be split into 3 8-bit data for transmission, but it should be noted that the low level time between each set of data cannot exceed 50us RESET signal time, otherwise the IC will be reset. If the PWM duty cycle is calculated and the data is received again, the correct transmission of the data cannot be achieved.

一组 24bit 数据控制一个芯片，其中每 8 个数据控制一个恒流输出。

PMW 占空比从 0 到 255 连续可调，0 的时候为关灯，255 为最高辉度。24bit 数据发送时由高位开始发起，按照 RGB 的顺序发送数据，每 24 位数据可以拆分为 3 个 8 位数据进行发送，但是需要注意的是每组数据之间的低电平时间不能超过 50us 的 RESET 信号时间，否则 IC 会被复位，计算 PWM 占空比并且重新开始接收数据，则无法实现数据的正确传输。

■ Acceptance and forwarding of data 数据的接受与转发
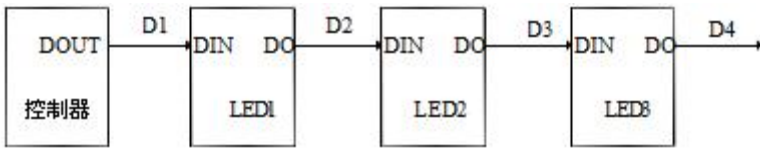
D1 indicates the data sent by the Dout port of the controller, and D2, D3, and D4 indicate the data forwarded in cascading mode.

其中 D1 为控制器 Dout 端口发送的数据，D2、D3、D4 为级联转发的数据。
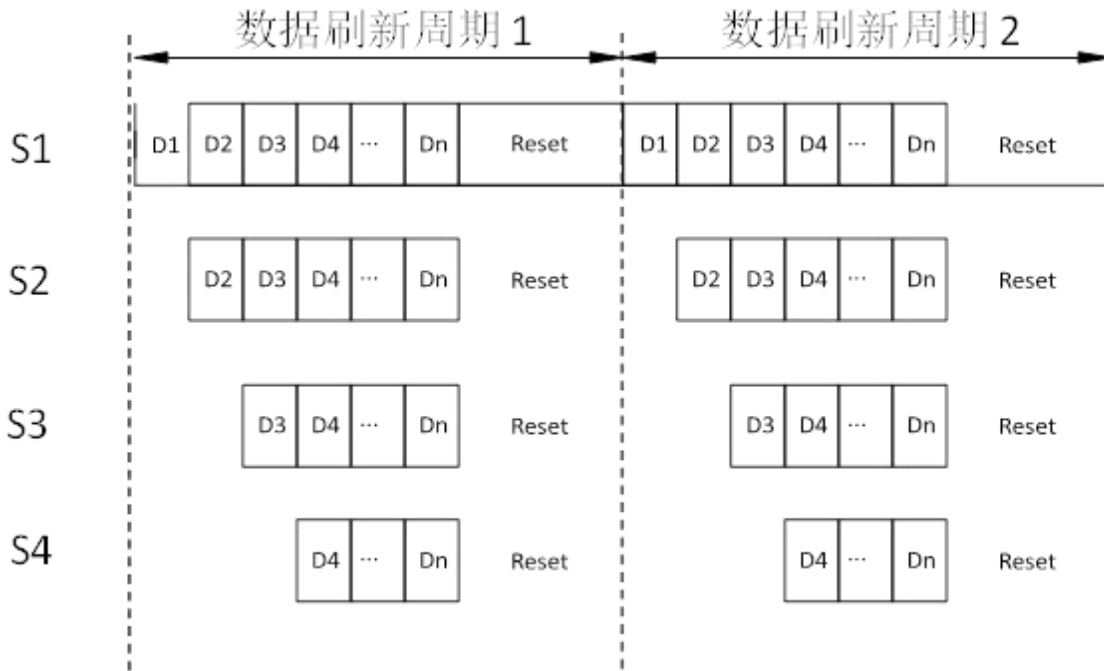
■ Application information 应用信息

How to calculate the data refresh rate(如何计算数据刷新速率)

The data refresh time is calculated based on how many pixels are connected to a system, according to the normal mode:

The data period of 1bit is 1.25us (frequency is 800 MHZ). A pixel data contains 24 bits of R (8bit), G (8bit), and B (8bit). The transmission time is 1.25us x 24=30μs. If a system has a total of 1000 pixels, the time for refreshing all the displays at one time is 30μs×1000=30ms (ignoring the Reset signal time), that is, the refresh rate of one second is: 1÷30ms=33.3Hz.

数据刷新时间是根据一个系统中级联了多少像素点来计算的,按照正常模式计算：

1bit 数据周期为 1.25us（频率 800MHz），一个像素数据包括 R（8bit）、G（8bit）、B（8bit） 共 24bit，传输时间为 1.25us×24=30μs。如果一个系统中共有 1000 个像素点，一次刷新全部显示 的时间为 30μs×1000=30ms（忽略 Reset 信号时间），即一秒钟刷新率为：1÷30ms=33.3Hz。

Below is a table of the number of cascades corresponding to the highest data refresh rate(以下是级联点数 对应最高数据刷新率表格):

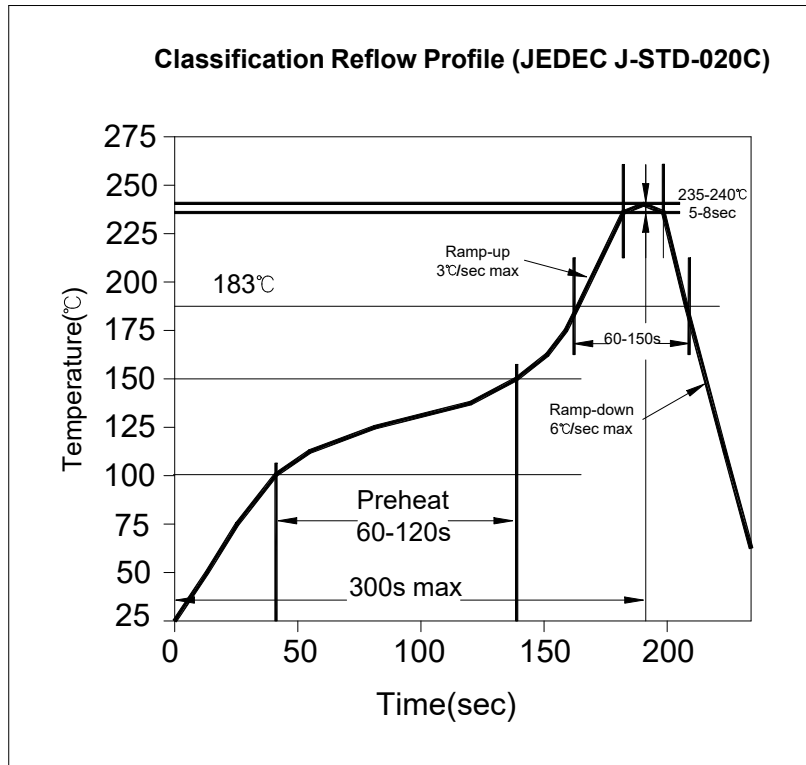| Pixel count 像素点数	Fastest data refresh time (ms) 最快一次数据刷新时间（ms）	Maximum data refresh rate (Hz) 最高数据刷新率（Hz）
1~500	15	66.7
1~1000	30	33.3
1~2000	60	16.7

Typical application circuit 典型应用电路
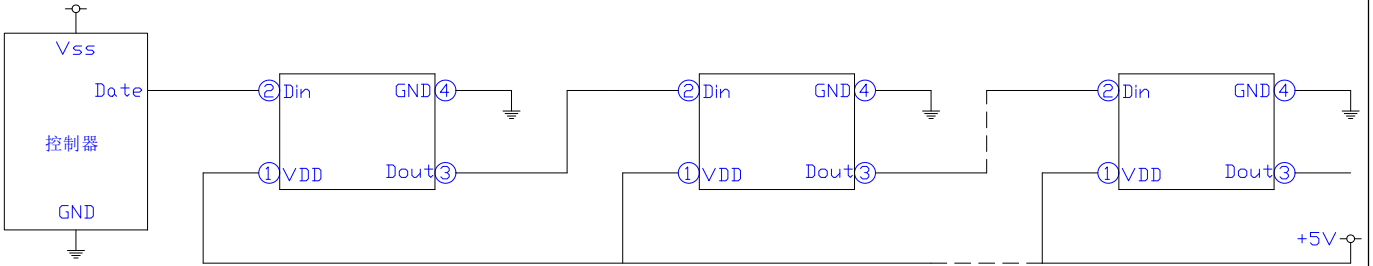
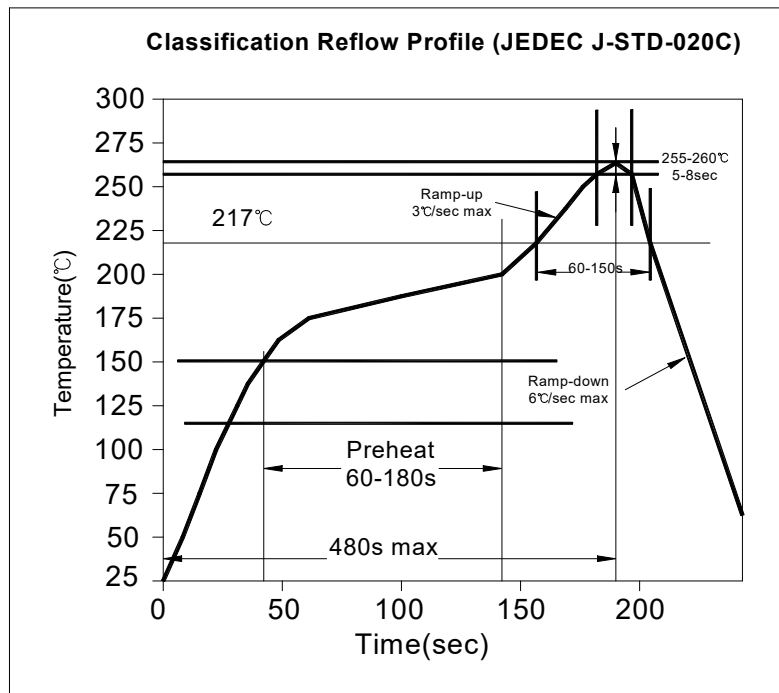## ■ Test Items and Conditions:

No.	Test Item 测试项目	TJ. Standard 腾杰参照标准	Test Conditions 测试条件	Note 频次	Number of Damaged 允许破坏数
01	Temperature Cycle 高低温循环	JIS C 7021 (1977)A-4	-40°C 30min ↑↓5min 90°C 30min	100 cycle	0/22
02	Thermal Shock 冷热冲击测试	MIL-SLD-107D	-40°C 15min ↑↓5min 90°C 15min	50 cycle	0/22
03	High Humidity Heat Cycle 高温度热循环	JIS C 7021 (1977)A-5	30°C 〈=〉65°C 90%RH 24hrs/1cycle	10 cycle	0/22
04	High Temperature Storage 高温存储	JIS C 7021 (1977)B-10	T_a=90°C	1000 hrs	0/22
05	Humidity Heat Storage 高温高湿存储	JIS C 7021 (1977)B-11	T_a=60°C RH=90%	1000 hrs	0/22
06	Low Temperature Storage 低温贮藏	JIS C 7021 (1977)B-12	T_a=－40°C	1000 hrs	0/22
07	Life Test 常温寿命测试	JIS C 7035 (1985)	T_a=25°C I_F=20mA	1000 hrs	0/22
08	High Humidity Heat Life Test 高温高湿寿命测试	∩	60°C RH=90% I_F=20mA	500 hrs	0/22
09	Low Temperature Life Test 低温寿命测试	∩	Ta=-25°C I_F=20mA	1000 hrs	0/22

■Soldering heat reliability:
Lead Solder

Classification Reflow Profile (JEDEC J-STD-020C)

Lead-Free Solder

Classification Reflow Profile (JEDEC J-STD-020C)
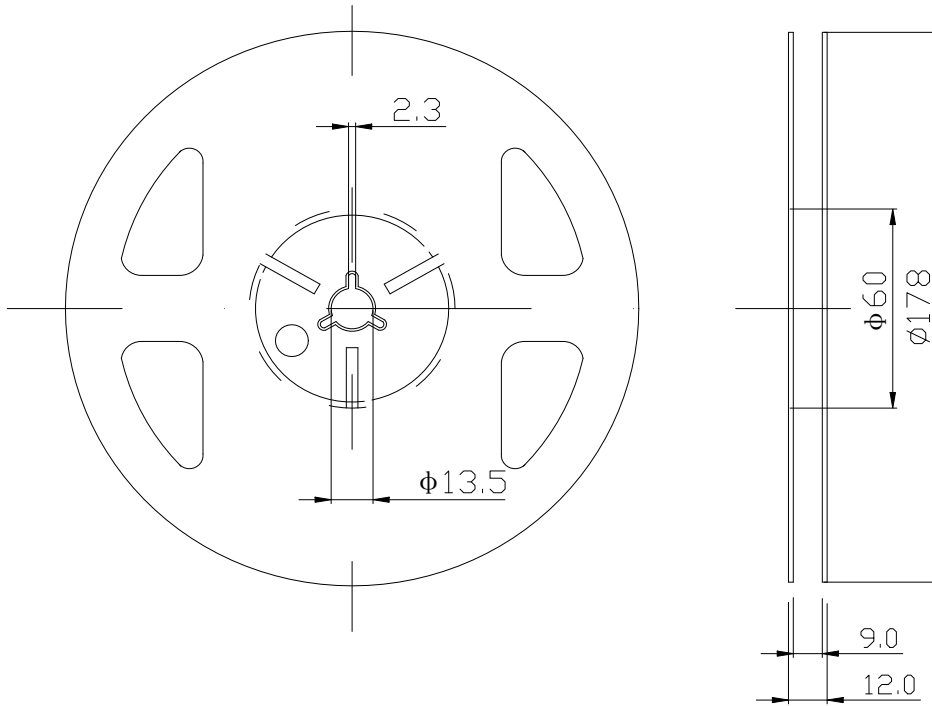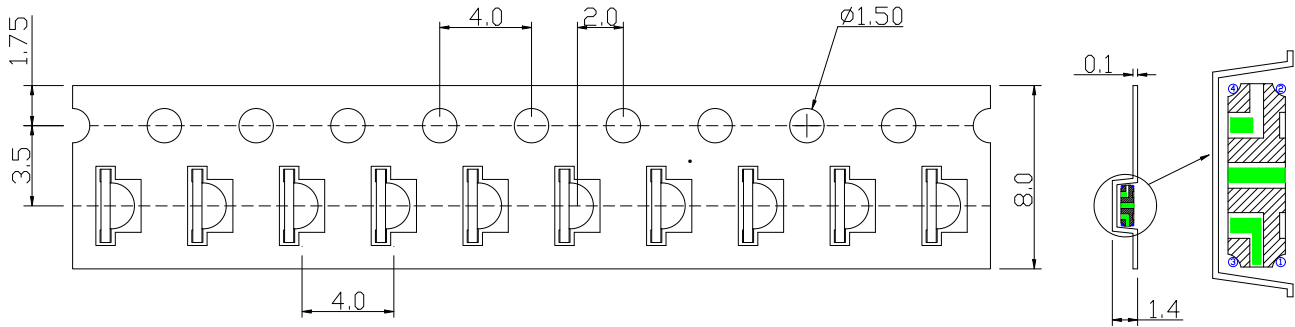
■Packing Specifications:

Dimensions ate specified as follows:mm

Notes:

1) The packing only appropriate for TJ.
2) Normal packing quantity: 3,000pcs/reel

■Precaution of Application 应用预防措施

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 driven 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 flows through every parallel circuits.

1：电路设计

由于 LED 的正向电压随温度和驱动电流的变化而变化，在 LED 电路设计中应考虑限制电流保护电路的设计。

LED 作为并联电路时，LED 固有电阻的不同会引起不平衡电流。每一并联电路中存在的不平衡驱动电流可能使驱动电源处于不同的功率状态。因此，高功率驱动的 LED 可能受到过驱动电流的破坏，低功率驱动的 LED 可能比其他 LED 更亮。

针对这种情况，推荐一种合适的电阻与每个 LED 电路串联。电阻将限制和平衡流经每个并联电路的驱动电流。

2: Electric Static Discharge (ESD) Protection

All kinds of LED materials, such as GaP, AlGaAs, AllnGaP, GaN, or InGaN chips, are STATIC SENSITIVE device. ESD protection or surge voltages shall be considered and taken care in the initial design stage, and whole production process.

The following protection is recommended:

(1) A wrist band or an anti-electrostatic glove shall be used when handling the LEDs
(2) All devices, equipment and machinery must be properly grounded

If LED is damaged by ESD or surge voltage, damaged LED may show some unusual characteristics. It may appear leakage current, and LED does not emit at low current.

And when using microscope to inspect damaged LED chip at low driving current, it may have some black dots within the emitting area.

2：静电放电（ESD）保护

各种 LED 材料，如 GaP，AlGaAs，AllnGaP，GaN，InGaN 芯片，是静电敏感器件。静电放电保护或浪涌电压应在初始设计阶段和整个生产过程中加以考虑和采取措施。

建议采取以下防护措施：
（1）在处理 LED 时应使用手环或防静电手套。
（2）所有装置、设备和机器必须接地。

如果 LED 被静电放电或浪涌电压损坏，损坏的 LED 可能会显示一些不寻常的特性。它可能出现漏电，并且 LED 在低电流时不会发光的。

低驱动电流时，当用显微镜检查受损 LED 芯片，可能会在发光区域内有一些黑点。

3: Pick and Place

The following items should be paid attention in assembly process:

(1) It should be avoided to load stress on the resin during pick and place process, especially at high temperature.

(2) Avoid rubbing or scraping the resin by any object, and avoid leaving fingerprints on the lens.

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

3：拾起和放置

装配过程中应注意以下事项：

（1）在拾起和放置过程中，特别是在高温下，应避免在胶体上施加重力。
（2）避免任何物体摩擦或刮伤胶体，避免在胶体上留下指纹。
（3）静电可能会对 LED 造成损坏。请确认该设备接地良好。

4: Storage

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

(1) Shelf life in sealed bag: 3 months at $T_A<30℃$ and Hum.<30%RH.(Base on aluminum laminated moisture barrier bag.)

(2) After the package bag is opened and kept in the following environment, the LED products should be used completely as soon as possible:

Humidity (Hum.) : 60%RH Max.

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

Assembly duration: within 168 hours, after bag is opened.

If the some of LED are not used, they need to be kept at Hum. ≦10%RH in zip-locked sealed bags. And if the

duration exceeds 168 hours, re-baking process is required to keep LED from moisture.

Baking condition: 70±5℃/24 hours.

4：储存

建议在下列条件下储存产品：
(1) 在密封袋内保质期:在温度＜30℃及湿度＜30% RH 的条件下，3 个月。（铝制层压防潮袋。）
(2)包装袋打开后，在以下环境下，应尽快使用 LED 产品：湿度：＞60%RH 温度：5℃～30℃（41℉～86℉）
装配时间:打开包后，在 168 小时内使用完。
如果有 LED 没有使用，则需要保存在有密封链的密封袋中，湿度≦10%RH。
如果使用时间超过 168 小时，则需要重新烘烤。
烘烤条件：70±5℃/24 小时。

5: Cleaning

An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended to clean the LED, after soldering process, if cleaning is necessary. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

It is not recommended to use unspecified chemical liquids as cleaning material for cleaning the LED. It's also not recommended to use ultrasonic power to clean the LED device. The chemical and ultrasonic power could harm the LED devices.

5：清洁

在焊接过程中，如果需要清洁，建议使用醇基溶剂，如异丙醇(IPA)清洗 LED。在清洗之前，应该做一个预先测试，以确定是否会对 LED 造成损坏。

不建议使用不明的化学液体作为清洗材料。也不建议使用超声波电源清洗 LED。这种化学和超声波的力量会对 LED 造成伤害。

6: Manual Soldering and Rework

The manual soldering process is not recommended for quality consideration. When it is absolutely necessary, the LEDs may be mounted in this fashion but the user will assume responsibility for any problems.

The the following conditions are recommended :

(1) Soldering material : SN60 (60% tin and 40% lead) solder or solder with silver content is recommended.

(2) Temperature of the iron : lower than 300°C

(3) Soldering time : maximum 3 seconds

(4) Operation cautions:

   - Please avoid overheating of LED component in any process. Overheating may damange

    the LED package.

   - Please don′t place any stress on the lens of LED, especially at high temperature

6：手动焊接和返工

对于质量考虑，不推荐手工焊接。当绝对必要时，LED 可以手工焊接，但焊接方将承担任何问题的责任。
建议以下条件：
  (1)焊接材料：建议采用 SN60（60%锡，40%铅）焊锡或使用银焊料。
  (2)焊铁的温度：低于 300°C
  (3)焊接时间：最高 3 秒
  (4)操作注意事项：
    –请在任何过程中避免 LED 过热。
    –过热可能会损坏 LED 的封装。
    –请不要把任何重力放在 LED 透镜上，尤其是在高温的时候

7: Application

(1) The strong light from LEDs may injure human eyes. Precautions should be taken to prevent looking directly at the LEDs with unaided eyes.

(2) In order to get maximum light output during the duration of LED's long life, designer should consider how to make excellent thermal dissipation when making the whole system design.   It's recommended to avoid intense heat generation and to operate within the maximum ratings given in this approval sheets.

(3) 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.

7：应用

(1)　led 强光可能会伤害人眼。应采取预防措施，以防止眼睛直视发光二极管。

(2)　在 LED 正常寿命内，为了获得最大的光能输出，设计者应考虑如何在整个系统的设计过程中进行良好的散热。建议避免高温产生，并在本规格书内的最大额定值内操作。

(3)　每个 LED 灯珠都将被分类，相同 BIN 号的 LED 灯珠将被放在同一个卷盘里或放在同一个袋子里。建议使用相同 BIN 号的 LED 来装配单个成品。这将确保 LED 单个成品颜色,亮度的一致性。