

Shenzhen H-Great Optoelectronic Co., Ltd.

承认书 Approved Sheet

客户名称：	
客户物料名称：	
客户物料编码：	
文件编号：	
华皓品名：	<u>P36-RGB05P05N3P1INA03-CC</u>
华皓料号：	

客户确认

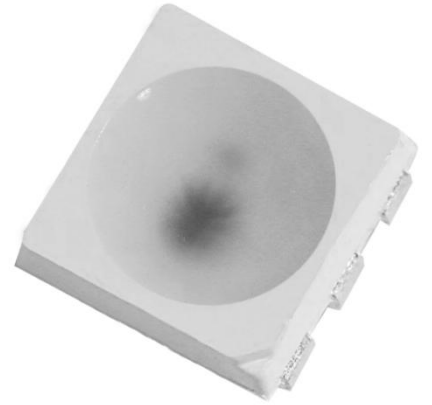
检测员：
审核：
批准：
盖章：

华皓

检测员：赵小吹
审核：刁发开
批准：黄增富
日期：20240902

P36-RGB05P05N3P1INA03-CC

The Ultra high reliability and luminous efficacy ,PLCC LED Series are optimized to be used as lighting for automotive interior ambient lighting designs or LED light strip.



Applications/产品应用

Automotive interior ambient lighting
Indoor ambient lighting

汽车内氛围灯
室内氛围灯

Features/特性

Size(mm) : 3.6*3.5*1.47	尺寸 (毫米) : 3.6*3.5*1.47
Color : Full color LED product	发光颜色: 全彩LED产品
Viewing angle: 120°	发光角度: 120°
Data frequency : 15MHz	数据频率: 15MHz
8bits PWM control with 256 grayscales for each output	8位PWM控制, 每个输出256个灰度级
ESD protection up to 2KV	抗静电: 2 kV
Qualifications: The product qualification test based on the guidelines of AECQ-102	质量检测: AECQ-102
MSL: Level 5	湿敏等级: Level 5
RoHS compliant	通过RoHS认证

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Absolute maximum ratings($T_a=25^{\circ}\text{C}$)/最大额定值

Parameters/参数	Symbol/符号	Value/数值	Unit/单位
DC Forward Current 直流工作电压	VDD	+3.5~+5.5	V
Output 0/1/2 Voltage 0/1/2输出电压	Vledout	6.5	V
Maximum Output Current 最大输出电流	Iledout	20	mA
Electrostatic discharge 抗静电	ESD	2000	V
Operating temperature 工作温度	T_{OPR}	-40~+85	$^{\circ}\text{C}$
Storage temperature 储存温度	T_{STG}	-40~+105	$^{\circ}\text{C}$
Maximum junction temperature(1) 最大结温	T_{J}	125	$^{\circ}\text{C}$

Proper current derating must be observed to maintain junction temperature below the Maximum.

Electro optical characteristics(led current=20mA, $T_a=25^{\circ}\text{C}$)/光电特性

Item 项目	Color 颜色	Min 最小值	Typ 典型值	Max 最大值	Unit 单位
Luminous Intensity 光强	R	450	700	900	mcd
	G	1450	1800	2350	
	B	280	350	450	
	W	1800	2800	4500	
Dominant Wavelength 波长	R	615	620	630	nm
	G	520	525	535	
	B	460	465	475	

Note:

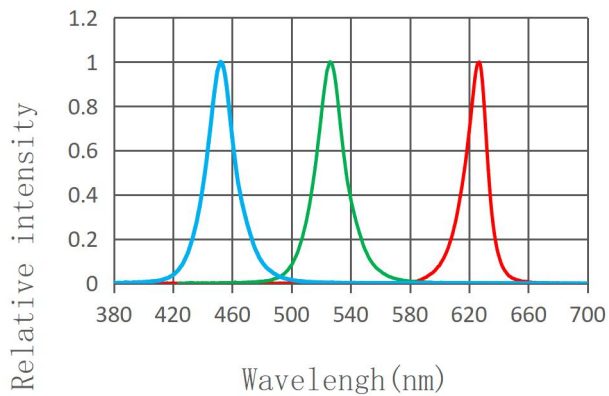
①The Luminous Intensity performance is guaranteed within published operating conditions. H-GREAT maintains a tolerance of $\pm 10\%$ on Intensity measurements.

②Dominant wavelength measurement allowance is $\pm 1\text{nm}$.

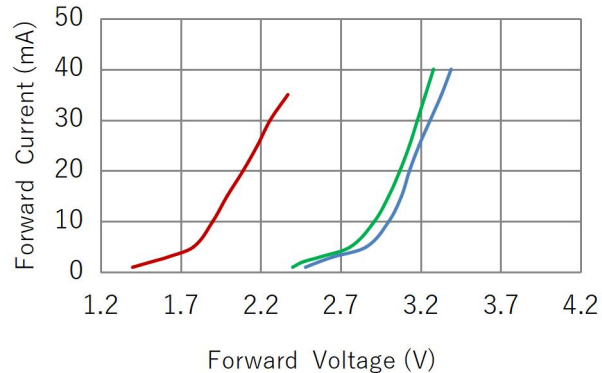
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Typical electrical optical characteristic curves(Full PWM)/典型光电特征曲线

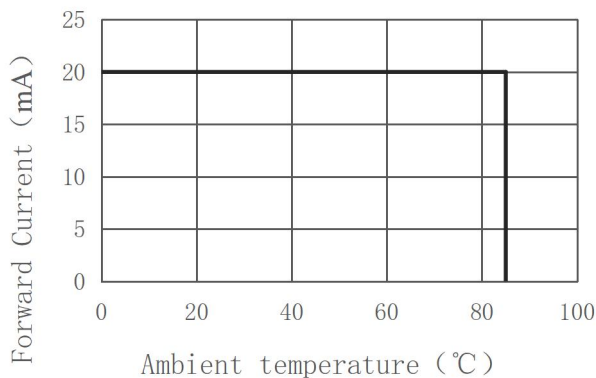
Spectrum Distribution
(led current=20mA, Ta=25°C)



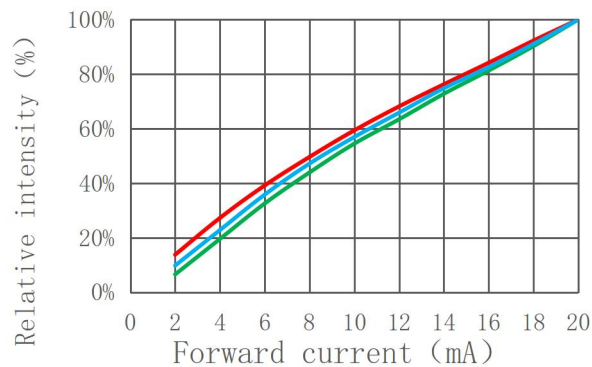
Forward current VS. Forward voltage
(Ta=25°C)



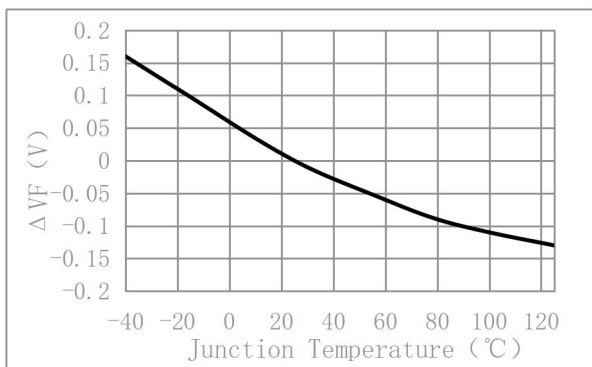
Forward current derating curve
VS. Ambient temperature



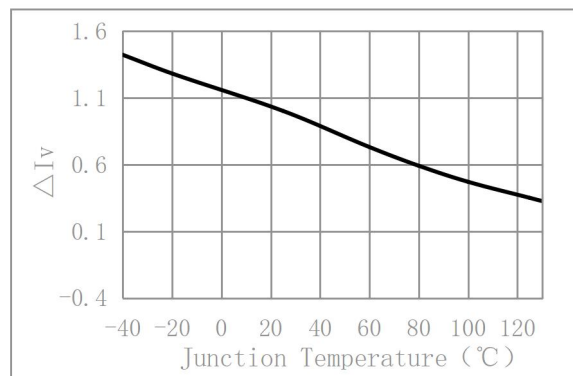
Relative intensity VS. Forward current
(Ta=25°C)



Relative Forward Voltage (ΔV_F)

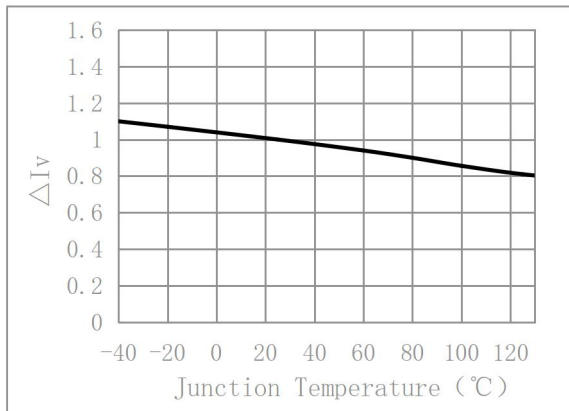


Fluctuations in relative luminous intensity
(Red $\Delta I_V = I_V / I_V$)

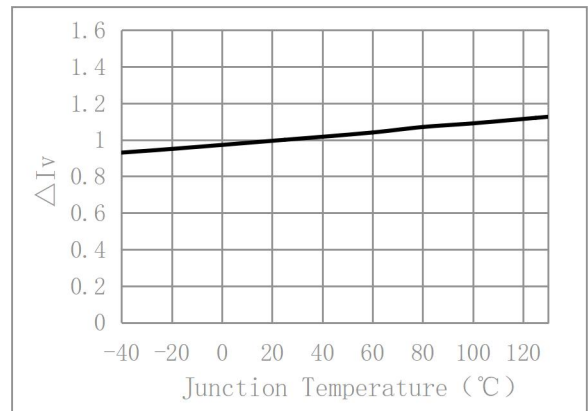


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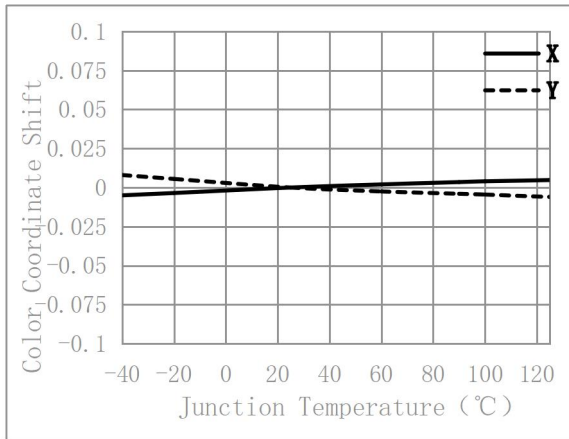
Fluctuations in relative luminous intensity
(Green $\Delta IV=IV/IV$)



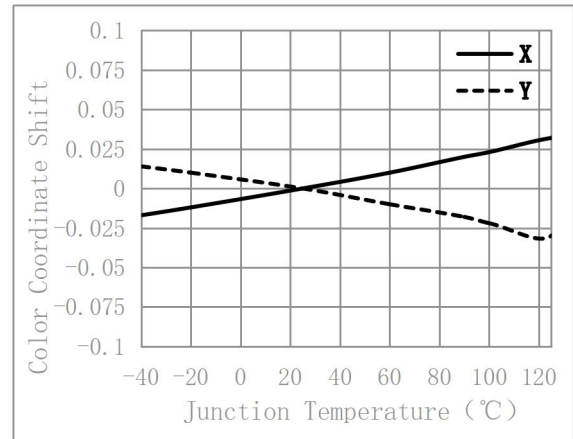
Fluctuations in relative luminous intensity
(Blue $\Delta IV=IV/IV$)



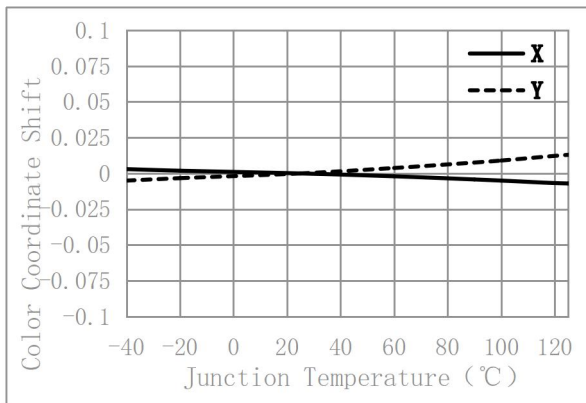
Color coordinate offset(Red ΔX 、 ΔY)



Color coordinate offset(Greed ΔX 、 ΔY)

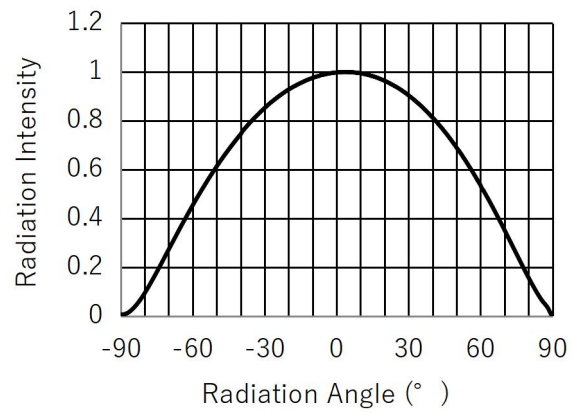
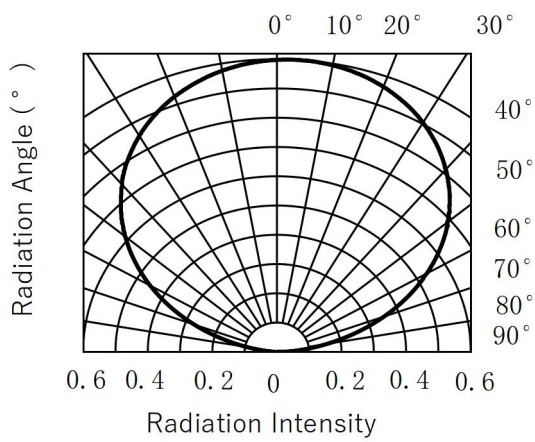


Color coordinate offset(Blue ΔX 、 ΔY)



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Radiation Intensity vs Radiation Angle



Notes:

1. $2\theta_{1/2}$ is the off axis angle from lamp centerline where the luminous intensity is 1/2 of the peak value.
2. View angle tolerance is $\pm 5^\circ$.

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Data Transfer Characteristics/传输特性

Parameter 参数	Describe 描述	Min 最小值	Typ 代表值	Max 最大值	Unit 单位
V _{IH}	Input High “H”	2.7	---	VDD+0.4	V
V _{IL}	Input High “L”	0.4	---	1.0	V
V _{OH}	Output High “H”	4.5	---	---	V
V _{OL}	Output High “L”	---	---	0.4	V
C _{FREQ}	CIN Frequency	---	---	15	MHz
T _{CKH}	CIN High pulse width	30	---	---	ns
T _{CKL}	CIN Low pulse width	30	---	---	ns
T _{SETUP}	DIN to CIN setup	10	---	---	ns
T _{HOLD}	DIN to CIN hold time	5	---	---	ns
I _{sleep}	Standby Current	---	1	---	uA

Ranks(sorting current=20mA, Ta=25°C)/档位

① Luminous Intensity/光强

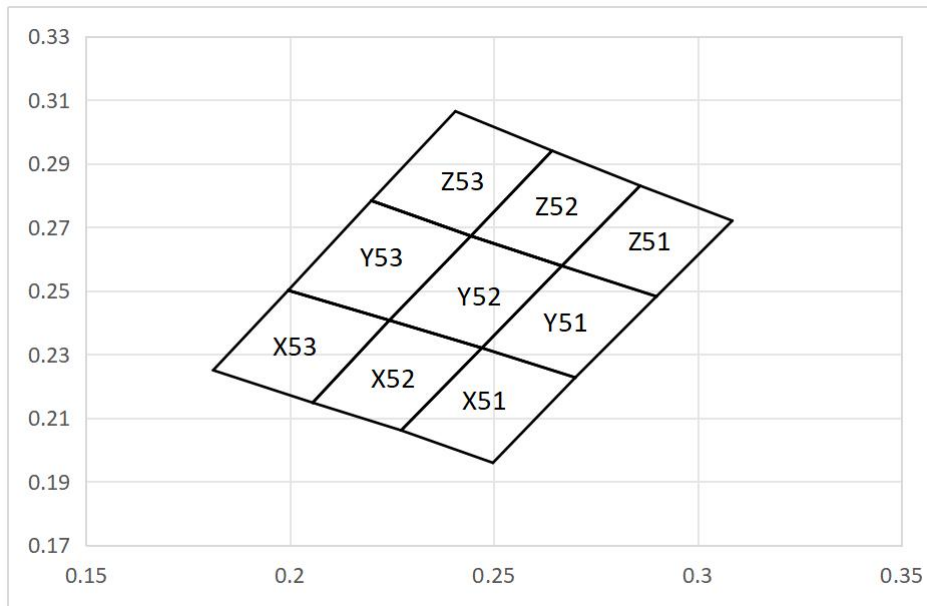
Item 项目	Light Color 发光颜色	Rank 档位	Min 最小值	Max 最大值	Unit 单位
Luminous Intensity 光强	W	I31	1800	2350	mcd
		I32	2350	2800	
		I33	2800	3500	
		I34	3500	4500	

Note:

The luminous Intensity performance is guaranteed within published operating conditions. H-GREAT maintains a tolerance of $\pm 10\%$ on flux measurements.

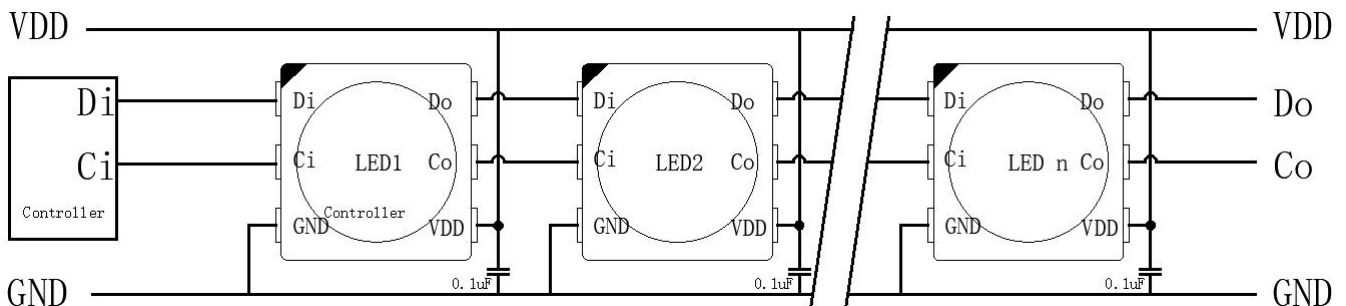
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②Chromaticity Coordinates/色坐标



色区	X	Y	色区	X	Y	色区	X	Y
X51	0.2471	0.2320	Y51	0.2667	0.2578	Z51	0.2667	0.2578
	0.2273	0.2061		0.2899	0.2482		0.2859	0.2830
	0.2498	0.1959		0.2700	0.2227		0.3085	0.2720
	0.2700	0.2227		0.2471	0.2320		0.2899	0.2482
X52	0.2244	0.2407	Y52	0.2444	0.2672	Z52	0.2444	0.2672
	0.2056	0.2148		0.2244	0.2407		0.2643	0.2940
	0.2273	0.2061		0.2471	0.2320		0.2859	0.2830
	0.2471	0.2320		0.2667	0.2578		0.2667	0.2578
X53	0.1996	0.2501	Y53	0.2200	0.2783	Z53	0.2200	0.2783
	0.1812	0.2250		0.1996	0.2501		0.2406	0.3064
	0.2056	0.2148		0.2244	0.2407		0.2643	0.2940
	0.2244	0.2407		0.2444	0.2672		0.2444	0.2672

Connection method/连接方式



Note1: The by-pass capacitor of VDD pin is necessary to be added on the board for the stability of chip operation. The suggested value of capacitor is 0.1uF.

注2: 为了芯片工作的稳定性, 需要在板上增加VDD引脚的旁路电容器C1。电容器的建议值为0.1uF。

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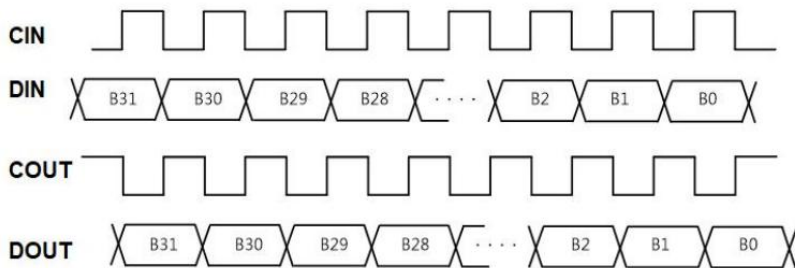
The method of data transmission/数据传输方法:

32个连续的0表示RGB LED的命令的开始，之后LED获得以下32位作为接收到的命令，包括FLAG、DIMMING、BLUE、GREEN和RED字段。

32-bit 0's	FLAG[2:0]	DIMMING[4:0]	BLUE[7:0]	GREEN[7:0]	RED[7:0]	FLAG[2:0]	FLAG[2:0]	DIMMING[4:0]	RED[7:0]	N/2 # of dummy data ("1" or "0")
Start	LED 1				LED 2	N-1	LED N				Need extra N/2 of clocks		

Command Type	Bit [50:48]	Description
FLAG	3'b111	111 to start a 32-bit command
DIMMING	5'b00001	32-level current control for R/G/B drivers 00000:0/31(LED Output Current MIN) 00001:1/31 ... 11111:31/31(LED Output Current MAX)
R	8'b0000_0000	(Default) 8 bits PWM grayscale setting for Red
G	8'b0000_0000	(Default) 8 bits PWM grayscale setting for Green
B	8'b0000_0000	(Default) 8 bits PWM grayscale setting for Blue

串行命令首先与MSB一起传输，DIN在CIN时钟的上升沿被锁存。为下一个LED重新生成COUT和DOUT。当遇到32个连续的0时，下一个1将启动32位命令，即FLAG[2:0]=111。当FLAG[2:0]=111时，则DIMMING、BLUE、GREEN和RED字段分别被锁存。当获得当前32位命令时，当前的LED将剩余的命令位传递给下一个LED。



Sleep Mode/睡眠模式

BGR数据接收到24位0，（即BLUE[7:0]=8hh0，G[7:0]=8hh0，R[7:0]=8hh0），同时3位flag和5位DIMMING中的数据为8b'A0（即flag[2:0]=3b'101和DIMMING[4:0]=5b'000000），LED进入睡眠模式。

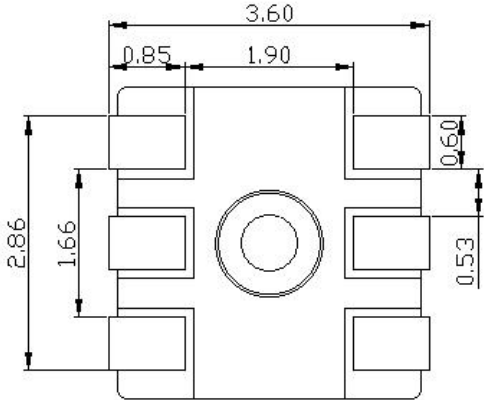
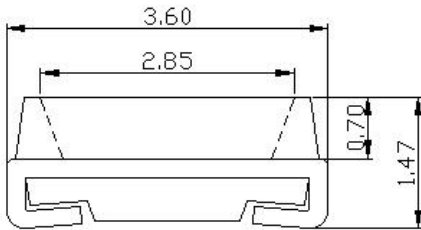
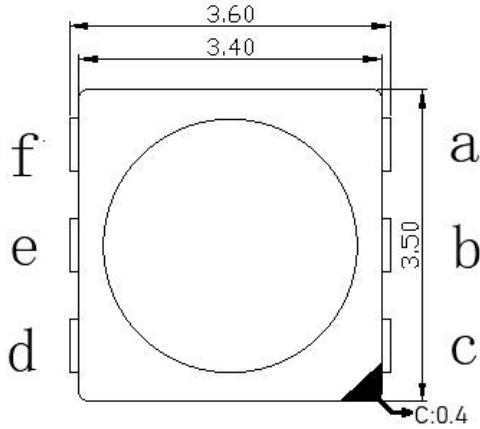
32 bits 0	Flag[2:0]=3'b101	Dimming[4]=5'b00000	Blue[8'h00]	Green[8'h00]	Red[8'h00]
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Leave "Sleep Mode" /离开睡眠模式

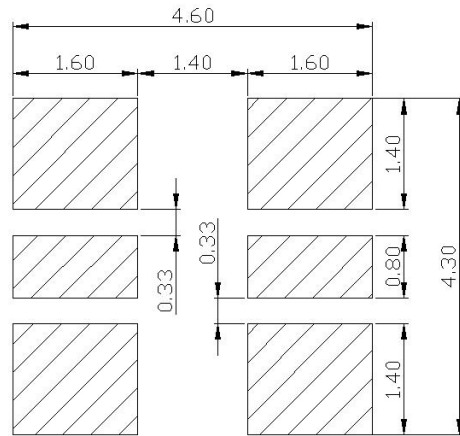
LED一旦接收到具有的新数据，就会离开睡眠模式；结束睡眠模式后，LED中的所有休眠电路1ms内恢复到正常工作模式。由于睡眠模式需要1ms返回正常功能模式，建议主机等待1ms后发送显示数据命令。

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Package dimensions/产品外观尺寸



PIN configuration		
NO	Symbol	Fountion description
a	GND	Ground terminal
b	CKI	Clock signal input
c	DIN	Serial data input
d	DOOUT	Serial data output
e	CKO	Clock signal output
f	VDD	Supply voltage



Soldering pad suggested

Notes:

1. All dimensions are measured in mm.
2. Tolerance : ± 0.1 mm

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Packaging specifications/包装规格

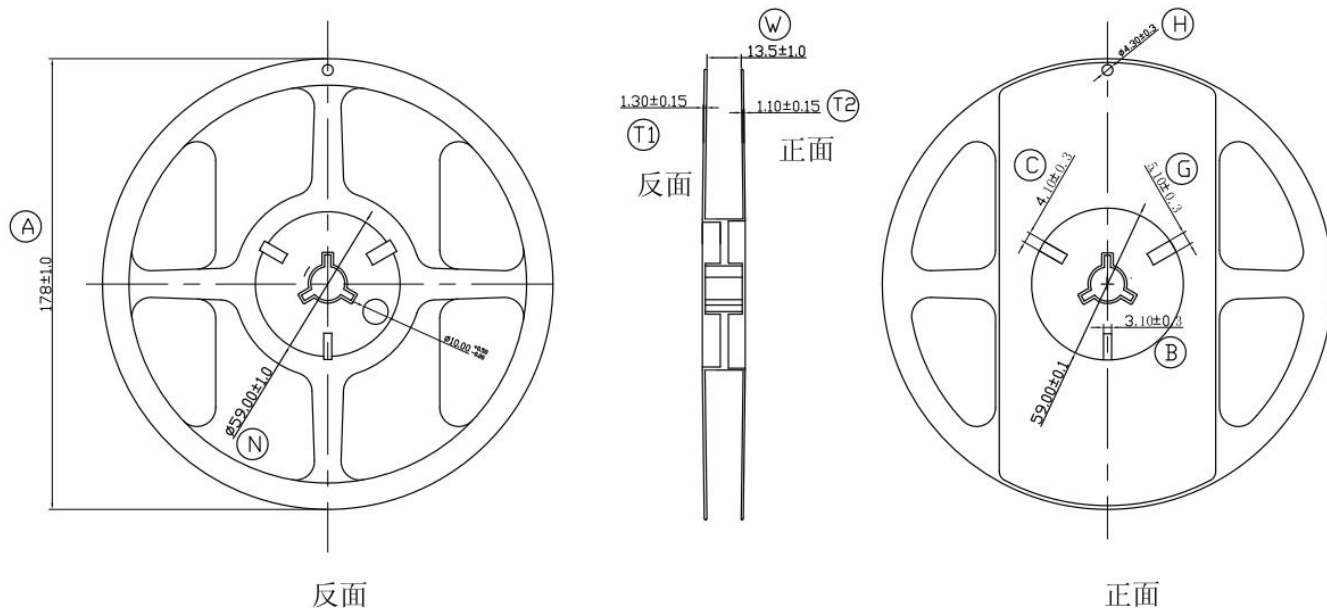
Product Labeling/产品标签

Label Explanation/标签解释

CPN: Internal system part number	
P/N: Product Number	
VF(V): Forward voltage Bin	
IV:Luminous intensity rank	
CIE:Coordinates rank	
Lot NO: Lot Number	
QTY: quantity	
Date: date of manufacture	

Carrier Tape Dimensions/卷盘包装

Reel Dimensions/卷盘尺寸



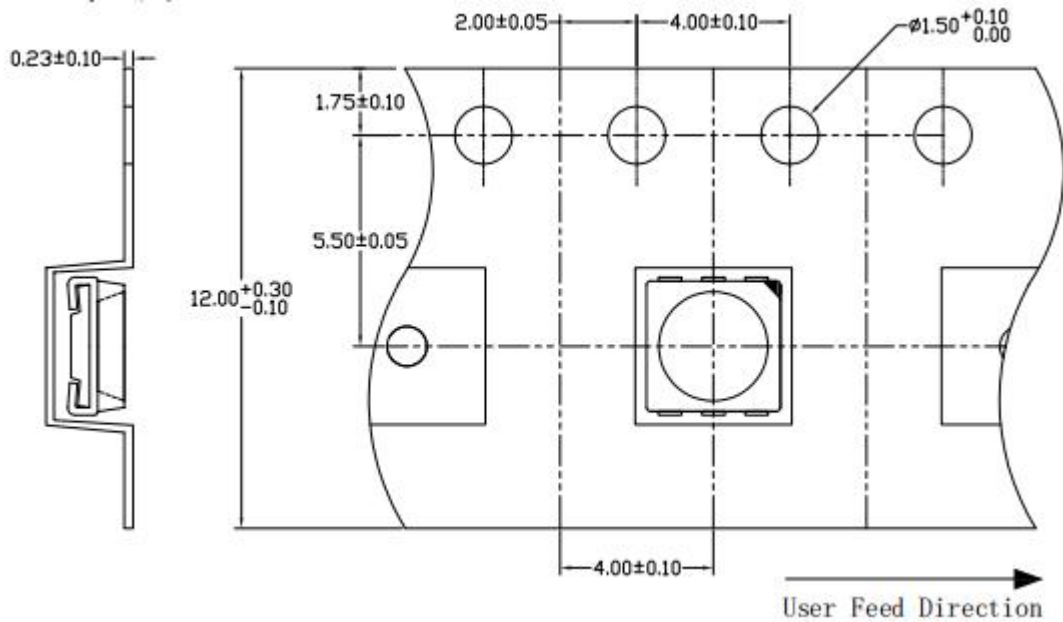
Note/备注:

- 1. All dimensions are in millimeters;
单位: 毫米

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Tape On Reel Package/载带包装

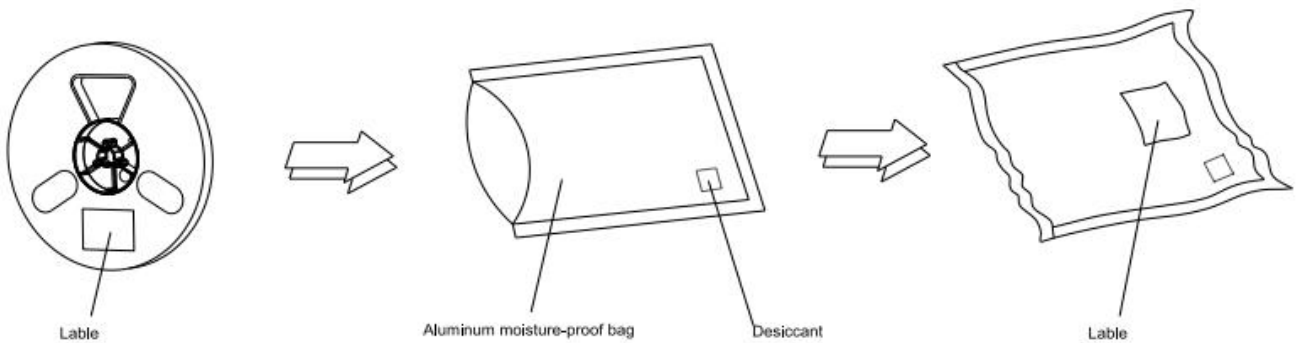
Carrier Tape Dimensions as the following/载带尺寸



Note/备注:

- (1) The cathode is oriented towards the tape sprocket hole in accordance with data sheet specifications.
根据图表显示，负极朝向载带孔。
- (2) MPQ: 1000 pcs per reel.
1000颗/每盘。
- (3) 60 empty in front of the tape sprocket, 80 empty in the end of the tape sprocket.
载带前空60颗，后空80颗。

Moisture Resistant Packaging/防潮包装

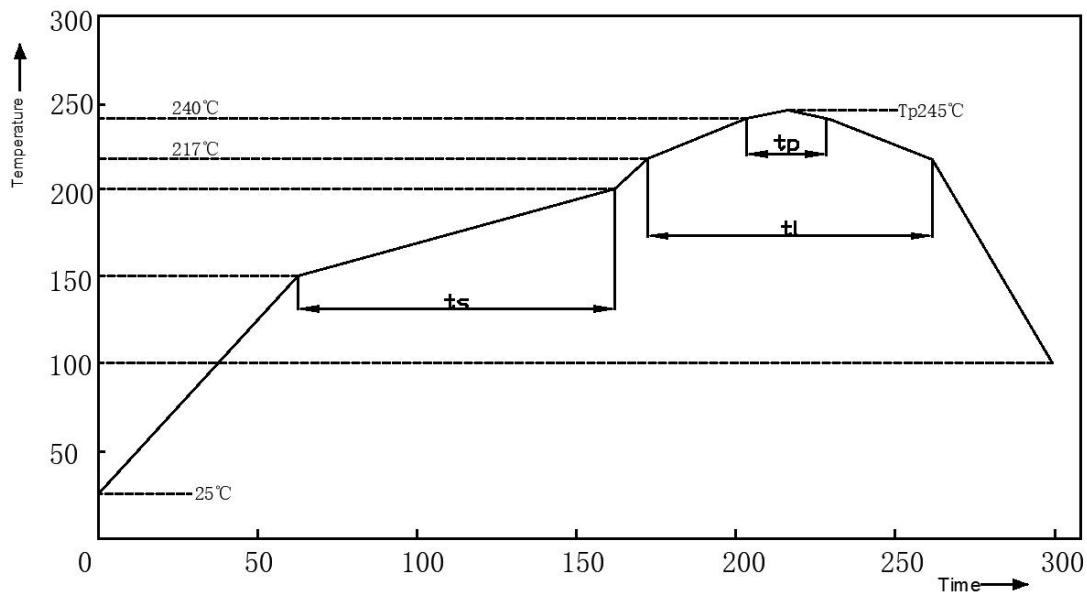


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Soldering Characteristics/焊接工艺

Reflow Soldering Profile/回流曲线

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E



Profile Feature	Pb-Free Assembly	Unit Einheit
Average Ramp-up Rate 25 ° C to 150 ° C	2-3	° C /sec
Preheat Temperature Min.	150	sec
Preheat Temperature Max.	200	sec
Preheat Time	60- 120	sec
Time Maintained Above Temperature	217	° C
Time Maintained Above Time	60-90	sec
Peak Temperature (max.)	260	° C

c. Reflow soldering should not be done more than twice.

d. In soldering process, stress on the LEDs during heating should be avoided.

e. After soldering, do not bend the circuit board.

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Cautions/注意事项

1. Moisture-Proof Package/防潮包装

1.1 When moisture is absorbed into the LED package it may vaporize and expand products during soldering. There is a possibility that this may cause exfoliation of the contacts and damage to the optical characteristics of the LEDs. For this reason, the moisture-proof package is used to keep moisture to a minimum in the package.

当水分被吸收到 LED 包装中时，它可能会在焊接过程中蒸发并膨胀产品。这可能会导致触点脱落并损坏 LED 的光学特性。因此，防潮包装需要将包装中的水分保持在最低限度。

2. Iron Soldering/烙铁焊接

2.1 Hand soldering is not recommended for regular production. These guidelines are for rework only. 常规生产不建议手工焊接。此方法仅适用于返工。

2.2 The recommended condition is less than 5s at 260°C.

建议的条件是在 260°C 时小于 5s。

2.3 The time must be shorter for higher temperatures. (+10°C → -1sec)

对于较高的温度，时间必须更短。（+10°C → -1 秒）

2.4 The power dissipation of the soldering iron should be lower than 25W and the surface temperature of the device should be controlled at under 300°C.

烙铁的功耗应低于 25W，器件表面温度应控制在 300°C 以下。

3. Storage Conditions/储存条件

3.1 Before opening the package : The LEDs should be kept at 30°C or less and 90%RH or less. The LEDs should be used within a year. When storing the LEDs, moisture-proof packaging with moisture-absorbent material is recommended.

打开包装前：LED 应保持在 30°C 或以下，相对湿度为 90% 或以下。LED 应在一年内使用。储存 LED 时，建议使用吸湿材进行防潮包装。

3.2 After opening the package: The LEDs should be kept at 30°C or less and 60%RH or less. The LEDs should be soldered within 48 hours (1 day) after opening the package. If unused LEDs remain, they should be stored in moisture-proof packages, such as sealed containers with packages of moisture-absorbent material. It is also recommended to return the LEDs to the original moisture-proof bag and to reseal the moisture-proof bag again.

打开包装后：LED 应保持在 30°C 或以下，相对湿度为 60% 或以下。LED 应在打开包装后 48 小时（1 天）内焊接。如果仍有未使用的 LED 灯珠，则应将其储存在防潮包装中，例如带有吸湿材料包装的密封容器中。也建议将 LED 灯珠放回原来的防潮袋，并再次重新密封防潮袋。

3.3 If the moisture-absorbent material has faded away or the LEDs have exceeded the recommended storage time, baking treatment should be performed using the following conditions. Baking treatment: more than 24 hours at 65±5°C

如果吸湿材料褪色或 LED 超过建议的存储时间，则应使用以下条件进行除湿处理。除湿处理：在 65±5°C 下烘烤超过 24 小时。

3.4 H-Great LED electrode sections are comprised of a silver-plated copper alloy. The silver surface may be affected by environments which contain corrosive gases and so on. Please avoid condition which may cause difficulty environments during soldering operations. It is recommended that the user uses the LEDs as soon as possible.

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华皓 LED 灯珠电极部分由镀银铜合金组成。银表面可能受到含有腐蚀性气体等环境的影响。在焊接操作过程中，避免出现可能由环境导致问题的情况。建议用户尽快使用 LED 灯珠。

3.5 Please avoid rapid transitions in ambient temperature, especially in high humidity environments where condensation can occur.

请避免环境温度快速变化，尤其是在可能发生冷凝的高湿度环境中。

4. Handling of Silicone LEDs/硅胶 LED 灯珠处理

4.1 Avoid silicone resin parts especially with sharp tools such as tweezers.

避免使用锋利工具，尤其是使用镊子等接触硅胶部分。

4.2 Avoid leaving fingerprints on silicone part.

避免在硅胶零件上留下指纹。

5. Usage/用途

5.1 Do not exceed the values given in this specification.

不要超出本规范中给出的使用条件。

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Revision History

Versions	Description	Release Date
A0	Standard data sheet	2023/12/19
A1	Update label templates in packaging specifications	2023/12/27
A2	Revise the relationship curve between optical performance parameters and temperature	2024/9/2