Technical Data Sheet

Customer Part No.:

Inhere Part No.: S3535NPRGBWD-AM-PC01

Part Name: 3535RGBW+IC

Spec Issue Date: 2023-10-10

Revision No.: C

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To Customer:

We submit herewith the following information for your approval:

■Sample ☐OQC Inspection Record ■LED Dimension

■Electrical Characteristics Curve ■Internal Circuit Diagram

■Soldering recommendation

Prepared by : Lily	Checked by : Tom	Approved by : Evan
Date : 2023-10-10	Date : 2023-10-10	Date : 2023-10-10

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Customer Opinion

☐ Approve and no objection

☐ Reject with the following reason:

_____

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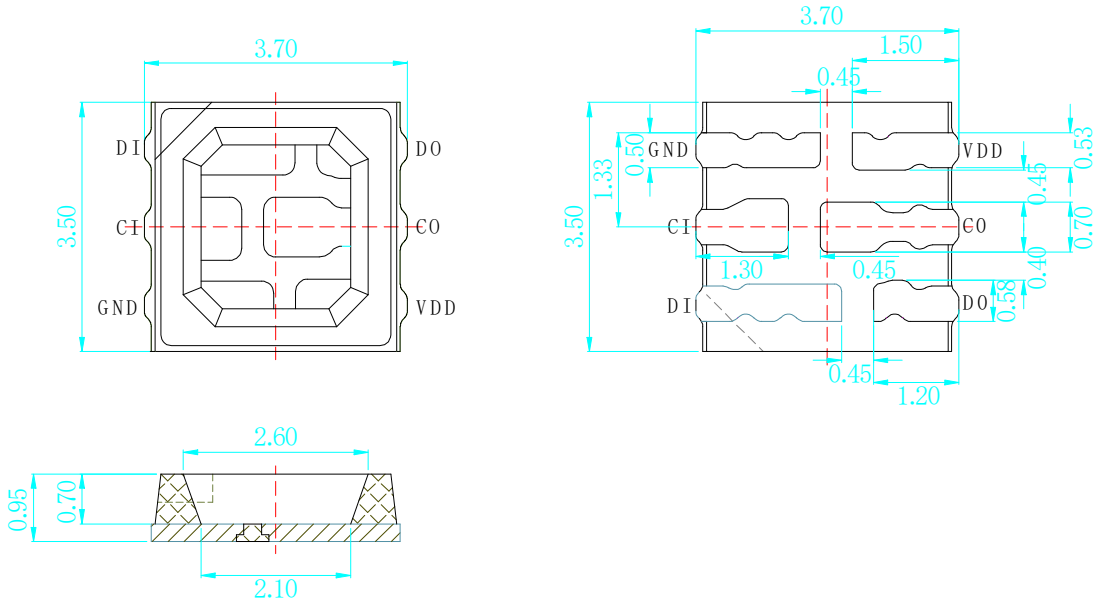
Features

- RoHS 2.0 Compliant
- Package din 12mm tape on 7" diameter reels
- EIA STD package
- Compatible with automatic placement equipment and infrared reflow solder process
- Preconditioning: accelerate to JEDEC level 5
- Serial data transmission signal by (DATA CLK) two line
- One pixel contains R, G, and B color that each can achieve 256 level brightness grayscale, which forms 16, 777, 216 combination colors.
- Supports sleep /wake-up mode. In sleep mode, the LED's current was lower than 5uA
- Compliance to automotive standard: AEC-Q102

Applications

- Telecommunication, office automation, home appliances, industrial equipment
- Status indicator
- Signal and symbol luminaire
- Front panel backlighting
- Full-color strip.
- Indoor decorative lighting / curtain display

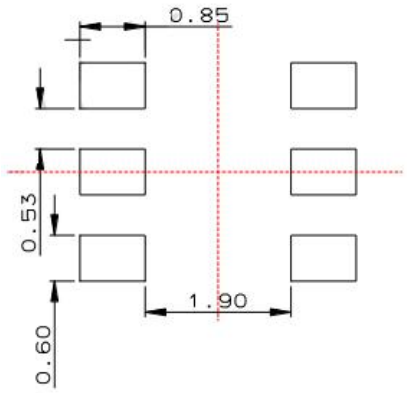
Dimensions



Notes:

1. All dimensions are in millimeters.
2. Tolerance is ± 0.10 unless otherwise noted.

Recommended Pad Layout



PIN Configuration

NO.	Symbol	Function description
1	VDD	Supply voltage
2	CO	Clock output
3	DO	Data output
4	GND	Ground
5	CI	Clock input
6	DI	Data input

Maximum Rating(Ta=25℃)

Parameter	Symbol	Range	Unit
IC power supply voltage	V_{DD}	< 6.5	V
LED voltage	V led	4.5-5.5	V
Rate of data signal	F_{CLK}	15	MHZ
The max led output current	I_{OMAX}	20/channel	mA
Power dissipation	P_D	< 400	mW
Soldering temperature*1	T_{SD}	260	℃
Operating temperature range	Topt	-40-+100	℃
Storage temperature range	Tstg	-40-+105	℃

Electrical Characteristics (Ta=25℃;VDD=5V)

Parameter	Symbol		Min	Typical	Max	Unit	Test conditions
Luminous intensity	Iv	R	--	550	--	mcd	I_F =20mA
		G	--	1700	--		
		B	--	300	--		
		W	6	--	9	lm	
Dominant wavelength	λd	R	615	--	630	nm	I_F =20mA
		G	520	--	535		
		B	460	--	475		
Color coordinate	X	W	0.2170	--	0.2380	--	I_F =20mA
	Y		0.1920	--	0.2680		
View angle	2θ1/2		--	120	--	deg	I_F =20mA

Electrical Characteristics (Ta=25℃;VDD=5V)

Parameter	Symbol	Min	Typ.	Max	Unit	Test conditions
Supply voltage	V_{DD}	4.5	5.0	5.5	V	--
Input high voltage	V_{IH}	2.7	--	VDD+0.4	V	--
Input low voltage	V_{IL}	-0.4	--	1.0	V	--
The clock high level width	T_{CLKH}	30	--	--	ns	--
The clock low level width	T_{CLKL}	30	--	--	ns	--
Data set up time	T_{SETUP}	10	--	--	ns	--
Data hold time	T_{HOLD}	5	--	--	ns	--
Working current(IC)	IDD	--	--	2	mA	I out= "OFF"
Static current	I sleep	--	--	5	uA	Sleep mold
ESD pressure	V_{ESD}	--	6000	--	V	HBM

Test Items and Results of Reliability (1)

Test Item	Test Conditions	Standard Test Method	Note	Number of Test
External Visual	Ta=25±3℃ ψ(%)=40%RH～60%RH	JESD22 B-101B	--	--
Parametric Verification	Ta=25±3℃ ψ(%)=40%RH～60%RH	JESD22 A-108C	--	0/25
D.P.A	Ta=25±3℃ ψ(%)=40%RH～60%RH Random Sample H3TRB, HAST,TC	AEC-Q101-004-C	--	0/3
ESD	Ta=25±3℃ ψ(%)=40%RH～60%RH HBM: R=1.5KΩ C=100pF	JESD22 A-114E	3 times Negative/ Positive	0/30
Physical Dimension	Ta=25±3℃ ψ(%)=40%RH～60%RH	JESD22 B-100B	--	0/3
Vibration Variable Frequency	Ta=25±3℃ ψ(%)=40%RH～60%RH 0.06inch displacement,20 to 100Hz,50g 100Hz to 2KHz	JESD22 B-103B	4times	0/30
Mechanical Shock	Ta=25±3℃ ψ(%)=40%RH～60%RH 1500g’ s for 0.5s,5blows, 3orentation	JESD22 B-104C	3times	0/30
Temperature Cycling	Ta=-40°-100°C,30min dwell, 5min transfer,1000 cycles	JESD22 A-104C	1000cycles	0/77
Power Temperature Cycling	Ta=-40～85℃,@20mA, 20min dwell/1hour transition 2 min ON / 2 min OFF	JESD22 A-105C	1000cycles	0/77
Steady-state temperature-humidity bias life test	Ta=85℃,ψ(%)=85%RH, @20mA	JESD22 A-101C	1000hrs	0/77

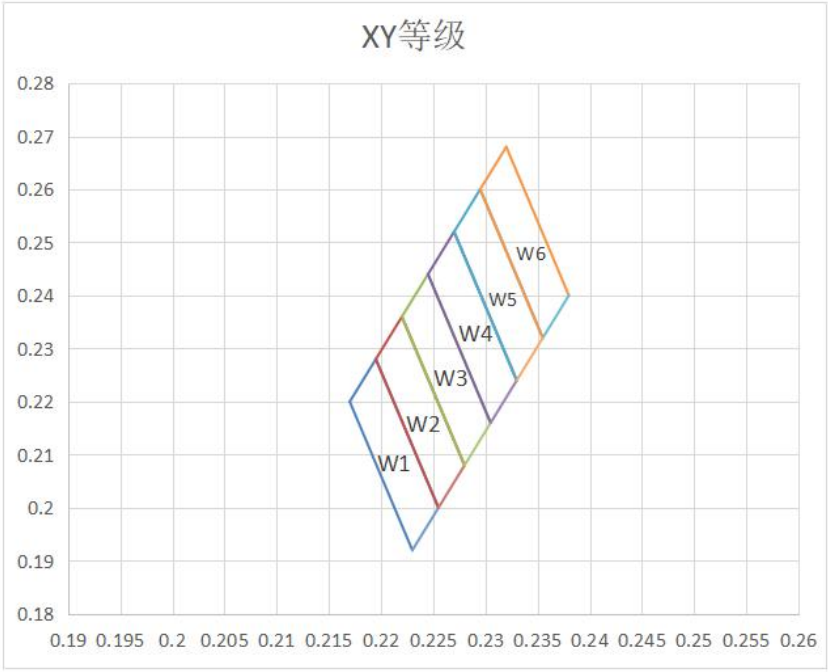
Test Items and Results of Reliability (2)

Test Item	Test Conditions	Standard Test Method	Note	Number of Test
High Temperature Operating Life	Ta=85℃,@20mA	JESD22 A-101C	1000hrs	0/77
Low Temperature Operating Life	Ta=-40℃,@20mA	JESD22 A-101C	1000hrs	0/77
Low Temperature Storage Life	Ta=-40℃, non-operating	JESD22 A-119	1000hrs	0/77
High Temperature Storage Life	Ta=100℃,non-operating	JESD22 A-103C	1000hrs	0/77
Thermal Cycles	Ta=-40～100℃,20min dwell, <10 second transfer	JESD22 A-104C	1000cycles	0/77
High Temperature Reverse Bias Test	Ta=85℃,VR=5V	JESD22 A-108C	1000hrs	0/77
Bond Shear/Die Shear	Ta=25±3℃ ψ(%)=40%RH～60%RH	AEC-Q101-D1	--	0/10
Sulphur resistance	Ta=40±3℃ ψ(%)=90%RH Concentration:H2S/15PPM	IEC60810	336hrs	0/10
Salt Atmosphere	Ta=35±3℃,PH=6.0～7.5	JESD22 A-107B	24hrs	0/5
Reflow soldering	Ta=260±5℃,Time=10S	JESD22 B-106C	5 times	0/30

Luminous Flux-White (IF = 20mA)

Bin Code	Min. Φ (lm)	Max. Φ (lm)
L6	6	7
L7	7	8
L8	8	9

Color Coordinates Comparison-White

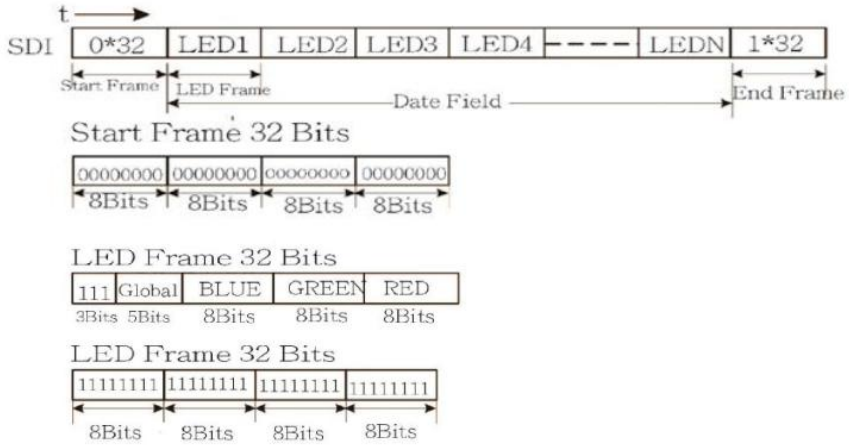


Rank	Chromaticity Coordinates				
W1	X	0.2230	0.2170	0.2195	0.2255
	Y	0.1920	0.220	0.2280	0.2000
W2	X	0.2255	0.2195	0.2220	0.2280
	Y	0.200	0.2280	0.2360	0.2080
W3	X	0.2280	0.2220	0.2245	0.2308
	Y	0.2080	0.2360	0.2440	0.2160
W4	X	0.2305	0.2245	0.2270	0.2330
	Y	0.2160	0.2440	0.2520	0.2240
W5	X	0.2330	0.2270	0.2295	0.2355
	Y	0.2240	0.2520	0.2600	0.2320
W6	X	0.2355	0.2295	0.2320	0.2380
	Y	0.2320	0.2600	0.2680	0.2400

Function Description

(1) Series data structure

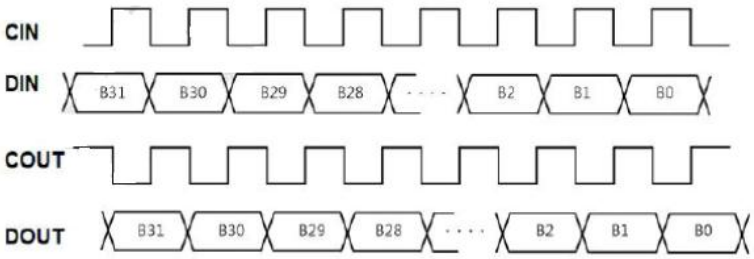
Tandem N-LED



(2) 5-Bit (level 32) brightness adjustment (simultaneous control of OUTR\OUTG\OUTB three port current

DATA MSB←→LSB	Driving Current
00000	0/31
00001	1/31
00010	2/31
…	
11110	30/31
11111	31/31(max)

(3) PWM input/output signals relations

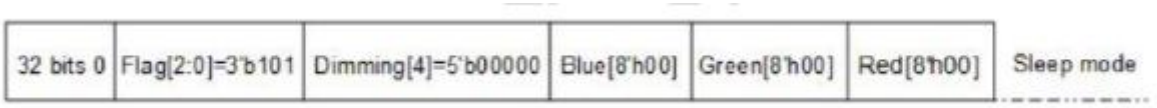


Data MSB—	Duty Cycle
00000000	0/256(min)
00000001	1/256
00000010	2/256
…	
11111101	253/256
11111110	254/256
11111111	255/256(max)

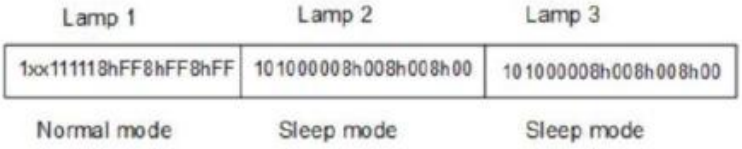
(4) Sleep and power saving mode

LED supports the sleep/wake-up modes for power-saving purpose. After the IC receives 24-bit 0’ s BGR data (that is BLUE[7:0]=8h00, G[7:0]=8h00, R[7:0]=8h00), in the meantime, both of the data in 3-bits flag and 5-bits DIMMING is 8h’ A0’ (that is FLAG[2:0] =3b101 and DIMMING [4:0] =5b00000), the IC will enter sleep mode, its current is about 1uA.

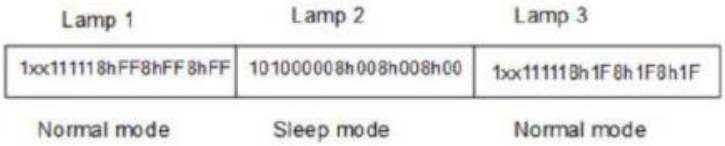
The IC will wake up from sleep mode once receiving the new data with the data of Flag[2:0]，DIMMING [4:0] is not 8h"A0"; after wake-up, all sleeping circuits in IC return to normal working mode within1ms. Since it takes 1ms for a sleeping IC returning to normal function mode, it is recommended for a host to wait for 1ms to send display data and command after issuing a wake-up command



Case 1:



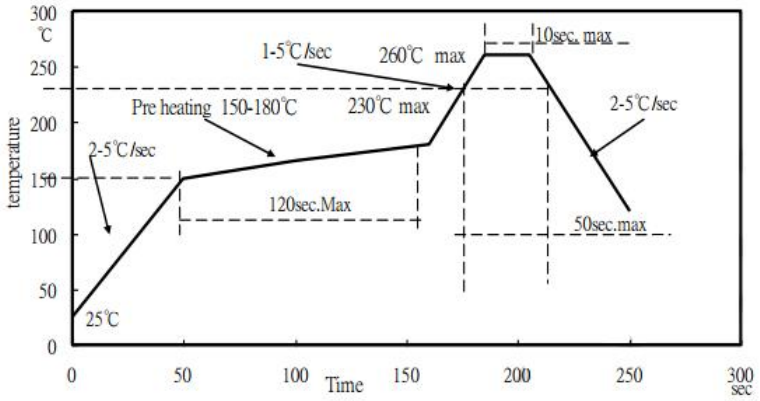
Case 2:



In case 2, while lamp2 is under sleep mode, in the following data transfer process, the state of lamp 2 will be not changed as long as the 32 bits data for lamp 2 is received with data of Flag[2:0]、DIMMING[4:0] being 8h” A0” . It means lamp2 will keep in sleep mode as well. In the situation, lamp2 can pass through the remaining data to lamp 3 (32bits) to change the display data of lamp 3. In other words, the sleeping chip is able to pass the data to the next chips.

Reflow Profile

1. IR reflow soldering Profile for Lead Free solder



Notes:

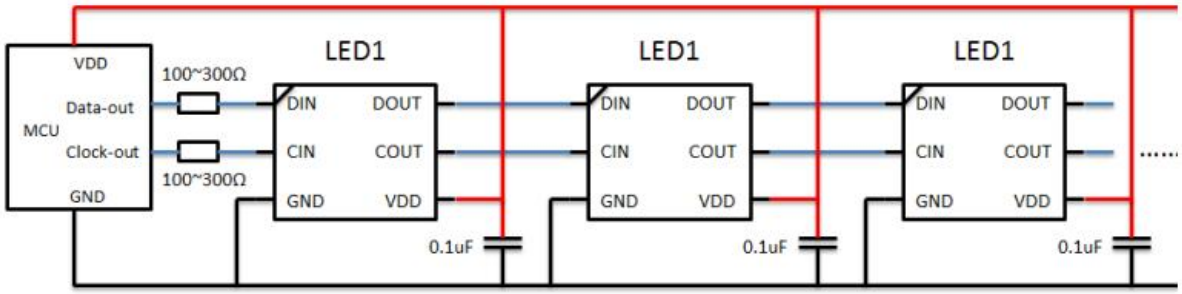
1. We recommend the reflow temperature at 240℃ (±5℃), and the maximum soldering temperature should be limited to 260℃.

2. Don’ t cause stress to the silicone resin while it is exposed to high temperature.

3. Number of reflow process shall not be more than 1 time.

Test Circuit and Precautions for Use

1. Typical application circuit



Notes:

When the first LED is connected to the MCU, a resistance R is needed in series between its signal input line and the MCU. The size of R depends on the number of cascade beads. The more cascades, the smaller resistance R is used. It is generally recommended that the value be between 100-1K. Usually the recommended value is around 300 R. In order to make the LEDs work more stably, a parallel capacitor is needed between VDD and GND of each.

2. Precautions for Use

2.1. Over-current-proof

Customer must apply resistors for protection; otherwise slight voltage shift will cause big current change (Burn-out will happen).

2.2. Storage

1). To store the products is recommended with following conditions:

Humidity: 60% R.H. Max.

Temperature: 5℃ ~30℃

2). Shelf life in sealed bag: 12 months at ＜ 5℃ ~30℃ and ＜ 60% R.H. after the package is opened, the products should be used within 24 hours or they should be stored at ≦ 20%R.H. with zip-lock sealed bag.

2.3. Baking

The products are not used up within 24 hours, and please bake them before using:

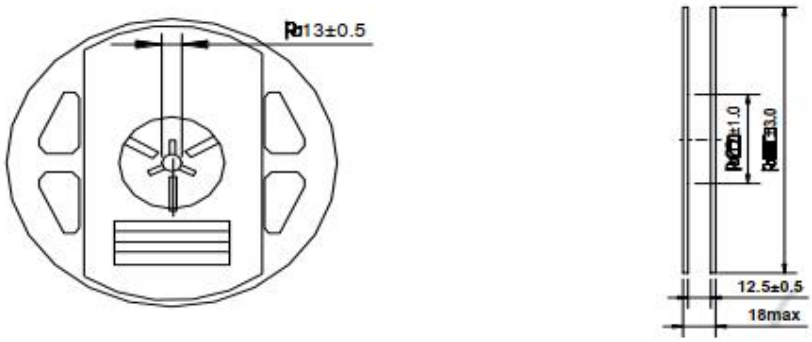
1). 60±3℃ X 6hrs and ＜ 5% RH, for reel

2). 125±3℃ X 2hrs, for single LED

It is normal to see slight color fading of carrier (light yellow) after baking in process.

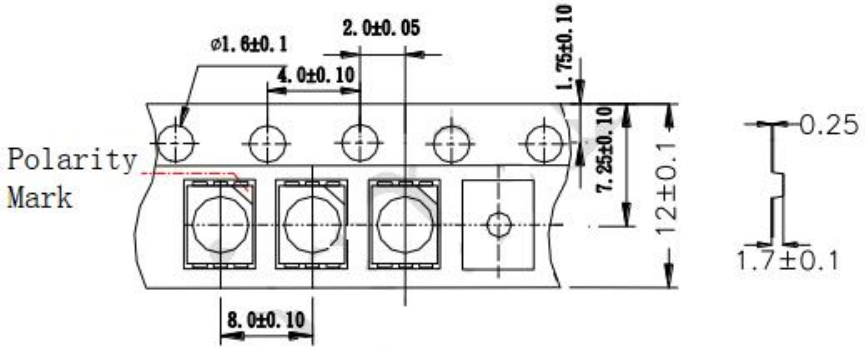
Packing

Dimensions of Reel (Unit: mm)

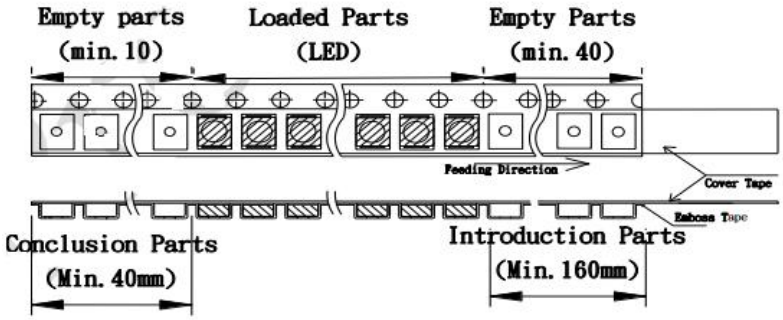


Note: 01.The tolerance unless mentioned is ±0.2mm. 02. the measured unit is "mm".

Dimensions of Tape (Unit: mm)



Arrangement of Tape



Notes:

1. Empty component pockets sealed with top cover tape.
2. The max number of consecutive missing SMD is 2pcs.
3. The cathode is put towards the tape sprocket hole in accordance with ANSI/EIA RS-481 specifications.
4. 1,300 pcs per reel
5. The remainders will be packed in a multiplication of 500pcs.

Precautions

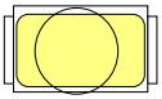
1. Abnormal situation caused by improper setting of collect

To choose the right collect is the key issue in improving the product’ s quality. LED is different from other electronic components, which is not only about electrical output but also for optical output. This characteristic made LED more fragile in the process of SMT. If the collect’ s lowering down height is not well set, it will bring damage to the gold wire at the time of collect’ s picking up and loading which will cause the LED fail to light up, light up now and then or other quality problems

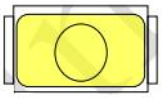
2. How to choose the collect

During SMT, please choose the collect that has larger outer diameter than the lighting area of lens, in case that improper position of collect will damage the gold wire inside the LED. Different collets fit for different products, please refer to the following pictures cross out

Outer diameter of collect should be larger than the lighting area



Picture 1(√)



Picture 2(X)

3. Other points for attention

A. No pressure should be exerted to the epoxy shell of the SMD under high temperature.

B. Do not scratch or wipe the lens since the lens and gold wire inside are rather fragile and cross out easy to break.

C. LED should be used as soon as possible when being taken out of the original package, and should be stored in anti-moisture and anti-ESD package.

4. This usage and handling instruction is only for your reference.