



SMD Multicolor LED (Visible LED) - NO: 8541401000SLA21
SPECIFICATION FOR APPROVALFOR APPROVAL

SA3528RGB4 & Multicolor LEDs



Guangdong Queendom Group Technology Co., Ltd.

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523800

Features:

PLCC 3528 package.

Emission color: **Multicolor LEDs** type.

Lens appearance: Water Clear

Inter reflector

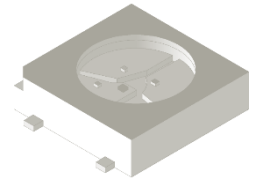
Applicable to all SMT assembly methods.

Compatible with infrared and vapor phase reflow soldering processes.

Compatible with automatic placement equipment.

Available on tape and reel (8mm Tape).

The product itself will remain within RoHS compliant



Descriptions:

The S3528 series is Due to the package design, LED has wide viewing angle and optimized light coupling by inter reflector.

This feature makes the SMTTOP LED ideal for light pipe application. The low current requirement makes this device ideal for portable equipment or any other application where power

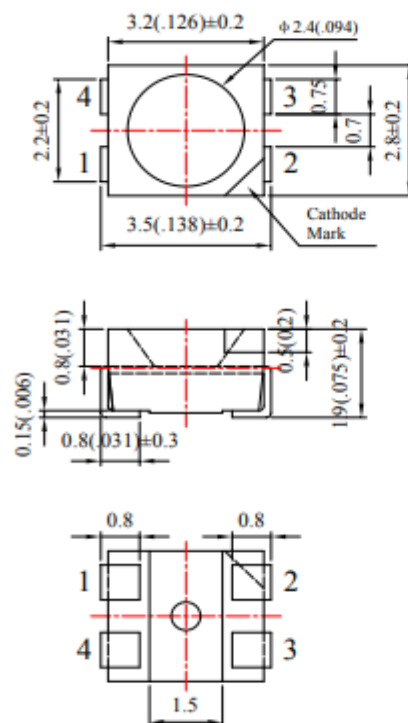
Applications:

Automobile: dashboard, brake lights, turn signals.

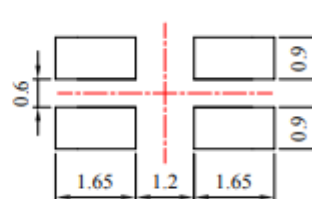
Status indicator: consumer electronics and industrial electronics

Package SIZE:

Picture 1



Recommended Soldering Pad Dimensions

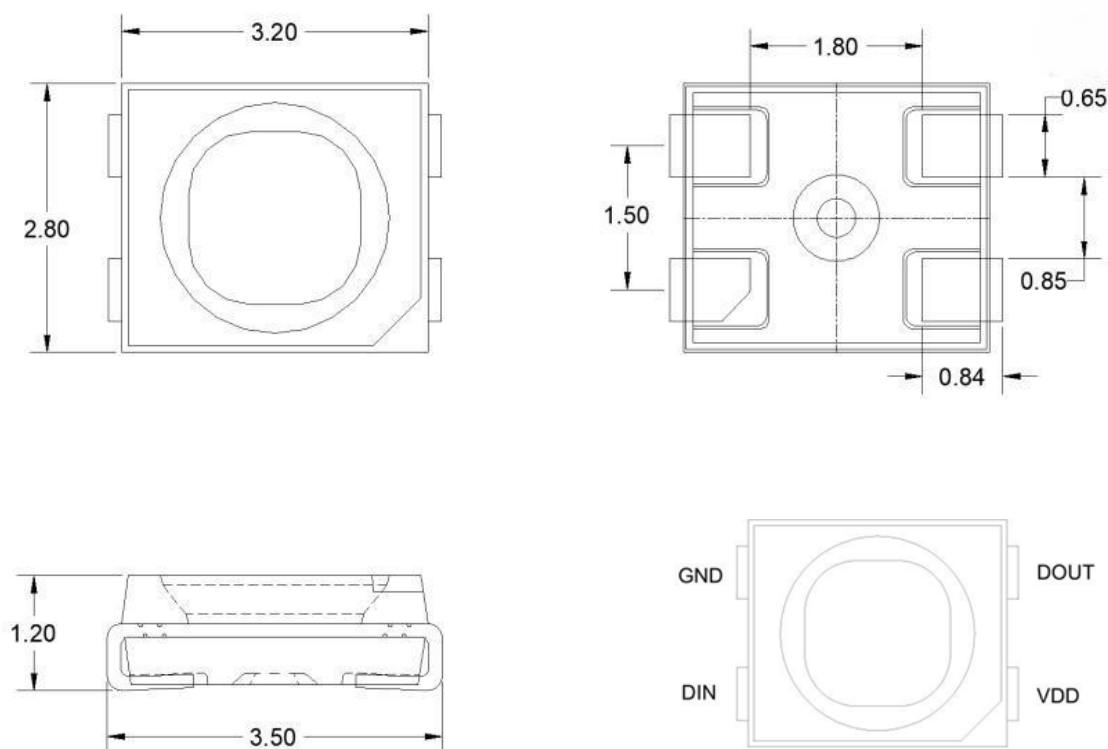


Notes:

1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25 mm (.010") unless otherwise noted.
3. Protruded resin under flange is 1.00mm (.039") max.

Process line

Picture 2



PIN polarity description

Table 1. Product performance of QUEENDOM RGB at Tj=25°C.

NO.	Pin identification	Explain the definition
1	VDD	芯片供电极&信号地及电源地
2	DO	显示数据级联输出
3	DI	显示数据输入
4	GND	接地

Table 2

Table 2. Product performance of QUEENDOM RGB at Tj=25°C.

参数 Parameter	符号 Symbol	范围 Range	单位 Units
逻辑电源电压 Logic supply voltage	Vdd	5.5	V
输出端口耐压 output port voltage withstand	Vout	24	V
逻辑输入电压 Logic input voltage	Vi	- 0.5 ~ Vdd + 0.5	V
工作温度 Operating Temperature Range	Topt	- 40 ~ + 85	°C
储存温度 Operating Temperature Range	Tstg	- 55 ~ + 150	°C
湿气敏感等级 Moisture sensitive level	MSL	5 a	-

Switching Characteristics

Table 3 Ta= - 4 0 ~ + 8 5 °C, Vss= 0 V, Vdd= 4.5 ~ 5.5 V) /Switching characteristics

参数 Parameter	符号 Symbol	最小 Min.	典型 Typ.	最大 Max.	单位 Units	测试条件 Conditions
振荡频率 Oscillation frequency	FOSC1	-	500	-	KHz	Vdd =5V
	FOSC2	-	10	-	MHz	Vdd =5V
传输延迟时间 Transmission Delay Time	Tflz	-	-	300	ns	CI= 15 pF, DIN → DOUT, RI = 10 kΩ
下降时间 Descent time	Tthz	-	-	120	μs	CI = 300 pF, OUTR / OUTG / OUTB
数据传输率 Data transfer rate	Fd	800	-	-	Kbps	占空比50 % 50% duty cycle
输入电容 Input capacitance	CI	-	-	15	pF	-

Electrical parameters

Table 4. Product performance of QUEENDOM RGB at Tj= Ta= - 4 0 ~ + 8 5 °C°C.

参数 Parameter	符号 Symbol	最小 Min.	典型 Typ.	最大 Max.	单位 Units	测试条件 Conditions
低电平输出电流 Low level output current	Iout	-	12	-	mA	R, G, B
低电平输出电流 Low level output current	Ido	10	-	-	mA	Vo = 0.4 V, Dout
输入电流/Input Current	Ii	-	-	±1	μA	
输出管脚电流/Output Pin current	Isink		12		mA	
高电平输入电压/High level input voltage	Vih	0.7 Vdd	-		V	DIN, SET
低电平输入电压/Low level input voltage	Vil	-	-	0.3 Vdd	V	DIN, SET
滞后电压/Lag Voltage	Vh	-	0.35	-	V	DIN, SET
电流偏移量（通道间） Current offset (between channels)	dIout		±1.5	±3.0	%	Vds=1V, Iout=12mA
电流偏移量（芯片间） Current offset (between chips)	dIout		±3.0	±5.0	%	Vds=1V, Iout=12mA
电流偏移量 VS-Vds/Current offset VS-Vds	%dVds		±0.1	±0.5	%/V	1V<Vds<3V
电流偏移量 VS-Vdd/Current offset VS-Vdd	%dVds		±1.0	±2.0	%/V	4.5V<Vdd<5.5V
动态电流损耗/Dynamic current loss	IDDdyn	无负载 No load			1	mA
消耗功率/Consumed power	PD	Ta=25°C			250	mW
热阻值/Thermal resistance	Rth(j-a)		80		190	°C/W

Performance Characteristics

Product Selection Guide

Table 5. Product performance of QUEENDOM RGB at 20mA, Tj=25°C.

PRODUCT	RANK NO.	DOMINANT WAVELENGTH ^[1] (nm)		INTENSITY ^[2] (mcd)		FORWARD VOLTAGE	
		[1] (nm)		[2] (mcd)		[3] (V/F)	
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
SA3528RGB4	Red	619	625	300	780	1.8	2.4
	Green	520	525	1060	3360	2.8	3.2
	Blue	460	470	120	780	2.8	3.2

Notes for Table 1:

- Queendom leds maintains a tolerance of $\pm 1\text{nm}$ on dominant wavelength measurements.
- Queendom leds maintains a tolerance of $\pm 10\%$ on luminous intensity measurements.

Optical Characteristics

Table 6. Optical characteristics for QUEENDOM RGB at 20mA, Tj=25°C.

PRODUCT	COLOR	TYPICAL SPECTRAL HALF-WIDTH ^[1] (nm)	TYPICAL TEMPERATURE COEFFICIENT OF DOMINANT WAVELENGTH (nm/°C)	TYPICAL VIEWING ANGLE ^[2]	PART NUMBER
SA3528RGB4	Red	6	0.04	120°	8541401000SLA21
	Green	5	0.04	120°	
	Blue	5	0.04	120°	

Notes for Table 2:

- Spectral half-width is the spectral bandwidth at 50% of the peak intensity.
- Viewing angle is the off axis angle from the LED centerline where the luminous intensity is $\frac{1}{2}$ of the peak value.

Electrical and Thermal Characteristics

Table 7. Electrical and thermal characteristics for QUEENDOM RGB at 20mA, Tj=25°C.

COLOR	PART NUMBER	FORWARD VOLTAGE ^[1] (V _f)			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE ^[2] (mV/°C)	TYPICAL THERMAL RESISTANCE—JUNCTION TO SOLDER PAD (°C/W)
		MINIMUM	TYPICAL	MAXIMUM		
Red	SA3528RGB4	1.80	2.10	2.40	-1.6	75
Green		2.80	3.00	3.20	-2.4	120
Blue		2.80	3.00	3.20	-2.6	85

Absolute Maximum Ratings

Table 4. Absolute maximum ratings for QUEENDOM RGB.

PARAMETER	RED	GREEN AND BLUE
DC Forward Current ^[1, 2]	25mA	25mA
Peak Pulsed Forward Current ^[1, 3]	100mA	100mA
LED Junction Temperature ^[1] (DC & Pulse)	115°C	115°C
ESD Sensitivity (ANSI/ESDA/JEDEC JS-001-2012)	Class 2	
LED Storage Temperature	-40°C to 80°C	
Soldering Temperature	JEDEC 020c 250°C	
Allowable Reflow Cycles	3	
Reverse Voltage (V _{reverse})	QUEENDOM RGB LEDs are not designed to be driven in reverse bias	

Notes for Table 4:

- Proper current derating must be observed to maintain the junction temperature below the maximum allowable junction temperature.
- Single-color light.
- At 0.01ms pulse on time test with a pulse period of 0.1ms.

Characteristic Curves

Spectral Power Distribution Characteristics

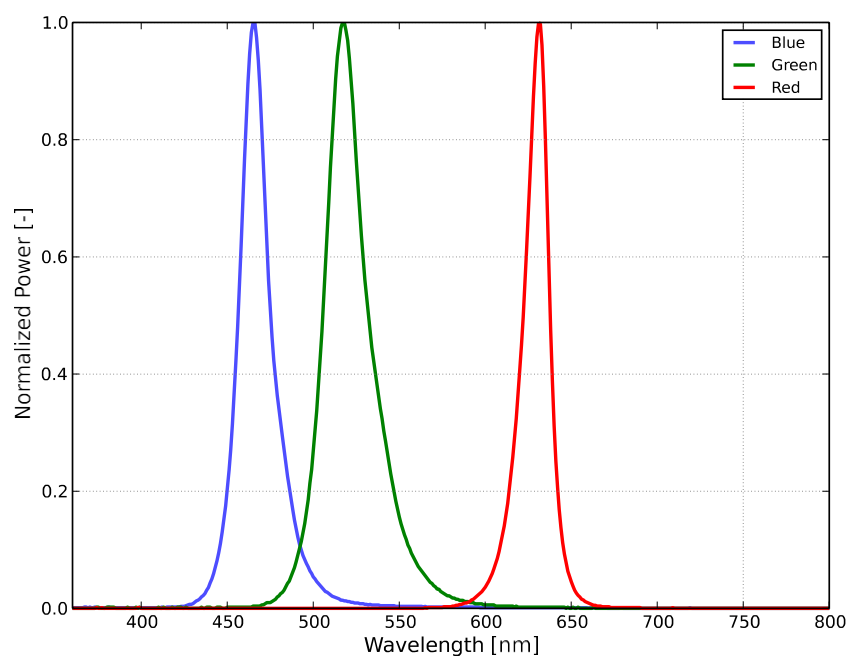


Figure 1. Typical normalized power vs. wavelength for Queendom 5050 RGB at 20mA, $T_j=25^{\circ}\text{C}$.

Light Output Characteristics

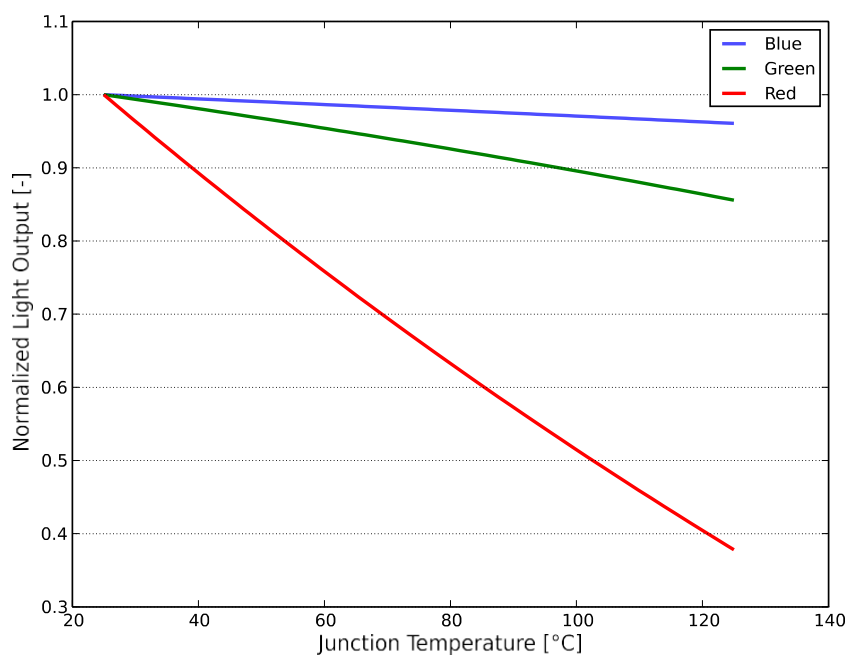
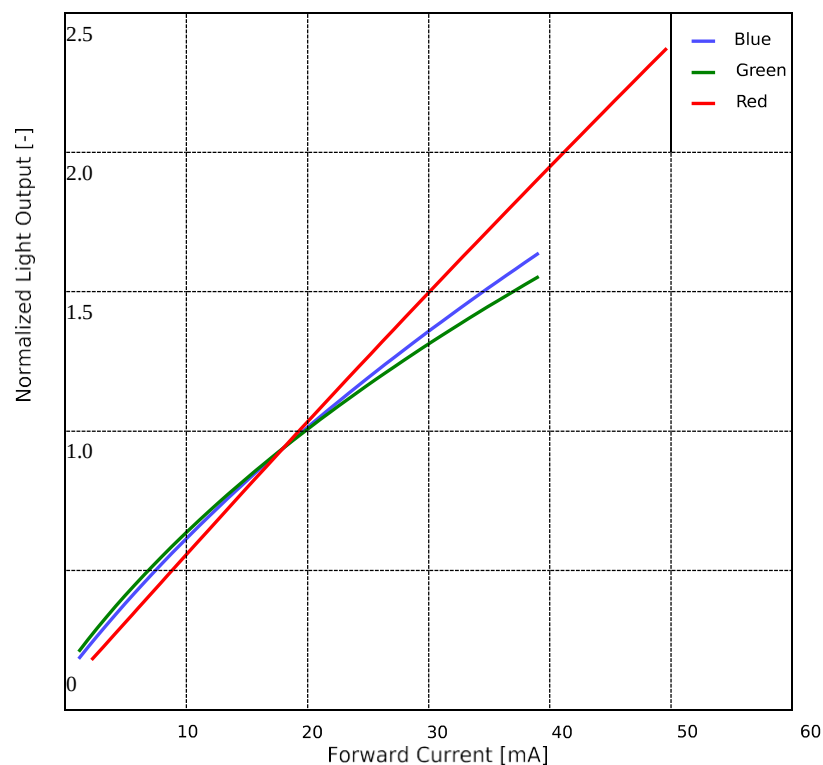


Figure 2. Typical normalized light output vs. junction temperature for Queendom 5050 RGB at 20mA.

Light Output Characteristics

Figure 3. Typical normalized light output vs. forward current for Queendom 5050 RGB at $T_j=25^{\circ}\text{C}$.



Forward Current Characteristics

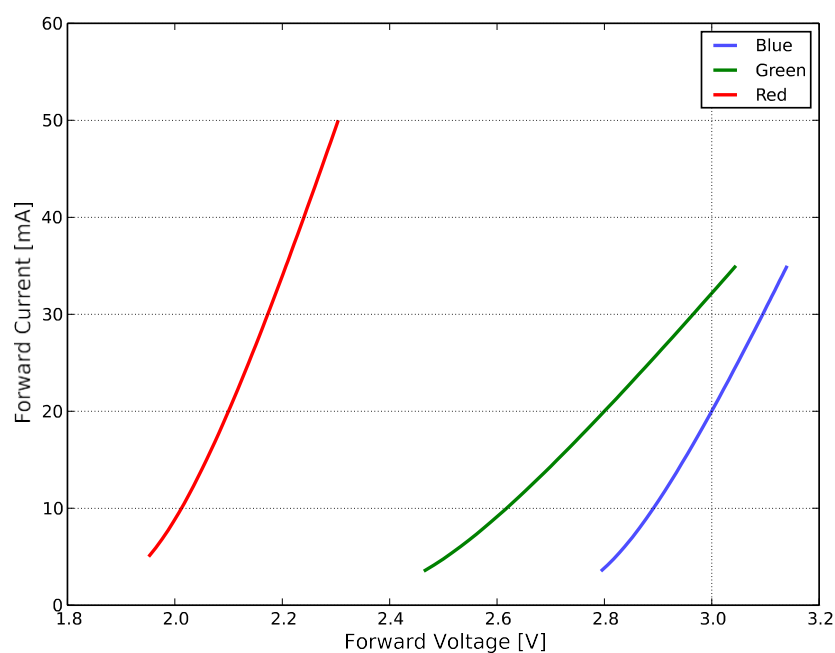


Figure 4. Typical forward current vs. forward voltage for Queendom 5050 RGB at $T_j=25^{\circ}\text{C}$.

Radiation Pattern Characteristics

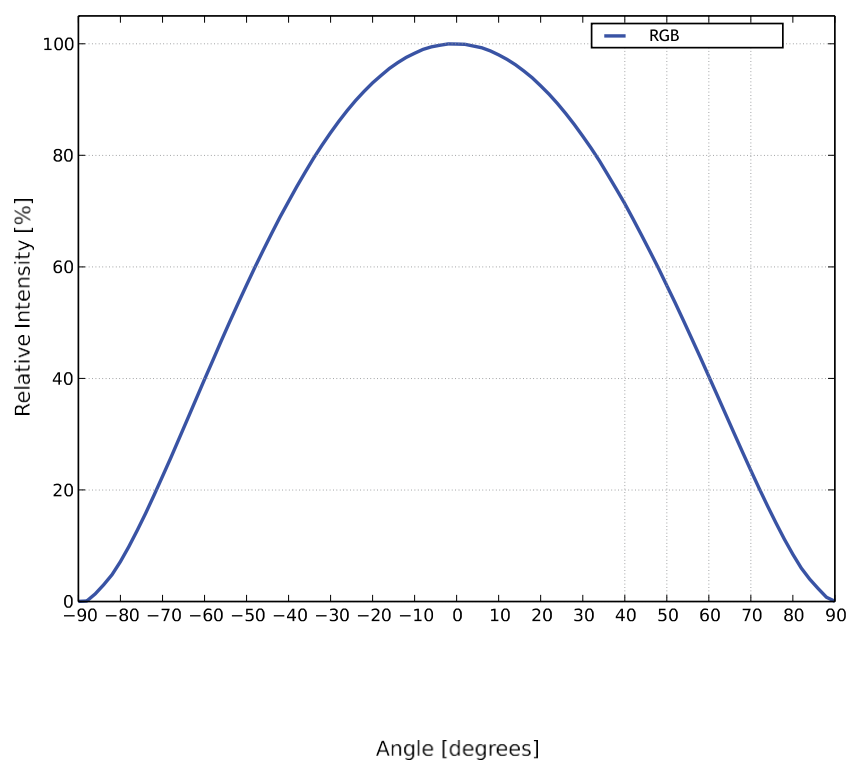


Figure 5. Typical radiation pattern for Queendom RGB at 20mA, $T_j=25^{\circ}\text{C}$.

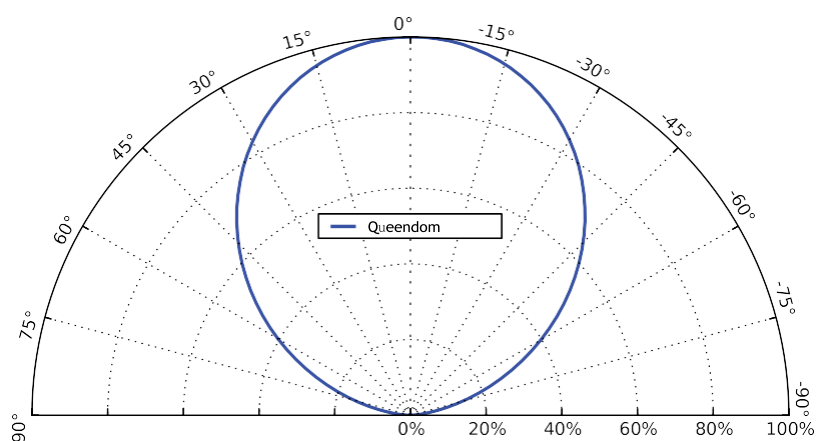


Figure 6. Typical polar radiation pattern for Queendom RGB at 20mA, $T_j=25^{\circ}\text{C}$.

TYPICAL APPLICATION

3528内封IC灯采用单线通讯方式，采用归零码的方式发送信号。芯片在上电复位以后，接收DIN端打来的数据，接收够24bit后，DO端口开始转发数据，供下一个芯片提供输入数据。

在转发之前，DO口一直拉低。此时灯珠将不接收新的数据，内置RGB芯片根据接收到的24bit数据后产生的不同占空比信号，展现不同亮度。

如果DIN端输入信号为RESET信号，芯片将接收到的数据送显示，芯片将在该信号结束后重新接收新的数据，在接收完开始的24bit数据后，通过DO口转发数据，灯珠在没有接收到RESET码前，RGB亮度保持不变，当接收到100us以上低电平RESET码后，灯珠内部RGB芯片将根据刚才接收到的24bit数据后产生的不同占空比信号，展现不同亮度。

The 3528 internally sealed IC lamp uses a single-line communication method and uses a return-to-zero code to send signals. After the chip is powered on and reset, it receives data from the DIN end. After receiving 24 bits, the DO port starts to forward data for the next chip to provide input data.

Before forwarding, the DO port is always pulled low. At this time, the lamp bead will not receive new data, and the built-in RGB chip will show different brightness according to the different duty cycle signals generated after receiving the 24-bit data.

If the input signal at the DIN end is a RESET signal, the chip will send the received data to the display, and the chip will receive new data again after the signal ends. After receiving the initial 24-bit data, the data is forwarded through the DO port. Before the lamp bead receives the RESET code, the RGB brightness remains unchanged. After receiving a low-level RESET code of more than 100us, the RGB chip inside the lamp bead will show different brightness according to the different duty cycle signals generated after the 24-bit data just received.

Figure 1 :Chip cascading method:

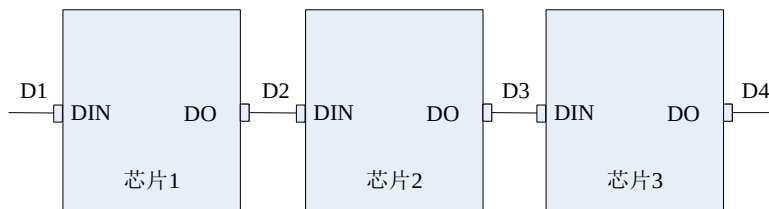
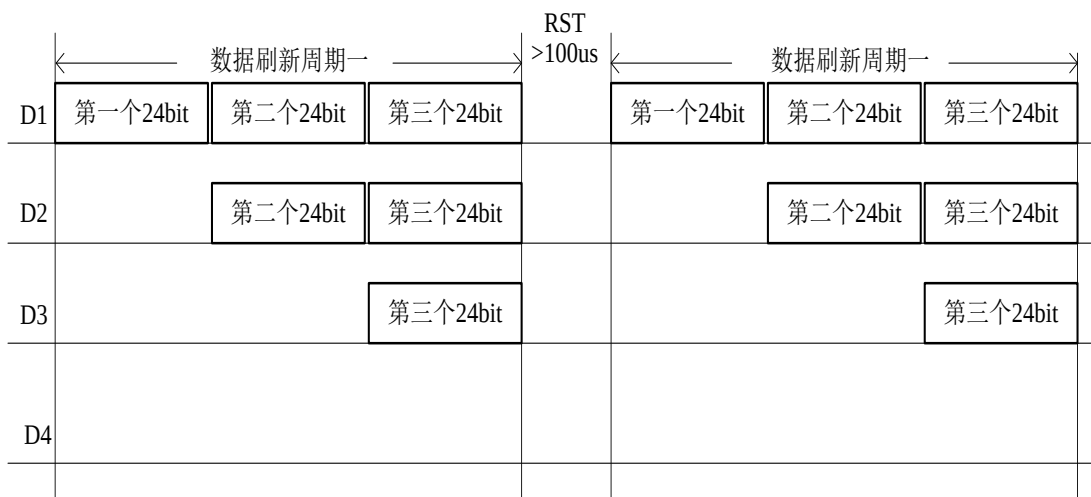


Figure 2 :



Note: Where D1 is the data sent by the MCU, D2, D3, and D4 are the data automatically transferred by the cascading circuit.

Figure 3 Reference design

24 bit data structure:

G	G	G	G	G	G	G	G	R	R	R	R	R	R	R	R	B	B	B	B	B	B	B	B
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Note: Higher-level starts, sending data in GRB order.

Figure 4 Sequential wave map:

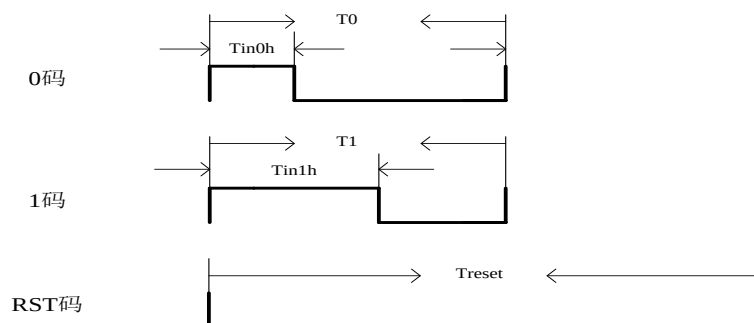


Figure 5.Signal Transmission Definition:

参数 Parameter	符号 Symbol	最小值 MIN.	典型值 Typ.	最大值 Max.	单位 Units
输入 0 码高电平时间 Enter a 0-yard high-level time	Tin0h	0.20	0.28	0.35	us
输入 1 码高电平时间 Enter 1 yard high level time	Tin1h	0.65	0.9	1.0	us
输入 0 码低电平时间 Enter the zero yard low level time	T0L	1.55	1.72	30	us
输入 1 码低电平时间 Enter 1 yard low level time	T1L	1.10	1.10	30	us
0 码/1 码周期 Zero-yard-per-yard period	T0/T1	1.75	-	35	us
RESET 码低电平时间 Reset Code Low level time	Treset	100	150	-	us

Figure 6.Recommended Controller Timing

名称 Name	描述 Description	典型值 Typ.	建议设定值 Recommended setting
T0H	0码, 高电平时间/Zero yards, high-level time	0.28us	0.28us
T1H	1码, 高电平时间/One Yard, high-level time	0.9us	0.9us
T0L	0码, 低电平时间/Zero yards, low-level time	>1.72μs	1.72μs
T1L	1码, 低电平时间/One Yard, low level time	>1.1us	1.1μs
T	"0"码或"1"码周期/Zero or one yard period	>2.0us	--
Treset	Reset码, 低电平时间/Reset Code, low-level time	>100us	150us

Figure 7. Constant-current curve

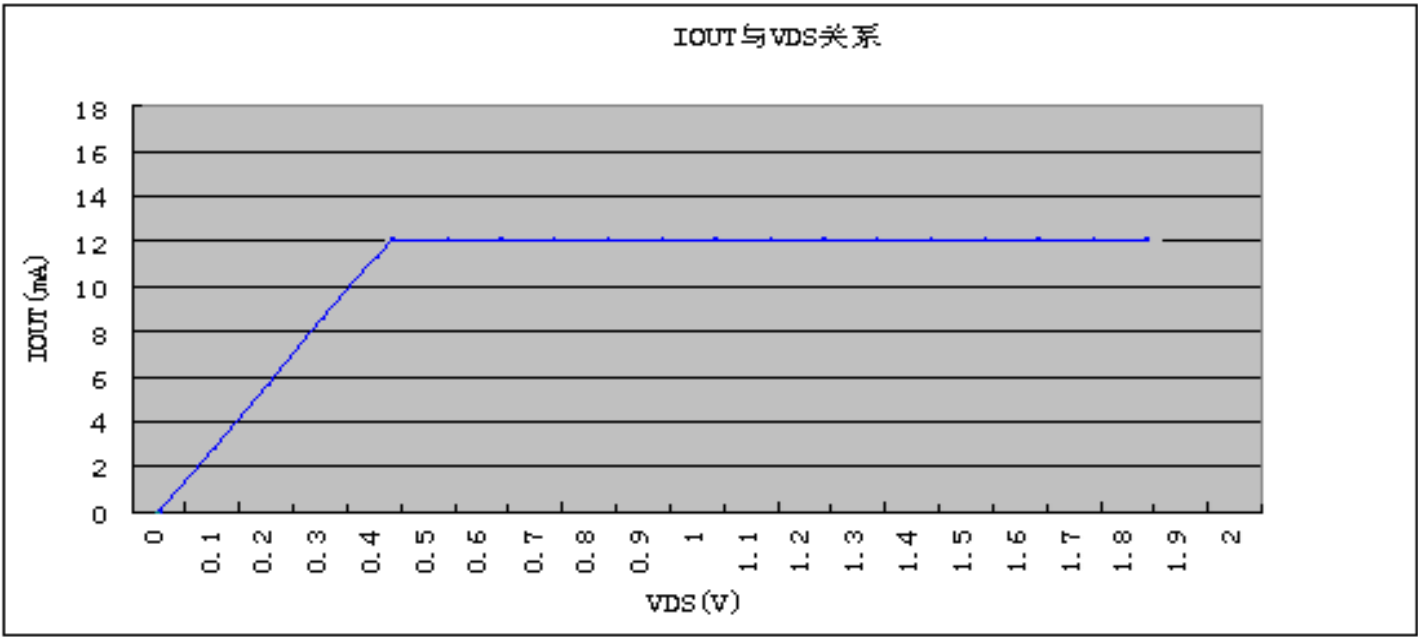
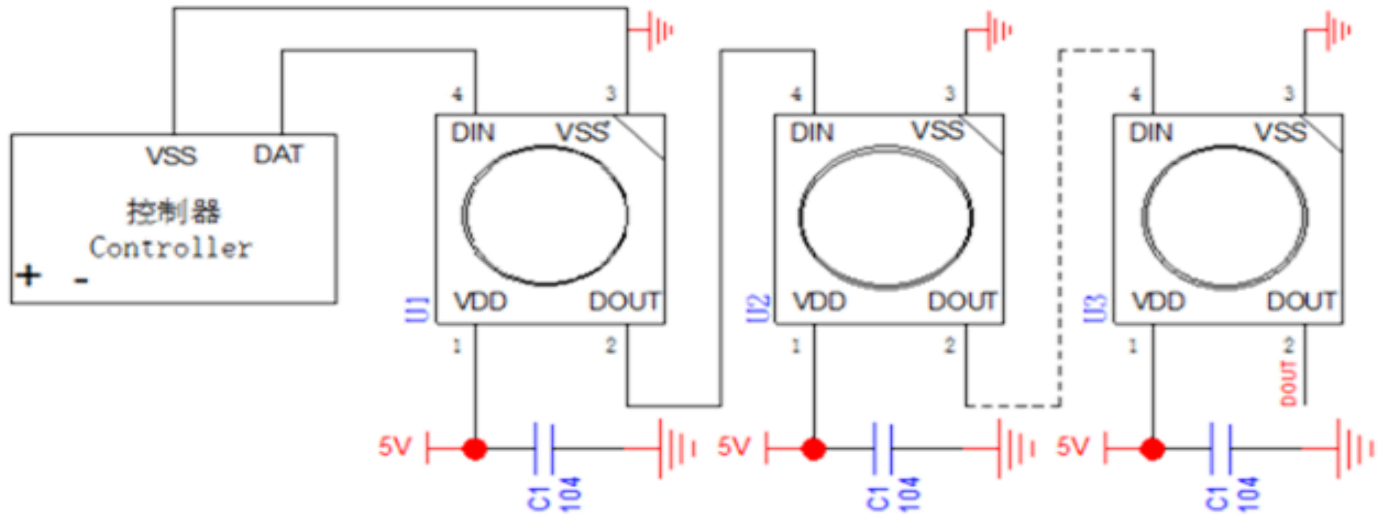


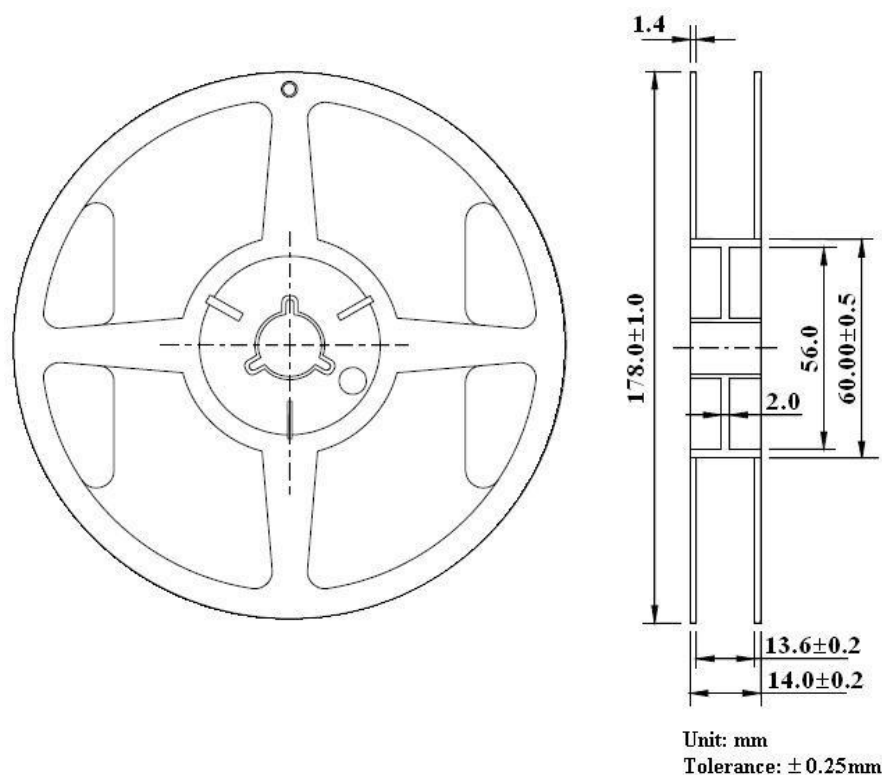
Figure 8 Application Route Diagram
Power supply voltage 5V(as shown)



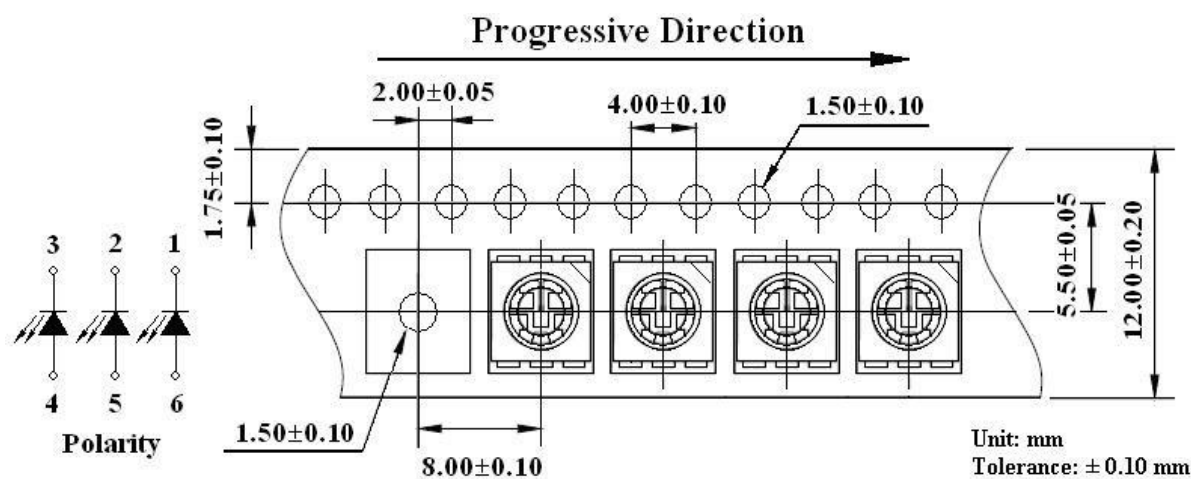
In the application of the product, there are big differences in the number of the cascade of the driving lights, the configuration of the controller parameters and the quality of the driving power, we are not committed to meeting all the application requirements of our customers.

Packaging Information

Reel Dimensions:

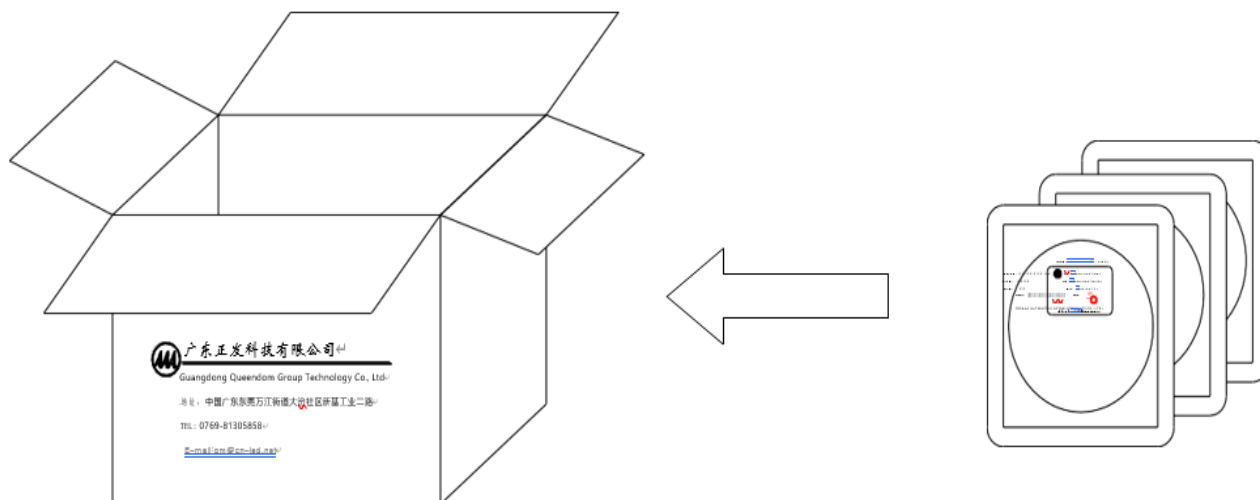


Carrier Tape Dimensions:



Loaded quantity 3000 pcs per reel.

Packaging cartons



Information

- With Stopper

CPN: P/N:XXXXXXXXXX 	VF:XX-XX
QTY:XXX 	IV:XX-XX
LOT NO:XXXXXXXXXX 	WLD:XX-XX
	BIN:XX-XX
	DATE:XX-XX-XX

Without Stopper

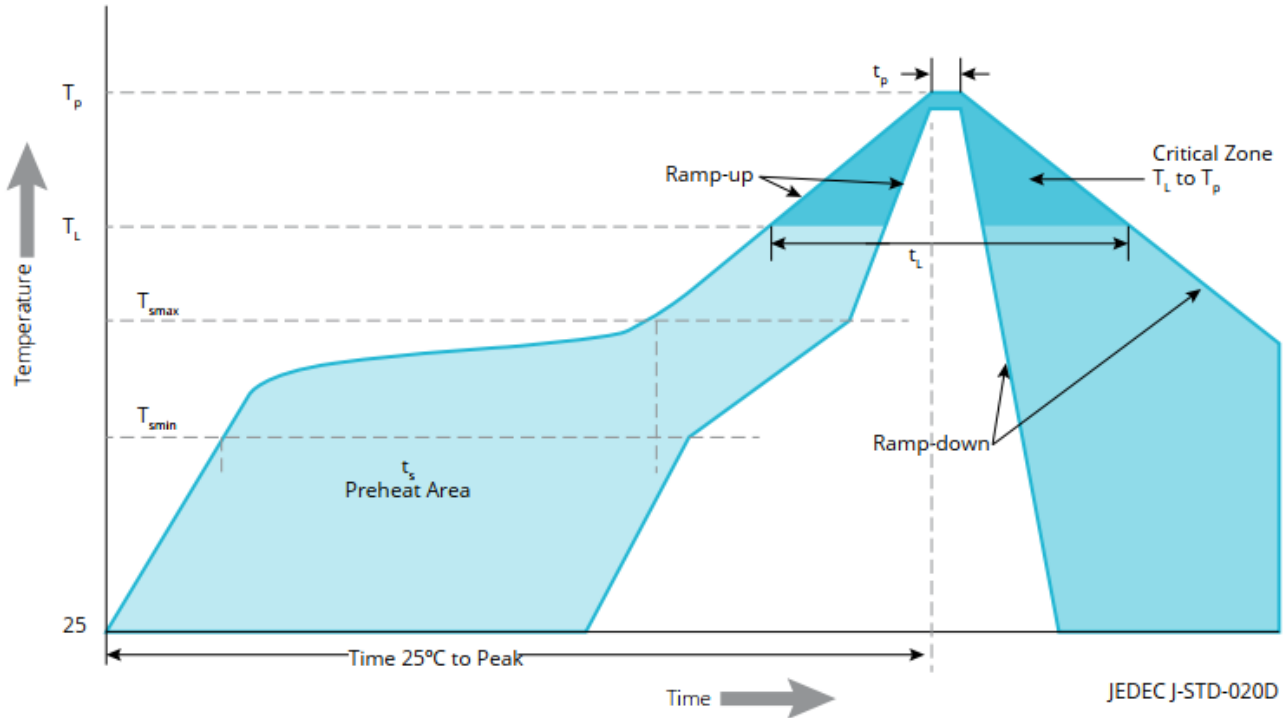
CPN:Customer's Product Number
P/N:Product Number
QTY:Packing Quantity
LOT NO:Lot Number
VF:Forward Voltage Rank
IV:Luminous Intensity Rank
WLD:Dom. Wavelength Rank
BIN:BIN Code
DATE:Date Of Dispatch

Packing Quantity

1. 3000 PCS/1 Bag,
- 2.10 Inner Cartons/1 Outside Carton

CAUTIONS

Reflow Soldering Guidelines



Visualization of the acceptable reflow temperature profile as specified

Reflow profile characteristics for Queendom smd.

PROFILE FEATURE	LEAD-FREE ASSEMBLY
Preheat Minimum Temperature (T_{smin})	150°C
Preheat Maximum Temperature (T_{smax})	200°C
Preheat Time (t_{smin} to t_{smax})	60 to 120 seconds
Ramp-Up Rate (T_L to T_p)	4°C / second maximum
Liquidous Temperature (T_L)	217°C
Time Maintained Above Temperature T_L (t_L)	60 to 150
seconds Peak / Classification Temperature (T_p)	250°C
Time Within 5°C of Actual Peak Temperature (t_p)	20 to 40 seconds
Ramp-Down Rate (T_p to T_L)	6°C / second maximum maximum
Time 25°C to Peak Temperature	8 minutes maximum

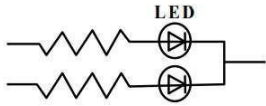
JEDEC Moisture Sensitivity

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS STANDARD	
	TIME	CONDITIONS	TIME	CONDITIONS
5a	24 hours	$\leq 30^\circ\text{C} / 60\% \text{ RH}$	48 Hours +2 / -0	$30^\circ\text{C} / 60\% \text{ RH}$

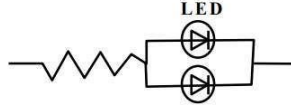
Drive Method

An LED is a current-operated device. In order to ensure intensity uniformity on multiple LEDs connected in parallel in an application, it is recommended that a current limiting resistor be incorporated in the drive circuit, in series with each LED as shown in Circuit A below.

Circuit model A



Circuit model B



Recommended circuit

The brightness of each LED might appear different due to the differences in the I-V characteristics of those LEDs.

Repairing

Repair should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.

ESD (Electrostatic Discharge)

Static Electricity or power surge will damage the LED. Suggestions to prevent ESD damage:

Use a conductive wrist band or anti- electrostatic glove when handling these LEDs.

All devices, equipment, and machinery must be properly grounded.

Work tables, storage racks, etc. should be properly grounded.

Use ion blower to neutralize the static charge which might have built up on surface of the LEDs plastic lens as a result of friction between LEDs during storage and handing.

Others

The information included in this document reflects representative usage scenarios and is intended for technical reference only.

The part number, type, and specifications mentioned in this document are subject to future change and improvement without notice. Before production usage customer should refer to the latest datasheet for the updated specifications.

When using the products referenced in this document, please make sure the product is being operated within the environmental and electrical limits specified in the datasheet. If customer usage exceeds the specified limits, Queendom will not be responsible for any subsequent issues.

The LEDs described here are intended to be used for ordinary electronic equipment (such as office equipment, communication equipment and household applications). Consult Queendom's Sales in advance for information on applications in which exceptional reliability is required, particularly when the failure or malfunction of the LEDs may directly jeopardize life or health, such as in aviation, transportation, traffic control equipment, medical and life support systems and safety devices.