Side View LED IC

ISD4516VGBC1MAK3

◆**Outline (L* W*H): 4.5*1.6*1.7mm**

◆**Good thermal dissipation & optical uniformity**

Table of Contents

Features

- RoHS Compliant
- Packaged in 12mm tape on 7" diameter reels
- EIA STD package
- Compatible with automatic placement equipment and infrared reflow solder process
- Preconditioning: accelerate to JEDEC level 3
- 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, 216combination colors.
- Supports sleep /wake-up mode. In sleep mode, the LED's current was lower than 5uA.

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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

■ Product Code Method

I - S - D - 4516- VGBC - 1 - M - A - K3

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①	②	③	④	⑤
Process Type	Category	LED Type	Lead Frame Size	Dice wavelength & luminous rank
I: With IC Series	S: SMD LED	C: PLCC top view D: PLCC side view	4516: 4.5*1.6mm	V:red G:green B:blue C:IC

⑥	⑦	⑧	⑨
Lap Polarity	Cap Color	PCB Module Code	Flow Code
1: common anode	M: white diffused	A article mode:	K: sleep mold IC 102 3: 20mA

■ Maximum Rating(Ta=25℃)

Parameter	Symbol	Rating	Unit
IC Power Supply Voltage	VDD	< 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}	Reflow Soldering 260 for 10 sec.	
		Hand Soldering 350 for 3 sec	
Operating Temperature Range	-40℃to+85℃		
Storage Temperature Range	-40℃to+105℃		

■ Typical Product Characteristics(Ta=25℃)

Characteristics	Symbol		Min.	Typ.	Max.	Unit	Test condition
Luminous Intensity	Iv	R		370		mcd	I_F=20mA
		G		1000			
		B		230			
		W		1450			
Dominant Wavelength	λd	R	615	-	630	nm	I_F=20mA
		G	520	-	530		
		B	460	-	475		
Color Coordinate	x		-	0.2225	-	-	I_F=20mA
	y		-	0.2585	-	-	
View Angle	$2\theta_{1/2}$		-	120	-	deg	I_F=20mA

■ Electrical Characteristics (Ta=25°C;VDD=5V)

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
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	I out= “OFF”	-	-	2	mA
Standby current	I sleep	Sleep mold			5	uA
Rate of data signal	F_{CLK}		1	-	15	MHZ
ESD pressure	V_{ESD}	HBM		6000		V

■ Range of Bins

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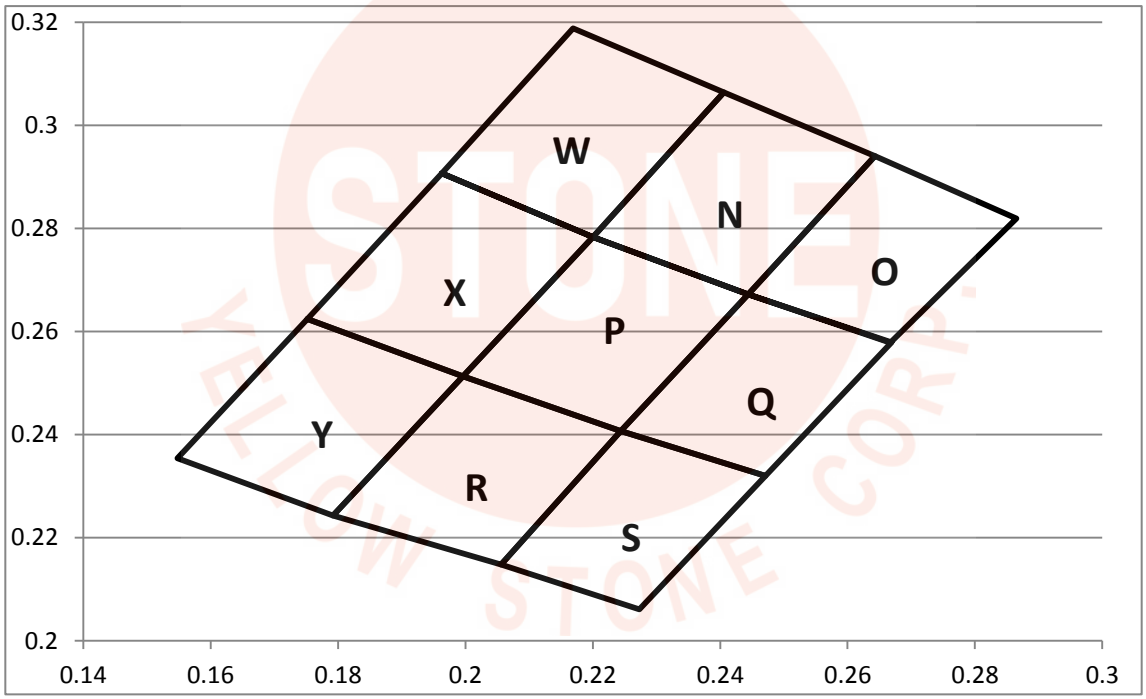
1) Luminous Intensity-White (I_F = 20mA ;VDD=5V)

Bin Code	Min. IV (mcd)	Max. IV (mcd)
14	780	1000
15	1000	1300
16	1300	1700
17	1700	2200

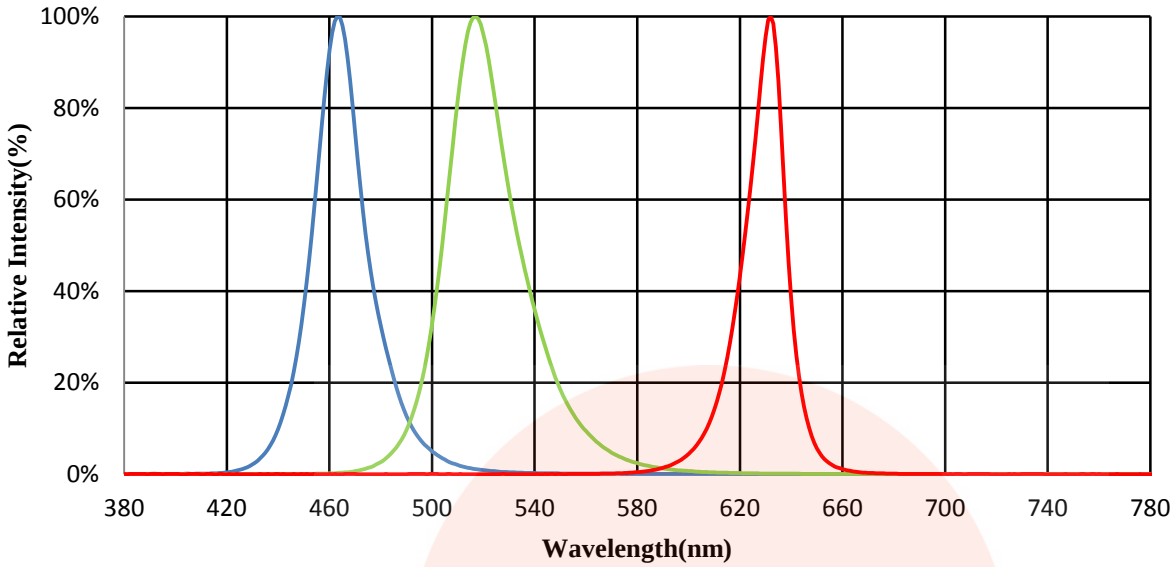
■ Color Coordinate Comparison-White



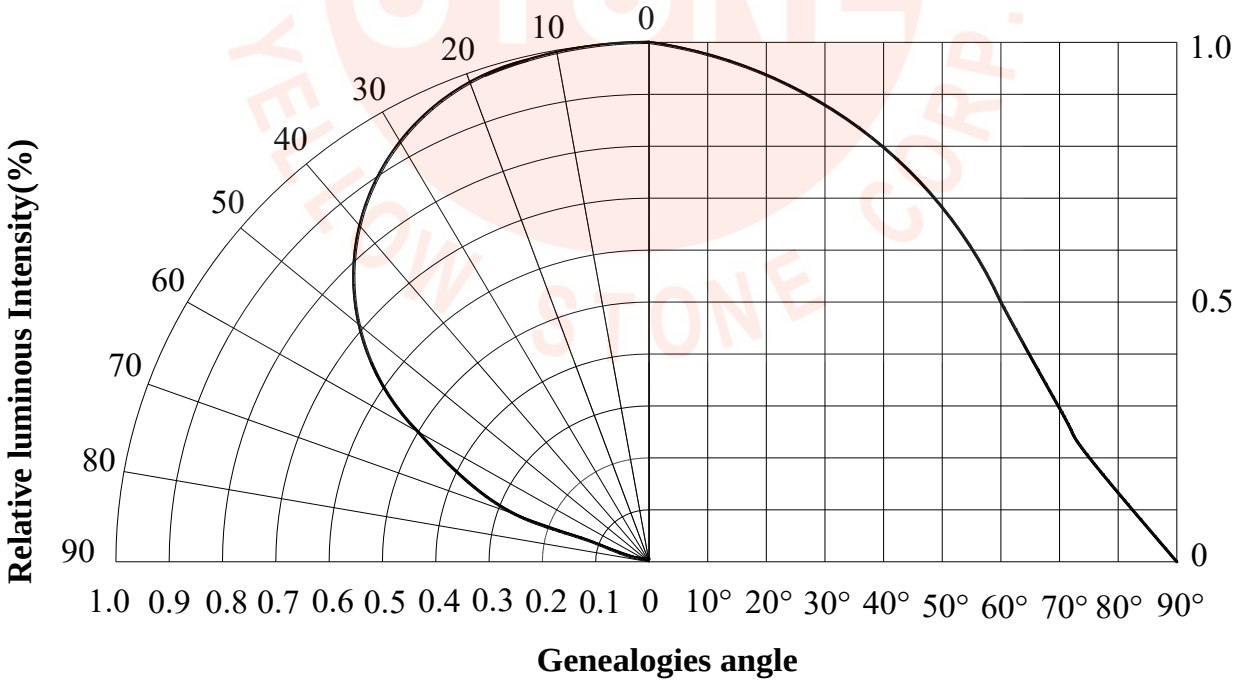
Color Rank

Bin	X	Y	X	Y	X	Y	X	Y
W	0.1963	0.2907	0.2169	0.3188	0.2406	0.3064	0.22	0.2783
X	0.1963	0.2907	0.1752	0.2624	0.1996	0.2513	0.22	0.2783
Y	0.1752	0.2624	0.1548	0.2354	0.1792	0.2243	0.1996	0.2513
N	0.22	0.2783	0.2406	0.3064	0.2643	0.294	0.2444	0.2672
P	0.22	0.2783	0.1996	0.2513	0.2244	0.2407	0.2444	0.2672
R	0.1996	0.2513	0.1792	0.2243	0.2056	0.2148	0.2244	0.2407
O	0.2444	0.2672	0.2643	0.294	0.2865	0.2819	0.2667	0.2578
Q	0.2444	0.2672	0.2244	0.2407	0.2471	0.232	0.2669	0.2579
S	0.2244	0.2407	0.2056	0.2148	0.2273	0.2061	0.2471	0.232

■ Relative Spectral Power Distribution

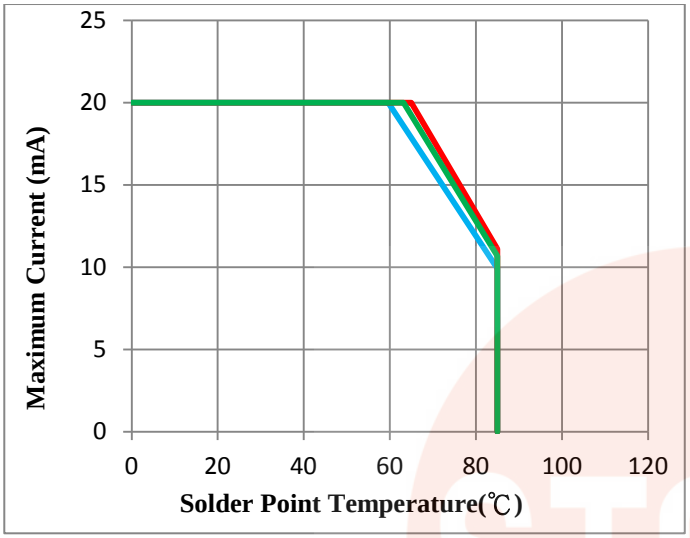


■ Typical Diagram Characteristics of Radiation



■ Thermal Design for De-rating

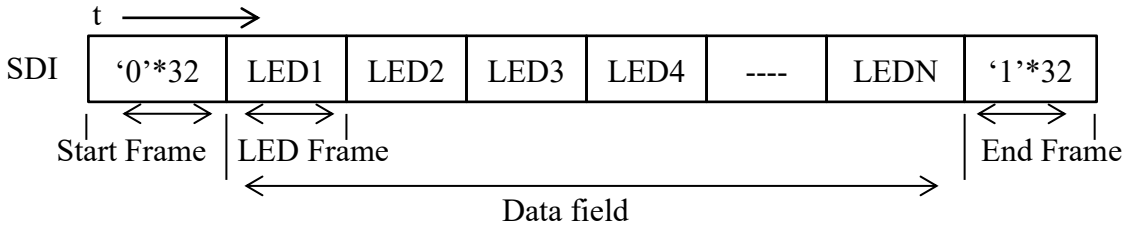
The maximum forward current is determined by the thermal resistance between the LED junction and solder point. It is crucial for the end product to be designed in a manner that minimizes the thermal resistance from the solder point to ambient in order to optimize lamp life and optical characteristics.one chip on board

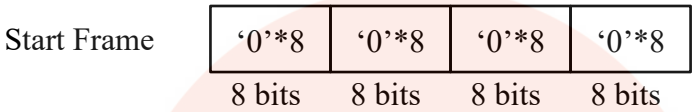


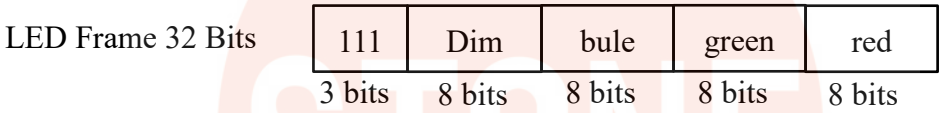
■ Function description

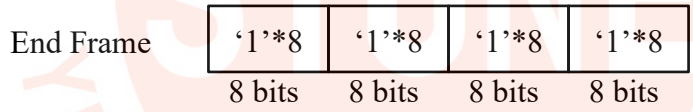
(1) Series data structure

Tandem N-LED





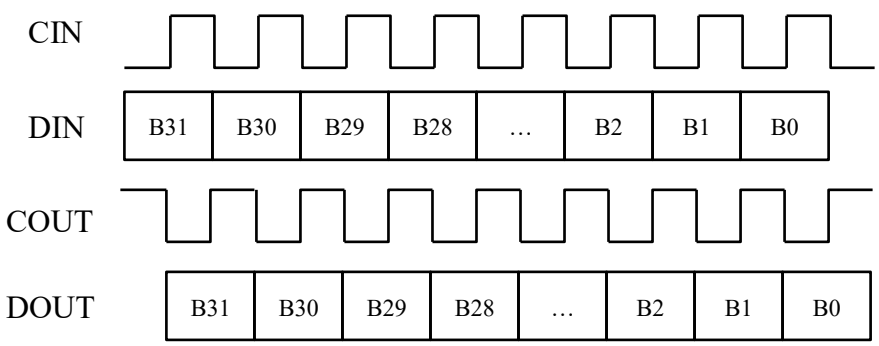




(2) Dim5-Bit (level 32) brightness adjustment (simultaneous control of OUTR\OUTG\OUTB three port current)

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, IC receives data at the rising edge of CLK

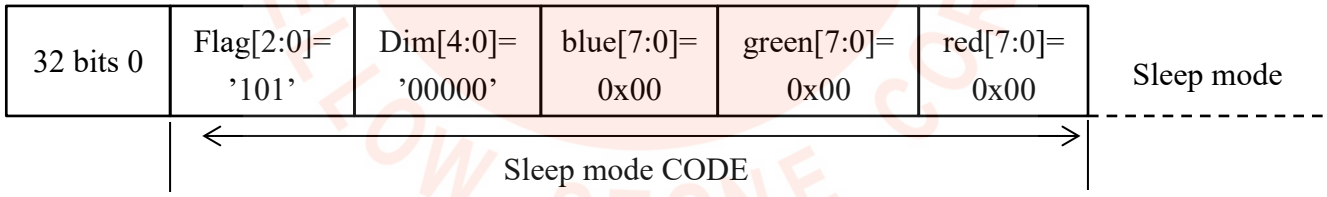


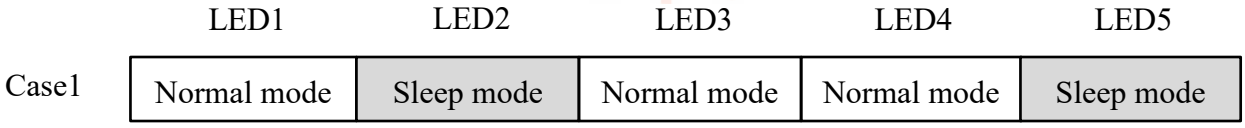
Data MSB--	Duty Cycle
00000000	0/255(min)
00000001	1/255
00000010	2/255
……	
11111101	253/255
11111110	254/255
11111111	255/255(max)

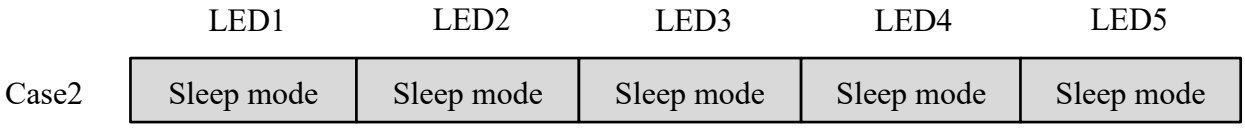
(1) Sleep and power saving mode

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

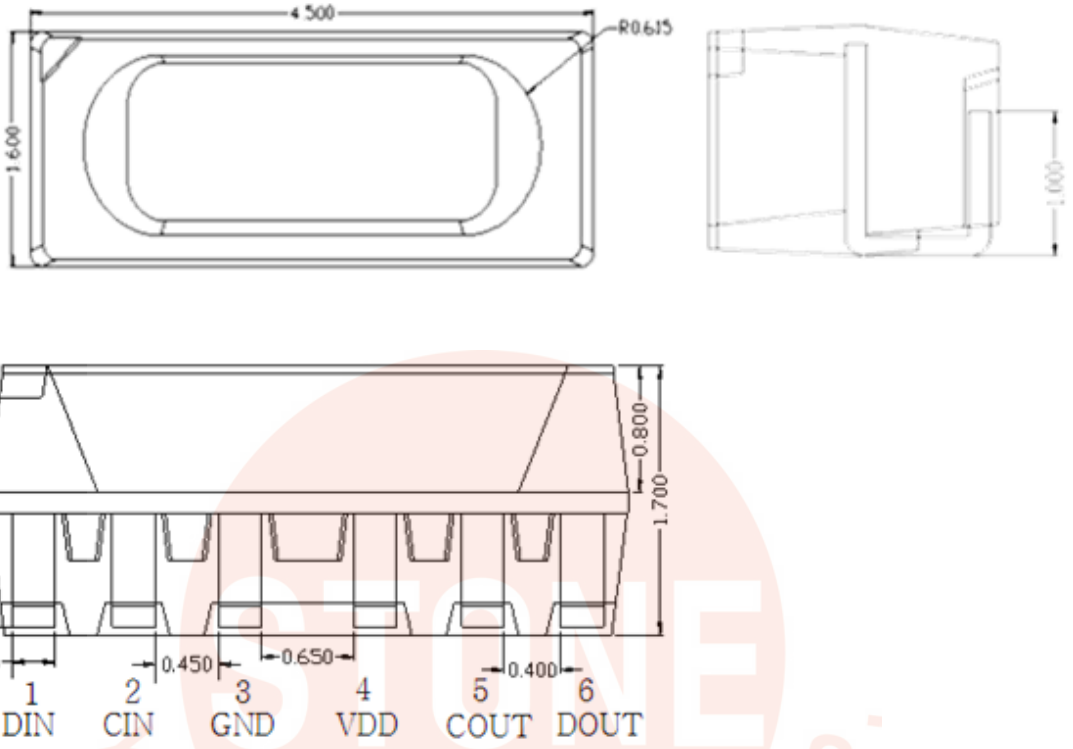




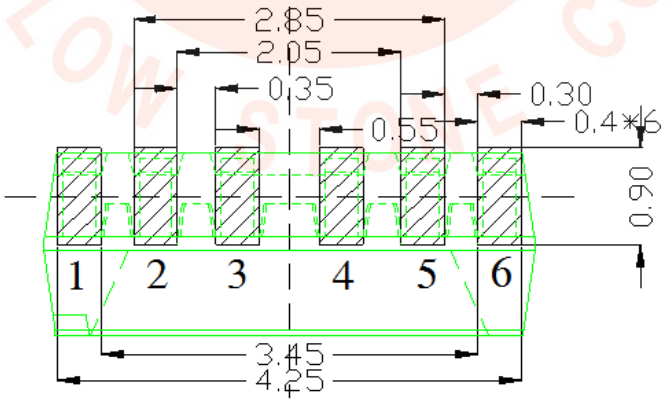


In case 1, while lamp2 is under sleep mode, in the following data transfer process, the state of lamp 2 will be not changed as long as the 32 bits data for lamp 2 is received with data of Flag[2:0]、DIMMING[4:0] being 8h"A0". It means lamp2 will keep in sleep mode as well. In the situation, lamp2 can 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.

■ Dimensions



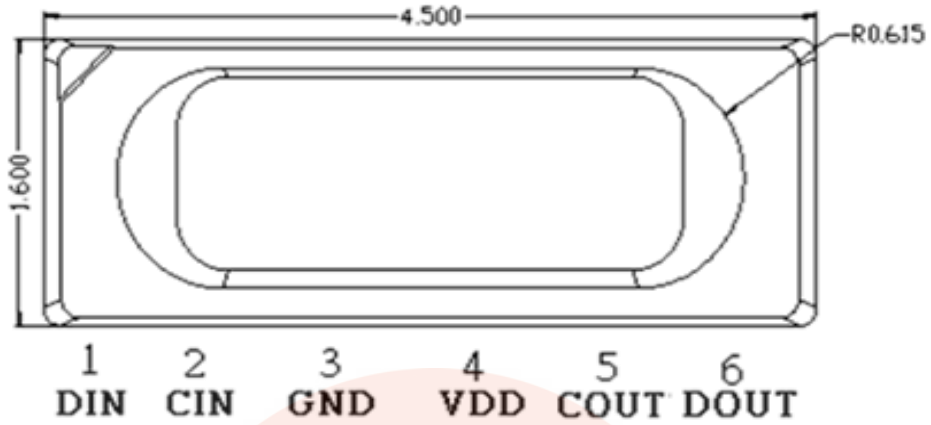
Recommended Pad Layout



SCALE 1:1

- § All dimensions are in millimeters.
- § Tolerance is ±0.1mm unless other specified
- § Specifications are subject to change without notice

■ PIN Configuration



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

■ Reflow Profile

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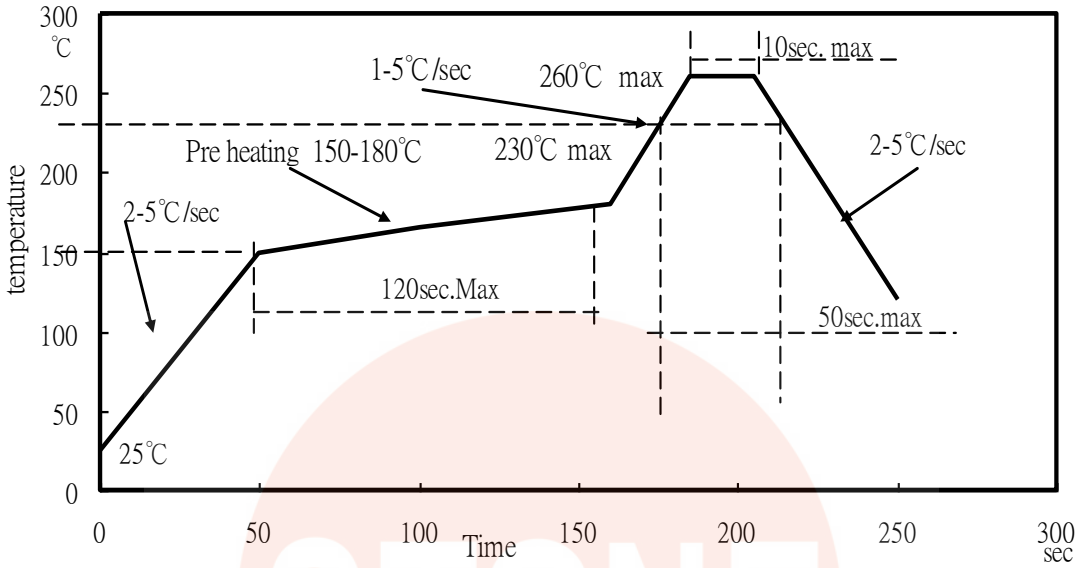
1. I_R reflow soldering Profile for Lead Free solder

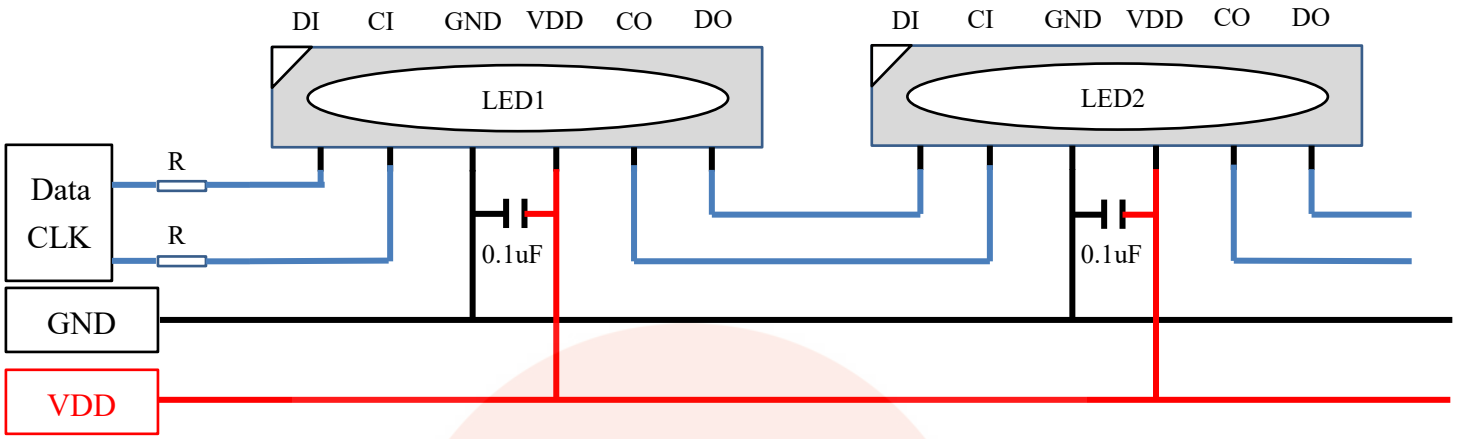


Notes:

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℃(41℉~86℉)

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

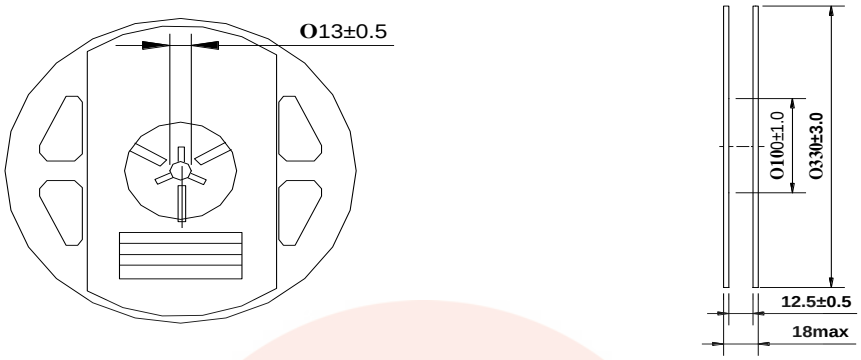
The products are not used up within 24 hours, and please bake them before using:

1). 60±3℃ X 6hrs and ＜5% RH, for reel

2). 125±3℃ X 2hrs, for single LED

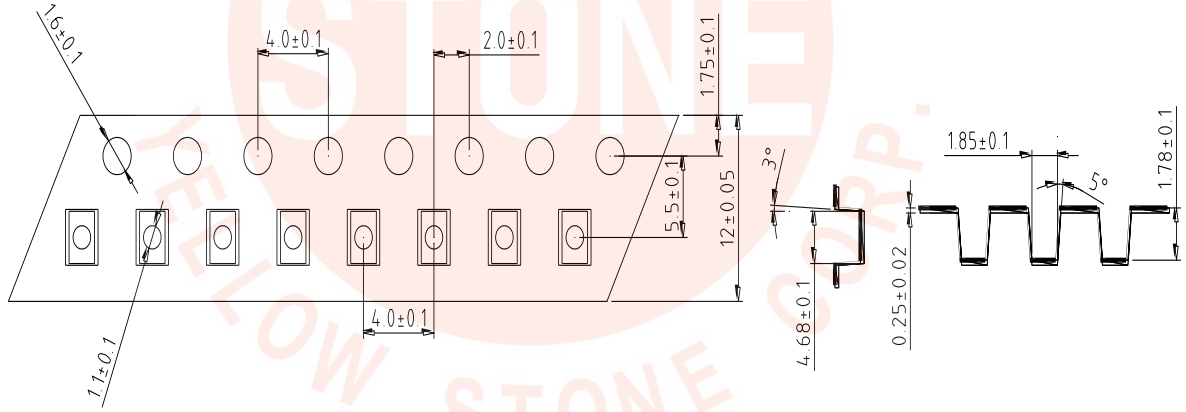
■ Packing

- **Dimensions of Reel (Unit: mm)**

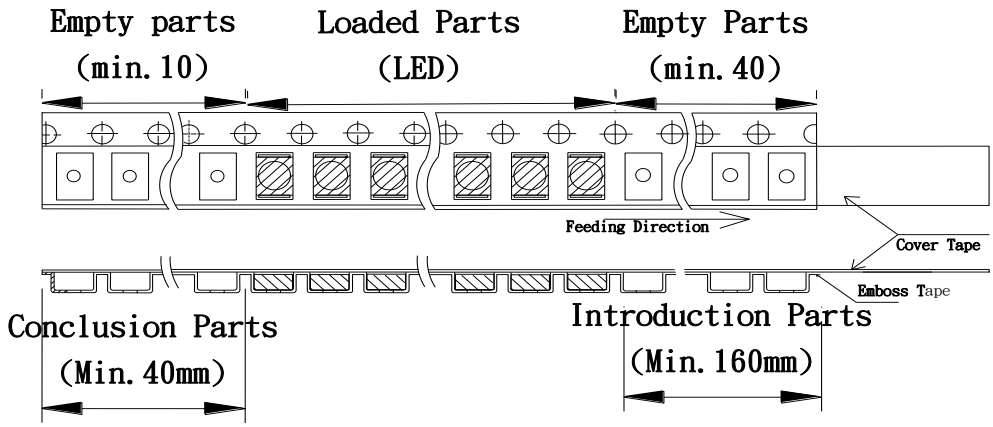


Note: 01.The tolerance unless mentioned is ±0.2mm.
02.The measured unit is "mm".

- **Dimensions of Tape (Unit: mm)**



- **Arrangement of Tape**

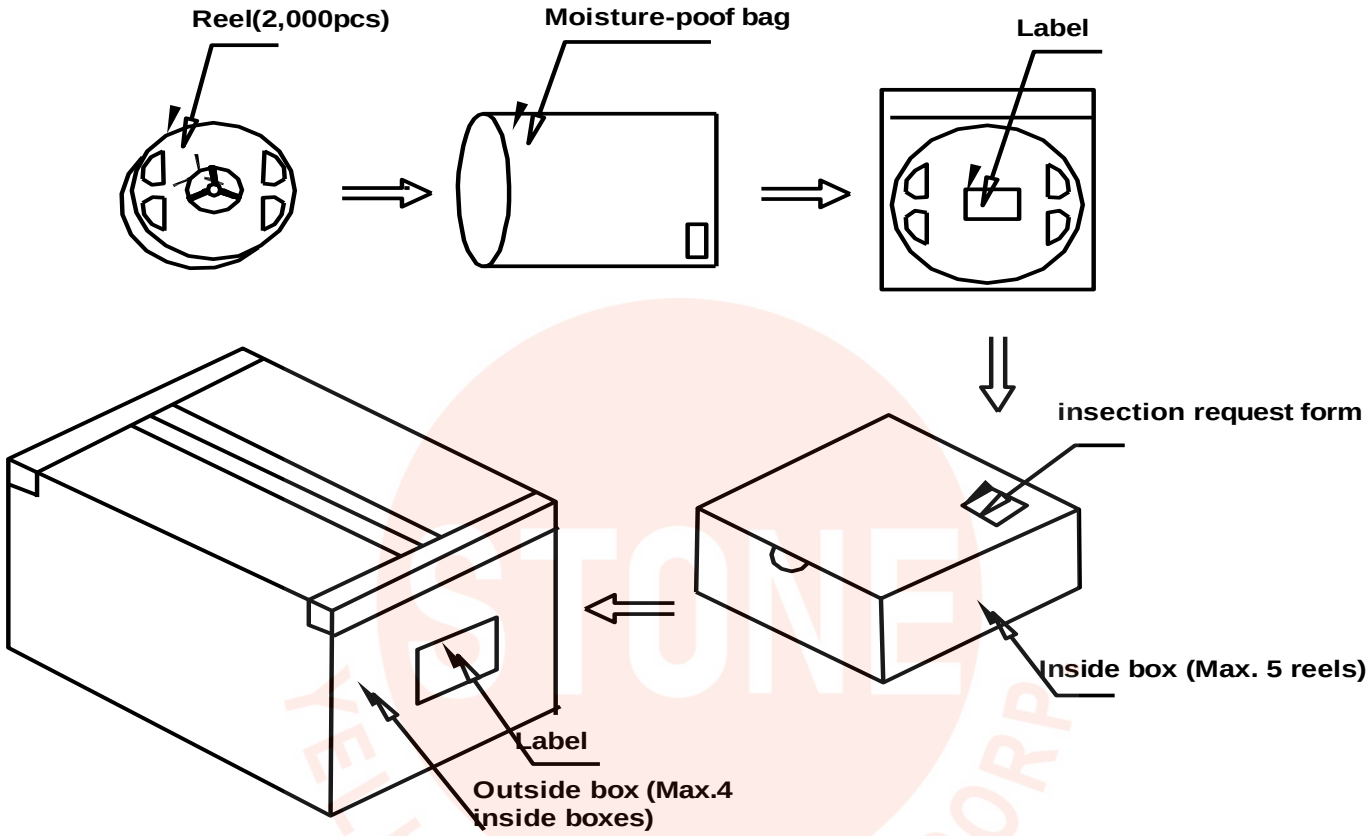


Notes:

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. 2000 pcs per reel;
5. The remainders will be packed in a multiplication of 500pcs.

■ Packing

● Packaging Specifications



Notes:

Reeled product (max.2000) is packed in a sealed moisture-proof bag. Five bags are packed in an inner box (size: about 260 X 230 X 100 mm) and four inner boxes are in an outer box (size: about 480 X 275 X 215 mm). On the label of moisture-poof bag, there should be the information of Part No., Lot No. and quantity number; also the total quantity number should be on inspection request form on outer box.

■ Precautions

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1. **Abnormal situation caused by improper setting of collet**

To choose the right collet 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 collet's lowering down height is not well set, it will bring damage to the gold wire at the time of collet'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 collet**

During SMT, please choose the collet that has larger outer diameter than the lighting area of lens, in case that improper position of collet 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 collet 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. **Soldering Iron**

Each terminal is to go to the tip of soldering iron temperature less than 350℃ for 3 seconds within once in less than the soldering iron capacity 25W. Leave two seconds and more intervals, and do soldering of each terminal. Be careful because the damage of the product is often started at the time of the hand solder.

5. **This usage and handling instruction is only for your reference.**

■ Test Items and Results of Reliability

Test Item	Test Conditions	Duration/ Cycle	Ac/Re	Number of Damage	Reference
Normal Temperature Life	Ta＝23℃(±5℃) I_F=20mA	1008 hrs	0/1	0/26	JESD22 A-108
High Temperature Life	Ta＝85℃(±5℃) I_F=20mA	1008 hrs	0/1	0/26	JESD22 A-108
High Humidity Heat Life	Ta＝85℃(±5℃) RH=85% I_F=20mA	1008 hrs	0/1	0/26	JESD22 A-108
Thermal shock	-45℃/30min~105℃ /30min (±5℃)	1008 hrs	0/1	0/26	JESD22 A-104
Electrostatic Discharge (ESD) Test	According to the SPEC	3 cycles	0/1	0/26	AEC Q101-001
Low Temperature Storage	T_a=-40℃	1008 hrs	0/1	0/26	JESD22-A103D
High Temperature Storage	T_a=105℃	1008 hrs	0/1	0/26	JESD22-A103D

***Criteria for Judging**

Item	Symbol	Condition	Criteria for Judgment of Pass	
			Min	Max
Luminous Intensity	Iv	I_F=20mA	LSL*2×0.7	-

[Note] LSL*2: Lower Specification Level

Note: Version updates will not be announced and Yellow Stone Corp. will have the final interpretation rights