SPECIFICATION FOR APPROVAL

Customer	:	
Customer Part No.	:	
Brightek Part No.	:	ISD4516VGBC1MAA2
Time	:	2020/06/15

Customer Comfirmation	Approval	Checkedy	Prepared By
	JJ.HE	CB.TAN	ZP.MA

ISD4516VGBC1MAA2

◆**Outline (L* W*H): 4.5*1.6*1.7mm**

◆**Good thermal dissipation & optical uniformity**

Table of Contents

Features

- RoHS2.0 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 5
- RGB and driver chip are integrated in a package, to form a complete control of pixel point with constant current.
- One pixel contains R, G, and B color that each can achieve 256 level brightness grayscale, which forms 16, 777, 216combination colors. Internal clock frequency operates at 800 kHz.
- Serial data transmission signal by single wire.

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 - A2

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	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	C: water transparent M: white diffused	A :article mode	A: IC Type 104 2: 12MA

Maximum Rating(Ta=25℃)

Parameter	Symbol	Rating	Unit
DC Forward Current	IF	30	mA
IC Power Supply Voltage	VDD	+3.5~+5.5	V
IC Input Voltage	VI	-0.4~VDD+0.4	V
Soldering Temperature	T_{SD}	260	℃
Operating Temperature Range		-40℃to+85℃	
Storage Temperature Range		-40℃to+105℃	

■ **Typical Product Characteristics(Ta=25°CVDD=5V)**

Characteristics	Symbol		Min.	Typ.	Max.	Unit	Test condition
Luminous Intensity	Iv	R	-	300	-	mcd	I_F=12mA
		G	-	1000	-		
		B	-	190	-		
		W	1000	1500	-		
Dominant Wavelength	λd	R	615	-	630	nm	I_F=12mA
		G	520	-	535		
		B	460	-	475		
Color Coordinate	x		-	0.242	-	-	I_F=12mA
	y		-	0.286	-	-	
View Angle	$2\theta_{1/2}$		-	120	-	deg	I_F=12mA

■ **Range of Bins**

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1) **Luminous Intensity-White (I_F = 12 mA VDD=5V)**

Bin Code	Min. Iv (mcd)	Max. Iv (mcd)
15	1000	1300
16	1300	1700
17	1700	2200
18	2200	2800
19	2800	3600

■ **Color Coordinate Comparison-White**
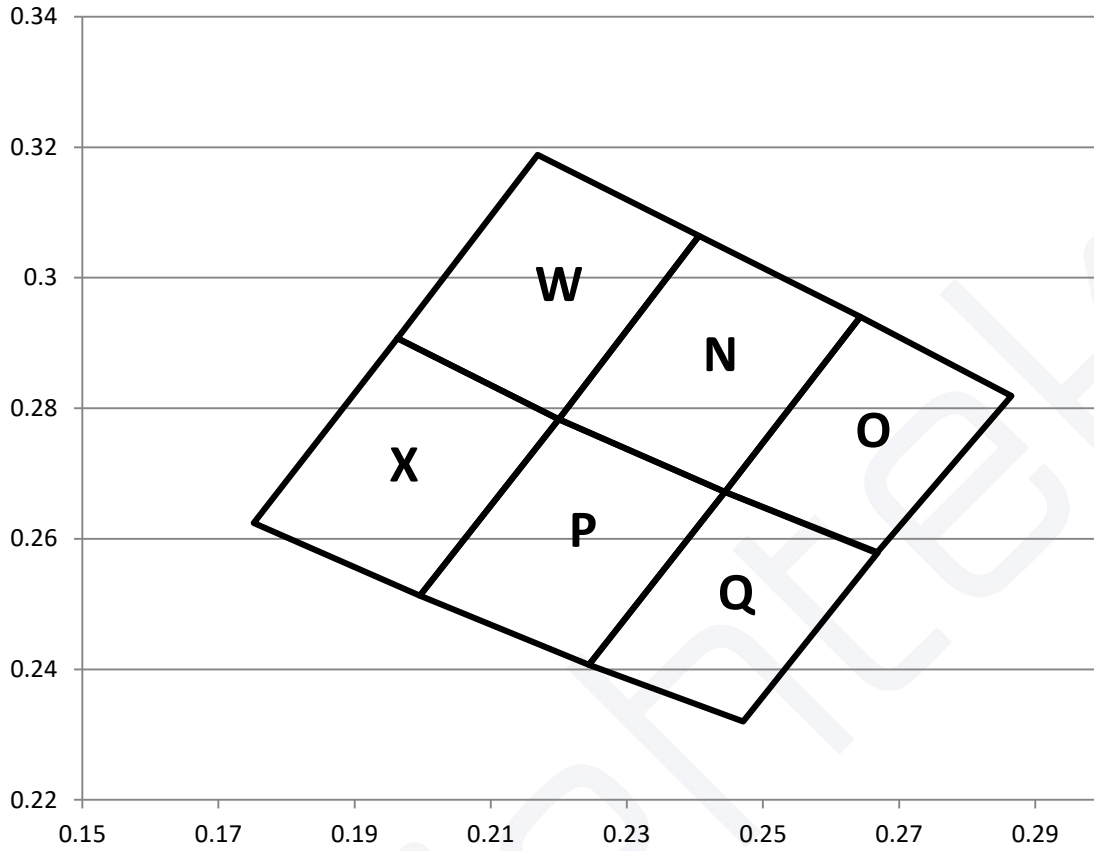
Color Rank

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
N	0.22	0.2783	0.2406	0.3064	0.2643	0.294	0.2444	0.2672
O	0.2444	0.2672	0.2643	0.294	0.2865	0.2819	0.2667	0.2578
X	0.1963	0.2907	0.1752	0.2624	0.1996	0.2513	0.22	0.2783
P	0.22	0.2783	0.1996	0.2513	0.2244	0.2407	0.2444	0.2672
Q	0.2444	0.2672	0.2244	0.2407	0.2471	0.232	0.2669	0.2579

■ Relative Spectral Power Distribution
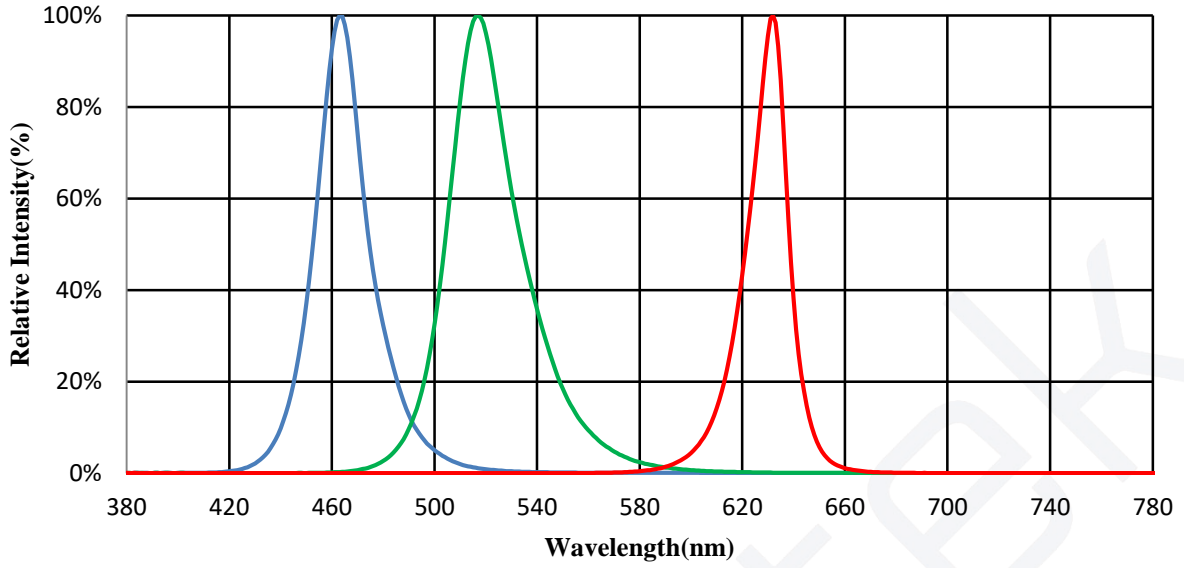
■ Typical Diagram Characteristics of Radiation
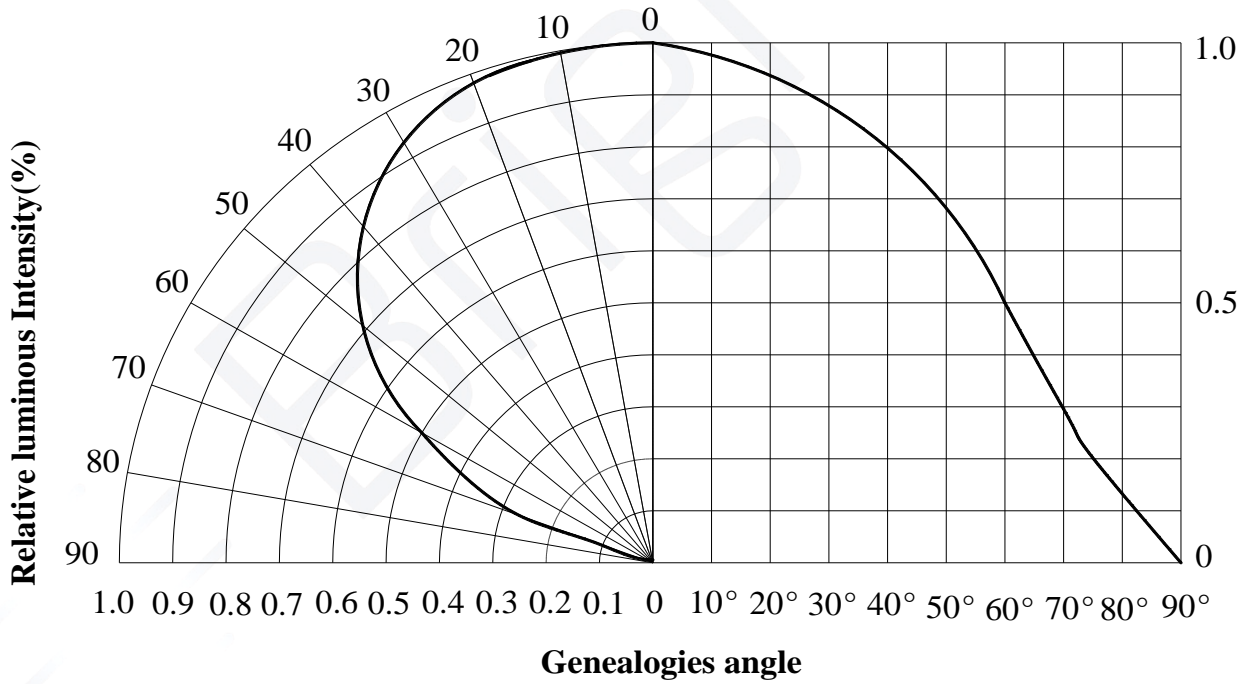
■ **Electrical Characteristics (Ta=25°C VDD=5V)**

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Static current	I_{DD}	VDD=5V,Iout="OFF"	-	-	2	mA
Input voltage level	V_{IH}	D_{IN}, SET	2.7	-	VDD	V
	V_{IL}	D_{IN}, SET	0	-	1.0	V

■ **Switching Characteristics (Ta=25°C)**

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Rate of data signal	F_{DIN}		-	800	-	KHZ
Transfer time	T_{PLH}	$D_{IN} \rightarrow D_{OUT}$	-	-	80	ns
	T_{PHL}				80	ns
Conversion time of IOUT R/G/B	Tr	IOUT R/G/B =20mA RL=200Ω, CL=30pF	-	-	50	ns
	Tf				50	ns

■ **Data transfer time (TH+TL=1.2μs±600ns)**

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1. **Timing Wave Form**

| T$_{1H}$ | T$_{1L}$ | T$_{0H}$ | T$_{0L}$ | T$_{Reset}$ |

1 code   0 code   Reset
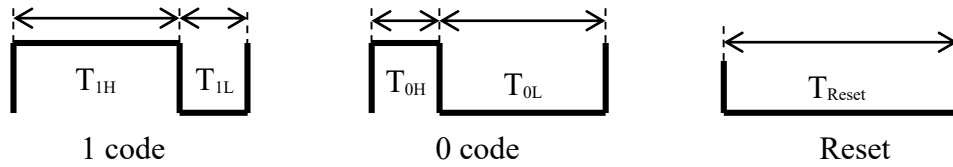
2. **High Speed Mode**

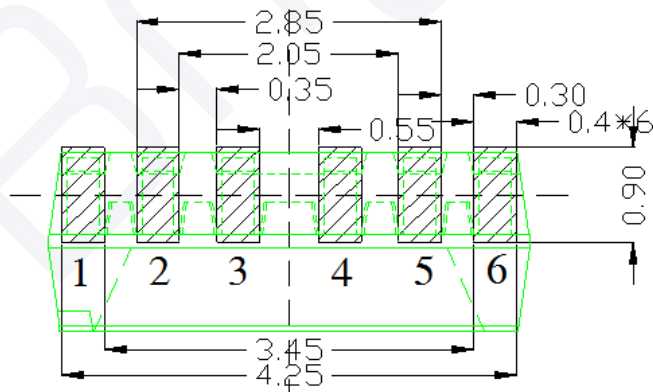| Item	Description	Typical	Allowance
T$_{OH}$	0 code, high voltage time	300ns	±150ns
T$_{OL}$	0 code, low voltage time	900ns	±150ns
T$_{1H}$	1 code, high voltage time	900ns	±150ns
T$_{1L}$	1 code, low voltage time	300ns	±150ns
RES	reset time	>250us	-

Notes:

1. The signal received by ICLED is a return to zero code, which consists of "0" and "1" codes of high and low levels at different times.

2. The 24bit signal consists of different Numbers of zeros and ones. The 24bit signal is the control signal of an LED.A "0" or "1" is 1bit.

3. The 1-code and 0-code defined in the table constitute a 24-bit signal. After input into IC, IC will be automatically converted into PWM signal to control RGB chip luminescence.

4. Controlling the LED at the limit of tolerance may occasionally cause instability. Please try to control with the specified typical values.

3. **Composition of 24 bit data**

G7	G6	G5	G4	G3	G2	G1	G0	R7	R6	R5	R4	R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0

bit23………...…………………………………………………………………..…………………………………….…bit0
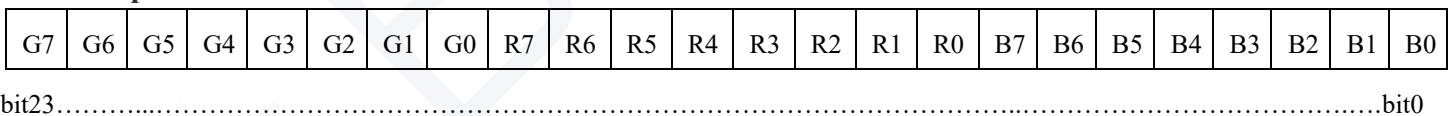
5. **Data transmission method**

Dimensions

4.50

1.60

1.00

0.80

1.70

0.13

0.3*6

0.45

0.65

0.40

1	2	3	4	5	6
DIN	NA	VDD	VDD	DOUT	GND

Recommended Pad Layout

2.85

2.05

0.35

0.30

0.4*6

0.55

0.60

1	2	3	4	5	6

3.45

4.25
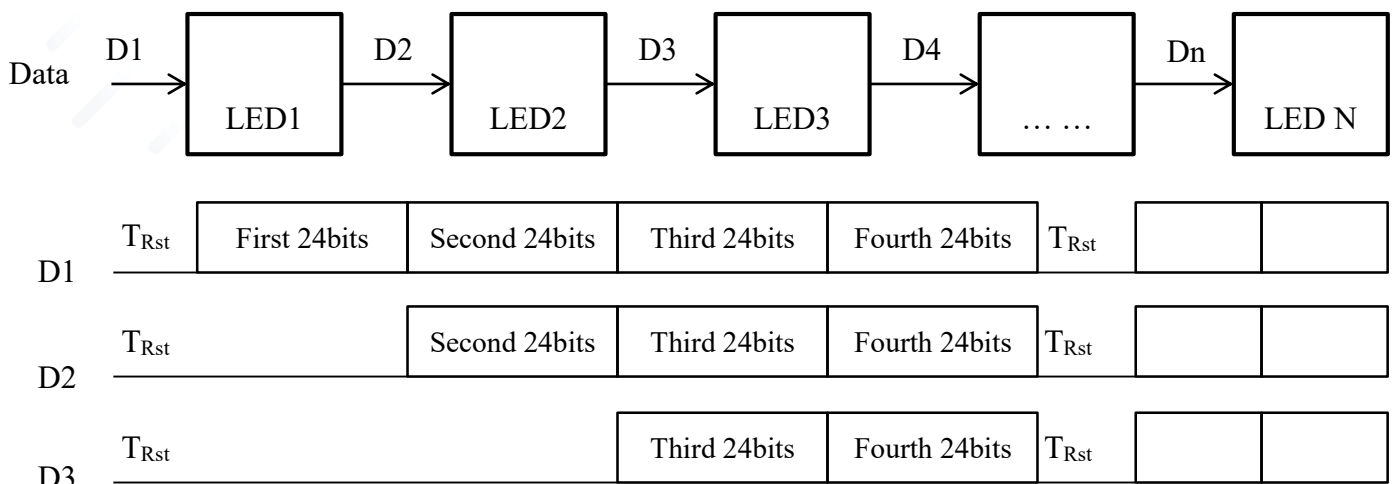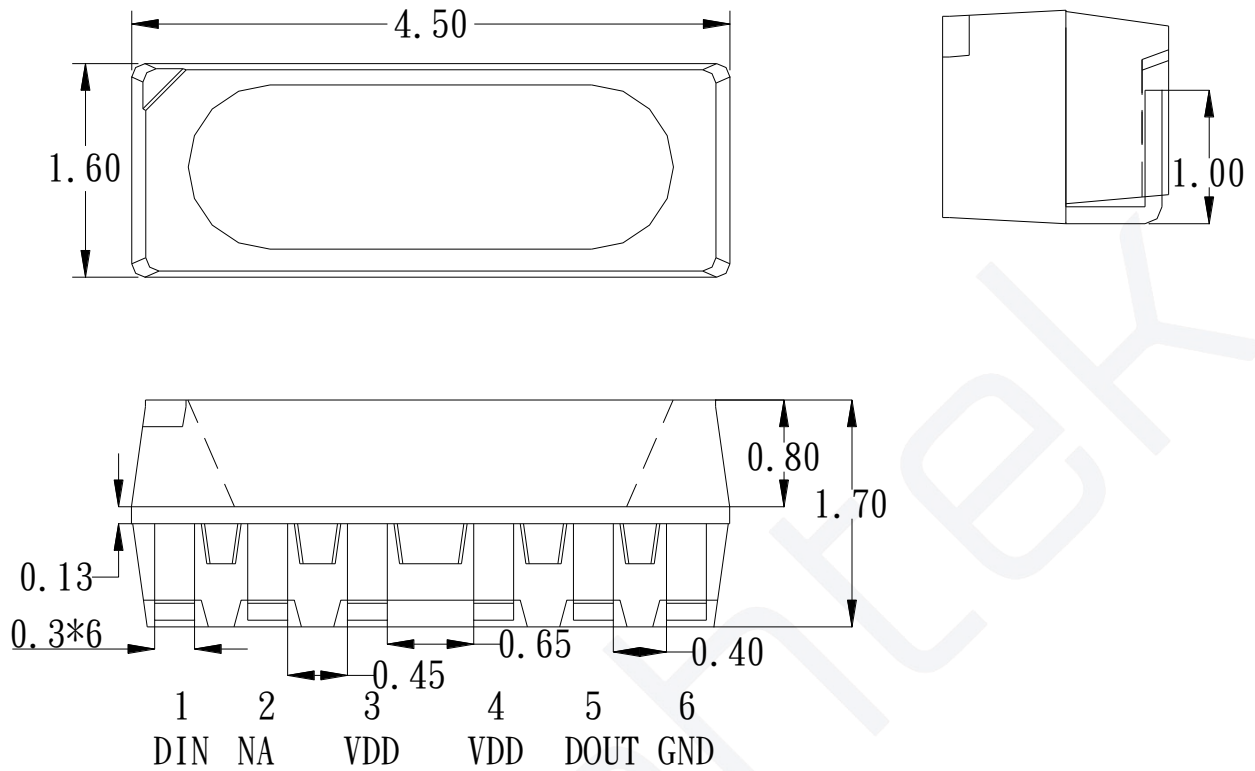
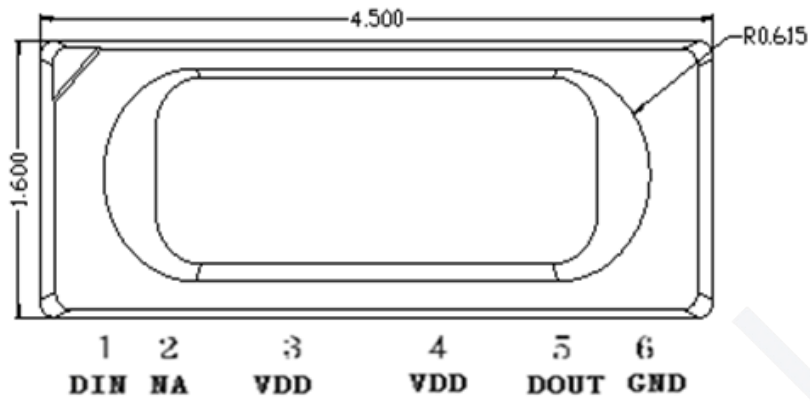## SCALE 1:1

§ 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	DIN	Control data signal input
2	NA	Insignificance
3、4	VDD	Power supply LED
5	DOUT	Control data signal output
6	GND	Ground

Reflow Profile

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1. I_R reflow soldering Profile for Lead Free solder
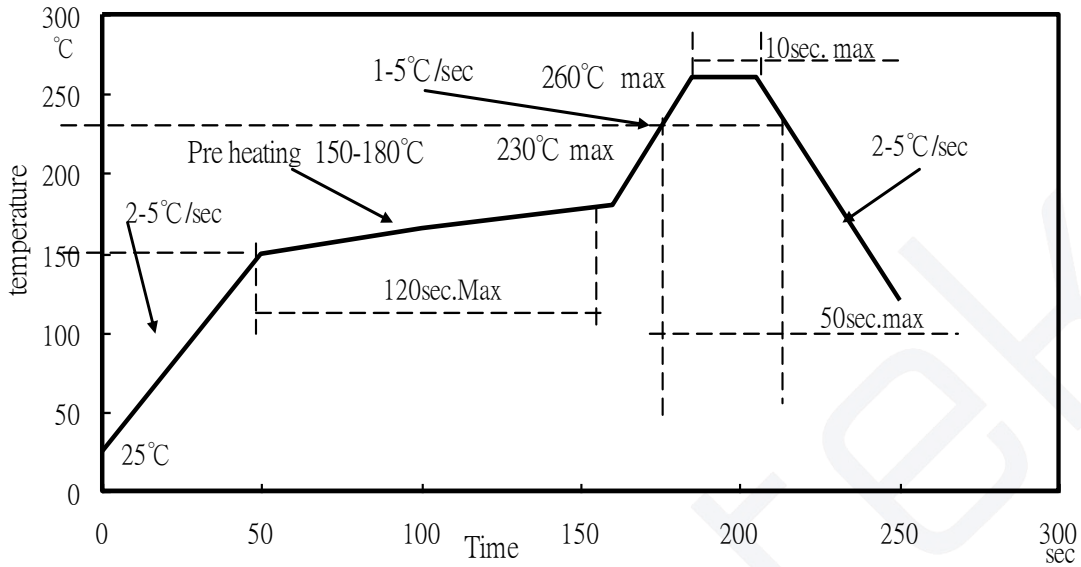
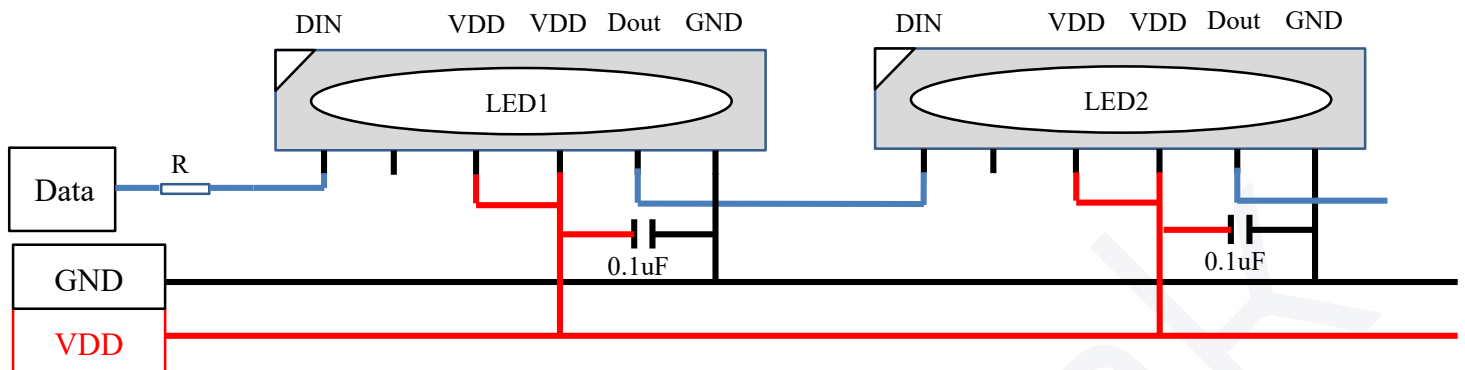**Notes:**

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**

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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 LED.

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 72 hours or they should be stored at ≦20%R.H. with zip-lock sealed bag.

2.3. Baking

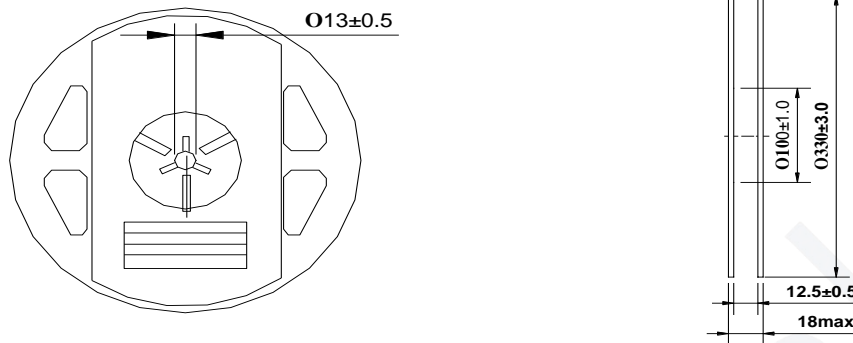The products are not used up within 72 hours, and please bake them before using:

1). 60±3℃ X 6hrs and ＜5% RH, for reel

2). 125±3℃ X 2hrs, for single LED

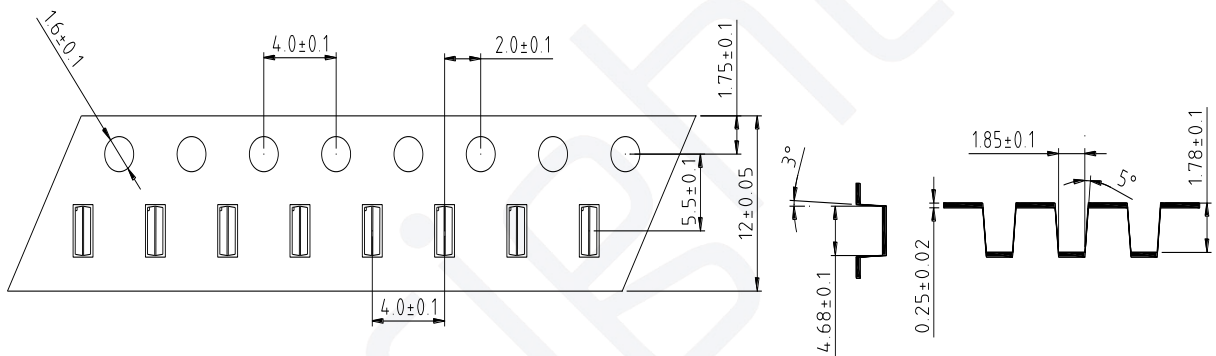It is normal to see slight color fading of carrier (light yellow) after baking in process.

■ Packing

● **Dimensions of Reel (Unit: mm)**

O13±0.5

O100±1.0
O330±3.0

12.5±0.5
18max
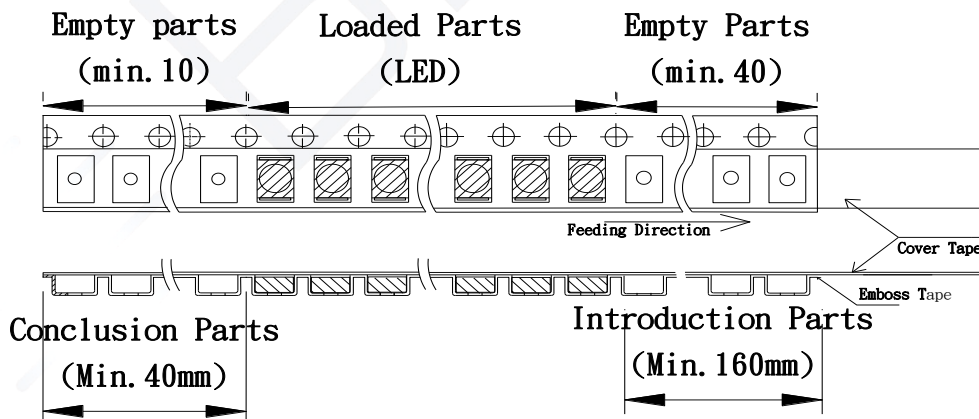
Note: 01.The tolerance unless mentioned is ±0.2mm.
02.The measured unit is "mm".

● **Dimensions of Tape (Unit: mm)**

1.6±0.1   4.0±0.1   2.0±0.1   1.75±0.1   1.78±0.1

5.5±0.1   12±0.05   3°   1.85±0.1   5°

4.0±0.1   4.68±0.1   0.25±0.02

● **Arrangement of Tape**

Empty parts   Loaded Parts   Empty Parts
(min. 10)   (LED)   (min. 40)

Feeding Direction

Cover Tape

Emboss Tape

Conclusion Parts   Introduction Parts
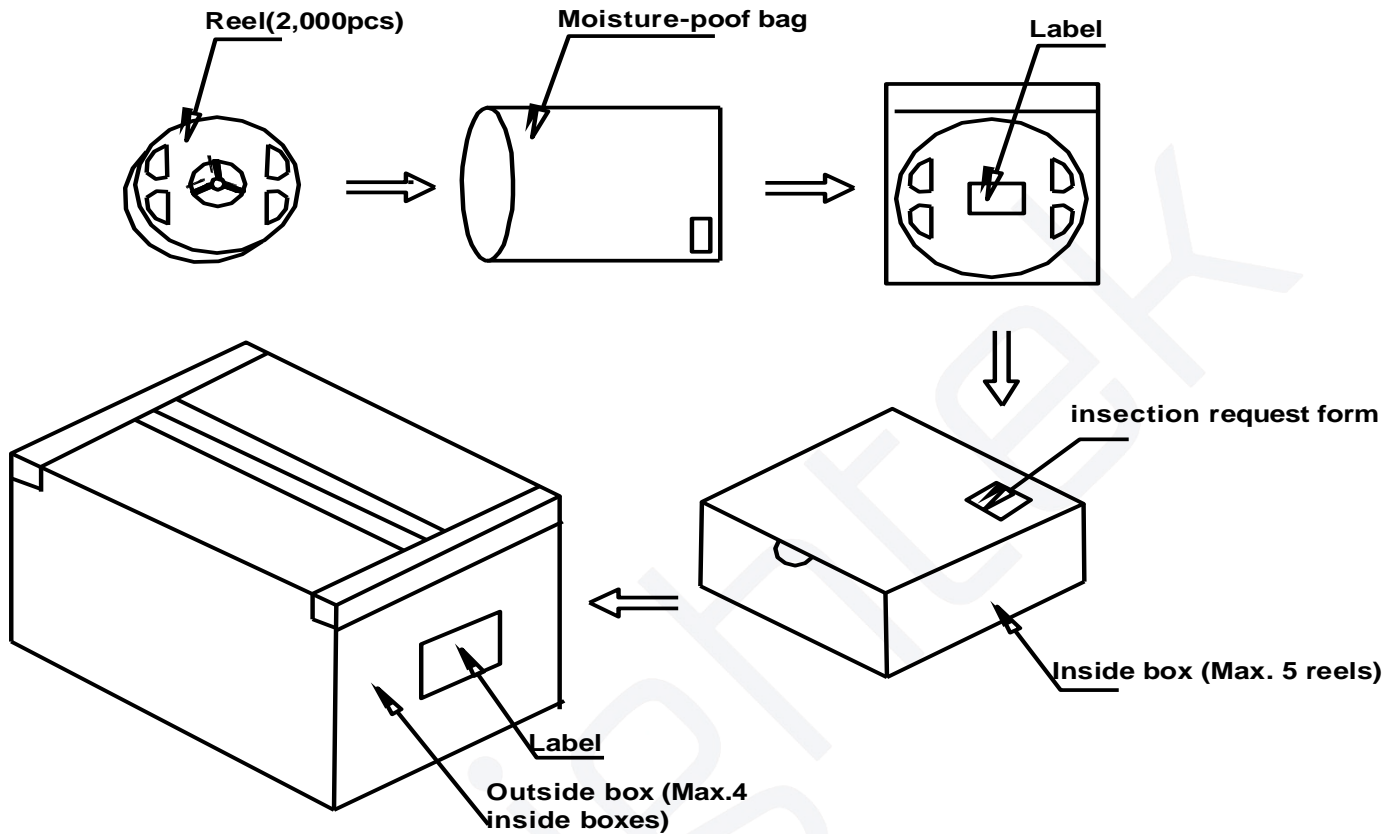(Min. 40mm)   (Min. 160mm)

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.

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■ **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. **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=12mA(5bit-level 15)	1008 hrs	0/1	0/22	JESD22 A-108
High Temperature Life	Ta＝85℃(±5℃) I_F=12mA(5bit-level 15)	1008 hrs	0/1	0/22	JESD22 A-108
High Humidity Heat Life	Ta＝85℃(±5℃) RH=85% I_F=12mA(5bit-level 15)	1008 hrs	0/1	0/22	JESD22 A-108
Thermal shock	-45℃/30min~105℃ /30min (±5℃)	1008 hrs	0/1	0/22	JESD22 A-104
Electrostatic Discharge (ESD) Test	According to the SPEC	3 cycles	0/1	0/22	AEC Q101-001
Low Temperature Storage	T_a=-40℃	1008 hrs	0/1	0/22	JESD22-A103D
High Temperature Storage	T_a=105℃	1008 hrs	0/1	0/22	JESD22-A103D

*Criteria for Judging

Item	Symbol	Condition	Criteria for Judgment of Pass	
			Min	Max
Luminous Intensity	Iv	I_F=12mA	LSL[*2]×0.7	-

[Note]   LSL[*2]: Lower Specification Level