6SC3535VGBC1MCK3-2 Datasheet

IC LED Series (L* W*H): 3.5*3.4*1.47mm

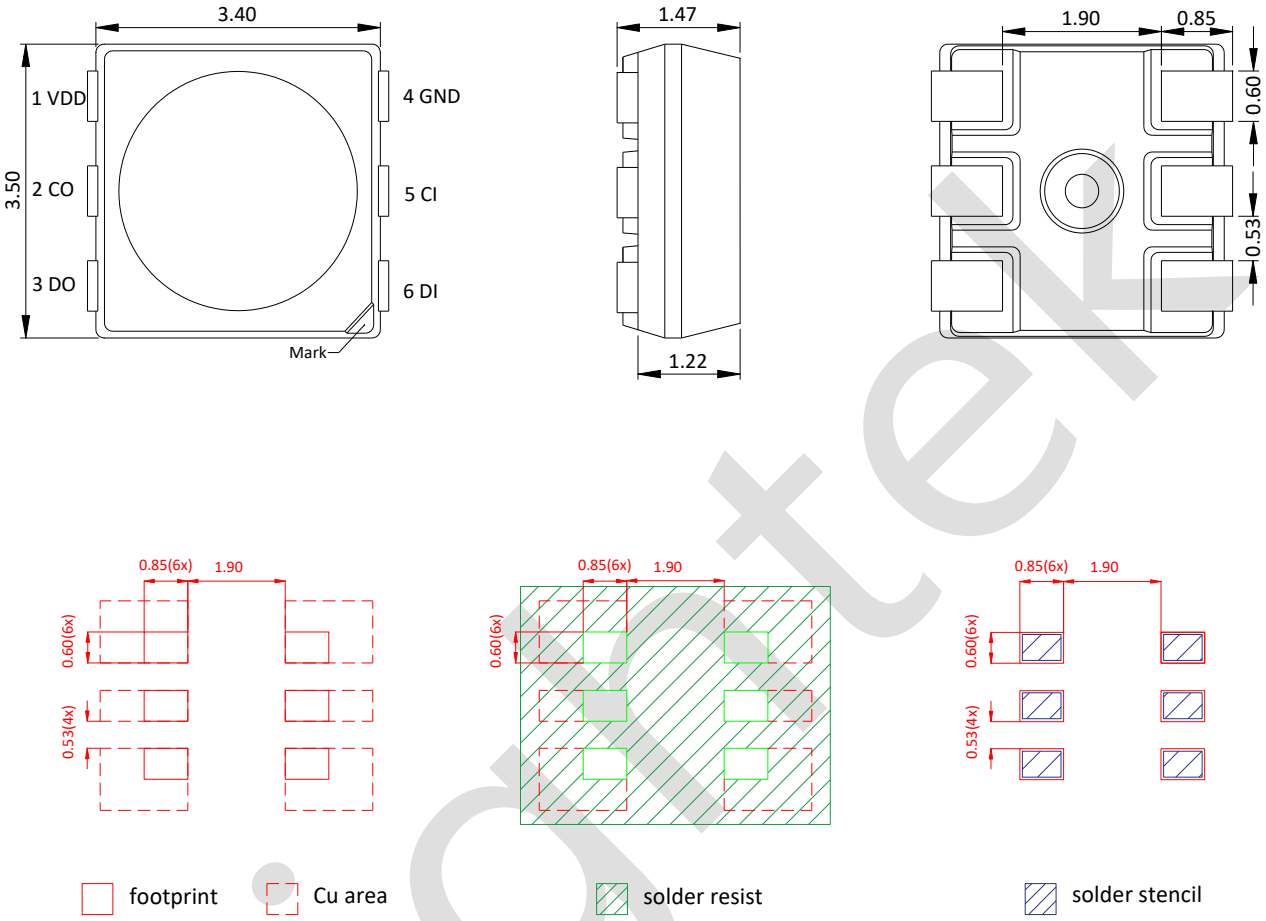
Applications

- Automotive interior light
- Functional Illumination

Features

- Serial data transmission signal by dual-wire (DATA & CLK) lines.
- Each LED contains R, G, B three colors, every color can achieve 256 levels of brightness creating a palette of 16,777,216 colors.
- Supports sleep / wake-up mode. In sleep mode, the LED's current was lower than 1uA.
- RoHS2.0 Compliant.
- ESD level 2kV(HBM).
- Preconditioning: accelerate to JEDEC level 3.
- Typical view angle:120°
- Qualifications:
  AEC-Q 100/AEC-Q102 qualified.

Dimensional Drawing



1. Dimensions are in millimeters.
2. General tolerance is ± 0.1mm.

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 Ratings

T_A : 25 °C

Parameter	Symbol		Values			
IC Power Supply Voltage	V_{DD}	max.			6.5	V
Rate of Data Signal	F_{CLK}	max.			15	MHz
Maximum Output Current	I_{OMAX}	max.			20	mA
Thermal Resistance Junction/ Solder Point	RTHJ-S	max	R 65	G 110	B 100	°C /W
Power Dissipation	P_D	max.			400	mW
Junction Temperature	T_j	max.			125	°C
Operating Temperature Range	T_{OP}	min. max.			-40 105	°C
Storage Temperature Range	T_{stg}	min. max.			-40 105	°C
Soldering Temperature	T_{SD}	max.			260	°C
ESD Withstand Voltage acc. to ANSI/ESDA/JEDEC JS-001	V_{ESD}	max.			2	kV

Electrical Characteristics

T_A : 25 °C

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	-	V_{DD}+0.4	V
Input Low Voltage	V_{IL}		-0.4	-	1.0	V
The Clock High Level Width	T_{CKH}		30	-	-	ns
The Clock Low Level Width	T_{CKL}		30	-	-	ns
Data Set Up Time	T_{SETUP}		10	-	-	ns
Data Hold Time	T_{HOLD}		5	-	-	ns
Working Current(IC)	I_{DD}	I_{out}= “OFF”	-	-	1.5	mA
Static Current	I_{sleep}	Sleep mode			1	uA
ESD Pressure	V_{ESD}	HBM		2		kV

Characteristics

V_{DD}=5V | I_F=20mA | T_A : 25 °C

Parameter	Symbol		Min.	Typ.	Max.	Unit
Luminous Intensity	Iv	R	530	900	1500	mcd
		G	1000	1700	2850	
		B	230	400	700	
		W	1700	2900	4800	
Dominant Wavelength	λ_d	R	615	-	630	nm
		G	520	-	535	
		B	460	-	475	
Color Coordinate	x		-	0.2662	-	-
	y		-	0.2410	-	-
View Angle	$2\theta_{1/2}$		-	120	-	°

1. Tolerance of Measure:

   Luminous Intensity: ±10%mcd, Dominant Wavelength: ±1.0nm, Color Coordinate: ±0.005

Bin Groups

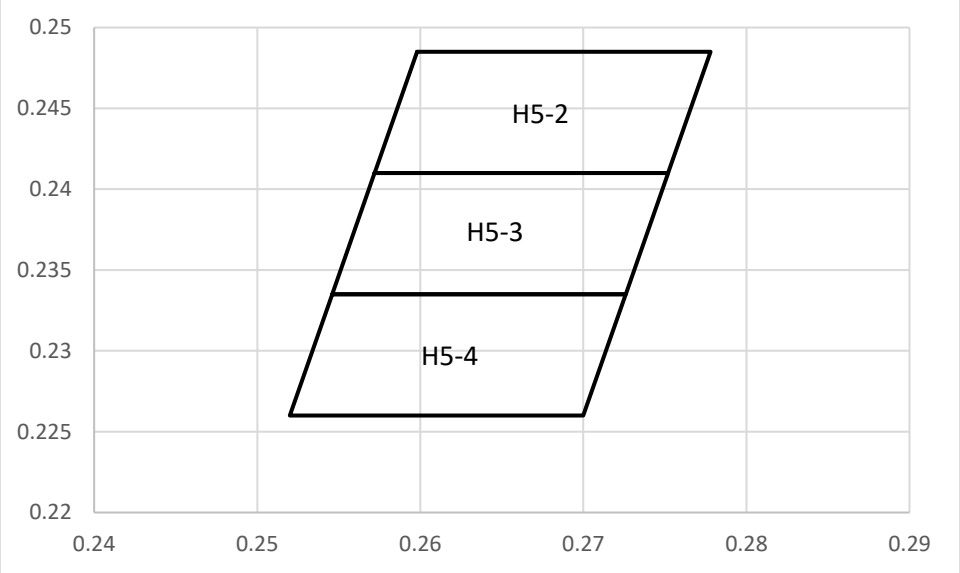
1. Luminous Intensity

V_{DD}=5V | I_F =20mA| T_A : 25 °C

Bin Code	Min. I_V (mcd)	Max. I_V (mcd)
17	1700	2200
18	2200	2800
19	2800	3600
20	3600	4800

2. Chromaticity Coordinate Groups

V_{DD}=5V | I_F=20mA | T_A : 25 °C



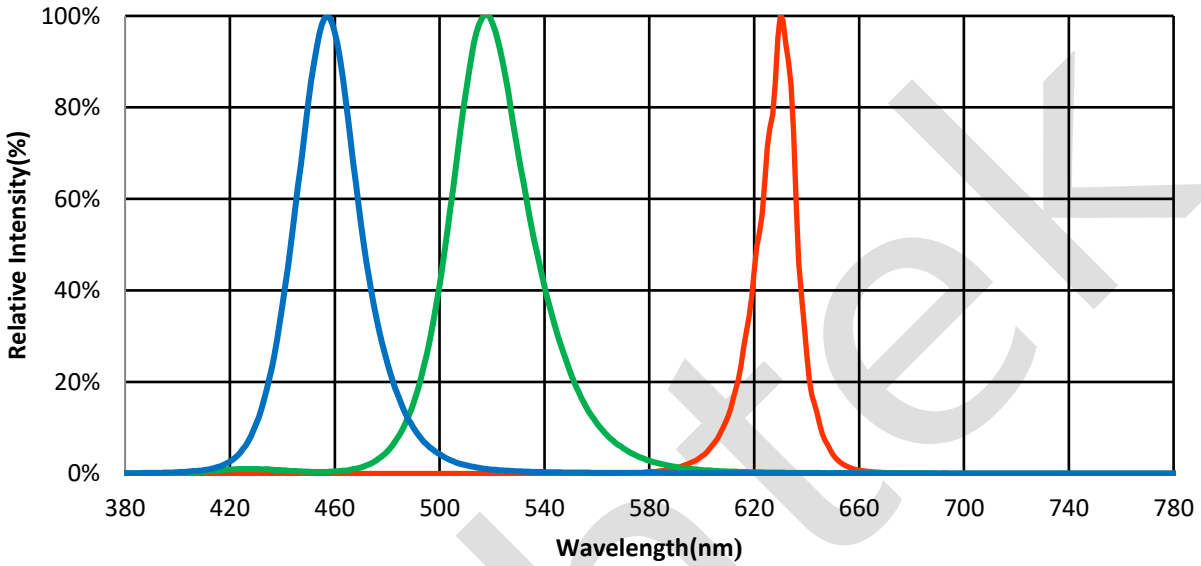
Bin	X	Y	X	Y	X	Y	X	Y
H5-2	0.2598	0.2485	0.2572	0.2410	0.2752	0.2410	0.2778	0.2485
H5-3	0.2572	0.2410	0.2546	0.2335	0.2726	0.2335	0.2752	0.2410
H5-4	0.2546	0.2335	0.2520	0.2260	0.2700	0.2260	0.2726	0.2335

Tolerance of X/Y：±0.005

Relative Spectral Power Distribution

Relative Spectral Emission

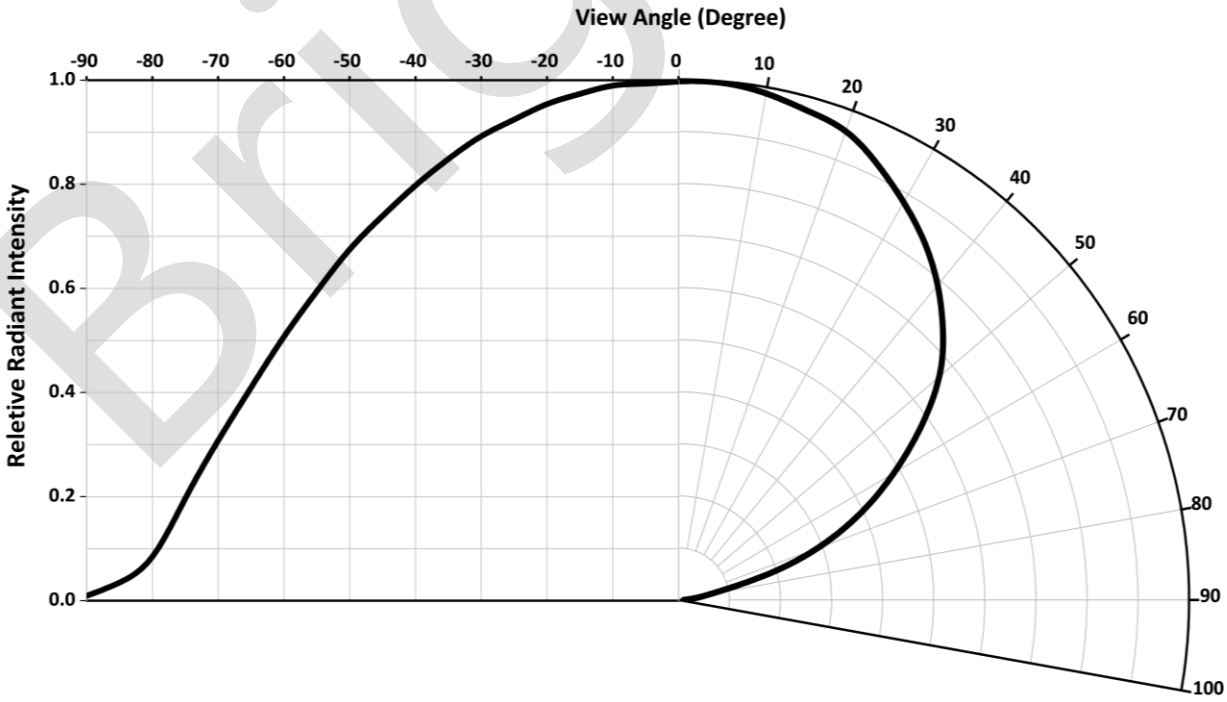
Φrel = f (λ); I_F=20mA;T_S = 25 °C



Typical Diagram Characteristics of Radiation

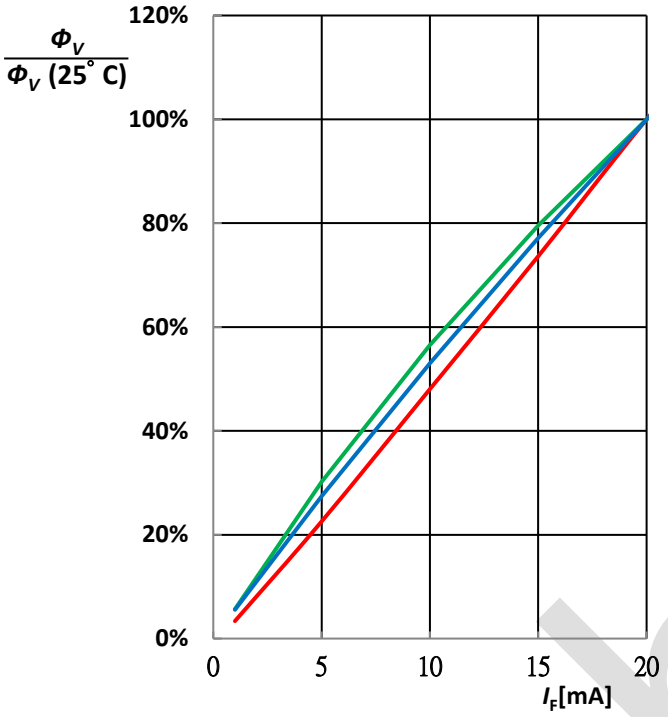
Relative Spectral Emission

I_{rel} = f (Φ); I_F=20mA;T_S = 25 °C



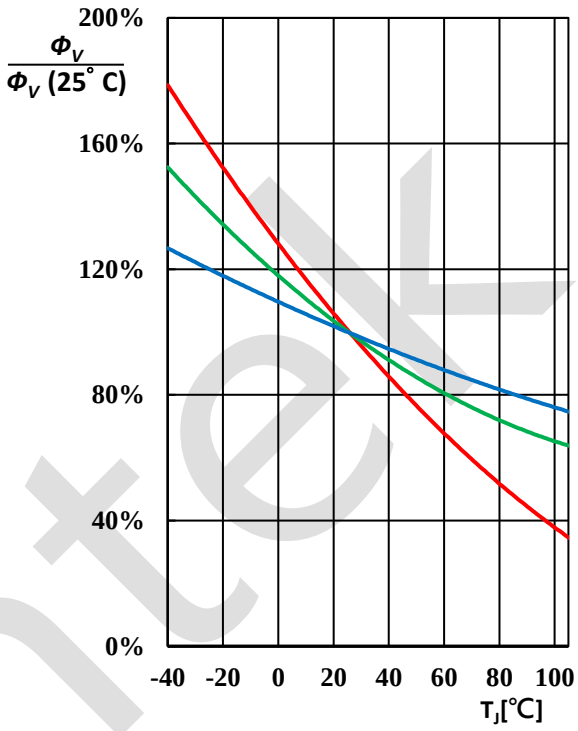
Relative Intensity vs. Forward Current

Φ_V/Φ_V (25°C) = f(I_F) ; TS = 25 °C;



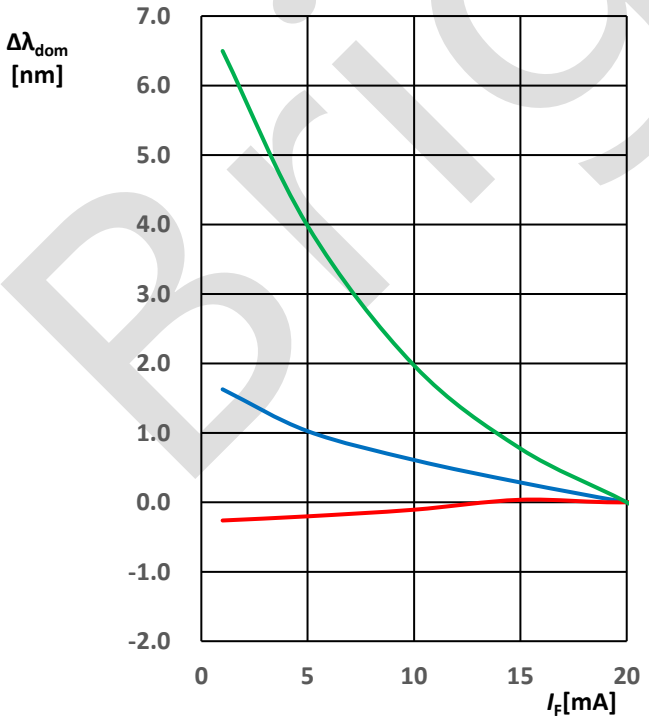
Relative Intensity vs. Temperature

Φ_V/Φ_V (25°C) = f(I_F) ; T_S = 25 °C;



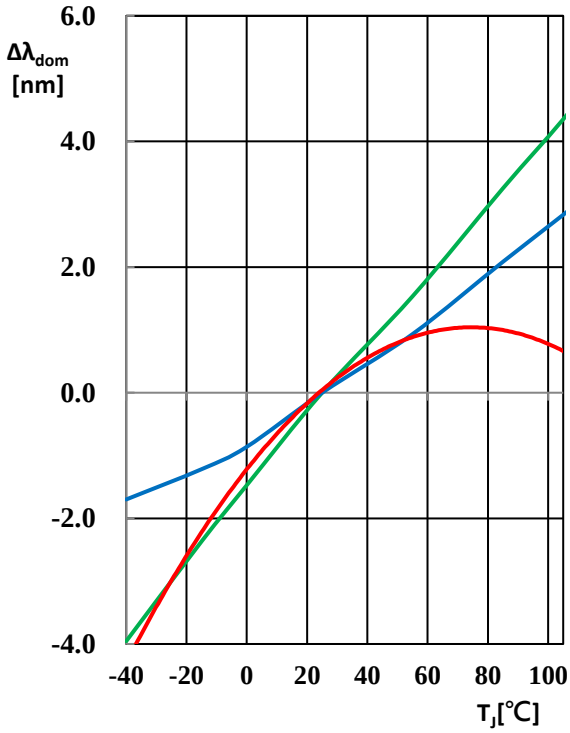
Dominant Wavelength

$\Delta\lambda_{dom} = \lambda_{dom} - \lambda_{dom}(25\ °C) = f(T_j)$



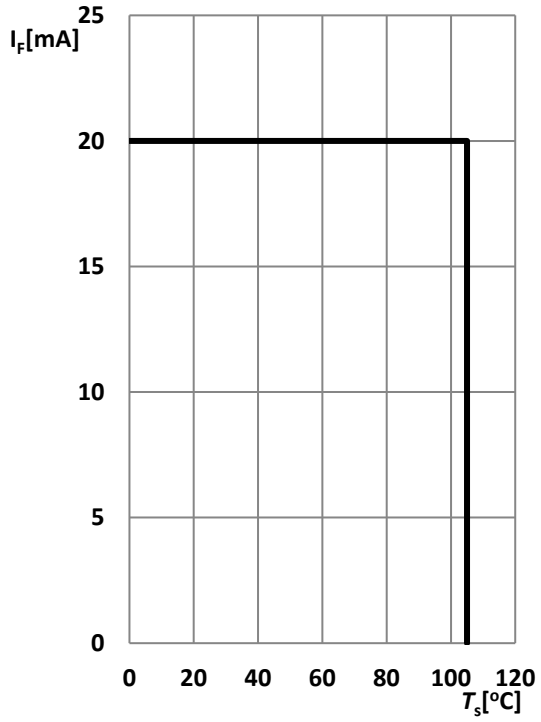
Dominant Wavelength

$\Delta\lambda_{dom} = \lambda_{dom} - \lambda_{dom}(25\ °C) = f(T_j)$



Max. Permissible Forward Current

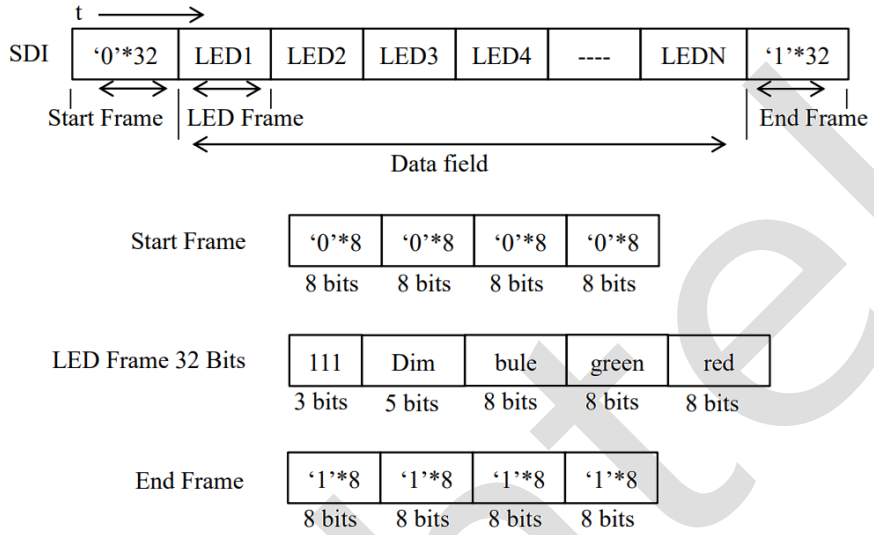
$I_F = f(T_s)$



Function Description

1.Series data structure

Tandem N-LED

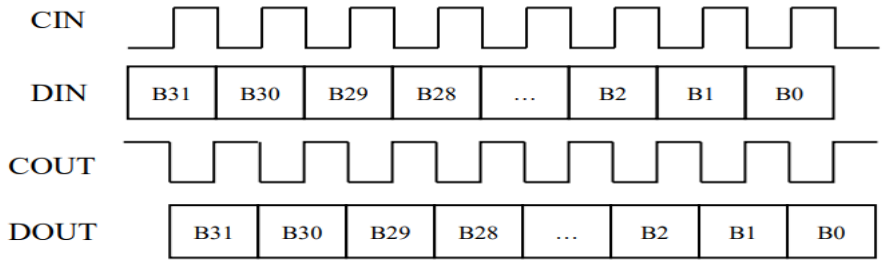


1.1 5-Bit Brightness Adjustment and Specification Limits

DIM 5-Bit (level 32) brightness adjustment involves simultaneous control of OUTR\OUTG\OUTB three port currents.

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

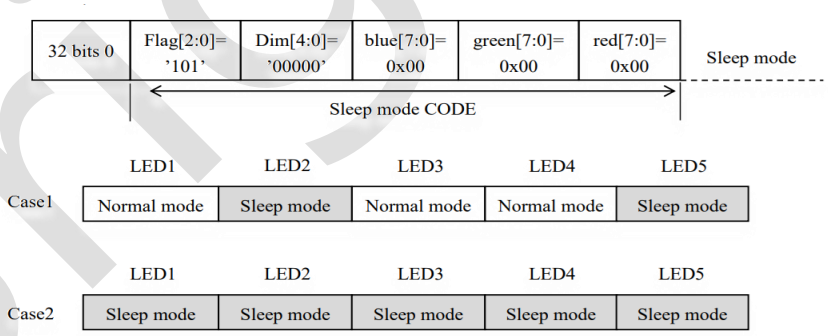
1.2 PWM input/output signals relations



2.Sleep and power saving mode

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

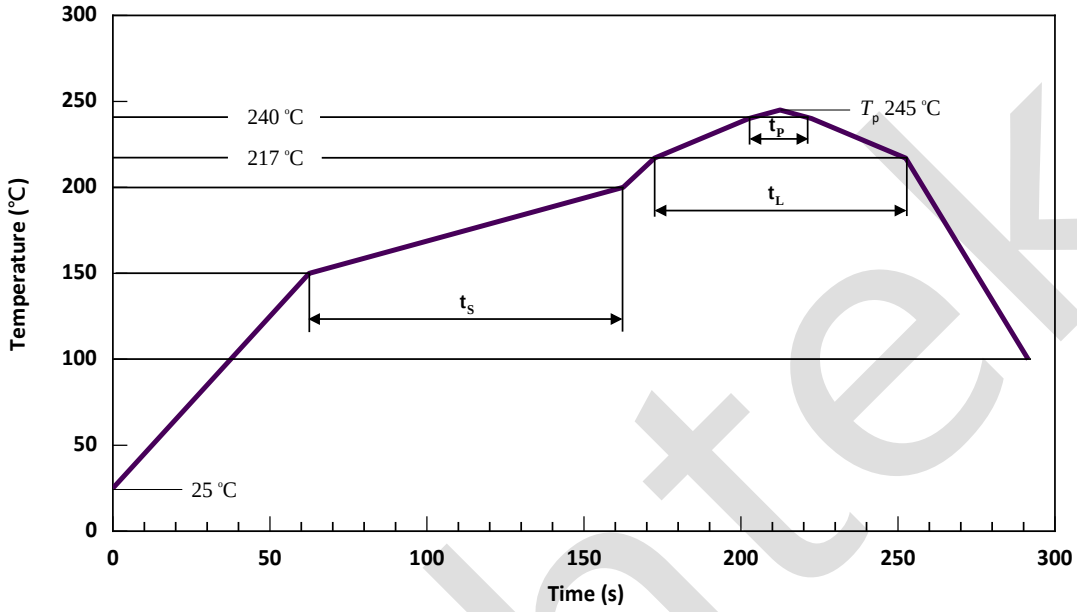
The LED supports sleep/wake-up modes for power-saving purposes. Upon receiving 24 bits of '0's in BGR data (where BLUE[7:0]=8h00, G[7:0]=8h00, R[7:0]=8h00), concurrently, both the 3-bit flag and the 5-bit DIMMING are set to 8h"A0" (indicating FLAG[2:0]=3b101 and DIMMING[4:0]=5b00000), the IC will enter sleep mode with a current of approximately 1uA. The IC will awaken from sleep mode upon receiving new data where Flag[2:0] and DIMMING[4:0] are not 8h"A0". Following the wake-up, all sleeping circuits within the IC return to normal operating mode within 1ms. Considering the 1ms required for the IC to transition from sleep to normal function, it is recommended for the host to wait 1ms after issuing a wake-up command before sending display data and commands.



In Case 1, if LED 2 is in sleep mode, during the subsequent data transfer process, the state of LED 2 will remain unchanged as long as 32 bits of data for LED 2 is received with Flag[2:0], DIMMING[4:0] set as 8h"A0". This indicates that LED 2 will remain in sleep mode. In this scenario, LED 2 can relay the remaining 32 bits of data to LED 3 to modify the display data of LED 3. In essence, the inactive chip (LED 2 in sleep mode) has the capability to relay data to the subsequent chips.

Reflow Soldering Profile

Product complies to MSL Level 3 acc. to JEDEC J-STD-020E

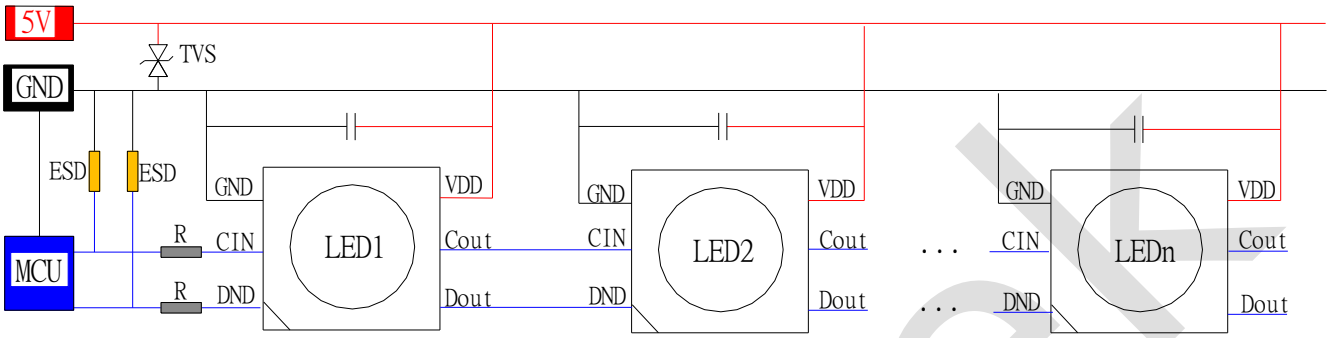


Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up Rate to Preheat 25 °C to 150 °C			2	3	K/s
Time t_S T_{Smin} to T_{Smax}	t_S	60	100	120	s
Ramp-up Rate to Peak T_{Smax} to T_P			2	3	K/s
Liquids Temperature	T_L		217		°C
Time Above Liquids Temperature	t_L		80	100	s
Peak Temperature	T_P		245	260	°C
Time Within 5 °C of the Specified Peak Temperature T_P - 5 K	T_P			10	s
Ramp-Down Rate T_P to 100 °C			3	4	K/s
Time 25 °C to T_P				480	s

1. Do not stress the silicone resin while it is exposed to high temperature.
2. The reflow process should not exceed 2 times.

Application Circuit

1. Typical application circuit



Circuit description:

1. A bypass capacitor should be connected in parallel between VDD and GND of each bead. It is recommended to use the 104 capacitor.
2. Connected between the first LED bead and the MCU signal line is a 100Ω to 300Ω resistor, reducing surge voltage impact from the MCU output signal. Alternatively, it can be replaced with a magnetic bead to improve interference resistance.
3. Add a TVS diode at the power input position of the LED module. Its breakdown voltage should be between 5.5-7.0V, with a clamping voltage below 6.5V, to avoid damage from high voltage surges to the LEDs.
4. Each iCLed's DIN and CIN connect to an ESD diode, grounding it to reduce EMC interference. The clamping voltage of the ESD diode is controlled to about 5.5V.

2. Handling precautions

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 It is recommended to store the products in the following conditions:

- Humidity: 60% R.H. Max.
- Temperature : 5℃~30℃(41℉~86℉)

② Shelf life in sealed bag: 12 month at ＜5℃~30℃ and ＜60% R.H. after the package is Opened, the products should be used within 1 week or they should be keeping to stored at ≦20%R.H. with zip-lock sealed.

2.3 Baking

Suggest packing open after 1 week, before use baking products, conditions as follows:

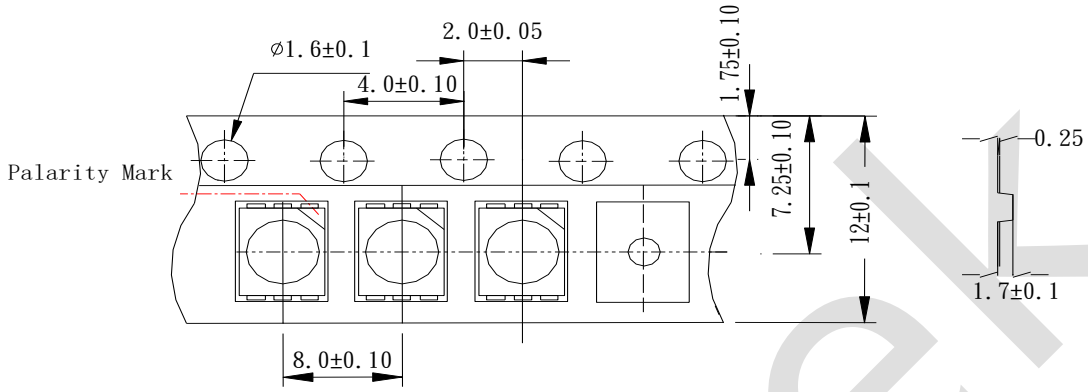
① 60±3℃ X 6hrs and ＜5%RH, for reel

② 125±3℃ X 2hrs, for single LED

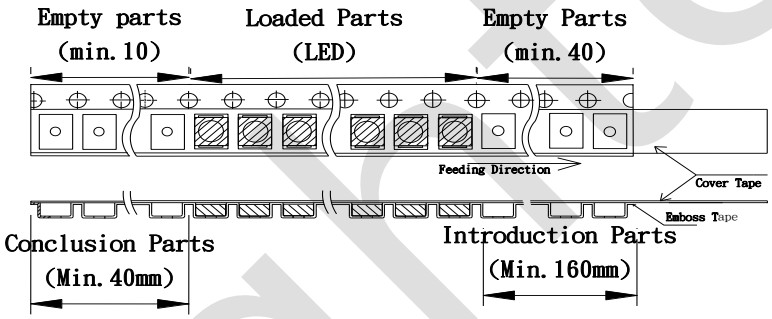
It shall be normal to see slight color fading of carrier (light yellow) after baking in process.

Taping

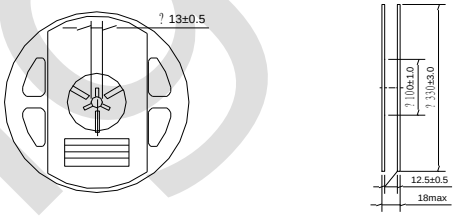
1. Dimensions of Tape (Unit: mm)



2. Arrangement of Tape



3. Dimensions of Reel (Unit: mm)



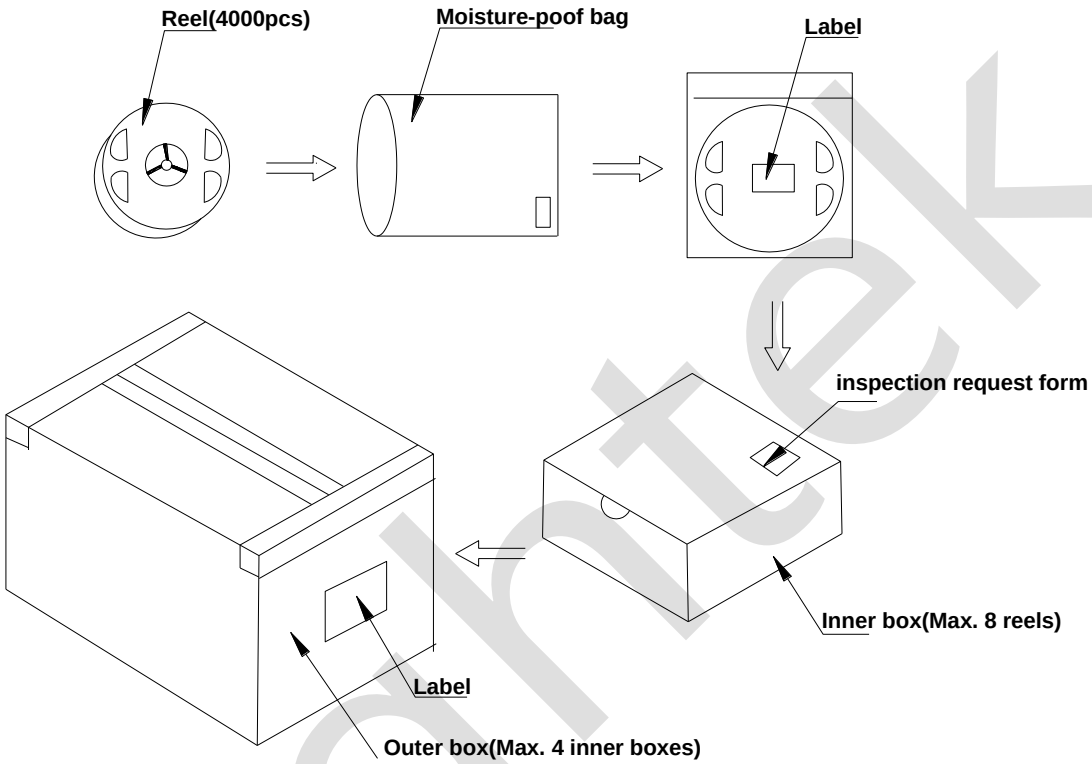
Note: 01.The tolerance unless mentioned is ±0.2mm.
02.The measured unit is "mm".

Notes:

1. Empty component pockets are sealed with top cover tape
2. The cathode is oriented towards the tape sprocket hole in accordance with ANSI/EIA RS-481 specifications
3. 4,000pcs per reel
4. The remainder packing in multiples of 500pcs.

Packing

- **Packaging Specifications**



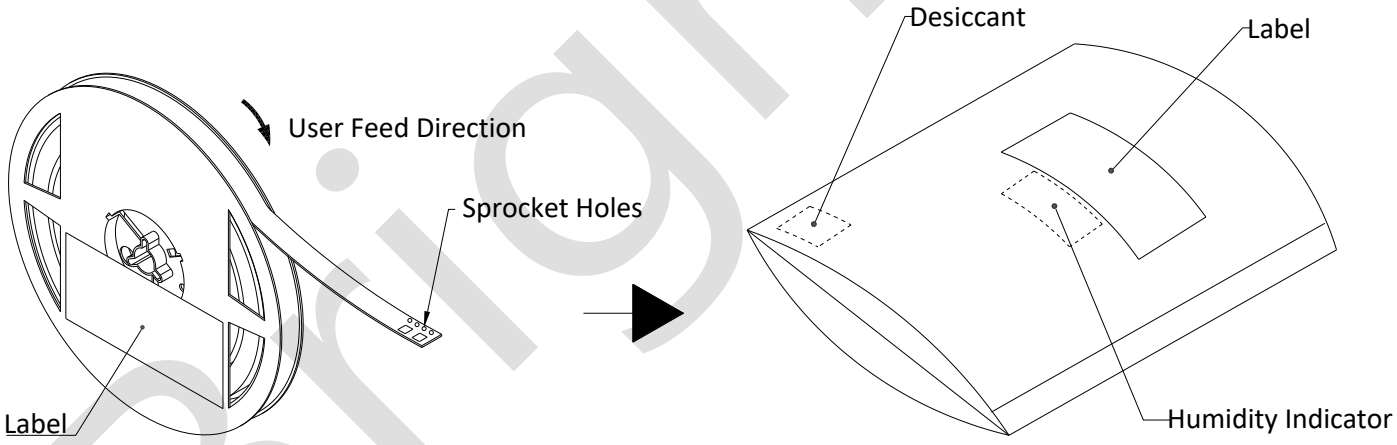
Reeled product (max.4,000) is packed in a sealed moisture-proof bag. Eight bags are packed in an inner box (size: about 260 X 230 X 100 mm) and four inner boxes are in an outer box (size: about 480 X 275 X 215 mm). On the label of moisture-poof bag, there should be the information of Part No., Lot No. and quantity number; also the total quantity number should be on inspection request form on outer box.

Barcode-Product-Label (BPL)

Part No:	MSL
O Item:	
N Item:	
Q'TY:	
VF:	(mA)
IV:	(mA)
WL:	(mA)
Lot No:	
XXXX-XXXX XXXX / PLSTXXXX	RoHS PASS

- Part No : Product Number
- O Item : Customer's Product Number
- N Item : Product Name
- Q'TY : Packing Quantity
- VF : Voltage Rank
- IV : Luminous Intensity Rank
- WL : Wavelength Rank
- Lot No : Lot Number
- MSL : MSL Level
- XXXX-XXXX XXXX / PLSTXXXX : Identify Label Number

Dry Packing Process and Materials



1. Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card according JEDEC-STD-033.

Precautions

1. Choosing the right nozzle for ensuring product quality

   Incorrect nozzle settings can potentially lead to abnormalities.
   Please follow the instructions below during operation:

   - **Nozzle lowering height**
     Incorrect height setting of the pick-and-place nozzle could result in over-pressure on the LED surface, further damaging the gold wire inside the LED during the SMT process.

   - **Proper nozzle selection**
     Please choose a nozzle with an outer diameter larger than the optical window of the LED to avoid the directly touching or pressing on the encapsulant resin of function area.
     Please refer to the images below:

Outer diameter of the nozzle must be larger than the optical window

Picture 1 (√)　　Picture 2 (X)

2. Do not apply pressure to the reflector and the encapsulant resin of the LED under high temperature.
3. Avoid scratching or wiping the LED surfaces to cause damages.

LEDs should be used immediately after taken out of the original packaging. We strongly recommend to seal and store the rest LEDs in the moisture-proof and anti-static packaging.

Disclaimer

1. Brightek reserves the right to adjust the material composition of the product to meet specification.
2. Within one year from the date of shipment, this product is guaranteed to comply with its specification published by Brightek.
3. The characterization figures shown in this data sheet are based on typical performance, which is not a guarantee to every piece of the products.
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