BRIGHTEK

BRIGHTEK (EUROPE) LIMITED

Brighten Up The World With LED !

ISO/TS 16949:2009 BS EN ISO 14001:2004 QC 080000 IECQ HSPM

PRODUCT DATASHEET

- PLCC Side View SMD with IC (6-Pins)
- 4516ICSV 1.6t Series
- Red/Green/Blue

Release Date: 08 September 2024 Version: A1.0

N0M67S07ICSV

4516 IC Integrated

4516 IC-Integrated

RoHS Compliant

FEATURES:

- **Package:** PLCC Side View EIA STD LED with Integrated IC
- **Forward Current:** 20mA/Channel
- **Forward Voltage (typ.):** +4.5~+5.5V * in order of R/G/B
- **Luminous Intensity (typ.):** 750/1450/240mcd*
- **Mixed White Intensity (typ.):** 2050mcd
- **Colour:** Red/Green/Blue
- **Dominant Wavelength:** 622/520/467nm
- **Viewing angle:** 120°
- **Materials:**
  - Resin: Silicone (White Diffused)
- **Operating Temperature:** -40~+85°C
- **Storage Temperature:** -40~+105°C
- **IC Feature:**
  One Pixel contains R, G, and B colour each can achieve 256 level brightness greyscales, which form 16,777,216 combination colours. Serial data transmission signal by DATA & CLK two lines. Support sleep/wake-up mode. In sleep mode current lower than 5μA.
- **Soldering methods:** IR Reflow soldering
- **Preconditioning:** acc. to JEDEC Level 3
- **Packing:** 12mm tape with max.2000pcs/reel, ø180mm (7'')

APPLICATIONS:

- Telecommunication
- Home Appliance
- Decoration Lighting
- Full Colour LED Strip
- Gaming Device
- Curtain LED Display

Support sleep/wake up mode. In sleep mode the LED's current was lower than 5μA

CHARACTERISTICS:

Absolute Maximum Characteristics (T_a=25°C)

Parameter	Symbol	Ratings	Unit
IC Power Supply Voltage	V_{DD}	Max. 6.5	V
Rate of Data Signal	F_{CLK}	15	MHz
Max. LED Output Current	I_{OMAX}	20/channel	mA
Power Dissipation	P_D	Max. 400	mW
Operating Temperature	T_{OPR}	-40~+85	°C
Storage Temperature	T_{STG}	-40~+105	°C
Electrostatic Discharge (HBM)	ESD	6000	V
Soldering Temperature (for max. 10s)	T_{SD}	260	°C

Electrical & Optical Characteristics (T_a=25°C)

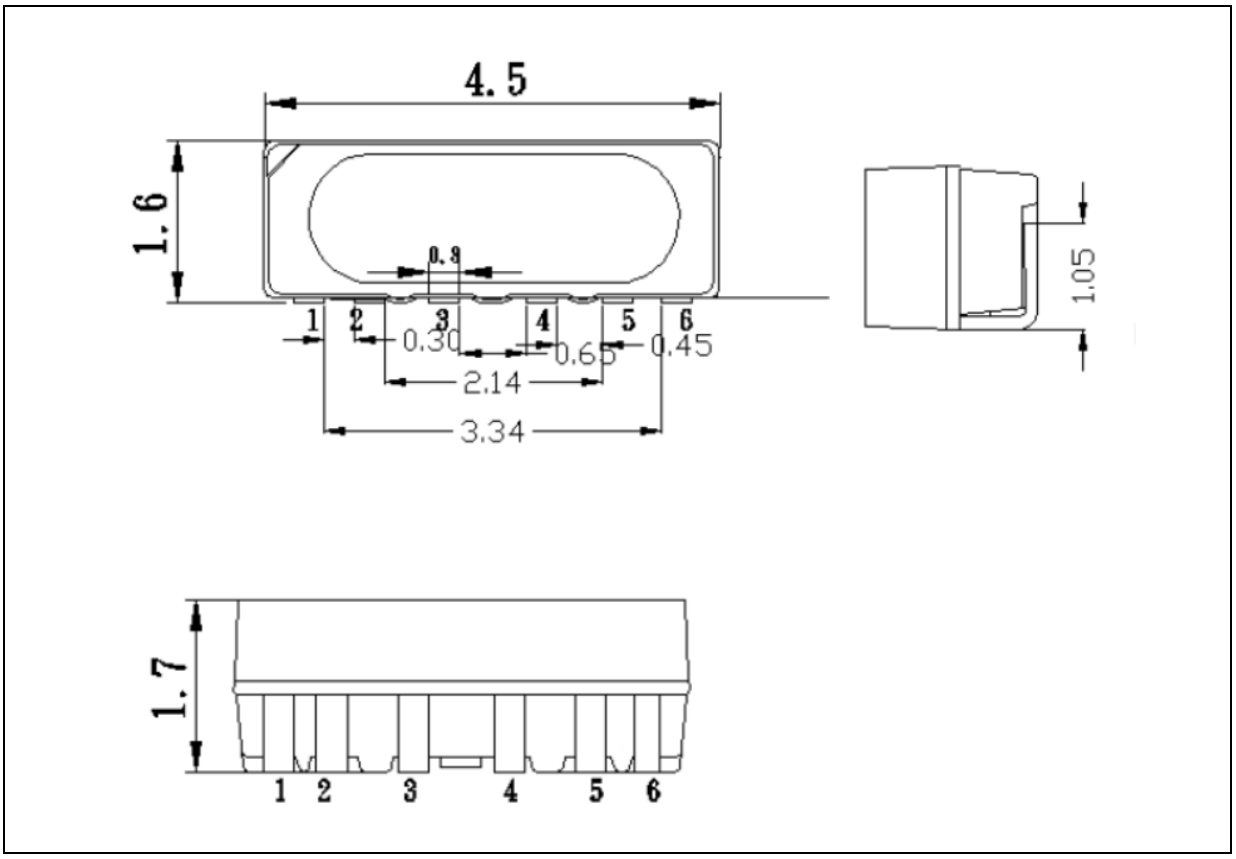
Parameter		Symbol	Values			Unit	Test Condition
			Min.	Typ.	Max.		
Luminous Intensity	R	I_V	---	750	---	mcd	I_F=20mA
	G		---	1450	---		
	B		---	240	---		
Mixed White Intensity	W	I_V	---	2050	---	mcd	---
Forward Voltage		V_F	4.5	---	5.5	V	I_F=20mA
Dominant Wavelength	R	λ_d	615	---	630	nm	I_F=20mA
	G		515	---	525		
	B		460	---	475		
Colour Coordinate	X	---	---	0.2661	---	---	I_F=20mA
	Y		---	0.2846	---		
Viewing Angle		$2\theta_{1/2}$	---	120	---	deg	I_F=20mA

Electrical & Optical Characteristics (T_a=25°C, V_{DD}=5V)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	4.5	5.0	5.5	V	---
Input Voltage Level	V_{IH}	2.7	---	V_{DD}+0.4	V	---
	V_{IL}	-0.4	---	1.0	V	
Clock High Level Width	T_{CLKH}	30	---	---	ns	---
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)	I_{DD}	---	---	2	mA	I_{out}=OFF
Static Current	I_{sleep}	---	---	5	μA	Sleep Mode
Rate of Data Signal	F_{CLK}	1	---	15	MHz	---

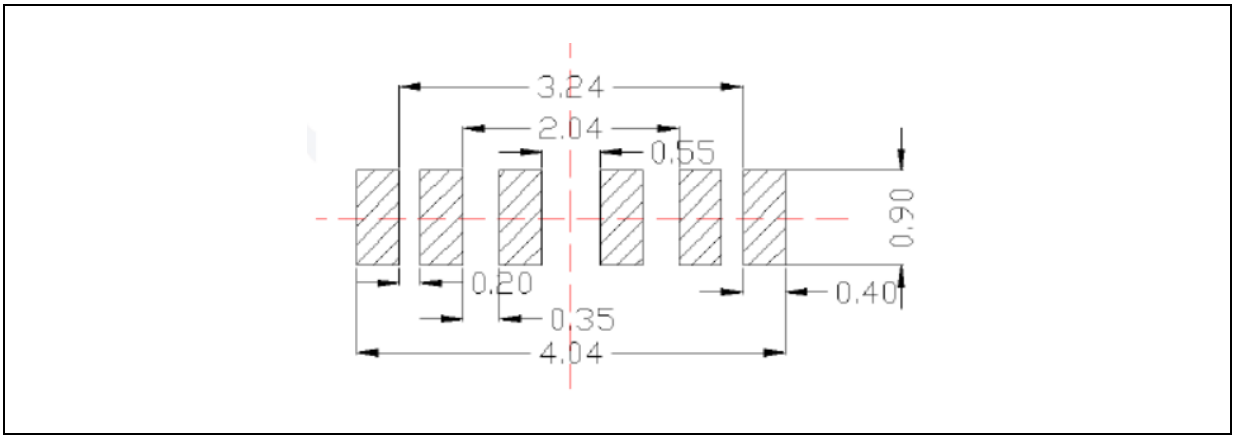
OUTLINE DIMENSION:

Package Dimension:



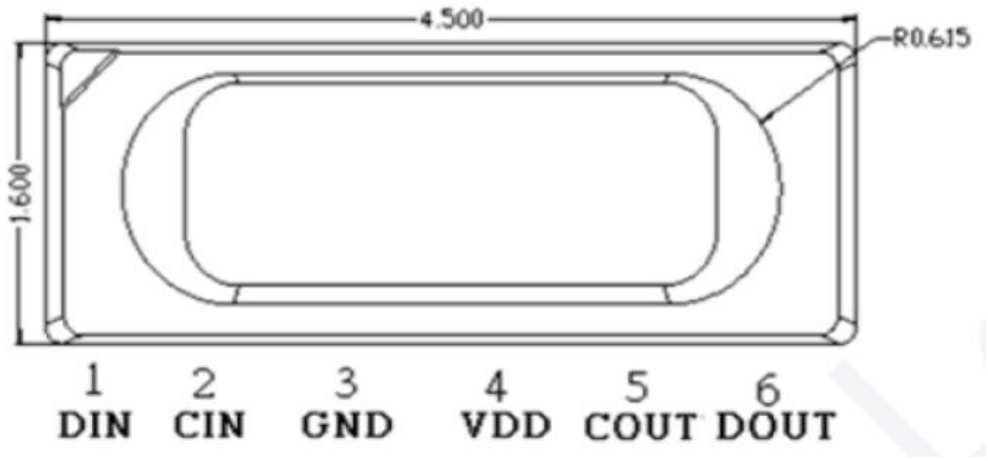
1. All dimensions are in millimetre (mm).
2. Tolerance ±0.1mm, unless otherwise noted.

Recommended Soldering Pad Dimension:



1. Dimensions are in millimetre (mm).
2. Tolerance ±0.1mm with angle tolerance ±0.5°.

PIN CONFIGURATION:



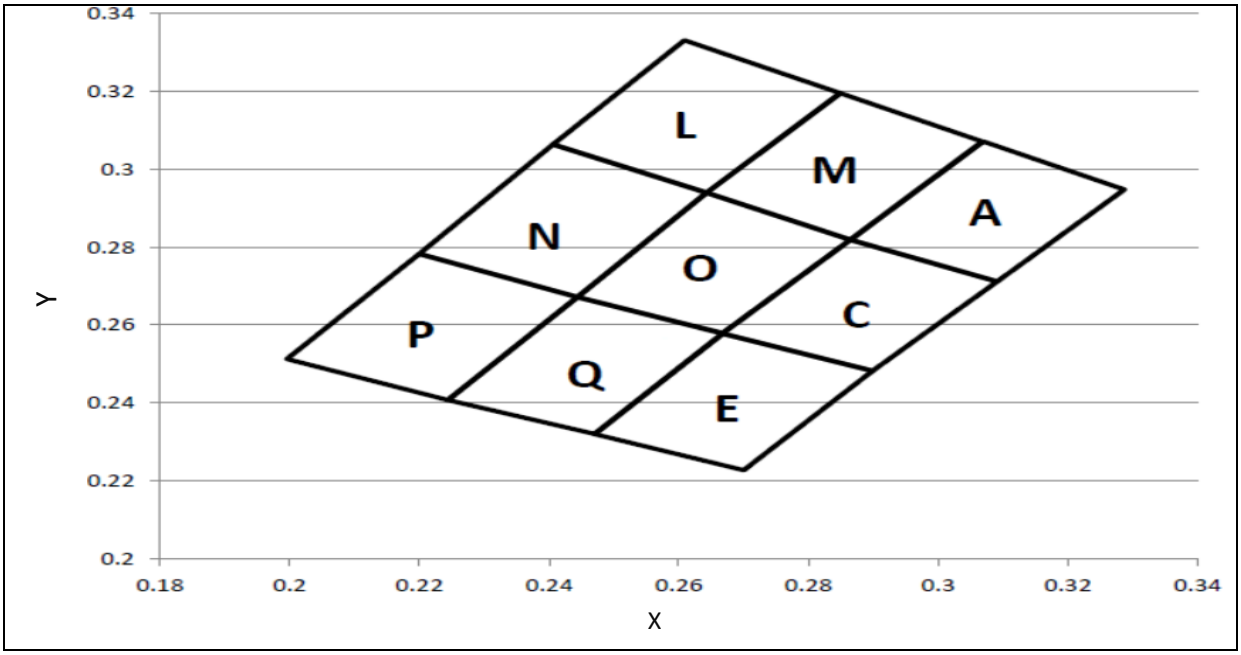
No.	Symbol	Function Description
1	DIN	Data Input
2	CIN	Clock Input
3	GND	Ground
4	VDD	Supply Voltage
5	COUT	Clock Output
6	DOUT	Data Output

BINNING GROUPS:

Luminous Intensity Classifications (V_{DD}=5V, I_F=20mA*3):

Code	Min.	Max.	Unit
16	1300	1700	mcd
17	1700	2200	
18	2200	2800	

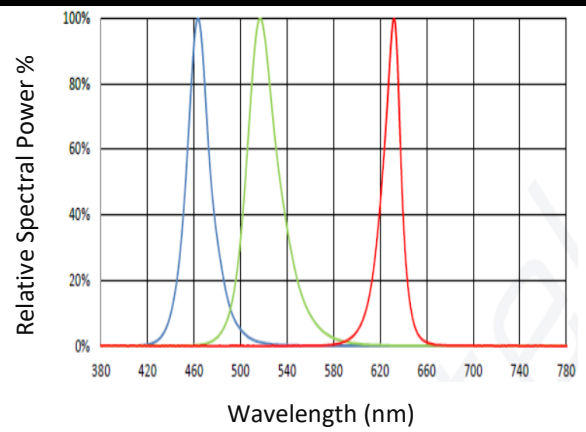
Chromaticity Coordinate Classifications (V_{DD}=5V, I_F=20mA*3):



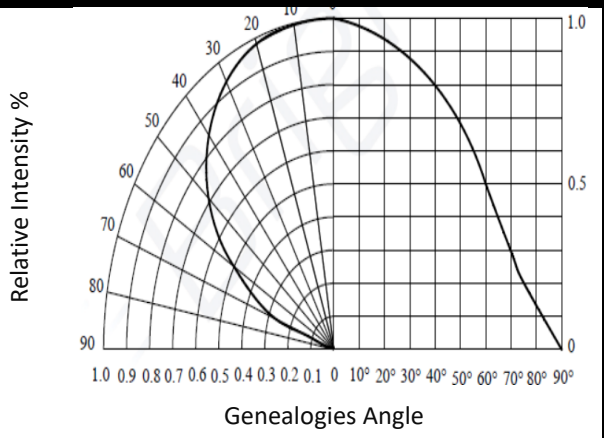
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
L	0.2406	0.3064	0.2609	0.3332	0.2849	0.3196	0.2643	0.2940
M	0.2643	0.2940	0.2849	0.3196	0.3068	0.3072	0.2865	0.2819
N	0.2200	0.2783	0.2406	0.3064	0.2643	0.2940	0.2444	0.2672
O	0.2444	0.2672	0.2643	0.2940	0.2865	0.2819	0.2667	0.2578
P	0.2200	0.2783	0.1996	0.2513	0.2244	0.2407	0.2444	0.2672
Q	0.2444	0.2672	0.2244	0.2407	0.2471	0.2320	0.2669	0.2579
A	.3070	0.3072	0.3287	0.2948	0.3091	0.2712	0.2865	0.2819
C	0.2865	0.2819	0.3091	0.2712	0.2899	0.2482	0.2667	0.2578
E	0.2667	0.2578	0.2899	0.2482	0.2700	0.2227	0.2470	0.2320

ELECTRO-OPTICAL CHARACTERISTICS:

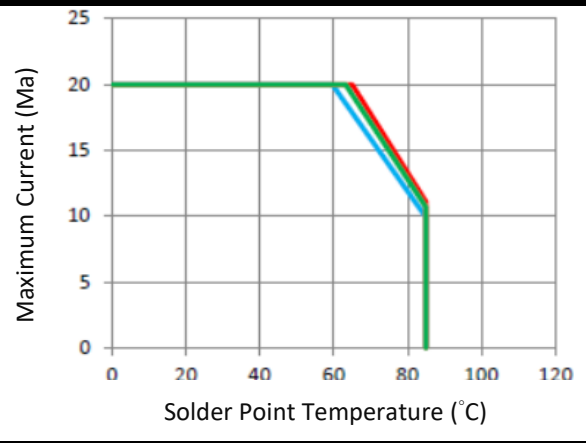
Relative Spectral Power v.s. Wavelength



Directive Radiation

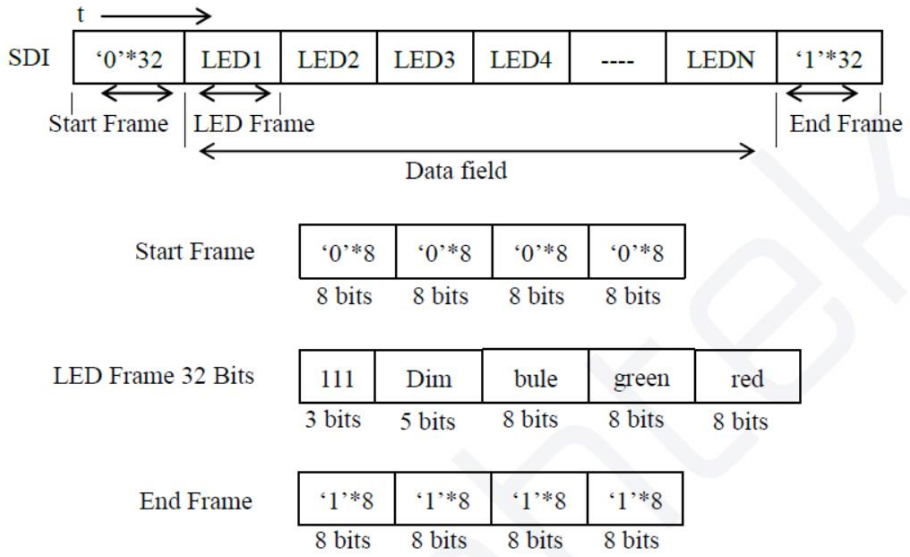


Thermal Design for De-Rating



Function Description:

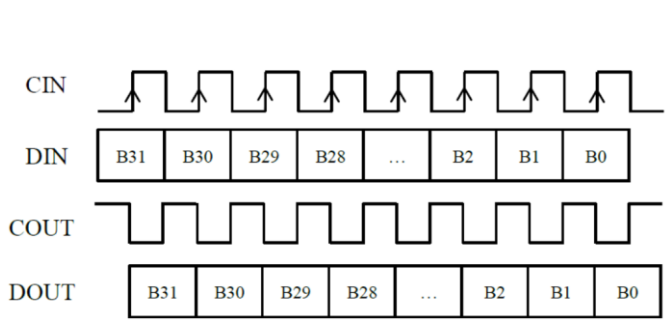
1. Tandem N-LED:



2. Dim 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 signal relations, IC receives data at rising edge of CLK:

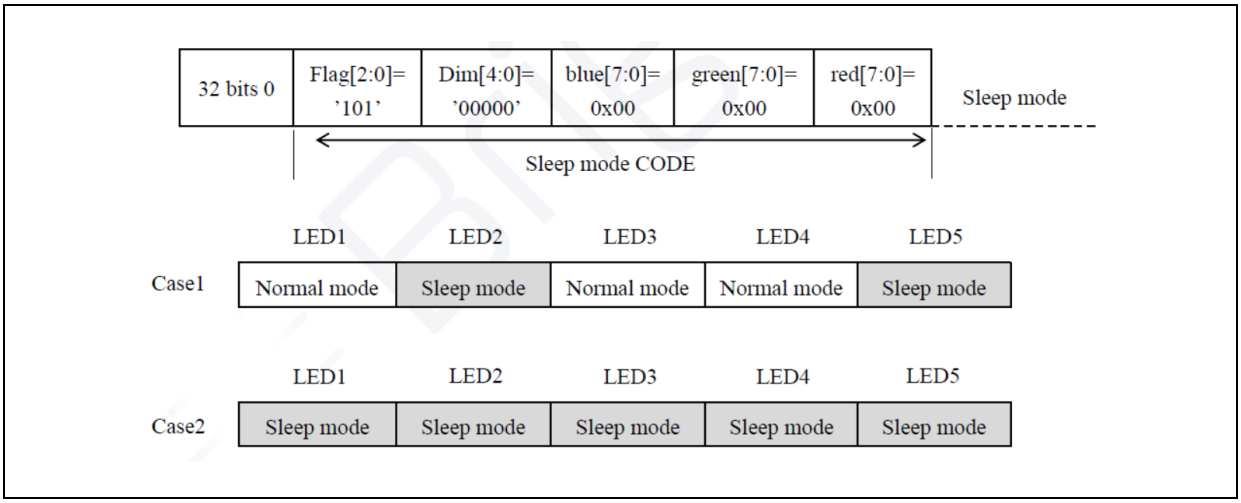


Data MSB--	Duty Cycle
00000000	0/255(min)
00000001	1/255
00000010	2/255
……	
11111101	253/255
11111110	254/255
11111111	255/255(max)

4. Sleep and power saving mode:

LED supports sleep/wake-up modes for power-saving purposes. After the IC receives 24-bit 0's BGR data (that is B[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.

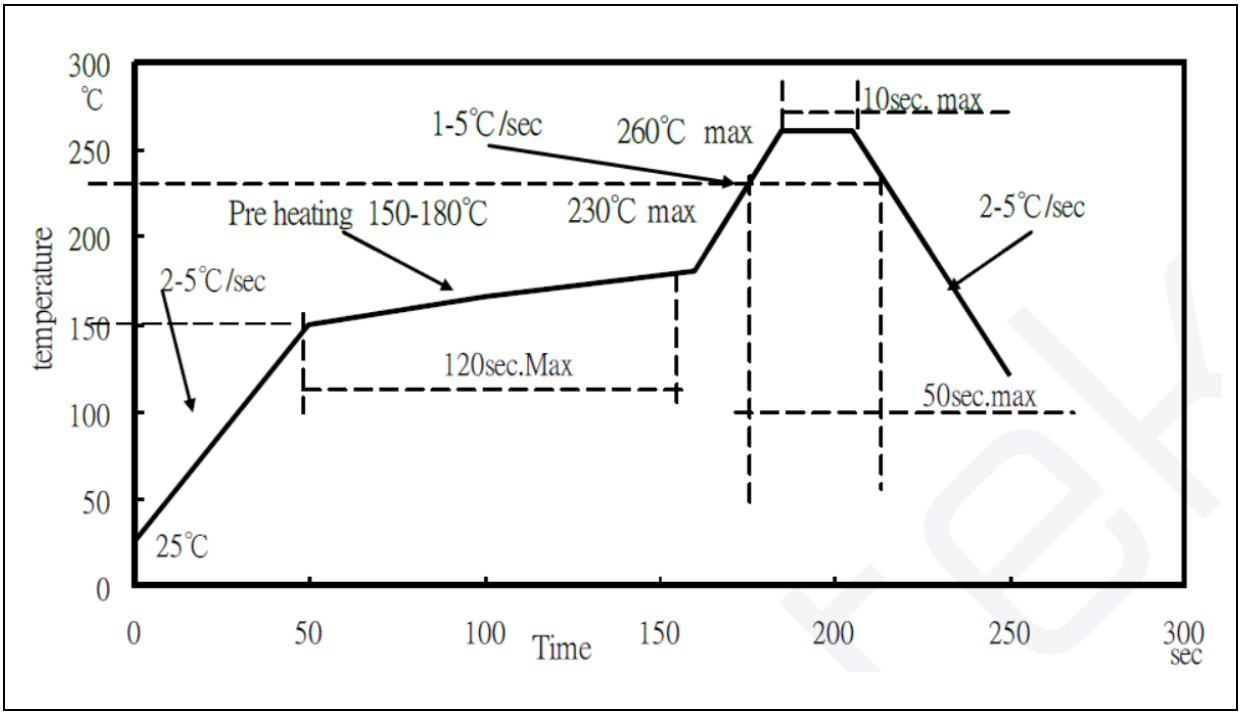
The IC will wake up from sleep mode once receiving the new data with the data of Flag[2:0], DIMMING [4:0] is not 8h"A0"; after wake-up, all sleeping circuits in IC return to normal working mode within 1ms. Since it takes 1ms for a sleeping IC to return to normal function mode, it is recommended for a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

RECOMMENDED SOLDERING PROFILE:

Lead-free Solder IR Reflow:



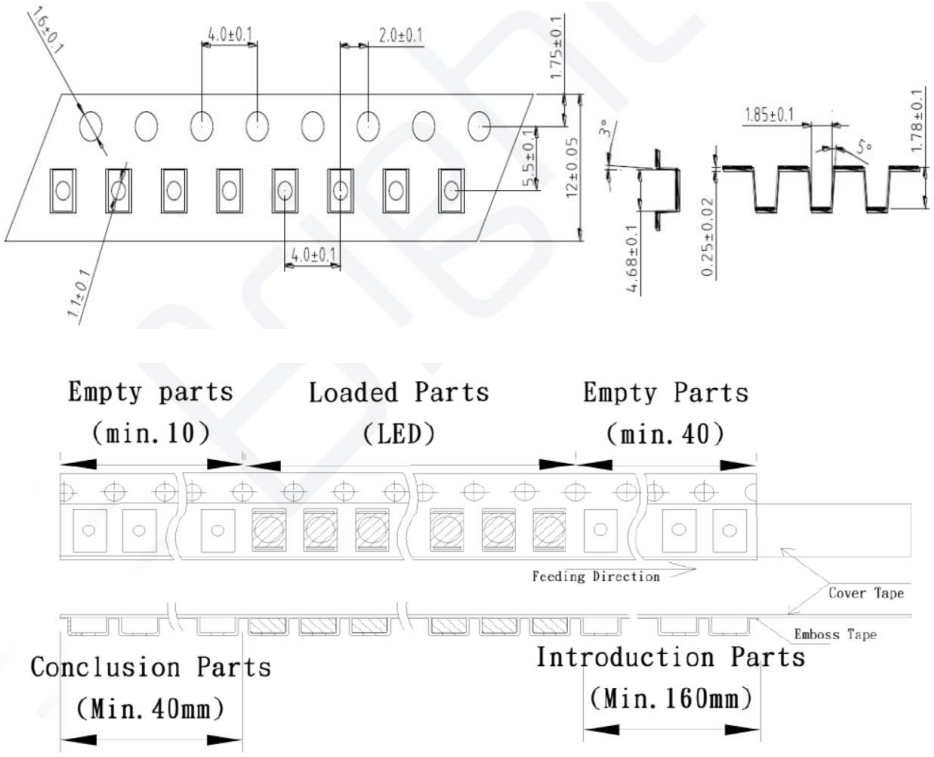
Note:

1. We recommend the reflow temperature 240°C (±5°C). The maximum soldering temperature should be limited to 260°C.
2. Maximum reflow soldering: 1 time.
3. Before, during, and after soldering, should not apply stress on the components and PCB board.

PACKING SPECIFICATION:

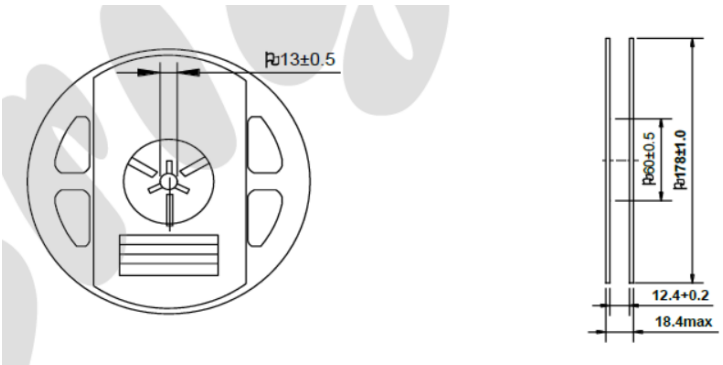
Reel Dimension:

Max.2000pcs/reel



Notes:

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



PRECAUTIONS OF USE:

Storage:

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

- Humidity: 60% R.H. Max.
- Temperature: 5°C~30°C (41°F ~86°F).

Shelf life in sealed bag: 12 months at 5°C~30°C and <60% R.H.

Once the package is opened, the products should be used within 4 weeks. Otherwise, they should be kept in a damp-proof box with descanting agent <10% R.H. and apply baking.

Over-Current Proof:

Must apply resistors for protection otherwise slight voltage shift will cause big current change and burn-out will happen.

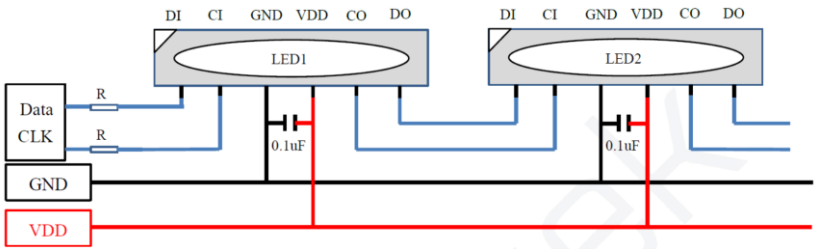
Baking:

It is recommended to bake the LED before soldering if the pack has been unsealed for longer than 24hrs. The suggested baking conditions are as followings:

- 60±3°C x 6hrs and <5%RH, taped / reel package.

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

Testing Circuit:



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 300R. In order to make the LEDs work more stably, a parallel capacitor is needed between VDD and GND of each.

Cleaning:

Use alcohol-based cleaning solvents such as isopropyl alcohol to clean the LED carrier / package. Avoid putting any stress force directly on to the LED lens.

ESD (Electrostatic Discharge):

Static Electricity or power surge will damage the LED. Use of a conductive wrist band or anti-electrosatic glove is recommended when handing the LED all time. All devices, equipment, machinery, work tables, and storage racks must be properly grounded.

REVISION RECORD:

Version	Date	Summary of Revision
A1.0	08/09/2024	Datasheet set-up.