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

ATTENTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

- PLCC6 SMD with IC
- 3535IC 1.47t Series
- Red/Green/Blue

Release Date: 11 August 2024 Version: A1.2

N0M50S15IC

Sleep Mode

3535 IC Integrated

3535 IC-Integrated

RoHS Compliant

AUTOMOTIVE AEC-Q102

FEATURES:

- **Package:** PLCC6 EIA STD Package with Integrated IC Sleep Mode Type 102
- **Forward Current:** 20mA
- **Forward Voltage (typ.):** +4.5~+5.5V
- **Luminous Intensity (typ.):** 2500mcd mixed white
- **Colour:** Red/Green/Blue
- **Dominant Wavelength:** 622/527/467nm
- **Viewing Angle:** 120°
- **Materials:**
  - Resin: Silicone (White Diffused)
- **Operating Temperature:** -40~+105°C
- **Storage Temperature:** -40~+105°C
- **IC Feature:** Serial data transmission signal by DATA & CLK two lines. Supports sleep/wake-up mode. In sleep mode, the LED's current was lower than 5μA.
- **Pixel:** One pixel contains R, G, and B colour that each can achieve 256 level brightness grayscales, which forms 16,777,216 combination colours.
- **Soldering Methods:** IR Reflow soldering
- **MSL Level:** acc. to JEDEC Level 3
- **Packing:** 12mm tape with max.1300pcs/reel, ø180mm (7'')

APPLICATIONS:

- Telecommunication
- Automotive Interior light
- Home Appliance
- Decoration Lighting
- Full Colour LED Strip
- Gaming Device

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

CHARACTERISTICS:

Absolute Maximum Characteristics (Ta=25°C)

Parameter	Symbol	Ratings	Unit
IC Power Supply Voltage	V_{DD}	Max. 6.5	V
LED Voltage	VLED	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	Max. 400	mW
Operating Temperature	T_{OPR}	-40~+105	°C
Storage Temperature	T_{STG}	-40~+105	°C
Soldering Temperature	T_{SD}	260	°C

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

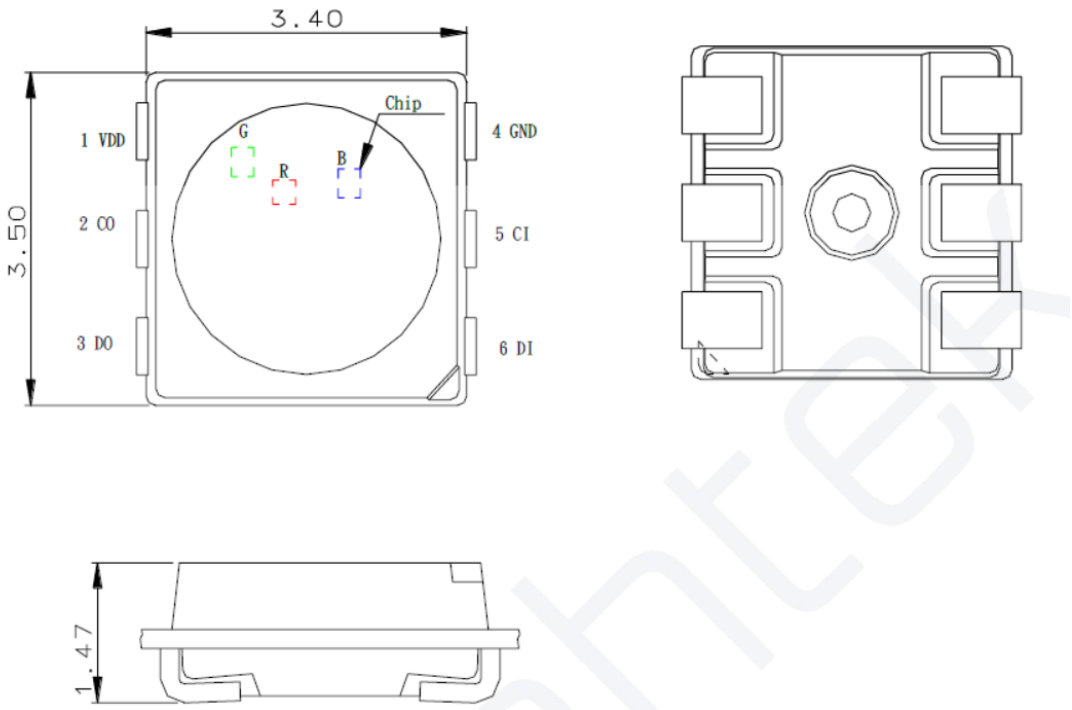
Parameter		Symbol	Values			Unit	Test Condition
			Min.	Typ.	Max.		
Forward Voltage		V_F	4.5	5.0	5.5	V	I_F=20mA
Luminous Intensity	R	I_V	---	550	---	mcd	I_F=20mA
	G		---	1700	---		
	B		---	300	---		
Mix White	W		---	2500	---		
Dominant Wavelength	R	λ_d	615	---	630	nm	I_F=20mA
	G		520	---	535		
	B		460	---	475		
Colour Coordinate	X	---	---	0.2500	---	---	I_F=20mA
	Y		---	0.2500	---	---	
Viewing Angle		$2\theta_{1/2}$	---	120	---	deg	I_F=20mA

Electrical & Optical Characteristics (Ta=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
ESD Pressure (HBM)	V_{ESD}	---	2000	---	V	---

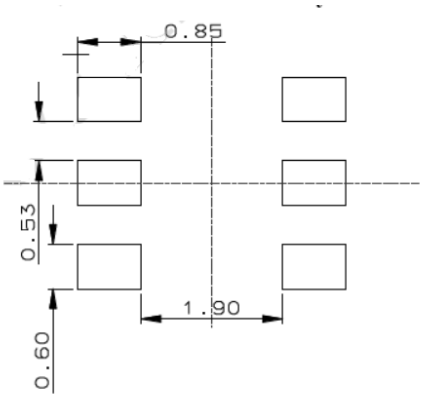
OUTLINE DIMENSION:

Package Dimension:



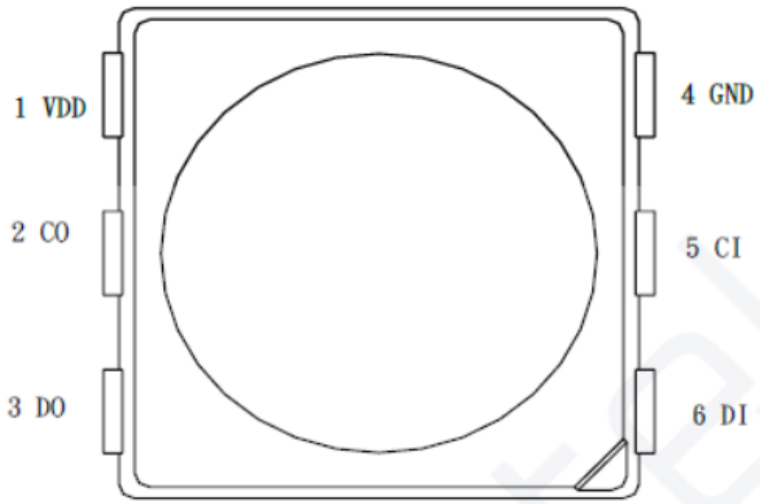
1. All dimensions are in millimetre (mm).
2. Tolerance ±0.2mm, unless otherwise noted.

Recommended Soldering Pad Dimension:



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

PIN CONFIGURATION:



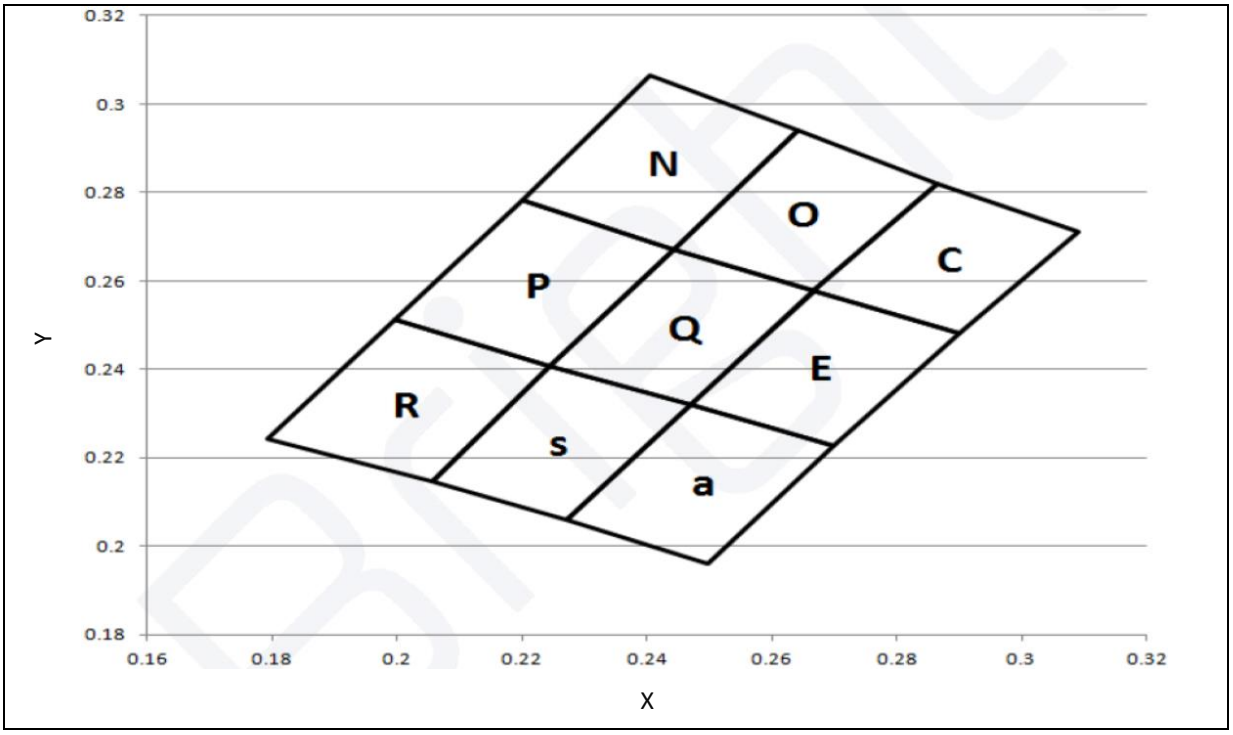
No.	Symbol	Function Description
1	VDD	Supply Voltage
2	CO	Clock Output
3	DO	Data Output
4	GND	Ground
5	CI	Clock Input
6	DI	Data Input

BINNING GROUPS:

Luminous Intensity Classifications (Mix White) (I_F = 20mA):

Code	Min.	Max.	Unit
16	1300	1700	mcd
17	1700	2200	
18	2200	2800	
19	2800	3600	
20	3600	4800	

CIE CHROMATICITY DIAGRAM:

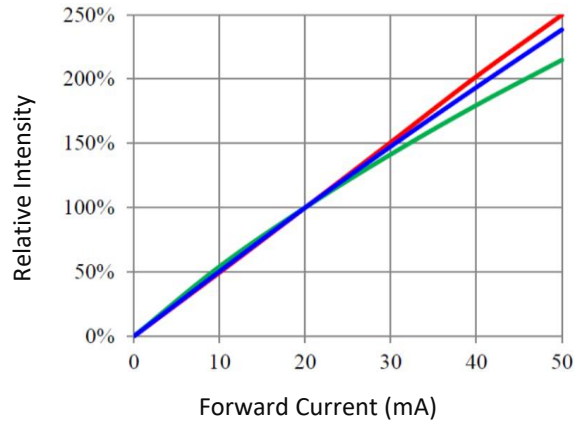


Chromaticity Coordinates Classifications (I_F = 20mA):

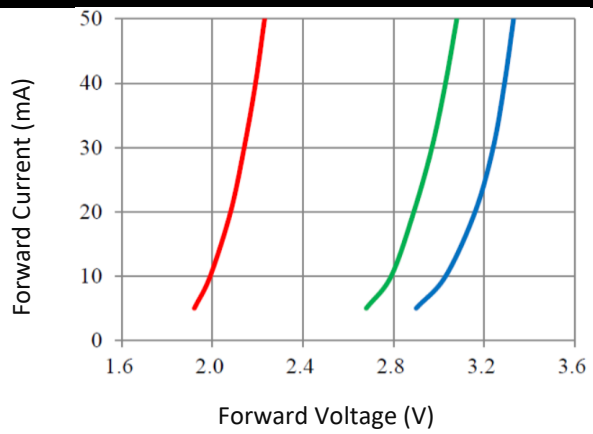
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
C	0.2865	0.2819	0.3091	0.2712	0.2899	0.2482	0.2667	0.2578
N	0.2200	0.2783	0.2406	0.3064	0.2643	0.2940	0.2444	0.2672
O	0.2444	0.2672	0.2643	0.2940	0.2865	0.2819	0.2667	0.2578
E	0.2667	0.2578	0.2899	0.2482	0.2700	0.2227	0.2470	0.2320
P	0.2200	0.2783	0.1996	0.2513	0.2244	0.2407	0.2444	0.2672
Q	0.2444	0.2672	0.2244	0.2407	0.2471	0.2320	0.2669	0.2579
R	0.1996	0.2513	0.1792	0.2243	0.2056	0.2148	0.2244	0.2407
s	0.2244	0.2407	0.2056	0.2148	0.2273	0.2061	0.2471	0.2320
a	0.2471	0.2320	0.2273	0.2061	0.2498	0.1959	0.2700	0.2227

ELECTRO-OPTICAL CHARACTERISTICS (Full PWM):

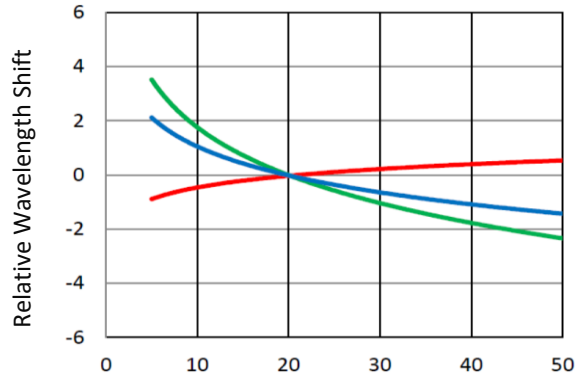
Relative Intensity v.s. Forward Current



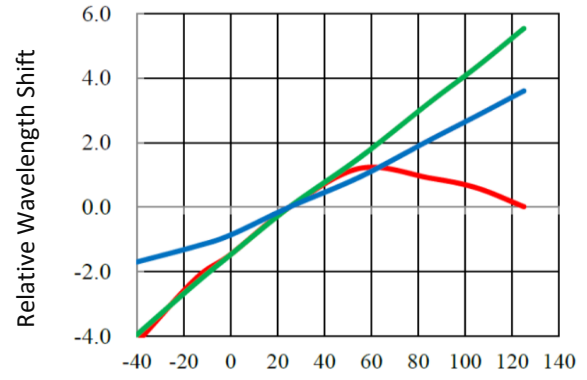
Directive Radiation



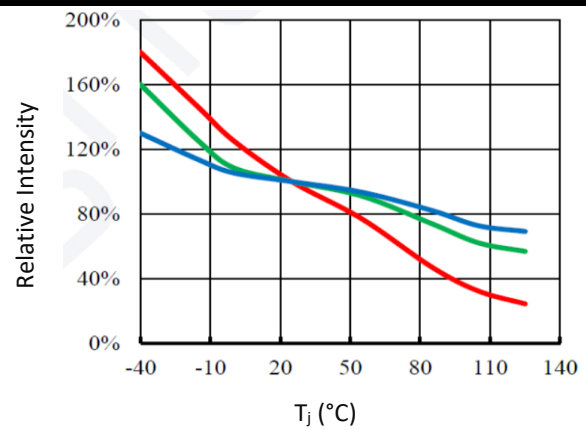
Wavelength Shift v.s. Forward Current



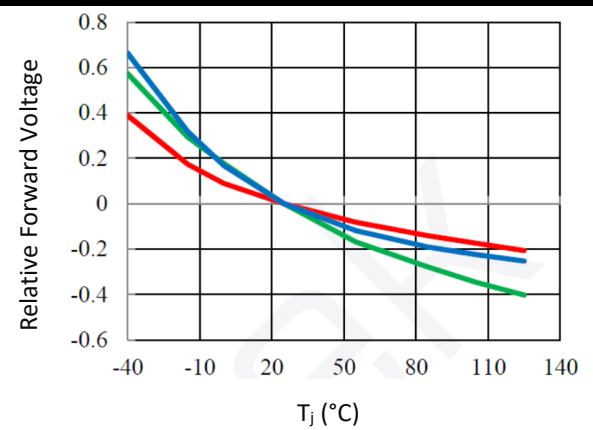
Wavelength Shift v.s. Temperature



Relative Intensity v.s. Temperature



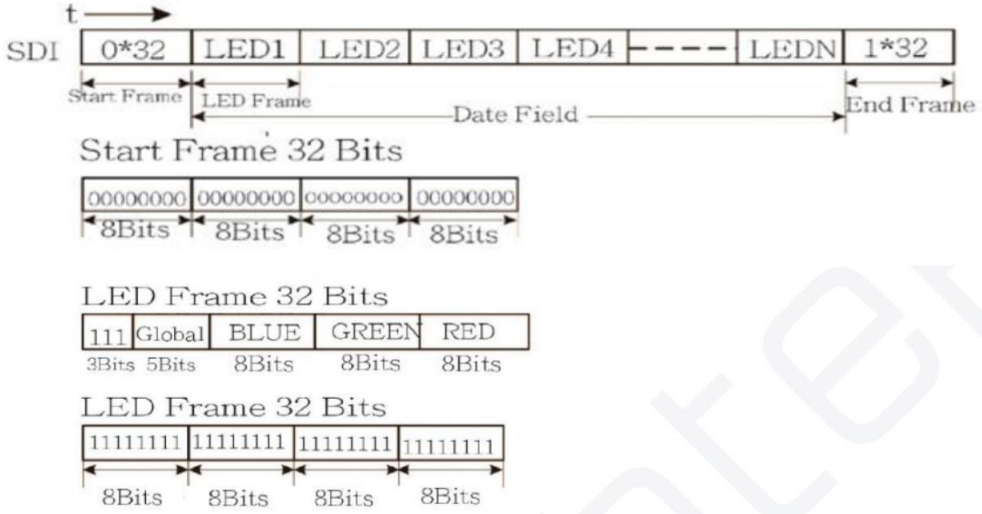
Relative Forward Voltage v.s. Temperature



Function Description:

1. Series data structure:

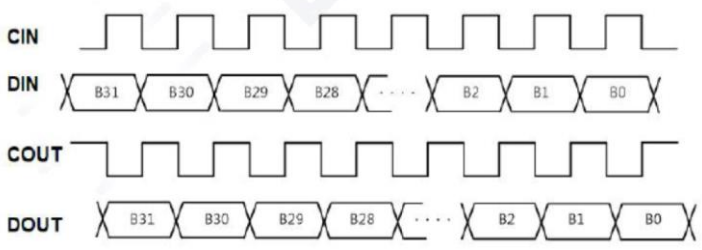
Tandem N-LED



2. 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:

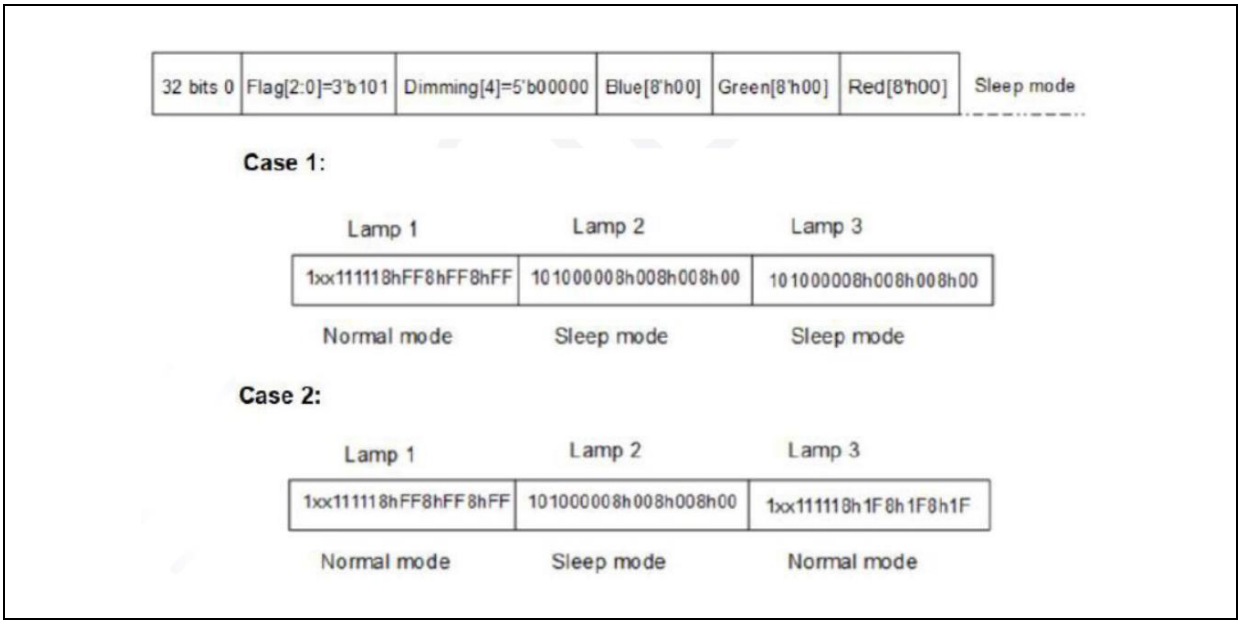


Data MSB—	Duty Cycle
00000000	0/256(min)
00000001	1/256
00000010	2/256
...	
11111101	253/256
11111110	254/256
11111111	255/256(max)

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.

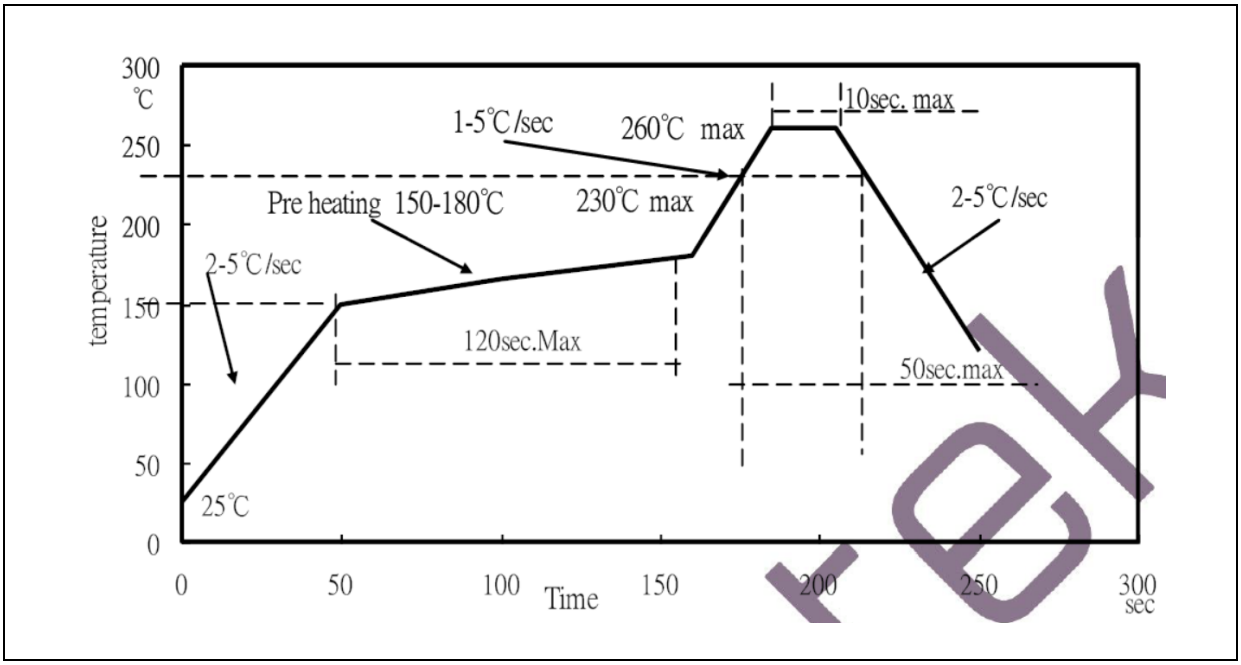
The IC will wake up from sleep mode once receiving the new data with the data of Flag[2:0], DIMMING [4:0] is not 8h"A0"; after wake-up, all sleeping circuits in IC return to normal working mode within1ms. Since it takes 1ms for a sleeping IC returning to normal function mode, it is recommended for a host to wait for 1ms to send display data and command after issuing a wake-up command



In case 2, 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:



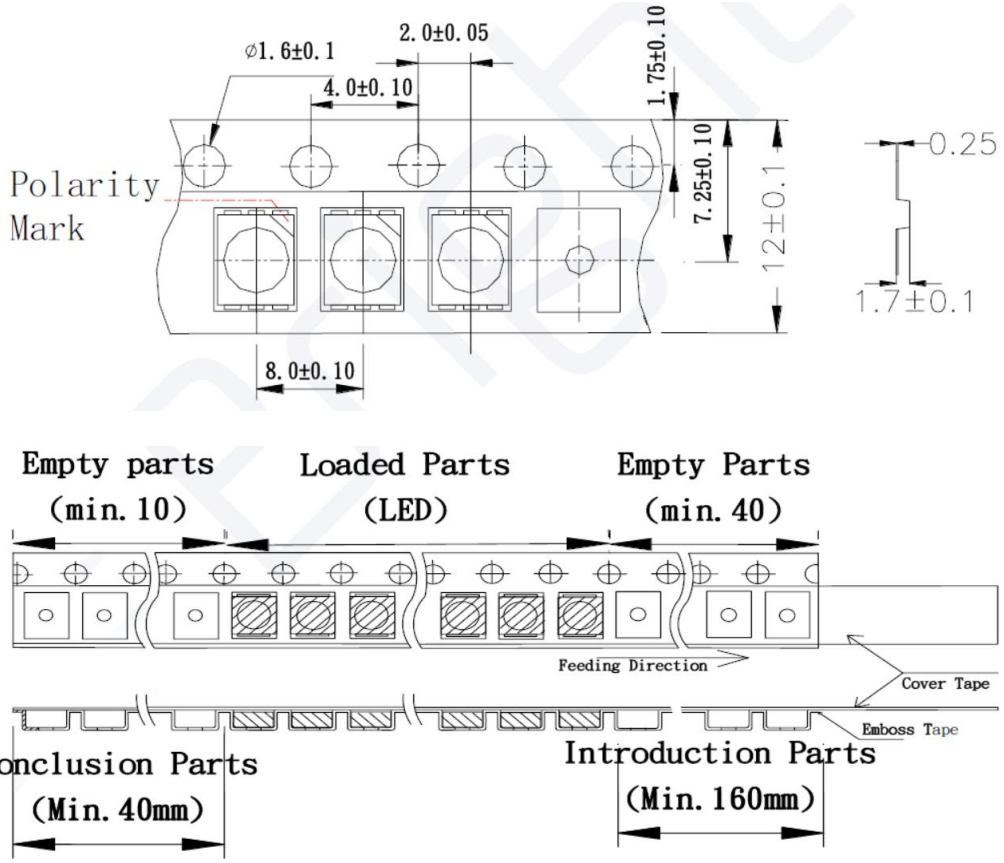
Note:

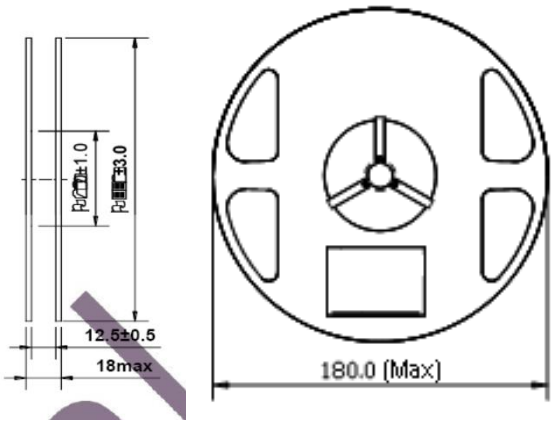
1. We recommend the reflow temperature 240°C (±5°C). The maximum soldering temperature should be limited to 260°C.
2. Maximum reflow soldering: 3 times.
3. Before, during, and after soldering, should not apply stress on the components and PCB board.

PACKING SPECIFICATION:

Reel Dimension:

Max.1300pcs/reel





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 a week. Otherwise, they should be kept in a damp-proof box with descanting agent stored at R.H.<20% and apply baking before use.

Over-Current Proof:

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

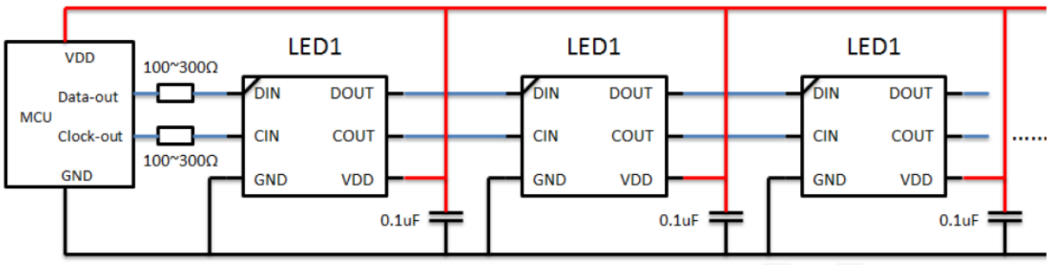
Baking:

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 300 R. 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	05/11/2019	Datasheet set-up.
A1.1	06/11/2019	Correct forward current (P.1).
A1.2	11/08/2024	Add characteristics curves.