



BRIGHTTEK
BRIGHTTEK (EUROPE) LIMITED

Brighten up The World With LED!



ISO/TS 16949:2009



BS EN ISO 14001:2004



QC 080000 IECQ HSPM

PRODUCT DATASHEET



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

NOM67S12IC



Sleep Mode



Release Date: 15 September 2024 Version: A1.1



3535 IC-Integrated

RoHS
Compliant



FEATURES:

- **Package:** PLCC6 STD Package with Integrated IC
- **Forward Current:** 12mA
- **Forward Voltage (typ.):** +4.5~+5.5V
- **Luminous Intensity (typ.):** 350/1200/270mcd*
- **Mixed White Luminous Intensity (typ.):** 1800mcd
- **Colour:** Red/Green/Blue
- **Dominant Wavelength (typ.):** 622/527/467nm
- **Viewing Angle:** 120°
- **Operating Temperature:** -40~+85°C
- **Storage Temperature:** -40~+105°C
- **IC Feature:** Serial data transmission signal by dual-wire DATA & CLK lines. One pixel contains R, G, and B colour that each can achieve 256 level brightness grayscales, which forms 16,777,216 combination colours. Support sleep/wake-up mode. In sleep mode, the LED current is lower than 5µA.
- **Soldering methods:** IR reflow soldering
- **MSL Level:** acc. to JEDEC J-STD-020E Level 5
- **Packing:** 12mm tape with max.1300pcs/reel, ø180mm (7")

* in order of Red/Green/Blue

APPLICATIONS:

- Telecommunication
- 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
Rate of Data Signal	F _{CLK}	15	MHz
Max. LED Output Current	I _{OMAX}	12/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) acc. To ANSI/ESDA/JEDEC JS-001	ESD	6000	V
Soldering Temperature (10s)	T _{SD}	245	°C

* in order of Red/Green/Blue

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	---	
Luminous Intensity	R	I _v	---	350	---	mcd	I _F =12mA
	G		---	1200	---		
	B		---	270	---		
Mix White	W		---	1800	---		
Dominant Wavelength	R	λ _d	615	---	630	nm	I _F =12mA
	G		520	---	535		
	B		460	---	475		
Colour Coordinate	X	---	---	0.2850	---	---	I _F =12mA
	Y		---	0.2850	---		
Viewing Angle	2θ _{1/2}	---	120	---	deg	I _F =12mA	

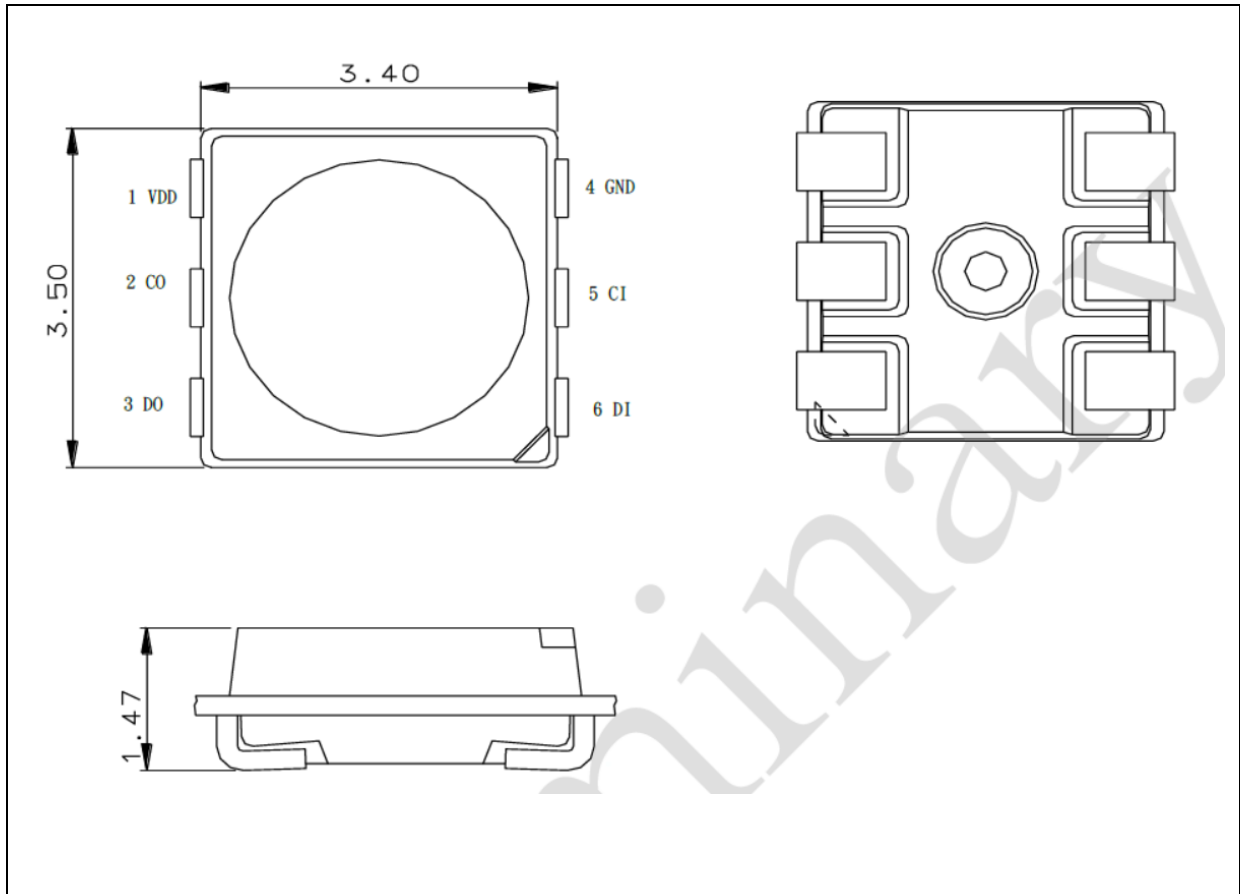
- Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
- 2θ_{1/2} is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
- The dominant wavelength, λ_d is derived from CIE chromaticity diagram and represents the single wavelength which defines the colour of the device. Peak Emission Wavelength Tolerance is ±1nm.

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

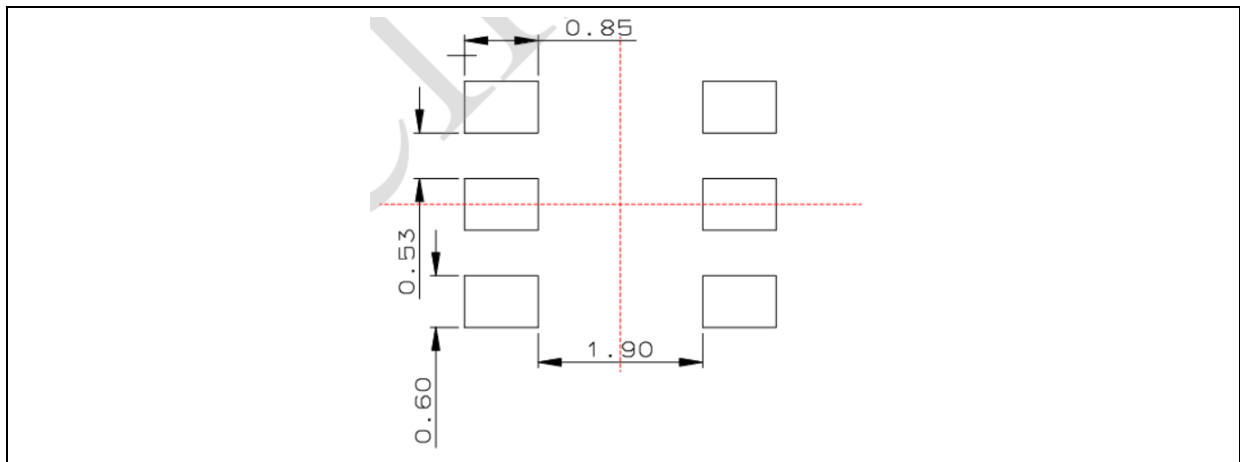
OUTLINE DIMENSION:

Package Dimension:



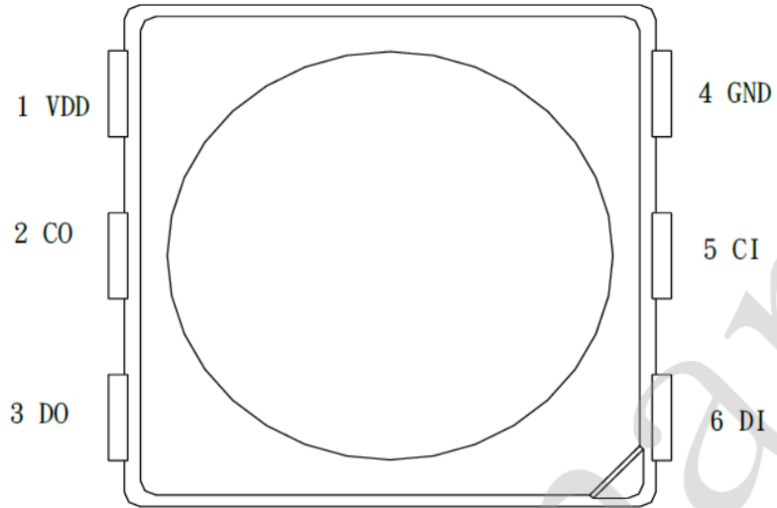
1. All dimensions are in millimetre (mm).
2. Tolerance $\pm 0.2\text{mm}$, unless otherwise noted.

Recommended Soldering Pad Dimension:



1. Dimensions are in millimetre (mm).
2. Tolerance $\pm 0.1\text{mm}$ with angle tolerance $\pm 0.5^\circ$.

PIN CONFIGURATION:



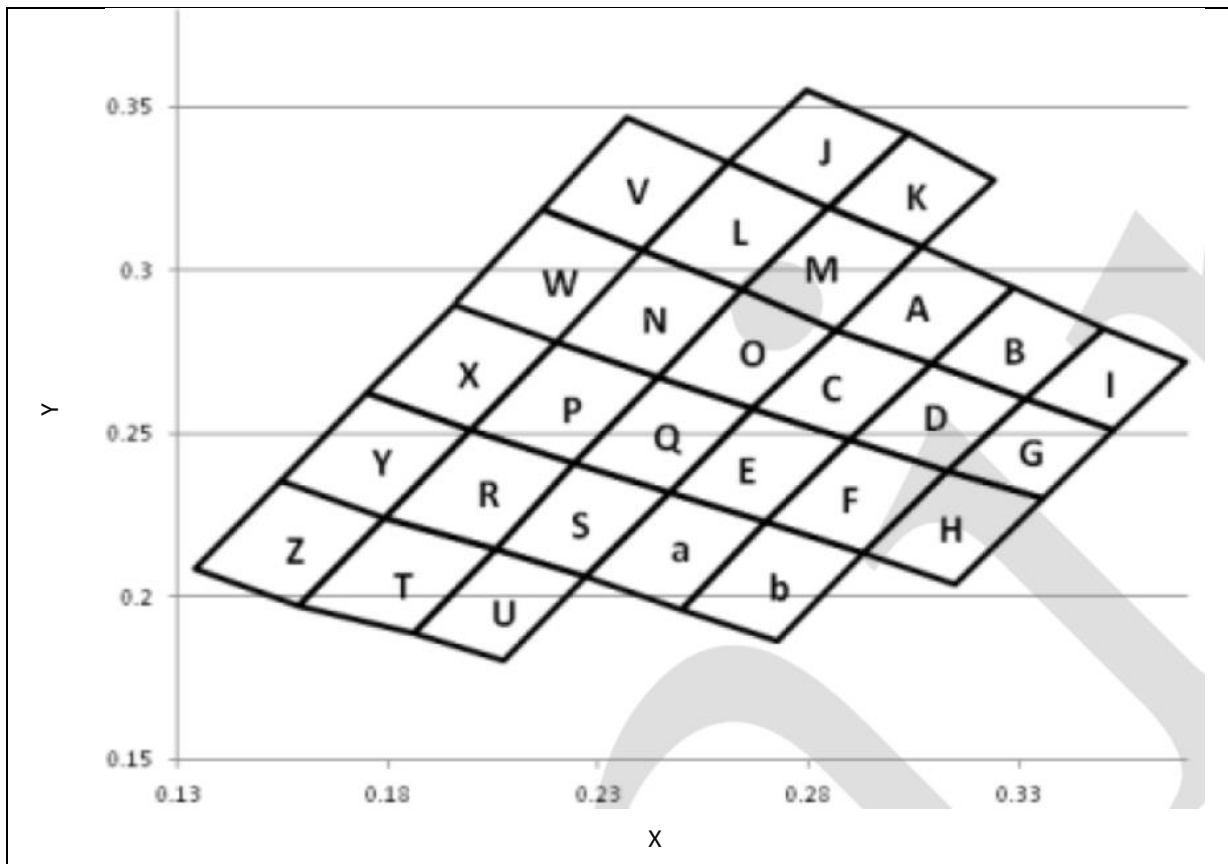
No.	Symbol	Function Description
1	VDD	Supply Voltage
2	CO	Clock Output
3	DO	Data Output
4	GND	Ground
5	CI	Clock Input
6	DI	Data Input

BINNING GROUPS:

Luminous Intensity Classifications ($V_{DD}=5V$; $I_F=12mA*3$):

	Code	Min.	Max.	Unit
Mix White	15	1000	1300	mcd
	16	1300	1700	
	17	1700	2200	
	18	2200	2800	

Chromaticity Coordinate Classifications ($V_{DD}=5V$; $I_F=12mA$):



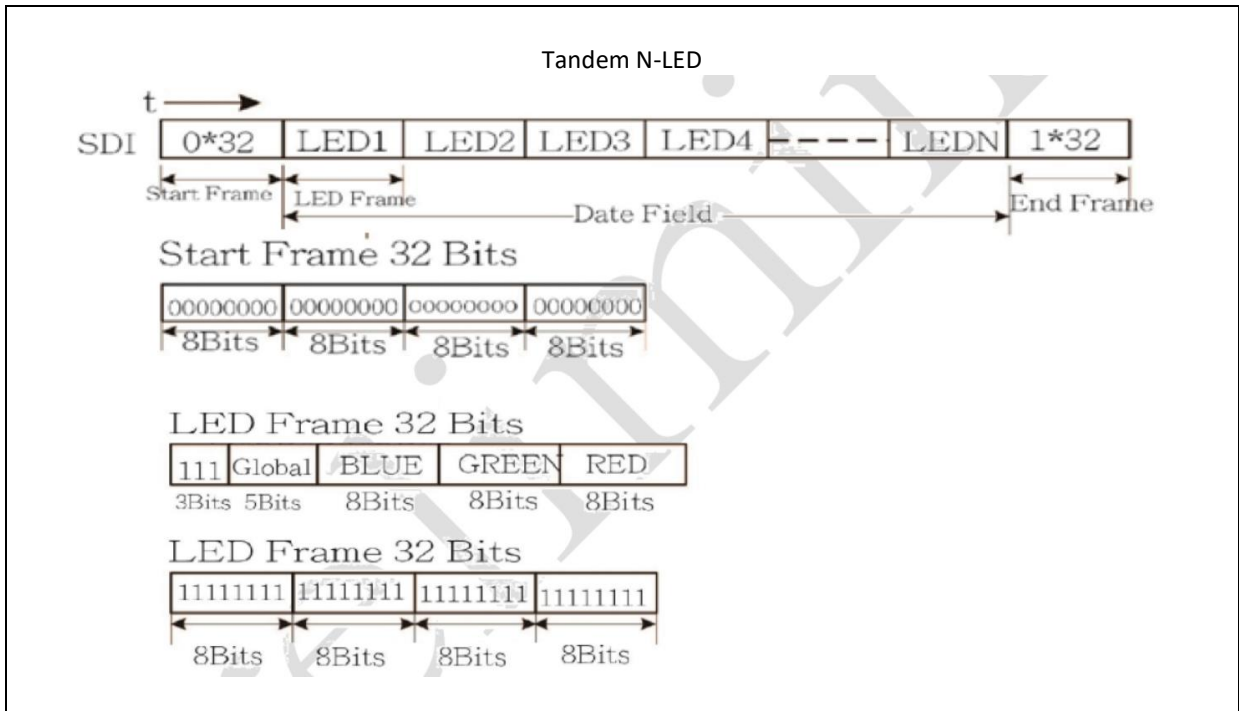
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
A	0.3070	0.3072	0.3287	0.2948	0.3091	0.2712	0.2865	0.2819
B	0.3287	0.2948	0.3504	0.2824	0.3318	0.2605	0.3091	0.2712
C	0.2865	0.2819	0.3091	0.2712	0.2899	0.2482	0.2667	0.2578
D	0.3091	0.2712	0.3318	0.2605	0.3132	0.2387	0.2899	0.2482



	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
E	0.2667	0.2578	0.2899	0.2482	0.2700	0.2227	0.2470	0.2320
F	0.2899	0.2482	0.3132	0.2387	0.2930	0.2134	0.2700	0.2227
G	0.3318	0.2605	0.3424	0.2513	0.3358	0.2299	0.3132	0.2387
H	0.2930	0.2134	0.3132	0.2387	0.3358	0.2299	0.3150	0.2040
I	0.3318	0.2605	0.3504	0.2824	0.3695	0.2719	0.3524	0.2513
J	0.2609	0.3332	0.2797	0.3550	0.3036	0.3420	0.2849	0.3196
K	0.2851	0.3196	0.3036	0.3420	0.3243	0.3280	0.3068	0.3072
L	0.2406	0.3064	0.2609	0.3332	0.2849	0.3196	0.2643	0.3940
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
R	0.1996	0.2513	0.1792	0.2243	0.2056	0.2148	0.2244	0.2407
T	0.1792	0.2243	0.1588	0.1973	0.1862	0.1886	0.2056	0.2148
U	0.2056	0.2148	0.1862	0.1886	0.2075	0.1802	0.2273	0.2061
X	0.1960	0.2894	0.1752	0.2624	0.1996	0.2513	0.2200	0.2783
Y	0.1752	0.2624	0.1548	0.2354	0.1792	0.2243	0.1996	0.2513
Z	0.1548	0.2354	0.1344	0.2084	0.1588	0.1973	0.1792	0.2243
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
b	0.2700	0.2227	0.2498	0.1959	0.2728	0.1866	0.2930	0.2134
V	0.2169	0.3188	0.2369	0.3468	0.2609	0.3332	0.2406	0.3064
W	0.1963	0.2907	0.2169	0.3188	0.2406	0.3064	0.2200	0.2783

FUNCTION DESCRIPTION:

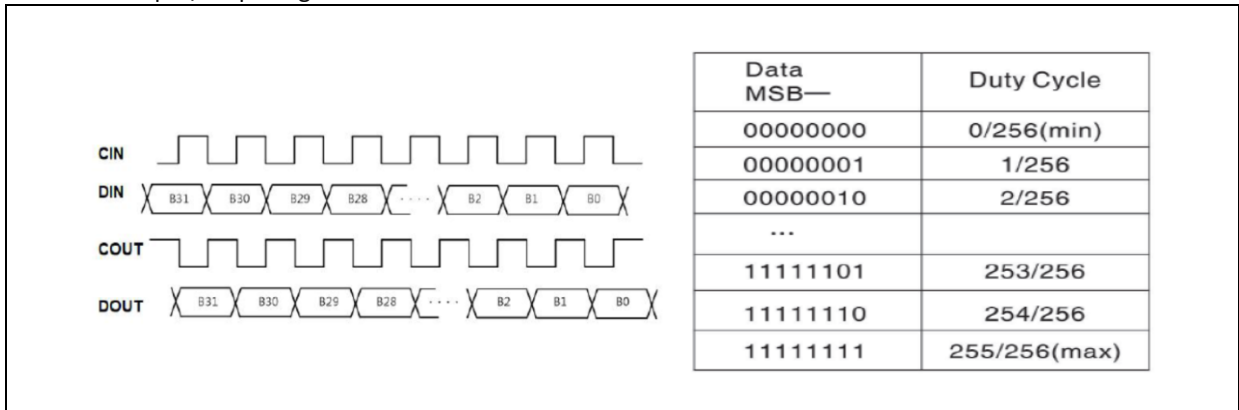
1. Series data structure:



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)

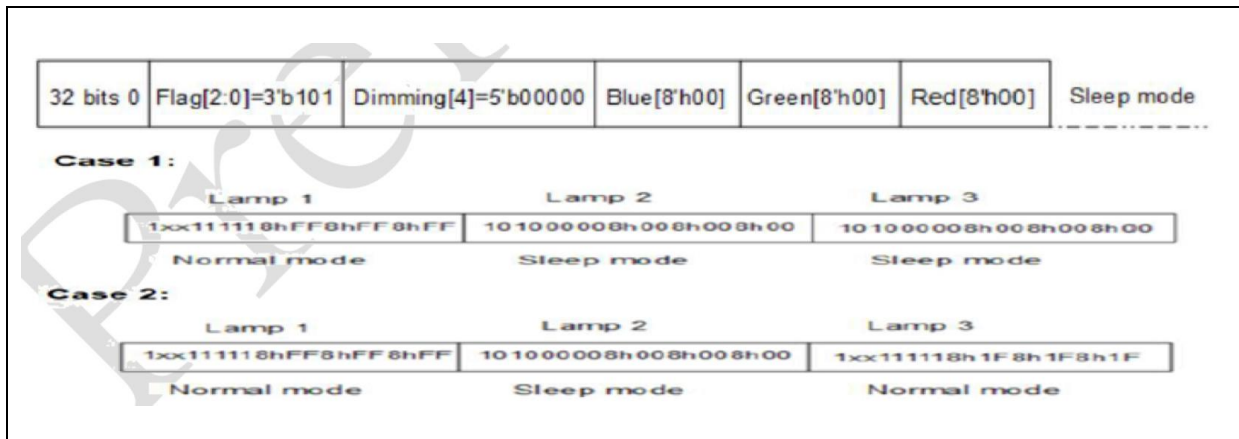
3. PWM input/output signal relations:



4. Sleep and power saving mode:

LED supports sleep/wake-up modes for power saving purposes. After the IC receives 24-bits 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 1μA.

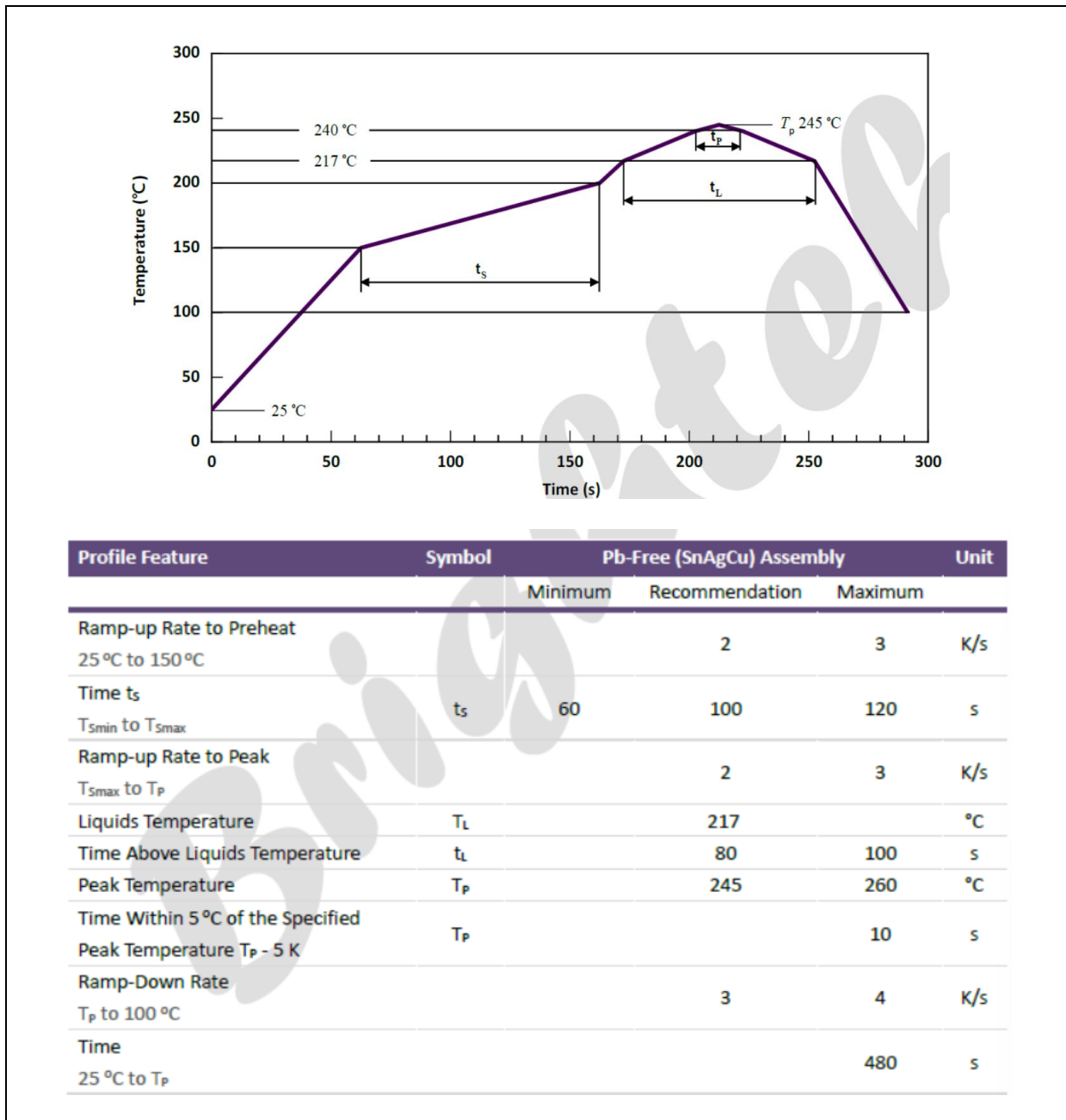
The IC will wake-up from sleep mode once receiving the new data with the data of FLAG[2:0], DIMMING[4:0] is not 8h'A0'; after wake-up, all sleeping circuits in IC return to normal working mode within 1ms. Since it takes 1ms for a sleeping IC to return to normal function mode, it is recommended for a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



In case 2, while lamp 2 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] and DIMMING[4:0] being 8h'A0'. It means lamp 2 will keep in sleep mode as well. In this situation, lamp 2 can pass through the remaining data to lamp 3 (32-bits) 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:

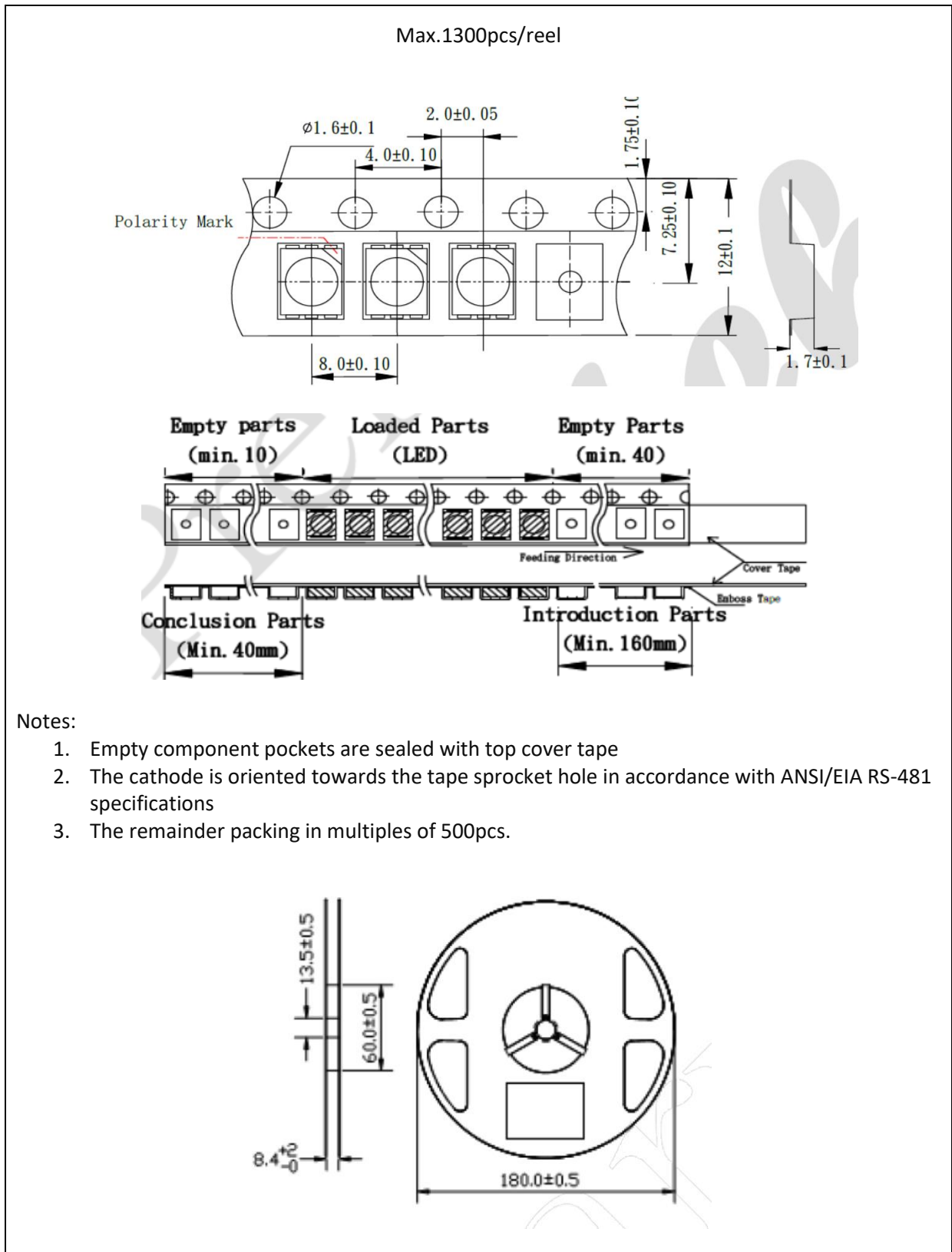


Note:

1. We recommend the reflow temperature 240°C (±5°C). The maximum soldering temperature should be limited to 245°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:



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 24 hours. Otherwise, they should be kept in a damp-proof box with desiccating agent stored at R.H.<10% 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.

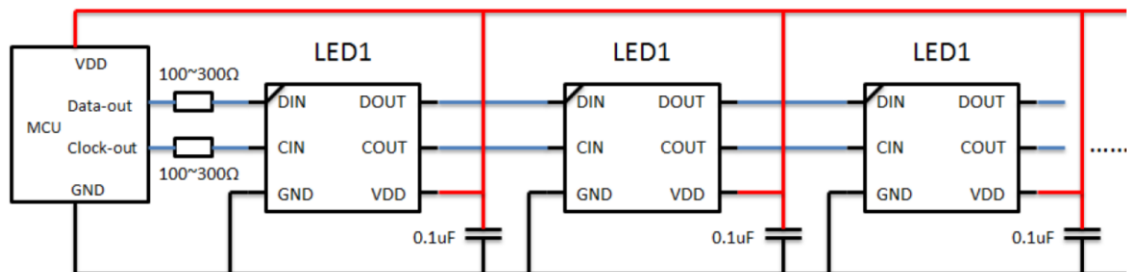
Baking:

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.

Typical Application Circuit:



Note:

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.

ESD (Electrostatic Discharge):

Static Electricity or power surge will damage the LED. Use of a conductive wrist band or anti-electrostatic glove is recommended when handling 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	15/09/2024	Datasheet set-up.