



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



- ▶ PLCC Side View SMD with IC
- ▶ 4516ICSV 1.6t Series
- ▶ Red/Green/Blue

NOM50S21ICSV



Sleep Mode



Release Date: 02 June 2022 Version: A1.1



4516 IC-Integrated

RoHS
Compliant



FEATURES:

- **Package:** PLCC Side View EIA STD Package with Integrated Sleep Mode IC Type 102
- **Forward Current:** 20mA
- **Forward Voltage (typ.):** +4.5~+5.5V
- **Luminous Intensity (typ.):** 1450mcd mixed white
- **Colour:** Red/Green/Blue
- **Wavelength:** 622/525/467nm
- **Viewing angle:** 120°
- **Materials:**
 - Resin: Silicone (Water Diffused)
 - L/F Finish: Ag Plated
- **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. 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
- Indicator
- Home Appliance
- Decoration Lighting
- Full Colour LED Strip
- Gaming Device

CHARACTERISTICS:

Absolute Maximum Characteristics (Ta=25°C)

Parameter	Symbol	Ratings	Unit
Max LED Output Current per Channel	I _{OMAX}	20	mA
IC Power Supply Voltage	V _{DD}	6.5	V
IC Input Voltage	V _I	4.5~5.5	V
Power Dissipation	P _D	400	mW
Operating Temperature	T _{OPR}	-40~+85	°C
Storage Temperature	T _{STG}	-40~+105	°C
Soldering Temperature	T _{SD}	260	°C

Electrical & Optical Characteristics (Ta=25°C)

Parameter	Symbol	Values			Unit	Test Condition	
		Min.	Typ.	Max.			
Luminous Intensity	R	I _v	---	370	---	mcd	I _F =20mA
	G		---	1000	---		
	B		---	230	---		
	W		---	1450	---		
Forward Voltage	V _F	4.5	5.0	5.5	V	I _F =20mA	
Dominant Wavelength	R	λ _D	615	---	630	nm	I _F =20mA
	G		520	---	530		
	B		460	---	475		
Colour Coordinate	X	---	---	0.2225	---	---	I _F =20mA
	Y		---	0.2585	---		
Viewing Angle	2θ _{1/2}	---	120	---	deg	I _F =20mA	

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

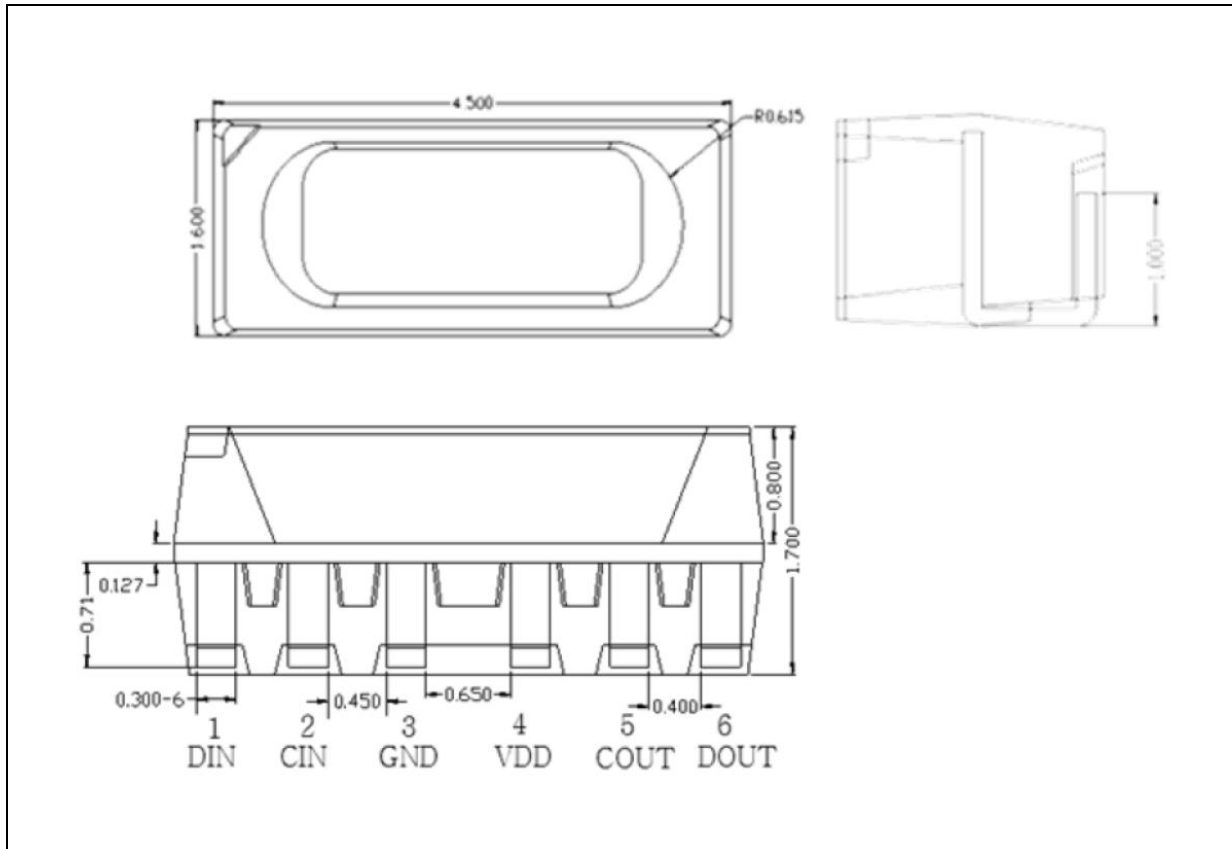
Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Working Current (IC)	I _{DD}	---	---	2	mA	I _{OUT} =OFF
Input Voltage Level	V _{IH}	2.7	---	V _{DD} +0.4	V	---
	V _{IL}	-0.4	---	1.0	V	---
ESD Pressure	V _{ESD}	---	6000	---	V	HBM

 Switching Characteristics (Ta=25°C, V_{DD}=5V)

Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Rate of Data Signal	F _{DIN}	---	15	---	MHz	---
Clock Level Width	T _{CLKH}	30	---	---	ns	---
	T _{CLKL}	30	---	---	ns	
Data Set-up Time	T _{SETUP}	10	---	---	ns	---
Data Hold Time	T _{HOLD}	5	---	---	ns	---
Standby Current	I _{SLEEP}	---	---	5	μA	Sleep Mode

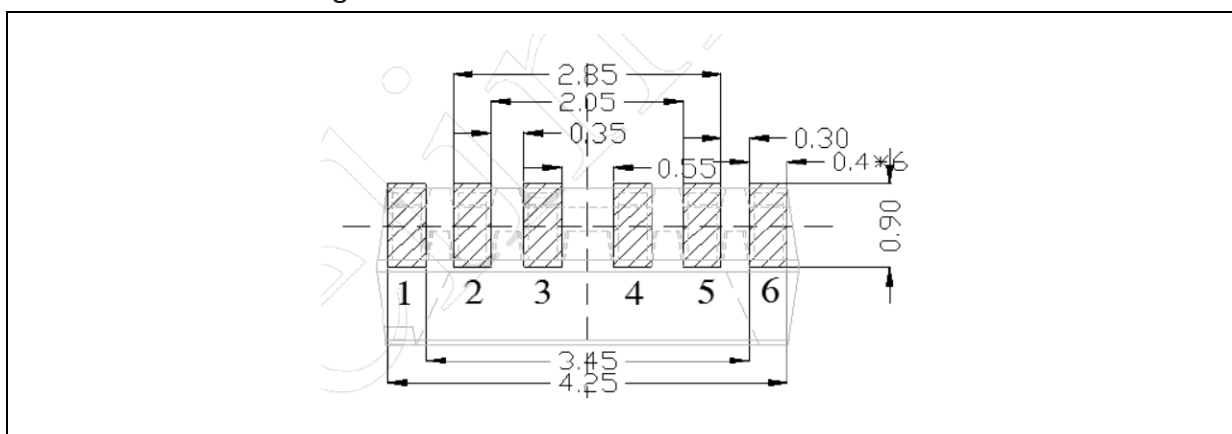
OUTLINE DIMENSION:

Package Dimension:

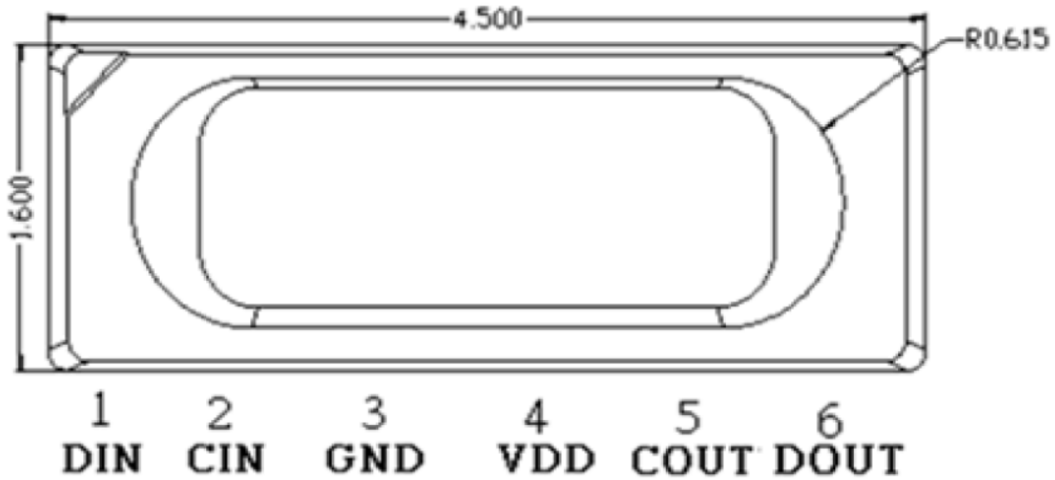


1. All dimensions are in millimetre (mm).
2. Tolerance ± 0.2 mm, unless otherwise noted.

Recommended Soldering Pad Dimension:



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

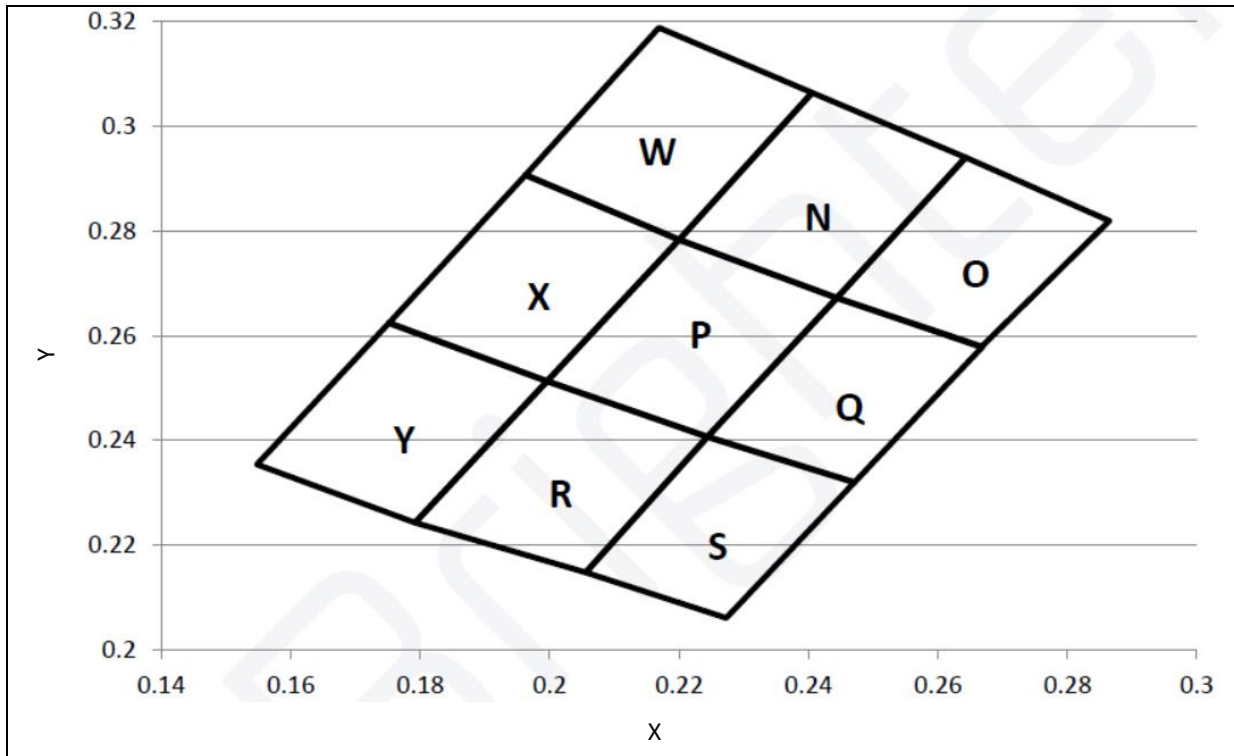
PIN CONFIGURATION:


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 (White) ($I_F = 20\text{mA}$, $V_{DD}=5\text{V}$):

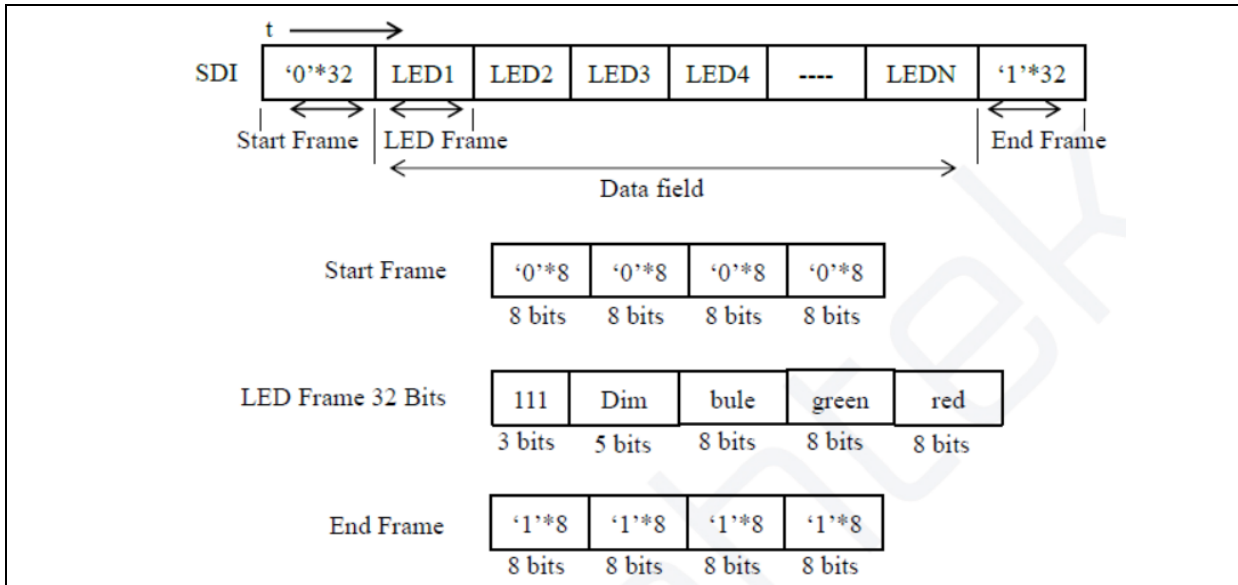
Code	Min.	Max.	Unit
14	780	1000	mcd
15	1000	1300	
16	1300	1700	
17	1700	2200	

CIE CHROMATICITY DIAGRAM:

Chromaticity Coordinates Classifications ($I_F = 20\text{mA}$):

	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
W	0.1963	0.2907	0.2169	0.3188	0.2406	0.3064	0.2200	0.2783
X	0.1963	0.2907	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
N	0.2200	0.2783	0.2406	0.3064	0.2643	0.2940	0.2444	0.2672
P	0.2200	0.2783	0.1996	0.2513	0.2244	0.2407	0.2444	0.2672
R	0.1996	0.2514	0.1792	0.2243	0.2056	0.2148	0.2244	0.2407
O	0.2444	0.2672	0.2643	0.2940	0.2865	0.2819	0.2667	0.2578
Q	0.2444	0.2672	0.2244	0.2407	0.2471	0.2320	0.2669	0.2579
S	0.2244	0.2407	0.2056	0.2148	0.2273	0.2061	0.2471	0.2320

Function Description:

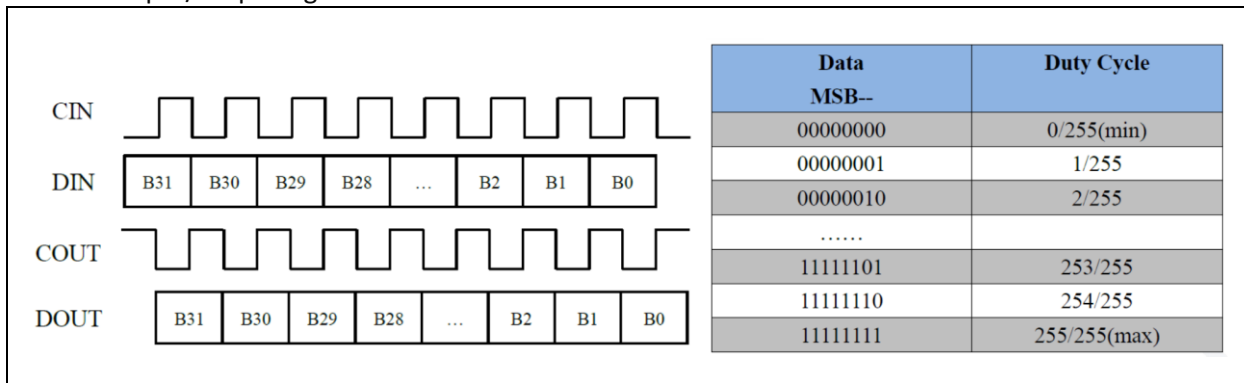
1. Tandem N-LED:



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)

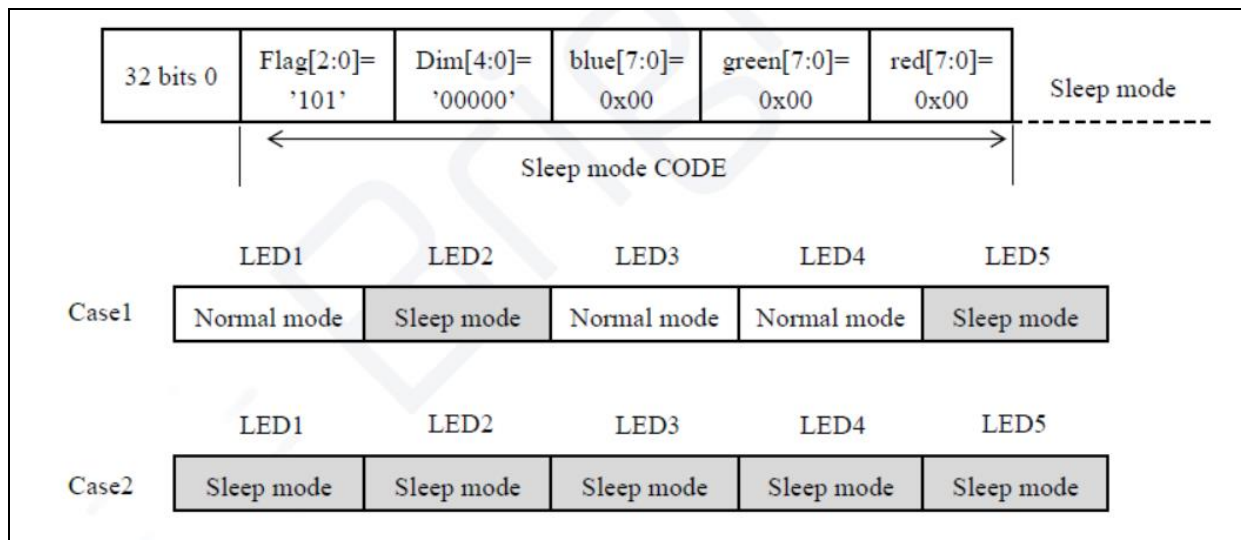
3. PWM input/output signal relations:



4. Sleep and power saving mode:

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

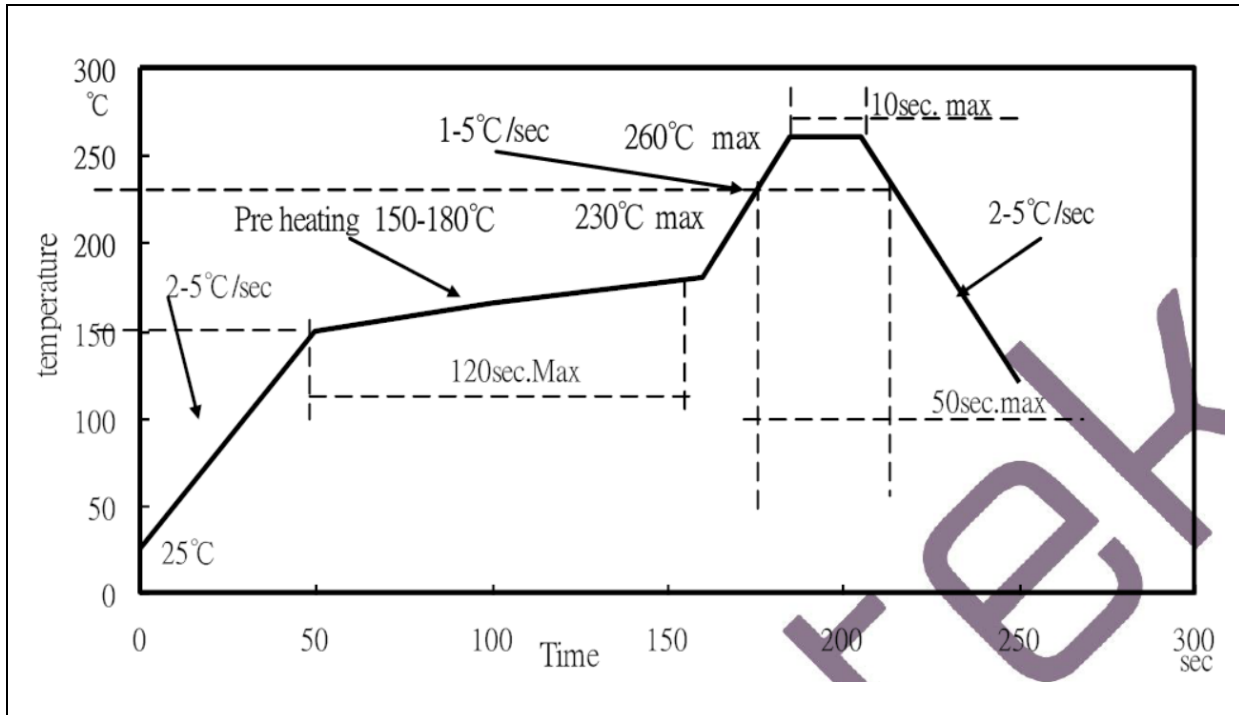
The IC will wake up from sleep mode once receiving the new data with the data of FLAG[2:0], DIMMING[4:0] is not 8h'A0'; after wake-up, all sleeping circuits in IC return to normal working mode within 1ms. Since it takes 1ms for a sleeping IC returning to normal function mode, it is recommended for a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



In case 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 the 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:

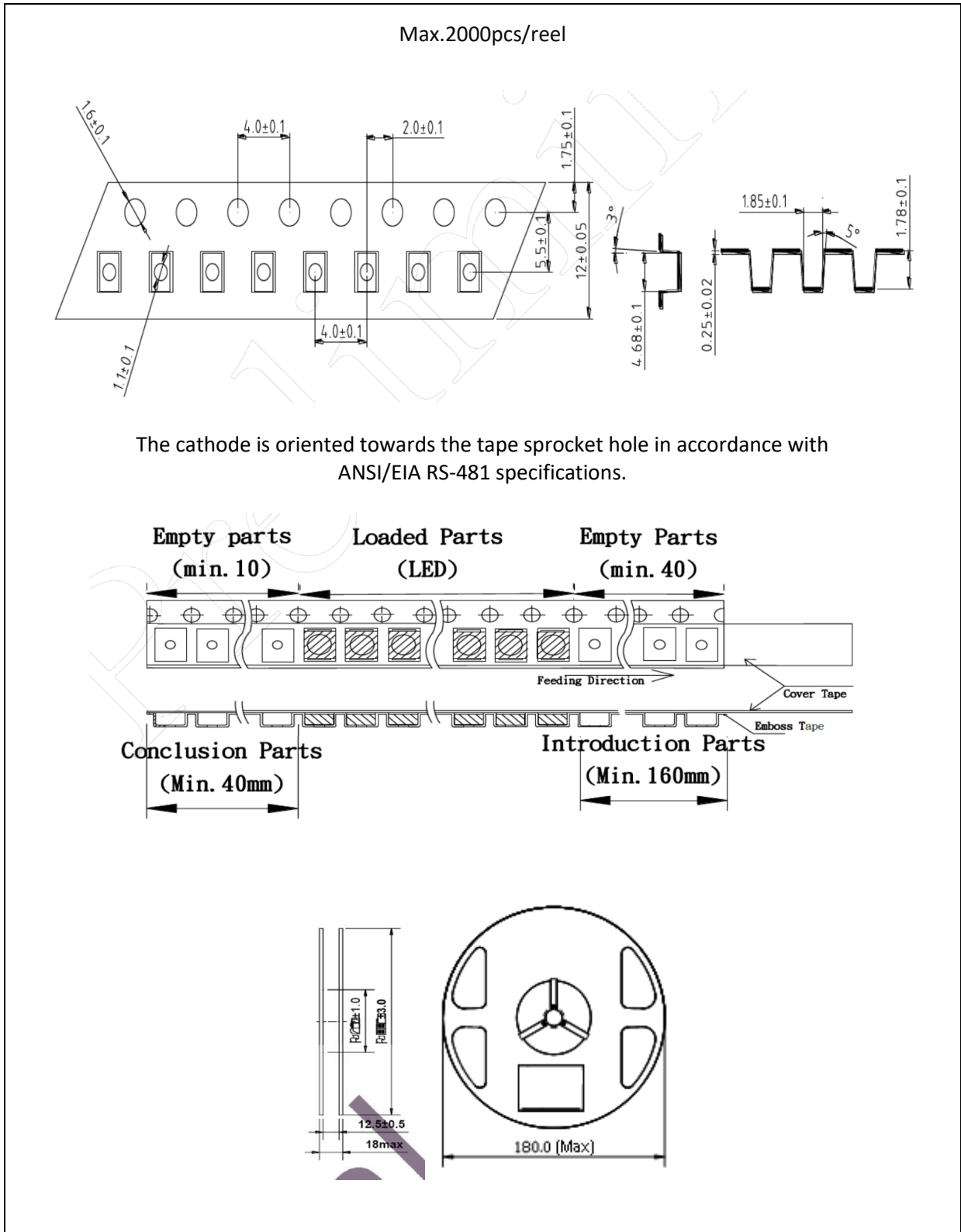


Note:

1. We recommend the reflow temperature 240°C ($\pm 5^\circ\text{C}$). 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:



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 <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.

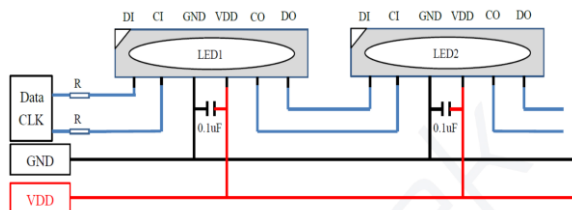
Baking:

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 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-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	20/11/2019	Datasheet set-up.
A1.1	02/06/2022	Revise data input instruction.