BRIGHTEK
BRIGHTEK (EUROPE) LIMITED
Brighten Up The World With LED !

PRODUCT DATASHEET

ATTENTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

▶ PLCC Side View SMD with IC

▶ 4516SV IC 1.6t

▶ Red/Green/Blue

N0M61S41ICSV

Sleep Mode

4 5 1 6 S V   I C - I n t e g r a t e d

4516SV IC-Integrated

RoHS Compliant

FEATURES:

- **Package:** PLCC Side View Package with Integrated IC
- **Operation Current:** 1.5mA
- **Forward Voltage (typ.):** +3.3~+5.5V
- **Mixed White Luminous Intensity (typ.):** 2400mcd
- **Colour:** Red/Green/Blue
- **Wavelength:** 622/522/466nm
- **Viewing angle:** 120°
- **Materials:**
  – Resin: Silicone (Water Clear)
  – L/F Finish: Ag Plated
- **Operating Temperature:** -40~+85°C
- **Storage Temperature:** -40~+85°C
- **Features:** Support the sleep/wake-up mode for power saving purpose. In sleep mode, the built-in oscillator and associated circuit will be disabled. The quiescent current of LED is approximately 1µA (typ.)
- **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
- Guardrail Tube

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CHARACTERISTICS:

Absolute Maximum Characteristics (Ta=25°C)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD}	6.5	V
Operating Temperature	T_{OPR}	-40~+85	°C
Storage Temperature	T_{STG}	-40~+85	°C

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

Parameter		Symbol	Values			Unit	Test Condition
			Min.	Typ.	Max.		
Supply Voltage		V_{DD}	3.3	5.0	5.5	V	---
Operation Current		I_{OC}	---	1.5	---	mA	V_{DD}=5V RGB off
Standby Current		I_{sleep}	---	1	---	µA	---
Input High Voltage		V_{IH}	2.7	---	V_{DD} +0.4	V	---
Input Low Voltage		V_{IL}	-0.4	---	1.0	V	---
CIN Frequency		C_{FREQ}	---	---	15	MHz	---
CIN High Pulse Width		T_{ckH}	30	---	---	ns	---
CIN Low Pulse Width		T_{ckL}	30	---	---	ns	---
DIN to CIN Setup		T_{setup}	10	---	---	ns	---
DIN to CIN Hold Time		T_{hold}	5	---	---	ns	---
Output High Voltage		V_{OH}	4.5	---	---	V	4mA@ V_{DD}=5V
Output Low Voltage		V_{OL}	---	---	0.4 V_{DD}	V	4mA@ V_{DD}=5V
Luminous Intensity		I_V	1680	---	3250	mcd	V_{DD}=5V
Dominant Wavelength	R	λ_D	---	622	---	nm	V_{DD}=5V
	G		---	522	---		
	B		---	466	---		
Viewing Angle		$2\theta_{1/2}$	---	120	---	deg	V_{DD}=5V

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OUTLINE DIMENSION:

Package Dimension:

NO.	Symbol	Function Description
1	DIN	Serial data input
2	CIN	Clock in
3	VSS	Ground
4	VDD	DC power input
5	COUT	Clock output
6	DOUT	Serial data outupt
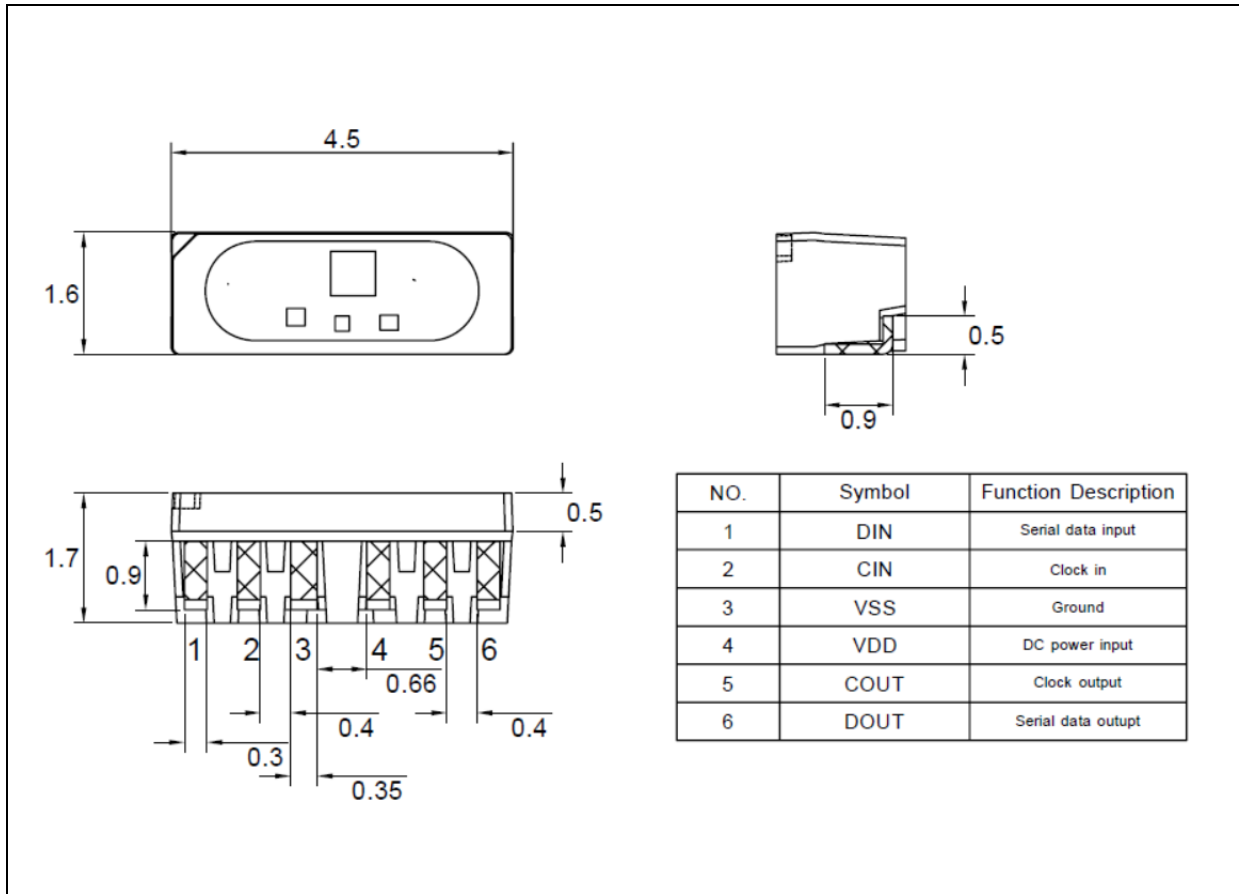
1. All dimensions are in millimetre (mm).
2. Tolerance ±0.2mm, unless otherwise noted.
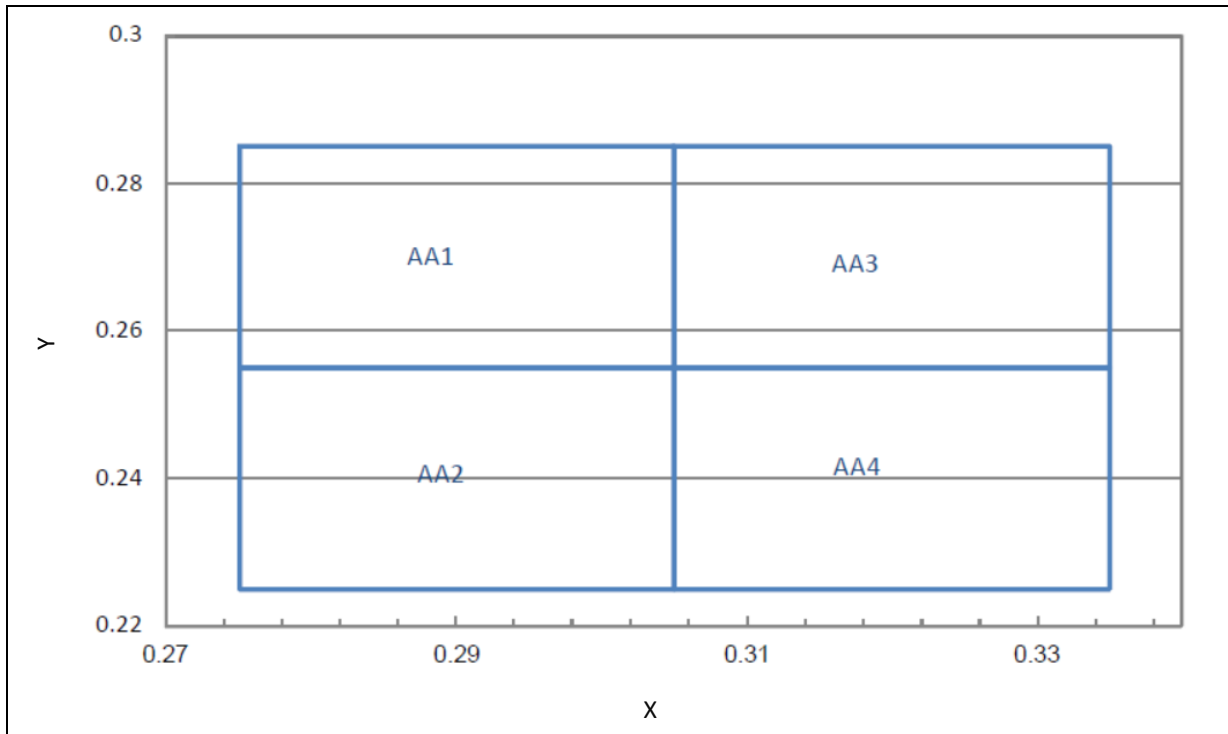
Recommended Soldering Pad Dimension:
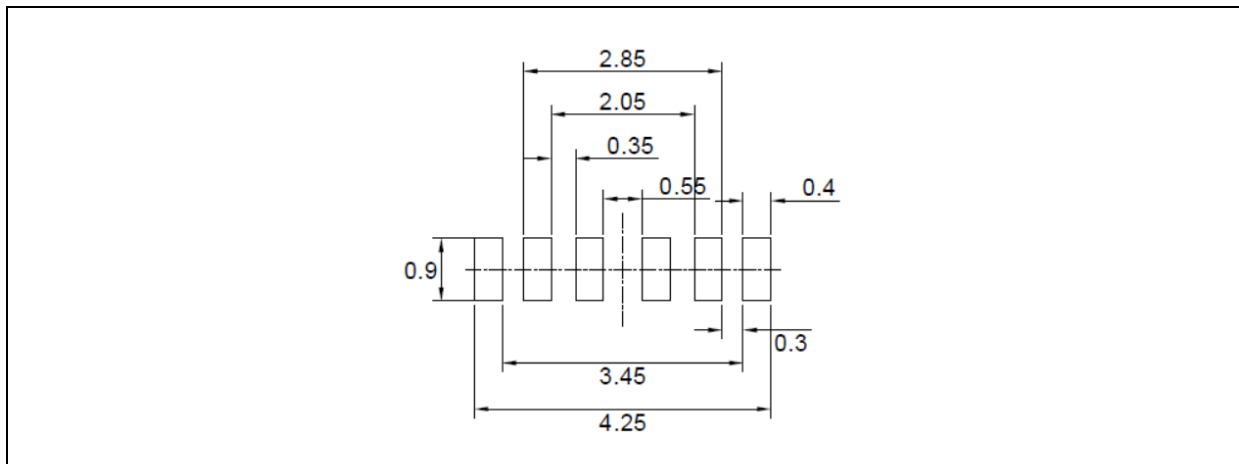
1. Dimensions are in millimetre (mm).
2. Tolerance ±0.1mm with angle tolerance ±0.5°.

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BINNING GROUPS:

Luminous Intensity Classifications:

Code	Min.	Max.	Unit
K1	1680	2100	
K2	2100	2600	mcd
K3	2600	3250	

CIE CHROMATICITY DIAGRAM:

Chromaticity Coordinates Classifications:

	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
AA1	0.275	0.255	0.275	0.285	0.305	0.285	0.305	0.255
AA2	0.275	0.225	0.275	0.255	0.305	0.255	0.305	0.225
AA3	0.305	0.255	0.305	0.285	0.335	0.285	0.335	0.255
AA4	0.305	0.225	0.305	0.255	0.335	0.255	0.335	0.225

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## Function Description:

1. Command Set:
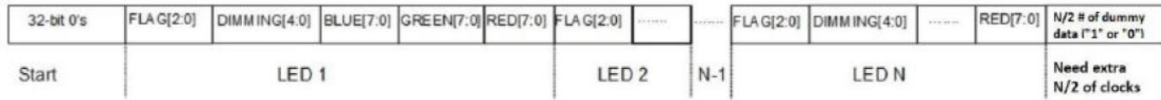
32 consecutive 0's denotes the start of a command for a RGB LED. After receiving 32 0's, LED gets the following 32 bits as the received command, including FLAG, DIMMING, BLUE, GREEN, and RED fields.
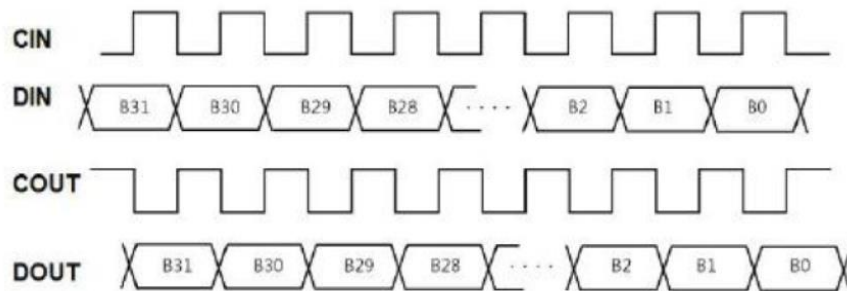
The serial command is transmitted with MSB first, DIN is latched at the rising edge of CON clock. COUT and DOUT are re-generated for the next RGB LED. COUT is inverted from CIN. When 32 consecutive 0's are encountered, the next 1 is expected to start a 32-bit command. i.e. FLAG[2:0]=111. When FLAG[2:0]=111, tehn DIMMING, BLUE, GREEN, and RED fields are latched respectively.

While the current 32-bit command is got, LED passes remaining command bits to the next RGB LED. After the last one command is issued for the last LED (LED n), MCU should issue the extra N/2 number of clocks signal if there are N LED lamps totally connected in the strip to make sure the data transfer and display of the last one LED lamp is complete and correct. The data for the extra N/2 # of clocks may be set as "0" or "1".
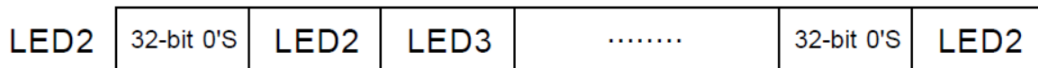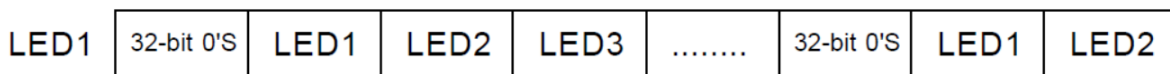
FLAG[2:0] : 111 to start a 32-bit command

DIMMING[4:0] : 32-level current control for R/G/B drivers

BLUE[7:0] : 256 gray levels for blue LED

GREEN[7:0] : 256 gray levels for green LED

RED[7:0] : 256 gray levels for red LED

2. Sleep and Power Saving Mode:

LED supports the sleep/wake-up modes for power-saving purpose. In sleep mode, the built-in oscillator and associated circuit will be disabled. The quiescent current of LED is approximately 1µA (typ).

Command Setup to Enable Sleep or Wake-up Mode:

When receiving 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-bit' FLAG and 5-bits' DIMMING is 8h'A0' (that is FLAG[2:0]=3b101 and DIMMING[4:0]=5b00000), LED will enter sleep mode.

LED 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 LED return to normal working mode within 1ms. Since it takes 1ms for a sleeping LED 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.
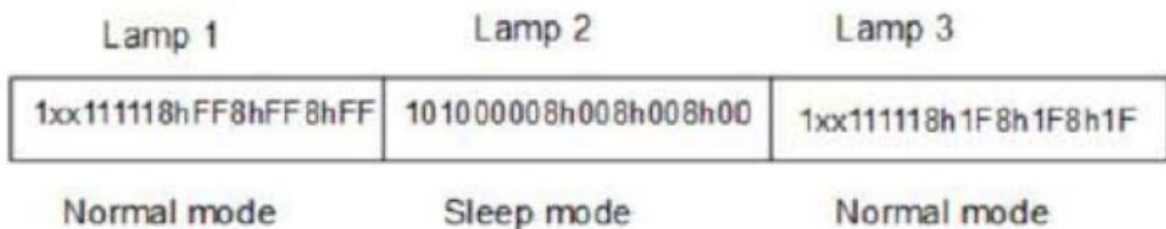
Sleep power-saving mode example:
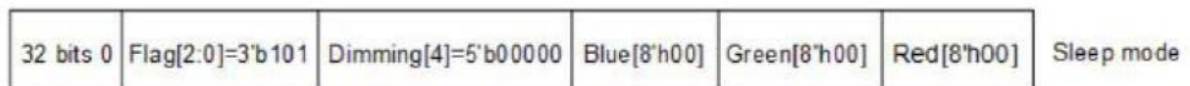
Case 1:

Case 2:

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], DIMMING[4:0] being 8h"A0". It means lamp 2 will keep in sleep mode as well. In the situation, lamp 2 can pass through the remaining data to lamp 3 (32 bits) to change the display data of lamp 3. In the other words, the sleeping chip is able to pass the data to the net chips.

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RECOMMENDED SOLDERING PROFILE:

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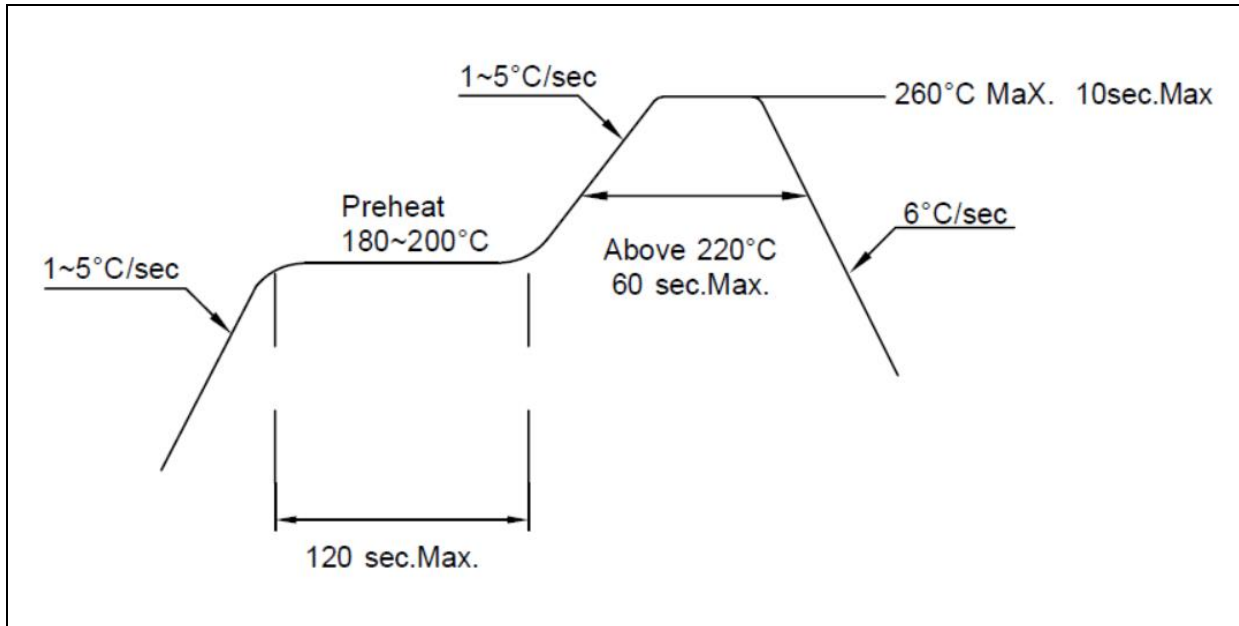
Note:
1. We recommend the reflow temperature 240°C (±5°C). The maximum soldering temperature should be limited to 260°C.
2. Maxima reflow soldering: 2 times.
3. Before, during, and after soldering, should not apply stress on the components and PCB board.

PACKING SPECIFICATION:

Reel Dimension:

Max.2000pcs/reel

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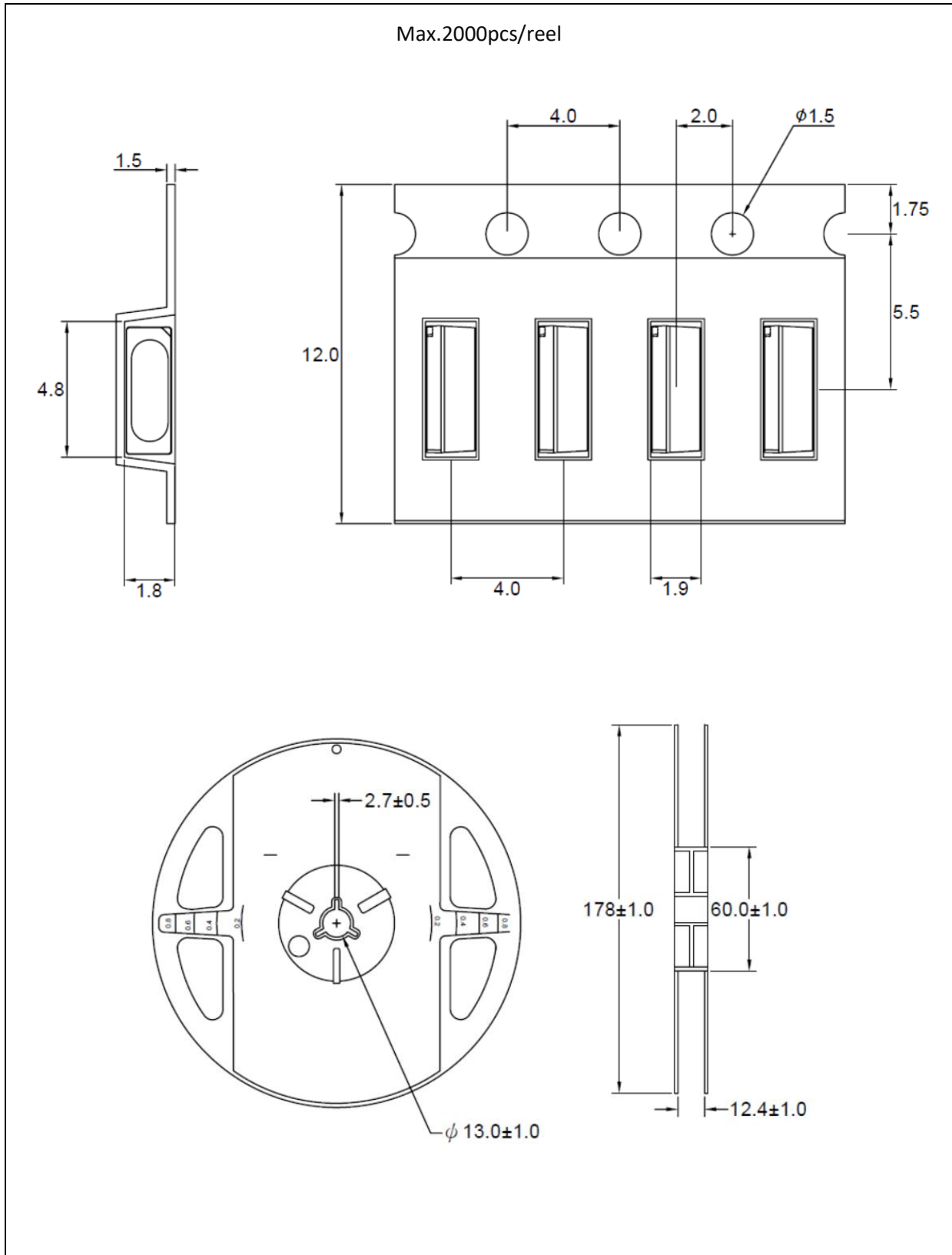
PRECAUTIONS OF USE:

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 72 hours. Otherwise, they should be kept in a damp-proof box with descanting 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.
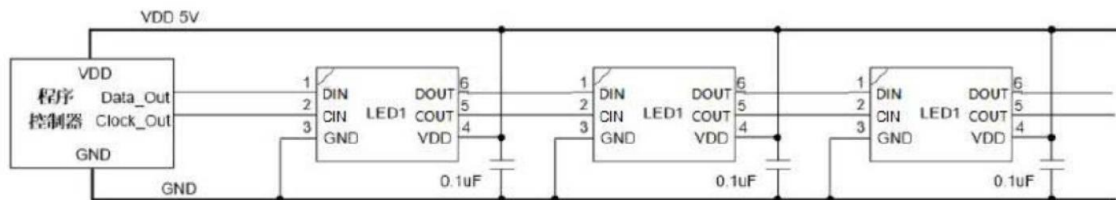
Baking:

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±5°C x 24hrs and <5%RH, taped / reel package.

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

Recommended Route:

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	25/05/2021	Datasheet set-up.
A1.1	24/09/2022	New datasheet format.

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