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Opto Plus LED Corp
OPS-L2020F7
Top View Chip LED

● **EDIT HISTORY**

Version A : FEB. 17, 2025

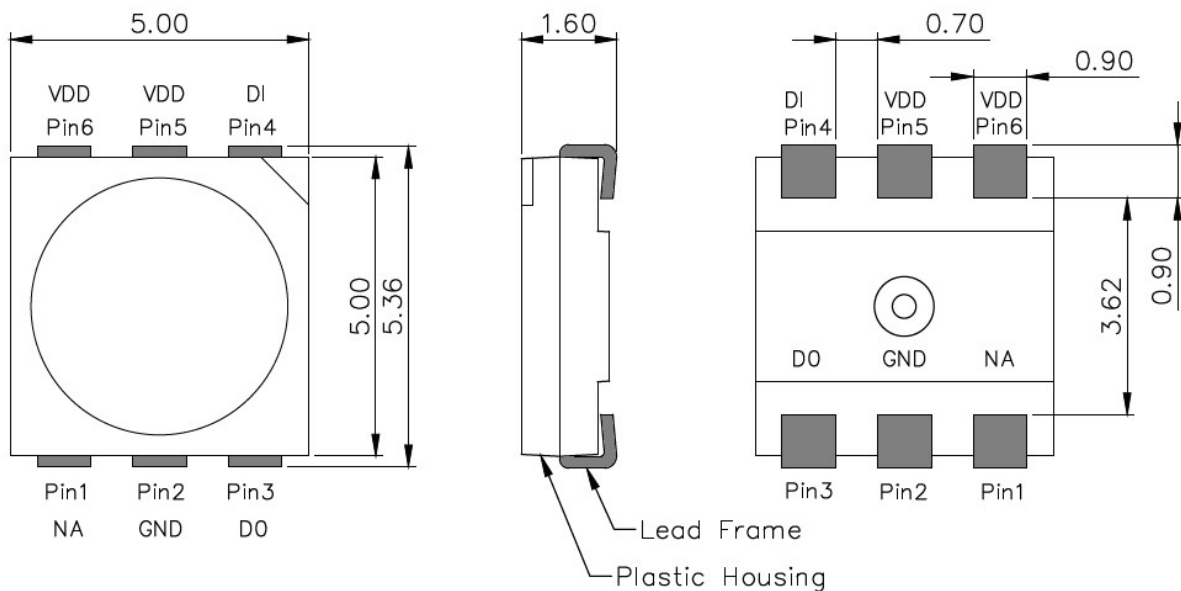
Preliminary Spec.

Confidential Document

● FEATURES

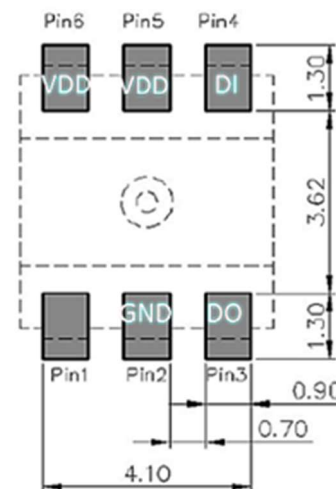
- 5.00mm x 5.00 mm x 1.60 mm. [0.20 inch x 0.20 inch x 0.06 inch]
- PLCC-6 Programmable LED. [Data Signal Input]
- Low power consumption.
- RoHS compliant.

● PACKAGE DIMENSIONS



Unit:mm Tolerance: +/-0.1

SOLDERING PATTERN



VDD : Power Supply.

GND : Ground.

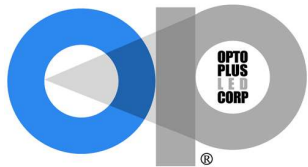
DI : Control Data Signal Input.

DO : Control Data Signal Output.

Unit:mm Tolerance: +/-0.1

Suggested pad dimension is just for reference only.

Please modify the pad dimension based on individual need.



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ABSOLUTE MAXIMUM RATING AT Ta=25°C

Parameter	Symbol	Maximum Rating	Unit
Supply Voltage	VDD	6.5	mW
Power Dissipation	PD	<250	mW
Maximum Output Current	I _{LED}	25	mA
Operating Temperature Range	TOPR	-40~85	°C
Storage Temperature Range	TSTO	-65~120	°C
VESD	ESD(HBM)	>2	kV
Soldering Temperature	T _{sol}	Reflow Soldering : 260 °C for 10 sec. Hand Soldering : 300 °C for 5 sec.	

ELECTRICAL - OPTICAL CHARACTERISTICS AT Ta=25°C

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Note.
Supply Voltage	VDD	3.3	5.0	5.5	V	
Operation Current (With IC)	I _{DD-1}		1.5	2.0	mA	R、G、B no load@VDD=5V
Operation Current (With IC)	I _{DD-2}		1.0		mA	R、G、B no load@VDD=3.3V
Input High "H" of DI	V _{IH}	2.7		VDD	V	
Input Low "L" of DI	V _{IL}	0		1.0	V	
Pull Down Resistance	R _{PD}		500K		Ω	DI, DO
Output High "H" of DO	V _{OH}	4.5			V	I _{OH} =4mA
Output Low "L" of DO	V _{OL}			0.4	V	I _{OL} =4mA
R, G, B Sink Current	I _{sink}	19	20	21	mA	V _O =VDD-3.0V @VDD=5V
Input leakage	I _{leak}			1	uA	DI=VDD
R, G, B off leakage current	I _{off}			1	uA	PWM=0(off), @R, G, B =5V
Propagation delay time	t _{PLZ}			80	ns	DI → DO, CL=15pF, RL=10KΩ
	t _{PZL}			80	ns	
Rising time	t _{TZH}		15		ns	R、G、B=20mA, CL=30pF
Falling time	t _{THZ}		15		ns	
Data rate	F _{data}		800		Khz	

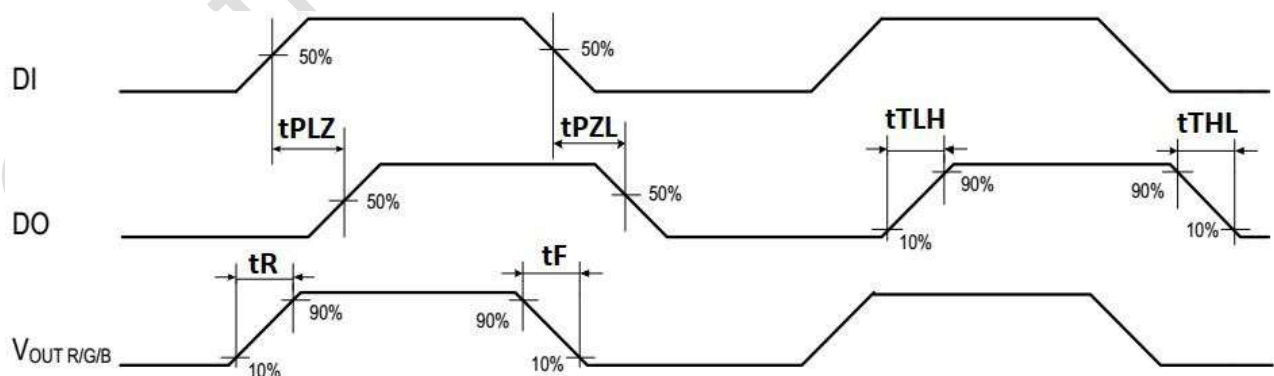
Dominant Wavelength (Red)	λ_D	624	nm	$I_{\text{sink}}=5\text{mA}$
Dominant Wavelength (Green)	λ_D	523	nm	$I_{\text{sink}}=5\text{mA}$
Dominant Wavelength (Blue)	λ_D	470	nm	$I_{\text{sink}}=5\text{mA}$
Luminous Intensity (Red)	I_V	600	mcd	$I_{\text{sink}}=5\text{mA}$
Luminous Intensity (Green)	I_V	900	mcd	$I_{\text{sink}}=5\text{mA}$
Luminous Intensity (Blue)	I_V	250	mcd	$I_{\text{sink}}=5\text{mA}$

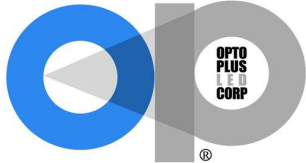
※EMITTED COLOR : RED & GREEN & BLUE

IN PRACTICAL CIRCUIT APPLICATIONS, IT IS CRUCIAL TO CONNECT THE SIGNAL INPUT AND OUTPUT PINS OF THE INTEGRATED CIRCUIT (IC) TO THEIR RESPECTIVE TERMINALS. ADDITIONALLY, FOR ENHANCED STABILITY OF THE IC CHIP, IT IS NECESSARY TO INCLUDE CAPACITANCE BETWEEN DISPLAYS.

FOR SHORT DISPLAY TRANSMISSION DISTANCES, IT IS RECOMMENDED TO CONNECT SERIES PROTECTION RESISTORS (APPROXIMATELY 330 OHMS) AT BOTH THE INPUT AND OUTPUT ENDS OF THE CLOCK LINE SIGNAL.

IN CASES WHERE THE DISPLAY TRANSMISSION DISTANCE IS LONGER, ESPECIALLY FOR MODULES OR SPECIALIZED PRODUCTS, VARIATIONS IN WIRE TYPE AND TRANSMISSION DISTANCE MAY OCCUR. AS A RESULT, SLIGHT DIFFERENCES IN GROUNDING PROTECTION RESISTANCE AT BOTH ENDS OF THE CLOCK LINE SIGNAL SHOULD BE ANTICIPATED AND ADDRESSED TO ENSURE CONSISTENT PERFORMANCE IN PRACTICAL USAGE.





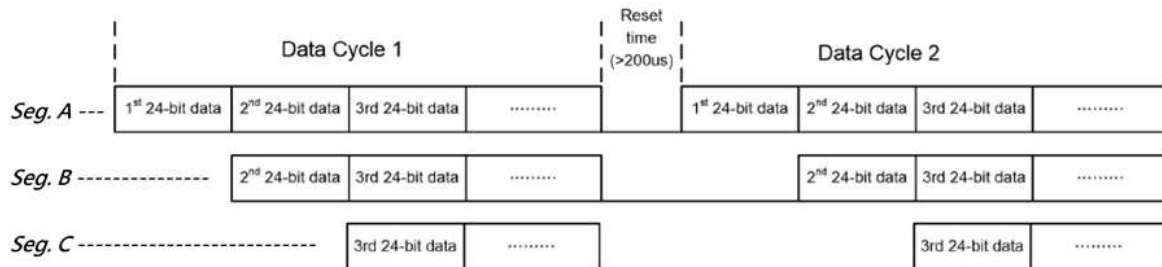
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● Data Transfer Protocol



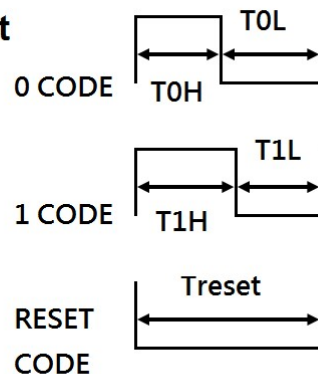
The single wire data transfer protocol supports 24-bit data for each LED RGB display data refresh.

The IC receives 24-bit data and passes the remaining data to next LED. The 24-bit data consist of red, green and blue data, each with 8-bit width, and are transferred with MSB first.



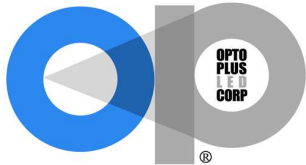
The transferred data are recognized based on the pulse widths received by the IC. A low bit 0 is represented by a 0.3us high pulse followed by a 0.9us low pulse. A high bit 1 is represented by a 0.9us high pulse followed by a 0.3us low pulse. A low pulse $\geq 200\mu s$ is used to issue a reset command to the IC to start a new cycle of serial commands.

Sequence Chart



(T0H:0.3us+0.15us, T0L:0.9us+0.15us)

(T1H:0.9us+0.15us, T1L:0.3us+0.15us)



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● Sample CODE

// Please write using Arduino IDE.

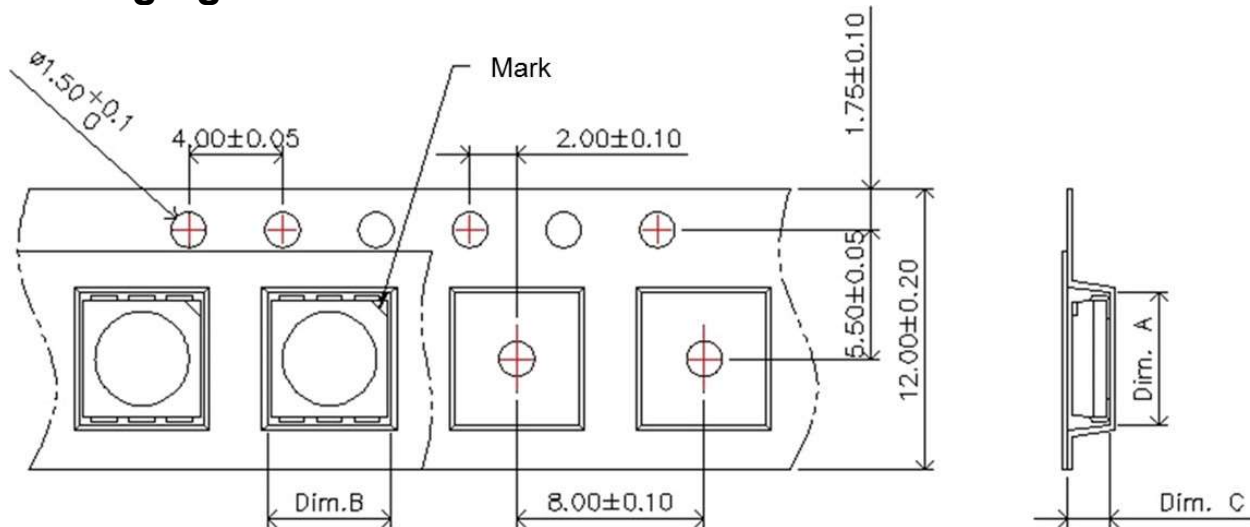
// Make sure that the Adafruit_NeoPixel library has been installed.

```
#include <Adafruit_NeoPixel.h>
#define LED_PIN 4 // Signal pin for the LED Display.
#define LED_COUNT 10 // Number of LEDs in the LED Display.
Adafruit_NeoPixel strip(LED_COUNT, LED_PIN, NEO_RGB + NEO_KHZ800);
// Function used to create colorful effects
void setup() {
  strip.begin();
  strip.show();
  strip.setBrightness(127); //Set brightness to approximately 1/2 (maximum value = 255)
}
void loop() {
  strip.setPixelColor(0, 255, 0, 0); // Turn on D1-Red
  strip.setPixelColor(1, 255, 0, 0); // Turn on D3-Red
  strip.setPixelColor(8, 0, 0, 0); // Turn off
  strip.setPixelColor(9, 0, 0, 0); // Turn off
  strip.show(); // Update to display
  delay(500); // delay 0.5 seconds.
  strip.setPixelColor(0, 0, 0, 0); // Turn off
  strip.setPixelColor(1, 0, 0, 0); // Turn off
  strip.setPixelColor(8, 0, 255, 0); // Turn on D9-Green
  strip.setPixelColor(9, 0, 255, 0); // Turn on D10-Green
  strip.show(); // Update to display
  delay(500); // delay 0.5 seconds.
}
```

● Notes

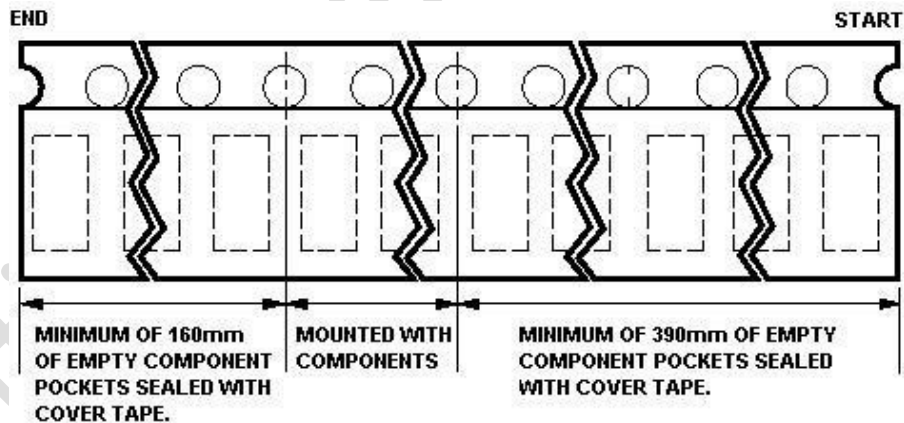
1. The chips should not be used directly in any type of fluid such as water, oil, organic solvent, etc.
2. When the LEDs are illuminating, the maximum ambient temperature should be first considered before operation.
3. LEDs must be stored in a clean environment. A sealed container with a nitrogen atmosphere is necessary if the storage period is over 3 months after shipping.
4. The LEDs must be used within 72 hours after unpacked. Unused products must be repacked in an anti-electrostatic package, folded to close any opening and then stored in a dry and cool space.
5. The appearance and specifications of the products may be modified for improvement without further notice.
6. The LEDs are sensitive to the static electricity and surge. It is strongly recommended to use a grounded wrist band and anti-electrostatic glove when handling the LEDs. If a voltage over the absolute maximum rating is applied to LEDs, it will damage LEDs. Damaged LEDs will show some abnormal characteristics such as remarkable increase of leak current, lower turn-on voltage and getting unlit at low current.

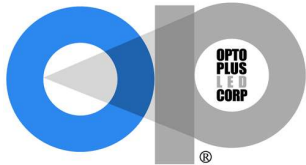
● Packaging



Unit:mm Tolerance: +/-0.1

Dim. A	Dim. B	Dim. C	Q'ty/Reel
5.70±0.10	5.30±0.10	1.80±0.10	1000





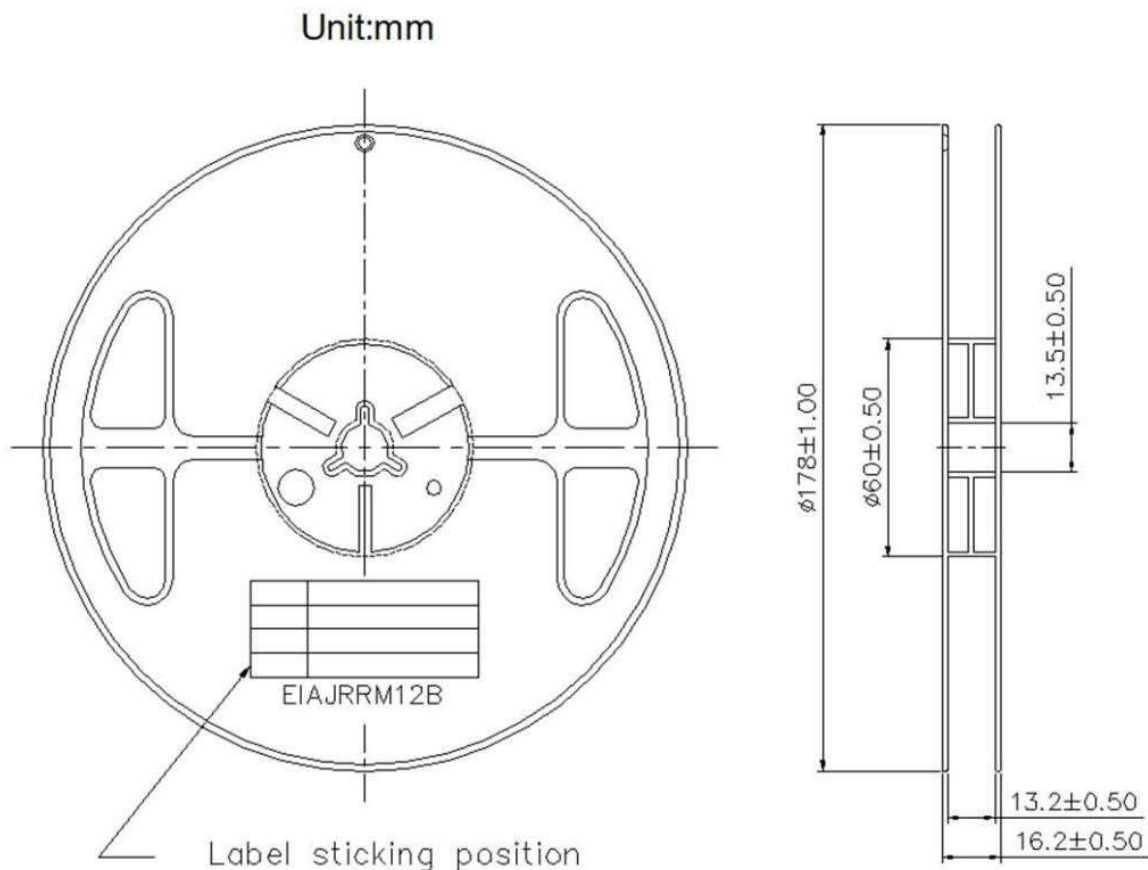
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● Reel Dimension

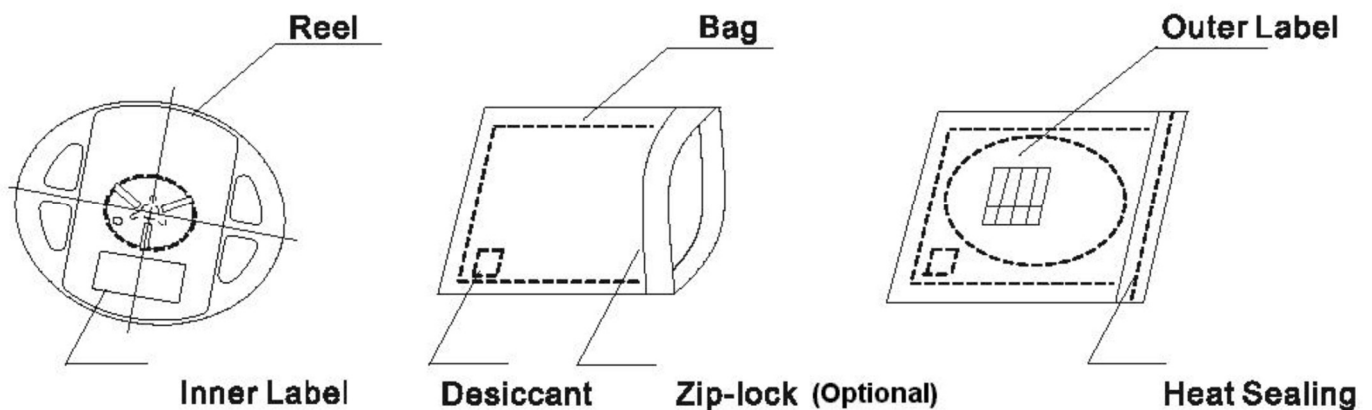


● Dry Pack

All SMD optical devices are **MOISTURE SENSITIVE**. Avoid exposure to moisture at all times during transportation or storage. Every reel is packaged in a moisture protected anti-static bag. Each bag is properly sealed prior to shipment.

A humidity indicator will be included in the moisture protected anti-static bag prior to shipment.

The packaging sequence is as follows:



● Baking

Baking before soldering is recommended when the package has been unsealed for 4 weeks.

The conditions are as followings:

1. $60 \pm 3^{\circ}\text{C} \times (12 \sim 24\text{hrs})$ and $< 5\% \text{RH}$, taped reel type.
2. $100 \pm 3^{\circ}\text{C} \times (45\text{min} \sim 1\text{hr})$, bulk type.
3. $130 \pm 3^{\circ}\text{C} \times (15\text{min} \sim 30\text{min})$, bulk type.

● Precautions

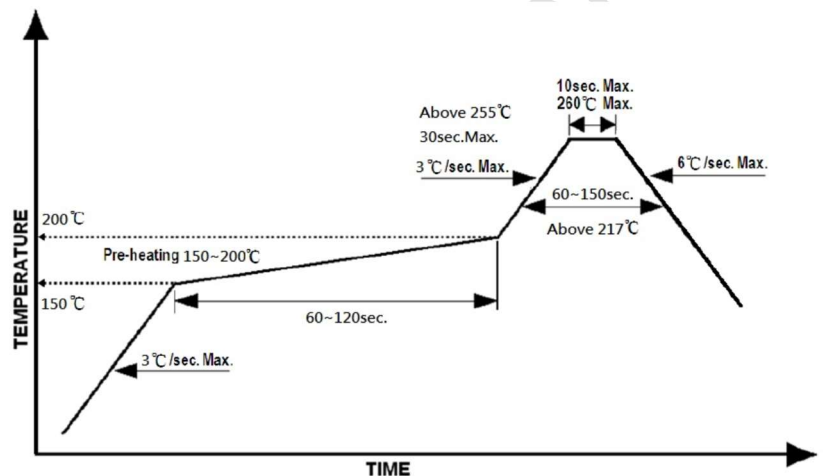
1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the specified limit.
4. Avoid operation beyond the limits as specified by the absolute maximum ratings.
5. Avoid direct contact with the surface through which the LED emits light.
6. If possible, assemble the unit in a clean room or dust-free environment.

● Reflow Soldering

Recommend soldering paste specifications:

1. Operating temp.: Above 217°C ,60~150 sec.
2. Peak temp.:260°C Max.,10sec Max.
3. Reflow soldering should not be done more than two times.
4. Never attempt next process until the component is cooled down to room temperature after reflow.
5. The recommended reflow soldering profile (measured on the surface of the LED terminal) is as following:

● Lead-free Solder Profile



● Reworking

- Rework should be completed within 5 seconds under 300°C.
- The iron tip must not come in contact with the copper foil.
- Twin-head type is preferred.

● Cleaning

Following are cleaning procedures after soldering:

- An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.
- Temperature x Time should be 50°C x 30sec. or <30°C x 3min
- Ultrasonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100°C max, <3min

● Cautions of Pick and Place

- Avoid stress on the resin at elevated temperature.
- Avoid rubbing or scraping the resin by any object.
- Electric-static may cause damage to the component.
- Please ensure that the equipment is properly grounded. Use of an ionizer fan is recommended.