

## HARVATEK Surface Mount CHIP LEDs DataSheet T37K3RGB-05C000112U1930 (Preliminary)

### Features

- Support signal reshaping to pass control waveforms to next adjacent driver
- Cascading port transmission by a single data line
- Built-in current regulator, three-way drive.
- R/G/B LED sink current: 5mA
- 256-step gray-scale output to allow 16,777,216 color display
- Data transmission rate:800Kbps
- RGB PWM frequency 4.5Khz
- Operating voltage 3.5~5.5V

### Applications

- Decorative LED lighting
- LED video display



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**Life Support Policy**

HARVATEK's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President of HARVATEK or HARVATEK INTERNATIONAL. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## Product Specifications

Item	Specification	Material	Quantity
Luminous Intensity(Iv)	Red : 180~280 mcd Green : 450~715 mcd Blue : 71.5~142 mcd IC@5V, R/G/B@5mA Ts= 25°C ; Tolerance ±10%		
Wavelength	Red : 615.0~625.0 nm Green : 520.0~530.0 nm Blue : 460.0~470.0 nm IC@5V, R/G/B@5mA Ts= 25°C ; Tolerance ±0.5nm		
Applied voltage	5V_DC		
View angle	120°		
Resin	Clear	Silicone	
Carrier tape	EIA 481-1A specs	Conductive black tape	2000 ea/reel
Reel	EIA 481-1A specs	Conductive black	
Label	HT standard	Paper	
Packing bag	250x230mm	Aluminum laminated bag/ no-zipper	One reel per bag
Carton	HT standard	Paper	Non-specified

### Others:

Each immediate box consists of 5 reels. The 5 reels may not necessarily have the same lot number or the same bin combinations of Iv,  $\lambda_D$  and Vf. Each reel has a label identifying its specification; the immediate box consists of a product label as well.

Note :This is shipped test conditions

※Remarks: This product should be operated in forward bias. If a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

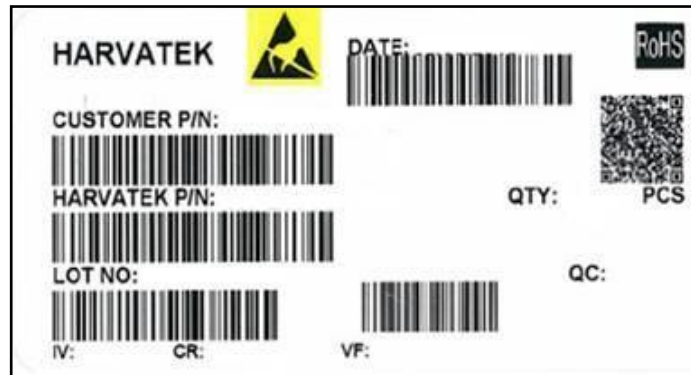
### ATTENTION: Electrostatic Discharge (ESD) protection



The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlGaInP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD precaution must be taken during design and assembly.

If manual work or processing is needed, please ensure the device is adequately protected from ESD during the process.

## Label Specifications



### ■ HARVATEK P/N:

**T      37K      3      RGB-      05C-      0001      12**

Product	Package	Dice Q'ty	Color	Current	Series Number	Taping
L/F	3.5(L)x2.8(W)x1.9(H) mm	3:Tri	RGB (Full Color)	5mA	X001~XZZZ	1.Taping style 2. Q'ty

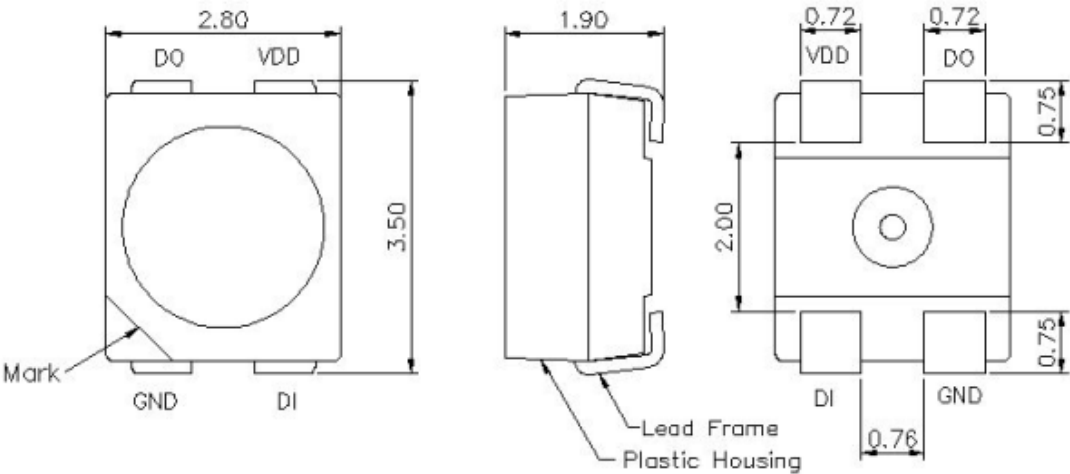
### ■ Lot No.

1	2	3	4	5	6	7	8	9	10
<b>E</b>	<b>1</b>	<b>A</b>	<b>1</b>	<b>A</b>	<b>2</b>	<b>2</b>	<b>L</b>	<b>1</b>	<b>2</b>
Code 1 2		Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9	Code 10
		Mfg. Year	Mfg. Month	Mfg. Date	Consecutive number		Special code		
Internal Tracing Code		2020-L		1:A	01~ZZ		000~ZZZ		
		2021-M		2:B					
		2022-P		3:C					
		2023-Q	1:Jan.	...					
		...	2:Feb.	...					
		...	...	26:Z					
		2026-T	A:Oct.	27:7					
		2027-V	B:Nov.	28:8					
		...	C:Dec.	29:9					
		2030-Y		30:3					
		2031-Z		31:4					
		...							

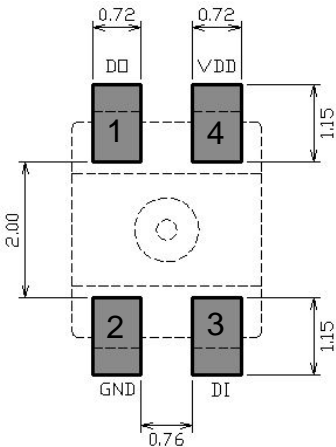
Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

(Unit: mm Tolerance: +/-0.1)

Outline Dim.



Suggest Soldering Pattern



No.	Symbol	Pin	Function
1	DO	Data Output	Control Data Signal Output
2	GND	Grand	Grand
3	DI	Grand Data Input	Control Data Signal Input
4	VDD	Power	Power supply control circuit

Soldering terminals may shift in the x,y direction.

## Absolute Maximum Rating

(Temperature=25℃)

Characteristic	Symbol	Rating	Unit
Supply Voltage	$V_{DD}$	6	V
Total DC Current	$I_F$	17	mA
Operating Temperature Range	$T_{OPR}$	-40~+85	℃
Storage Temperature Range	$T_{STO}$	-40~+85	℃
ESD Voltage	$V_{ESD}$	2	kV

## Optical Characteristics

Emitting Color	Material	Wavelength $\lambda$ (nm)	$I_V$ (mcd)	Test Condition 8bits	Viewing Angle $2\theta_{\frac{1}{2}}$
		$\lambda_D$	Typical		
R	AlGaInP	620	220	R : [11111111]	120
G	InGaN	525	528.5	G : [11111111]	120
B	InGaN	465	106	B : [11111111]	120

## Electrical characteristics

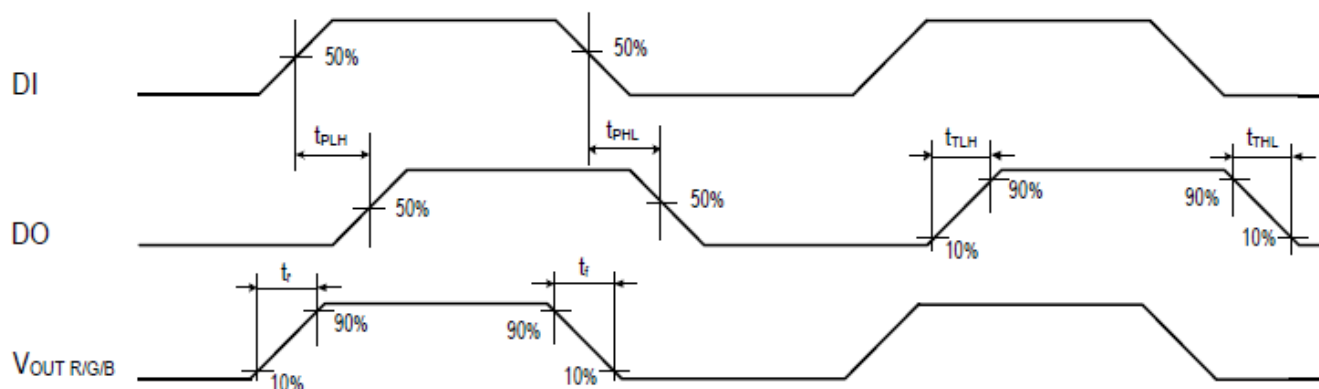
(Temperature=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Supply Voltage	$V_{DD}$	3.5	-	5.5	V	
Operation Current	$I_{DD}$	-	0.45	-	mA	R, G, B LED OFF
Input High "H" of DI	$V_{IH}$	3.1	-	-	V	
Input Low "L" of DI	$V_{IL}$	-	-	1.5	V	
R, G, B Sink Current	$I_{SINK}$	-	5		mA	
R, G, B off leakage current	$I_{off}$	-	-	1	uA	

### Switching characteristics

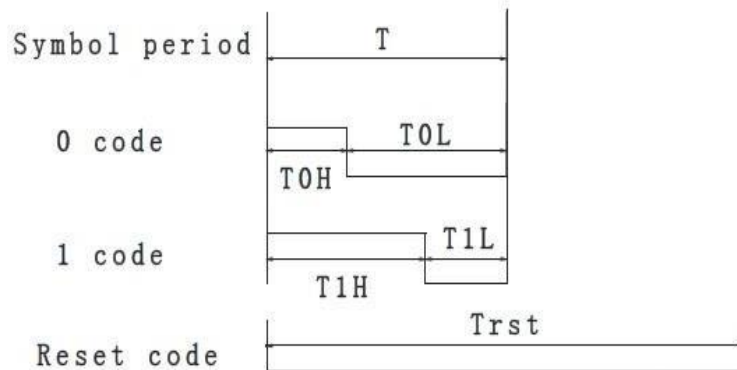
(Temperature=25°C)

Parameter	Symbol	Min	Typical	Max	Unit	Note
The PWM frequency	Fpwm	-	4.5	-	KHz	R、G、B
Transmission delay	Tpzi	-	80	-	ns	DI → DO
Input capacitance	Cin	-	-	30	pF	
Propagation delay time	tPLH		80		ns	
	tPHL		80		ns	
DO Transition time	tTLH		12		ns	
	tTHL		10		ns	
Transition time	tr		500		ns	
	tf		500		ns	



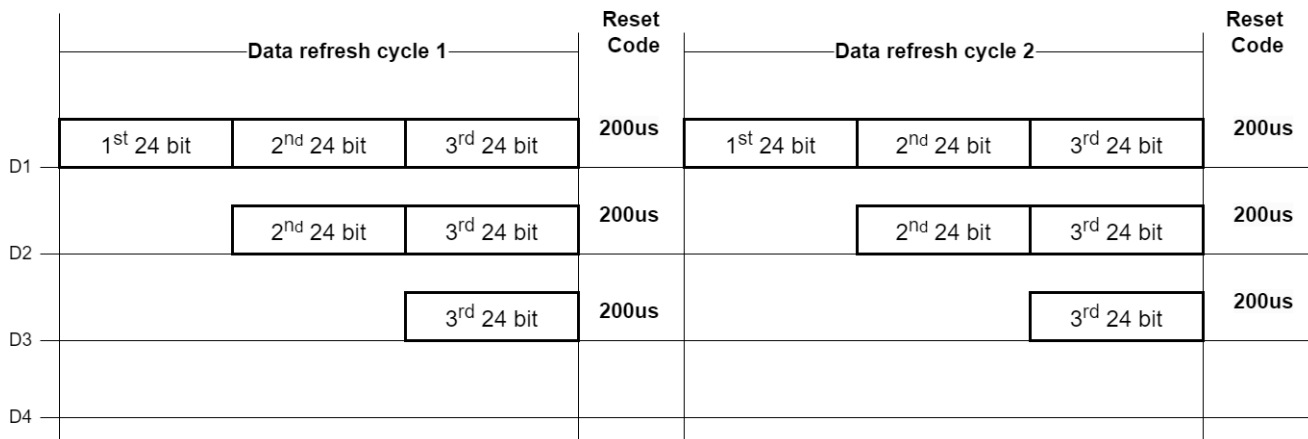
## Bit data structure

symbol	Parameter	Min	Typ.	Max	Units
T0H	0 code, high-level time	250	300	350	ns
T0L	0 code, low-level time	850	900	950	ns
T1H	1 code, high-level time	850	900	950	ns
T1L	1 code, low-level time	250	300	350	ns
T0/T1	bit code period	-	1200	-	ns
Trst	Reset code, low-level time	>200	-		μs



- (1) The minimum requirement for the symbol period is 1200ns
- (2) The high-level duration for '0' and '1' symbols must follow the specified range in the table above, and the low-level duration for both '0' and '1' symbols must be less than 20 μs.

### Data Transfer Protocol



Note: The D1 sends data for MCU, D2, D3, D4, for data forwarding automatic shaping cascade circuit.

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

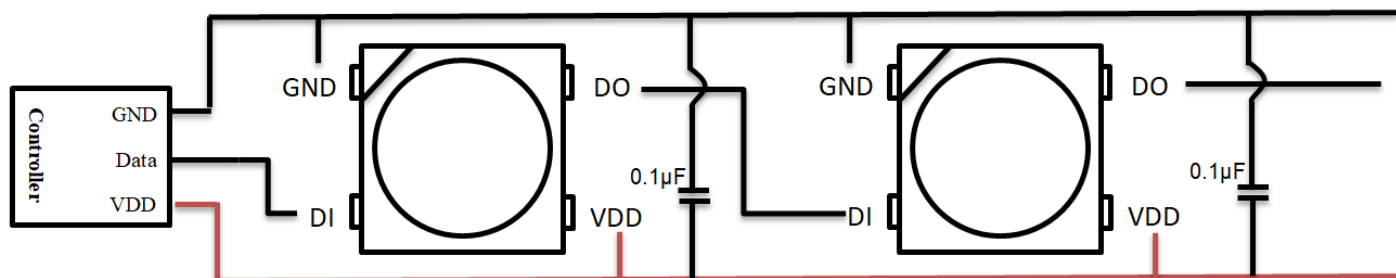
R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
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Each display data packet contains 8x3 bits of data, with the high bits transmitted first.

R[7:0]: Used to set the PWM duty cycle for the OUTR output. All zeros turn off the output, all ones set the maximum duty cycle, with 256 adjustable levels.

G[7:0]: Used to set the PWM duty cycle for the OUTG output. All zeros turn off the output, all ones set the maximum duty cycle, with 256 adjustable levels.

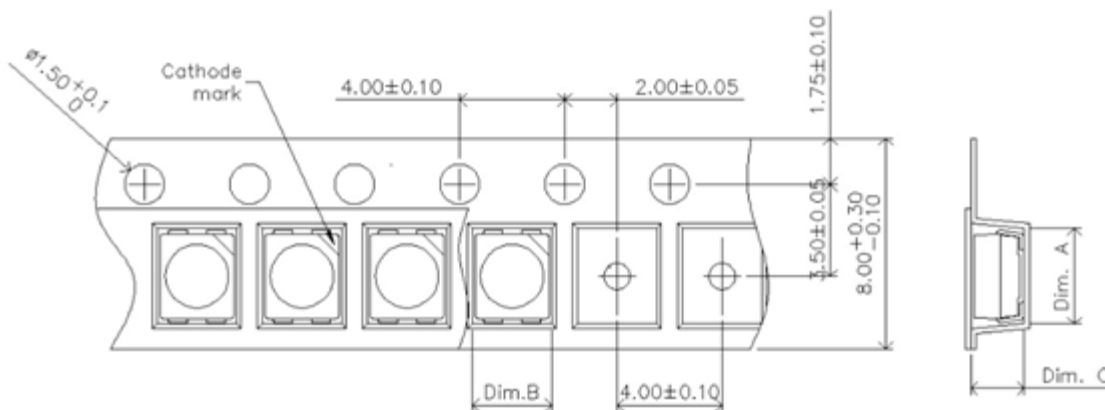
B[7:0]: Used to set the PWM duty cycle for the OUTB output. All zeros turn off the output, all ones set the maximum duty cycle, with 256 adjustable levels.



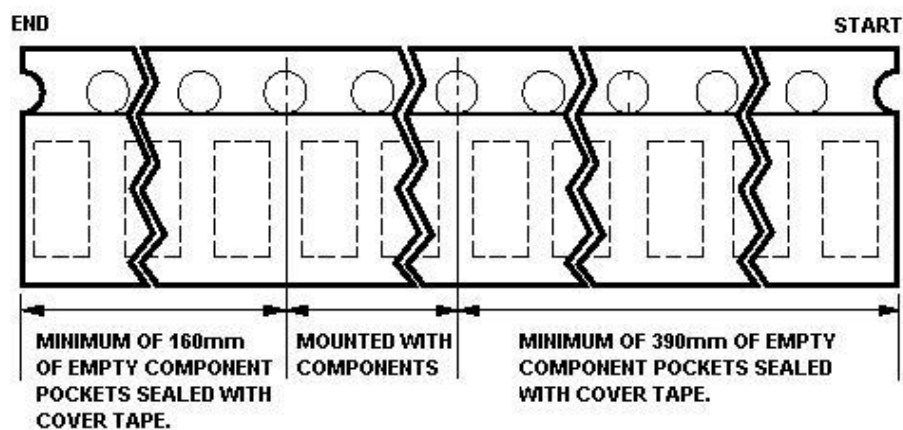
**Precaution for Use**

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 24 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.

## Tape Dim



Dim. A	Dim. B	Dim. C	Q'ty/Reel
3.64±0.10	3.02±0.10	2.03±0.10	2000



Technical drawing of the EIAJ-RRM 08 B connector, showing top and side views with dimensions.

**Top View Dimensions:**

- Overall diameter:  $\phi 17.8 \pm 1$
- Pin diameter:  $\phi 6.0 \pm 0.5$
- Pin spacing:  $\phi 13.0 \pm 0.2$
- Label: EIAJ-RRM 08 B, RL 07120900
- Label sticking position: Indicated by a line pointing to the label area.

**Side View Dimensions:**

- Overall height:  $17.8 \pm 1$
- Pin diameter:  $\phi 6.0 \pm 0.5$
- Pin spacing:  $\phi 13.0 \pm 0.2$
- Bottom flange thickness:  $1.2 \pm 0.15$

5 Reels per box  
( 7 inches reel )

Label sticking position

or

HARVATEK

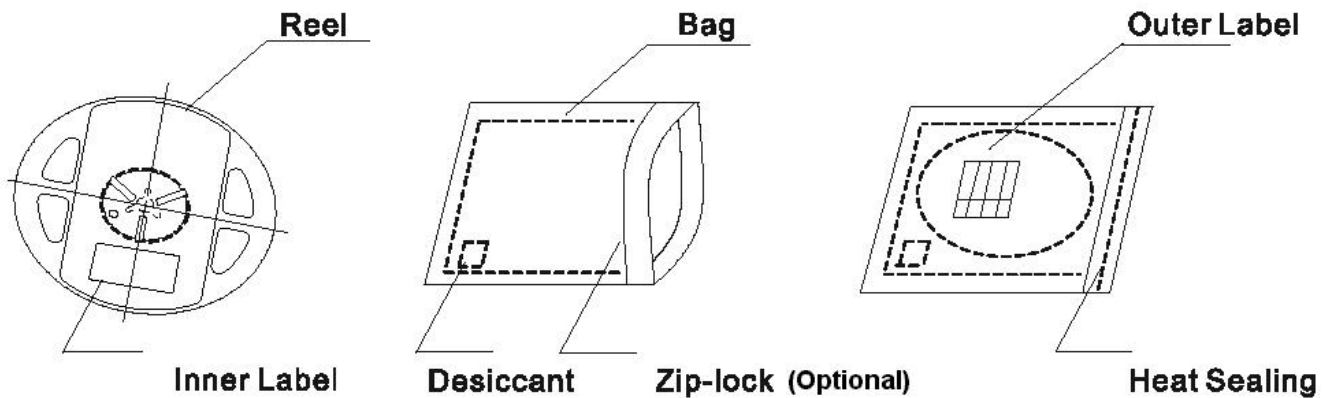
Specifications are subject to changes for improvement without advance notice.  
Proprietary data, drawings, company confidential all rights reserved.

## 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 24 hours.

The conditions are as followings:

1.  $60\pm3^{\circ}\text{C} \times (12\sim 24\text{hrs})$  and  $<5\%\text{RH}$ , taped reel type.
2.  $100\pm3^{\circ}\text{C} \times (45\text{min}\sim 1\text{hr})$ , bulk type.
3.  $130\pm3^{\circ}\text{C} \times (15\text{min}\sim 30\text{min})$ , bulk type.

## Precautions

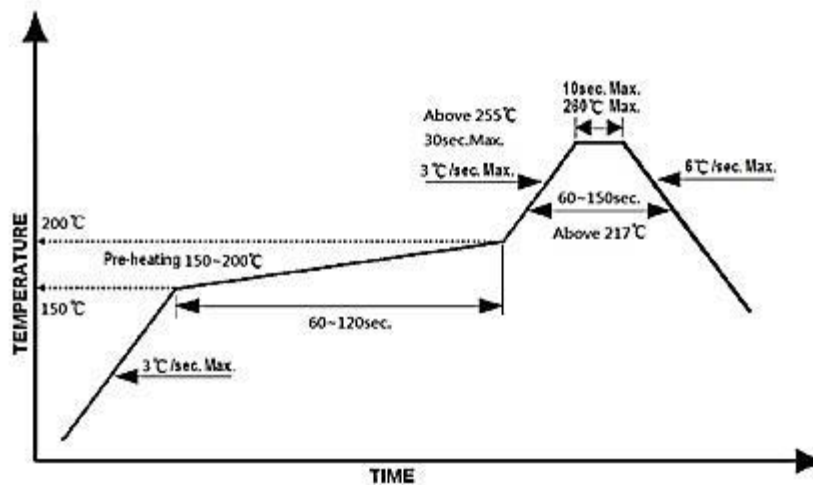
1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the 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 260 °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.

**Revise History**

Rev.	Descriptions	Date	Page
1.0	Preliminary	05/19/2025	-