

## **HARVATEK Surface Mount PLCC IC+RGB LEDs DataSheet T37G3GRB-12C0001X2U1930**

**(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.
- RGB LED sink current: 12mA
- 256-step gray-scale output to allow 16,777,216 color display
- Built-in power-on reset circuit
- RGB PWM frequency 3.6Khz
- Operating voltage 3.3~6V

### **Applications**

- Decorative LED lighting
- LED video display



**DISCLAIMER**

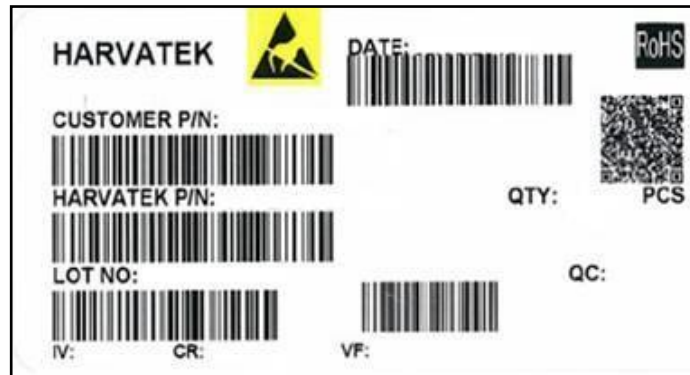
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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## Label Specifications



## HARVATEK P/N:

**T      37G      3      GRB-      12C-      0001      X2**

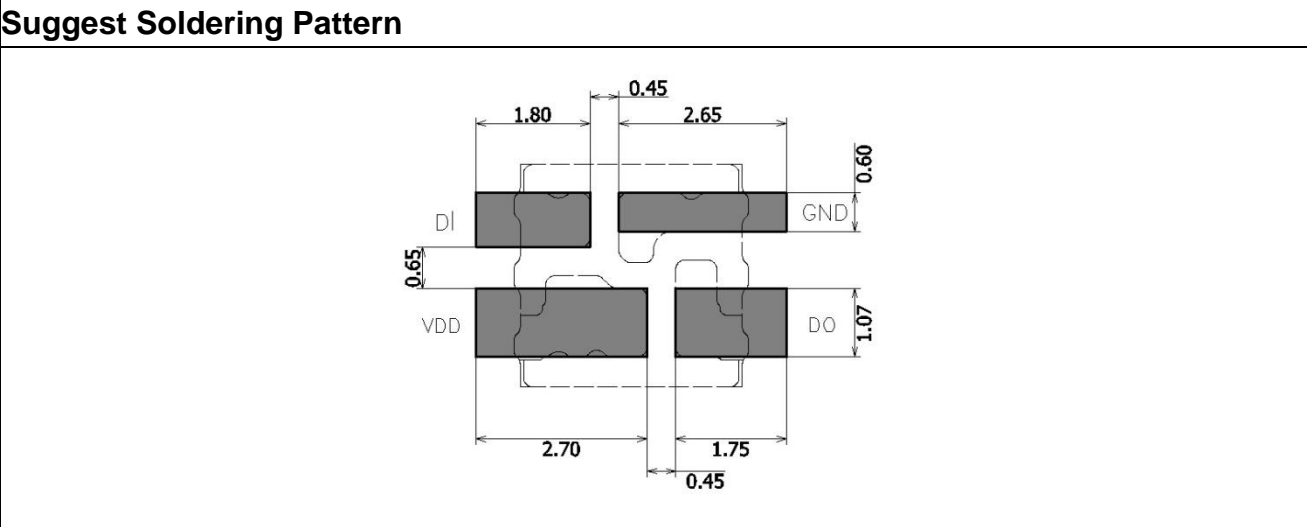
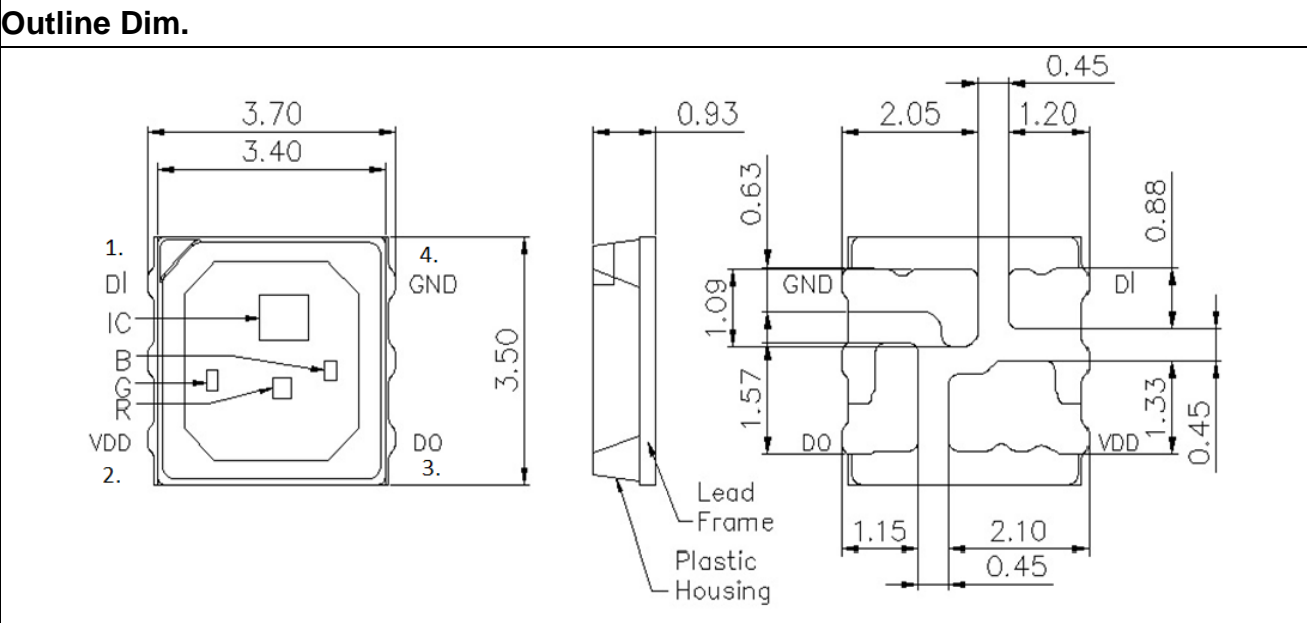
Product	Package	Dice Q'ty	Color	Current	Series Number	Taping
L/F	3.7(L)x3.5(W)x0.93(H) mm	3:Tri	GRB (Full Color)	12mA	X001~XZZZ	1.Taping style 2. Q'ty

## 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)



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

Soldering terminals may shift in the x,y direction.

## Absolute Maximum Rating

(Temperature=25℃)

Characteristic	Symbol	Rating	Unit
Supply Voltage	$V_{DD}$	6.5	V
Total DC Current	$I_F$	40	mA
Operating Temperature Range	$T_{OPR}$	-40~+85	℃
Storage Temperature Range	$T_{STO}$	-40~+85	℃
ESD Voltage	$V_{ESD}$	3	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	622.8	347	R : [11111111]	120
G	InGaIn	527.5	1056	G : [11111111]	120
B	InGaIn	468.3	214	B : [11111111]	120

## ■ Electrical characteristics

(Temperature=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Supply Voltage	$V_{DD}$	3.3	5	6	V	
Operation Current	$I_{DD}$	0.37	0.53	0.69	mA	R, G, B LED OFF
Input High "H" of DI	$V_{IH}$	2.6		$V_{DD}$	V	$V_{DD}=5V$
Input Low "L" of DI	$V_{IL}$	0		1.5	V	$V_{DD}=5V$
R, G, B Sink Current	$I_{SINK}$		12		mA	
R, G, B off leakage current	$I_{off}$			0.01	uA	

## Switching characteristics

(Temperature=25°C)

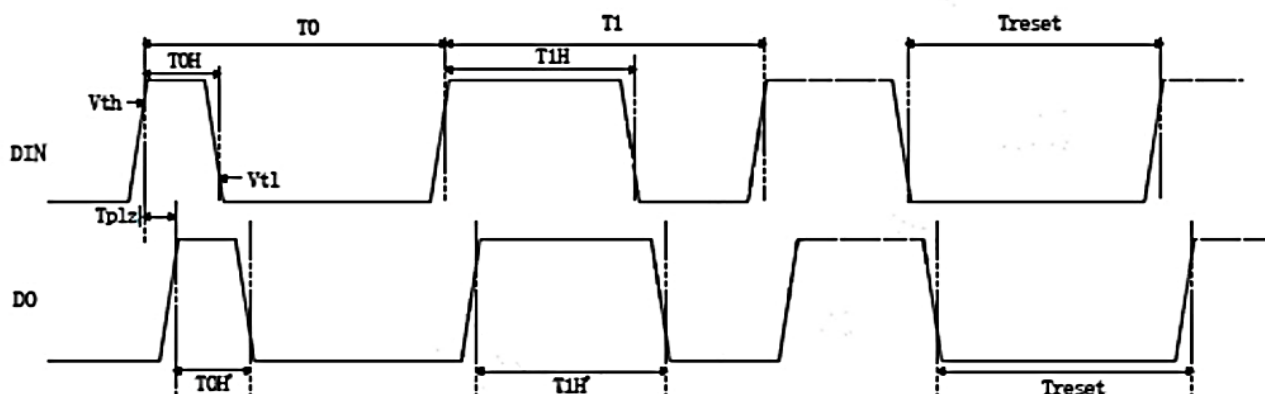
Parameter	Symbol	Min	Typical	Max	Unit	Note
Data transfer rate	$F_{DIN}$	-	800	-	KHz	
The PWM frequency	$F_{pwm}$	-	3.6	-	KHz	R、G、B
Transmission delay	$T_{pd}$	-	130	-	ns	DI → DO
Input capacitance	Cin	-	-	15	pF	

## Bit data structure

symbol	Parameter	Min	Typ.	Max	Units
T0H	0 code, high-level time	-	305	350	ns
T1H	1 code, high-level time	540	610	-	ns
T0/T1	bit code period	-	1250	-	ns
Treset	Reset code, low-level time	200	-	-	μs

(1) The product operates normally within a range of 1.25 μs (frequency 800 kHz) to 2.5 μs (frequency 400 kHz) for 0-bit or 1-bit periods. However, the high-level time for 0-bit and 1-bit must comply with the corresponding value range in the table above.

(2) When no reset is required, the low-level time between bytes should not exceed 50 μs; otherwise, after a reset, the system will be unable to correctly transmit data upon re-reception.



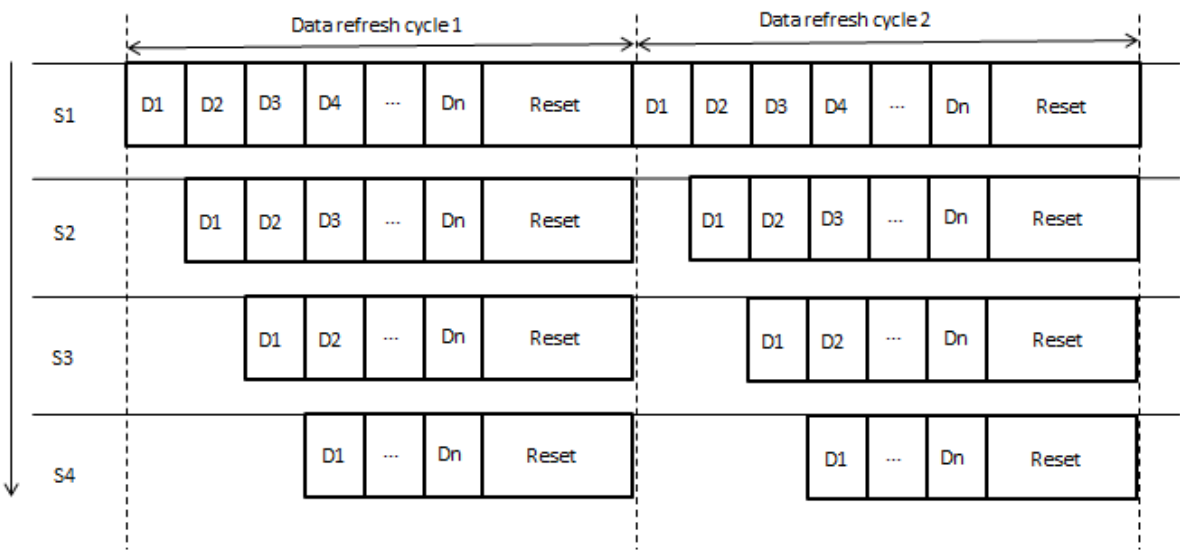
● **Function Description**

This chip uses a single-wire communication method and transmits signals using return-to-zero coding. After power-up and reset, the chip receives data from the DI pin. Once it has received 24 bits, the DO pin begins forwarding the data subsequently received from the DI pin, providing input data for the next cascaded chip. Before forwarding data, the DO pin remains at a low level.

If a RESET signal is input through DI, the chip will, upon successful reset, output the corresponding PWM duty cycle based on the received 24-bit data and will then wait to receive new data. After receiving the initial 24-bit data, it forwards data through the DO pin. Until a new RESET signal is received, the outputs on the R, G, and B pins remain unchanged.

The chip adopts an automatic reshaping and forwarding technology, ensuring that the signal does not degrade or attenuate. This allows for an unlimited number of cascaded chips in terms of signal transmission, with the only limitation being the screen refresh requirements.

● **Cascading data structure Typical Application Circuit**



The single wire data transfer protocol supports 24-bit data for each device display data refresh. T4213 receives 24-bit data and passes the remaining data to next device. The 24-bit data consist of green, red and blue data, each with 8-bit width, and are transferred with MSB first.

G7	G6	G5	G4	G3	G2	G1	G0	R7	R6	R5	R4	R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0
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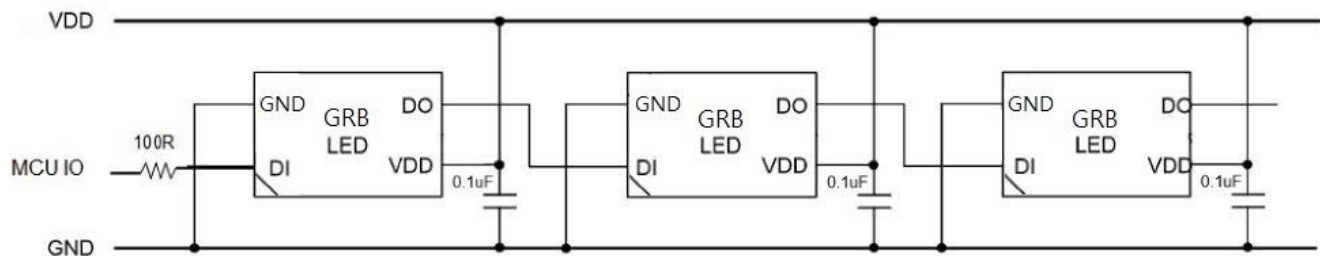
Each display data packet contains 8×3 bits of data, with the high bits transmitted first.

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.

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.

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.

## ● Typical Application Circuit

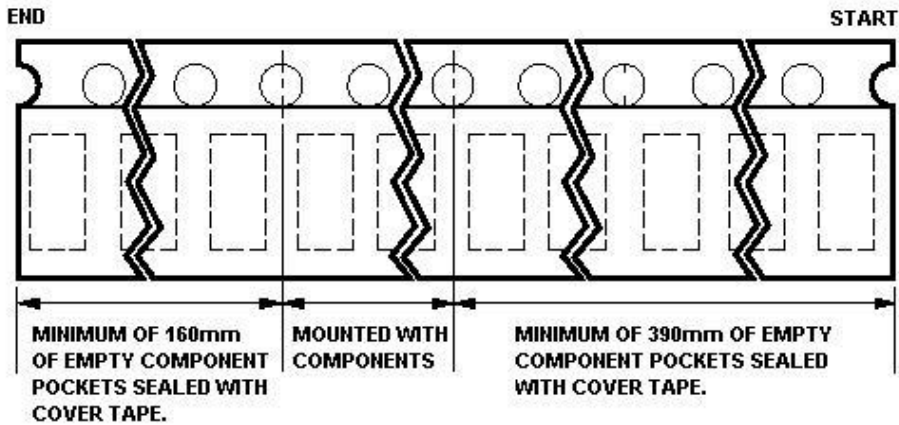
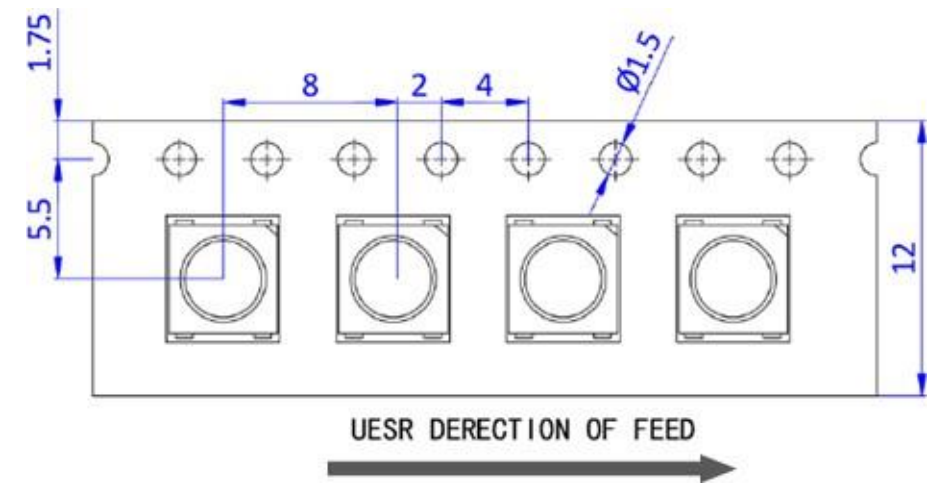




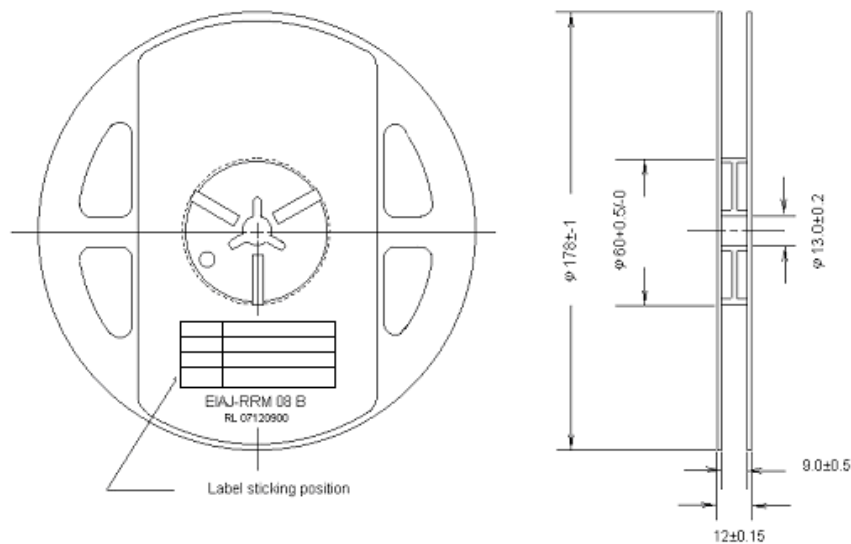
**Precaution for Use**

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.

Packaging  
Tape Dimension

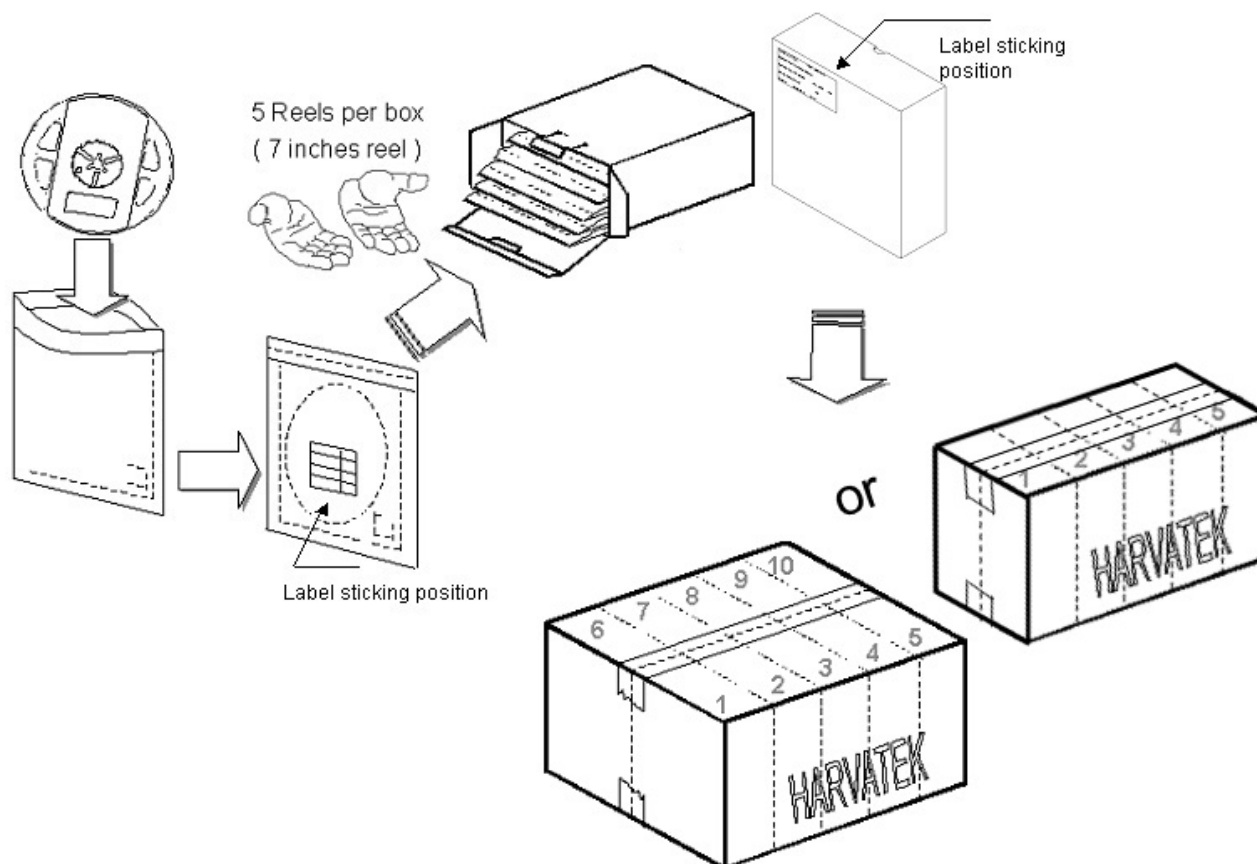


## Reel Dimension



Unit : mm

## Packing



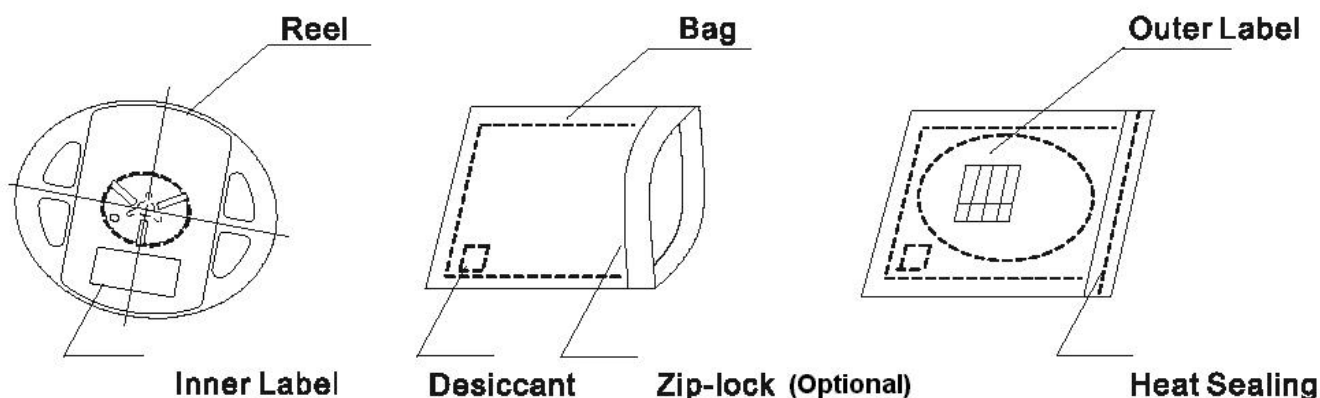
5 or 10 boxes per carton is available depending on shipment quantity.

## 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.  $60\pm3^{\circ}\text{C} \times (12\sim24\text{hrs})$  and  $<5\%\text{RH}$ , taped reel type.
2.  $100\pm3^{\circ}\text{C} \times (45\text{min}\sim1\text{hr})$ , bulk type.
3.  $130\pm3^{\circ}\text{C} \times (15\text{min}\sim30\text{min})$ , 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.

## Handling of Silicone Resin LEDs

### Handling Indications

During processing, mechanical stress on the surface should be minimized as much as possible. Sharp objects of all types should not be used to pierce the sealing compound.



Figure 1

In general, LEDs should only be handled from the side. By the way, this also applies to LEDs without a silicone sealant, since the surface can also become scratched.

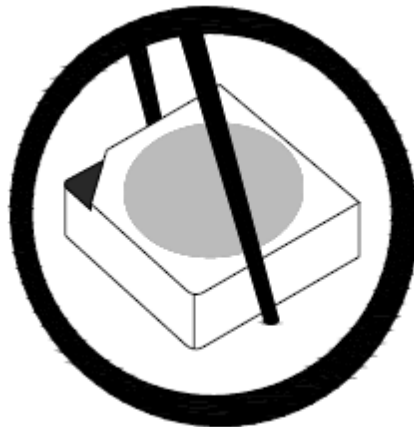


Figure 2

When populating boards in SMT production, there are basically no restrictions regarding the from of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented.

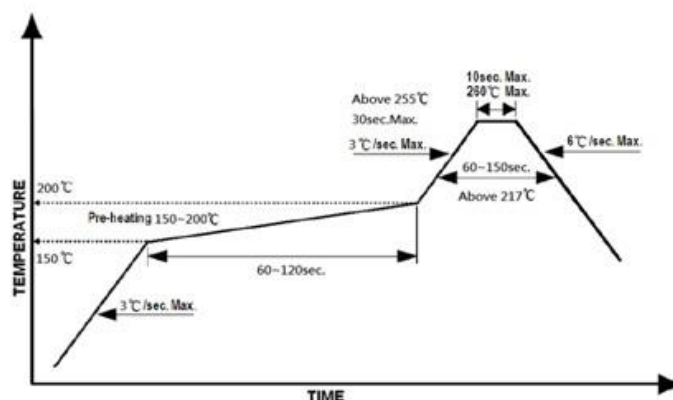
This is assured by choosing a pick and place nozzle which is large than LEDs reflector area.

## 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	05/09/2025	-