HARVATEK Surface Mount Chip LEDs DataSheet
B3WJ3GRB-12C000123U1930

(Preliminary)

Features

- Support signal reshaping to pass control waveforms to next adjacent driver
- Cascading port transmission by a single data line
- R/G/B LED sink current：12mA
- Support bi-directional data transfer protocol to feedback LED strip information, including quantity of the cascaded LED devices and the maximal sink current capability of driver chip
- Support parallel-connected multi-strip control mechanism
- Support DIN(IO1)、DOUT(IO2) auto detection and swap function
- Support sleep mode for power saving
- Support strips in-serial detection
- 256-step gray-scale output to allow 16,777,216 color display
- Support 32-level dimming control for R/G/B channel
- Built-in oscillator with 20MHz frequency
- Built-in power-on-reset (1.7V) (@VDD=5V)
- Built-in brown-out reset (1.8V) (@VDD=5V)
- Reverse mountable package
- Operating voltage 3.3~5.5V

Applications

- Decorative LED lighting
- LED video display

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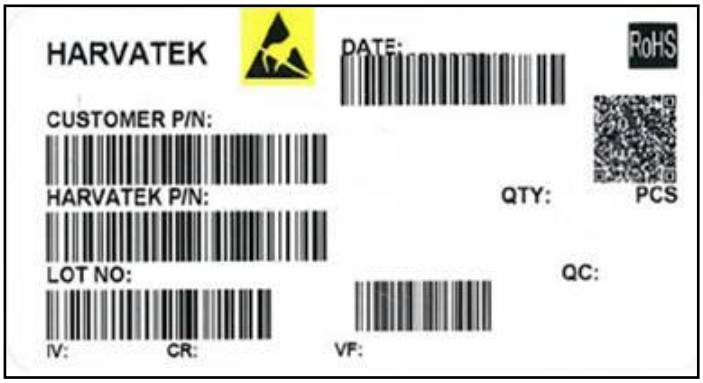
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Label Specifications



- **HARVATEK P/N:**

B	3WJ	3	GRB-	12C	0001	23

Product	Package	Dice Q'ty	Color	Current	Series Number	Taping
PCB	3.2(L)x1.2(W)x0.8(H) mm	3: Tri	FCH:GRB (Full Color)	12mA	X001~XZZZ	1.Taping style 2. Q'ty

- **Lot No:**

1	2	3	4	5	6	7	8	9	10
E	1	A	1	A	2	2	L	1	2
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 2021-M 2022-P 2023-Q … 2026-T 2027-V … 2030-Y 2031-Z …	1:Jan. 2:Feb. … A:Oct. B:Nov. C:Dec.	1:A 2:B 3:C … 26:Z 27:7 28:8 29:9 30:3 31:4	01~ZZ		000~ZZZ		

Specifications Range

- **Luminous Intensity (Iv)** :

Color	Spec. Range
R	112.5 – 285 mcd
G	450 – 1125 mcd
B	71.5 – 180 mcd

Note: It maintains a tolerance of ±10% on luminous intensity

- **Wavelength** :

Color	Spec. Range
R	615 – 630 nm
G	520 – 535 nm
B	465 – 480 nm

Note: It maintains a tolerance of ± 0.5nm on Wavelength Bin

Product Features

Electro-Optical Characteristics

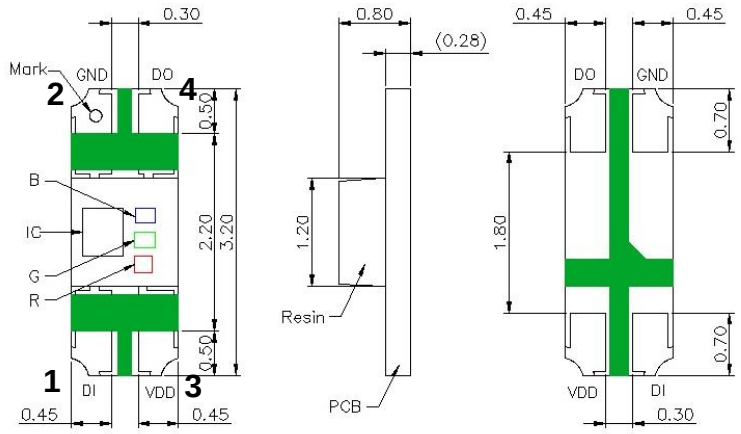
(Temperature=25℃)

Emitting Color	Material	Wavelength λ(nm)	I_V(mcd)	Test Condition 8bits	Viewing Angle $2\theta\frac{1}{2}$
		Typical	Typical		
R	AlGaInP	621	255	R：[11111111]	120
G	InGaN	528	547	G：[11111111]	120
B	InGaN	469	104	B：[11111111]	120

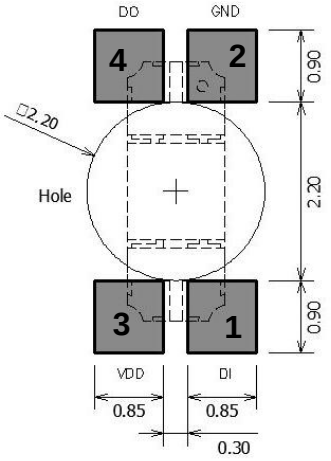
Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

(Unit: mm Tolerance: +/-0.1)

Outline Dim.



Suggest Soldering Pattern



Soldering terminals may shift in the x, y direction.

No.	Symbol	Pin	Function
1	DI	Data signal input	Control data signal input
2	GND	The grounding end	Signal grounding and power grounding
3	VDD	The power supply side	Power supply pin
4	DO	Cascade signal output terminal	Control data signal output

Absolute Maximum Ratings

(Temperature=25℃)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{DD}	5.5	V
Total DC current	I_F	38	mA
Operating Temperature Range	T_{OPR}	-40~85	°C
Storage Temperature Range	T_{STO}	-40~85	°C
ESD Voltage	V_{ESD}	2	KV

Electrical Characteristics

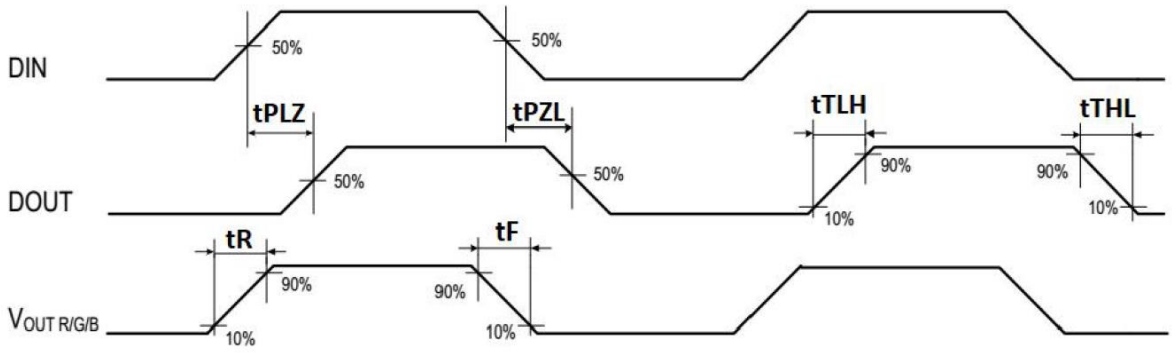
(Temperature=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Supply Voltage	V_{DD}	3.3		5.5	V	
Operation Current	I_{DD}		0.5	0.75	mA	V_{DD}=5V, LED OFF
Input High “H” of DI	V_{IH}	V_{DD}*0.6		V_{DD}+0.4	V	
Input Low “L” of DI	V_{IL}	-0.4		V_{DD}*0.2	V	
Output High “H” of DO	V_{OH}	4.4			V	I_{OH} = 3mA
Output Low “L” of DO	V_{OL}			0.3	V	I_{OL} = 3mA
R, G, B Sink Current	I_{SINK}	11.4	12	12.6	mA	
Input leakage	I_{leak}			1	μA	DI=0V
R, G, B off leakage current	I_{off}			1	μA	PWM=0 (off), @R, G, B =5V

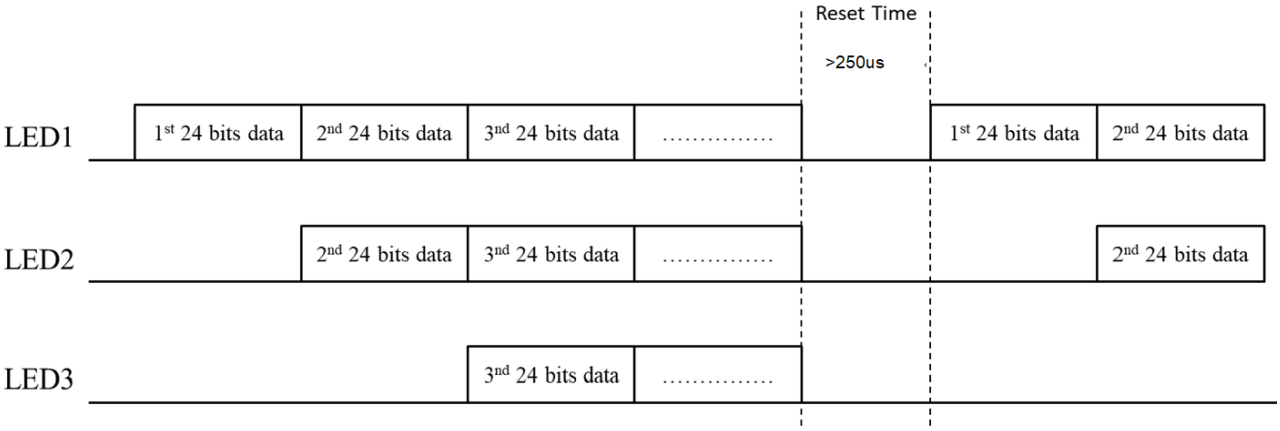
Dynamic characteristics

(VDD =5V，Temperature=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Propagation delay time	tPLZ			80	ns	DI->DOUT
Rising time	tTHL		15		ns	
Falling time	tTLH		15		ns	
$Vout_{RGB}$ Rising time	tR		50		ns	I_{LED} = 12mA
$Vout_{RGB}$ Falling time	tF		50		ns	
Data rate	F_{Data}		800		KHz	



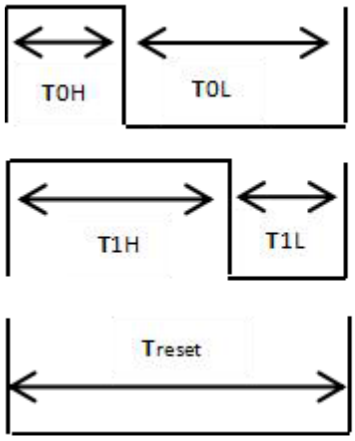
Data Transfer Protocol



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

The drive determines the received bit string based on the input pulse width on DIN port. 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 longer than 200us is recognized as a reset command to drive to synchronize and update the data for all devices to display simultaneously, and it also means to start a new cycle of serial commands.



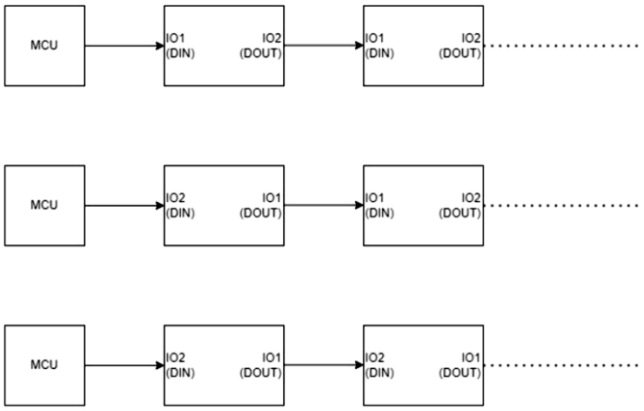
IO1、IO2(DIN、DOUT) detecting and setting

The drive supports DIN、DOUT auto detection and swap function

After power-on, IO1 and IO2 of drive is kept at high state, MCU needs to drive the IO of the drive which connects to MCU as low(Note:The IO of MCU must be at “low” state(output low) after power on). The DIO which detects the low level will be treated as DIN, and the other DIO is treated as DOUT. After the function of DIN and DOUT is validated, the drive will output low through DOUT to the next chip, the auto-detecting and setting process will be done one by one for all of drives in the strip

Typically, it takes 360us to complete power on reset and 45us for DIN、DOUT detecting、setting for one chip. If there are 10chips in the strip, it needs 360us+45us*10,810us, totally to complete the detecting and setting from power on

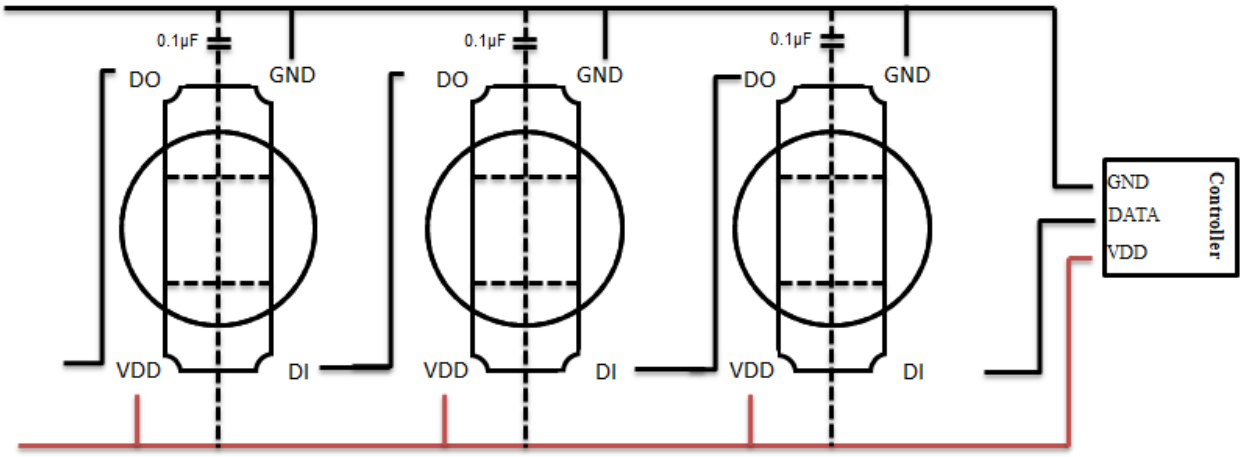
3 examples are illustrated in following diagram



Advanced Function Mode (feedback mode and high level setup mode)

A host MCU can issue special commands to make drive get into advanced function mode. In advanced mode, The drive supports bi-direction data transfer. Through the single wire protocol, drive can feedback the information about the cascaded number of LEDs or maximal sink current capability of R/G/B channel on the LED lamp strip to MCU. For dimming purpose, drive also features the current gain control function for the individual R/G/B channel of every single LED on the strip. Programmable PWM refresh rate is also available.

Typical Application Circuit

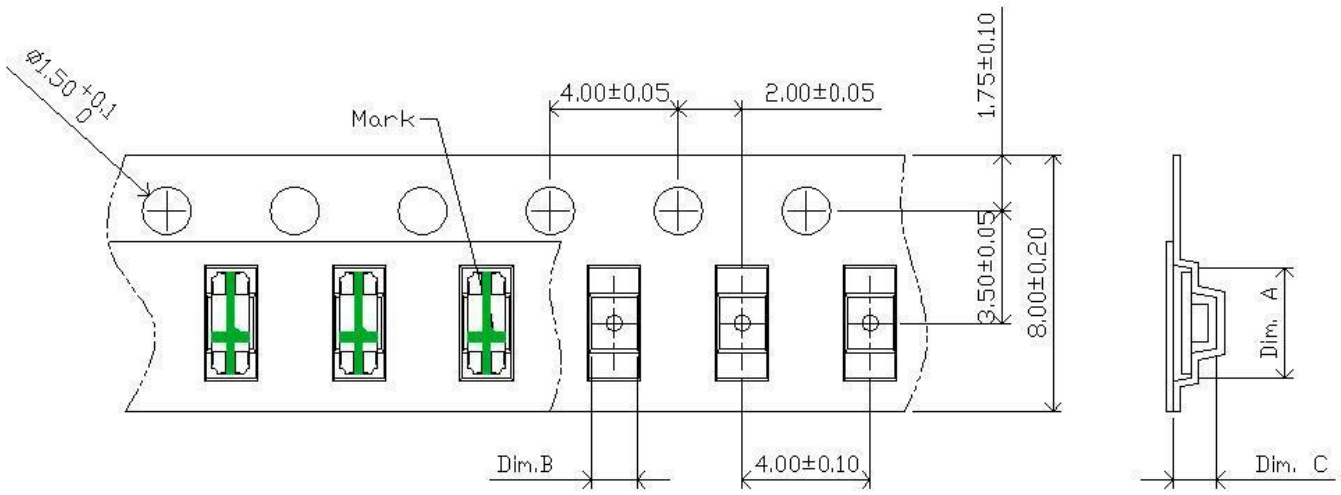


Precaution for Use

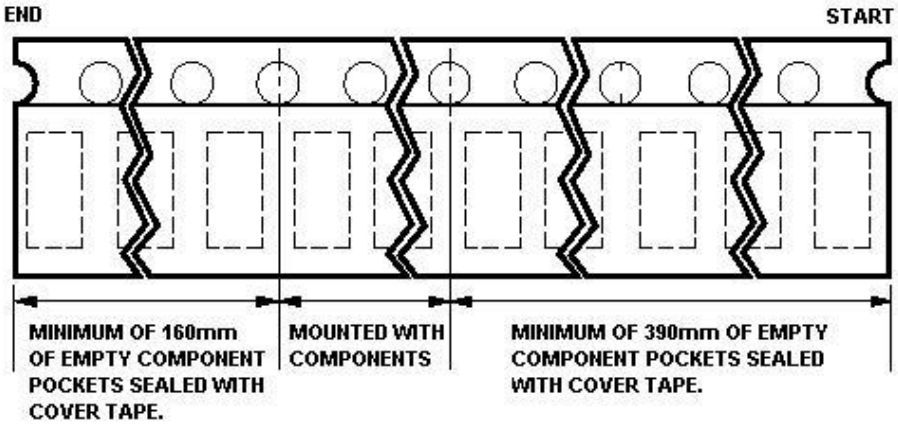
1. The chips should not be used directly in any type of fluid such as water, oil, organic solvent, etc.
2. When the LEDs are illuminating, the maximum ambient temperature should be first considered before operation.
3. LEDs must be stored in a clean environment. A sealed container with a nitrogen atmosphere is necessary if the storage period is over 3 months after shipping.
4. The LEDs must be used within 24hrs 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

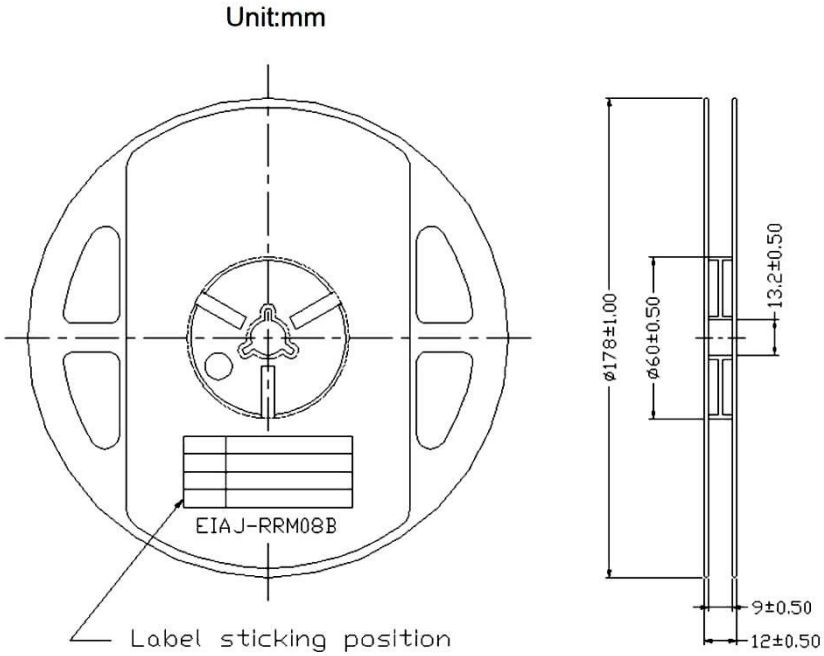
Tape Dimension



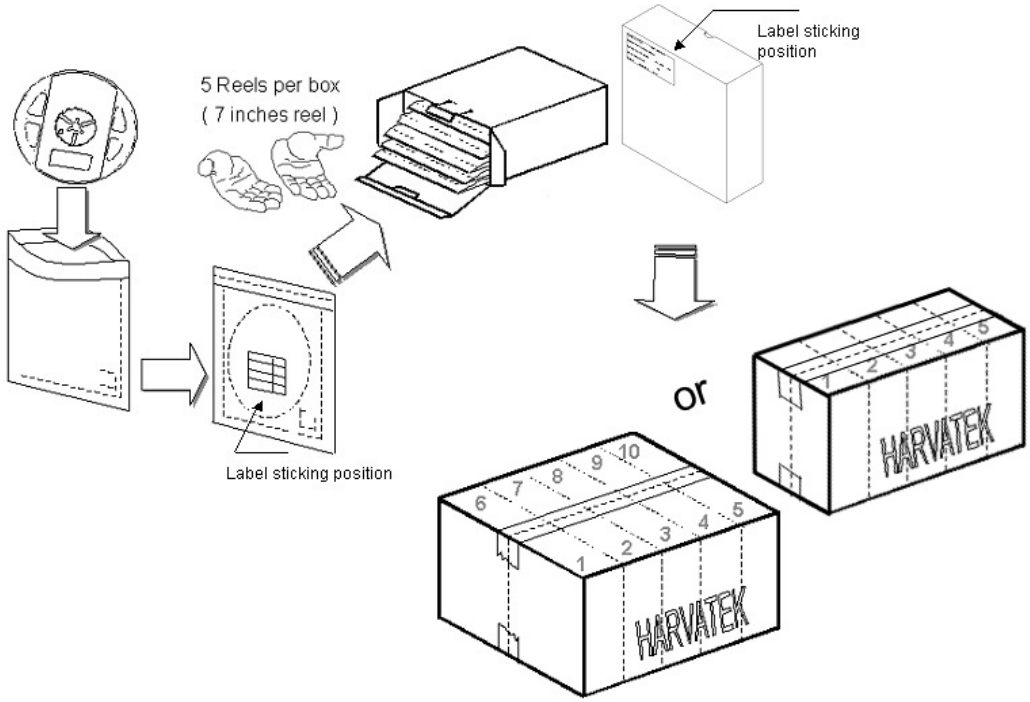
Dim. A	Dim. B	Dim. C	Q'ty/Reel
3.40±0.10	1.42±0.10	1.37±0.10	3K



Reel Dimension



Packing



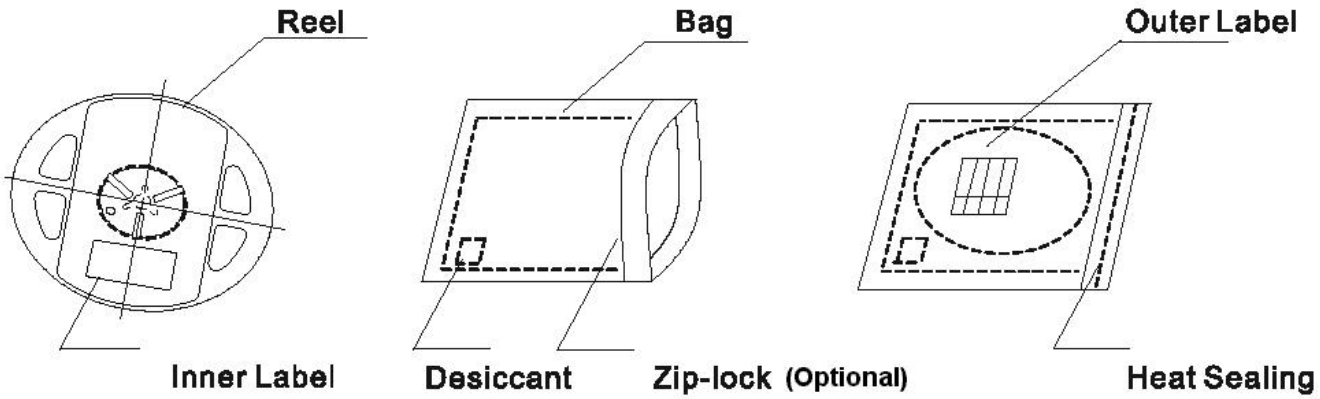
5 or 10 boxes per carton is available depending on shipment quantity.

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 4 weeks.
The conditions are as followings:

1. 60±3℃×(12~24hrs)and<5%RH, taped reel type.
2. 100±3℃×(45min~1hr), bulk type.
3. 130±3℃×(15min~30min), 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 AlGaInP 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.

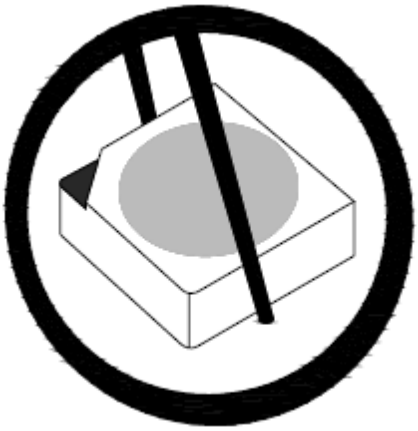


Figure 2

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

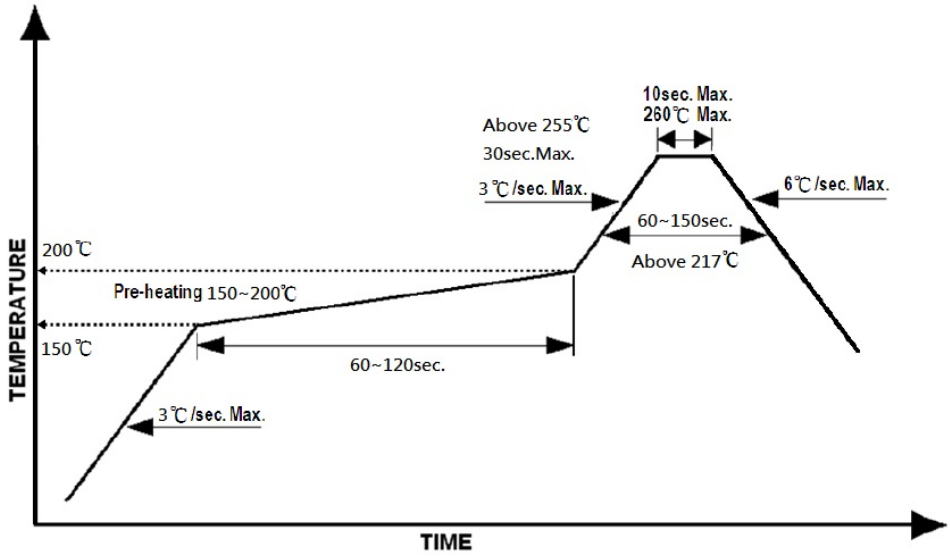
This is assured by choosing a pick and place nozzle which is large than LEDs reflector area.

Reflow Soldering

Recommend soldering paste specifications:

1. Operating temp.: Above 217℃, 60~150 sec.
2. Peak temp.:260℃ Max., 10 sec 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 ℃.
- 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℃ x 30sec. or <30℃ x 3min
- Ultrasonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100 ℃ 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	05/06/2025	-
1.1	增加 Pin 腳定義	07/23/2025	-