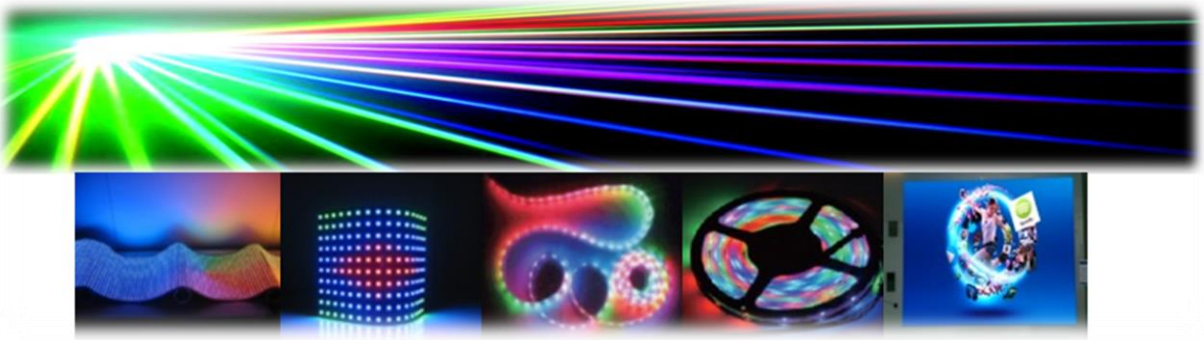
Harvatek Surface Mount CHIP LEDs Data Sheet
B3WC3GRB-05C0002L3U1930

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
- Maximal drive current: 5mA
- 256-step gray-scale output to allow 16,777,216 color display
- Built-in oscillator 20MHz
- RGB PWM frequency 20Khz
- Built-in power-on-reset (1.7V) (@VDD=5V)
- Built-in brown-out reset (1.8V) (@VDD=5V)
- Support patented sleep and wake up mode
- 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.

Product Specifications

Item	Specification	Material	Quantity
Luminous Intensity(Iv)	Red:45~180 mcd Green:71.5~285 mcd Blue:11.25~45 mcd IC@5V, R/G/B@5mA Ts= 25℃; Tolerance ±10%		
Wavelength	Red:615~625 nm Green:515~535 nm Blue:460~472 nm IC@5V, R/G/B@5mA Ts= 25℃; Tolerance ± 0.5nm		
Applied voltage	5V_DC		
View angle	120^{o}		
Resin	Clear	Epoxy	
Carrier tape		Conductive black tape	3000 ea/reel
Reel		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, λ_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

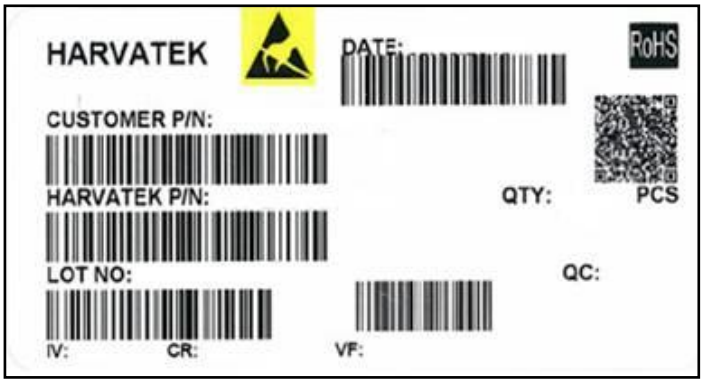
※Remarks: This product should be operated in forward bias. If a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

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:

B 3WC 3 GRB- 05C- 0002 L3

Product	Package	Dice Qty	Color	Current	Series Number	Taping
PCB	3.2(L)x1.0(W)x1.5(H) mm	3:Tri	GRB(Full Color)	5mA	X001~XZZZ	1.Taping style 2. Qty

■ 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	45-180 mcd
G	71.5-285 mcd
B	11.25-45 mcd

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

■Wavelength :

Color	Spec. Range
R	618-625 nm
G	518-535 nm
B	460-472 nm

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

Product Features

Electro-Optical Characteristics

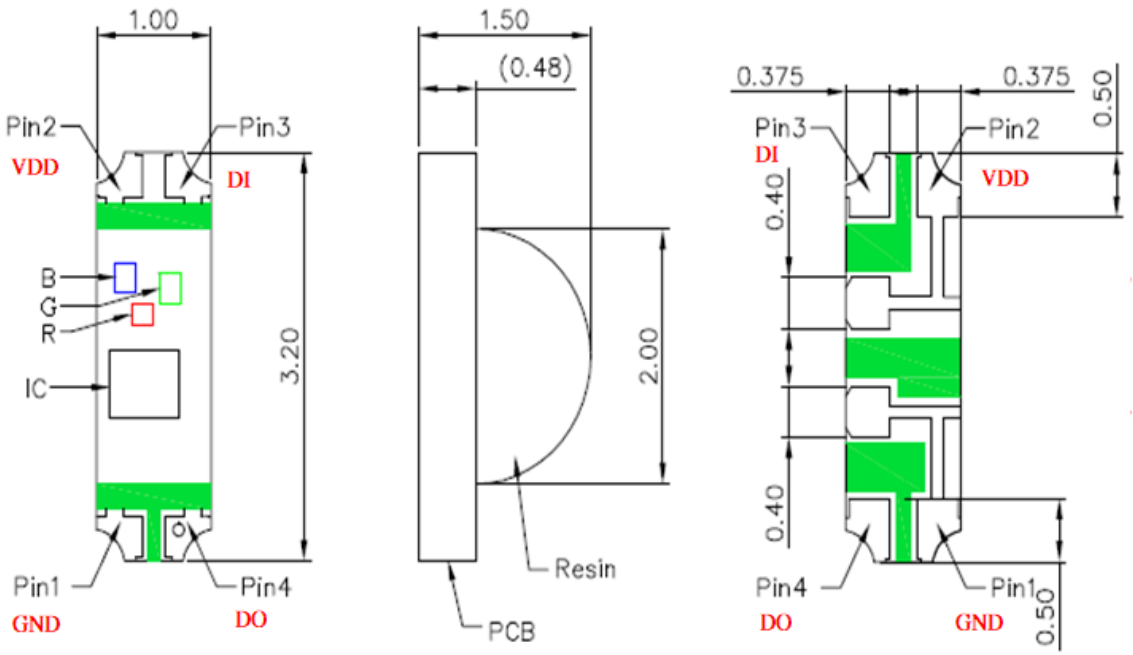
(VDD =5V，Temperature=25℃)

Series	Emitting Color	Material	Wavelength λ(nm)	I_V(mcd)	Test Condition 8bits	Viewing Angle $2\theta\frac{1}{2}$
			λ_D	Typical		
B3WC3	R	AlGaInP	620	113	R：[11111111]	120
	G	InGaN	523	178	G：[11111111]	120
	B	InGaN	468	28	B：[11111111]	120

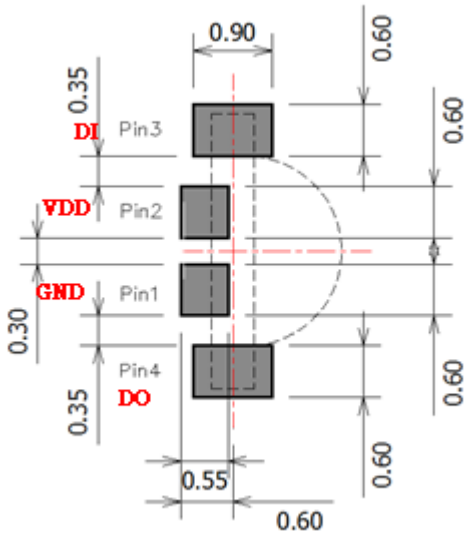
Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

(Unit:mm Tolerance: +/-0.1)

Outline Dim.



Suggest Soldering Pattern



Soldering terminals may shift in the x, y direction.

Absolute Maximum Ratings

(Temperature=25℃)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{DD}	6	V
Total DC Current	I_F	16.75	mA
Operating Temperature Range	T_{OPR}	-40~85	℃
Storage Temperature Range	T_{STO}	-65~120	℃
ESD Voltage	V_{ESD}	4	kV

Electrical Characteristics

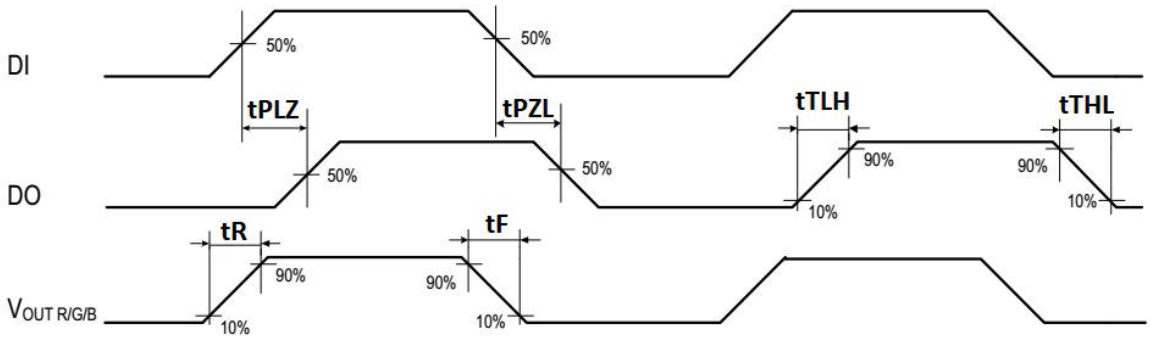
(Temperature=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Supply Voltage	V_{DD}	3.0	5	5.5	V	
Operation Current	I_{DD}	0.4	0.6	0.8	mA	R, G, B no load
Sleep Mode Current	I_{sleep}		1	5	uA	
Input High “H” of DI	V_{IH}	V_{DD}*0.45+0.5		V_{DD}	V	
Input Low “L” of DI	V_{IL}	0		1.0	V	
Output High “H” of DO	V_{OH}	V_{DD}-0.5			V	I_{OH}=4mA
Output Low “L” of DO	V_{OL}			0.4	V	I_{OL}=4mA
R, G, B Sink Current	I_{SINK}	4.75	5	5.25	mA	VDD-Vf_{LED}≥1.0V
Input leakage	I_{leak}			1	uA	D_I=0V
R, G, B off leakage current	I_{off}			1	uA	PWM=0 (off), @R, G, B =5V

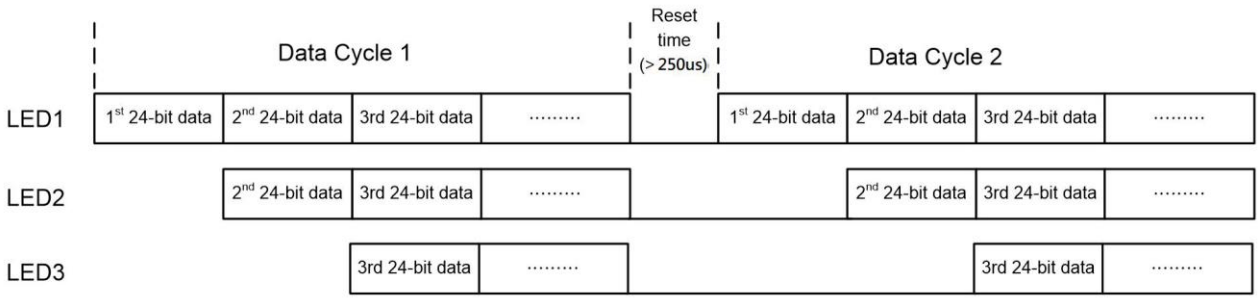
Dynamic characteristics

(VDD =5V，Temperature=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Propagation delay time	tPLZ			80	ns	D_I → D_O, CL=30pF
	tPZL			80	ns	
Rising time	tTHL		15		ns	
Falling time	tTLH		15		ns	
Rising time	tR		50		ns	R, G, B=5mA, CL=30pF
Falling time	tF		50		ns	
Data rate	F_{data}		800		Khz	
RGB port output frequency	F_{PWM}		20		KHz	


DI
DO
VOUT R/G/B
50%
50%
tPLZ
tPZL
50%
50%
tTLH
tTHL
90%
90%
10%
10%
tR
tF
90%
90%
10%
10%

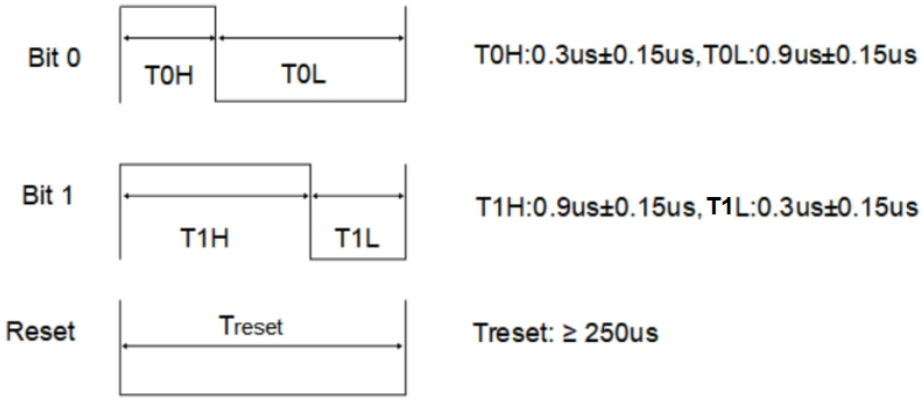
Data Transfer Protocol



The single wire data transfer protocol supports 24-bit data for each device display data refresh.B3WC3 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

B3WC3 determines the received bit string based on the input pulse width on Di port. A low bit 0 is represented by a 0.30us 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 250us is recognized as a reset command to B3WC3 to synchronize and update the data for all devices to display simultaneously, and it also means to start a new cycle of serial commands.



Sleep and wake-up mode

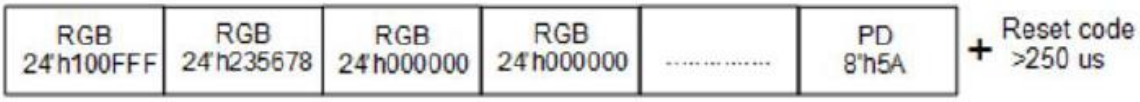
B3WC3 supports sleep/wake-up modes for power-saving purpose. When receiving 24-bit 0's GRB data, 8-bit 0x5A special data, and a reset command, B3WC3 will enter sleep mode. In sleep mode, the built-in oscillator and associated circuitry is disabled. The quiescent current of B3WC3 is approximately 5uA (typ) in sleep mode.

A sleeping B3WC3 wakes up from sleep mode when detecting an input rising edge on DI. Normally a positive pulse on DI can be used as a wake-up trigger. After waking up, all sleeping circuits in B3WC3 return to normal working mode within 1ms. To wake-up the next cascaded B3WC3, the received positive pulse on DI pin is passed to DO pin, which connected to DI pin of the next B3WC3, and in turn wakes up the next B3WC3.

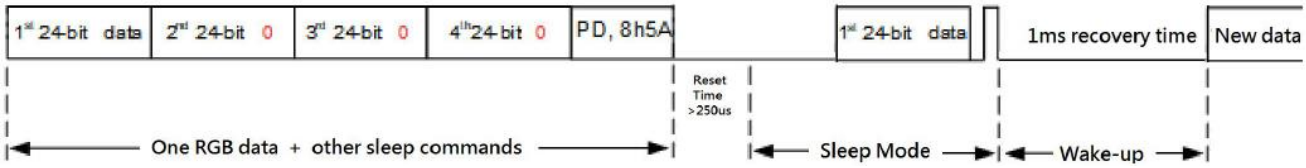
Hence, all cascaded sleeping B3WC3s can wake up successively.

Since it takes 1ms for a sleeping B3WC3 returning to normal functioning mode, it is recommended for MCU to wait for 1ms to send display data and commands after issuing a wake-up pulse.

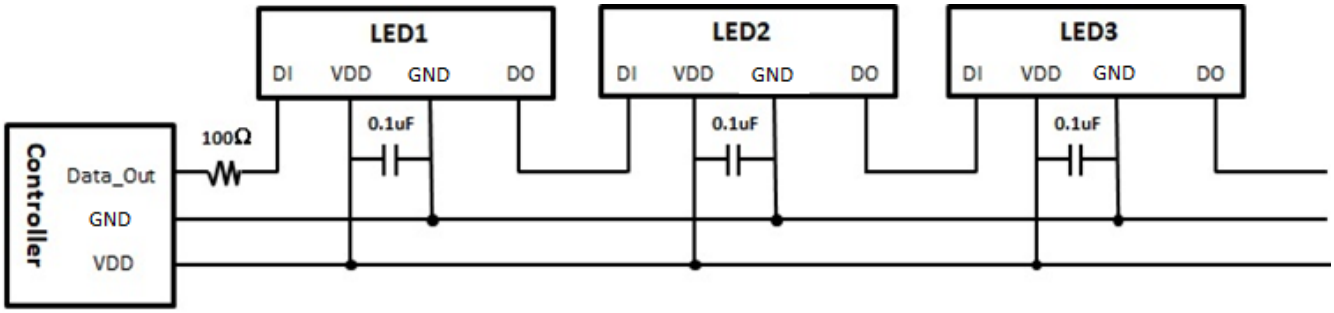
In an LED strip, it is possible to set certain B3WC3s active, while the others in sleep mode. As an example, the following commands are for two leading active B3WC3s and other sleeping B3WC3s.



As an example of sleep/wake-up commands shown below, the first B3WC3 is kept active and the remaining B3WC3's enter sleep mode by 24-bit 0's and an ending 0x5A byte. Later on, a positive pulse wakes up all sleeping B3WC3's.



Typical Application Circuit

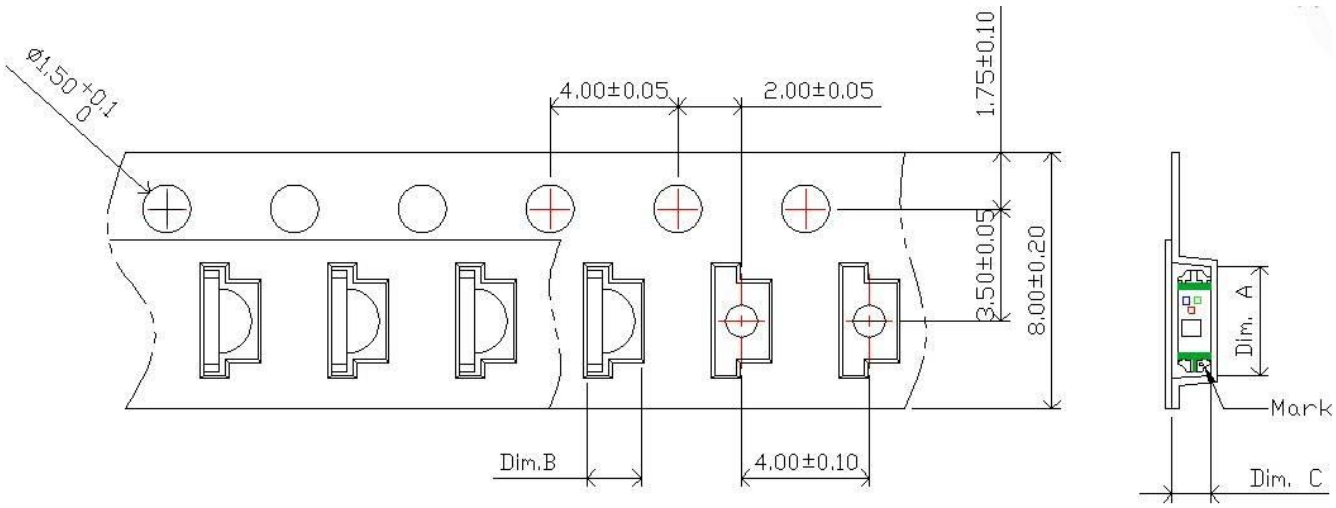


Precaution for Use

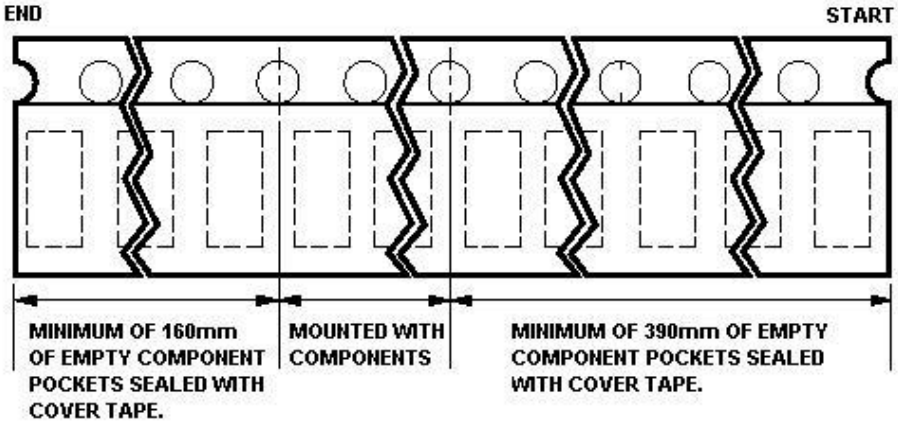
1. The chips should not be used directly in any type of fluid such as water, oil, organic solvent, etc.
2. When the LEDs are illuminating, the maximum ambient temperature should be first considered before operation.
3. LEDs must be stored in a clean environment. A sealed container with a nitrogen atmosphere is necessary if the storage period is over 3 months after shipping.
4. The LEDs must be used within 168 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

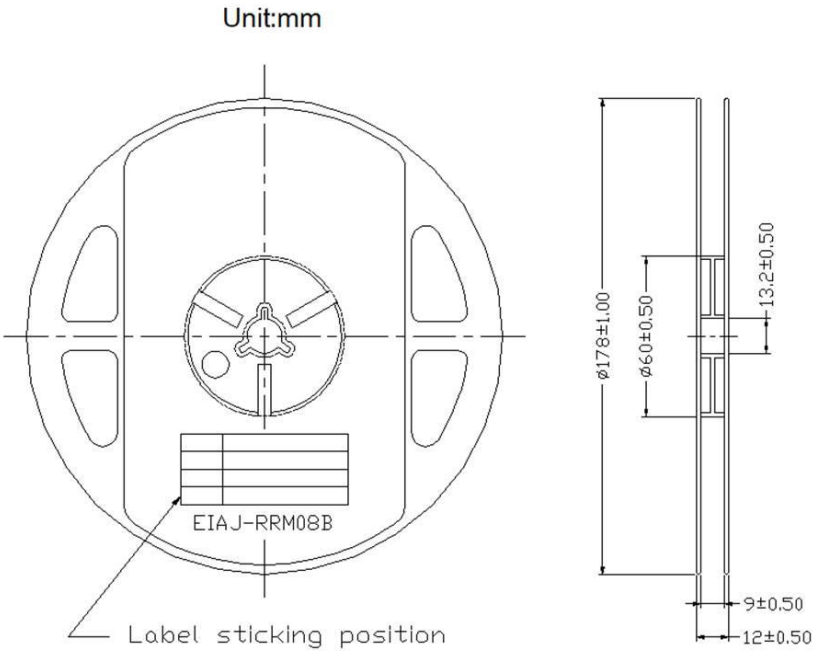
Tape Dimension



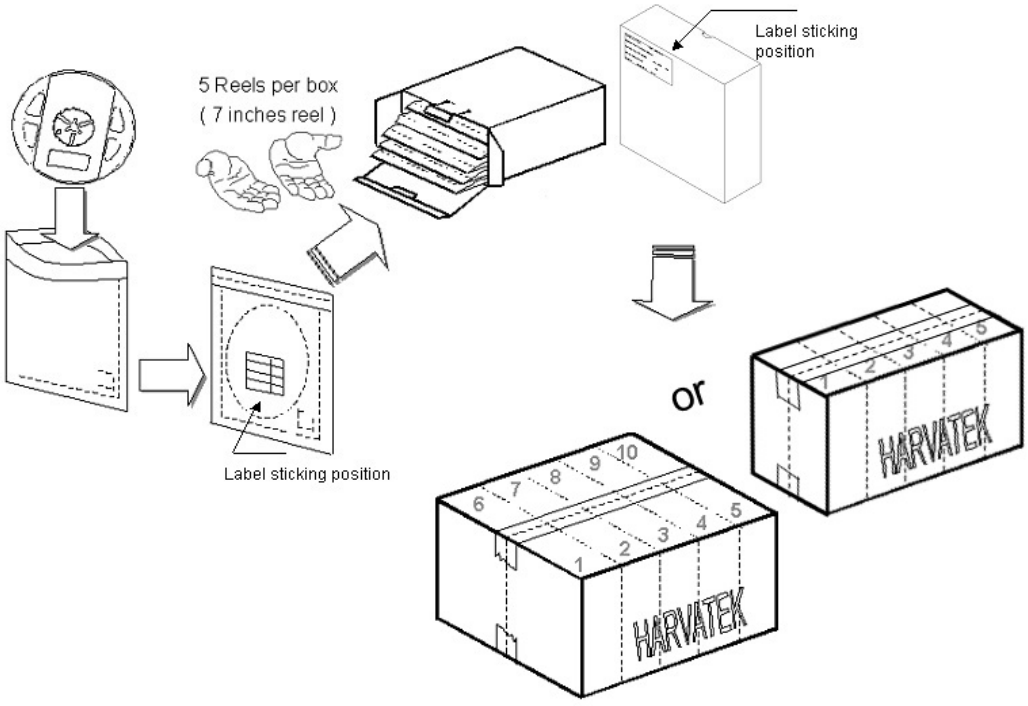
Dim. A	Dim. B	Dim. C	Qty/Reel
3.40±0.10	1.70±0.10	1.20±0.10	3K



Reel Dimension



Packing



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

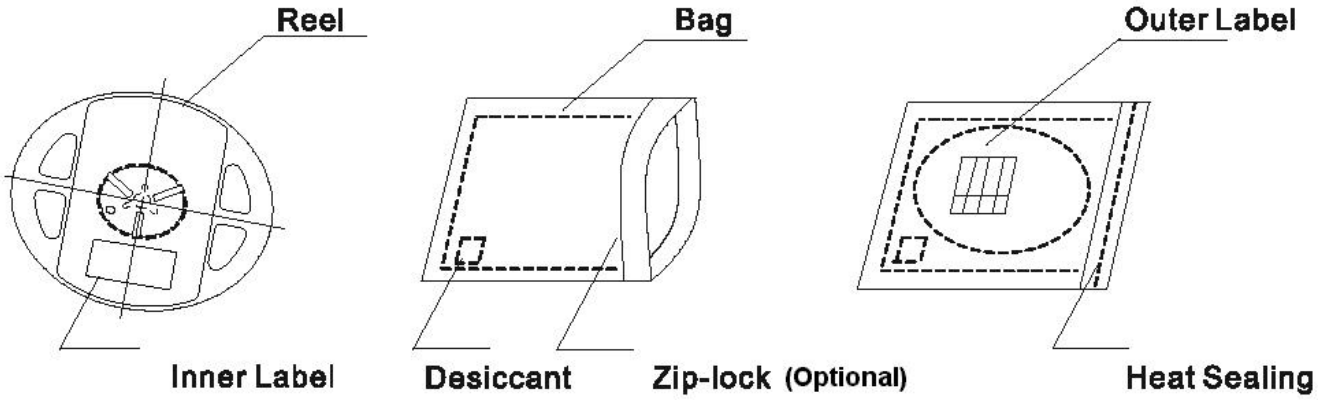
Dry Pack

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 168 hours.

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

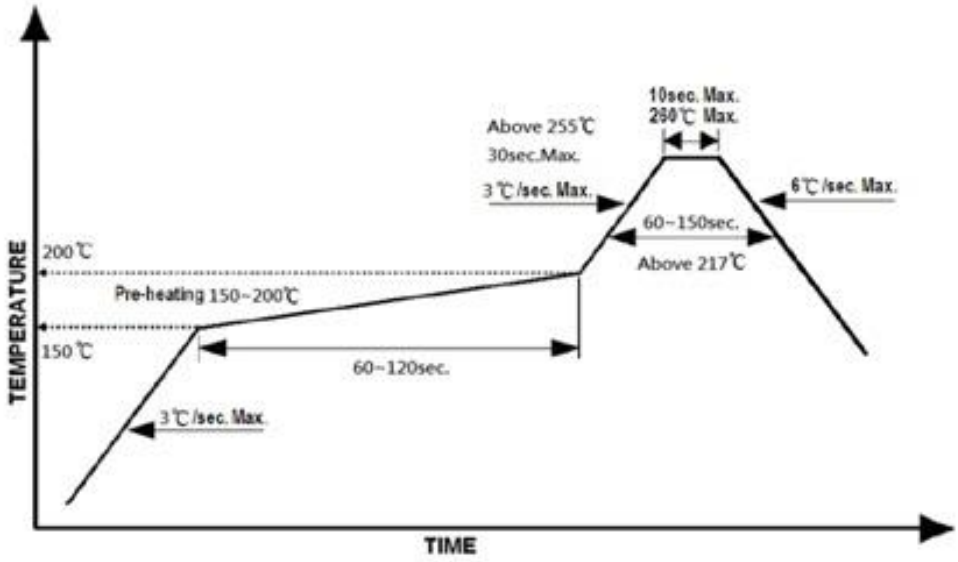
1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the 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℃ ,60~150 sec
2. Peak temp.:260 ℃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 ℃.
- 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	-	07/12/2024	