HARVATEK Surface Mount PLCC IC+RGB LEDs DataSheet
T3AN3GRB-12C0001X1U1930
(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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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 : 280~567 mcd Green : 715~1125 mcd Blue : 180~224 mcd IC@5V, R/G/B@12mA Ts= 25℃ ; Tolerance ±10%		
Wavelength	Red :615~625 nm Green : 520~530 nm Blue : 465~475nm IC@5V, R/G/B@12mA Ts= 25℃ ; Tolerance ±0.5nm		
Applied voltage	5V_DC		
View angle	120^{o}		
Resin	Clear	Silicone	
Carrier tape	EIA 481-1A specs	Conductive black tape	1000 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, 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

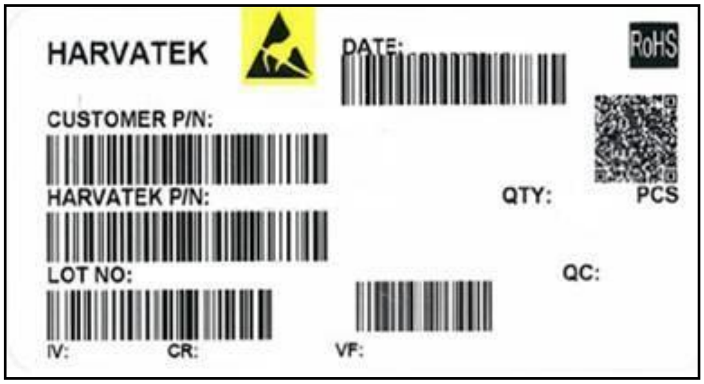
※Remarks: This product should be operated in forward bias. If a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

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

DATE:

RoHS

CUSTOMER P/N:

HARVATEK P/N:

QTY: PCS

LOT NO:

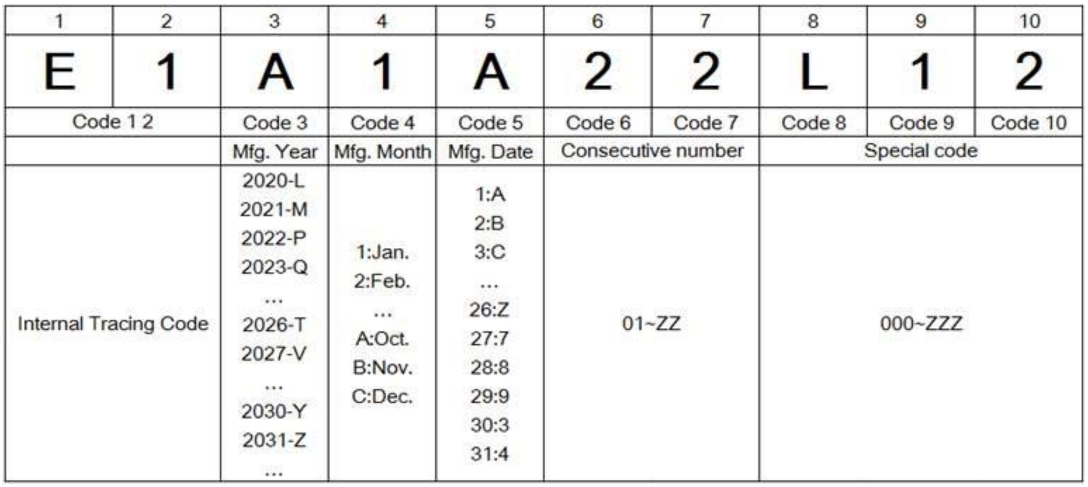
QC:

IV: CR: VF:

- **HARVATEK P/N:**

T	3AN	3	GRB-	12C-	0001	X1
Product	**Package**	**Dice Q'ty**	**Color**	**Current**	**Series Number**	**Taping**
L/F	**5.4(L)x5.0(W)x1.6(H) mm**	**3:Tri**	**GRB (Full Color)**	**12mA**	**X001~XZZZ**	**1.Taping style** **2. Q'ty**

- **Lot No.**

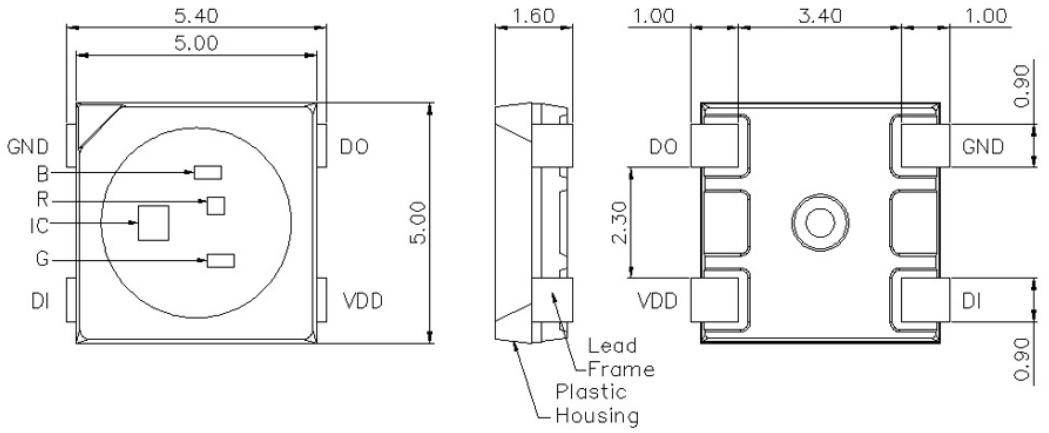


1	2	3	4	5	6	7	8	9	10
E	1	A	1	A	2	2	L	1	2
Code 1 2		Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9	Code 10
		Mfg. Year	Mfg. Month	Mfg. Date	Consecutive number		Special code		
Internal Tracing Code		2020-L 2021-M 2022-P 2023-Q … 2026-T 2027-V … 2030-Y 2031-Z …	1:Jan. 2:Feb. … A:Oct. B:Nov. C:Dec.	1:A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

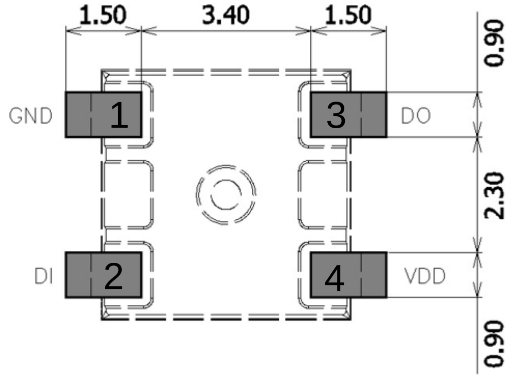
Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

(Unit: mm Tolerance: +/-0.1)

Outline Dim.



Suggest Soldering Pattern



No.	Symbol	Pin	Function
1	GND	Ground	Ground
2	DI	Data Input	Control Data Signal Intput
3	DO	Data Output	Control Data Signal Output
4	VDD	Power	Power

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	39	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 λ(nm)	I_V(mcd)	Test Condition 8bits	Viewing Angle
		λ_D	Typical		$2\theta\frac{1}{2}$
R	AlGalnP	620	423.5	R：[11111111]	120
G	InGaN	515	920	G：[11111111]	120
B	InGaN	470	202	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℃)

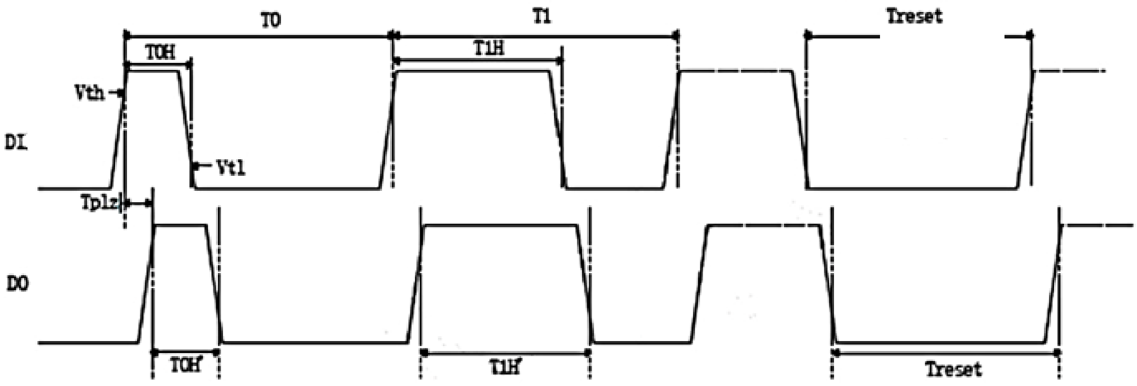
Parameter	Symbol	Min	Typical	Max	Unit	Note
Data transfer rate	F_{DIN}	-	800	-	KHz	
The PWM frequency	F_{pwm}	-	3.6	-	KHz	R、G、B
Transmission delay	T_{pzl}	-	130	-	ns	DI → DO
Input capacitance	Cin	-	-	15	pF	

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
Trst	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.



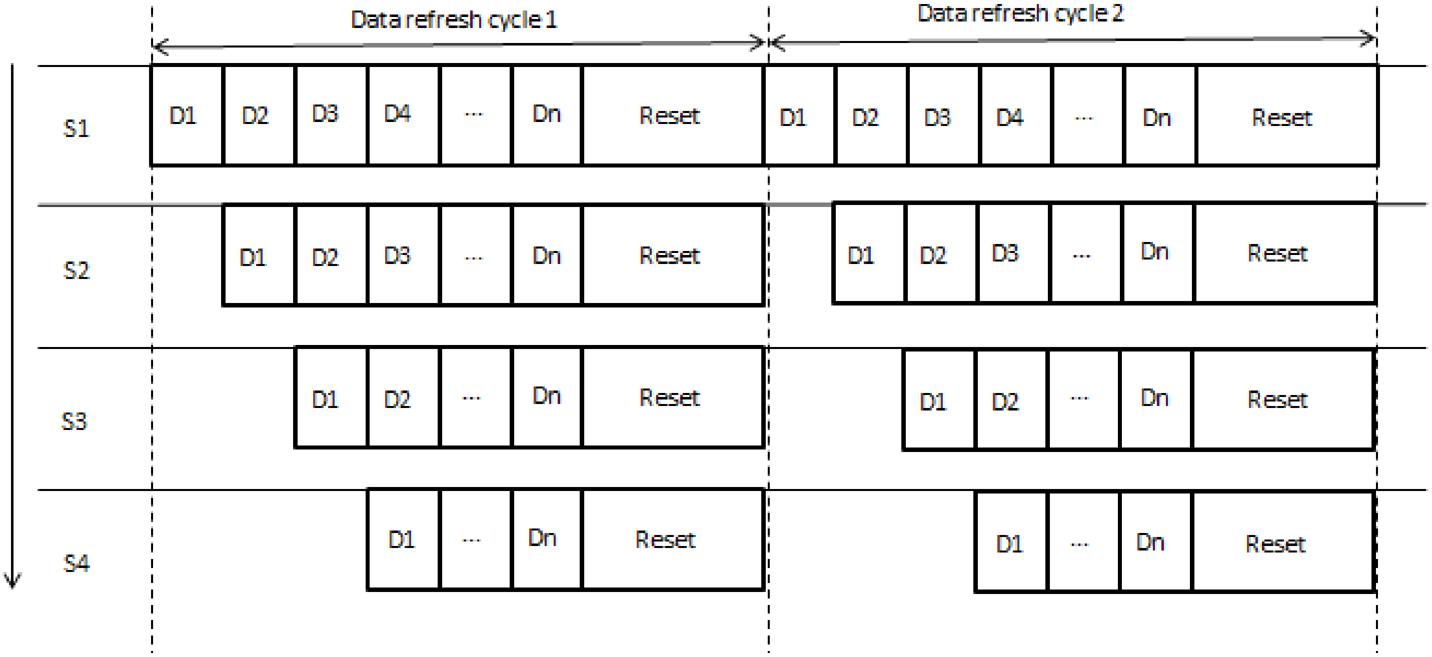
Function Description

This chip uses a single-wire communication method and transmits signals using return-to-zerocoding. 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. The device 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

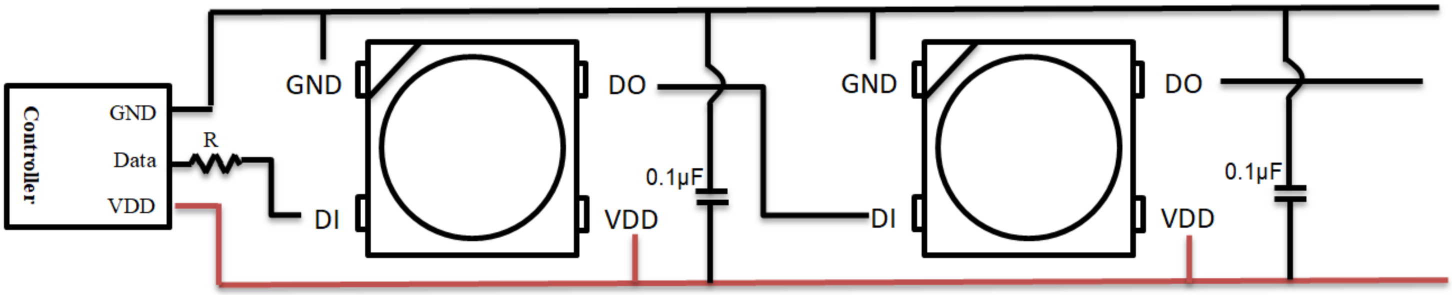
Each display data packet contains 8×3 bits of data, with the high bits transmitted first.

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

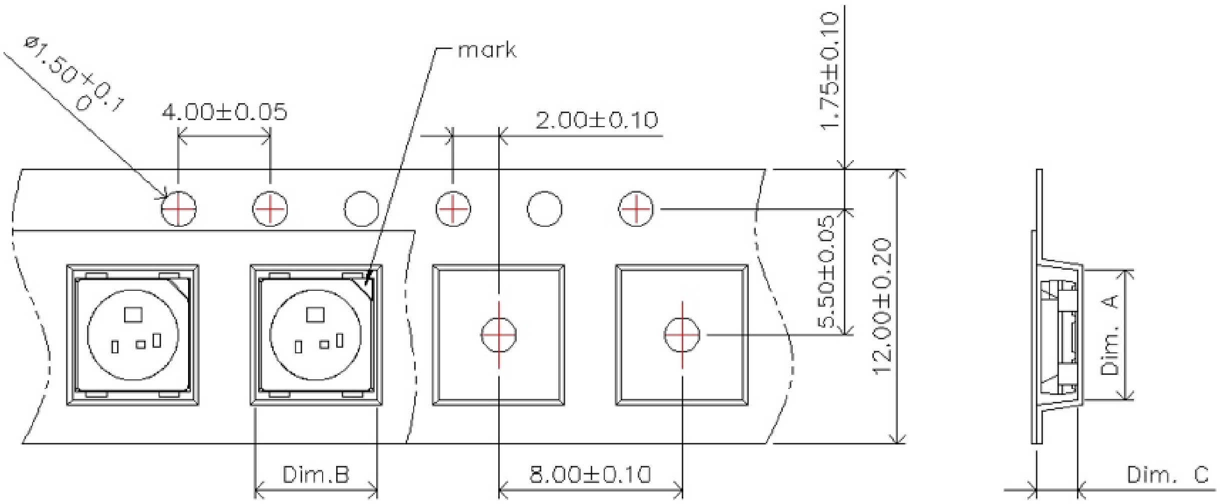


Precaution for Use

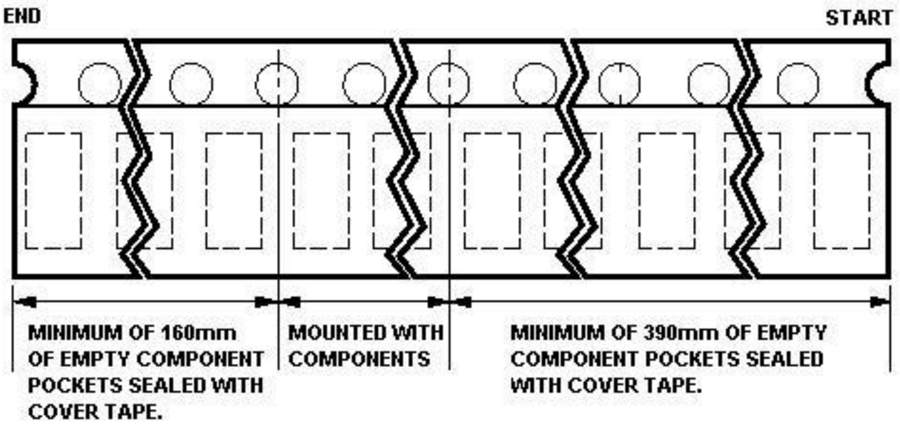
1. The chips should not be used directly in any type of fluid such as water, oil, organic solvent, etc.
2. When the LEDs are illuminating, the maximum ambient temperature should be first considered before operation.
3. LEDs must be stored in a clean environment. A sealed container with a nitrogen atmosphere 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

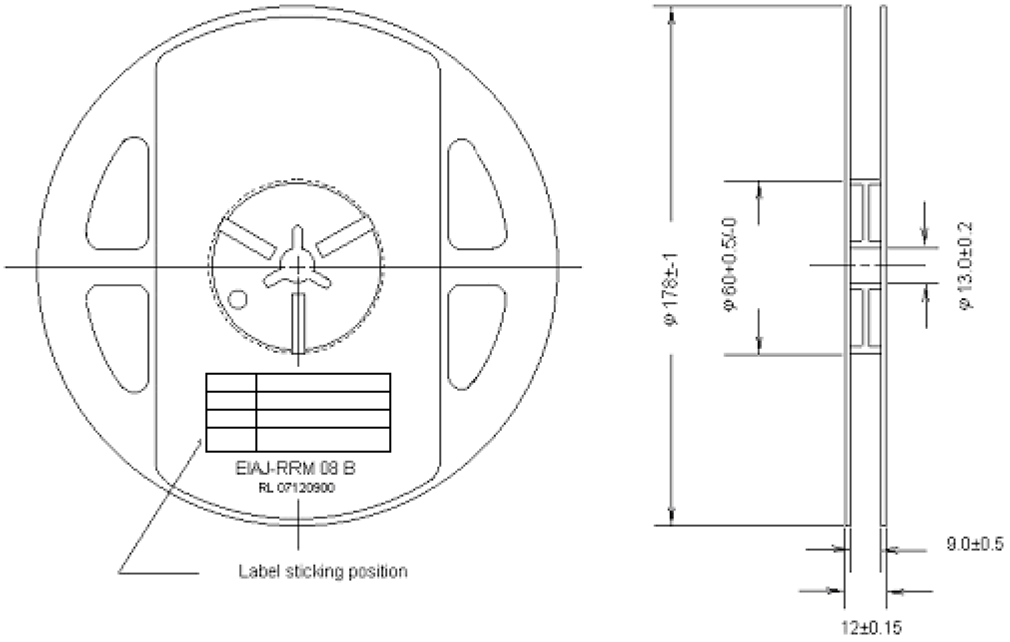
Tape Dim



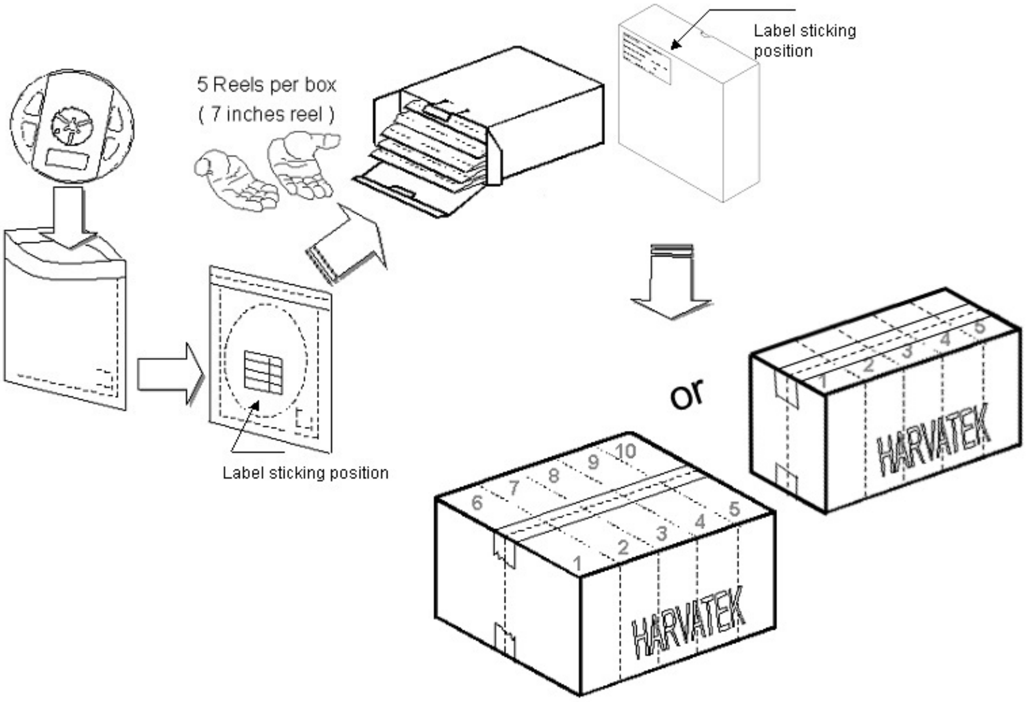
Dim. A	Dim. B	Dim. C	Q'ty/Reel
5.70±0.10	5.30±0.10	1.80±0.10	1000



Reel Dimension



Packing



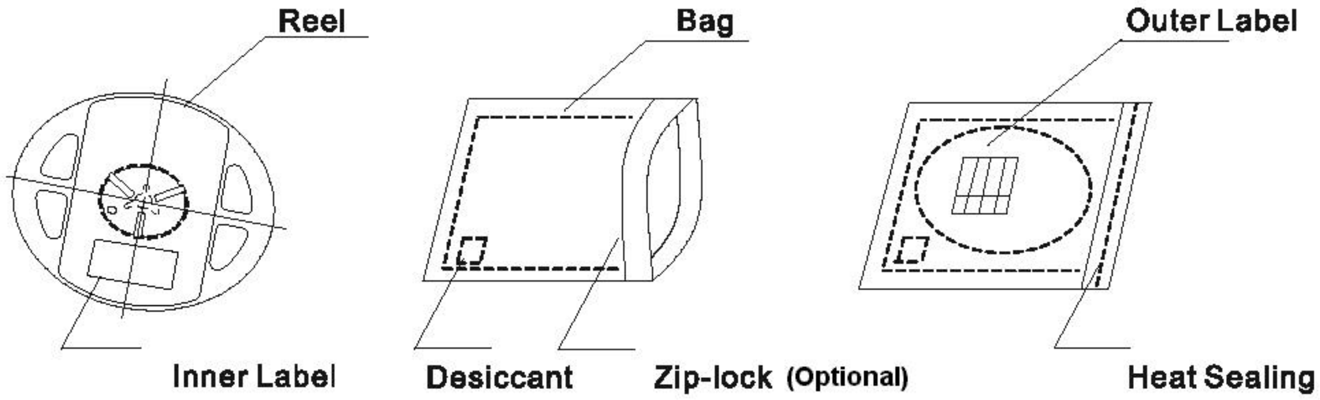
5 or 10 boxes per carton is available depending on shipment quantity.

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 24 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

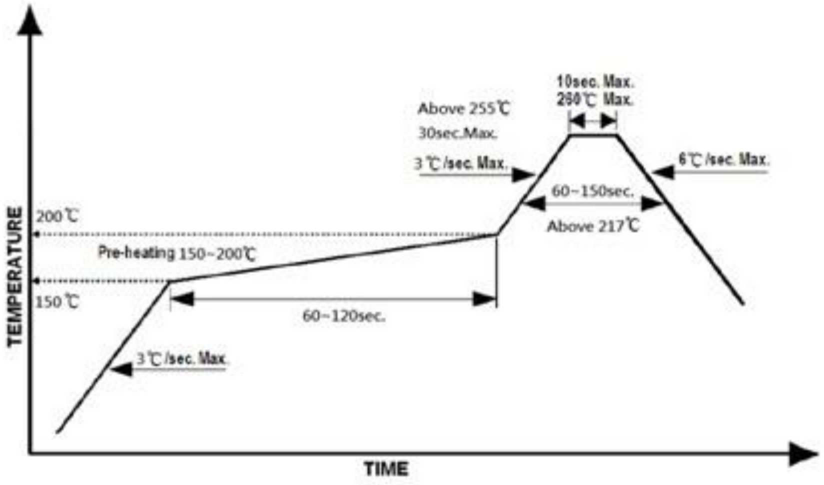
1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the 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	Preliminary	04/16/2025	-