

**Harvatek Surface Mount PLCC IC+RGB LEDs Data Sheet  
T3AG3RGB-H9C0001X1U1930**

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.
- Optional maximal drive current:20mA
- 256-step gray-scale output to allow 16,777,216 color display
- Built-in oscillator 20MHz
- LED driver port maximum withstand Voltage 6.5V
- Built-in power-on-reset (2.6V) (@VDD=5V)
- Operating voltage 4.5~5.5V

Applications

- Decorative LED lighting
- LED video display



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**DISCLAIMER** ..... 3

**LIFE SUPPORT POLICY** ..... 3

**PRODUCT SPECIFICATIONS**..... 4

**ATTENTION: ELECTROSTATIC DISCHARGE (ESD) PROTECTION** ..... 4

**LABEL SPECIFICATIONS** ..... 5

**PRODUCT FEATURES** ..... 6

**PACKAGE OUTLINE DIMENSION AND RECOMMENDED SOLDERING PATTERN FOR REFLOW SOLDERING** ..... 6

**ABSOLUTE MAXIMUM RATINGS**..... 7

**ELECTRICAL CHARACTERISTICS**..... 7

**PRECAUTION FOR USE**..... 9

**PACKAGING** ..... 10

**TAPE DIMENSION** ..... 10

**REEL** ..... 11

**DIMENSION**..... 11

**PACKING**..... 11

**DRY PACK** ..... 12

**BAKING**..... 12

**PRECAUTIONS** ..... 12

**HANDLING OF SILICONE RESIN LEDS** ..... 13

**REFLOW SOLDERING** ..... 14

**REWORKING**..... 14

**CLEANING**..... 14

**CAUTIONS OF PICK AND PLACE** ..... 15

**REVISE HISTORY** ..... 15

Official Product	HT Part No.T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.		04/07/2022	Version 3.0 Page 2/16

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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.

Official Product	HT Part No.T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.		04/07/2022	Version 3.0 Page 3/16

## Product Specifications

Item	Specification	Material	Quantity
Luminous Intensity (Iv)	R:360-900 mcd G:560-1440 mcd B:112.5-450 mcd @5V/ T <sub>s</sub> = 25°C;Tolerance: ± 10%		
Dominant Wavelength (Wd)	R:615.0-630.0 nm G:515.0-535.0 nm B:460.0-476.0 nm @5V/ T <sub>s</sub> = 25°C;Tolerance: ± 1 nm		
Applied voltage	5V_DC		
Resin	Clear	Silicone	
Carrier tape	EIA 481-1A specs	Conductive black tape	1000
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<sub>D</sub> 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**

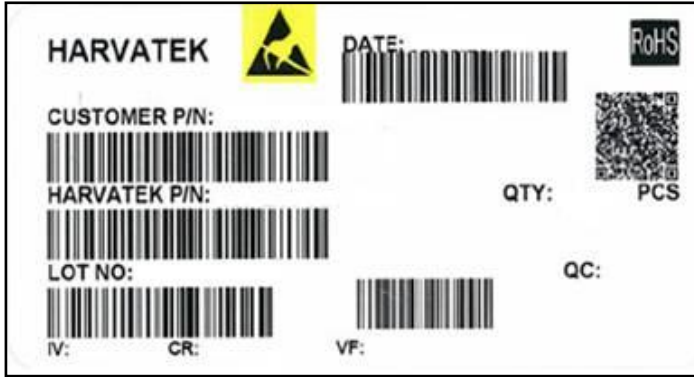


The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlGaInP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD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

Official Product	HT Part No.T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.	04/07/2022	Version 3.0	Page 4/16

## Label Specifications



### Harvatek P/N:

**T            3AG            3            RGB-            H9C            0001            X1**

Product	Package	Dice Qty	Color	Current	Series Number	Taping
FL	5.36(L)x5.0(W)x1.6(H) mm	3.TRI+IC	RGB	5V	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		

Official Product	HT Part No.T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.		04/07/2022	Version 3.0      Page 5/16

## Product Features

### Electro-Optical Characteristics

(T<sub>Soldering</sub> , 25 °C)

Series	Emitting Color	Material	Wavelength λ(nm)			I <sub>v</sub> (mcd)	Viewing
			λ <sub>D</sub>	λ <sub>P</sub>	Δλ	Typical	Angle $2\theta \frac{1}{2}$
T3A33RGB	G	InGaN	523	518	35	900	120
	R	AlInGaP	624	630	18	600	120
	B	InGaN	470	465	25	250	120

### Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

(Unit:mm Tolerance: +/-0.1)

Outline Dim.

Soldering Pattern

Soldering terminals may shift in the Wd direction.

Official Product	HT Part No.T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.	04/07/2022	Version 3.0	Page 6/16

## Absolute Maximum Ratings

(TA=25°C)

Symbol	Parameter	Range	Units
V <sub>DD</sub>	Supply Voltage	6.5	V
P <sub>D</sub>	Power Dissipation	<400	mW
I <sub>LEDOUT</sub>	Maximum Output Current	25	mA
T <sub>M</sub>	Welding Temperature	300(8S)	°C
T <sub>OPR</sub>	Operating Temperature Range	-40~85	°C
T <sub>STO</sub>	Storage Temperature Range	-65~120	°C

## Electrical characteristics

(TA=25°C VDD=5V)

Symbol	Parameter	Min.	Typ.	Max.	Units	Note
V <sub>DD</sub>	Supply Voltage	4.5	5.0	5.5	V	-
I <sub>DD</sub>	Operation Current			2	mA	R, G, B on load
V <sub>IH</sub>	Input High "H" of DI	2.7		V <sub>DD</sub>	V	-
V <sub>IL</sub>	Input Low "L" of DI	0		1.0	V	-
R <sub>PD</sub>	Pull Down Resistance		500k		Ω	DI, DO
V <sub>OH</sub>	Output High "H" of DO	4.5			V	I <sub>OH</sub> =4mA
V <sub>OL</sub>	Output Low "L" of DO			0.4	V	I <sub>OL</sub> =4mA
I <sub>SINK</sub>	R, G, B Sink Current	19	20	21	mA	V <sub>O</sub> =V <sub>DD</sub> -3.0V @V <sub>DD</sub> =5V
I <sub>LEAK</sub>	Input Leakage			1	μA	DI=VDD
L <sub>OFF</sub>	R, G, B Off Leakage Current			1	μA	PWM=0(off) @R, G, B=5V

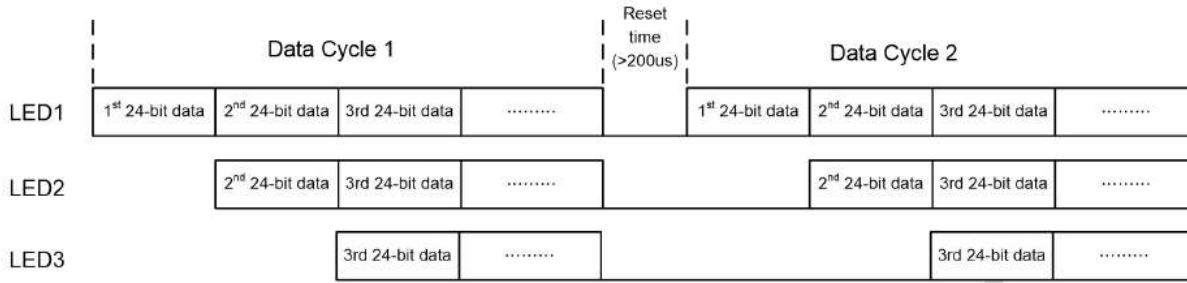
## Dynamic characteristics

(TA=25°C)

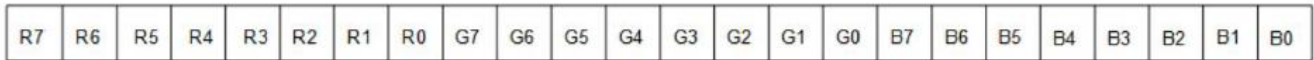
Symbol	Parameter	Min.	Typ.	Max.	Units	Note
t <sub>PLZ</sub>	Propagation delay time			300	ns	DI→DO, CL=15pF, RL=10kΩ
t <sub>PZL</sub>				300	ns	
t <sub>TZH</sub>	Rising time			200	ns	R, G, B=20mA, CL=30pF
t <sub>THZ</sub>	Falling time			200	ns	
F <sub>data</sub>	Data rate		800		kHZ	

Official Product	HT Part No.T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.		04/07/2022	Version 3.0 Page 7/16

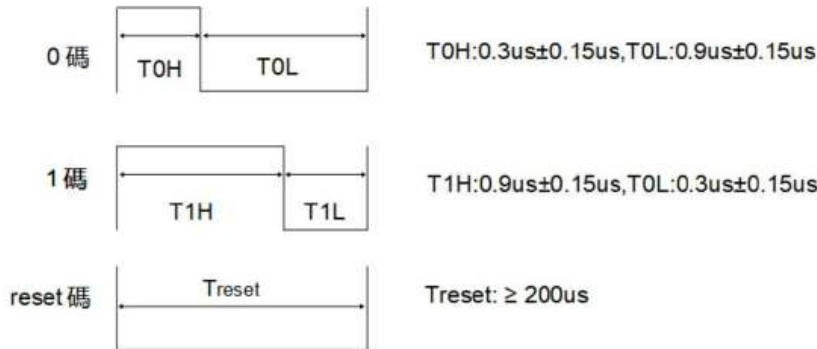
## ■ Cascading data structure



The single wire data transfer protocol supports 24-bit data for each LED RGB display data refresh. AP6110 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.



The transferred data are recognized based on the pulse widths received by AP6110. A low bit 0 is represented by a 0.3μs high pulse followed by a 0.9μs low pulse. A high bit 1 is represented by a 0.9μs high pulse followed by a 0.3μs low pulse. A low pulse ≥ 200μs is used to issue a reset command to AP6110-05 to start a new cycle of serial commands.



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Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.	04/07/2022	Version 3.0	Page 8/16

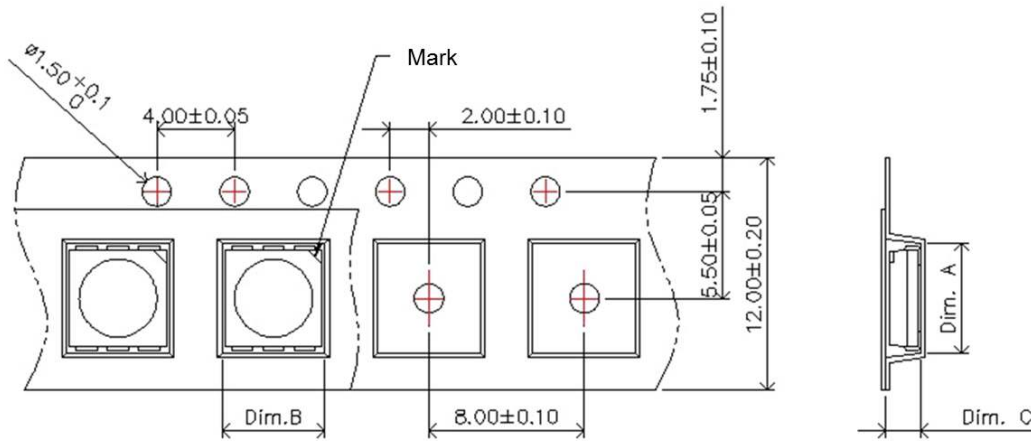


### Precaution for Use

- The chips should not be used directly in any type of fluid such as water, oil, organic solvent, etc.
- When the LEDs are illuminating, the maximum ambient temperature should be first considered before operation.
- 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.
- The LEDs must be used within 24 hrs 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.
- The appearance and specifications of the products may be modified for improvement without further notice.
- 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.

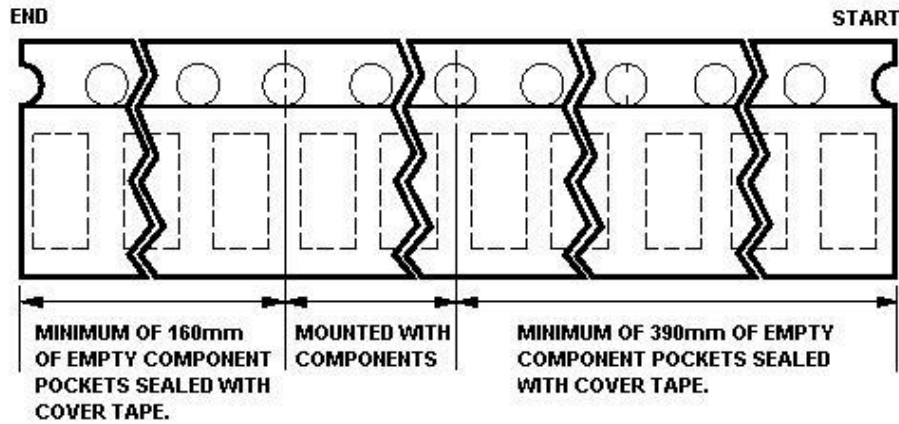
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Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.	04/07/2022	Version 3.0	Page 9/16

## Packaging Tape Dimension



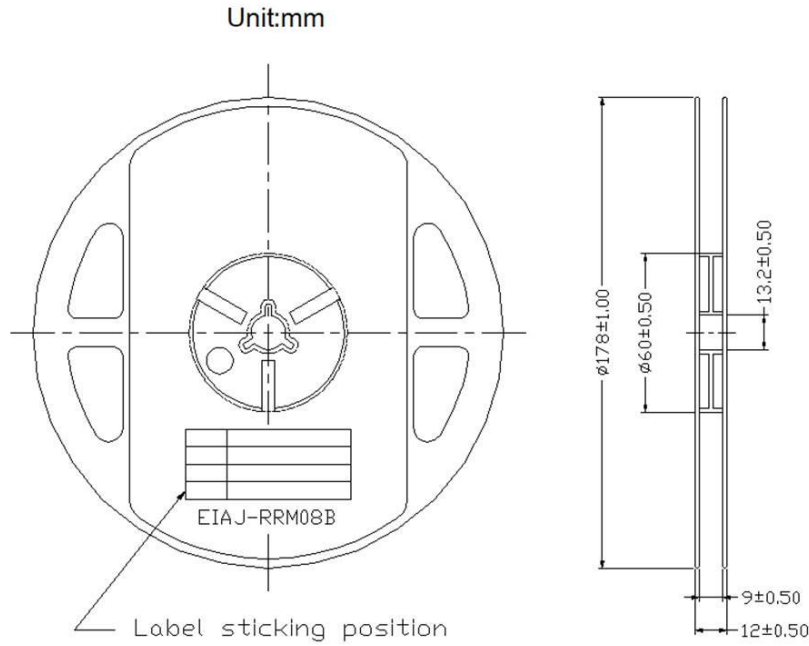
Dim. A	Dim. B	Dim. C	Qty/Reel
5.70±0.10	5.30±0.10	1.80±0.10	1000

Unit : mm

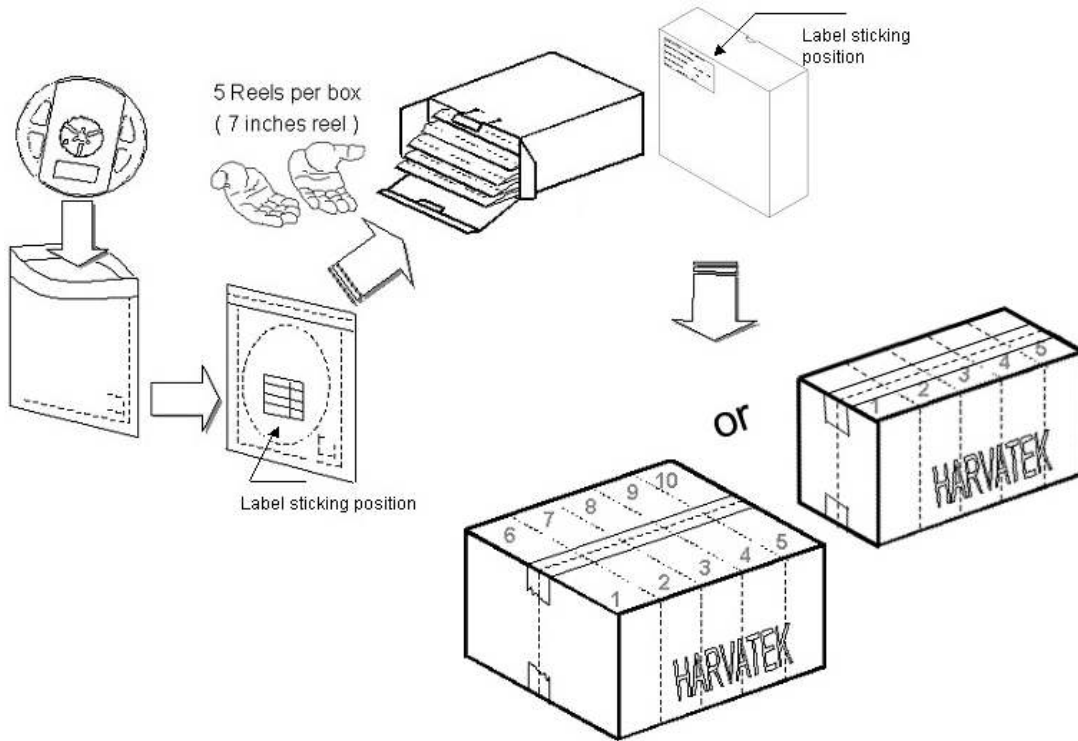


Official Product	HT Part No. T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.		04/07/2022	Version 3.0 Page 10/16

## Reel Dimension



## Packing



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

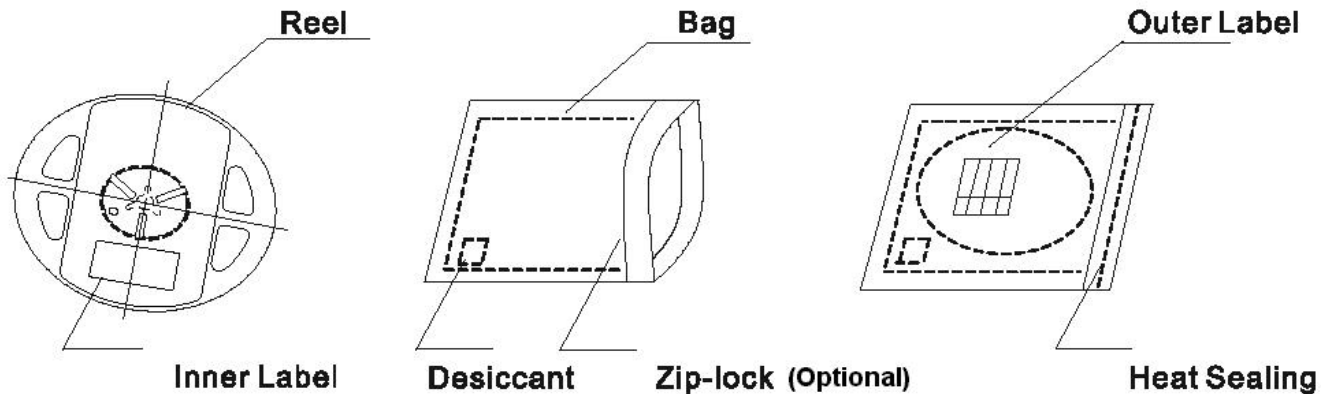
Official Product	HT Part No. T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.		04/07/2022	Version 3.0 Page 11/16

## 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.

Upon request, 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 hrs.

The conditions are as followings:

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

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Tentative Product	*****	*****	*****
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**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.

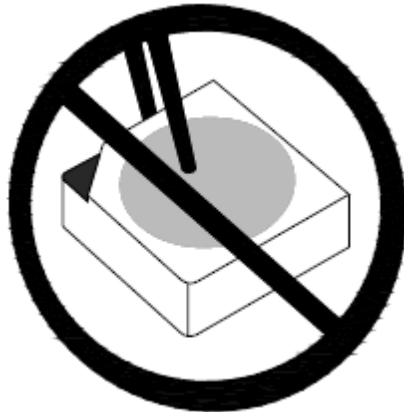


Figure 1

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.

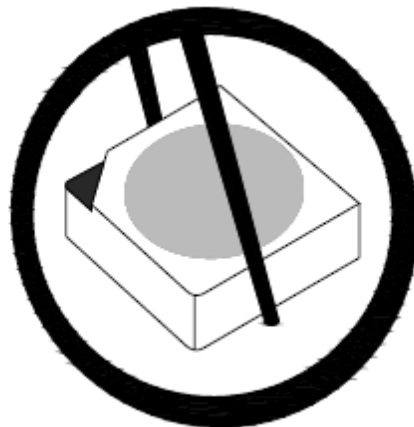


Figure 2

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.

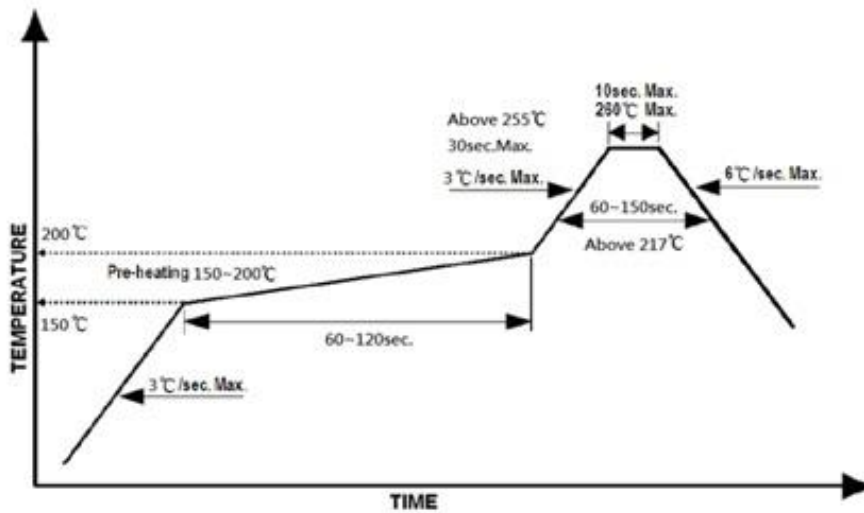
Official Product	HT Part No.T3AG3RGB-H9C0001X1U1930		
Tentative Product	*****	*****	*****
Specifications are subject to changes for improvement without advance notice. Proprietary data, drawings, company confidential all rights reserved.		04/07/2022	Version 3.0 Page 13/16

**Reflow Soldering**

Recommend soldering paste specifications:

1. Operating temp.: Above 217 °C ,60~150 sec.
2. Peak temp.:260 °CMax.,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

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