Harvatek Surface Mount PLCC IC+RGB LEDs Data Sheet
T3AG3RGB-H9C0001X1E0118

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 3.3~5.5V

Applications

Decorative LED lighting
LED video display

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 10
PACKAGING 11
TAPE DIMENSION 11
REEL 12
DIMENSION 12
PACKING 12
DRY PACK 12
BAKING 13
PRECAUTIONS 13
HANDLING OF SILICONE RESIN LEDS 13
REFLOW SOLDERING 14
REWORKING 15
CLEANING 15
CAUTIONS OF PICK AND PLACE 15
REVISE HISTORY 16

DISCLAIMER

HARVATEK reserves the right to make changes without further notice to any products herein to improve reliability, function or design. HARVATEK does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

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)	R:360-900 mcd G:560-1800 mcd B:112.5-450 mcd @5V/ T_S= 25℃;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_S= 25℃;Tolerance:± 0.5 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_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

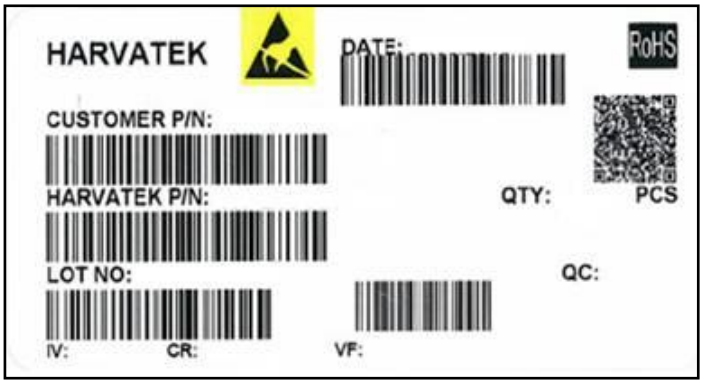
※Remarks: This product should be operated in forward bias. If a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

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:

T 3AG 3 RGB- H9C- 0001 X1

Product	Package	Dice Qty	Color	Current	Series Number	Taping
LF	5.36(L)x5.0(W)x1.6(H) mm	3.TRI	RGB (Full Color)	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		

Product Features

Electro-Optical Characteristics

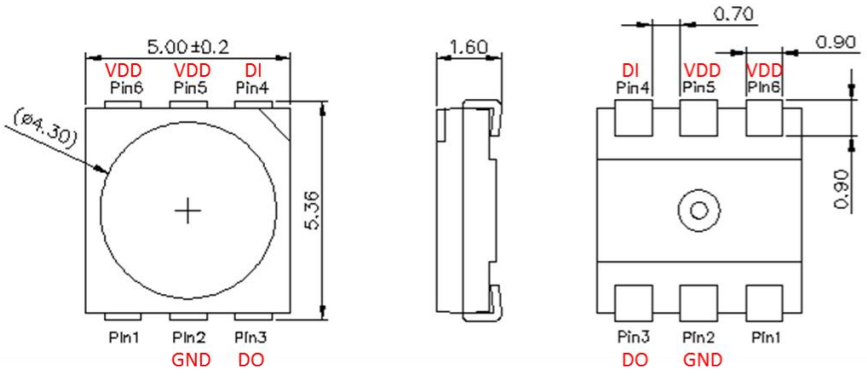
($T_{Soldering}$, 25℃)

Series	Emitting Color	Material	Wavelength λ(nm)			I_V(mcd)	Viewing Angle $2\theta\frac{1}{2}$
			λ_D	λ_P	△λ	Typical	
T3AG3GRB	G	InGaN	523	518	35	900	120
	R	AlGaInP	624	630	18	600	120
	B	InGaN	470	465	25	250	120

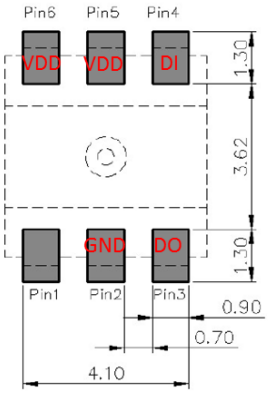
Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

(Unit:mm Tolerance: ± 0.1)

Outline Dim.



Suggest Soldering Pattern



Soldering terminals may shift in the Wd direction.

Absolute Maximum Ratings

(TA=25℃)

Symbol	Parameter	Range	Units
V_{DD}	Supply Voltage	6.5	V
P_D	Power Dissipation	<250	mW
I_{LEDOUT}	Maximum Output Current	25	mA
T_M	Welding Temperature	300(8S)	℃
T_{OPR}	Operating Temperature Range	-45~85	℃
T_{STO}	Storage Temperature Range	-65~120	℃
V_{ESD}	ESD(HBM)	>2	kV

Electrical characteristics

(TA=25℃ VDD=5V)

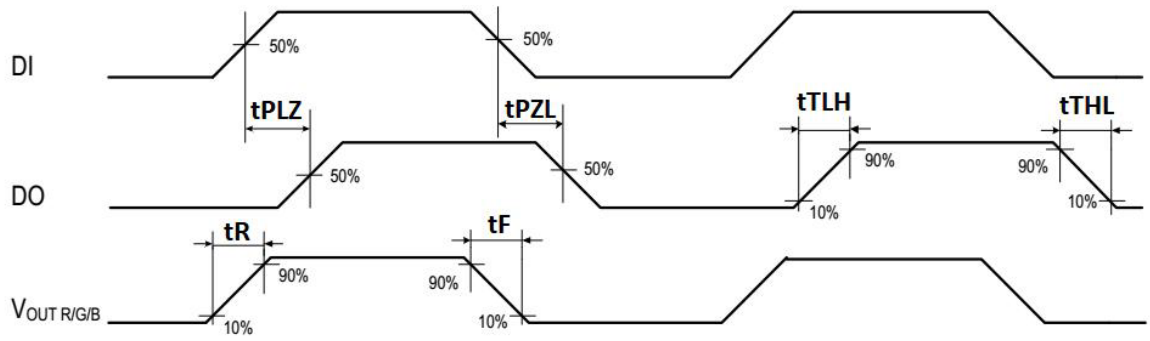
Symbol	Parameter	Min.	Typ.	Max.	Units	Note
V_{DD}	Supply Voltage	3.3	5.0	5.5	V	-
I_{DD}	Operation Current	-	1.5	2	mA	R, G, B on load
V_{IH}	Input High “H” of DI	2.7	-	V_{DD}	V	-
V_{IL}	Input Low “L” of DI	0		1.0	V	-
R_{PD}	Pull Down Resistance	-	500k	-	Ω	DI, DO
V_{OH}	Output High “H” of DO	4.5	-	-	V	I_{OH}=4mA
V_{OL}	Output Low “L” of DO	-	-	0.4	V	I_{OL}=4mA
I_{SINK}	R, G, B Sink Current	19	20	21	mA	V_O=V_{DD}-3.0V @V_{DD}=5V
I_{LEAK}	Input Leakage	-	-	1	μA	DI=VDD
L_{OFF}	R, G, B Off Leakage Current	-	-	1	μA	PWM=0(off) @R, G, B=5V

▪ Dynamic characteristics

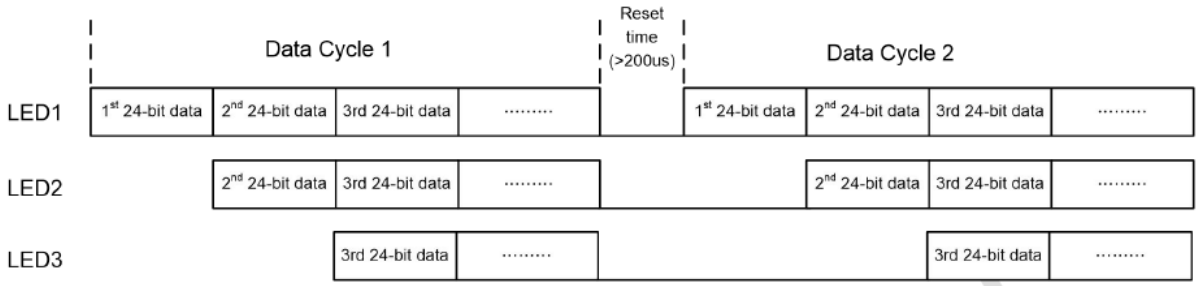
(TA=25℃)

Symbol	Parameter	Min.	Typ.	Max.	Units	Note
tPLZ	Propagation delay time	-	-	80	ns	DI→DO, CL=15pF, RL=10kΩ
tPZL		-	-	80	ns	
tTZH	Rising time	-	15		ns	R, G, B=20mA, CL=30pF
tTHZ	Falling time	-	15		ns	
tR	Rising time		50			

tF	Falling time		50			
F_{data}	Data rate	-	800	-	kHZ	



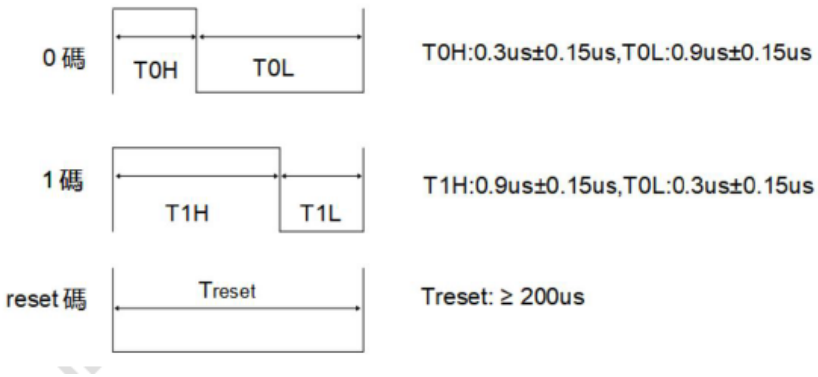
▪ Cascading data structure



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.

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0

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.

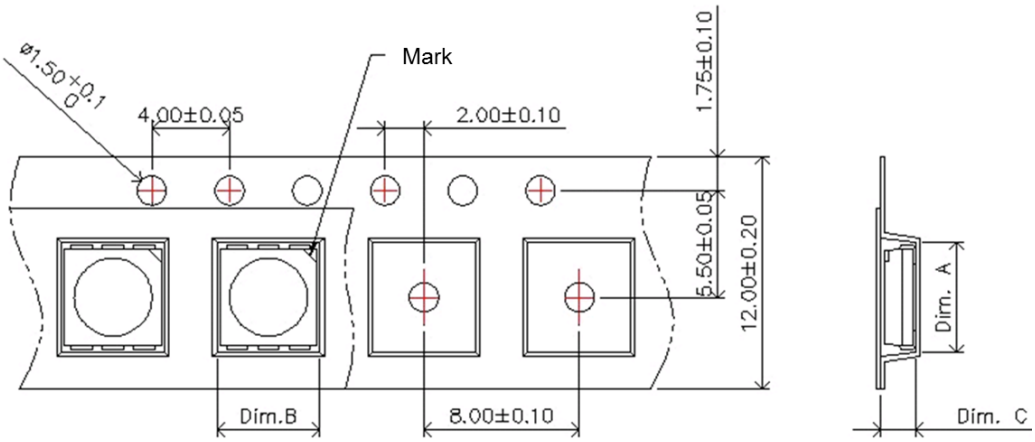

0 碼
T0H
T0L
T0H:0.3us±0.15us,T0L:0.9us±0.15us
1 碼
T1H
T1L
T1H:0.9us±0.15us,T0L:0.3us±0.15us
reset 碼
Treset
Treset: ≥ 200us

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 48 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.
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.

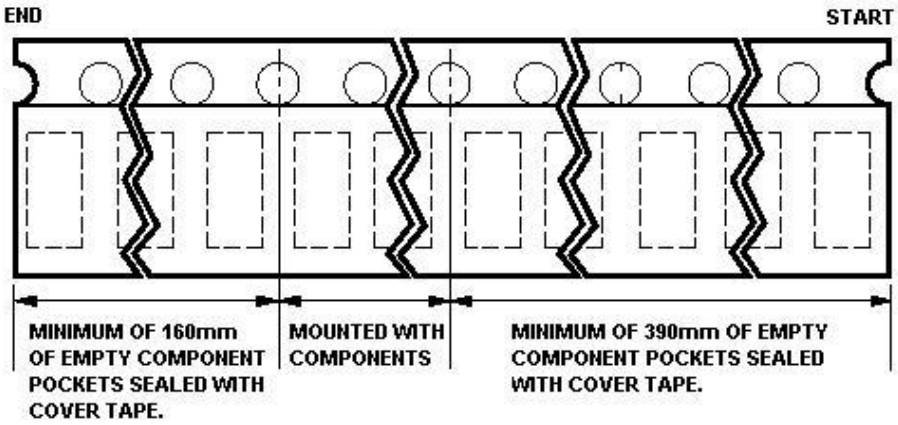
Packaging

Tape Dimension



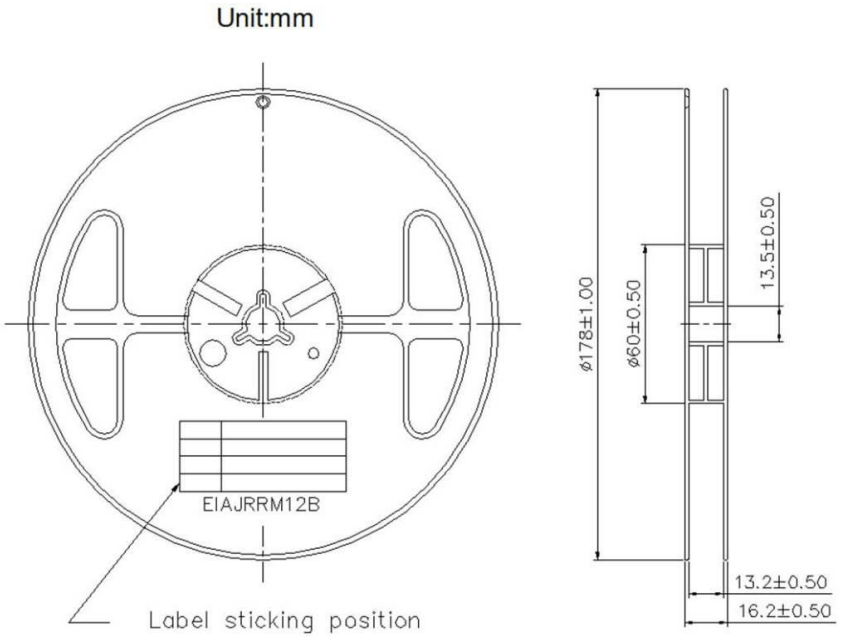
Dim. A	Dim. B	Dim. C	Qty/Reel
5.70±0.10	5.30±0.10	1.80±0.10	1000

Unit : mm



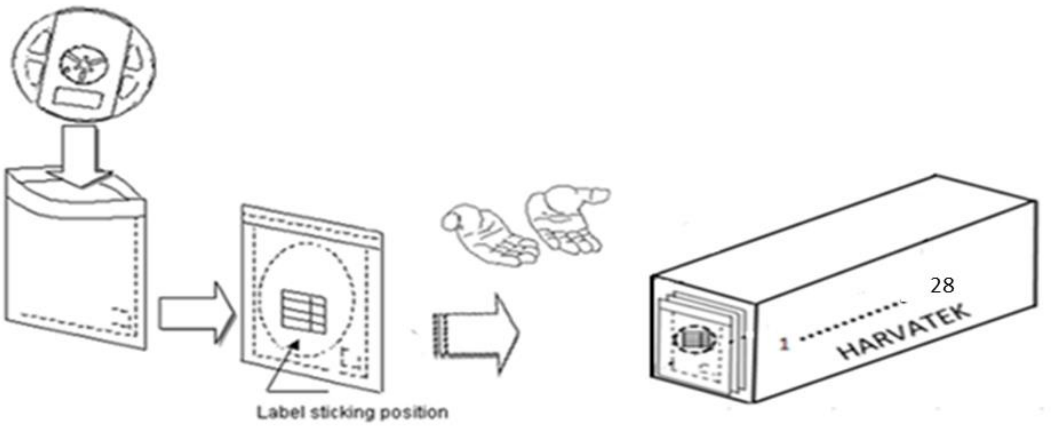
Reel

Dimension



Unit : mm

Packing



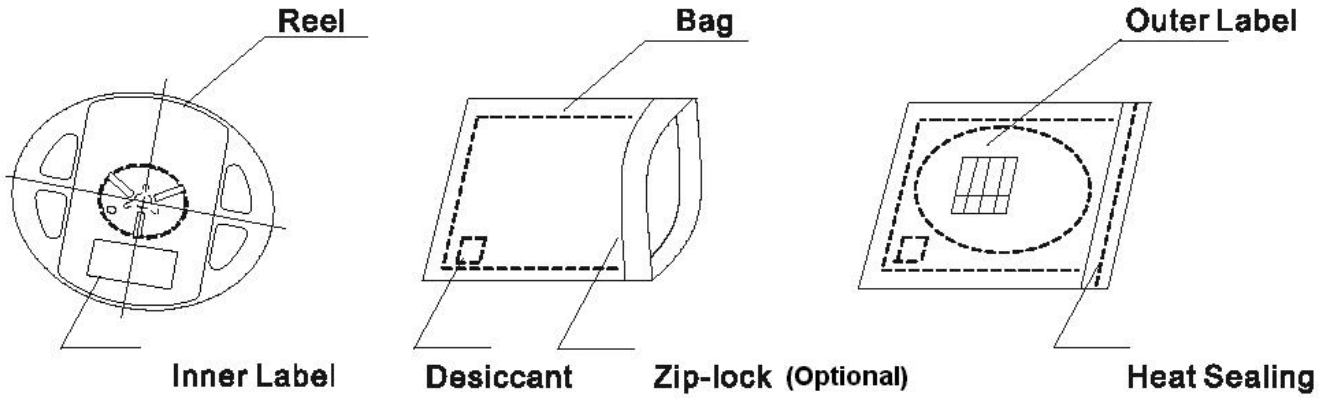
28 boxes per carton is available depending on shipment quantity.

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.

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 48 hrs.

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.

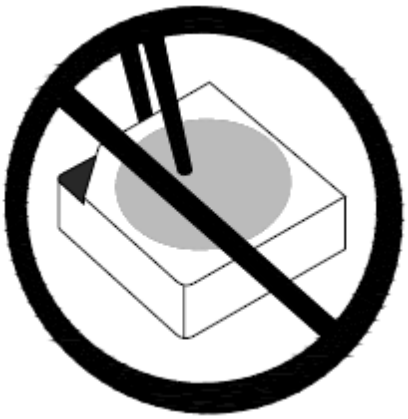


Figure 1

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.

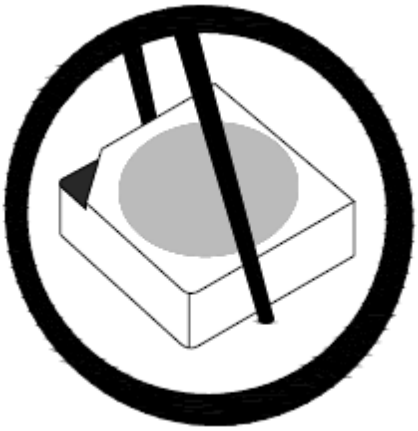


Figure 2

When populating boards in SMT production, there are basically no restrictions regarding the 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.

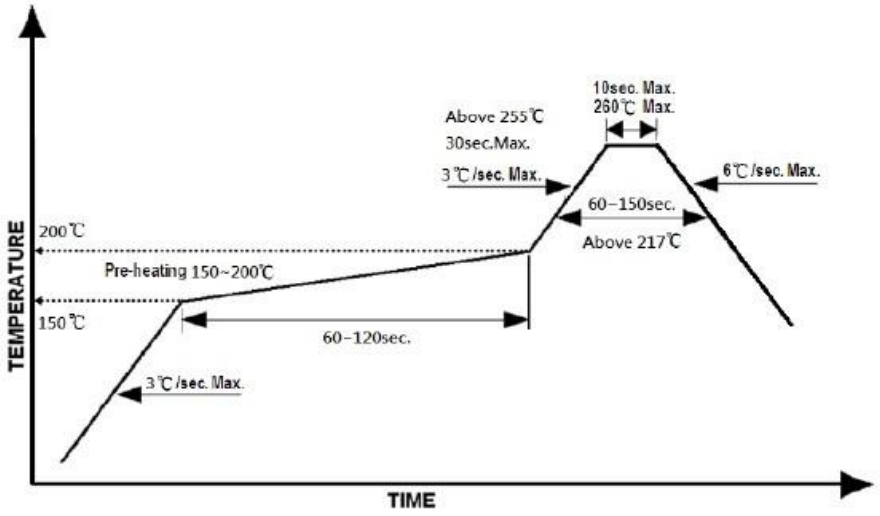
Reflow Soldering

Recommend soldering paste specifications:

1. Operating temp.: Above 217℃ ,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	New Format	04/13/2022	-
1.1	Optimize the drawing	12/08/2023	P11 &P14
1.2	Modify T_{STO} temperature & Iv Green light scope	12/13/2023	P4、P8
1.3	Modify Packing Content and graphics& upgrade Level 5	12/15/2023	P8、P11、P12
1.4	ADD Features & Applications	01/09/2024	P1