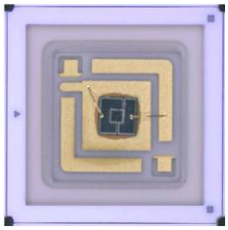
CUSTOMER : .

DATE : 2013. 11. 29.

REV : REV 1.0 .

SPECIFICATIONS FOR APPROVAL



278nm 1in1 LED PKG @ If = 20mA

MODEL NAME : LEUVA66B00HF00

RoHS Compliant

APPROVAL	REMARK	APPENDIX

DESIGNED	CHECKED	APPROVED
2013.11.29	2013.11.29	2013.11.29
H. N. Kim	H. Kodaira	M. S. Oh

LG Innotek

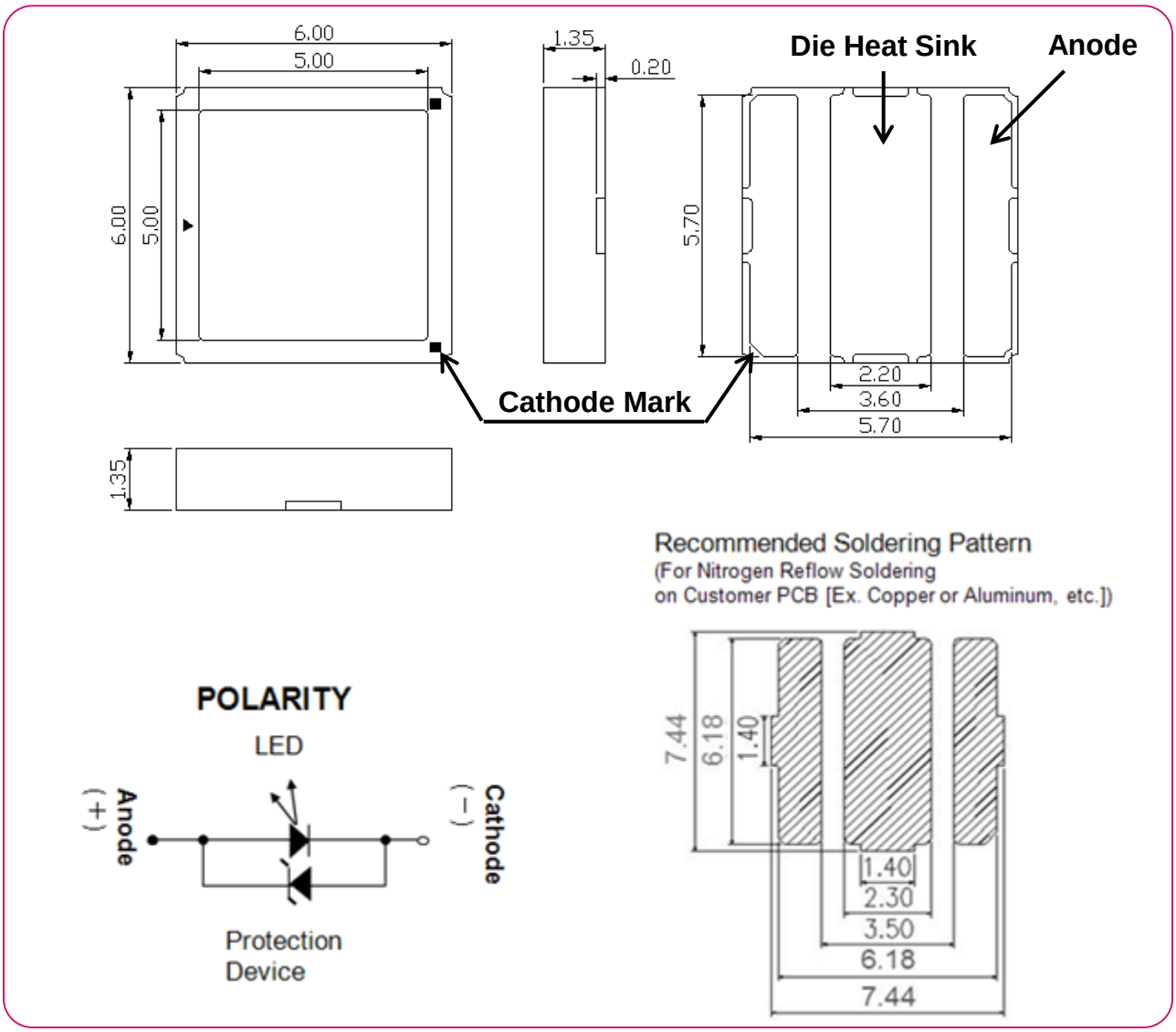
CONTENTS

1. Features

- Lighting Color(Peak Wavelength) : 278nm
- Surface Mount Type LED Package : 6.0 x 6.0 x 1.35 (L x W x H) [Unit : mm]
- Viewing Angle : 121˚
- Soldering Methods : Pb-Free IR- Nitrogen Reflow Soldering

2. Outline Dimensions

(Unit : mm)



Tolerances unless otherwise mentioned are ± 0.10 mm

3. Applications

- Disinfection, Phototherapy, Fluorescent Spectroscopy, Sensor Light, Bio-Analysis / Detection, Counterfeit Detectors, etc.

4. Absolute Maximum Ratings

(Ta= 25℃)

Items	Symbol	Rating	Unit
Forward Current	If	30	mA
Power Dissipation	Pd	225	mW
Operating Temperature	Topr	-40 ~ +60	℃
Storage Temperature	Tstg	-40 ~ +100	℃
Soldering Temperature	JEDEC-J-STD-020D		
ESD Classification	Class 2 (JESD22-A114)		

※ Operating the LED beyond the listed maximum ratings may affect device reliability and cause permanent damage. These or any other conditions beyond those indicated under recommended operating conditions are not implied. The exposure to the absolute maximum rated conditions may affect device reliability.

※ The LEDs are not designed to be driven in reverse bias.

5. Electro-Optical Characteristics

(Ta= 25℃)

Items	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If = 20mA	5.9	6.5	7.5	V
Radiant Flux	Φe	If = 20mA	1.28	2.0	2.8	mW
Peak Wavelength	λp	If = 20mA	265	278	285	nm
Spectrum Half Width	△λ	If = 20mA	-	12.0	-	nm
Thermal Resistance, Junction to Solder Point	Rth j-s	If = 20mA	-	37	-	°C/W

※ These values measured by Optical spectrum analyzer and integrating sphere measuring system. And tolerances are followings as below.

- Forward Voltage (Vf) : ±2%
- Radiant Flux (Φe) : ±10%
- Peak Wavelength (λp) : ±3.0nm

※ Although all LEDs are tested by LG Innotek equipment, some values may vary slightly depending on the conditions of the test equipment.

6. Bin Structures

(Ta = 25℃, If = 20mA)

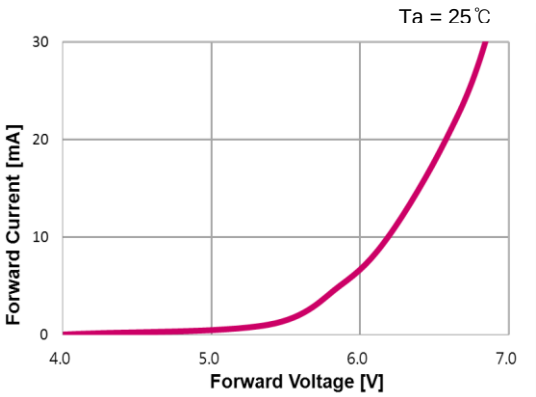
Items	Bin	Min.	Typ.	Max.	Unit
Peak Wavelength	DW1	265	278	285	nm
Radiant Flux	R4	2.20	-	2.80	mW
	R3	1.90	-	2.20	
	R2	1.60	-	1.90	
	R1	1.28	-	1.60	
Forward Voltage	V3	7.0	-	7.5	V
	V2	6.5	-	7.0	
	V1	5.9	-	6.5	

※ Bin Code (name) method : Please refer to the following example

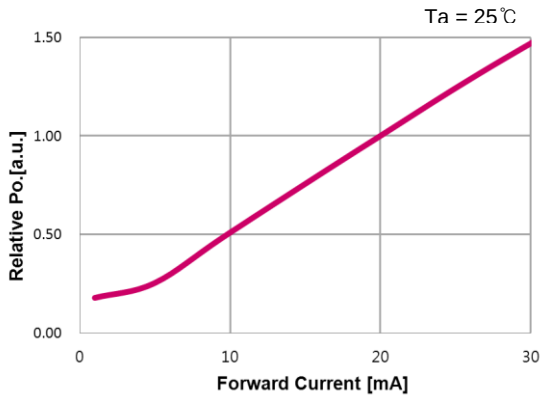
Bin Code : DW1-R2-V2
- Peak Wavelength = DW1
- Radiant Flux = R2
- Forward Voltage = V2

7. Typical Characteristic Curves

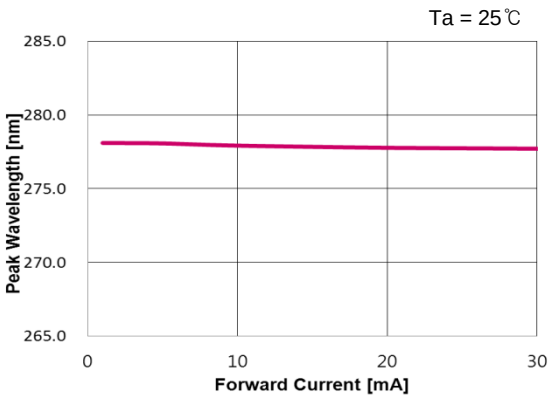
▪ Forward Current vs. Forward Voltage



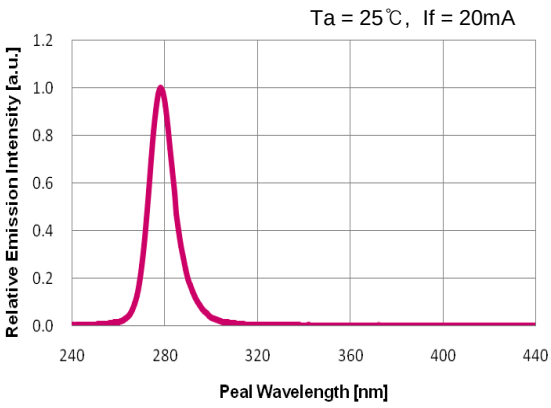
▪ Relative Radiant Flux vs. Forward Current



▪ Peak Wavelength vs. Forward Current

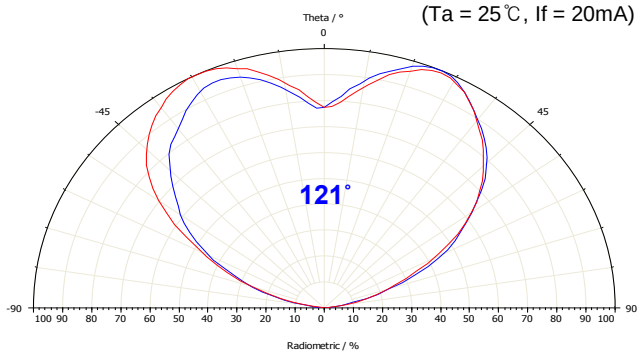


▪ Spectrum



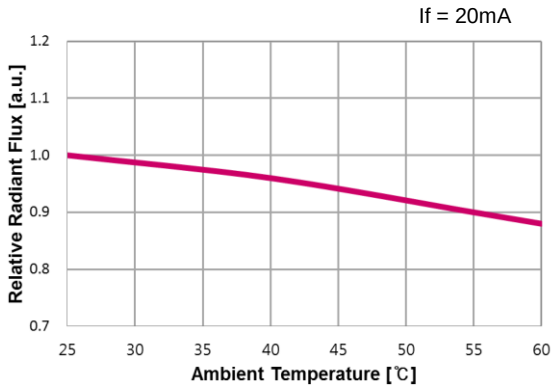
▪ Radiation Characteristics (Angle of Beam Spread, Directivity)

(Ta = 25℃, If = 20mA)

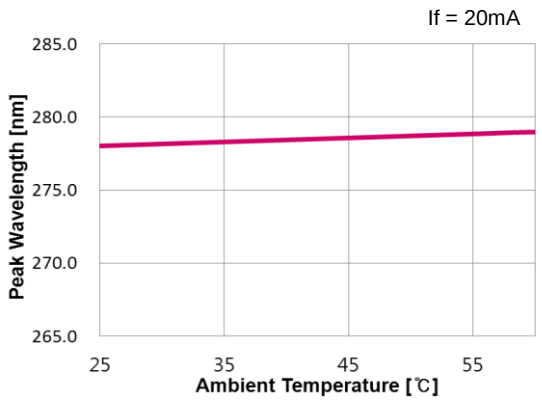


7. Typical Characteristic Curves

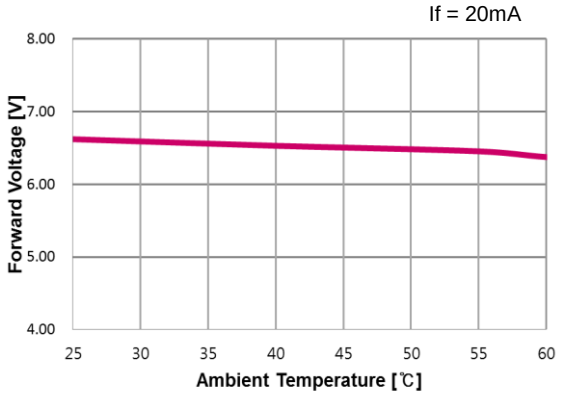
▪ Relative Radiant Flux vs. Temperature



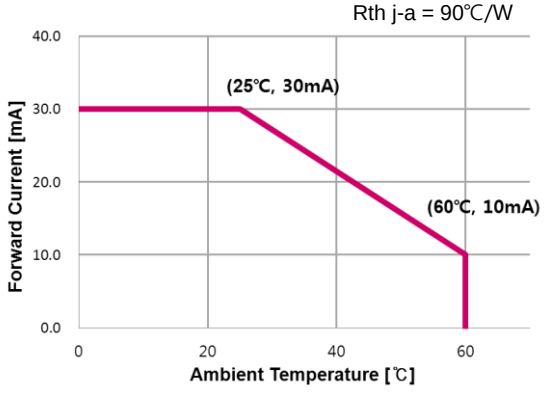
▪ Peak Wavelength vs. Temperature



▪ Forward Voltage vs. Temperature



▪ Derating Curve



※ The ambient temperature values for each graph are obtained with LG Innotek equipment.

8. Reliability Test Items and Conditions

8-1. Failure Criteria

Items	Symbol	Test Conditions	Criteria	
			Min.	Max.
Forward Voltage	Vf	If = 20mA	-	Initial Value × 1.1
Radiant Flux	Φe	If = 20mA	Initial Value × 0.5	-

8-2. Reliability Tests

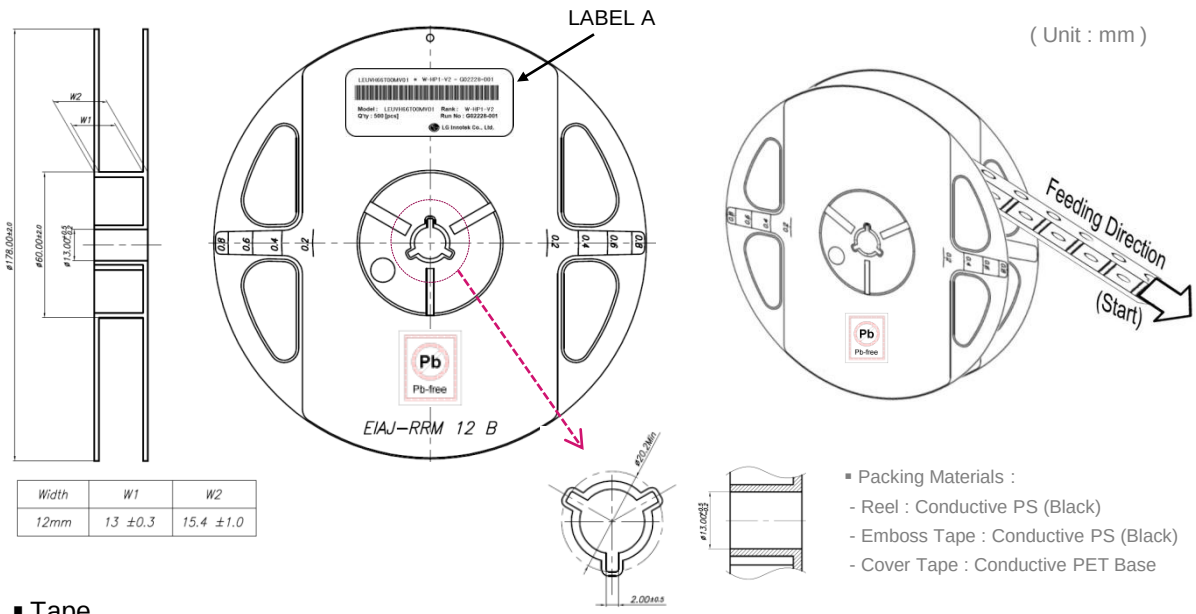
No	Items	Test Conditions	Test Hours /Cycles
1	Room Temperature Operating Life (RTOL)	Ta = 25℃, If = 20mA	500 Hours
2	Room Temperature Operating Life 2 (RTOL)	Ta = 25℃, If = 30mA	500 Hours
3	Wet High Temperature Operating Life (WHTOL)	Ta = 60℃, RH = 90%, If = 7mA	500 Hours
4	High Temperature Operating Life (HTOL)	Ta = 60℃, If = 10mA	500 Hours
5	Low Temperature Operating Life (LTOL)	Ta = -40℃, If = 20mA	500 Hours
6	High Temperature Storage Life (HTSL)	Ta = 100℃	500 Hours
7	Low Temperature Storage Life (LTSL)	Ta = -40℃	500 Hours
8	Wet High Temperature Storage Life (WHTSL)	Ta = 60℃, RH = 90%	500 Hours
9	Moisture Sensitivity Level (MSL)	Tsld = 260℃ (Pre treatment 60℃,60%,168 hours)	3 Times
10	Temperature Cycle (TC)	-40℃(30min) ~ 25℃(5min) ~ 100℃(30min) ~ 25℃(5min)	100 Cycles
11	Electrostatic Discharge (ESD)	R = 1.5kΩ, C = 100pF, Test Voltage = 2KV, H.B.M.(Human Body Model)	3 Times
12	Vibration	100~2000~100Hz Sweep 4min. 200m/s², 3 directions	48 Minutes

※ All samples are tested using LG Innotek Standard Metal PCB (25x25x1.6 mm^3(L×W×H)) except MSL test .
※ All samples must pass each test item and all test items must be satisfied.

9. Packing and Labeling of Products

9-1. Taping Outline Dimensions

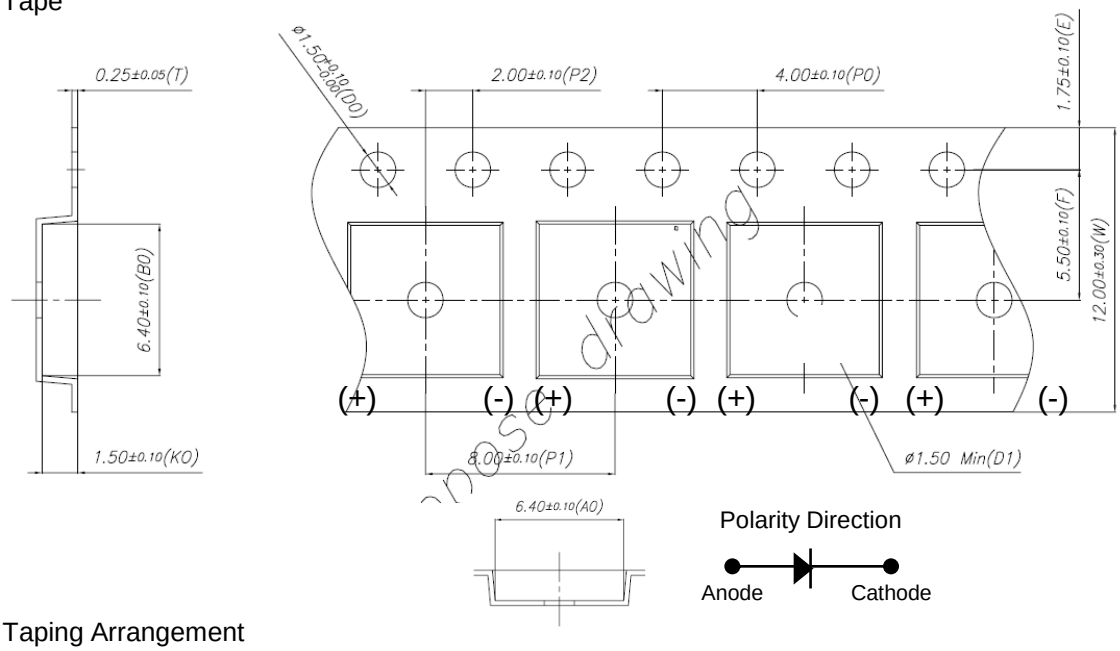
▪ Reel



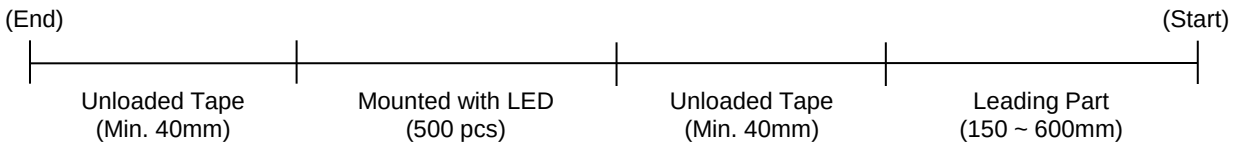
Width	W1	W2
12mm	13 ±0.3	15.4 ±1.0

▪ Packing Materials :
- Reel : Conductive PS (Black)
- Emboss Tape : Conductive PS (Black)
- Cover Tape : Conductive PET Base

▪ Tape



▪ Taping Arrangement

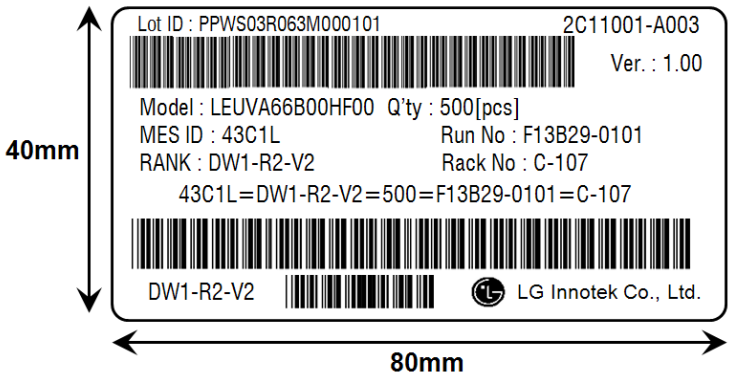


9. Packing and Labeling of Products

9-2. Label Structure

※. Label A

Specifying Model Name, Rank, Rack, Quantity and Run number



▪ Run No. indication

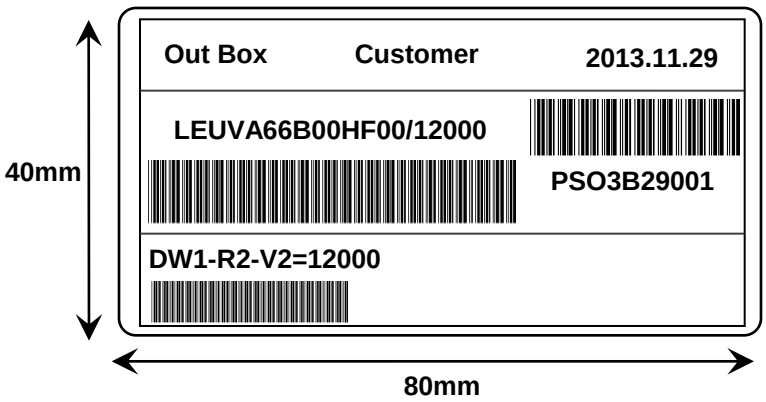
1	2	3	4	5	6	—	7	8	9	10
Code	Manufacture Site	Manufacture Year	Manufacture Month	Manufacture date			TH #		Serial No	
	Paju : 1 Huizhou : 9	2013 : 3 ... 2020 : 0 2021 : 1	1~9 : 1~9 10 : A 11 : B 12 : C	(01~31)			(00 ~ 99)		(00 ~ ZZ)	

9. Packing and Labeling of Products

9-2. Label Structure

※. Label C

Specifying Customer, Date, Model Name, Quantity, Customer Part no, Outbox ID, Rank/Rank Q'ty



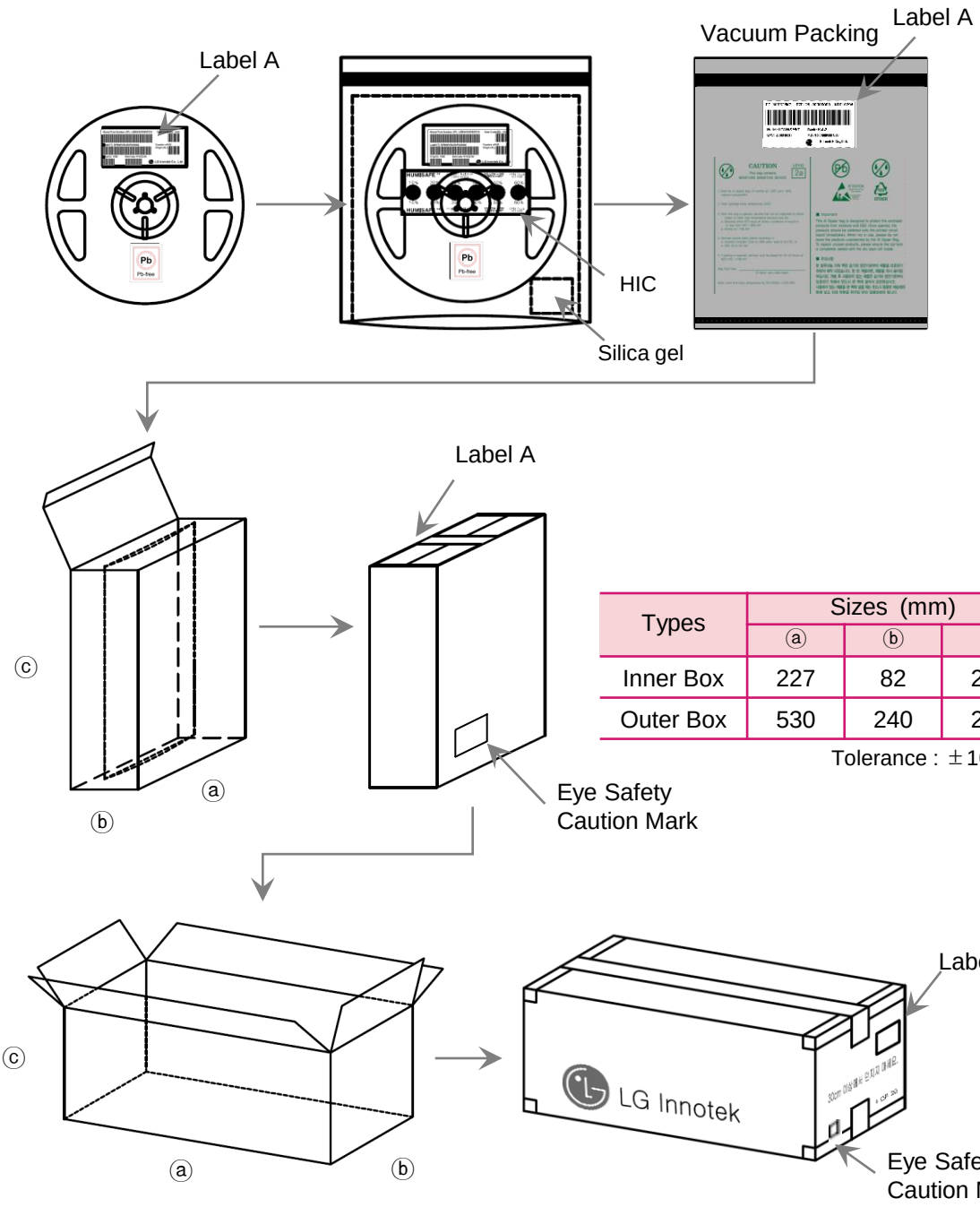
▪ Box ID. indication

1	2	3	4	5	6	7	8	9	10
Manufacture Site	PKG Site	Box	Year	Month	Date		Serial No		
Paju : P Huizhou : H	PKG : S, P	Inner Box : I Outer Box : O	2013 : 3 … 2020 : 0 2021 : 1	1~9 : 1~9 10 : A 11 : B 12 : C	(01 ~ 31)		(001 ~ 999)		

9. Packing and Labeling of Products

9-3. Packing Structures

Reeled products(Q'ty : 500 pcs) are packed in a sealed-off and moisture-proof aluminum bag with desiccants (silica gel) and Humidity Indicator Card(HIC). A maximum of four aluminum bags are packed in an inner box and six inner boxes are packed in an outer box.



Types	Sizes (mm)		
	ⓐ	ⓑ	ⓒ
Inner Box	227	82	258
Outer Box	530	240	280

Tolerance : ±10mm

10. Cautions on Use

10-1. Moisture-Proof Package

- The moisture in the SMD package may vaporize and expand during soldering.
- The moisture can damage the optical characteristics of the LEDs due to the encapsulation.

10-2. During Storage

Conditions		Temperature	Humidity	Time
Storage	Before Opening Aluminum Bag	5℃ ~ 30℃	< 50%RH	Within 1 Year from the Delivery Date
	After Opening Aluminum Bag	5℃ ~ 30℃	< 60%RH	≤ 672 hours
Baking		65 ± 5℃	< 10%RH	10 ~ 24 hours

10-3. During Usage

- The LED should avoid direct contact with hazardous materials such as sulfur, chlorine, phthalate, etc.
- The metal parts on the LED can rust when exposed to corrosive gases. Therefore, exposure to corrosive gases must be avoided during operation and storage.
- The silver-plated metal parts also can be affected not only by the corrosive gases emitted inside of the end-products but by the gases penetrated from outside environment.
- Extreme environments such as sudden ambient temperature changes or high humidity that can cause condensation must be avoided.

10-4. Cleaning

- Do not use brushes for cleaning or organic solvents (i.e. Acetone, TCE, etc..) for washing as they may damage the resin of the LEDs.
- Isopropyl Alcohol(IPA) is the recommended solvent for cleaning the LEDs under the following conditions.
- Cleaning Condition : IPA, 25℃ max. × 60sec max.
- Ultrasonic cleaning is not recommended.
- Pretests should be conducted with the actual cleaning process to validate that the process will not damage the LEDs.

10. Cautions on Use

10-5. Thermal Management

- The thermal management is the most important thing of the hear dissipation(cooling) performance for the deep UV(UVC) LED Package.
- The thermal design of the product must be seriously considered even from the beginning stage.
- The co-efficiency between the heat generation and the input power is affected by the thermal resistance of the circuit boards and the density of the LED placements together with other components.
- The deep UV(UVC) LED soldered on a metal PCB with a high thermal conductivity.
  Or Please combine the deep UV(UVC) LED with a metal PCB and a large volume-Heat Sink(Heat Block), a mini(compact / slim)-air or water cooler, etc.
- Please design the LED module or system in customer that the temperature of the LED Package does not exceed the maximum junction temperature(T_J).

10-6. Electrostatic Discharge (ESD)

- The LEDs are sensitive to static electricity or surge voltage and current.
  The Electrostatic Discharge can damage a LED Chip.
  Also, It can be affect a reliability belong to the life time of LED package.
  When handling LEDs, the following measures against ESD are actively recommended :
  1) Please wear a wrist strap, anti-static clothes, foot wear and gloves.
  2) Please set up a grounded or anti-static paint floors, a grounded or the ability to surge protection
     - workstation equipment or power supply, pulse generator, current/voltage driver circuit, etc. and tools.
  3) ESD protection- worktable/bench, mat made of a conductive materials.
- An appropriate grounding is required for all devices, equipment, and machinery used in product assembly.
  Please apply surge protection after review when designing of commercial products.
- If tools or equipment contain insulating materials such as glass or plastics,
  the following measures against ESD are strongly recommended :
  1) Dissipating static charge with conductive materials
  2) Preventing charge generation with moisture
  3) Plug in the ionizing blowers(ionizer) for neutralizing the charge
- The customer is advised to check if the LEDs are damaged by ESD when performing the characteristics inspection of the LEDs in the application.
  Damage of LED can be detected with a forward voltage checking(measuring) at low current(≤1.0mA).
- ESD damaged LEDs may have a current flow at a low voltage.
  * Failure Criteria : Vf < 4.0V at If= 0.5mA.

10. Cautions on Use

10-7. Recommended Circuit

- The driving circuits must be designed and operated by forward bias only so that the LEDs are not to be operated by the reverse voltages while turned off, which can damage the LEDs.
- Reverse voltage can damage the zener diode and cause destructions.
- The current through each LED must not exceed the absolute maximum ratings when design the circuits.
- Customer must apply resistors for a protection, others slight voltage shift will cause a big current change (Burn out will happen. Especially these LEDs are sensitive to surge current.).
- In general, there can be various forward voltages for LEDs.

  Different forward voltages in parallel via a single resistor can result different forward currents to each LED, which also can output different radiant flux values.

  In the worst case, the currents can exceed the absolute maximum ratings which can stress the LEDs.

  Matrix circuit with a single resistor for each LED is recommended to avoid the radiant flux fluctuations.
- Constant-current operation by driver IC controller is recommended.

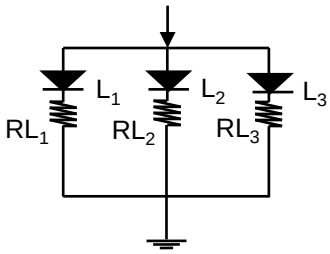


Fig.1. Recommended Circuit in Parallel Mode :
Separate resistors must be used for each LED.

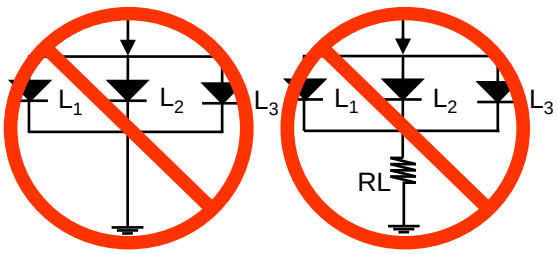
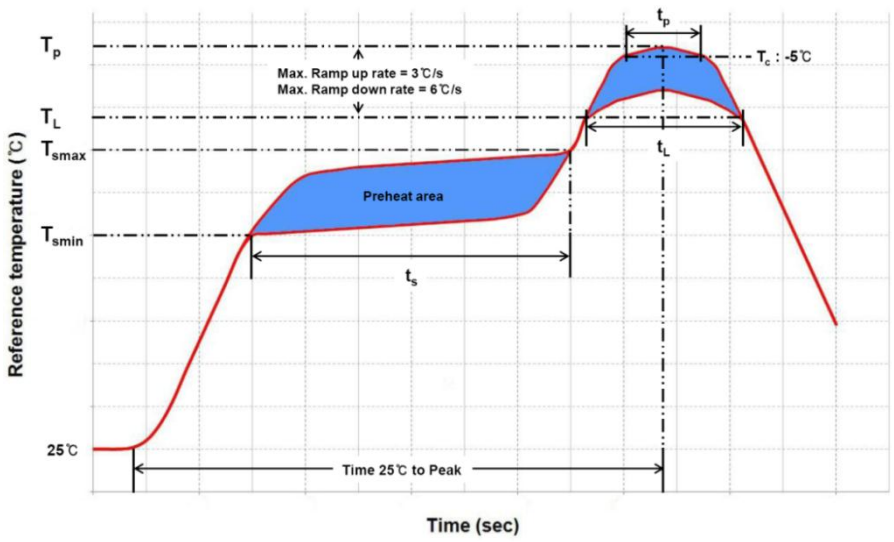


Fig.2. Abnormal Circuit :
Avoid this circuits! The current through the LEDs
may vary due to the variation in LED forward voltage.

10. Cautions on Use

10-8. Soldering Conditions

- Reflow soldering is the recommended method for assembling LEDs on a circuit board.
- LG Innotek does not guarantee the performance of the LEDs assembled by the dip soldering method.
- Recommended soldering conditions(According to JEDEC J-STD-020D)



Profile Feature	Pb-Free Assembly	Pb-Based Assembly
Preheat/Soak Temperature Min.(T_{smin}) Temperature Max.(T_{smax}) Maximum Time(t_s) from $T_{smin.}$ to $T_{smax.}$	 150℃ 200℃ 60~120 seconds	 100℃ 150℃ 60~120 seconds
Ramp-Up Rate (T_L to T_p)	3℃/ second max.	3℃/ second max.
Liquidous Temperature (T_L)	217℃	183℃
Time (t_L) maintained above T_L	60~150 seconds	60~150 seconds
Maximum Peak Package Body Temperature (T_p)	260℃	235℃
Time(t_p) within 5℃ of the specified Temperature (T_c)	30 seconds	20 seconds
Ramp-Down Rate (T_p to T_L)	6℃/second max.	6℃/second max.
Maximum Time 25℃ to Peak Temperature	8 minutes max.	6 minutes max.

- Although the recommended soldering conditions are specified in the above diagram, reflow or a hand iron dip soldering at the lowest possible temperature is desirable for the LEDs.
- A rapid-rate process is not recommended for cooling the LEDs down from the peak temperature.
- Occasionally there is a brightness decrease caused by the influence of heat of ambient atmosphere during air reflow.
  It is recommended that the customer use the nitrogen reflow method.
- The hermetic sealed material of the LEDs is a glass plate.
  Therefore, the LEDs have a soft and very fragile surface on the top of the package.
  The pressure to the surface will be influence to the reliability of the LEDs.
  Precautions should be taken to avoid the strong pressure on the encapsulated part.
  So, when using the chip mounter, the picking up nozzle that does not affect the silicone resin should be used.
- Reflow soldering should not be done more than two times.

10. Cautions on Use

10-9. Soldering Iron

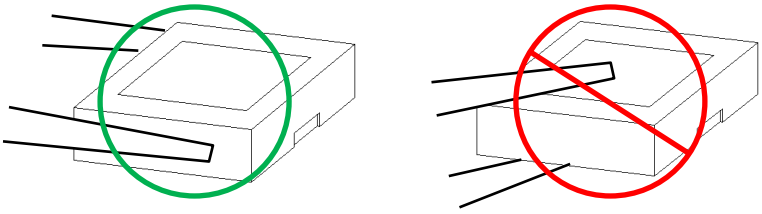
- The recommended condition is less than 5 seconds at 260℃.
- The time must be shorter for higher temperatures. (+10℃ → -1sec).
- The power dissipation of the soldering iron should be lower than 15W and the surface temperature of the device should be controlled at or under 230℃.

10-10. Safety for Human Eyes

- Do not view directly in to the deep UV(UVC) light of UV LED driven at low current or the LED with optical instruments for measuring such as radiant flux, light distribution and spectrum, etc.
- Do not expose to the human body and eyes during the LED light emitting because UV(UVC) light can be bad for human.
- Please wear UV protective products such as UV protective glasses, mask, etc.

10-11. Manual Handling

- Use tweezers to grab these LED products at the ceramic body.
  Teflon coated tweezers would be recommended that the LED package is not to scratch .



- During assembly processing, a mechanical stress on the surface should be minimized as much as possible.
  Our product consists of fragile ceramic material and glass, etc.
  During SMT processing, there are basically no restrictions regarding the form of the pick and place nozzles and tweezers, except that overload a mechanical pressure on the LED package must be prevented.
  Also, Do not drop the LED Product.

11. Disclaimers

- LG Innotek is not responsible for any damages or accidents caused if the operating or storage conditions exceed the absolute maximum ratings recommended in this document.
- The LEDs described in this document are intended to be operated by ordinary electronic equipment.
- Consult LG Innotek, sales staff in advance for information on the applications in which exceptional quality and reliability are required, particularly when the failure or malfunction of the LEDs, may directly jeopardize life or health.
- It is recommended to consult with LG Innotek when the environment or the LED operation is non-standard in order to avoid any possible malfunctions or damage to product or risk of life or health.
- Disassembly of the LED products for the purpose of reverse engineering is prohibited without prior written consent from LG Innotek. All defected LEDs must be reported to LG Innotek and are not to be disassembled or analyzed.
- The product information can be modified and upgraded without prior notice.

Change History of Revision

Revision	Date	Contents of Revision Change	Remark
Rev.1.0	’13.11.29	New Establishment	