

CUSTOMER : LG Electronics

DATE : 2013. 04. 10

REV : REV. 3

# SPECIFICATIONS FOR APPROVAL






## L/F Type NUV SMD LED

MODEL NAME : LEUVS33G10TZ00

**RoHS**  
Compliant

APPROVAL	REMARK	APPENDIX

DESIGNED	CHECKED	APPROVED
13.03.20	13.03.20	13.03.20
D.G. Kim	H.J. Park	B.G. Min
		

## CONTENTS

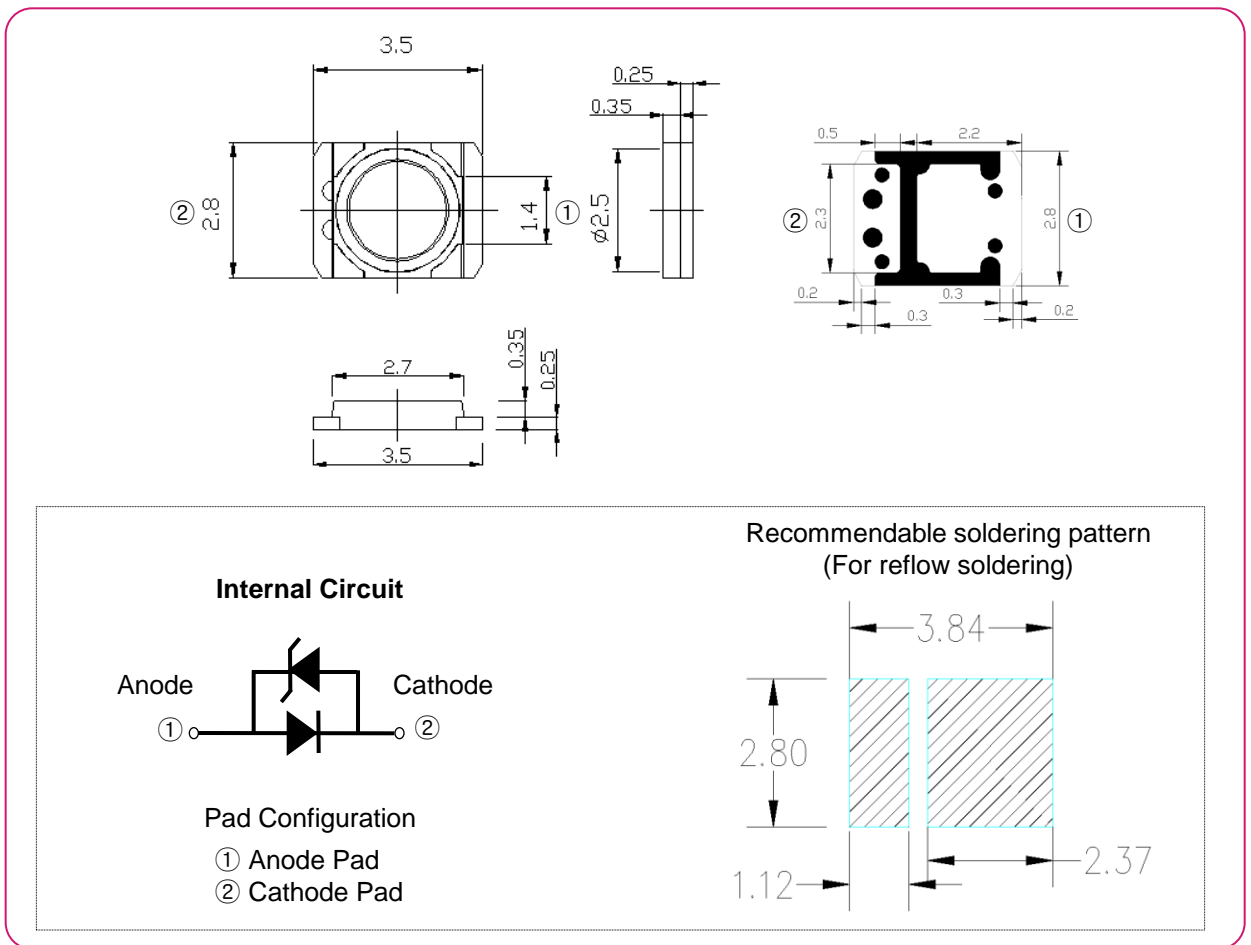
1. Features	-----	3
2. Outline Dimensions	-----	3
3. Applications	-----	4
4. Absolute Maximum Ratings	-----	4
5. Electro-Optical Characteristics	-----	4
6. Bin Structure	-----	5
7. Typical Characteristic Curves	-----	6~7
8. Reliability Test Items and Conditions	-----	8
9. Packing and Labeling of Products	-----	9~12
10. Cautions on Use	-----	13~16
11. Disclaimers	-----	16

## 1. Features

- Lighting Color : NUV (385nm)
- Lead Frame Type NUV LED PKG : 3.5×2.8×0.6 mm (L×W×H)
- Viewing Angle : 130°
- Soldering Methods : Reflow Soldering
- Taping : 12 mm conductive black carrier tape & antistatic clear cover tape  
3,000 pcs/reel, Φ178 mm Reel

## 2. Outline Dimensions

( Unit : mm )



▪ Tolerances unless otherwise specified  $\pm 0.1\text{mm}$

## 3. Applications

- UV Sterilization System
- UV Photo-catalyst
- UV Sensor Light

## 4. Absolute Maximum Ratings

( Ta=25°C )

Item	Symbol	Rating	Unit
Forward Current	If	25	mA
Power Dissipation	Pd	87.5	mW
Operating Temperature	Topr	-20 ~ +85	°C
Storage Temperature	Tstg	-40 ~ +100	°C
Junction Temperature	Tj	90	°C
Soldering Temperature	JEDEC-J-STD-020D		
ESD Classification	HBM	Class 3A (JESD22-A114D)	
	MM	Class C (JESD22-A115-A)	

- ※ The stresses beyond those listed under absolute maximum ratings may cause permanent damages to the device .  
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.
- ※ LEDs are not designed to be driven in reverse voltage.

## 5. Electro - Optical Characteristics

( Ta=25°C )

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If=20 [mA]	3.20	-	3.50	V
Peak Wavelength	Wp	If=20 [mA]	380.0	385.0	390.0	nm
Radiant Flux	Φe	If=20 [mA]	7.5	11.0	18.0	mW
Viewing Angle	2Θ1/2	If=20 [mA]	-	130	-	deg

- ※ These values are measured by the LG Innotek optical spectrum analyzer within the following tolerances.
  - Forward Voltage (Vf) : ±0.10V
  - Peak Wavelength (Wp) : ±3.0nm
  - Radiant Flux (Φe) : ±10%
- ※ Although all LEDs are tested by LG Innotek equipment, some values may vary slightly depending on the conditions of the test equipment.

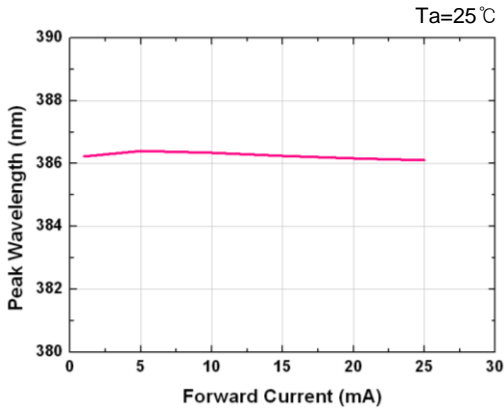
## 6. Bin Structure

Item	Rank	Min.	Typ.	Max.	Unit
Peak Wavelength	W	380	385	390	nm
Radiant Flux	HP	7.5	11	18	mW
Forward Voltage	V1	3.2	-	3.3	V
	V2	3.3	-	3.4	
	V3	3.4	-	3.5	

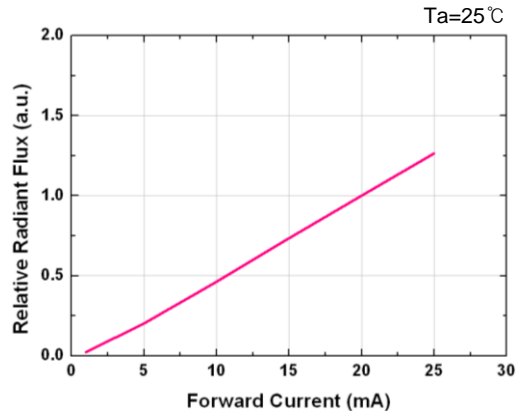
※ Bin structure: Please refer to the following example.  
 Bin Code : W-HP-V2  
 (Wp Bin = W, Φe Bin = HP, Vf Bin = V2)

## 7. Typical Characteristic Curves

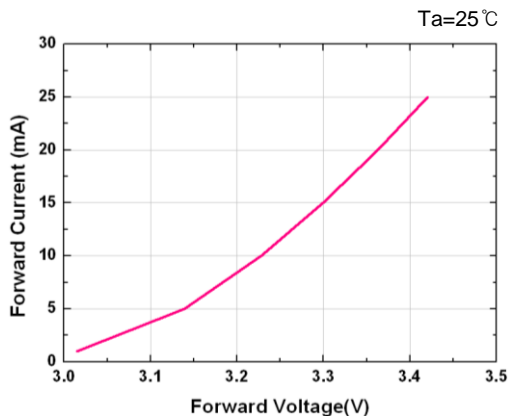
- Forward Current vs. Peak Wavelength



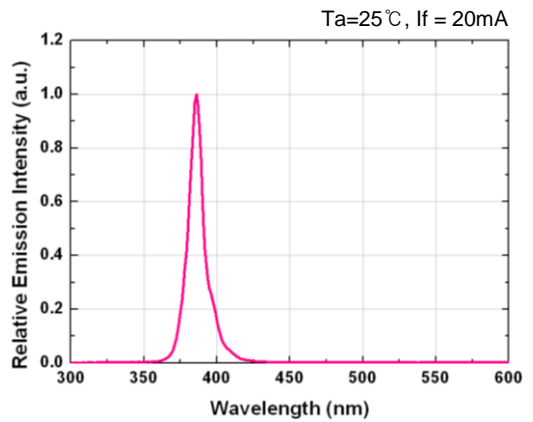
- Forward Current vs. Relative Radiant Flux



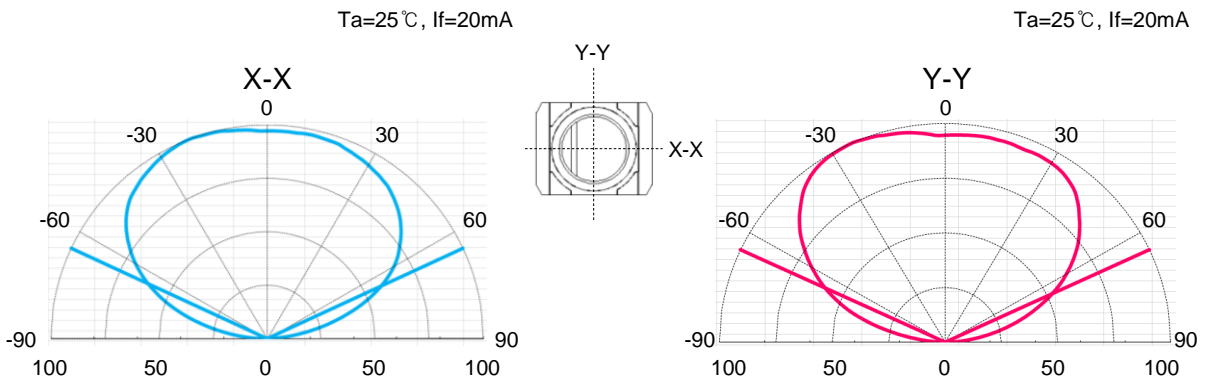
- Forward Voltage vs. Forward Current



- Spectrum

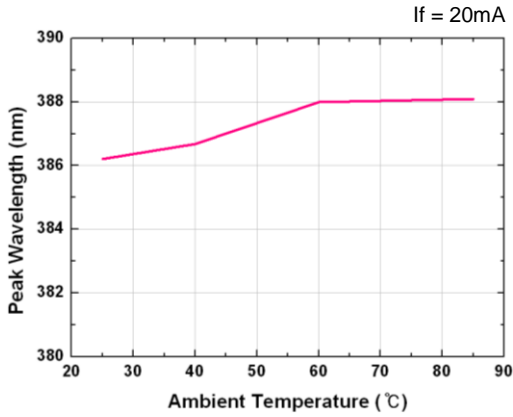


- Radiation Characteristics

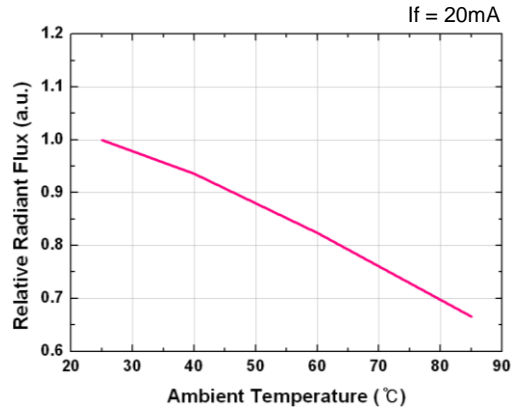


## 7. Typical Characteristic Curves

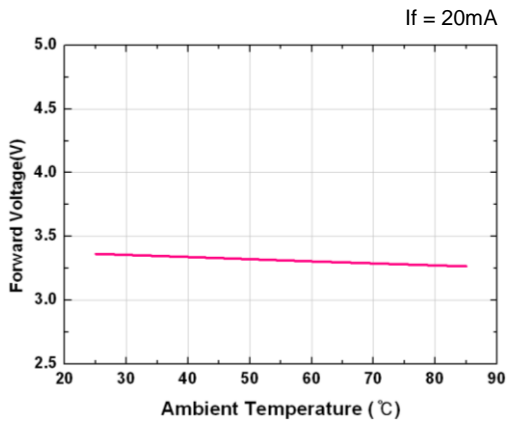
- Ambient Temp vs. Peak Wavelength



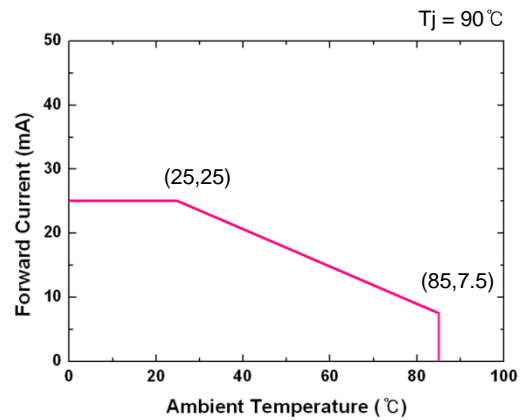
- Ambient Temp vs. Relative Radiant Flux



- Ambient Temp vs. Forward Voltage



- Derating Curve



※ The ambient temperatures for each graph are based on the LG Innotek equipment.

## 8. Reliability Test Items and Conditions

### 8-1. Criteria for Judging the Damage

Items	Symbols	Test Conditions	Limits	
			Min.	Max.
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> = 20mA	-	Initial Value × 1.1
Radiant Flux	Φ <sub>e</sub>	I <sub>f</sub> = 20mA	Initial Value × 0.7	-

### 8-2. Reliability Test

No	Items	Test Conditions	Test Hours /Cycles
1	Room Temperature Operating Life (RTOL)	T <sub>a</sub> =25°C, I <sub>f</sub> =25mA	1,000 hrs
2	Wet High Temperature Operating Life (WHTOL)	85°C, RH=85%, I <sub>f</sub> =15mA	500 hrs
3	High Temperature Operating Life (HTOL)	T <sub>a</sub> =85°C, I <sub>f</sub> =7.5mA	1,000 hrs
4	Low Temperature Operating Life (LTOL)	T <sub>a</sub> =-20°C, I <sub>f</sub> =20mA	1,000 hrs
5	Low Temperature On/Off Operating Life	T <sub>a</sub> =-20°C, I <sub>f</sub> =20mA	20,000 cycles
6	Wet High Temperature Storage Life (WHTSL)	T <sub>a</sub> =85°C, RH=85%	1,000 hrs
7	High Temperature Storage Life (HTSL)	T <sub>a</sub> =100°C	1,000 hrs
8	Low Temperature Storage Life (LTSL)	T <sub>a</sub> =-40°C	1,000 hrs
9	Thermal Shock (TMSK)	-40°C~100°C Dwell : 30min., Transfer : 10sec.)	300 cycles
10	Electrostatic Discharge (ESD)	HBM R:1.5kΩ / C:100pF / ±4kV	3 times
		MM C: 200pF / ±400V	
11	Moisture Sensitivity Level (MSL)	T <sub>sld</sub> =260°C (Pre treatment 60°C, 60%, 168hrs)	3 times
12	Pressure Cooker Test (PCT)	T <sub>a</sub> =121°C, RH=100% @2atm	48 hrs

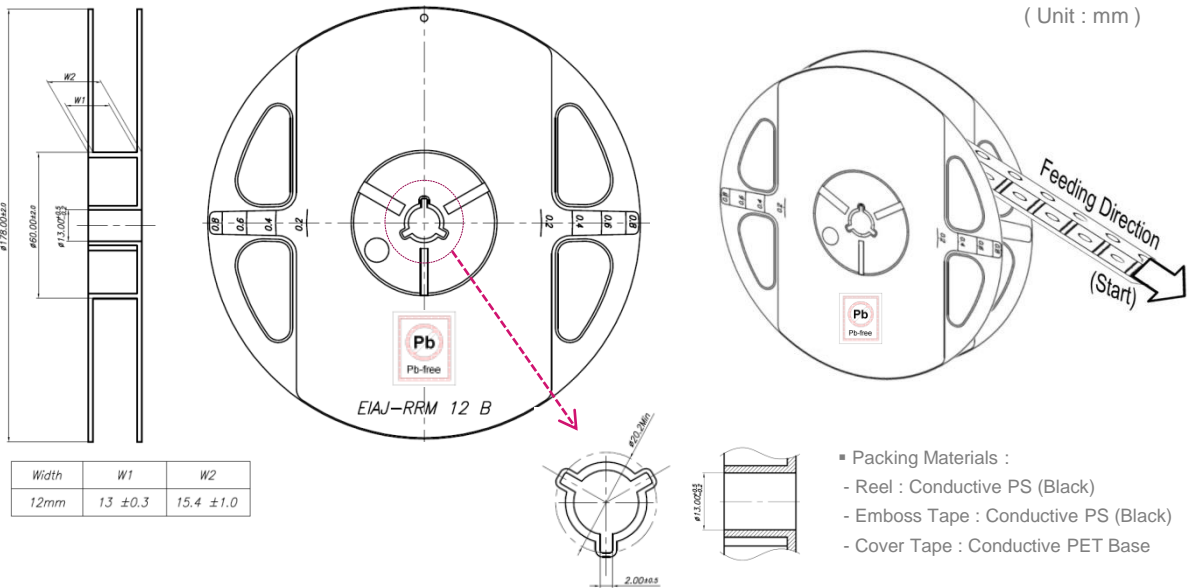
※ All samples are tested using LG Innotek Standard Metal PCB (25x25x1.5mm<sup>3</sup>(L×W×H)) except MSL test.  
 ※ All samples must pass each test item and all test items must be satisfied.



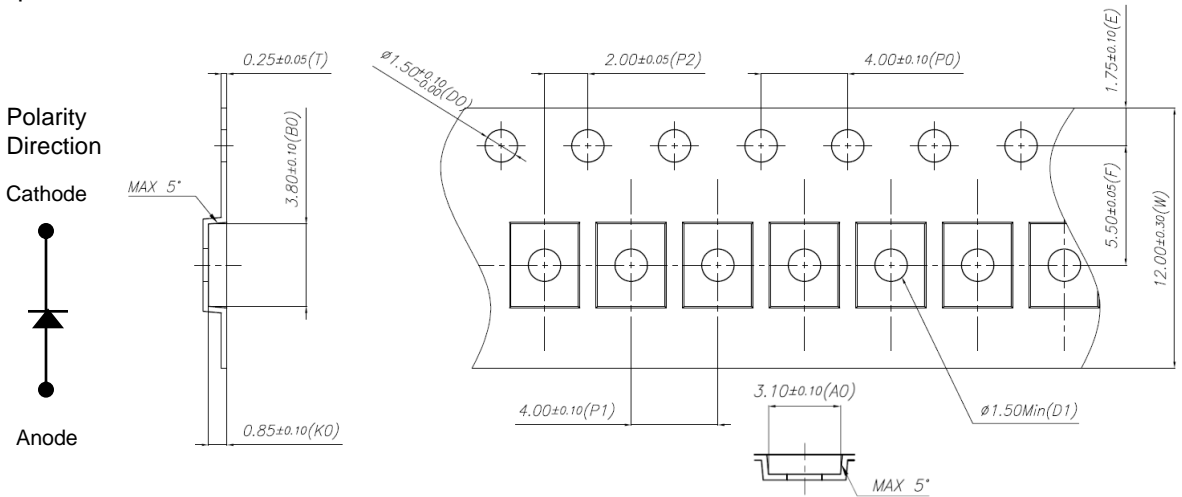
## 9. Packing and Labeling of Products

### 9-1. Taping Outline Dimensions

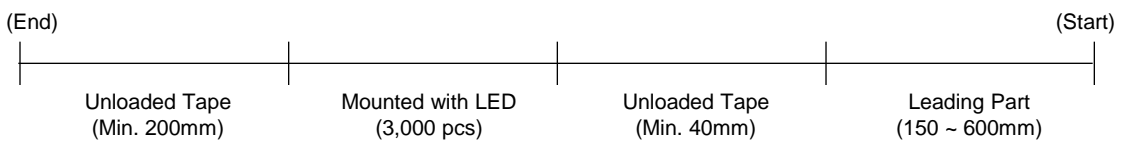
#### Reel



#### Tape



#### Taping Arrangement

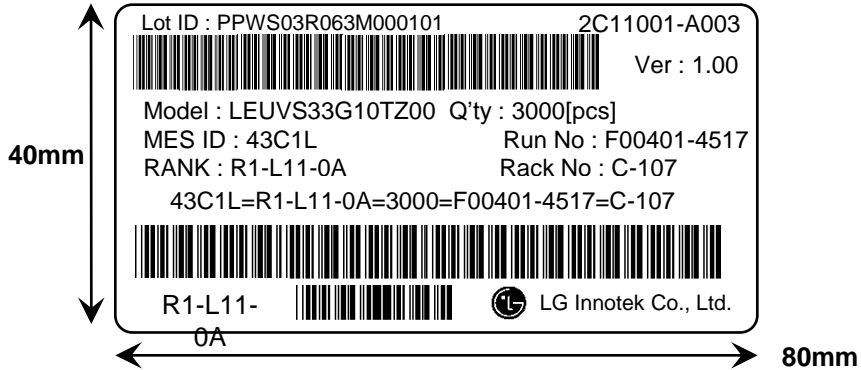


## 9. Packing and Labeling of Products

### 9-2. Label Structure

#### ※. Label A

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



#### ▪ Run No. indication

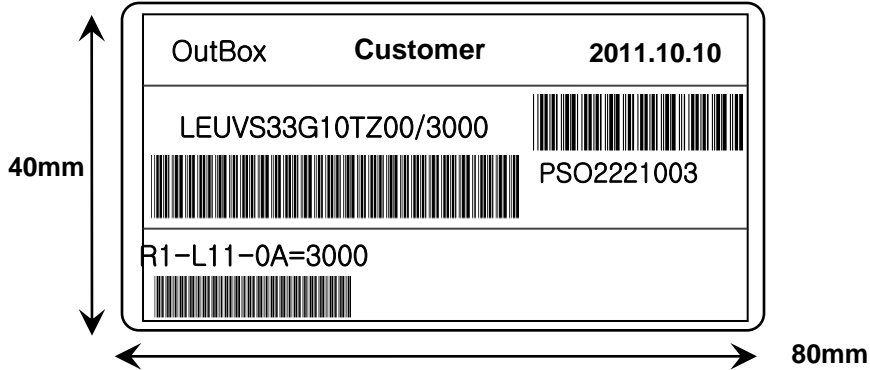
1	2	3	4	5	6	—	7	8	9	10
Code	Manufacture Site	Manufacture Year	Manufacture Month	Manufacture date			TH #		Serial No	
	Paju : 1 Huizhou : 9	2012 : 2 2013 : 3 ... 2020 : 0 2021 : 1	1-9 : 1-9 10 : A 11 : B 12 : C	( 01-31 )			( 00 ~ 99 )		( 00 ~ ZZ )	

## 9. Packing and Labeling of Products

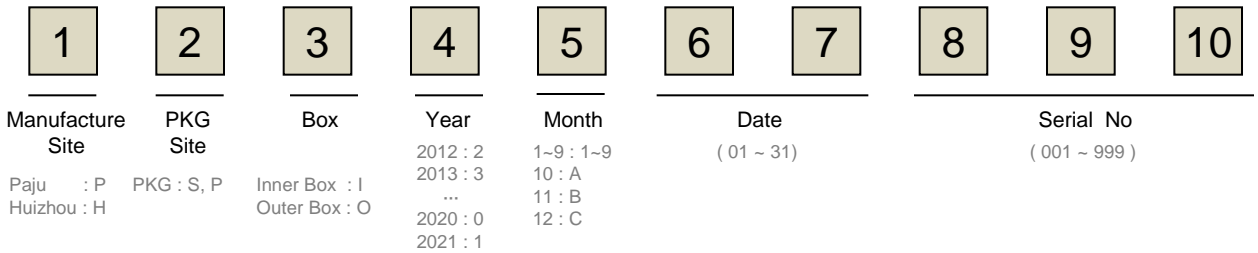
### 9-2. Label Structure

#### ※. Label C

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



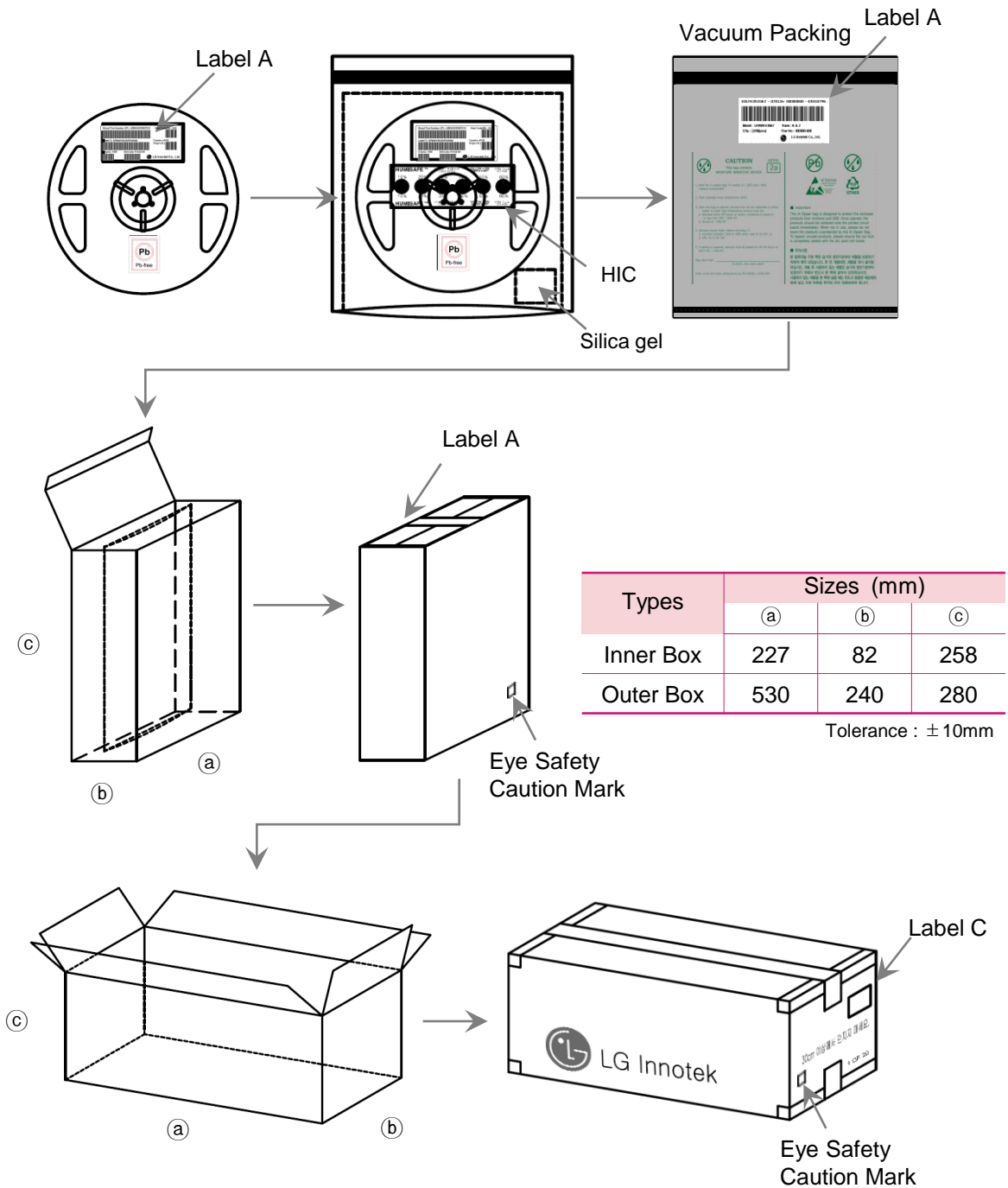
#### ▪ Box ID. indication



## 9. Packing and Labeling of Products

### 9-3. Packing Structures

Reeled products are packed in a sealed-off and moisture-proof aluminum bag with desiccants (silica gel) and HIC (Humidity Indicator Card). Max four aluminum bags are packed in an inner box and six inner boxes are packed in an outer box.



## 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°C ~ 30°C	< 50%RH	within 1 Year from the Delivery Date
	after Opening Aluminum Bag	5°C ~ 30°C	< 60%RH	≤ 672 hours
Baking		65 ± 5°C	< 10%RH	10 ~ 24 hours

### 10-3. During Usage

- LED should avoid the direct contact with exposure to hazardous materials such as sulfur, chlorine, phthalate, etc..
- The silver-plated metal parts on LEDs can be rusted when exposed to corrosive gases.
- 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.
- The corrosive atmosphere must be avoided during the use and storage.
- 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 recommendable solvent for cleaning the LEDs under the following conditions.  
Cleaning Condition : IPA, 25°C max. × 60sec max.
- Ultrasonic cleaning is not recommended.
- Pretests must be followed by the actual cleaning processes to avoid any possible damages to the LEDs.

## 10. Cautions on Use

### 10-5. Thermal Management

- The thermal design of the end 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.

### 10-6. Static Electricity

- Wristbands and anti-electrostatic gloves are strongly recommended and all devices, equipment and machineries must be properly grounded when handling the LEDs which are sensitive against static electricity and surge.
- Precautions are to be taken against surge voltage to the equipment that mounts the LEDs.
- Some unusual characteristics such as significant increase of current leakage, decrease of turn-on voltage, or no operation at a low current can be occurred by damaged LEDs.

### 10-7. Recommended Circuit

- The current through each LED must not exceed the absolute maximum rating when design the circuits.
- 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 luminous 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 luminous flux fluctuations.

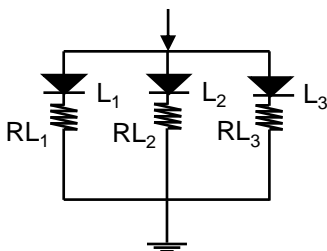


Fig.1 Recommended Circuit in Parallel Mode  
: Separate resistors must be used for each LED.

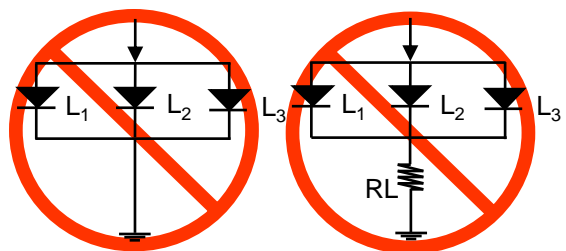


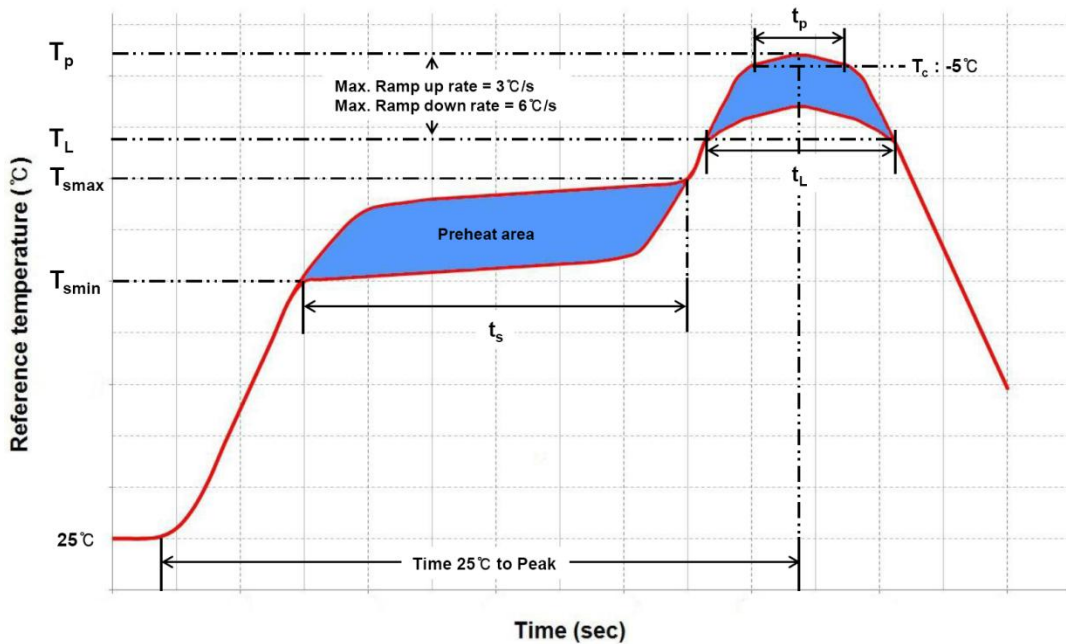
Fig.2. Abnormal Circuit  
Circuits to Avoid: The current through the LEDs may vary due to the variation in LED forward voltage.

- 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.
- Constant-current operation by driver IC controller is recommended.

## 10. Cautions on Use

### 10-8. Soldering Conditions

- Reflow soldering method is recommended for LEDs assembly.
- LG Innotek does not guarantee the performance of the LEDs assembled by dip soldering method.
- Recommended Soldering Profile (according to JEDEC J-STD-020D)



Profile Feature	Pb-Free Assembly	Pb-Based Assembly
Preheat/Soak		
Temperature Min( $T_{smin}$ )	150°C	100°C
Temperature Max( $T_{smax}$ )	200°C	150°C
Maximum time( $t_s$ ) from $T_{smin}$ to $T_{smax}$	60~120 seconds	60~120 seconds
Ramp-up rate ( $T_L$ to $T_p$ )	3°C/ second max.	3°C/ second max.
Liquidous temperature ( $T_L$ )	217°C	183°C
Time ( $t_L$ ) maintained above $T_L$	60~150 seconds	60~150 seconds
Maximum peak package body temperature ( $T_p$ )	260°C	235°C
Time( $t_p$ ) within 5°C of the specified temperature ( $T_c$ )	30 seconds	20 seconds
Ramp-down rate ( $T_p$ to $T_L$ )	6°C/second max.	6°C/second max.
Maximum Time 25°C to peak temperature	8minutes max.	6minutes max.

- Reflow or hand soldering at the lowest possible temperature is desirable for the LEDs although the recommended soldering conditions are specified in the above diagrams.
- A rapid cooling process is not recommended for the LEDs from the peak temperature.
- The LEDs encapsulate silicone and have soft surfaces on the tops, which can easily be damaged by pressure. Precautions should be taken to avoid strong pressure on the encapsulated part when leveraging the pick and place machines. The pick up nozzles should not directly contact the silicone resin of the LEDs.
- 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 °C.
- The time must be shorter for the higher temperature. (+10°C → -1sec).
- The power dissipation of the soldering iron should be lower than 15W when the surface temperature of the device should be controlled at or under 230 °C.

### 10-10. Eye Safety Guidelines

- Do not directly look at the light when the LEDs are on.
- Proceed with caution to avoid the risk of damage to the eyes when examining the LEDs with optical instruments.

### 10-11. Manual Handling

- Use Teflon-type anti-electrostatic tweezers to grab base of LED and do not apply mechanical pressure on the surface of the encapsulant.



## 11. Disclaimers

- LG Innotek is not responsible for any damages caused by any accidents or operational environments exceeding the absolute maximum ratings.
- Generally accepted electronic equipment must be used to operate the LEDs in this document.
- Consultation with LG Innotek is recommended for unassured environments or operations to avoid any possible malfunctions or damages of the products or risk of life or health.
- Any unauthorized, without prior written consents from LG Innotek, disassembly is prohibited if purposed for reverse-engineering. All defected LEDs must be reported to LG Innotek and not to be disassembled or analyzed.
- The product information can be modified and upgraded without prior notice.



## History of Revision

Revision	Date	Contents Revision	Remark
Rev. 0	'12.12.15	New Establishment	-
Rev. 1	'12.12.20	Change of Customer Spec. (Min. Po, Max. Vf) Addition of Typical Characteristic Curves	P.4 P.6~7
Rev. 2	'13.03.13	Change of Customer Spec. (Min. Po, Max. Vf) Addition of Rank Sorting Method Addition of Reliability Test Items and Conditions (Requested by Customer)	P.4 P.5 P.8
Rev. 3	'13.04.10	Change of Reliability Test Items and Conditions (Requested by Customer)	P.8