CUSTOMER : .

DATE : 2012. 08. 31.

SPECIFICATIONS FOR APPROVAL

Top View Type White SMD LED

MODEL NAME : LEMWS59T80HZ10

APPROVAL	REMARK	APPENDIX

DESIGNED	CHECKED	APPROVED

LG Innotek

SPECIFICATION

MODEL	LEMWS59T80HZ10	DOCUMENT No.	
REG. DATE	12.08.31.	REV. No.	0.0
REV. DATE		PAGE	2 / 18

History of Revision

Revision	Date	Contents of Revision	Remark
Rev. 0.0	12.08.31	New establishment	

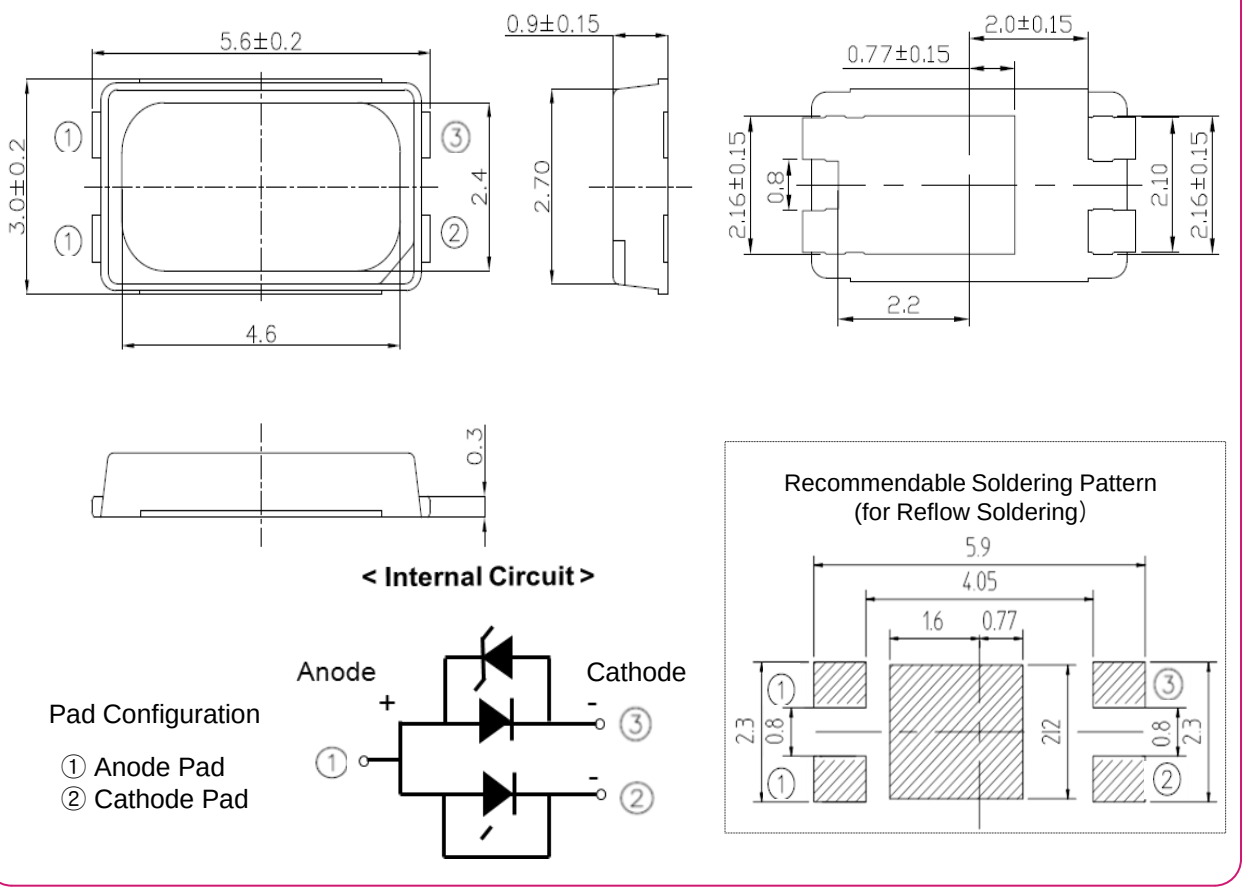
CONTENTS

1. Features

- Lighting Color : White
- Lead Frame Type LED Package : 5.6×3.0×0.9 mm (L×W×H)
- Chip Material : InGaN
- 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)



▪ Tolerance unless otherwise Mentioned ±0.1 mm

3. Applications

- Interior and exterior illuminations

4. Maximum Ratings

(Ta=25℃)

Item	Symbol	Rating	Unit
Forward Current	If	160	mA
Pulse Forward Current*1)	Ifp	300	mA
Power Dissipation	Pd	540	mW
Operating Temperature	Topr	-30 ~ +85	℃
Storage Temperature	Tstg	-40 ~ +100	℃
Junction Temperature	Tj	110	℃
ESD (HMD)	-	5	kV

*1) Pulse Width = 10 ms, Duty ≤ 10%

※ 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.

5. Electro - Optical Characteristics

(Ta=25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If=120 [mA]	2.90	3.17	3.30	V
Reverse Voltage*1)	Vr	Ir=10 [mA]	0.60	-	1.20	V
Luminous Flux	Φv	If=120 [mA]	37.0	42.0	47.0	lm
Luminous Intensity	Iv	If=120 [mA]	11.8	13.4	14.3	cd
Color	Cx / Cy	If=120 [mA]	Refer to '6. Bin structure'			-
Viewing Angle	2Θ1/2	If=120 [mA]	-	120	-	deg
Color Rendering Index (Ra)	-	If=120 [mA]	80	-	-	-
Thermal Resistance, Junction to Solder Point	Rth j-s	If=120 [mA]	-	14	-	℃/W
Typical Temperature Coefficient of Forward Voltage*2)	ΔVf / ΔTj	If=120 [mA]	-1.0	-	-3.0	mV/℃

*1) The values are based on the performance of zener diode.
*2) Measured at Ta between 25℃ and 85℃.

※ These values are measured by the LG Innotek optical spectrum analyzer within the following tolerances.
Luminous Flux (Φv) : ±7%, Forward Voltage (Vf) : ±0.1V, Color Value : ±0.005, CRI Value : ±2, Viewing Angle : ±5°
※ Although all LEDs are tested by LG Innotek equipments, some values may vary slightly depending on the conditions of the test equipments.
※ Luminous Intensity : Reference Data Only

5. Electro - Optical Characteristics

If (mA)	Vf (V)	Power (W)	Φv (lm)	lm/W
20	2.88	0.05	8.0	160
40	2.95	0.11	15.6	141
60	3.01	0.18	22.7	126
80	3.07	0.24	29.4	122
100	3.12	0.31	35.8	115
120(Typ.)	3.17	0.38	42.0	110
160	3.25	0.52	53.7	103

※ Φv values are for representative references only.

6. Bin Structure

▪ Forward Voltage Bins

Bin	Vf (V, @120mA)		
	Min	Typ	Max
0	2.9	-	3.0
1	3.0	-	3.1
2	3.1	-	3.2
3	3.2	-	3.3

▪ Luminous Flux Bin

Bin	Φv (lm, @120mA)		
	Min	Typ	Max
T	37.0	-	47.0

▪ CRI Bin

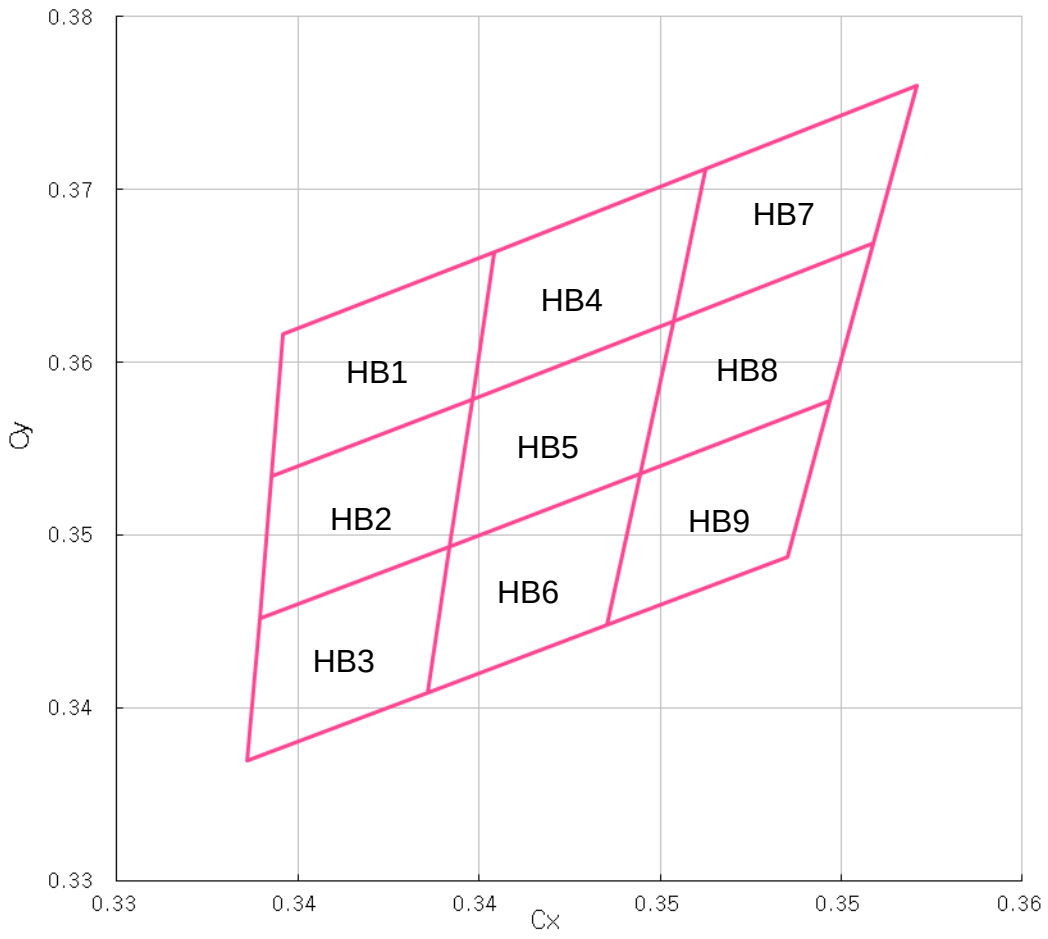
Bin	CRI @120mA		
	Min.	Typ.	Max.
80	80	-	-

※ Bin structure: Please refer to the following example.
Bin Code : T–HB1–0
(Φv Bin = T, Color Bin = HB1, Vf Bin = 0)

▪ Color Bins (@120mA)

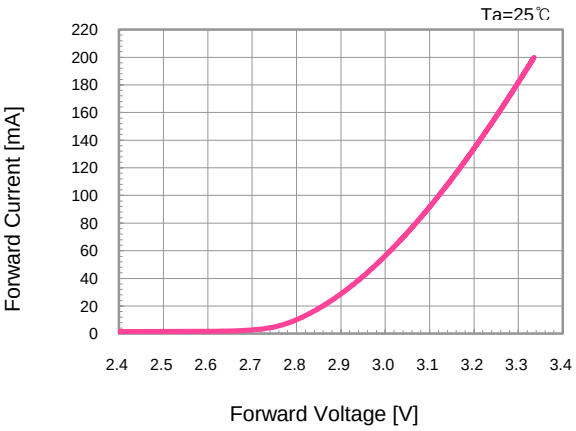
Bin	Cx	Cy	Bin	Cx	Cy
HB1	0.3376	0.3616	HB6	0.3422	0.3494
	0.3434	0.3664		0.3474	0.3536
	0.3428	0.3579		0.3465	0.3448
	0.3373	0.3534		0.3416	0.3408
HB2	0.3373	0.3534	HB7	0.3493	0.3712
	0.3428	0.3579		0.3551	0.3760
	0.3422	0.3494		0.3539	0.3669
	0.3369	0.3451		0.3484	0.3624
HB3	0.3369	0.3451	HB8	0.3484	0.3624
	0.3422	0.3494		0.3539	0.3669
	0.3416	0.3408		0.3527	0.3578
	0.3366	0.3369		0.3474	0.3536
HB4	0.3434	0.3664	HB9	0.3474	0.3536
	0.3493	0.3712		0.3527	0.3578
	0.3484	0.3624		0.3515	0.3487
	0.3428	0.3579		0.3465	0.3448
HB5	0.3428	0.3579			
	0.3484	0.3624			
	0.3474	0.3536			
	0.3422	0.3494			

Color Bins Structure

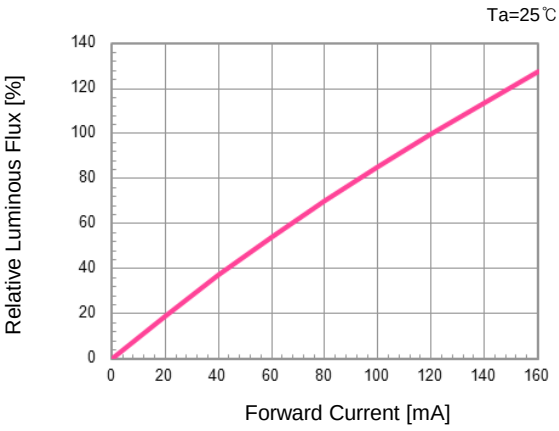


7. Typical Characteristic Curves

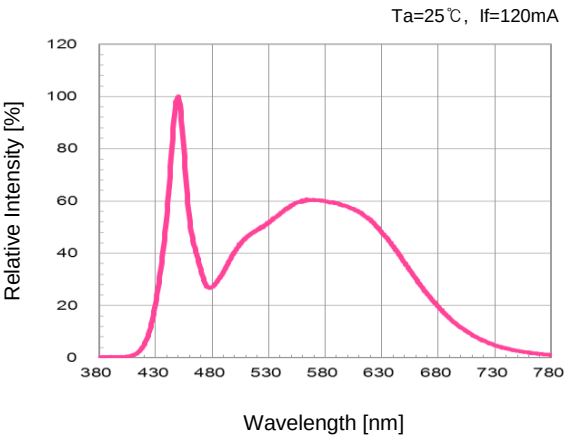
▪ Forward Current vs. Forward Voltage



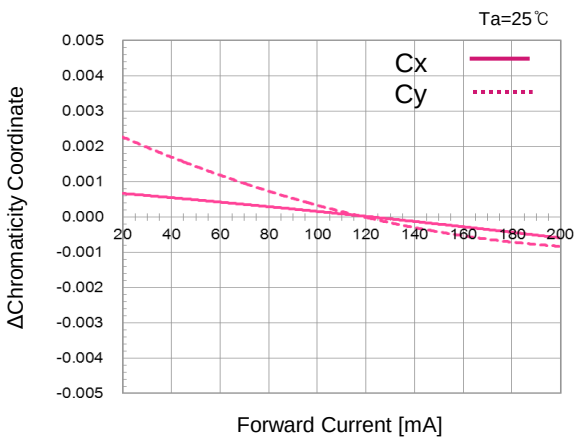
▪ Relative Luminous Flux vs. Forward Current



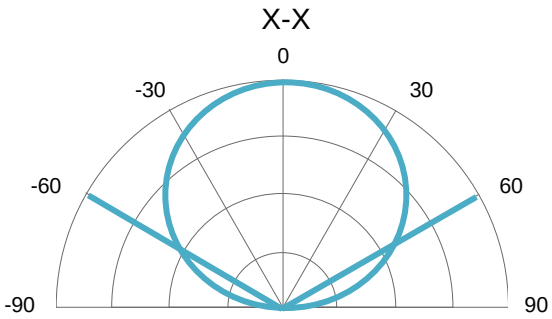
▪ Spectrum

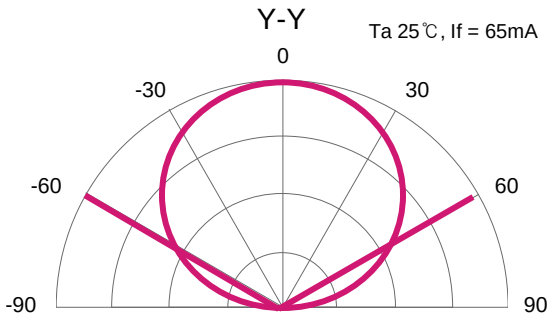


▪ Chromaticity Coordinate vs. Forward Current



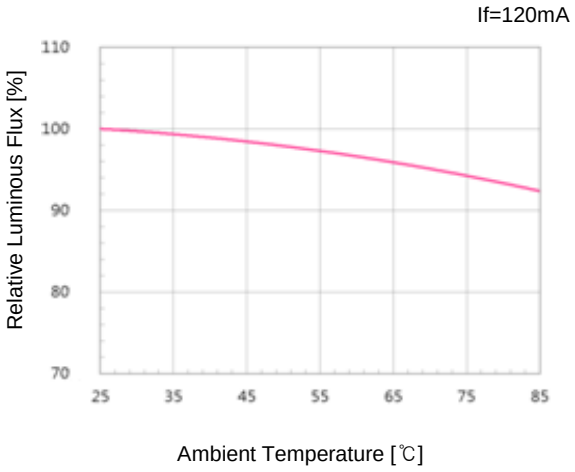
▪ Radiation Characteristics



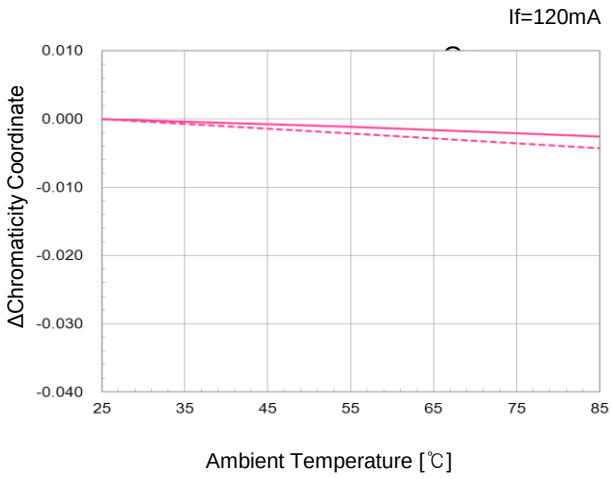


7. Typical Characteristic Curves

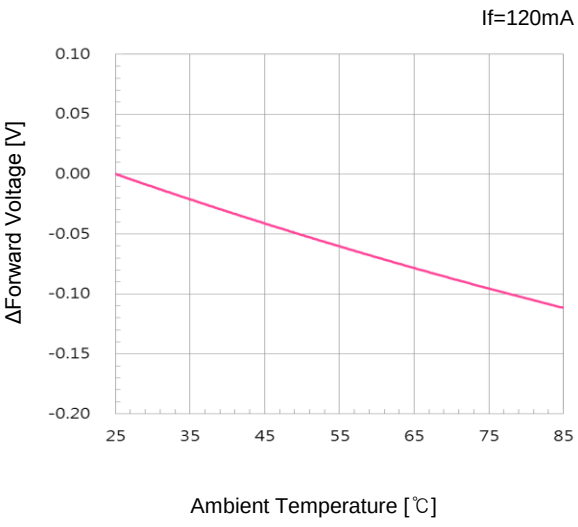
▪ Luminous Flux vs. Temperature



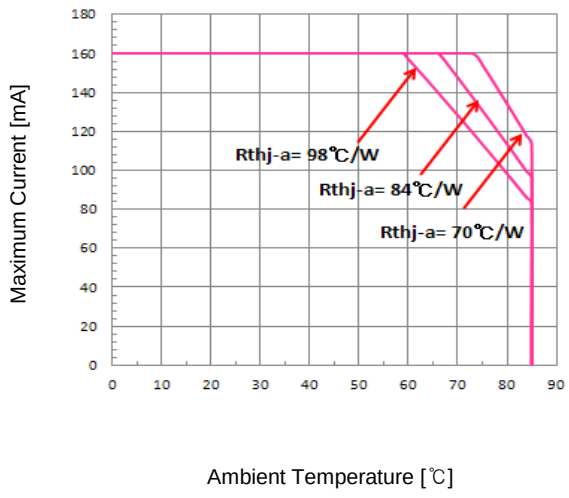
▪ Chromaticity Coordinate vs. Temperature



▪ Forward Voltage vs. Temperature



▪ Derating Curve

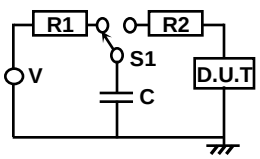


8. Reliability Test Items and Conditions

8-1. Criteria for Judging Damages

Items	Symbols	Test Conditions	Limits	
			Min.	Max.
Forward Voltage	Vf	If = 120mA	-	Initial value × 1.1
Luminous Flux	Φ_V	If = 120mA	Initial value × 0.7	-

8-2. Items and Results of Reliability Test

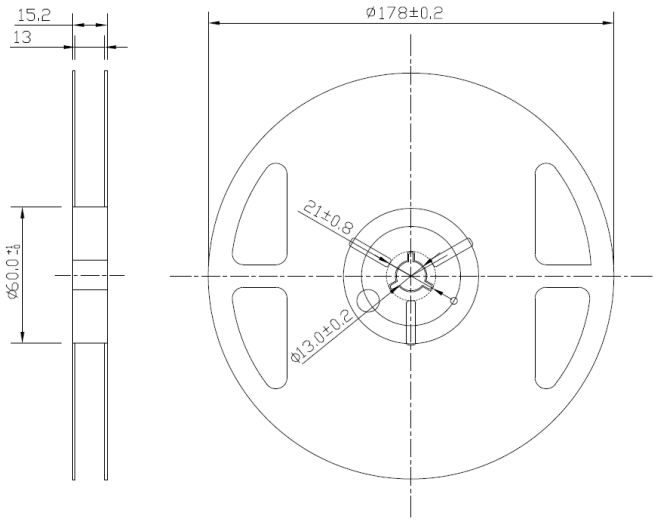
No	Items	Test Conditions	Test Hours /Cycles
1	Steady-State Operation	Ta=25℃, If=150mA	1,000 hours
2	High Temperature / High Humidity	Ta=60℃, RH=90%, If=150mA	1,000 hours
3	Steady-State Operation under High Temperature	Ta=85℃, If=150mA	1,000 hours
4	Steady-State Operation under Low Temperature	Ta=-30℃, If=150mA	1,000 hours
5	High Temperature Storage	Ta=100℃	1,000 hours
6	Low Temperature Storage	Ta=-40℃	1,000 hours
7	Temperature Cycling	Ta=85℃, RH=85%	1,000 hours
8	Thermal Shock	-40℃(30 min.) ~ 25℃(5 min.) ~ 100℃(30 min.) ~ 25℃(5 min.)	200 cycles
9	Resistance to Soldering Heat (Reflow Soldering)	100℃ ~ -40℃ Dwell : 15 min., Transfer : 10 sec.	200 cycles
10	Electrostatic Discharge (HBM, ±2kV)	 R1 :10MΩ, R2:1.5KΩ C:100pF	3 times
11	Vibration	Tsld=260℃, 10 sec. (Pre treatment 30℃,70%,168 hours)	2 times

※ The entire test fails if one (or more) LED(s) from the sample set remain(s) within the listed failure criteria.

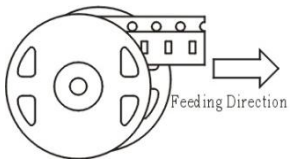
9. Packing and Labeling of Products

9-1. Taping Outline Dimensions

Reel



(Unit : mm)



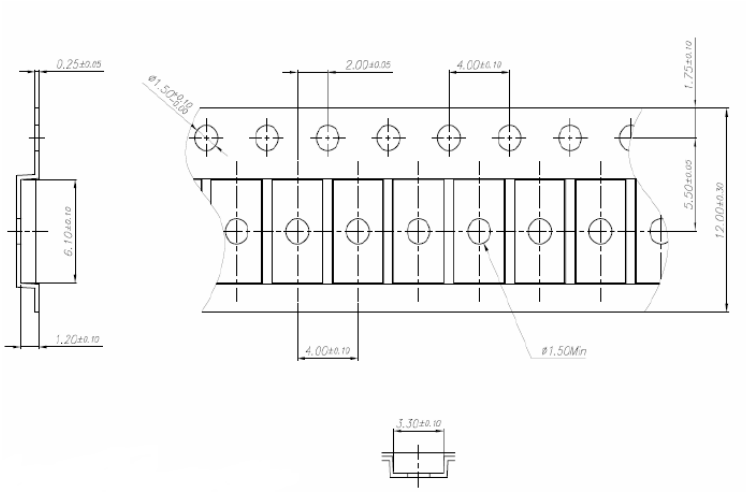
▪ Packing Materials :
- Reel : Conductive PS (Black)
- Emboss Tape : Conductive PS (Black)
- Cover Tape : Conductive PET Base

Tape

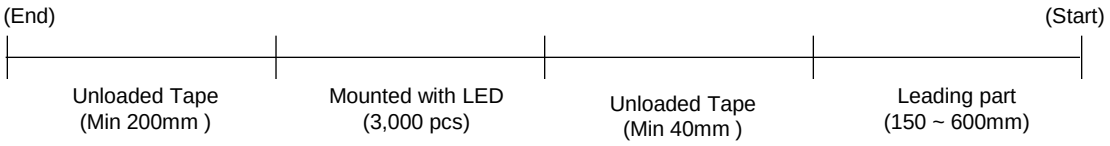
Polarity Direction

Anode

Cathode



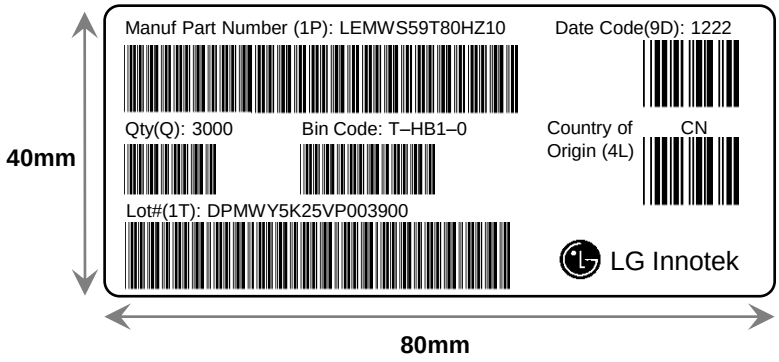
Taping Arrangement



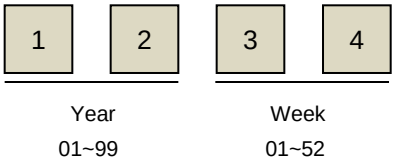
9-2. Label Structure

※. Label A

Specifying ‘Manufacturing Part Number’, ‘Quantity’, ‘Bin Code’, ‘Lot#’, ‘Date Code’ and Country of Origin



▪ Date Code(9D)

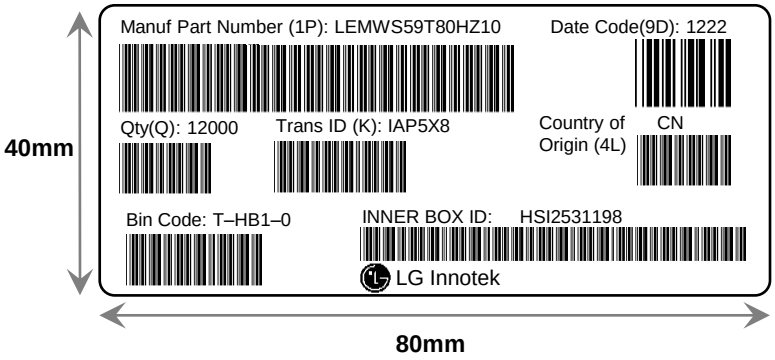


▪ Lot#(1T)

LG Innotek Trace Code

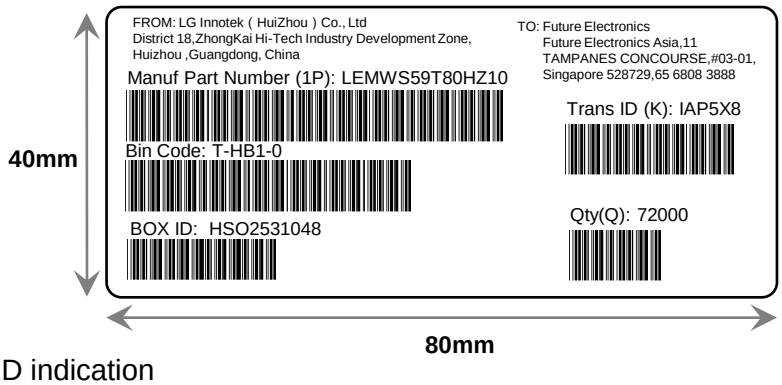
※. Label B

Specifying ‘Manufacturing Part Number’, ‘Quantity’, ‘Bin Code’, ‘Trans ID’, ‘Date Code’, ‘Country of Origin’, ‘Inner BoxID’



※. Label C

Specifying ‘Manufacturing Site’, ‘Customer Address’, ‘Manufacturing Part Number’, ‘Bin Code’, ‘Box ID’, ‘Trans ID’ and Q’ty

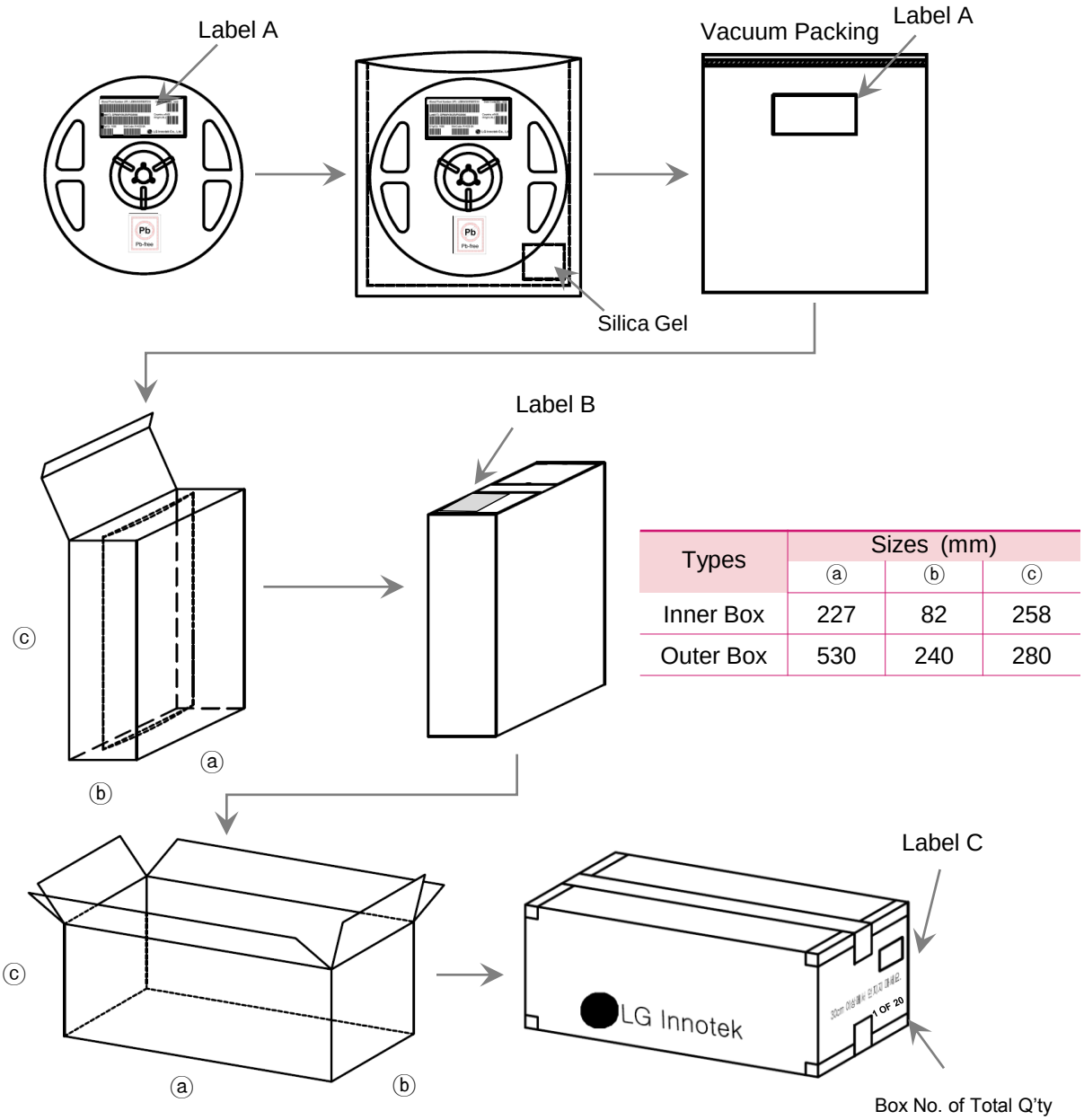


▪ Box ID indication

1	2	3	4	5	6	7	8	9	10
Site	Code	Outbox	Year	Month	Date		Serial No		
Paju: P Huizhou: H	S, P	Outbox: O Inbox: I	12 : 2 13 : 3 14 : 4 15 : 5	1~9 : 1~9 10 : A 11 : B 12 : C	(01 ~ 31)		(001 ~ 999)		

9-3. Packing Structure

Reeled products (3,000 pcs per bag) are packed in a sealed-off and moisture-proof aluminum bag with desiccants (silica gel). Four aluminum bags (12,000 pcs total per box) are packed in an inner box and six inner boxes are packed in an outer box (72,000 pcs per box).



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

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	< 30℃	< 50%RH	Within 1 Year from Delivery Date
	after Opening Aluminum Bag	< 30℃	< 60%RH	≤ 672 hours
Baking		65 ± 5℃	< 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.

-. IPA is the recommendable solvent for cleaning the LEDs under the following conditions.
Clearing condition : IPA, 25℃ 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.

10-5. Heat Generation

-. 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, equipments 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.

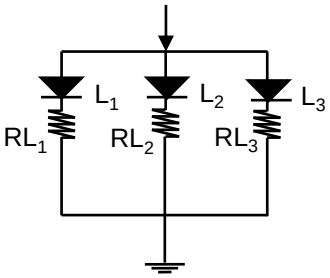


Fig.1 Recommended Circuit in Parallel Mode
: Separate resistor must be used for each LED.

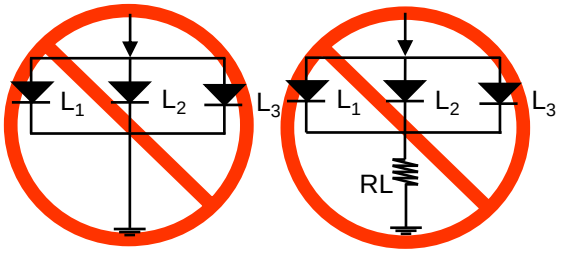


Fig.2. Abnormal Circuit
Circuits to Avoid: The current through the LEDs may vary due to the variation in LED forward voltage.

-. 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.

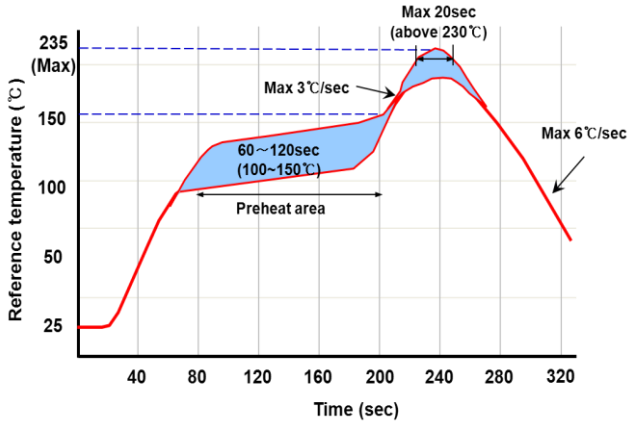
-. Constant-current operation by driver IC controller is recommended.

10-8. Soldering Conditions

-. Reflow soldering method is recommended for LEDs assembly.

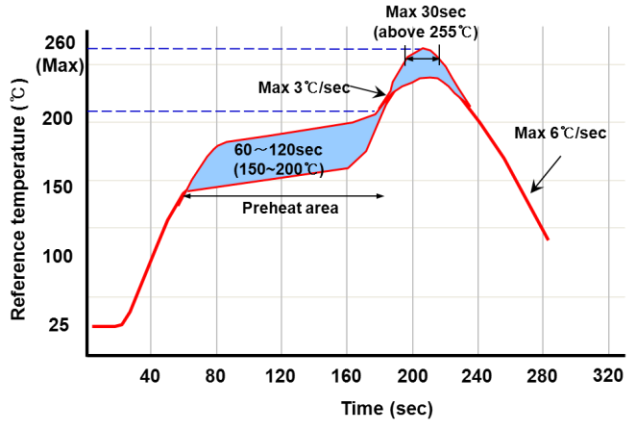
-. LG Innotek does not guarantee the performance of the LEDs assembled by dip soldering method.

-. Recommended Soldering Profile for Pb-Based Solder (according to JEDEC J-STD-020D)



Pb-Based Solder	
Pre-Heat	100~150℃
Pre-Heat time	60~120sec.
Peak Temperature	235℃ max.
Time within 5℃ of actual Peak Temperature	20sec. max.

-. Recommended Soldering Profile for Pb-Free Solder (according to JEDEC J-STD-020D)



Pb-Free Solder	
Pre-Heat	150~200℃
Pre-Heat time	60~120sec.
Peak Temperature	260℃ max. (10sec. max)
Time within 5℃ of actual Peak Temperature	30sec. 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 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.

10-9. Soldering Iron

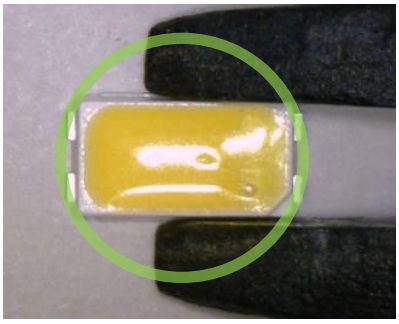
-. The recommended Condition is less than 5 seconds at 260℃.
-. The time must be shorter for the higher temperature. (+10℃ → -1sec).
-. The power dissipation of the soldering iron should be lower than 15W when the surface temperature of the device should be controlled at or under 230℃.

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 tweezers to grab base of LED and do not touch the lens.



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 equipments 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 products can be modified and upgraded without prior notice.