

DATE OF ISSUE : 2009. 04. 10

SPECIFICATION

MODEL : SLHNNWH511N1

[Rank : (S0), (Q0, R0), (H1, I1, J1)]

HIGH POWER LED – SUNNIX5

CUSTOMER : _____

| CUSTOMER | | |
|--------------------|---------|----------|
| CHECKED | CHECKED | APPROVED |
| Preliminary | | |
| | | |

| SAMSUNG LED | | | |
|-------------|----------------|------------------|----------|
| DRAWN | CHECKED(Sales) | CHECKED(Quality) | APPROVED |
| | | | |
| | | | |

SAMSUNG LED CO.,LTD.
314, MAETAN3-DONG, YEONGTONG-GU,
SUWON-SI, GYEONGGI-DO, KOREA, 443-743

Contents

| | | | |
|-----|---------------------------------------|-------|----|
| 1. | Product Outline | ..... | 3 |
| 2. | Absolute Maximum Rating | ..... | 3 |
| 3. | Characteristics | ..... | 3 |
| 4. | Chromaticity Diagram | ..... | 4 |
| 5. | Typical Characteristic Graphs | ..... | 5 |
| 6. | Outline Drawing and Dimension | ..... | 6 |
| 7. | Package Structure | ..... | 7 |
| 8. | Solder Conditions | ..... | 7 |
| 9. | Reliability Test Items and Conditions | ..... | 8 |
| 10. | Taping Dimension | ..... | 9 |
| 11. | Label Structure | ..... | 10 |
| 12. | Lot Number | ..... | 10 |
| 13. | Reel Packing Structure | ..... | 11 |
| 14. | Precaution for Use | ..... | 13 |
| 15. | Hazard Substance Analysis | ..... | 15 |
| 16. | Revision History | ..... | 18 |

1. Product Outline

1) Features

- Plastic Molded Lead Frame Type : 7.0 mm(L), 7.0 mm(W), 2.0 mm(T)
- Beam View Angle($\Delta\theta$)* : 115 °
- High Power / Brightness Chip & Long Time Reliability

2) Applications

- Automotive Interior Lamp, Illumination etc.

※ View Angle describes the spatial intensity distribution and is the difference between the angles corresponding to 50% of the maximum intensity.

2. Absolute Maximum Rating

- Operation Forward Current 350 mA
- Reverse Voltage* 5 V
- Thermal Resistance ($R_{th\ j-s}$) \cong 10 °C/W
- Operating Temperature Range (T_{OPR}) -40 °C ~ 85 °C
- Storage Temperature Range (T_{STG}) -40 °C ~ 110 °C
- LED Junction Temperature (T_j) 125 °C

※ Does not operate in the reverse direction.

3. Characteristics

1) Electrical properties ($T_j = 25\text{ °C}$)

| Parameter | Symbol | Condition | Rank | Min. | Typ. | Max. | Unit |
|-----------------|--------|-----------------------|------|------|------|------|------|
| Reverse Voltage | V_R | $I_R = 10\text{ mA}$ | - | 0.5 | - | 2.0 | V |
| Forward Voltage | V_F | $I_F = 350\text{ mA}$ | S0 | 3.0 | - | 4.0 | V |

2) Chromaticity Coordinates ($T_j = 25\text{ °C}$)

| Rank | CCT(K) | Condition | CCx | | | | CCy | | | | |
|------|--------|-----------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| QR | Q0 | 6000~7000 | $I_F = 350\text{ mA}$ | 0.3128 | 0.3250 | 0.3200 | 0.3011 | 0.2864 | 0.2981 | 0.3600 | 0.3407 |
| | R0 | 5000~6000 | | 0.3250 | 0.3428 | 0.3484 | 0.3200 | 0.2981 | 0.3138 | 0.3818 | 0.3600 |

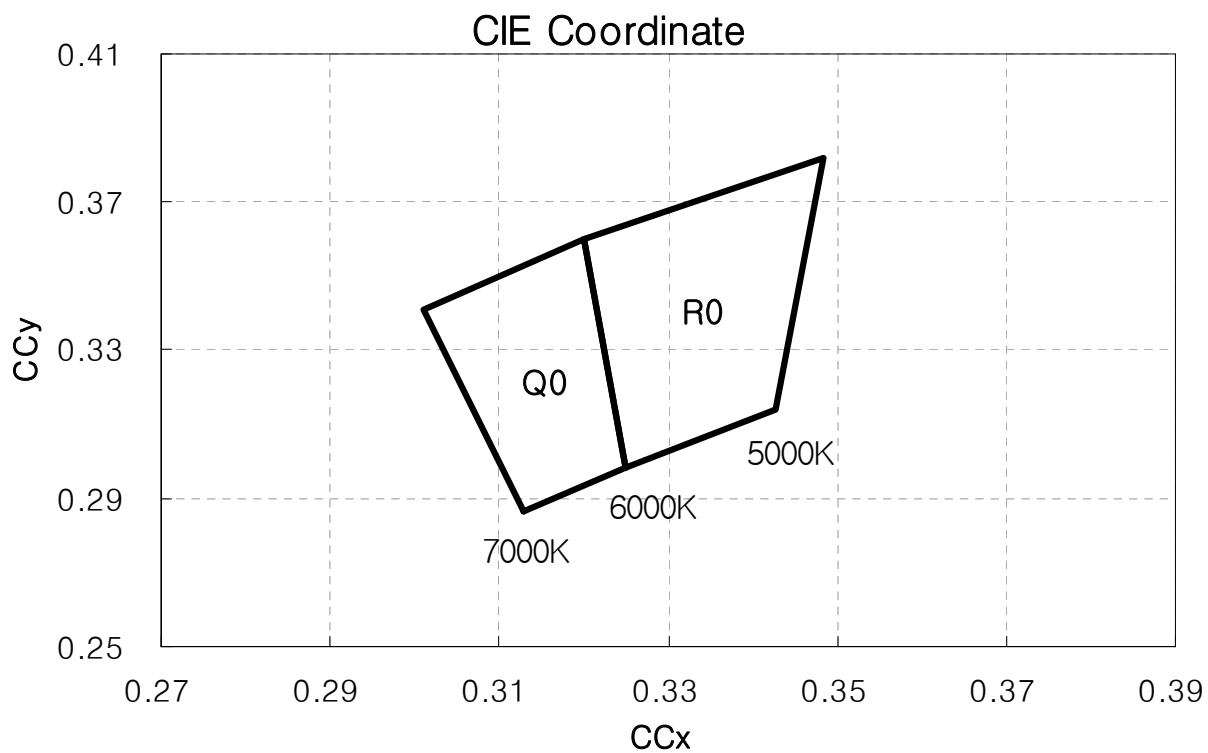
3) Luminous Flux ($T_j = 25\text{ °C}$)

| Rank | Symbol | Condition | Min. | Typ. | Max. | Unit | |
|------|--------|-----------|-----------------------|------|------|------|----|
| H3 | H1 | Φ_V | $I_F = 350\text{ mA}$ | 70 | - | 80 | lm |
| | I1 | | | 80 | - | 90 | |
| | J1 | | | 90 | - | 100 | |

※ Tolerance : V_F : ± 0.1 , Φ_V : $\pm 10\%$, CCx CCy : ± 0.02

※ Color Rendering Index (R_a) : Typ. 75

4. Chromaticity Diagram

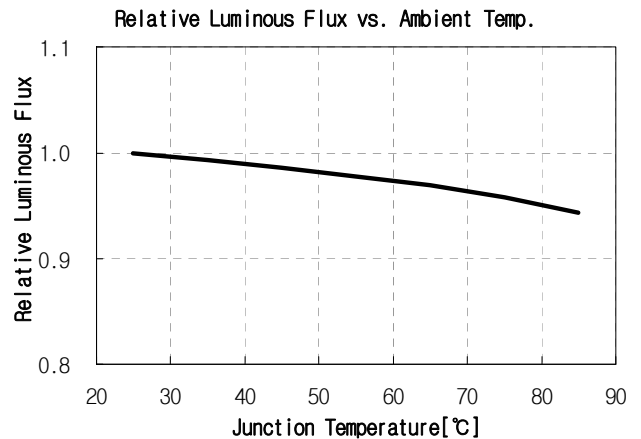
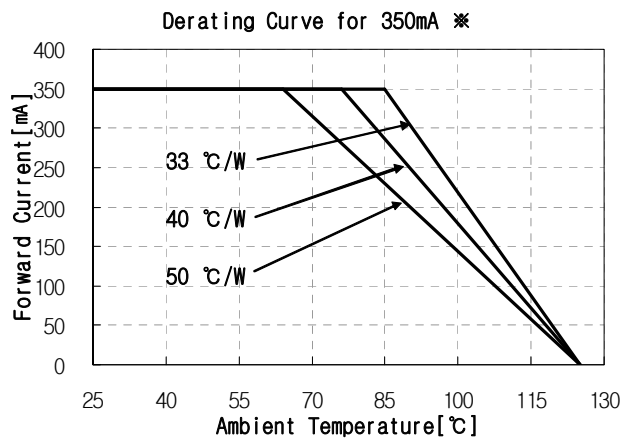
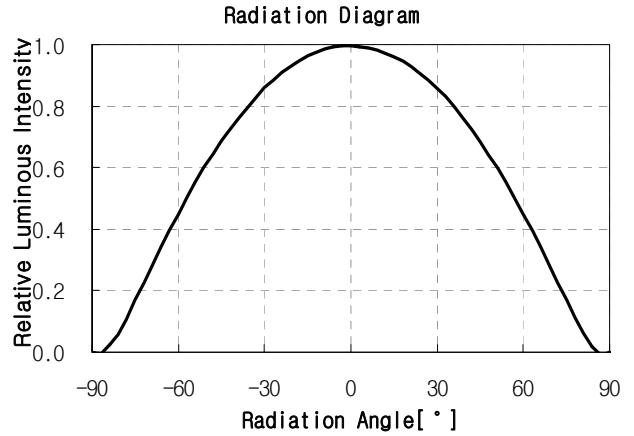
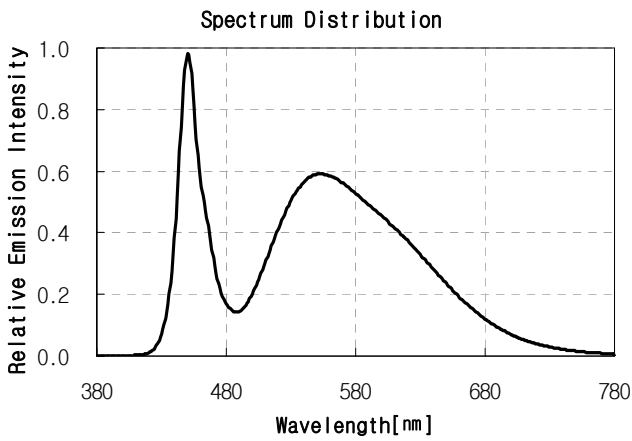
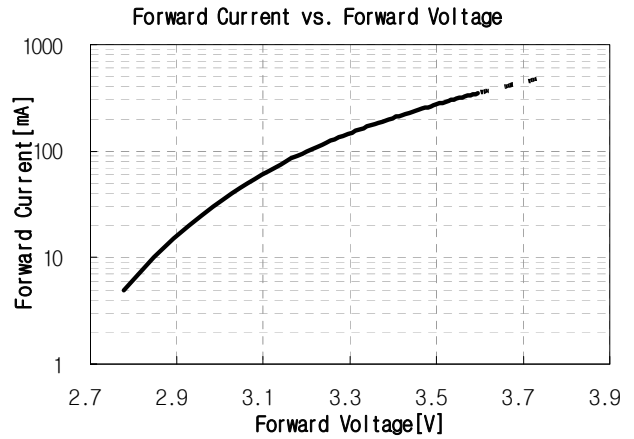
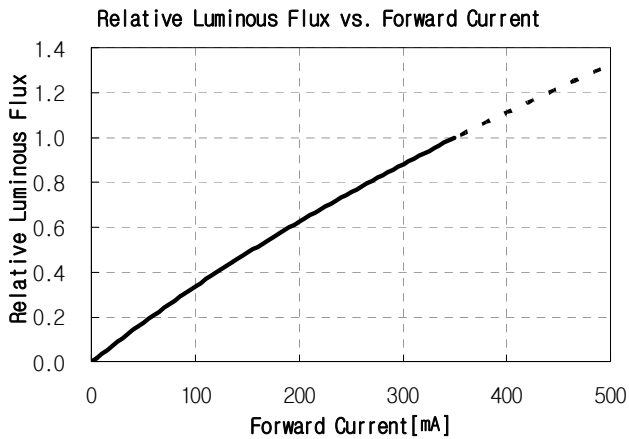


Approved Rank

| Symbol | V _F | CIE | Φ _v |
|--------|----------------|--------|----------------|
| Rank | S0 | Q0, R0 | H1, I1, J1 |

5. Typical Characteristic Graphs

$T_j = 25\text{ }^\circ\text{C}$



※ Thermal Resistance Test Conditions

- Junction to ambient thermal resistance
- JEDEC Standard JESD 51-2,3

JESD 51-2 : Integrated Circuits Thermal Test Method Environmental Conditions

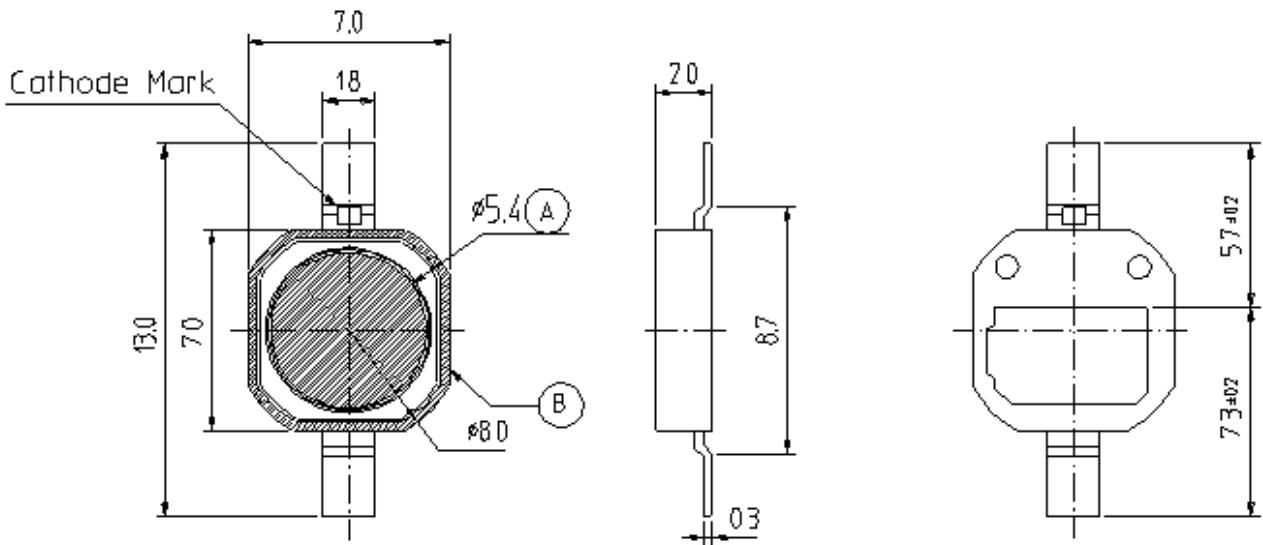
- Natural Convection (Still Air)

JESD 51-3 : Low Effective Thermal Conductivity Test Board for Leaded Surface Mount Package

6. Outline Drawing and Dimension

Unit : mm

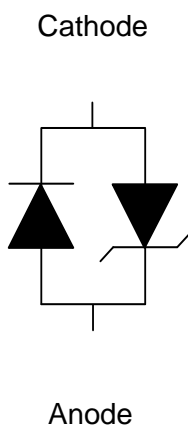
Tolerance : ± 0.1



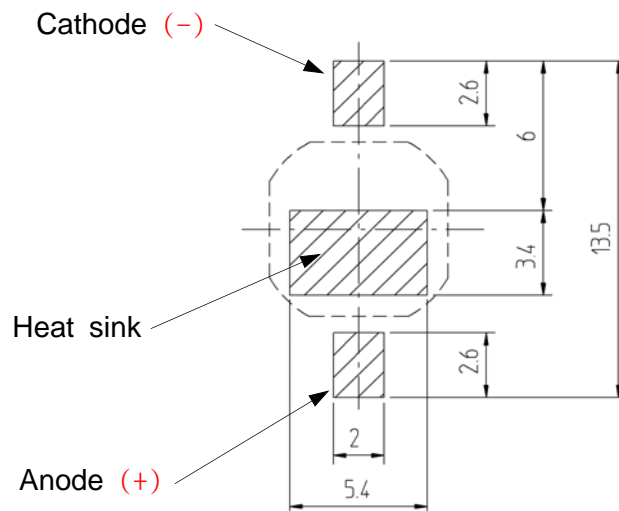
Pick and Place

1. Do not place pressure on the encapsulating resin ("A")
It is recommended to use a pick & place nozzle with inside diameter of 5.8mm
2. The maximum compressing force is 15N on the polymer ("B")

Circuit



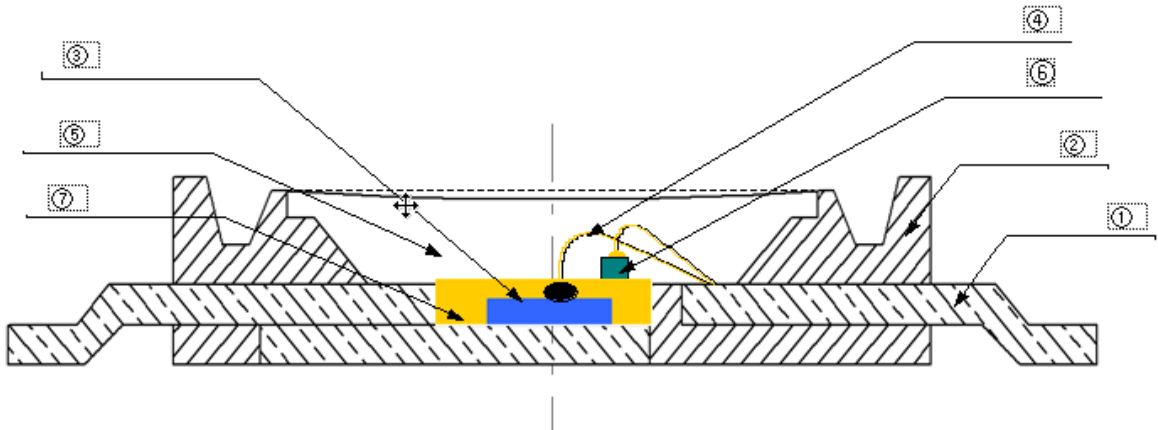
Solder Pattern for Surface Mount



Remarks

Make sure that the heat sink is electrically connected to the Anode.
Heat sink is to be soldered, If not, use the heat conductive adhesive.

7. Package Structure

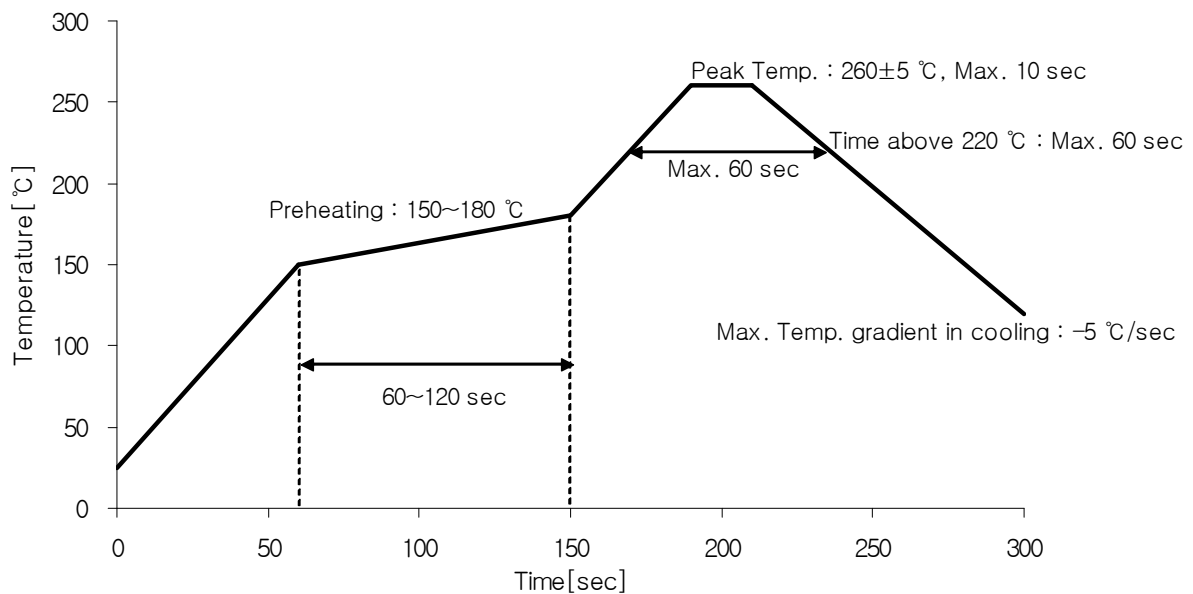


| No | Component | Material |
|----|---------------------|-----------------------------|
| ① | FRAME | Copper frame(Silver plated) |
| ② | PACKAGE | Heat-resistant polymer |
| ③ | LED CHIP | GaN |
| ④ | WIRE | Gold wire |
| ⑤ | RESIN | Silicone |
| ⑥ | ZENER DIODE | Si |
| ⑦ | ENCAPSULATION RESIN | Silicone + Phosphor |

8. Solder Conditions

1) Reflow Conditions (Pb-Free)

Reflow Frequency : 2 time max.

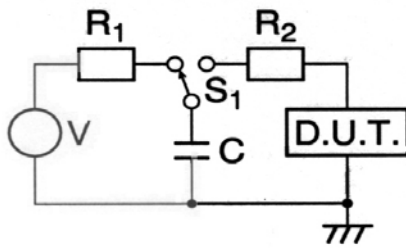


2) For Manual Soldering

Not more than 5 seconds @Max. 300 °C, under soldering iron.

9. Reliability Test Items and Conditions

1) Test Items

| Test Items | Test Conditions | Test Hours/Cycles |
|--|---|-------------------|
| Room Temperature life test | 25 °C, $I_F = \text{Max DC}^*$ | 1,000 h |
| High Temperature humidity life test | 85 °C, 60 % RH, $I_F = \text{Max DC}^*$ | 1,000 h |
| High Temperature life test | 85 °C, $I_F = \text{Max DC}^*$ | 1,000 h |
| Low Temperature life test | -40 °C, $I_F = \text{Max DC}^*$ | 1,000 h |
| High Temperature Storage | 110 °C | 1,000 h |
| Low Temperature Storage | -40 °C | 1,000 h |
| Thermal Shock | -40 / 120 °C, each 30 min | 200 cycles |
| Temperature humidity Cycle On/Off test | -40 / 85 °C, each 20 min, 100 min transfer Power On/off each 5 min, DC 350 mA | 100 cycles |
| Reflow (Pb-Free) | Peak 260±5 °C for 10 sec | 3 times |
| ESD(HBM) |  <p>R1 : 10 MΩ , R2 : 1.5 kΩ , C : 100 pF</p> | 3 times (± 5 kV) |

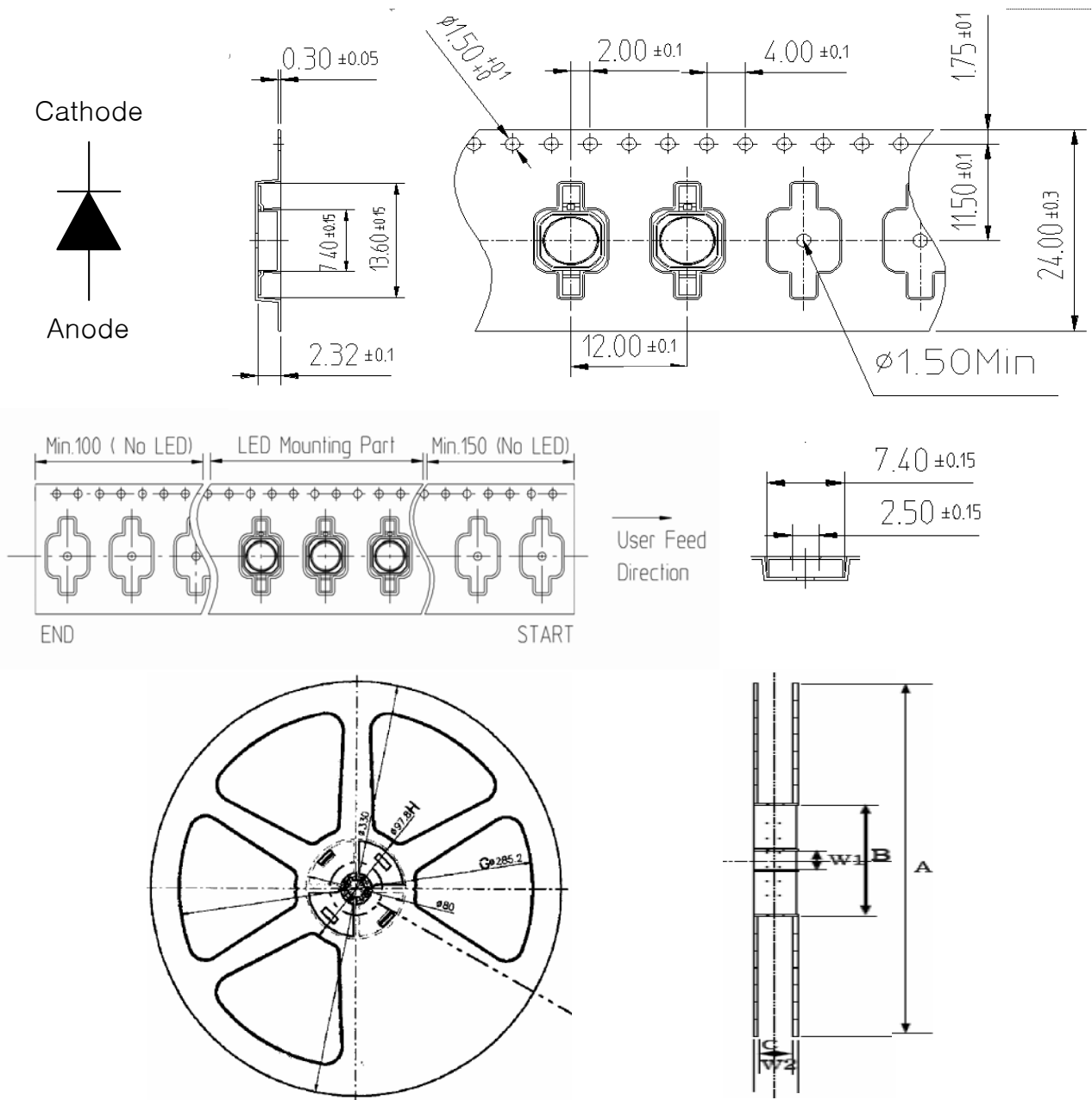
* Max. DC current is depending on maximum current derating curve.

2) Criteria for Judging the Damage

| Item | Symbol | Test Condition | Limit | |
|-----------------|----------|------------------------|------------|------------|
| | | | Min | Max |
| Forward Voltage | V_F | $I_F = 350 \text{ mA}$ | - | U.S.L.*1.2 |
| Luminous Flux | Φ_V | $I_F = 350 \text{ mA}$ | L.S.L.*0.5 | - |

* U.S.L : Upper Standard Level, L.S.L : Lower Standard Level

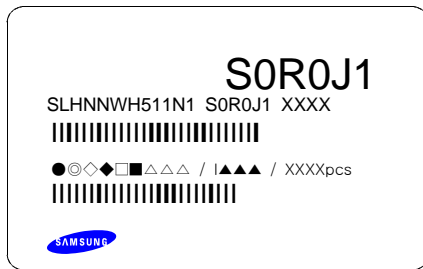
10. Taping Dimension



| Symbol | A | B | C | W1 | W2 |
|---------------|---------|--------|----------|----------|----------|
| Dimension(mm) | 330 ± 1 | 80 ± 1 | 25 ± 0.5 | 13 ± 0.3 | 29.5 ± 1 |

- (1) Quantity : 2,000 Pcs / 13" Reel.
- (2) Cumulative Tolerance : Cumulative Tolerance/10 pitches is less than ±0.2 mm
- (3) Adhesion Strength of Cover Tape : Adhesion strength to be 0.1–0.7N when the cover tape is turned off from the carrier tape at 10 °C angle to be the carrier tape.
- (4) Packaging : P/N, Manufacturing data Code No. and quantity to be indicated on a damp proof Package

11. Label Structure



Rank Code

/S0/ : VF Rank (refer to page 3)

/R0/ : Chromaticity Coordinate Rank, CIE (refer to page 3)

/J1/ : Luminous Flux (refer to page 3)

12. Lot Number

The Lot number is composed of the following characters

●◎◇◆□■△△△ / |▲▲▲ / 2000PCS

● : Production Site (S:SAMSUNG LED, G:Gosin China)

◎ : L (LED)

◇ : Product State (A:Normality, B:Bulk, C:First Production, R:Reproduction, S:Sample)

◆ : Year (S:2008, T:2009, U:2010...)

□ : Month (1 ~ 9, A, B)

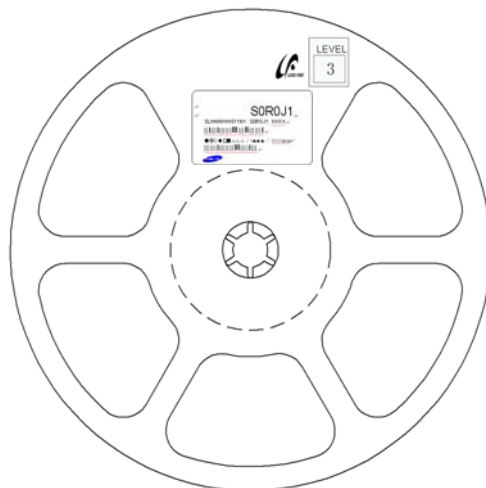
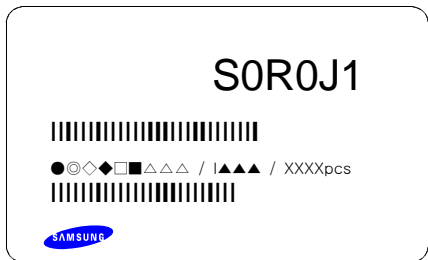
■ : Day (1 ~ 9, A, B ~ V)

△ : SAMSUNG LED Product Number (1 ~ 999)

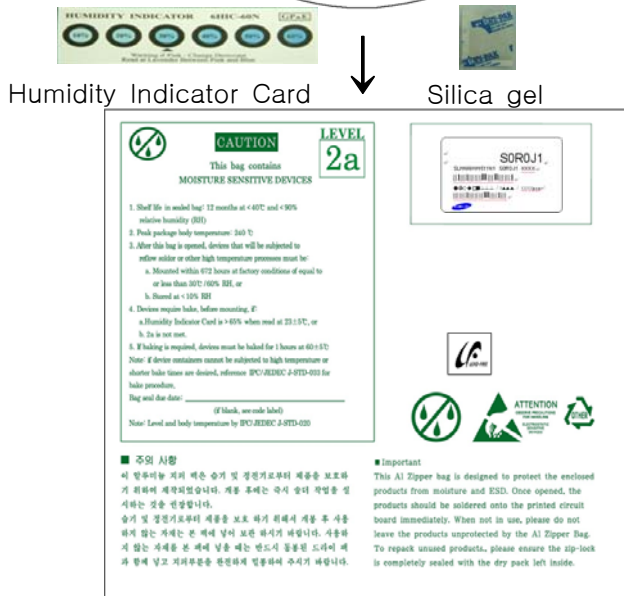
▲ : Reel Number (1 ~ 999)

13. Reel Packing Structure

1) Reel



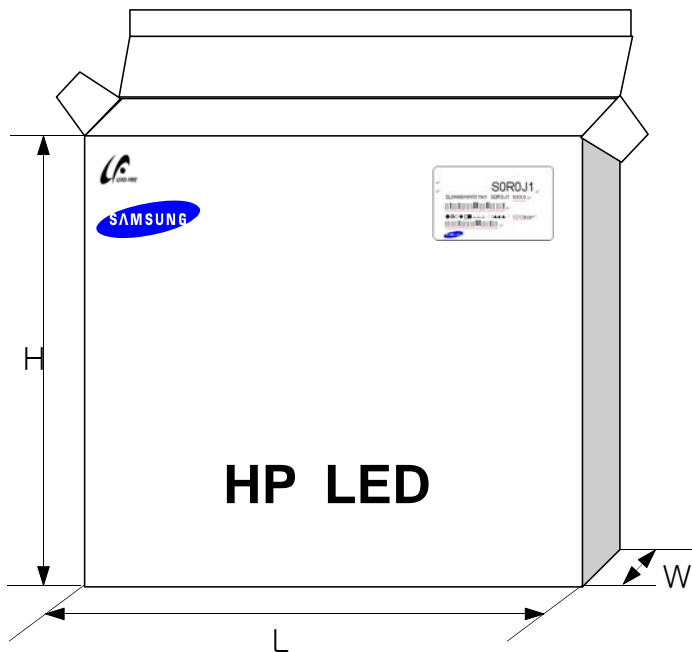
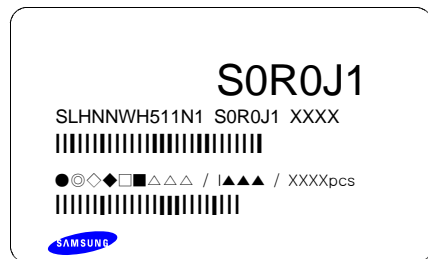
2) Aluminum Bag



3) Inner Box

Material : Paper(SW3B(B))

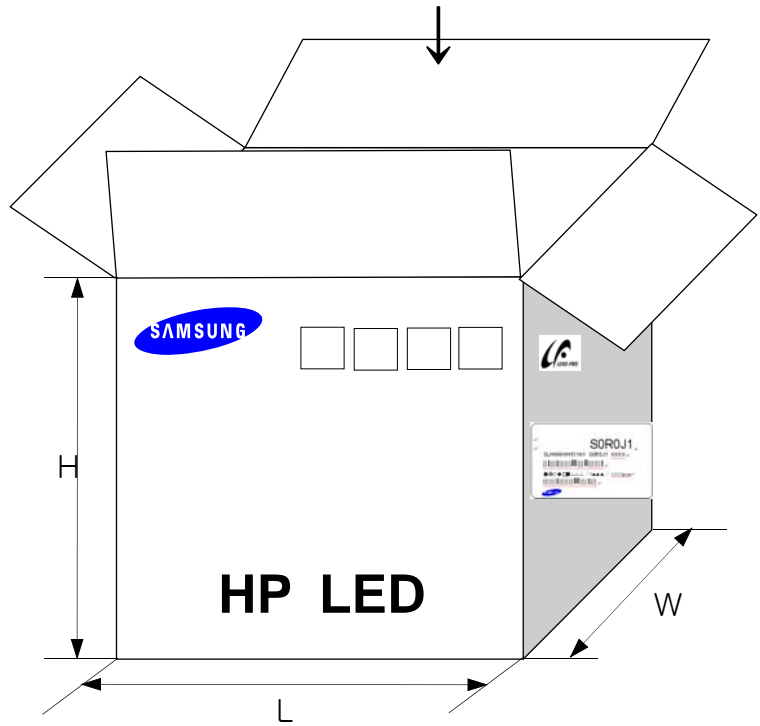
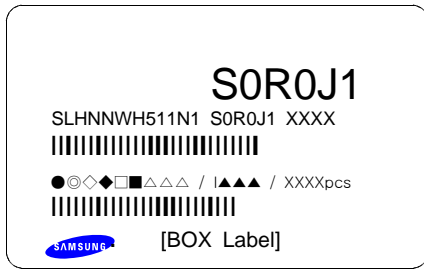
| TYPE | SIZE(mm) | | |
|--------|----------|----|-----|
| | L | W | H |
| 13inch | 335 | 45 | 335 |



4) Carton Box

Material : Paper(SW3B(B))

| TYPE | SIZE(mm) | | |
|--------|----------|-----|-----|
| | L | W | H |
| 13inch | 350 | 350 | 350 |



14. Precaution for Use

- 1) For over-current-proof function, customers are recommended to apply resistors to prevent sudden change of the current caused by slight shift of the voltage.
- 2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When washing is required, IPA is recommended to use.
- 3) When the LEDs illuminate, operating current should be decided after considering the ambient maximum temperature.
- 4) LEDs must be stored in a clean environment. If the LEDs are to be stored for 3 months or more after being shipped from SAMSUNG LED, they should be packed by a sealed container with nitrogen gas injected. (Shelf life of sealed bags : 12 months, temp. 0~40°C, 20~70%RH)
- 5) After storage bag is open, device subjected to soldering, solder reflow, or other high temperature processes must be:
 - a. Mounted within 168 hours (7days) at an assembly line with a condition of no more than 30°C/60%RH,
 - b. Stored at <10% RH.
- 6) Repack unused Products with anti-moisture packing, fold to close any opening and then store in a dry place.
- 7) Devices require baking before mounting, if humidity card reading is >60% at 23±5°C.
- 8) Devices must be baked for 24hours at 65±5°C, if baking is required.
- 9) The LEDs are sensitive to the static electricity and surge. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs.
 If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices.
 Damaged LEDs may show some unusual characteristics such as increase in leak current, lowered turn-on voltage, or abnormal lighting of LEDs at low current.

- 10) When handling LED with tweezers, the LED Should only be held by the polymer body, not by the encapsulant or LENS.

- 11) The use of appropriate nozzle for the LED recommended. For the recommended nozzle size, refer to the figure at the below.

- 12) Do not stack assembled PCBs together. Since silicone is a soft material, abrasion between two PCB assembled with silicone encapsulated LED might cause catastrophic failure of the LEDs due to damage to encapsulant and wire and LED detachment.

15. Hazard Substance Analysis



Test Report No. F690501/LF-CTSAYAA08-20300

Issued Date: July 11, 2008

Page 1 of 3

To: SAMSUNG ELECTRO-MECHANICS CO., LTD.
314, Maetan3-dong
Yeongtong-gu
Suwon-city
GYEONGGI-DO 442-373
Korea

The following merchandise was submitted and identified by the client as :

Product Name : LED

SGS File No. : AYAA08-20300

Received Date : July 07, 2008

Test Performing Date : July 08, 2008

Test Performed : SGS Testing Korea tested the sample(s) selected by applicant with following results

Test Results : For further details, please refer to following page(s)

Comments : By the applicant's specific request, the sampling and testing was performed only for the part indicated in the photo without disassembly.

SGS Testing Korea Co. Ltd.

Pluto Kim
Monet Jeong
Billy Oh / Testing Person

Jeff Jang / Chemical Lab Mgr

This document is issued by the Company under its General Conditions of Service printed hereon or available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This document cannot be reproduced except in full, without prior approval of the Company.

F052 Version2


Test Report No. F690501/LF-CTSAYAA08-20300

Issued Date: July 11, 2008

Page 2 of 3

Sample No. : AYAA08-20300.001
Sample Description : LED
Item No./Part No. : 7070 No LENS(RGY)

Heavy Metals

| Test Items | Unit | Test Method | MDL | Results |
|-----------------------------|-------|--|-----|---------|
| Cadmium (Cd) | mg/kg | US EPA 3052(1996), US EPA 6010B(1996), ICP | 0.5 | N.D. |
| Lead (Pb) | mg/kg | US EPA 3052(1996), US EPA 6010B(1996), ICP | 5 | N.D. |
| Mercury (Hg) | mg/kg | US EPA 3052(1996), US EPA 6010B(1996), ICP | 2 | N.D. |
| Hexavalent Chromium (Cr VI) | mg/kg | US EPA 3060A(1996), US EPA 7196A(1992), UV | 1 | N.D. |

Flame Retardants-PBBs/PBDEs

| Test Items | Unit | Test Method | MDL | Results |
|--------------------------|-------|---------------------|-----|---------|
| Monobromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Dibromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Tribromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Tetrabromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Pentabromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Hexabromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Heptabromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Octabromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Nonabromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Decabromobiphenyl | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Monobromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Dibromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Tribromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Tetrabromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Pentabromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Hexabromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Heptabromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Octabromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Nonabromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |
| Decabromodiphenyl ether | mg/kg | US EPA 3540C, GC/MS | 5 | N.D. |

- NOTE: (1) N.D. = Not detected.(<MDL)
 (2) mg/kg = ppm
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) ** = Qualitative analysis (No Unit)
 (6) Negative = Undetectable / Positive = Detectable

This document is issued by the Company under its General Conditions of Service printed hereof or available on request and accessible at <http://www.sgs.com/sgsweb>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained herein reflects the Corporate Findings as the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not constitute parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This document cannot be reproduced except in full, without prior approval of the Company.

P052 Version2



Test Report No. F690501/LF-CTSAYAA08-20300

Issued Date: July 11, 2008

Page 3 of 3

Sample No. : AYAA08-20300.001

Sample Description : LED

Item No./Part No. : 7070 No LENS(RGY)

Halogen Contents

| Test Items | Unit | Test Method | MDL | Results |
|--------------|-------|--------------------|-----|---------|
| Fluorine(F) | mg/kg | EN 14582:2007 , IC | 30 | N.D. |
| Bromine(Br) | mg/kg | EN 14582:2007 , IC | 30 | N.D. |
| Chlorine(Cl) | mg/kg | EN 14582:2007 , IC | 30 | N.D. |
| Iodine(I) | mg/kg | EN 14582:2007 , IC | 30 | N.D. |

Picture of Sample as Received:

Sample Color : Orange yellow



*** End ***

- NOTE:
- (1) N.D. = Not detected, (<MDL)
 - (2) mg/kg = ppm
 - (3) MDL = Method Detection Limit
 - (4) - = No regulation
 - (5) ** = Qualitative analysis (No Unit)
 - (6) Negative = Undetectable / Positive = Detectable

This document is issued by the Company under its General Conditions of Service printed hereon or available on request and accessible at http://www.sgs.com/terms_and_conditions. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This document cannot be reproduced except in full, without prior approval of the Company.

FD52 Version2

Revision History
(Model : SLHNNWH511N1)

| Date | Revision History | Author | |
|------------|-------------------------------|---------|----------|
| | | Drawn | Approved |
| 2009.04.10 | Initial Edition - Preliminary | S.H Lee | H.M Kim |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |