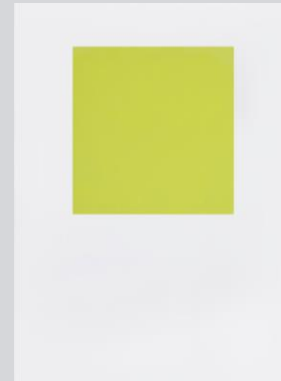


High Power LED C-Series Gen3

# 1W White

## SPHWH1A1N1A0



### Features

- Package : Ceramic package
- Dimension : 1.20 mm x 1.60 mm
- Chip Technology : Thin GaN
- ESD : 8 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM)
- Qualifications : AEC-Q102 Qualified with RV-level 1



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## 1. Characteristics

### a) Typical Characteristics ( $T_S = 25^\circ\text{C}$ )<sup>[1]</sup>

| Item  | Symbol                | Value                              | Unit.           |
|---|-----------------------|------------------------------------|-----------------|
| Chromaticity Coordinate                                     | Cx<br>Cy              | 0.32<br>0.33                       |                 |
| Luminous Flux ( $I_F = 350\text{ mA}$ )                     | $\Phi_V$              | Typ. 141                           | lm              |
| Forward Voltage ( $I_F = 350\text{ mA}$ )                   | $V_F$                 | Typ. 3.0                           | V               |
| Viewing Angle   | $\Phi$                | Typ. 120                           | °               |
| Reverse Current   | $I_R$                 | Not designed for reverse operation |                 |
| Real Thermal Resistance<br>(Junction to Solder point)       | $R_{th\_J-S (Real)}$  | Typ. 5.2<br>Max. 6.0               | K/W             |
| Electrical Thermal Resistance<br>(Junction to Solder point) | $R_{th\_J-S (Elec.)}$ | Typ. 3.3<br>Max. 3.8               | K/W             |
| Radiant Surface   | A                     | 0.55                               | mm <sup>2</sup> |

**Note:**

[1] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms.

### b) Absolute Maximum Rating

| Item  | Symbol    | Rating                           | Unit |
|---|-----------|----------------------------------|------|
| Ambient / Operating Temperature   | $T_a$     | -40 ~ +125                       | °C   |
| Storage Temperature   | $T_{stg}$ | -40 ~ +125                       | °C   |
| LED Junction Temperature  | $T_j$     | 150                              | °C   |
| Maximum Forward current <sup>[2]</sup> ( $T_S: 25^\circ\text{C}$ ) <sup>[3]</sup> | $I_F$     | 800                              | mA   |
| Minimum Forward current <sup>[2]</sup> ( $T_S: 25^\circ\text{C}$ ) <sup>[3]</sup> | $I_F$     | 50                               | mA   |
| Maximum Reverse current   |           | Do not apply for reverse current |      |
| ESD Sensitivity <sup>[4]</sup>  | -         | ±8 HBM                           | kV   |

**Note:**

[2] Driving the product at forward current ( $I_F$ ) below Min.  $I_F$  or above Max.  $I_F$  may result in unpredictable behavior of the product.

[3] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms

[4] It is included the device to protect the product from ESD.

## 2. Product Code Information

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| S | P | H | W | H | 1 | A | 1 | N | 1  | A  | 0  | A  | B  | C  | D  | E  | F  |

| Digit | PKG Information   |
|-------|---|
| 1 2   | Company name and Samsung LED PKG (SP for Samsung PKG)       |
| 3     | Power variant (H for automotive high power)                 |
| 4 5   | Color variant (WH for automotive white color)               |
| 6     | LED PKG version (1 for 1 <sup>st</sup> version up)          |
| 7 8   | Product configuration and type (A1 for automotive PKG type) |
| 9     | Lens configuration (N for no lens)                          |
| 10    | Typical power (1 for 1±0.5W)                                |
| 11    | Special internal code (A for automotive version)            |
| 12    | Specific property (0 for default)                           |
| 13 14 | Forward voltage property                                    |
| 15 16 | CIE coordination property                                   |
| 17 18 | Luminous flux property                                      |

**a) Luminous Flux Bins <sup>[5]</sup> ( $I_F = 350 \text{ mA}$ ,  $T_S = 25^\circ\text{C}$ )**

| Symbol   | Flux Bin Code | Flux Range (lm) |     |
|----------|---------------|-----------------|-----|
|          |               | Min             | Max |
| $\Phi_V$ | BA            | 120             | 135 |
|          | CA            | 135             | 150 |
|          | DA            | 150             | 165 |

**b) Voltage Bins <sup>[5]</sup> ( $I_F = 350 \text{ mA}$ ,  $T_S = 25^\circ\text{C}$ )**

| Symbol | Voltage Bin Code | Voltage Range (V) |      |
|--------|------------------|-------------------|------|
|        |                  | Min               | Max  |
| $V_F$  | 1D               | 2.75              | 3.00 |
|        | 1E               | 3.00              | 3.25 |

**Note:**

[5] Luminous flux measuring equipment : CAS140CT

$\Phi_V$  and  $V_F$  tolerances are  $\pm 7\%$  and  $\pm 0.1\text{V}$ , respectively

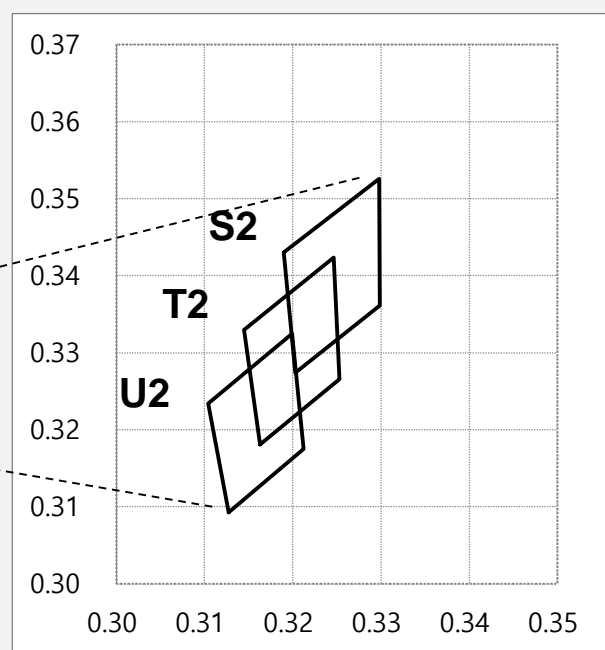
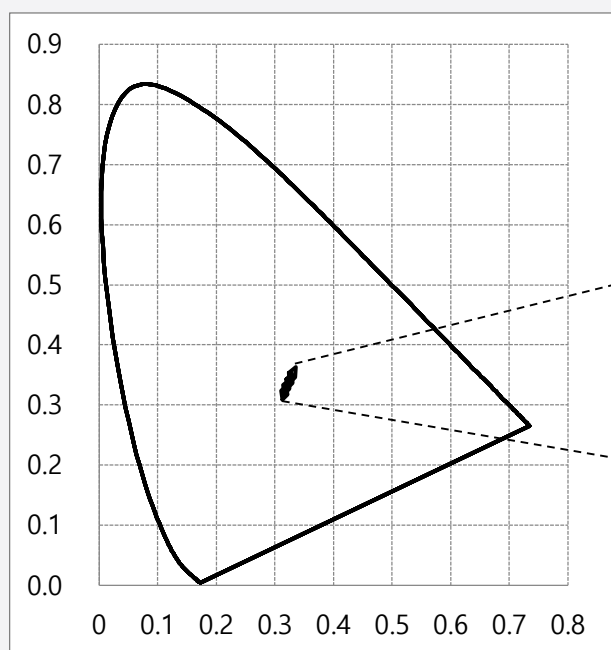
**c) Color Bin <sup>[6]</sup>(I<sub>F</sub> = 350mA)**

| Symbol | Color Bin Code | Cx     |        |        |        | Cy     |        |        |        |
|--------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Cx, Cy | S2             | 0.3190 | 0.3203 | 0.3299 | 0.3298 | 0.3430 | 0.3274 | 0.3361 | 0.3526 |
|        | T2             | 0.3163 | 0.3145 | 0.3246 | 0.3253 | 0.3181 | 0.3330 | 0.3424 | 0.3266 |
|        | U2             | 0.3127 | 0.3104 | 0.3199 | 0.3212 | 0.3093 | 0.3234 | 0.3325 | 0.3175 |

**Note**

[6] Luminous flux measuring equipment : CAS140CT

Chromaticity coordinates : Cx, Cy according to CIE 1931. Cx and Cy tolerances are ±0.005, respectively.

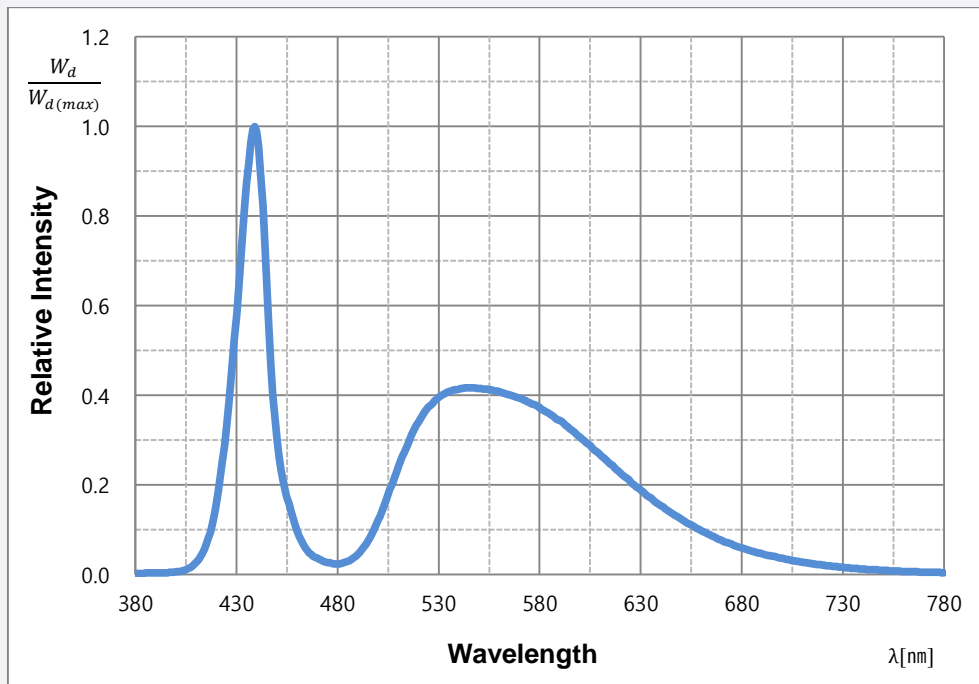


**d) Luminous Flux Bins according to Color Bin (I<sub>F</sub> = 350 mA, T<sub>s</sub> = 25 °C)**

| Symbol   | Flux Bin Code | BA  |     | CA  |     |
|----------|---------------|-----|-----|-----|-----|
|          |               | Min | Max | Min | Max |
|          |               | 120 | 135 | 135 | 150 |
| $\Phi_V$ | S2            |     |     | O   |     |
|          | T2            | O   |     | O   |     |
|          | U2            | O   |     | O   |     |

### 3. Typical Characteristics Graphs

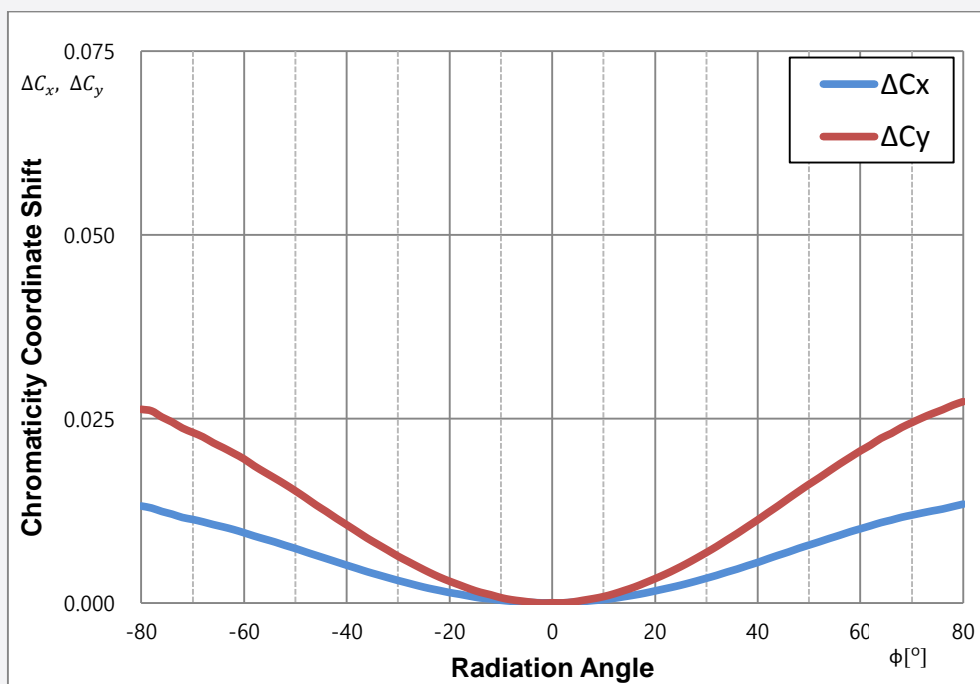
#### a) Spectrum Distribution ( $I_F = 350 \text{ mA}$ , $T_S = 25 \text{ }^\circ\text{C}$ )<sup>[7]</sup>



**Note:** The red content of the light (610~780nm) >5% according to ECE regulation

The UV radiation of the light (250~400nm)  $\leq 10^{-5} \text{ W/m}$  according to ECE regulation

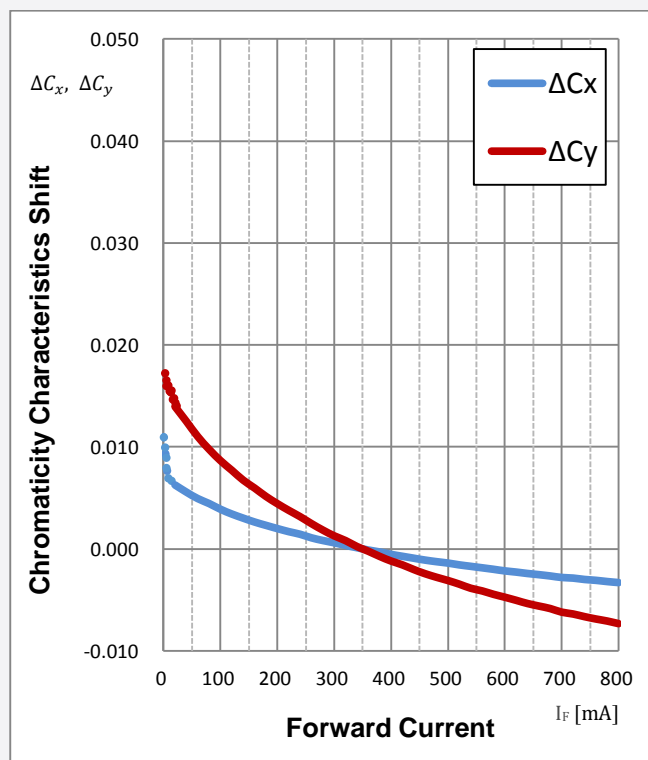
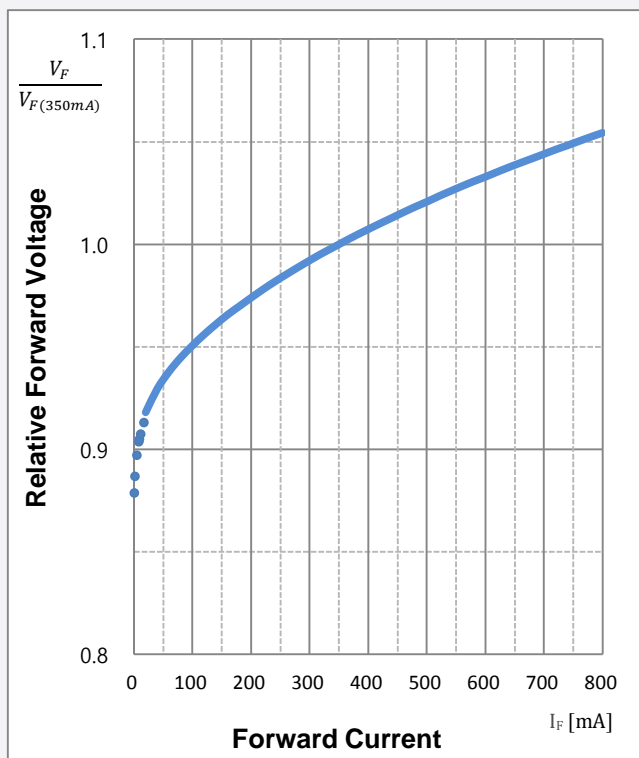
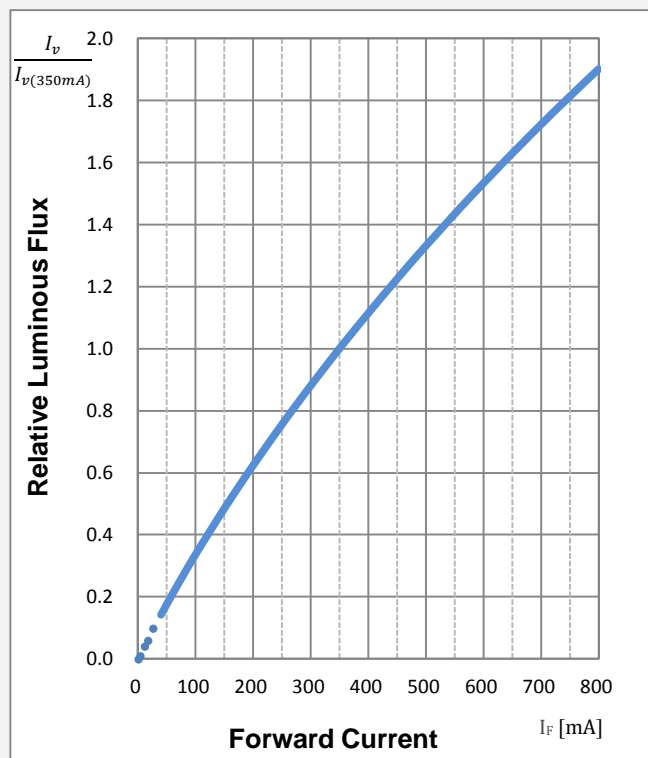
#### b) Typical Chromaticity Coordinate Shift vs Radiation Angle ( $I_F = 350 \text{ mA}$ , $T_S = 25 \text{ }^\circ\text{C}$ )<sup>[7]</sup>



**Note:**

[7] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms

### c) Forward Current Characteristics ( $T_s = 25\text{ }^{\circ}\text{C}$ ) [8]

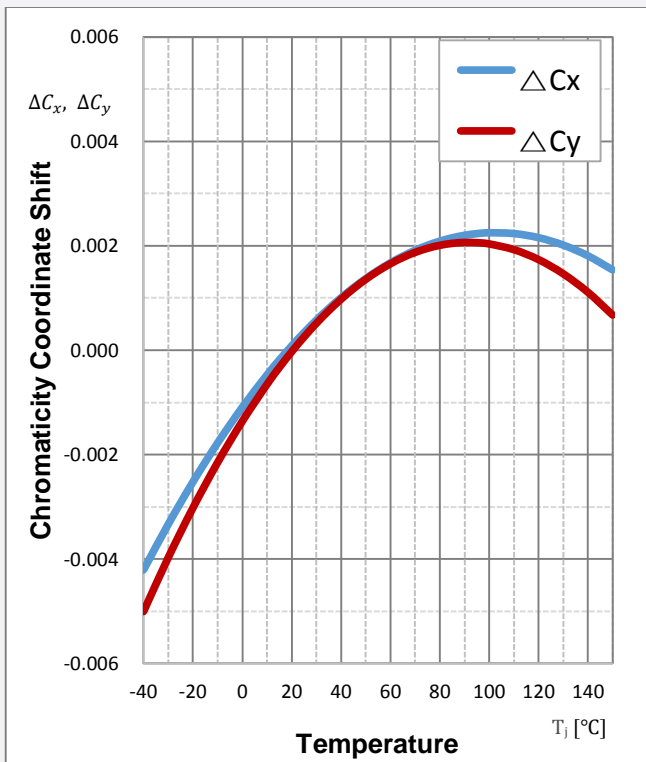
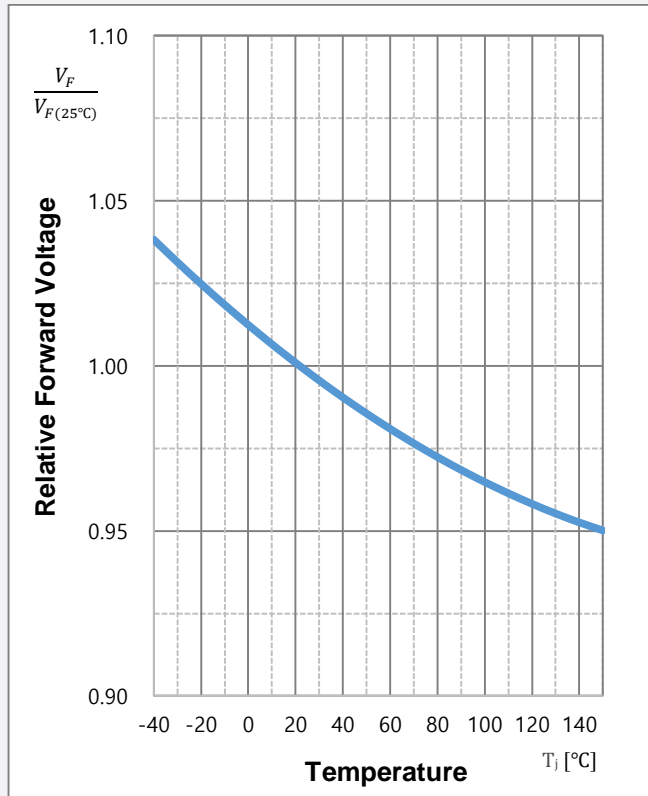
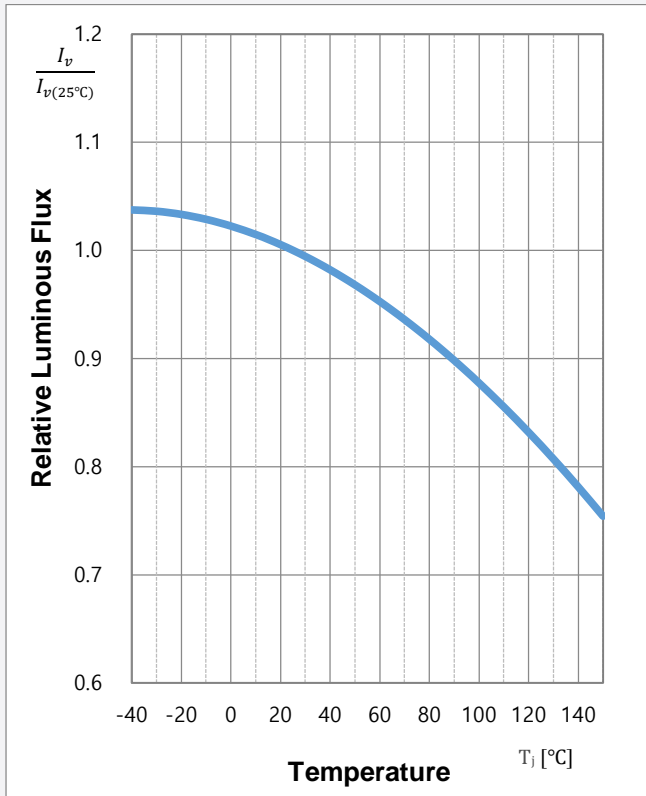


#### Note:

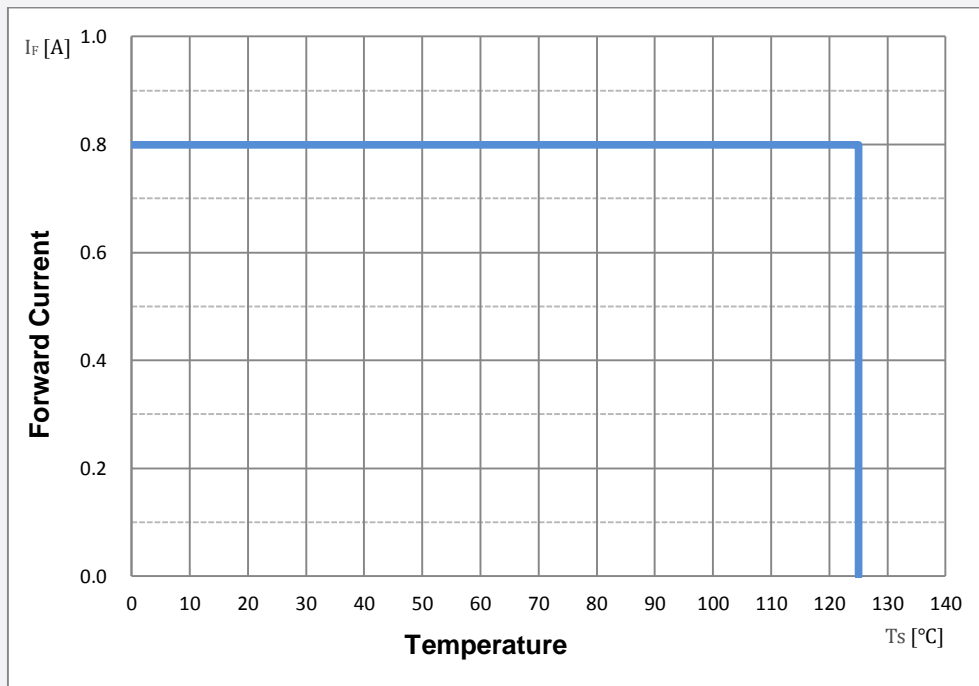
[8] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms



d) Temperature Characteristics ( $I_F = 350 \text{ mA}$ )



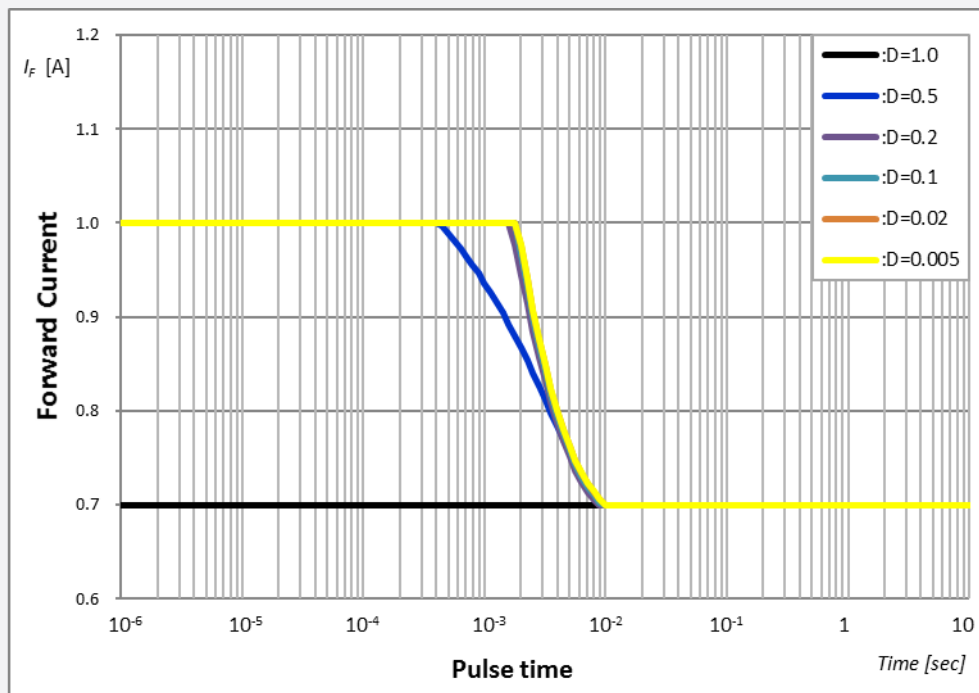
### e) Derating Curve <sup>[9]</sup>



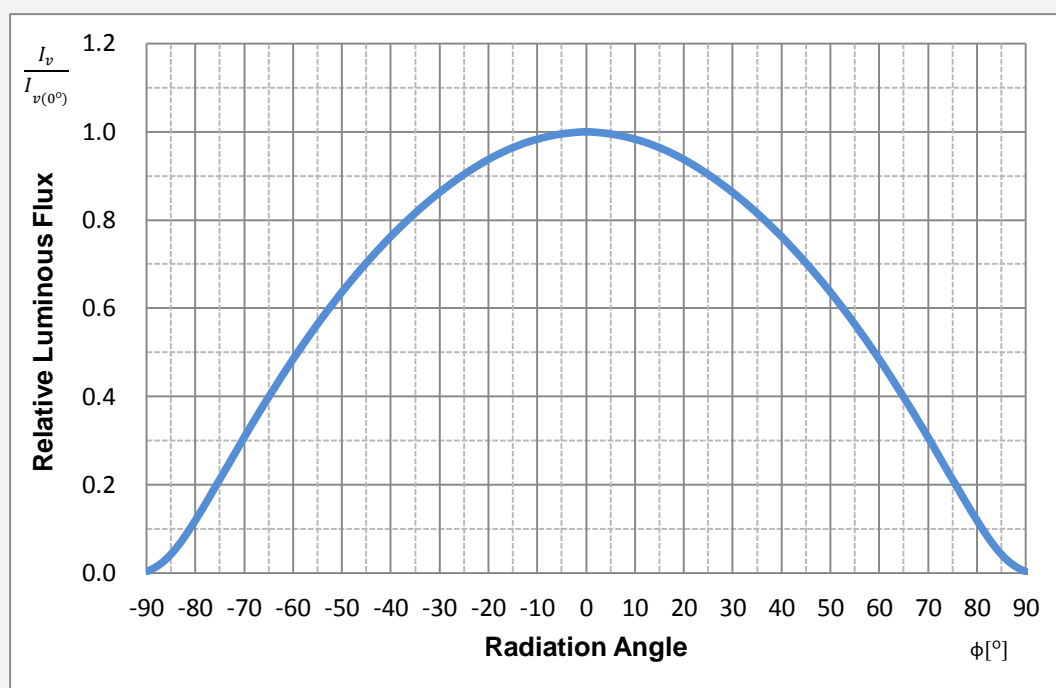
#### Note:

[9] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms

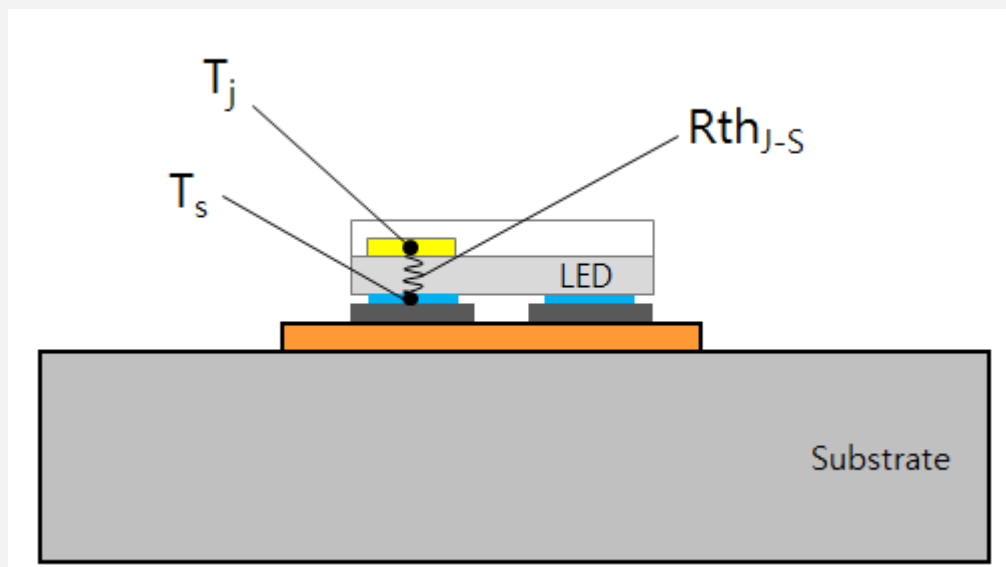
### f) Permissible Pulse Handling Capacity ( $I_F = f(t_p)$ ; D : Duty cycle, $T_s = 125$ °C)



g) Beam Angle Characteristics ( $I_F = 350 \text{ mA}$ ,  $T_S = 25 \text{ }^\circ\text{C}$ )



#### 4. Soldering Temperature Location

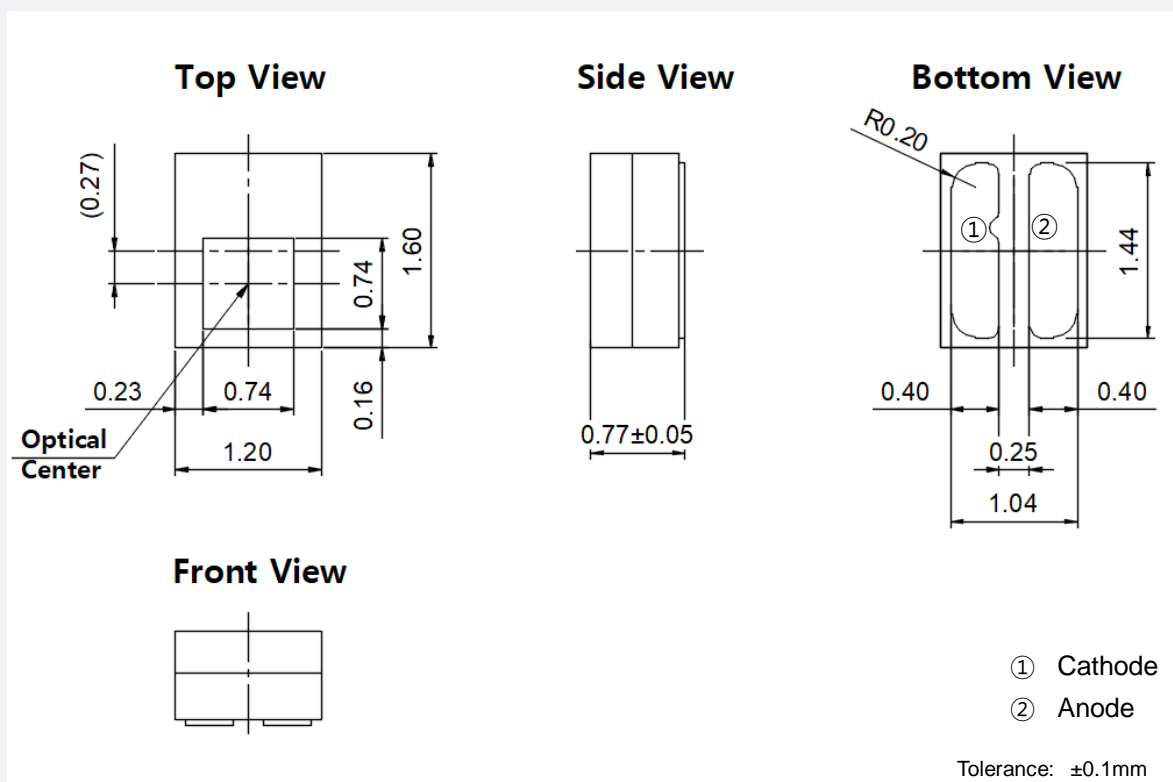


$T_j$  : Temperature of Junction

$T_s$  : Temperature of Solder Pad

$R_{th_{J-S}}$  : Thermal Resistance from Junction to Solder Pad

## 5. Mechanical Dimension



### Note:

The dimensions in parentheses are for reference purposes.

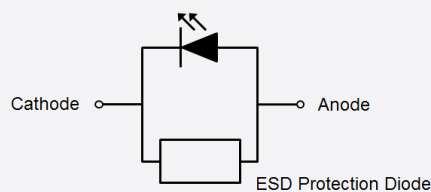
Unit: mm, Approximate weight : 4.6mg

### a) Pick and Place

Do not place pressure on the resin molded part

It is recommended to use a pick & place nozzle CN040, etc.

### b) Electric Schematic Diagram

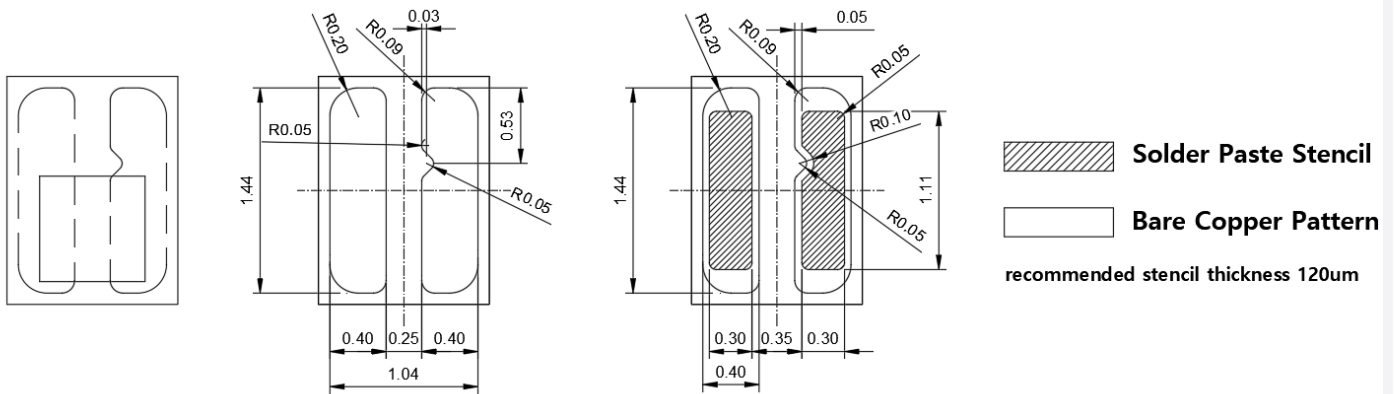


### c) Material Information

| Description    | Material          |
|----------------|-------------------|
| Substrate      | AlN Substrate     |
| Plating        | Au                |
| LED Die        | Thin GaN          |
| Phosphor sheet | Phosphor In Glass |
| Zener Diode    | Silicon           |
| Wire           | Au                |
| Resin Mold     | Silicone          |

## 6. Soldering Conditions

### a) Pad Configuration



<PKG Top>

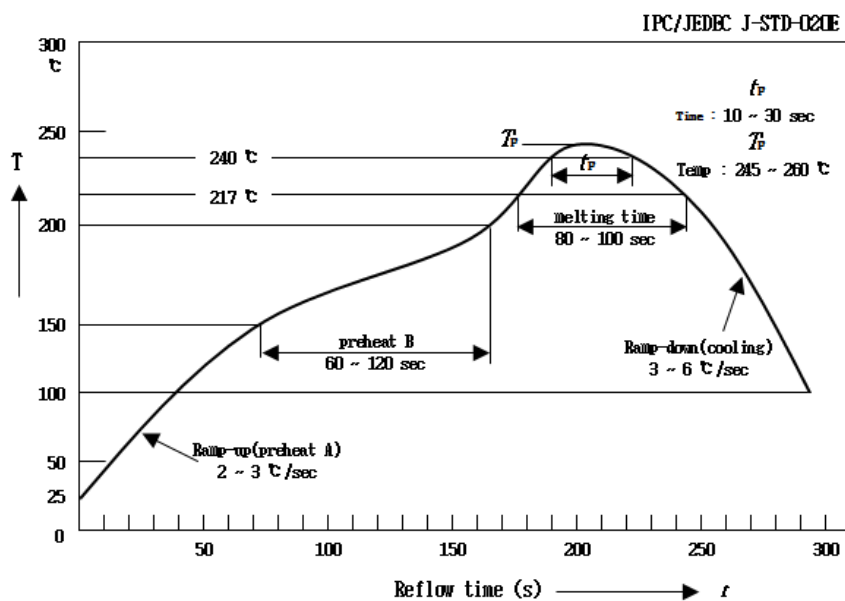
<PKG Pad>

<Recommend PCB Land>

Notes: Unit : mm, Tolerance :  $\pm 0.10$  mm

### b) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.

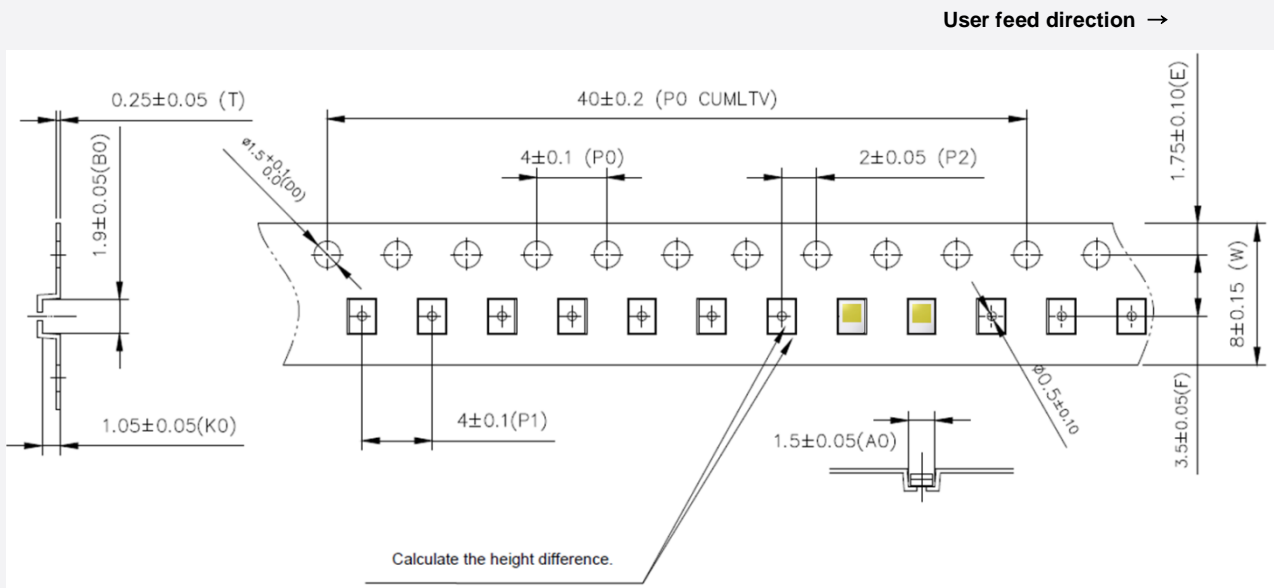


### c) Manual Soldering Conditions

Not more than 5 seconds @ max.  $300$   $^{\circ}\text{C}$ , under soldering iron. (one time only)

## 7. Tape & Reel

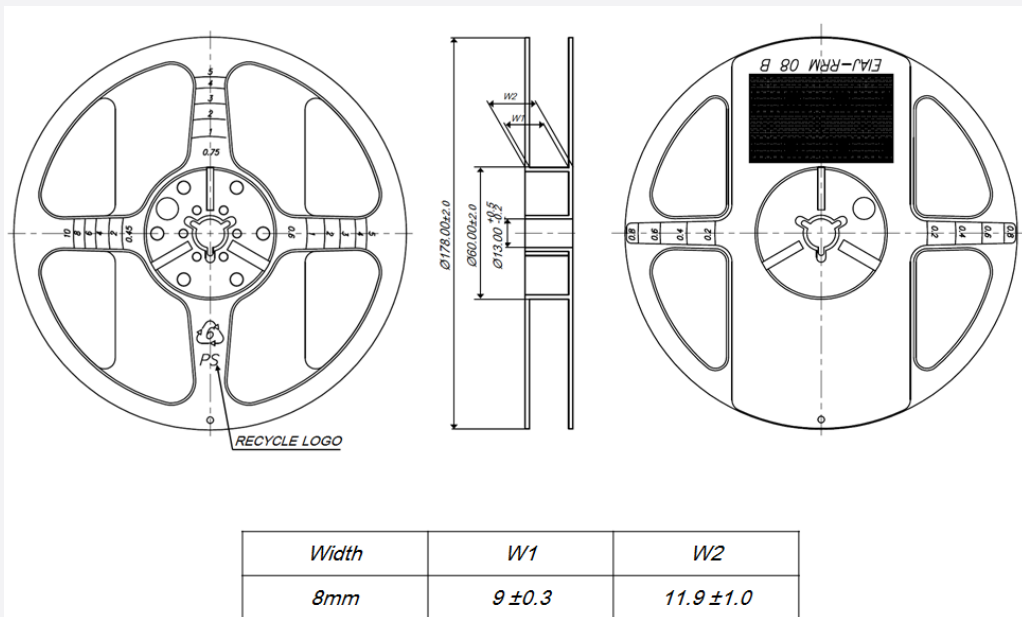
### a) Taping Dimension



**Notes:**

Unit: mm, LED taping quantity: 3,000EA / Reel

### b) Reel Dimension

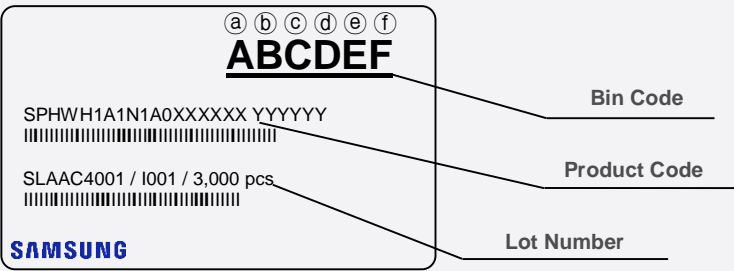


**Notes:**

Unit: mm, Tolerance: ±0.2mm

8. Label Structure

a) Label Structure



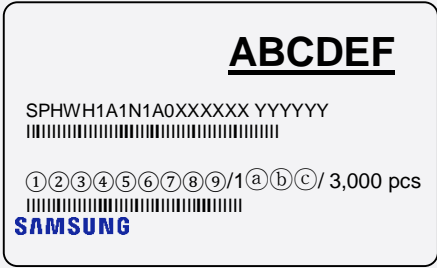
Note: Denoted bin code and product code above is only an example (see description on page 5)

Bin Code:

- Ⓐ Ⓑ: Forward Voltage bin (refer to page 5)
- Ⓒ Ⓓ: Chromaticity bin (refer to page 6)
- Ⓔ Ⓕ: Luminous Flux bin (refer to page 5)

b) Lot Number

The lot number is composed of the following characters:

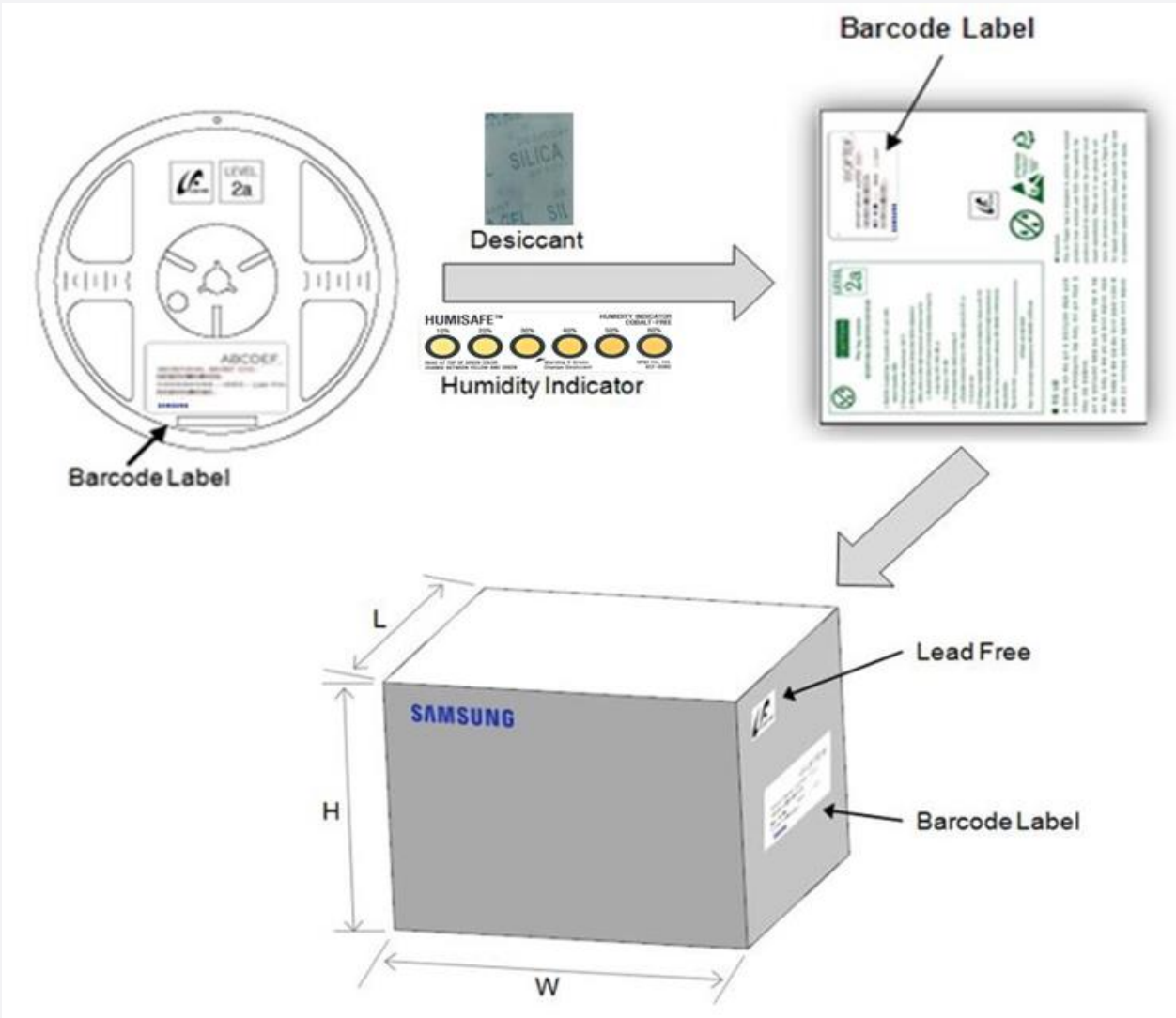


|                                  |   |
|----------------------------------|---|
| ① ②③③②③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / 3,000 pcs |   |
| ① ②                              | : Production site ( SL : Giheung)   |
| ③                                | : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample) |
| ④                                | : Year ( F : 2021, G : 2022, H : 2023...)   |
| ⑤                                | : Month (1~9, A, B, C)  |
| ⑥                                | : Day (1~9, A, B~V)   |
| ⑦⑧⑨                              | : Serial number (001 ~ 999)   |
| Ⓐ Ⓑ Ⓒ                            | : Product serial number (001 ~ 999)   |



9. Packing Structure

a) Packing Process



Dimension of Transportation Box in mm

| Width | Length | Height |
|-------|--------|--------|
| 220   | 245    | 182    |

## 10. Precautions in Handling & Use

- 1) For over-current protection, we recommend the use of resistors to prevent sudden current surges caused by slight shifts in voltage
- 2) LEDs should not be contacted to any type of fluid (i.e. water, oil, organic solvent, etc.). If cleaning is required, only use isopropyl alcohol.
- 3) The maximum ambient temperature must be considered in order for the maximum temperature ratings not to be exceeded.
- 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 Electronics, they should be packed by a sealed container with nitrogen gas injected. (Shelf life of sealed bags: 12 months, temp.  $\sim 40^{\circ}\text{C}$ ,  $\sim 90\%$  RH)
- 5) After storage bag is open, LED subjected to soldering, solder reflow, or other high temperature processes must be:
  - a) Mounted within 672 hours (28 days) at an assembly line with a condition of no more than  $30^{\circ}\text{C}$  /  $60\%$  RH.
  - b) Stored at  $<10\%$  RH.
- 6) Repack unused products using anti-moisture packing, fold to close any openings and store in a dry place with  $<10\%$  RH.
- 7) LEDs require baking before mounting, if humidity card reading is  $>60\%$  at  $23\pm 5^{\circ}\text{C}$ .
- 8) If baking is required, LEDs must be baked for 1 day at  $60\pm 5^{\circ}\text{C}$ .
- 9) LEDs are sensitive to electrostatic discharge and surges. Applying any voltage exceeding the absolute maximum rating of the LED can cause permanent damage to the device. Damaged LEDs may have some unusual characteristics such as increased leakage current, lower turn-on voltage or may light abnormally at low current. When handling LEDs, using grounding wrist-bands or anti-static gloves is recommended.
- 10) VOCs (volatile organic compounds) present in adhesives, flux, hardeners or organic additives, etc. that are used in luminaires may lead to discoloration of the LED when exposed to heat or light. Note that VOCs can permeate silicone bags. This phenomenon can significantly affect light output from the luminaire. To avoid this issue, please carefully evaluate materials used in your process and/or luminaire to be free of VOCs.

## 11. Company Information

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**SAMSUNG**

# Legal and additional information.

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