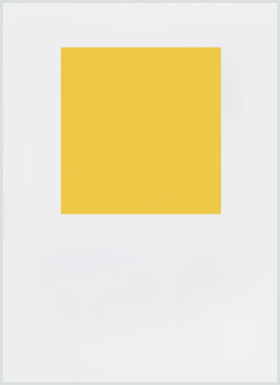
High Power LED C-Series

# 1W Amber

## SPHAMTA1N1A0



### 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 0

SAMSUNG

## Table of Contents

## 1. Characteristics

### a) Typical Characteristics

[Ts=25°C][1]

| Item | Symbol | Value | Unit. |
|---|---|---|---|
| Chromaticity Coordinate | Cx<br>Cy | 0.57<br>0.42 | |
| Luminous Flux ($I_F$ = 350 mA) | $\Phi_V$ | Typ. 90 | lm |
| Forward Voltage ($I_F$ = 350 mA) | $V_F$ | Typ. 3.0 | V |
| Viewing Angle | $\Phi$ | Typ. 120 | ° |
| Reverse Current | $I_R$ | Not designed for reverse operation | |
| Real Thermal Resistance (Junction to Solder point) | $R_{th\_J\text{-}S\ (Real)}$ | Typ. 5.2<br>Max. 5.8 | K/W |
| Electrical Thermal Resistance (Junction to Solder point) | $R_{th\_J\text{-}S\ (Elec.)}$ | Typ. 4.0<br>Max. 4.5 | K/W |
| Radian Surface | A | 0.58 | ㎟ |

**Note:**

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

### 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[2] ($T_S$:25℃) [3] | $I_F$ | 700 | mA |
| Minimum Forward current[2] ($T_S$:25℃) [3] | $I_F$ | 50 | mA |
| Maximum Reverse current | | Do not apply for reverse current | |
| ESD Sensitivity[4] | - | ±8 for HBM | kV |

**Note:**

[2] Driving the product at forward current (IF) below Min. IF or above Max. IF 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 | A | M | T | 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 (AM for automotive Amber color) |
| 6 | LED PKG version (T for initial 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 [5] ($I_F$ = 350 mA, $T_S$= 25ºC)

| Symbol | Flux Bin Code | Flux Range (lm) | |
|---|---|---|---|
| | | Min | Max |
| $\Phi_V$ | 1B | 84 | 93 |
| | 2B | 88 | 97 |
| | 3B | 93 | 102 |
| | 4B | 97 | 107 |

### b) Voltage Bins [5] ($I_F$ = 350 mA, $T_S$ = 25 ºC)

| 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 ±7% and ±0.1V, respectively

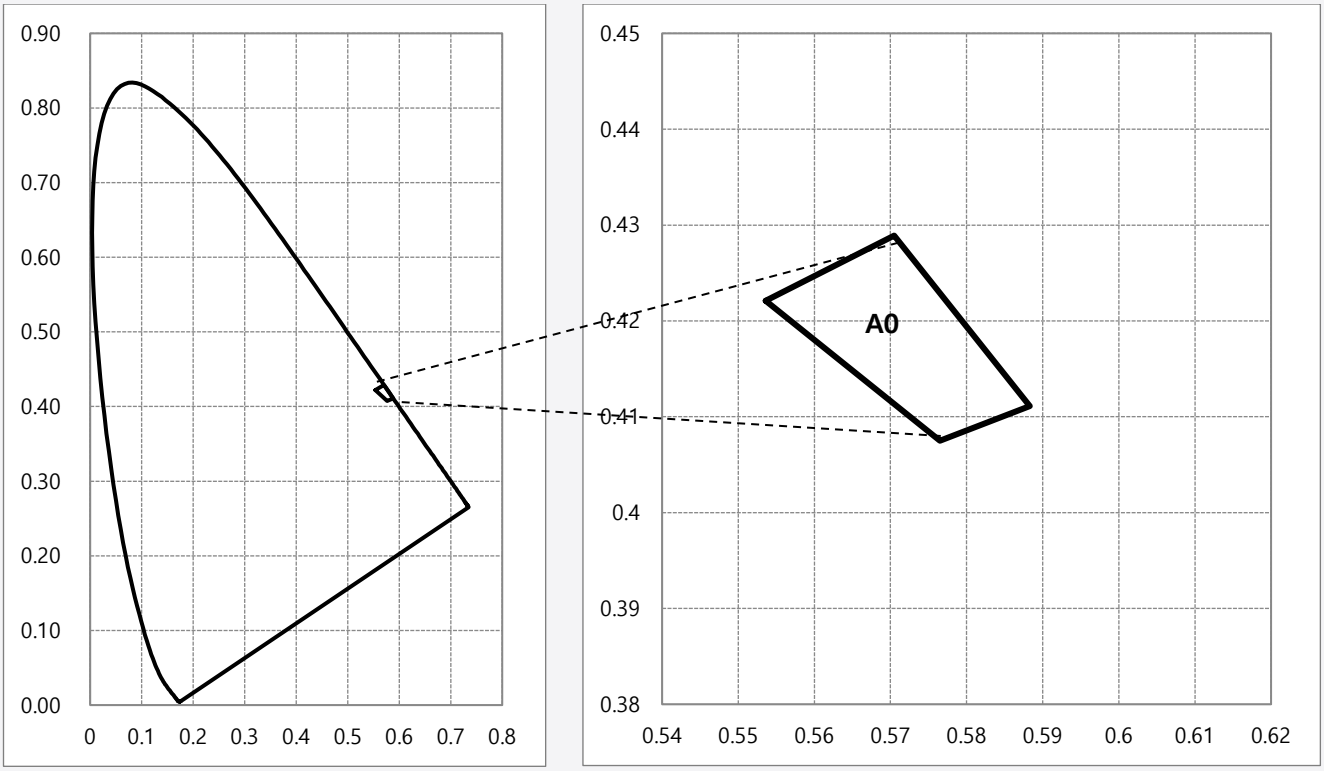
### c) Color Bin [6]($I_F$ = 350 mA)

| Symbol | Bin Code | $C_x$ | | | | $C_y$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| $C_x$, $C_y$ | A0 | 0.5536 | 0.5765 | 0.5883 | 0.5705 | 0.4221 | 0.4075 | 0.4111 | 0.4289 |

**Note**

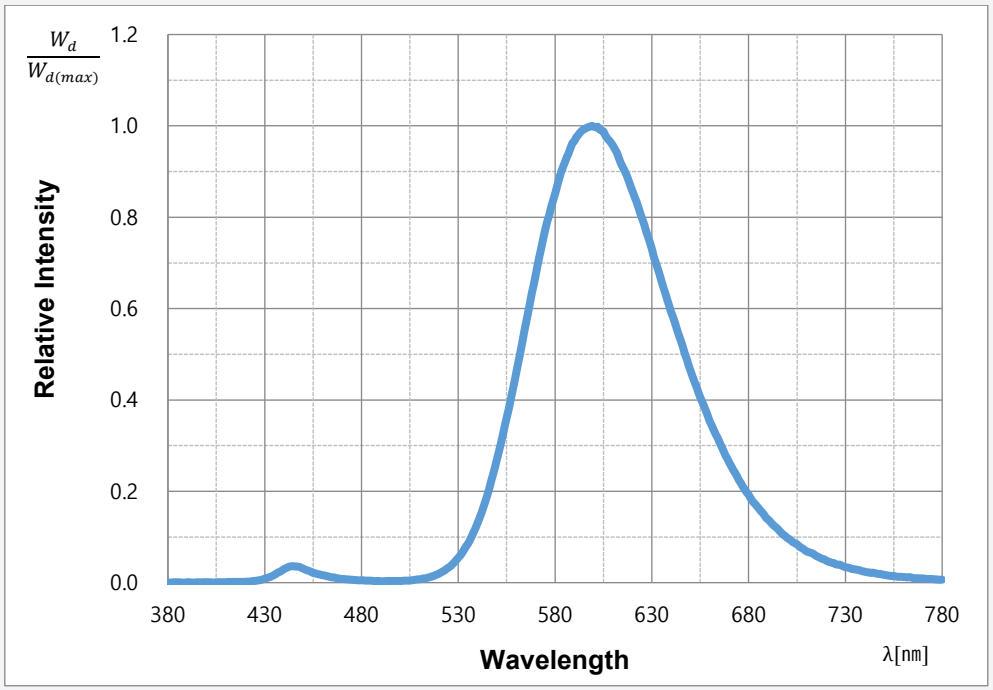
[6] Luminous flux measuring equipment : CAS140CT

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

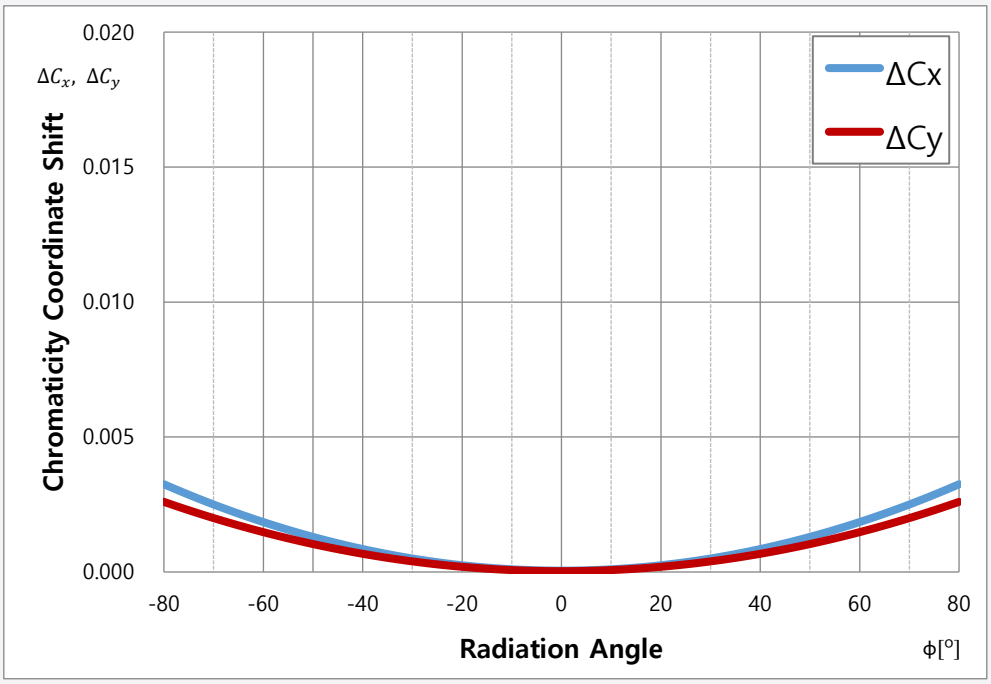


## 3. Typical Characteristics Graphs

### a) Spectrum Distribution ($I_F$ = 350 mA, $T_s$= 25 ºC) [7]



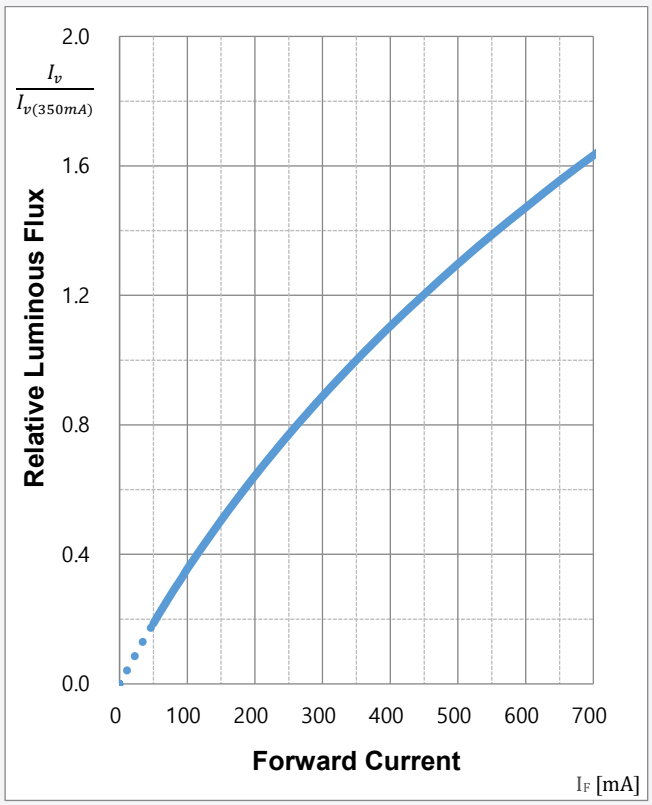

### b) Typical Chromaticity Coordinate Shift vs Radiation Angle ($I_F$ = 350 mA, $T_S$ = 25 ºC) [7]

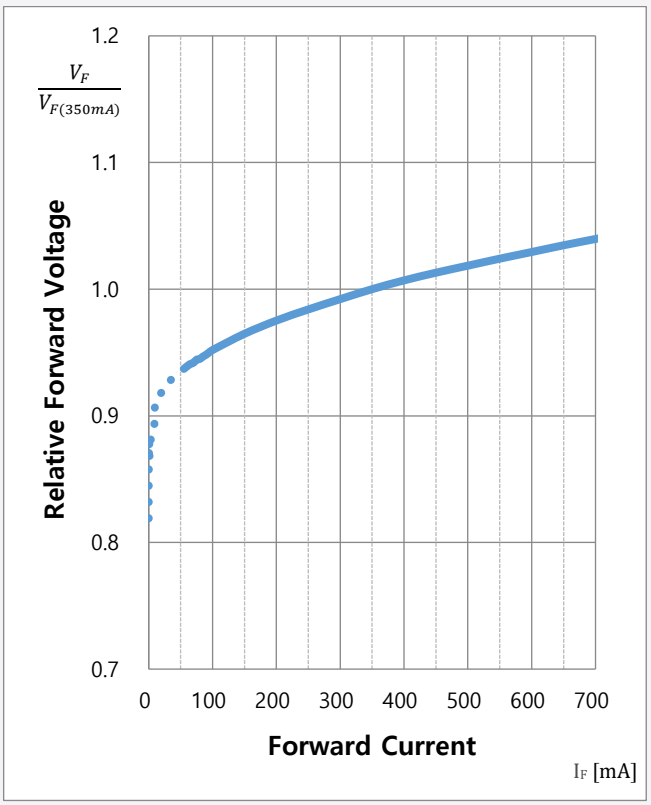


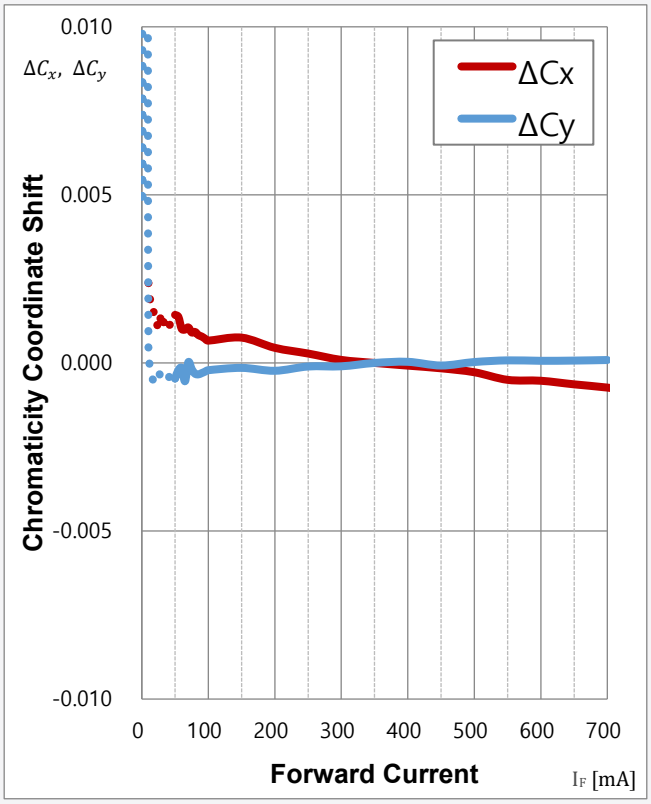

**Note:**

[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 ºC) [8]



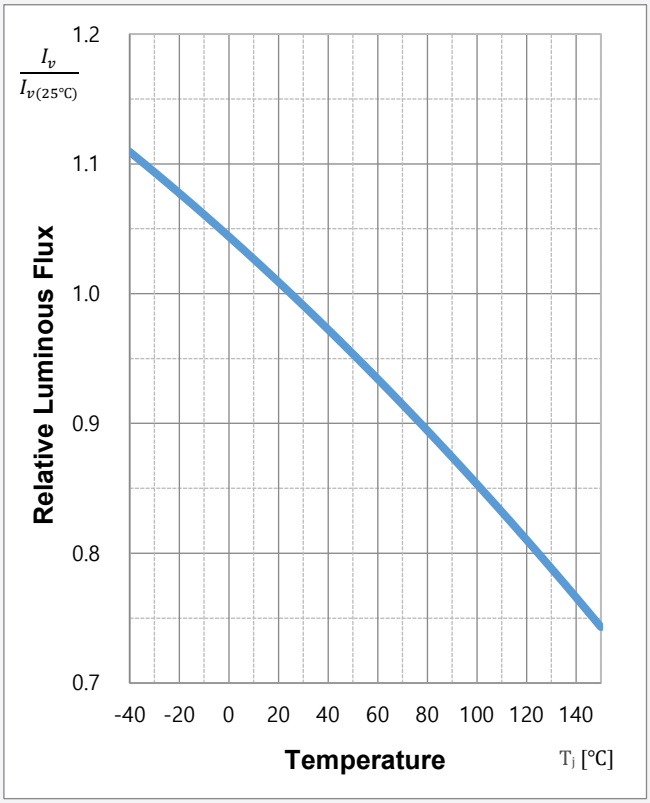



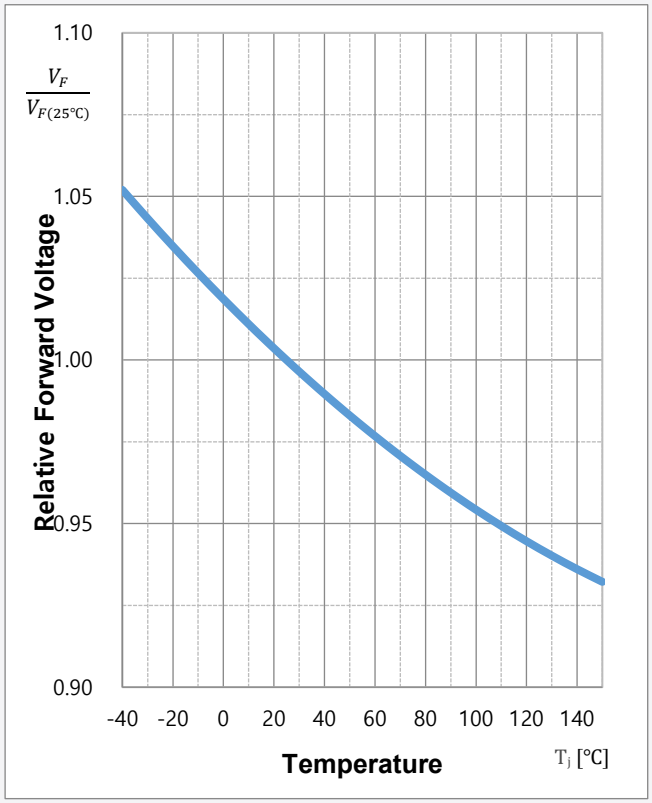



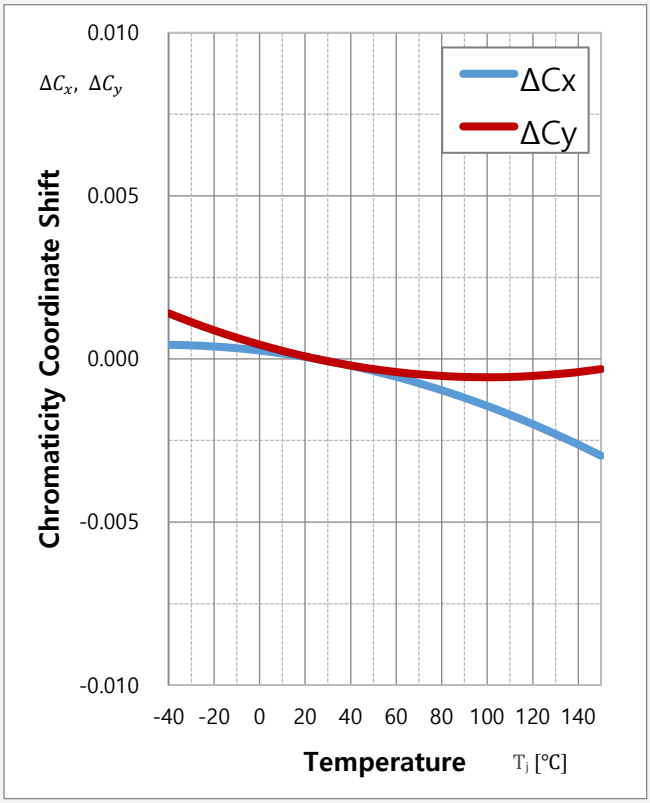

**Note:**

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

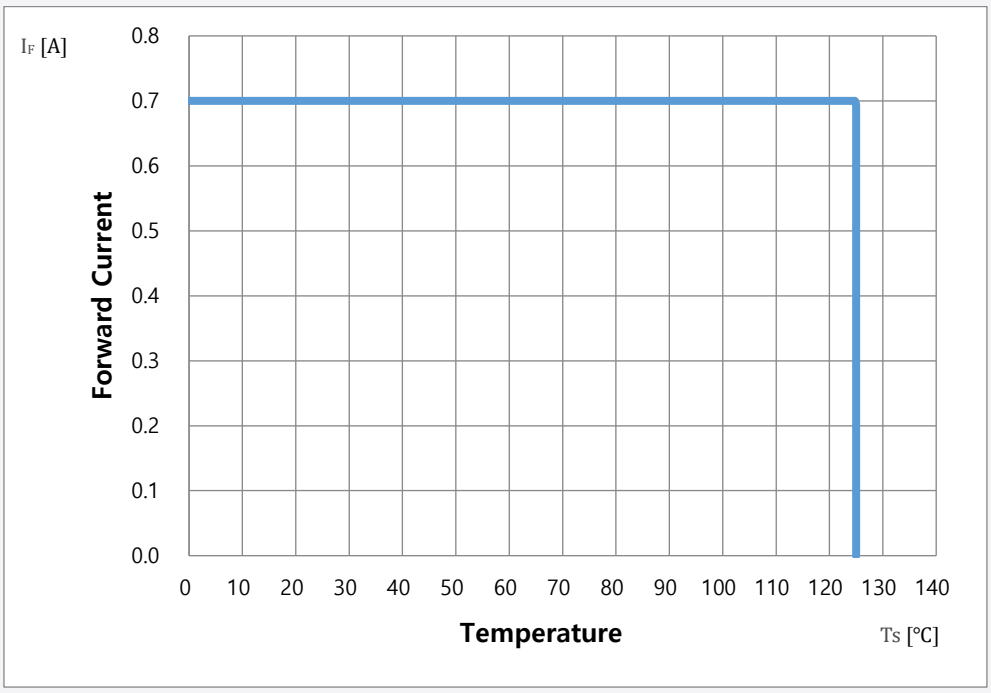
**d) Temperature Characteristics ($I_F$= 350 mA)**



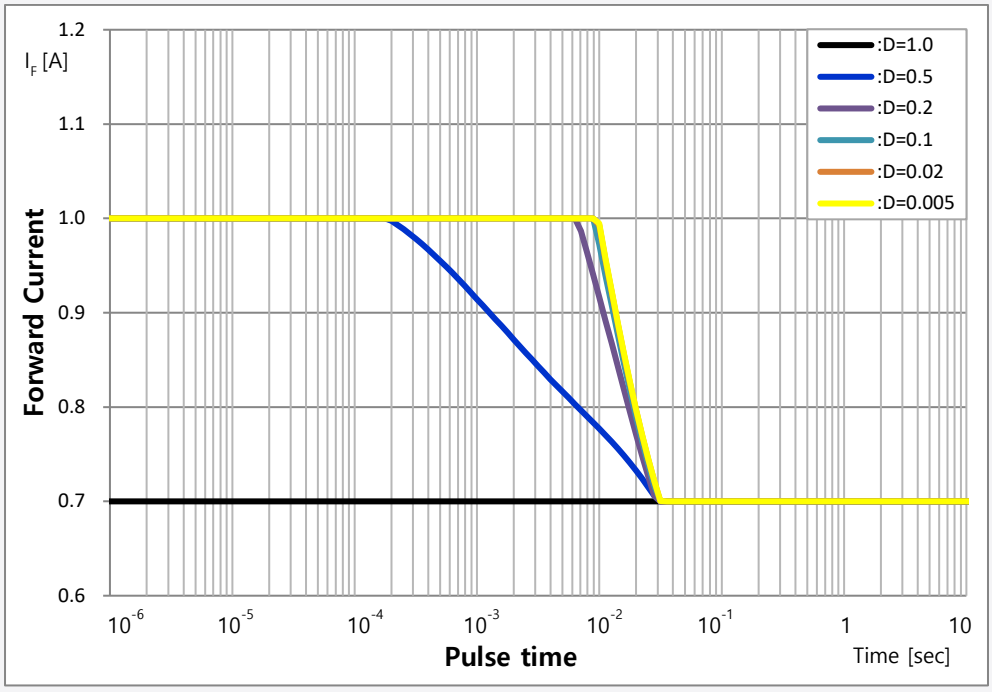
### e) Derating Curve [9]



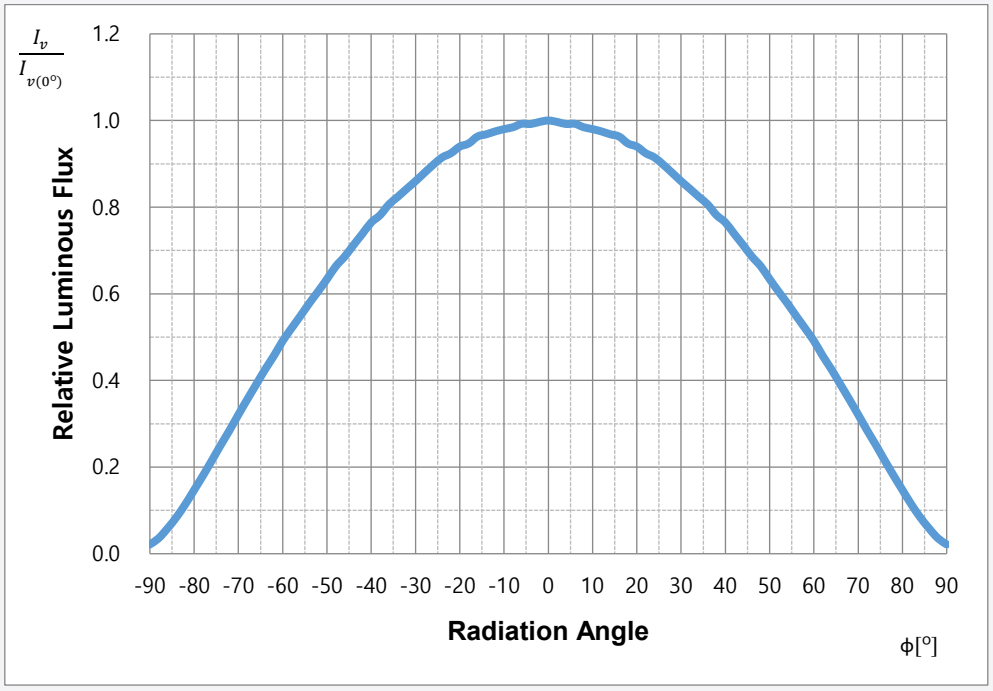

**Note:**

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

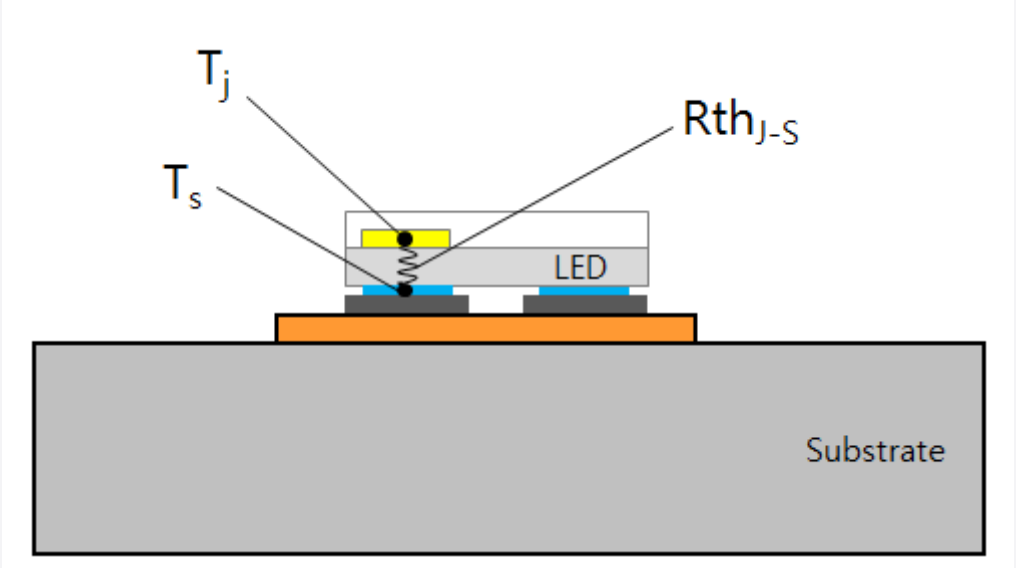
### f) Permissible Pulse Handling Capacity ($I_F=f(t_p)$; D : Duty cycle, $T_S$=125 ºC)



**g) Beam Angle Characteristics ($I_F$ = 350 mA, $T_S$ = 25 ºC)**



## 4. Soldering Temperature Location

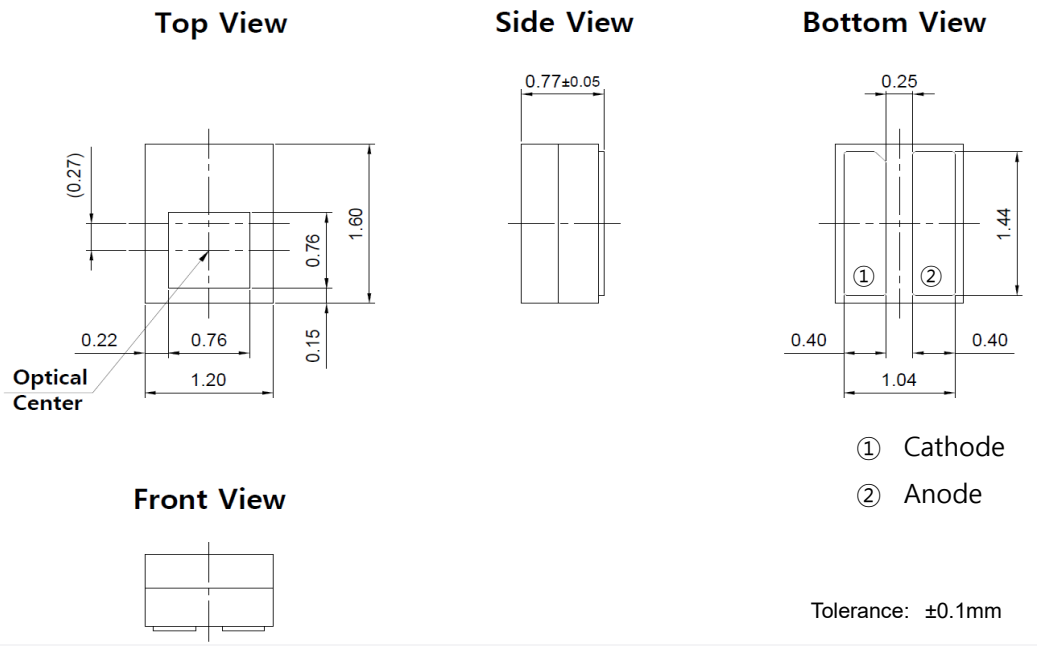



$T_j$ : Temperature of Junction

$T_s$ : Temperature of Solder Pad

$Rth_{j-s}$ : Thermal Resistance from Junction to Solder Pad

## 5. Mechanical Dimension




**Note:**

The dimensions in parentheses are for reference purposes.

Unit: mm

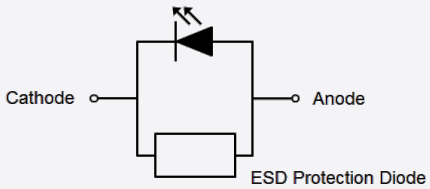
Approximate weight : 4.7mg

### a) Pick and Place

Do not place pressure on the resin molded part

It is recommended to use a pick & place nozzle AM03-024820A(Hanhwa Techwin), etc.

### b) Electric Schematic Diagram

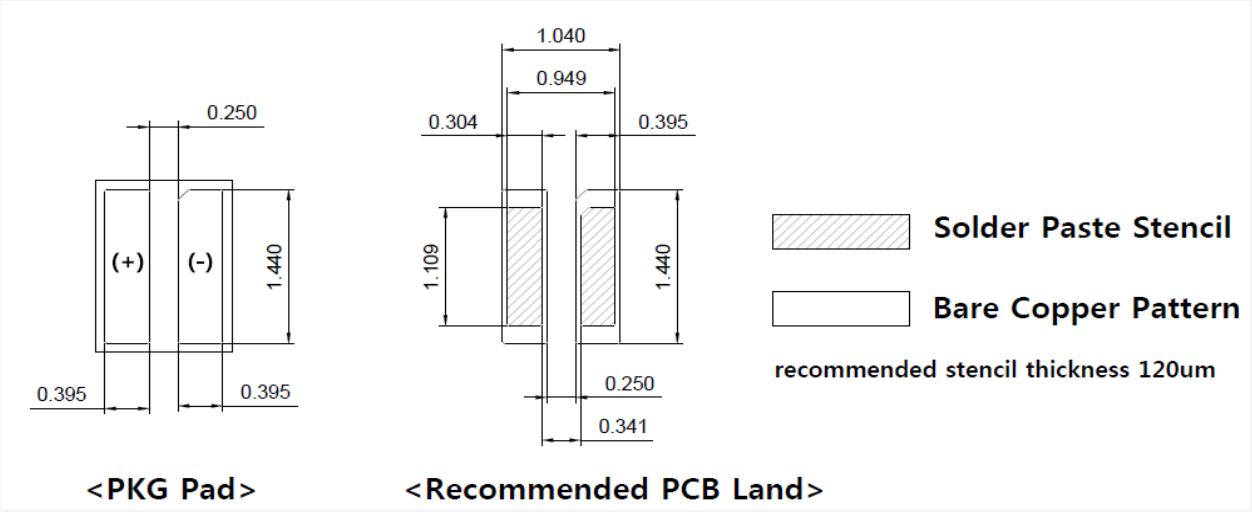



### c) Material Information

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

## 6. Soldering Conditions

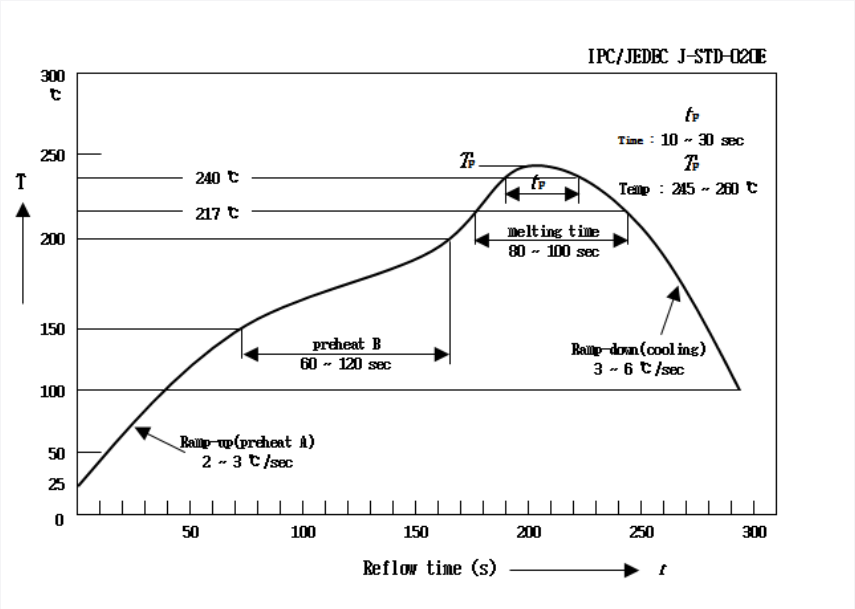
### a) Pad Configuration




**Notes:** mm, Tolerance : ±0.10mm, recommended stencil thickness 120um

### b) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.




**※ All temperature refer to the pad of package.**

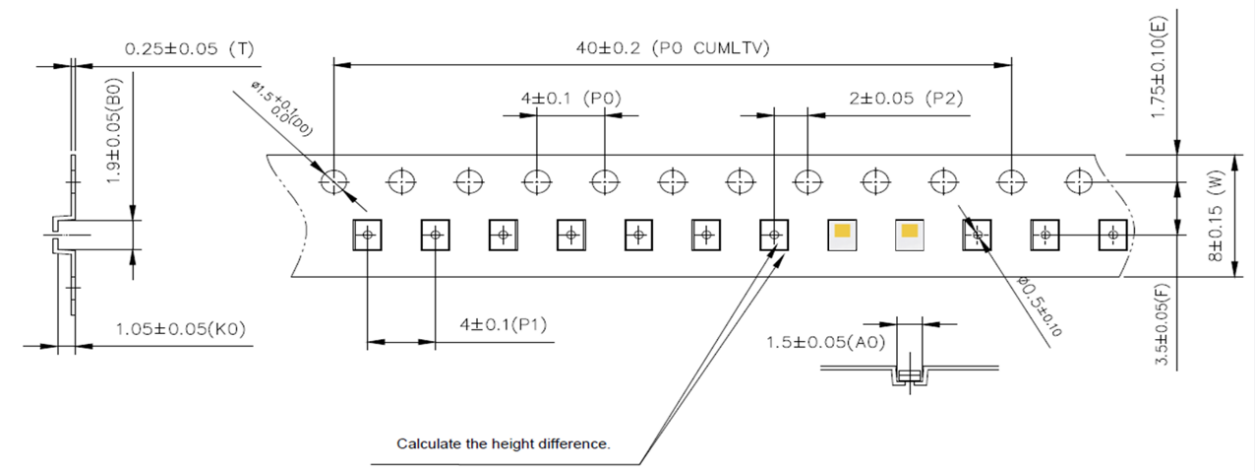
### c) Manual Soldering Conditions

Not more than 5 seconds @ max. 300 ºC, under soldering iron.(one time only)

## 7. Tape & Reel

### a) Taping Dimension

**User feed direction →**



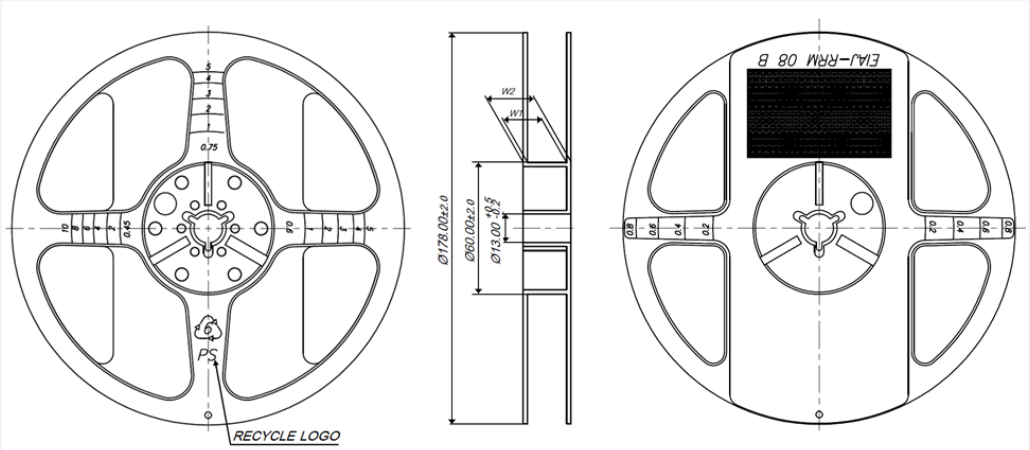

※ Package placement condition in a reel tape

| | | |
|---|---|---|
| Empty pocket(Min. 100ea) | LED mounting part | Empty pocket(Min. 100ea) |

**Notes:**

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

### b) Reel Dimension



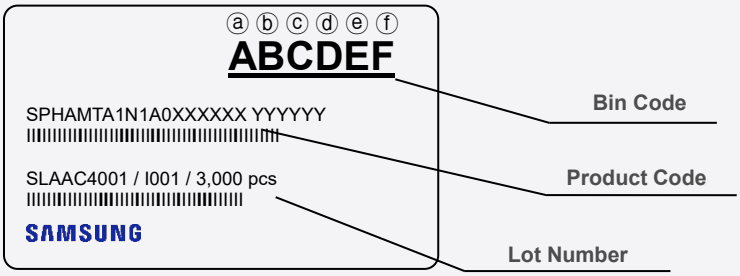

| *Width* | *W1* | *W2* |
|---|---|---|
| *8mm* | *9 ±0.3* | *11.9 ±1.0* |

**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:

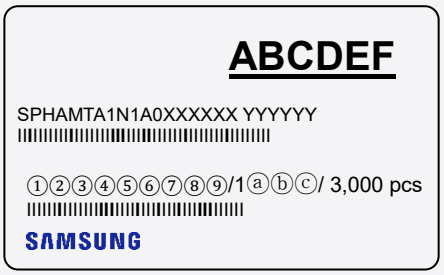
ⓐⓑ: Forward Voltage bin (refer to page 5)

ⓒⓓ: Chromaticity bin (refer to page 6)

ⓔⓕ: Luminous Flux bin (refer to page 5)

### b) Lot Number

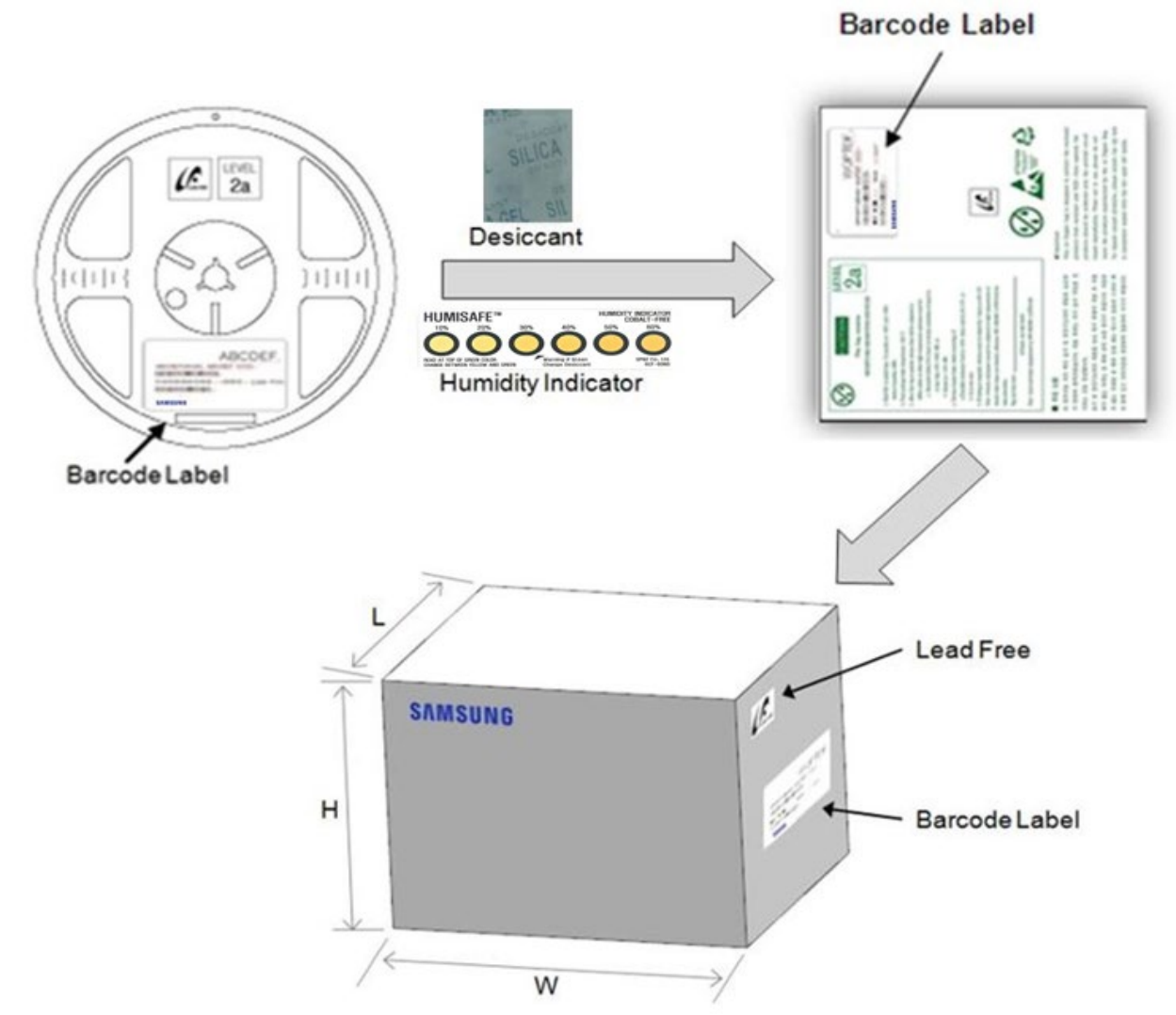
The lot number is composed of the following characters:




| ①②③③②③④⑤⑥⑦⑧⑨ / Iⓐⓑⓒ / x,000 pcs | |
|---|---|
| ①② | : Production site |
| ③ | : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample) |
| ④ | : Year (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** (The quantity of PKG on the Reel to be Max 3,000pcs)




Dimension of Transportation Box in ㎜

| 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. ~40℃, ~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℃ / 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±5℃.

8) If baking is required, LEDs must be baked for 1 day at 60±5℃.

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) To avoid risk of sulfurization (or tarnishing), do not use or store LEDs near materials containing sulfur, fluorine, chlorine, bromine, iodine or other halogens or compounds that can potentially react with the LED's silver plated lead frame. Examples of these materials include: various rubbers, paper products, certain solder pastes, cleaning solutions, adhesives, etc. or may be present in certain environments in form of fertilizers, lubricants, etc. This reaction can result into the lead frame darkening when exposed to such compounds, resulting in degradation of intensity, change in forward voltage, chromaticity coordinate shift and it may go as far as becoming an open circuit in more extreme cases.

## 11. Company Information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# Legal and additional information.

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