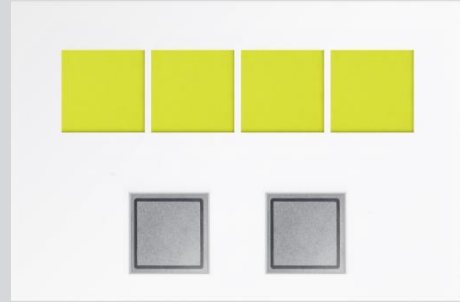


High Power LED T-Series

# 12W White

## SPHWHTT4NAA0



### Features

- Package : Ceramic package
- Dimension : 5.70 mm x 3.75 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<sub>b</sub> = 25°C] <sup>[1]</sup>

Item	Symbol	Value	Unit.
Chromaticity Coordinate	C <sub>x</sub>	0.32	
	C <sub>y</sub>	0.33	
Luminous Flux (I <sub>F</sub> = 1,000 mA)	Φ <sub>V</sub>	Typ. 1,560	lm
Forward Voltage (I <sub>F</sub> = 1,000 mA)	V <sub>F</sub>	Typ. 12.6	V
Viewing Angle	Φ	Typ. 120	°
Reverse Current	I <sub>R</sub>	Not designed for reverse operation	
Real Thermal Resistance (Junction to Board)	R <sub>th_J-B (Real)</sub>	Typ. 1.2	K/W
		Max. 2.2	
Electrical Thermal Resistance (Junction to Board)	R <sub>th_J-B (Elec.)</sub>	Typ. 0.8	K/W
		Max. 1.5	
Radian Surface	A	4.46	mm <sup>2</sup>

**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 <sub>a</sub>	-40 ~ +135	°C
Storage Temperature	T <sub>stg</sub>	-40 ~ +135	°C
LED Junction Temperature	T <sub>j</sub>	150	°C
Maximum Forward current <sup>[2]</sup> (T <sub>b</sub> :25°C) <sup>[3]</sup>	I <sub>F</sub>	1,500	mA
Minimum Forward current <sup>[2]</sup> (T <sub>b</sub> :25°C) <sup>[3]</sup>	I <sub>F</sub>	50	mA
Maximum Reverse current		Do not apply for reverse current	
ESD Sensitivity <sup>[4]</sup>	-	±8 for HBM	kV

**Note:**

[2] Driving the product at forward current (I<sub>F</sub>) below Min. I<sub>F</sub> or above Max. I<sub>F</sub> may result in unpredictable behavior of the product.

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

[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	T	T	4	N	A	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 (T for initial version up)
7 8	Product configuration and type (T4 for 4chip type)
9	Lens configuration (N for no lens)
10	Typical power (Internal code)
11 12	Specific property (A0 for T Series)
13 14	Forward voltage property
15 16	CIE coordination property
17 18	Luminous flux property

**a) Voltage Bins <sup>[5]</sup> ( $I_F = 1,000 \text{ mA}$ ,  $T_b = 25^\circ\text{C}$ )**

Symbol	Voltage Bin Code	Voltage Range (V)	
		Min	Max
$V_F$	CE	10.9	13.9

**b) Luminous Flux Bins <sup>[5]</sup> ( $I_F = 1,000 \text{ mA}$ ,  $T_b = 25^\circ\text{C}$ )**

Symbol	Flux Bin Code	Flux Range (lm)	
		Min	Max
$\Phi_V$	5K	1435	1576
	6K	1505	1654
	7K	1576	1731
	8K	1654	1817

[5] Luminous flux measuring equipment: CAS140CT

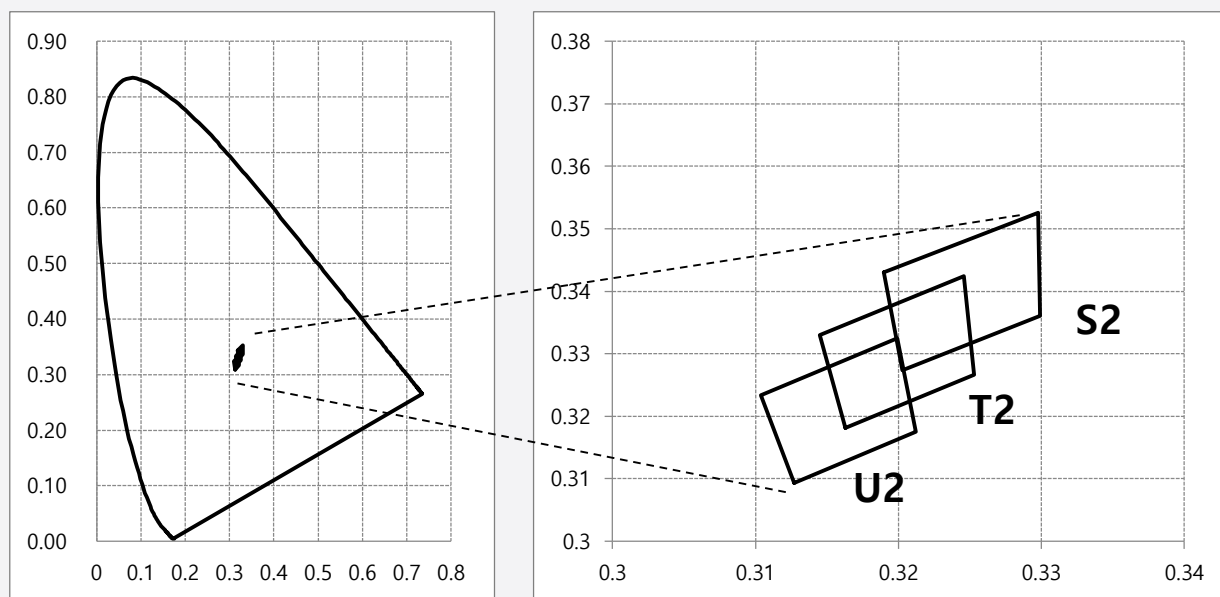
$\Phi_V$  and  $V_F$  tolerances are  $\pm 7\%$  and  $\pm 0.1\text{V}$ , respectively.

**c) Color Bin <sup>[6]</sup> ( $I_F = 1,000 \text{ mA}$ )**

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:**

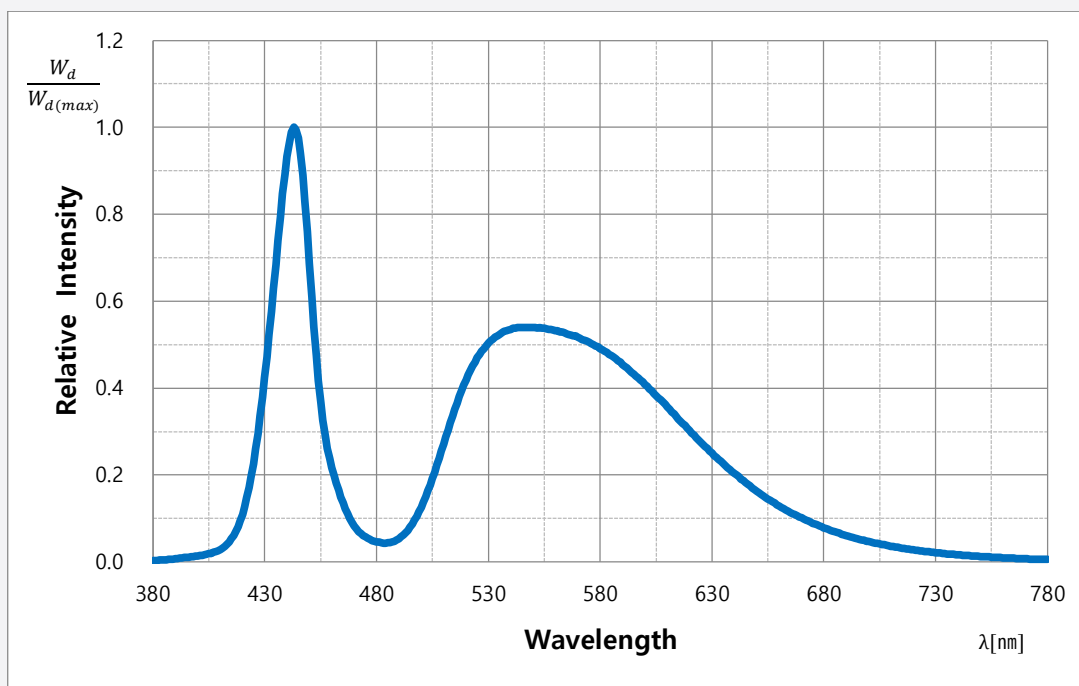
[6] Chromaticity coordinates:  $C_x$ ,  $C_y$  according to CIE 1931.  $C_x$  and  $C_y$  tolerances are  $\pm 0.005$ , respectively.

**• Color Bin Definition**

**d) Luminous Flux Bins according to Color Bin ( $I_F = 1,000 \text{ mA}$ ,  $T_b = 25 \text{ }^\circ\text{C}$ )**

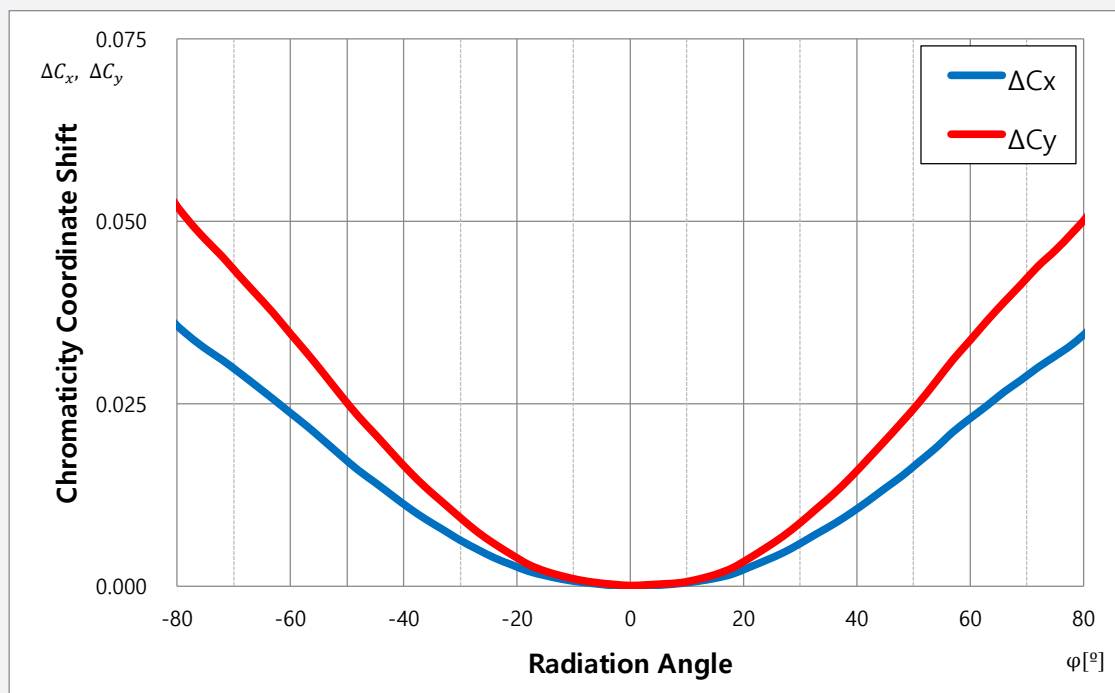
Symbol	Flux Bin Code	5K		6K		7K		8K	
		Min	Max	Min	Min	Min	Min	Max	Min
		1435	1576	1505	1654	1576	1731	1654	1817
$\Phi_V$	S2			O		O		O	
	T2	O		O		O		O	
	U2	O		O		O			

### 3. Typical Characteristics Graphs

#### a) Spectrum Distribution ( $I_F = 1,000 \text{ mA}$ , $T_b = 25 \text{ }^\circ\text{C}$ )



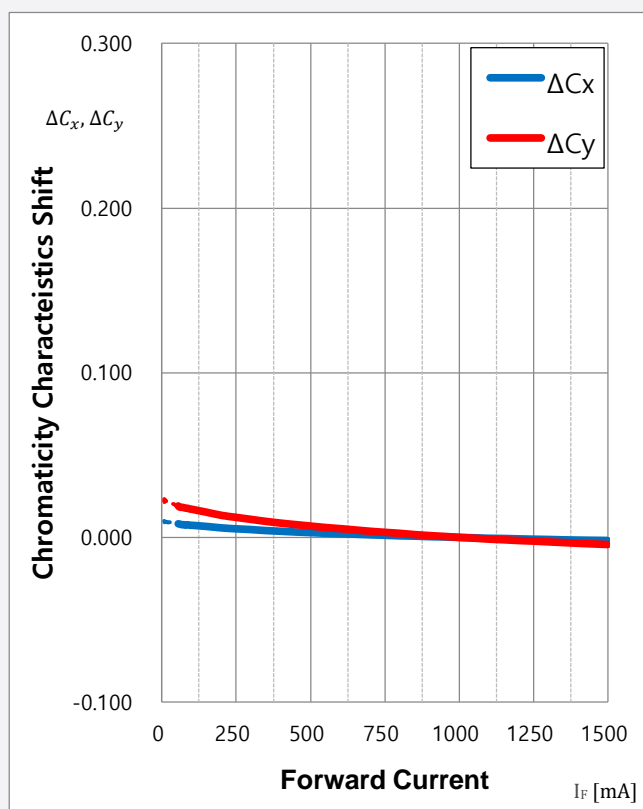
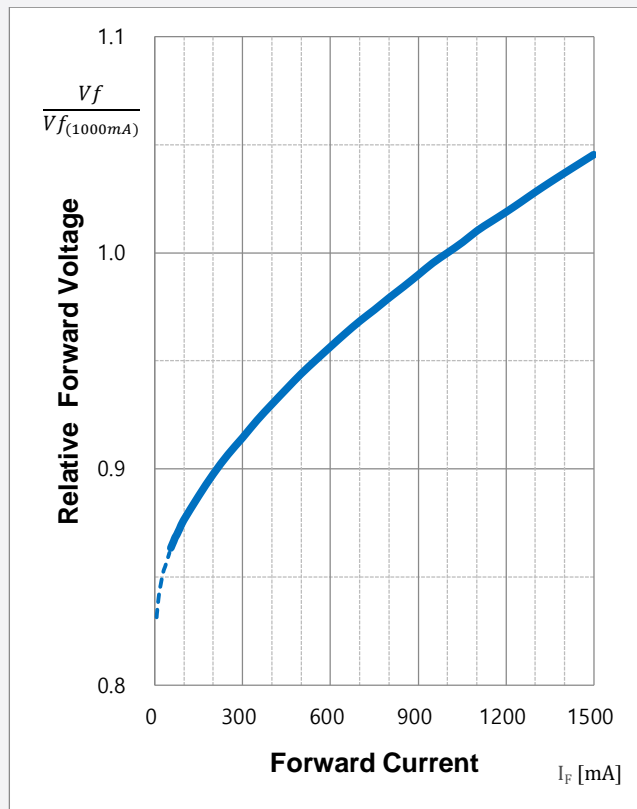
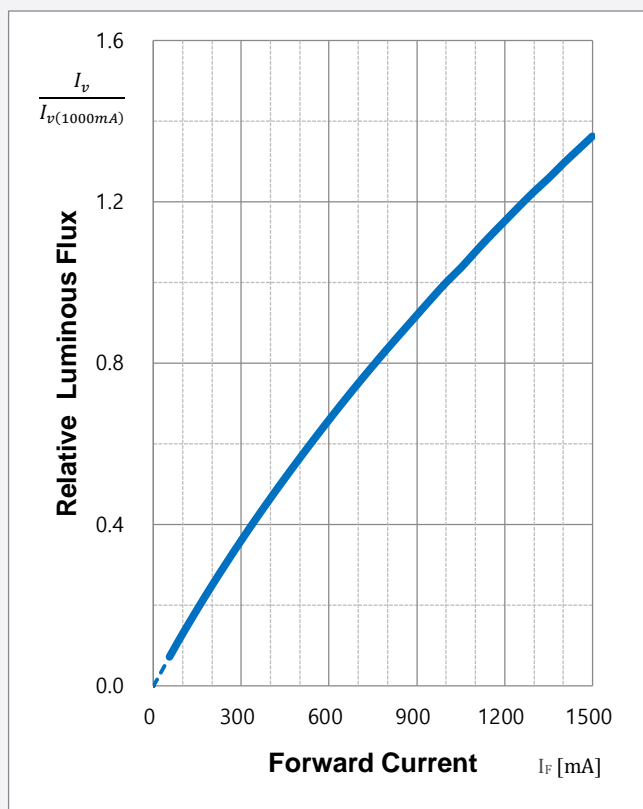
#### b) Typical Chromaticity Coordinate Shift vs Radiation Angle ( $I_F = 1,000 \text{ mA}$ , $T_b = 25 \text{ }^\circ\text{C}$ ) <sup>[7]</sup>



**Note:**

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

### c) Forward Current Characteristics ( $T_b = 25\text{ }^{\circ}\text{C}$ )<sup>[8]</sup>

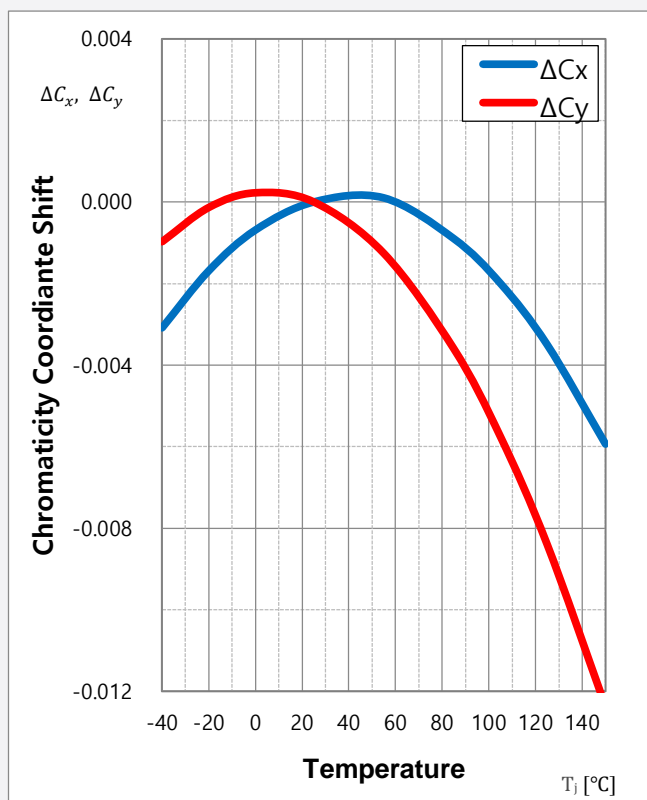
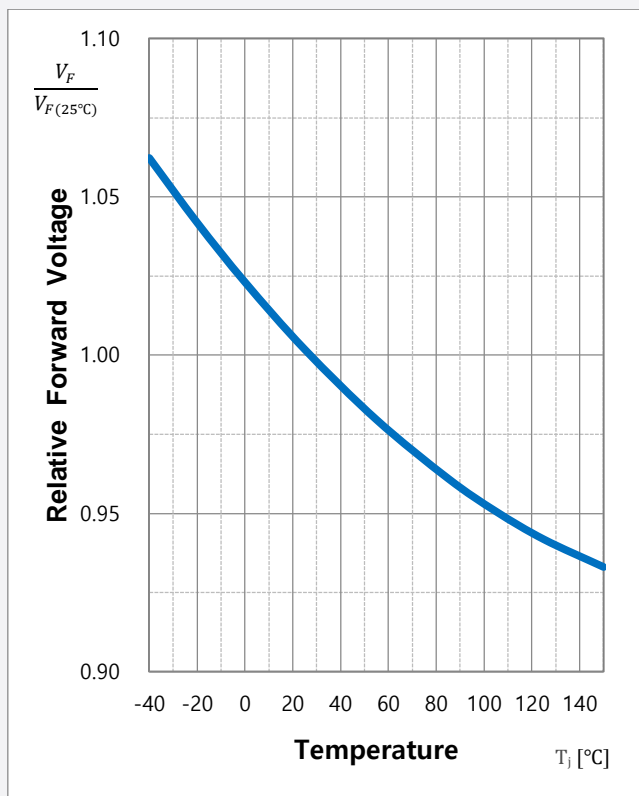
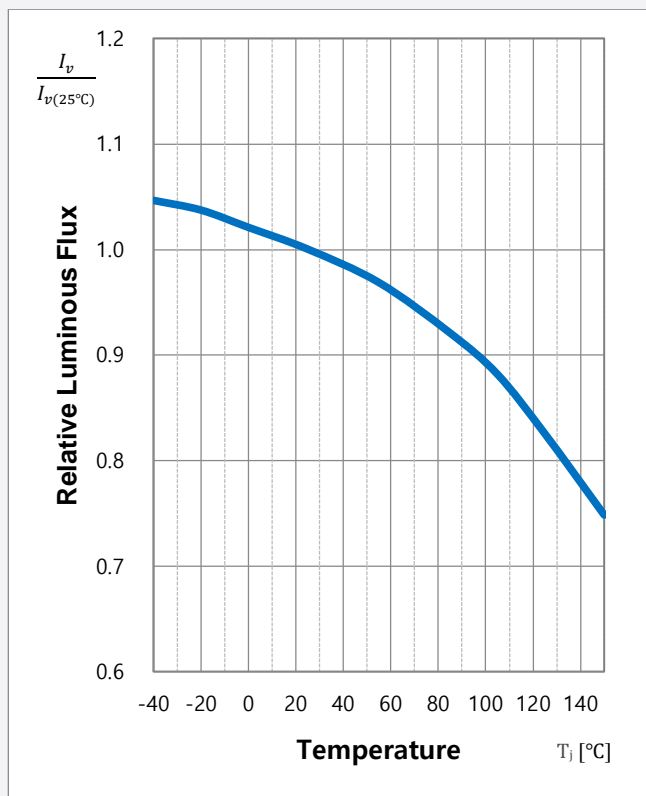


**Note:**

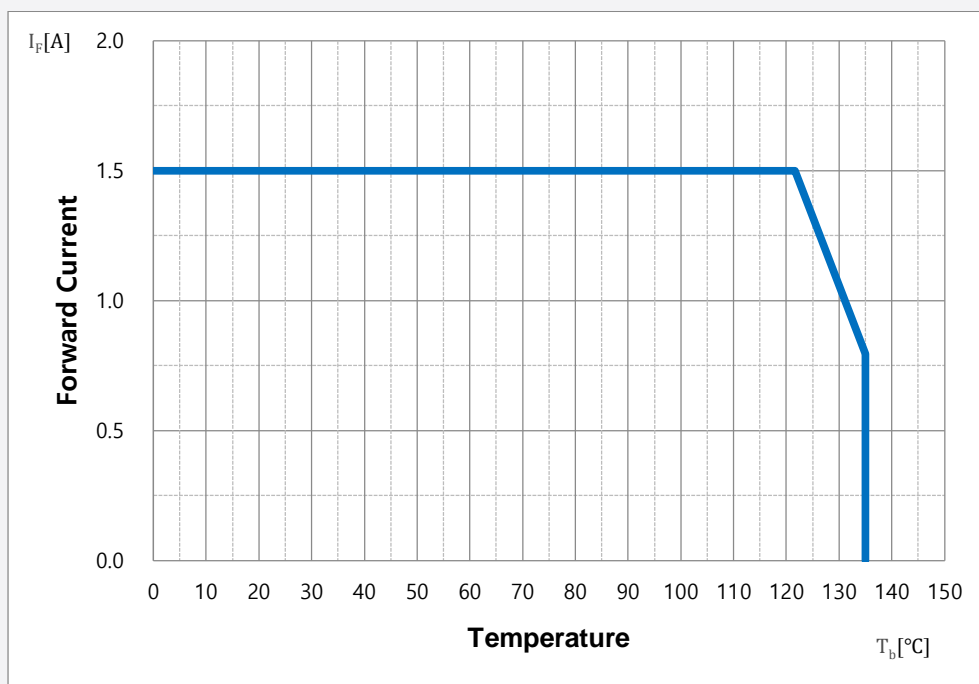
[8] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms



#### d) Temperature Characteristics ( $I_F = 1,000 \text{ mA}$ )



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

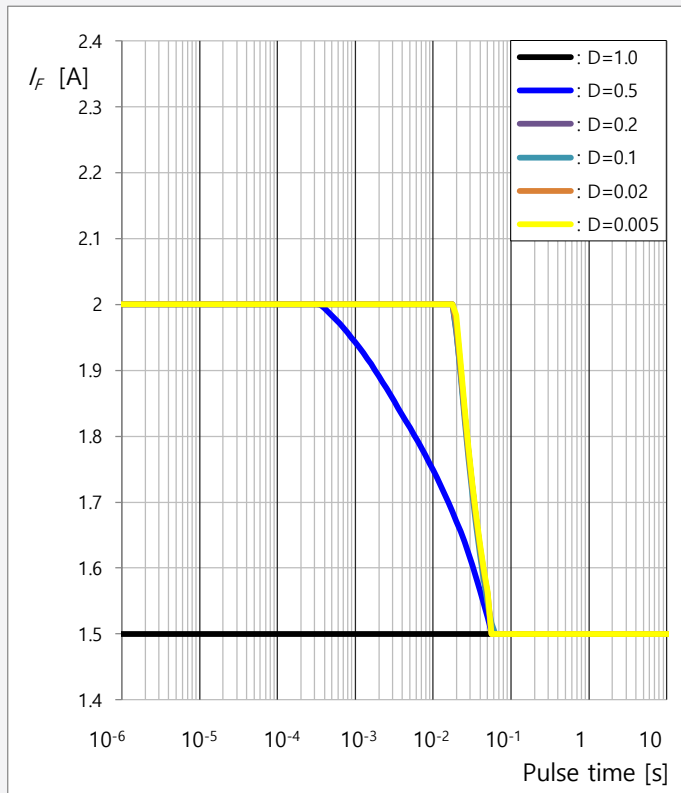


**Note:**

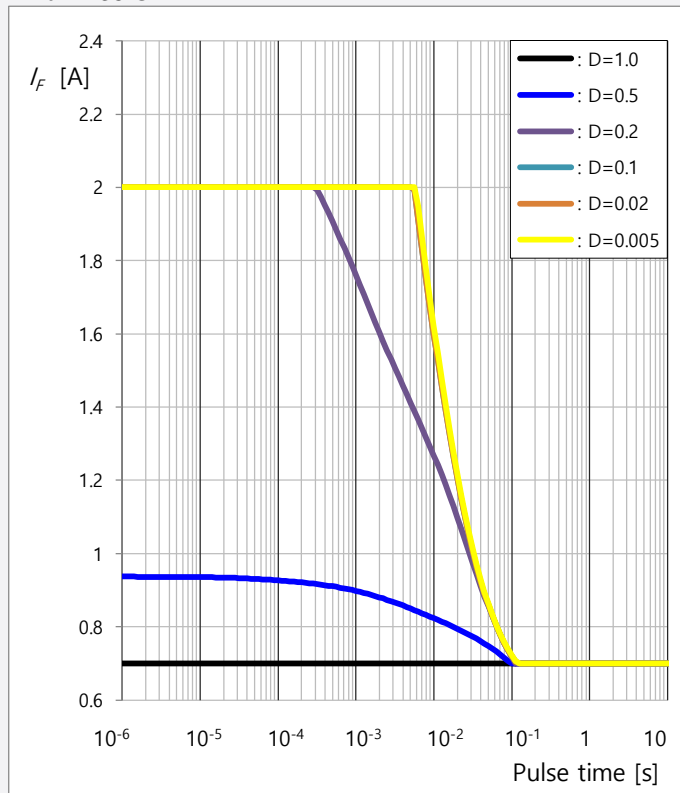
[9] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25ms

### f) Permissible Pulse Handling Capability ( $I_F = f(t_p)$ ; D: Duty cycle)

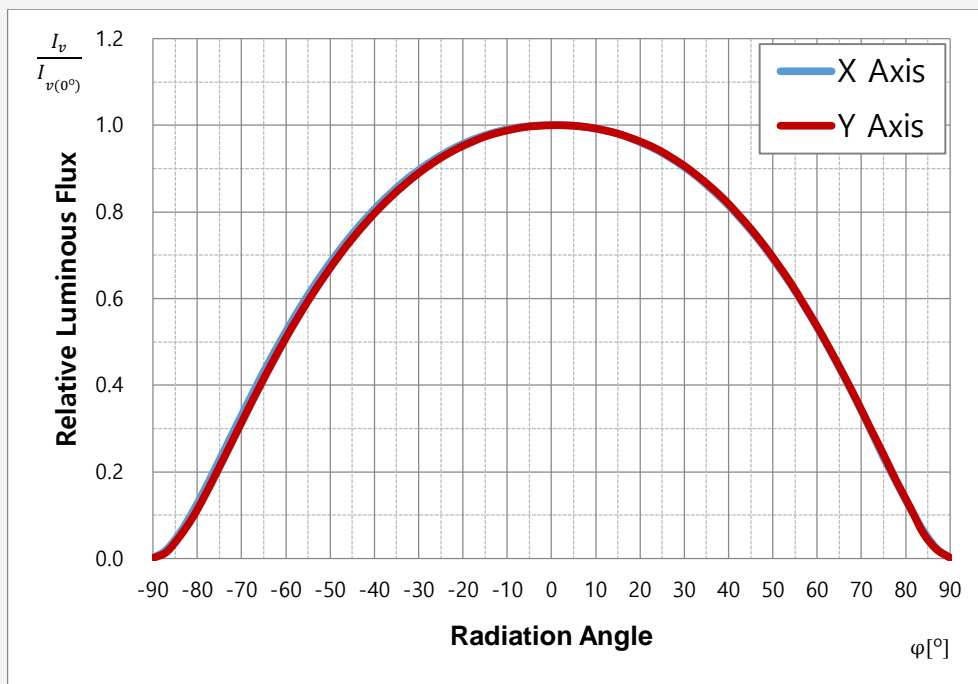
$T_b = 0^\circ\text{C} \sim 119^\circ\text{C}$



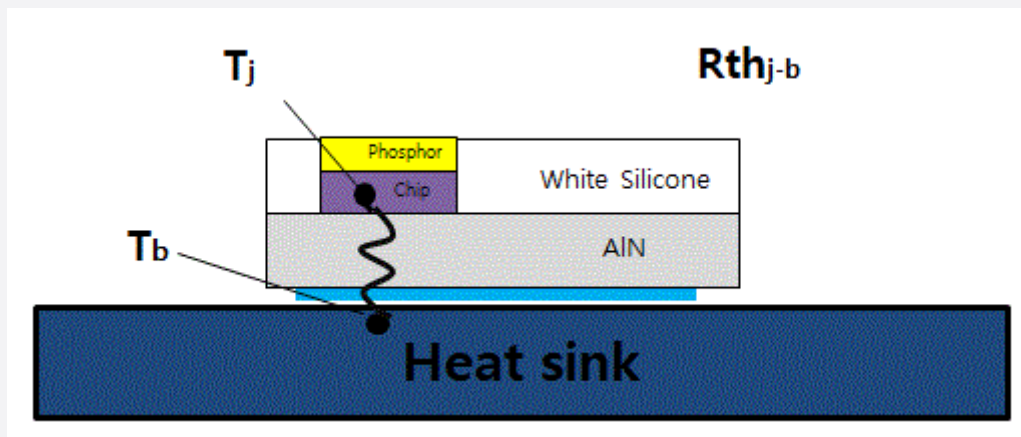
$T_b = 135^\circ\text{C}$



**g) Beam Angle Characteristics ( $I_F = 1,000 \text{ mA}$ ,  $T_b = 25 \text{ }^\circ\text{C}$ )**



#### 4. Soldering Temperature Location

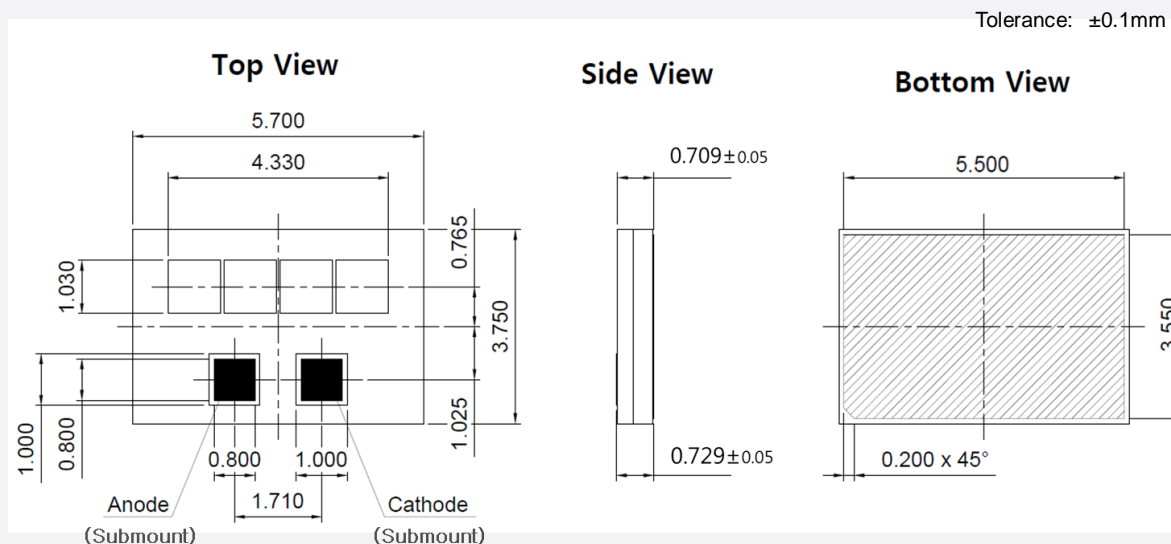


$T_j$  : Temperature of Junction

$T_b$  : Temperature of Board

$R_{thj-b}$  : Thermal Resistance from Junction to Board

## 5. Mechanical Dimension



### Note:

The dimensions in parentheses are for reference purposes. Unit: mm, Approximate Weight : 52mg

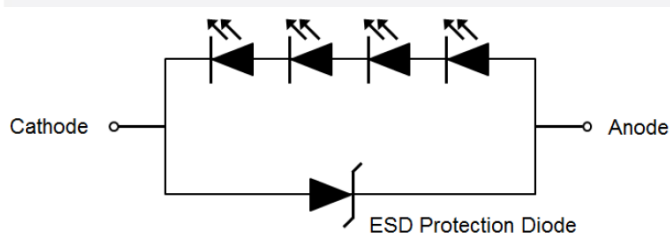
There may be occasional probing marks on the Submount, but no problem with wedge bonding.

### 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



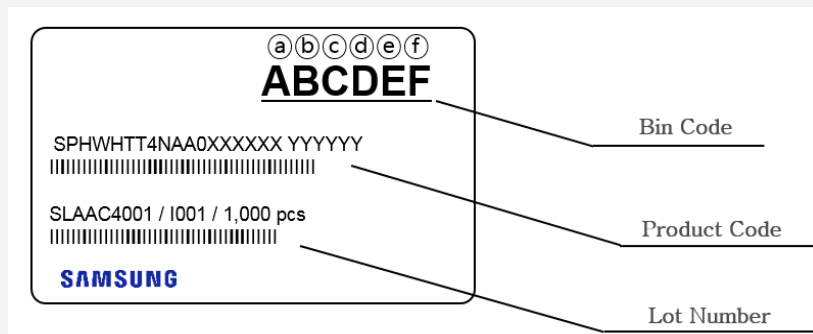
### c) Material Information

Description	Material
Substrate	AlN Substrate
LED Die	Thin GaN
Phosphor	Phosphor In Glass
Zener Diode	Silicon
Wire	Au
Resin Mold	Silicone
Sub Mount	Silicon



## 7. Label Structure

### a) Label Structure



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

Bin Code:

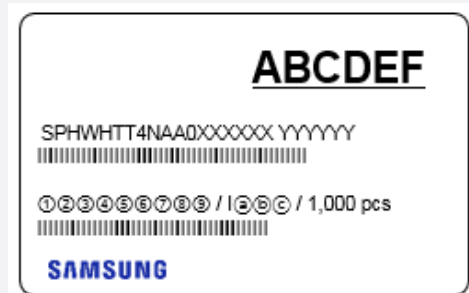
ⒶⒷ: Forward Voltage ( $V_F$ ) Bin (refer to page 5)

ⒸⒹ: Chromaticity ( $C_x$ ,  $C_y$ ) Bin (refer to page 5)

ⒺⒻ: Luminous Flux( $I_v$ ) Bin (refer to page 5)

### b) Lot Number

The lot number is composed of the following characters:

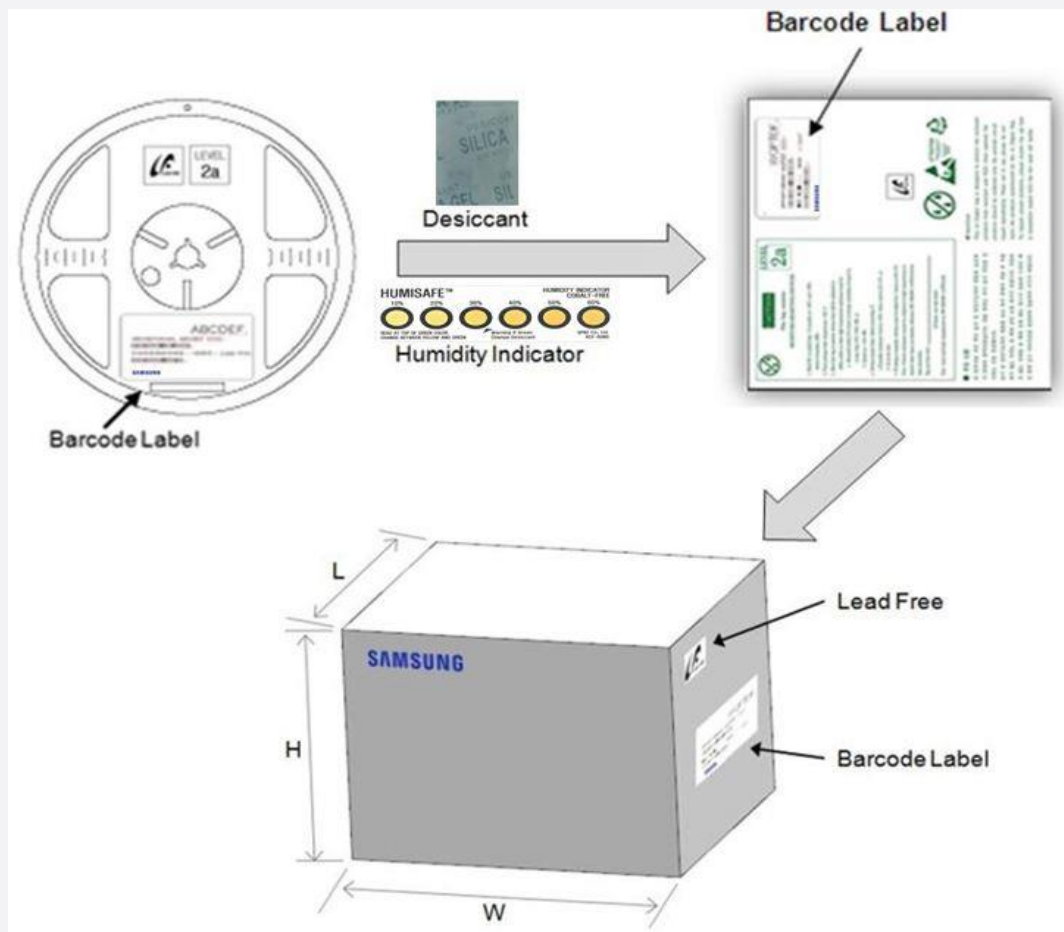


①②③③②③④⑤⑥⑦⑧⑨ / ①②③ / 1,000 pcs

①②	Production site (S : SAMSUNG LED, L : Kiheung , Korea)
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)
①②③	Product serial number (001 ~ 999)

## 8. Packing Structure

### a) Packing Process



Dimension of Transportation Box in mm

Width	Length	Height
220	245	182



## 9. 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.

## 10. Company Information

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# SAMSUNG

# Legal and additional information.

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KOREA

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The Samsung logo, consisting of the word "SAMSUNG" in a bold, blue, sans-serif typeface.