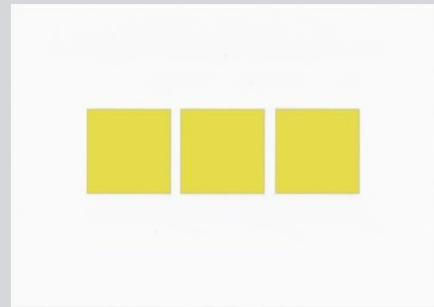


High Power LED I-Series

# 9W White

## SPHWH1B5N9A0



### Features

- Package : Lead frame package
- Dimension : 5.12 mm x 3.60 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 Cy	0.32 0.33	
Luminous Flux ( $I_F = 1,000\text{ mA}$ )	$\Phi_V$	Typ. 1,182	lm
Forward Voltage ( $I_F = 1,000\text{ mA}$ )	$V_F$	Typ. 9.0	V
Viewing Angle	$\Phi$	Typ. 120	°
Reverse Current	$I_R$	Not designed for reverse operation	
Real Thermal Resistance (Junction to Solder point)	$R_{th\_J-S (Real)}$	Typ. 1.4 Max. 1.7	K/W
Electrical Thermal Resistance (Junction to Solder point)	$R_{th\_J-S (Elec.)}$	Typ. 0.9 Max. 1.1	K/W
Radiant Surface	A	3.35	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	$T_a$	-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>	$I_F$	1,500	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 for 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	B	5	N	9	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 2nd version )
7 8	Product configuration and type (B5 for automotive Individual 5XXX PKG type)
9	Lens configuration (N for no lens)
10	Typical power (9 for 9±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> ( $I_F = 1,000 \text{ mA}$ ,  $T_s = 25^\circ\text{C}$ )**

Symbol	Flux Bin Code	Flux Range (lm)	
		Min	Max
$\Phi_V$	N5	1100	1150
	P5	1150	1200
	Q5	1200	1250
	R5	1250	1300

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

Symbol	Voltage Bin Code	Voltage Range (V)	
		Min	Max
$V_F$	3D	8.90	9.65
	3E	9.65	10.40

**Note:**

[5] Luminous flux measuring equipment : CAS140CT

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

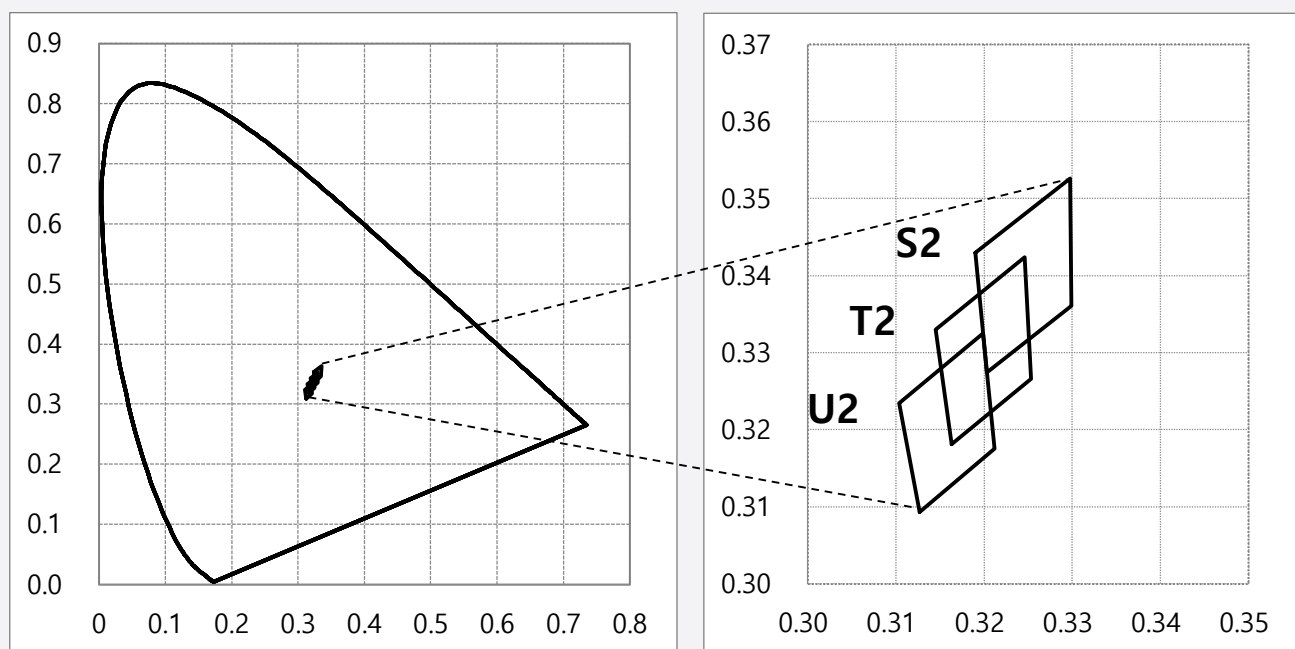
### c) Color Bin <sup>[6]</sup>(I<sub>F</sub> = 1,000 mA)

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] Luminous flux measuring equipment : CAS140CT

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

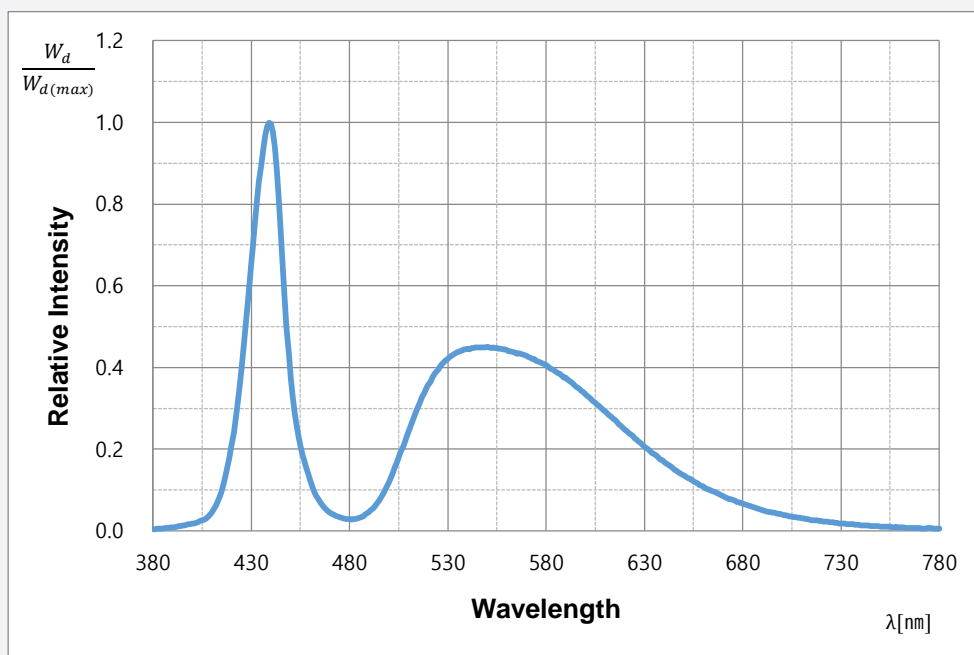


### d) Luminous Flux Bins according to Color Bin (I<sub>F</sub> = 1,000 mA, T<sub>s</sub> = 25 °C)

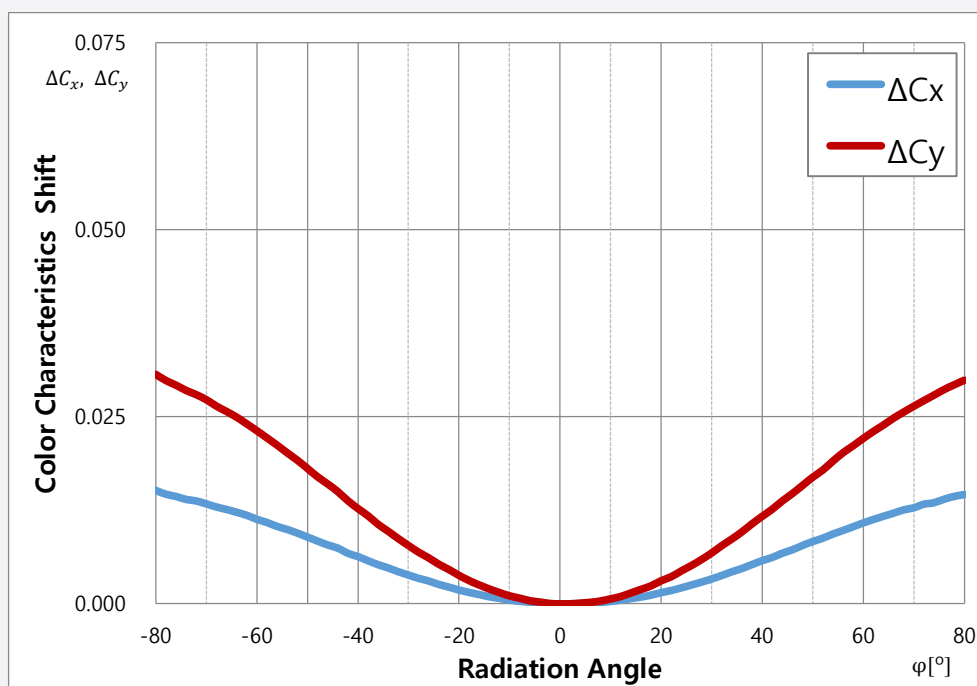
Symbol	Flux Bin Code	N5		P5		Q5		R5	
		Min	Max	Min	Max	Min	Max	Min	Max
		1100	1150	1150	1200	1200	1250	1250	1300
$\Phi_v$	S2			O		O		O	
	T2	O		O		O			
	U2	O		O					

### 3. Typical Characteristics Graphs

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



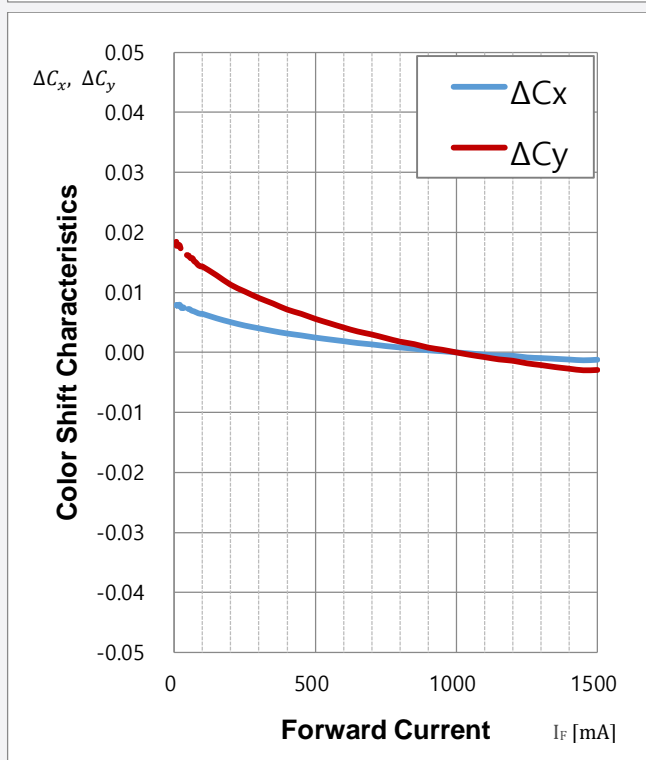
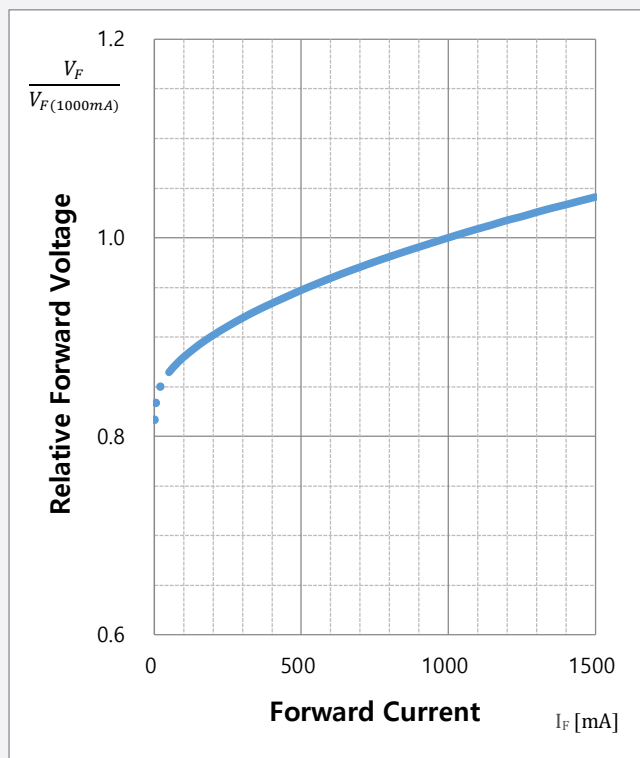
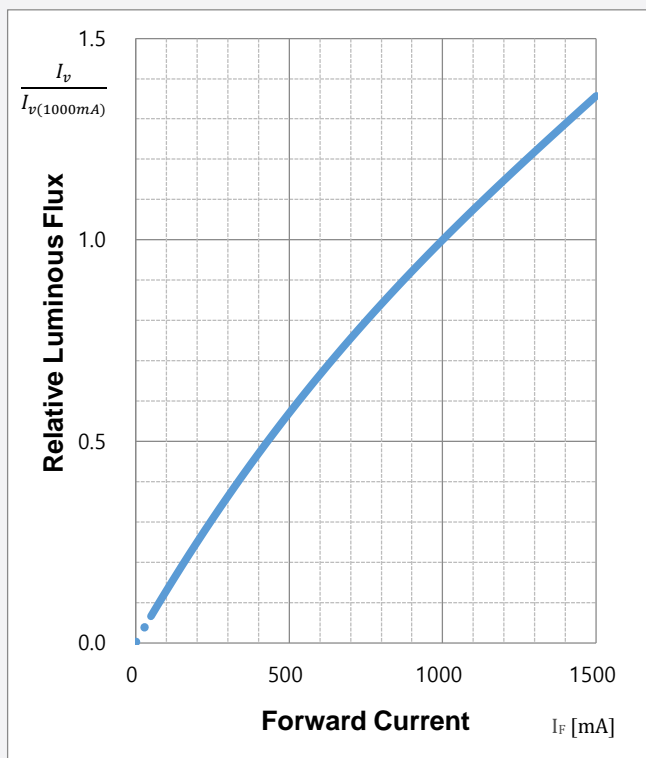
#### b) Typical Chromaticity Coordinate Shift vs Radiation Angle ( $I_F = 1,000 \text{ mA}$ , $T_S = 25 \text{ }^\circ\text{C}$ )<sup>[7]</sup>



**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]

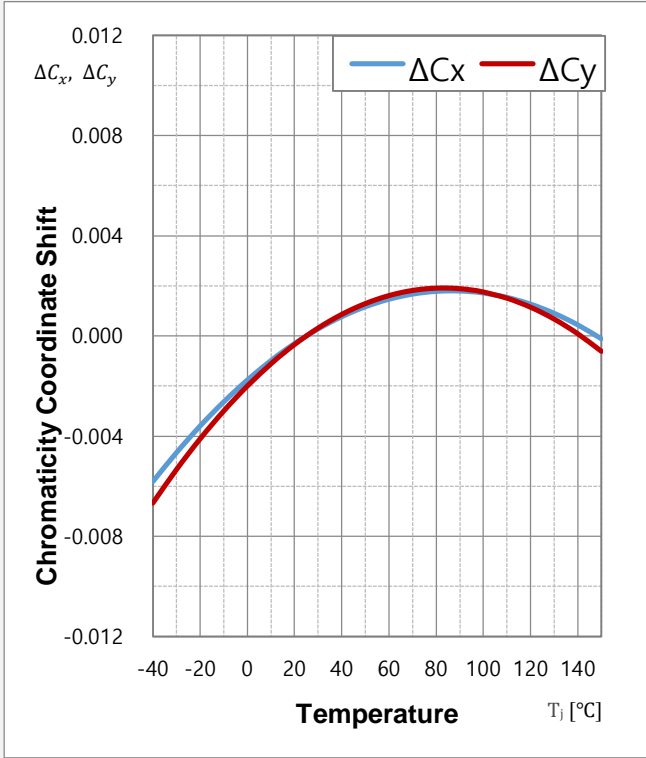
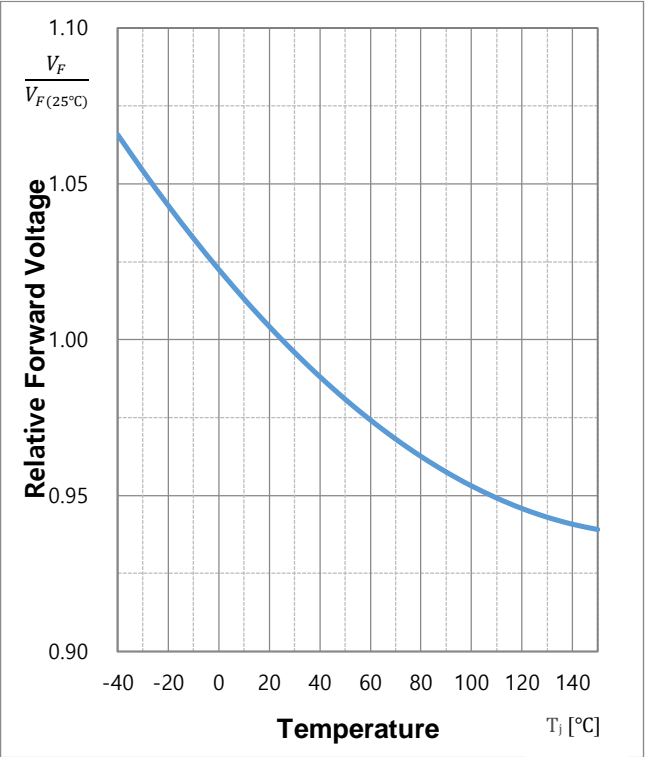
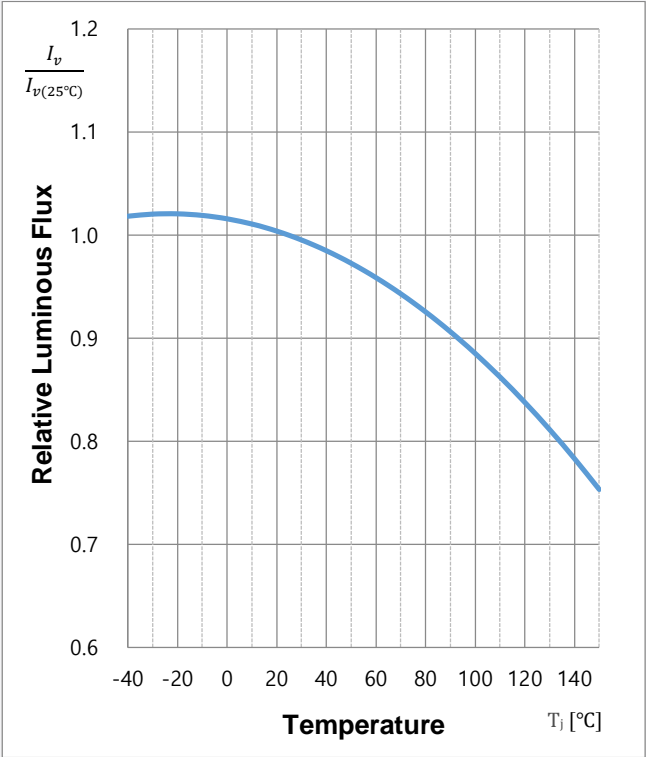


#### Note:

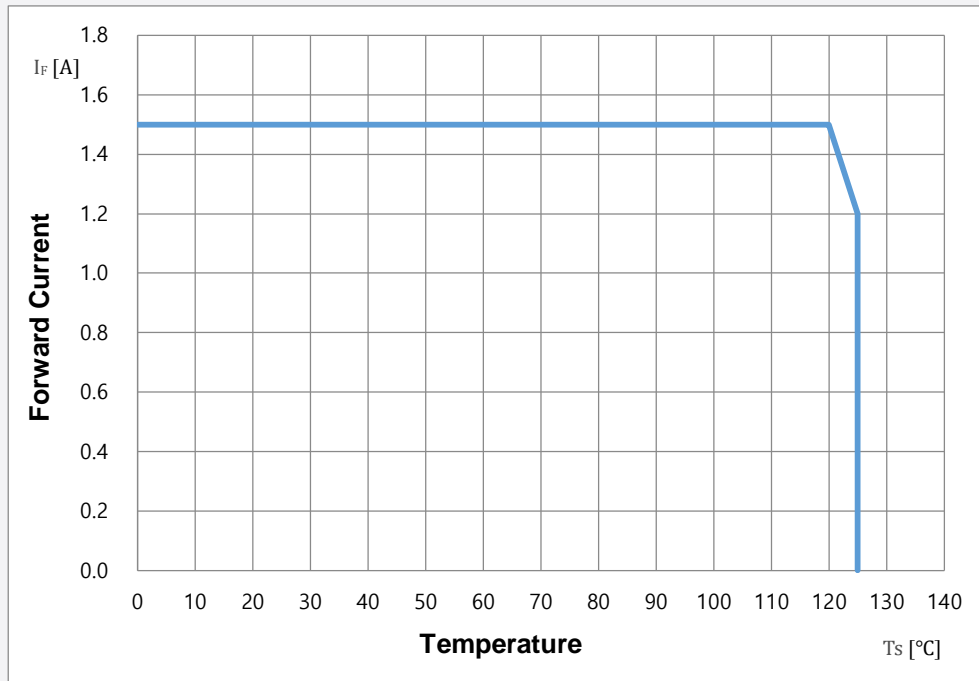
[8] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms



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



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

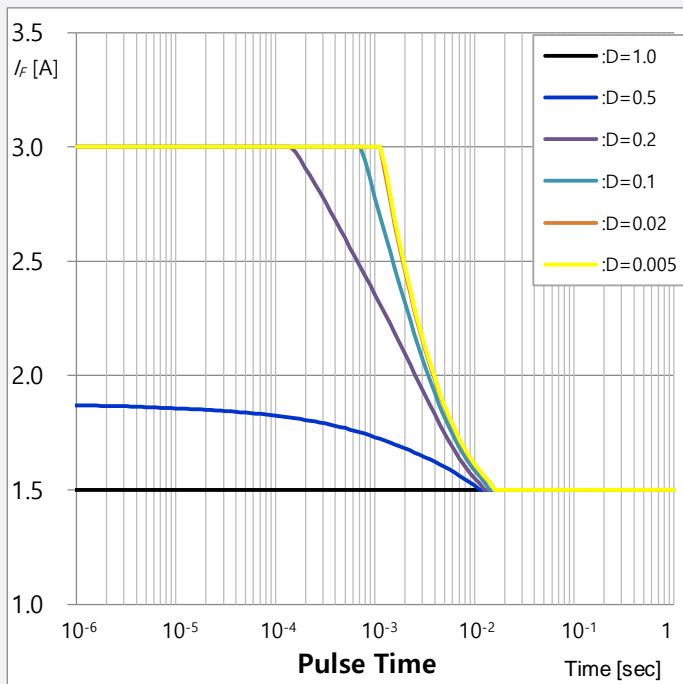


#### Note:

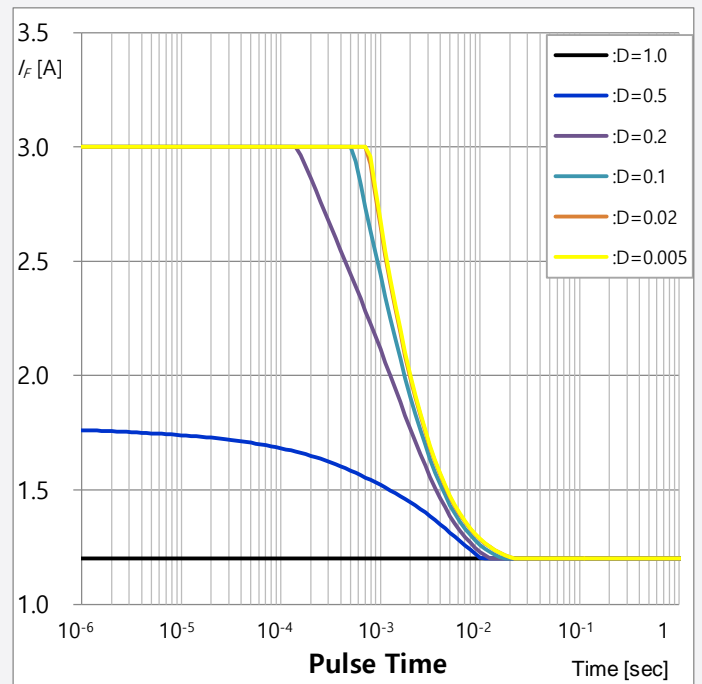
[9] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms

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

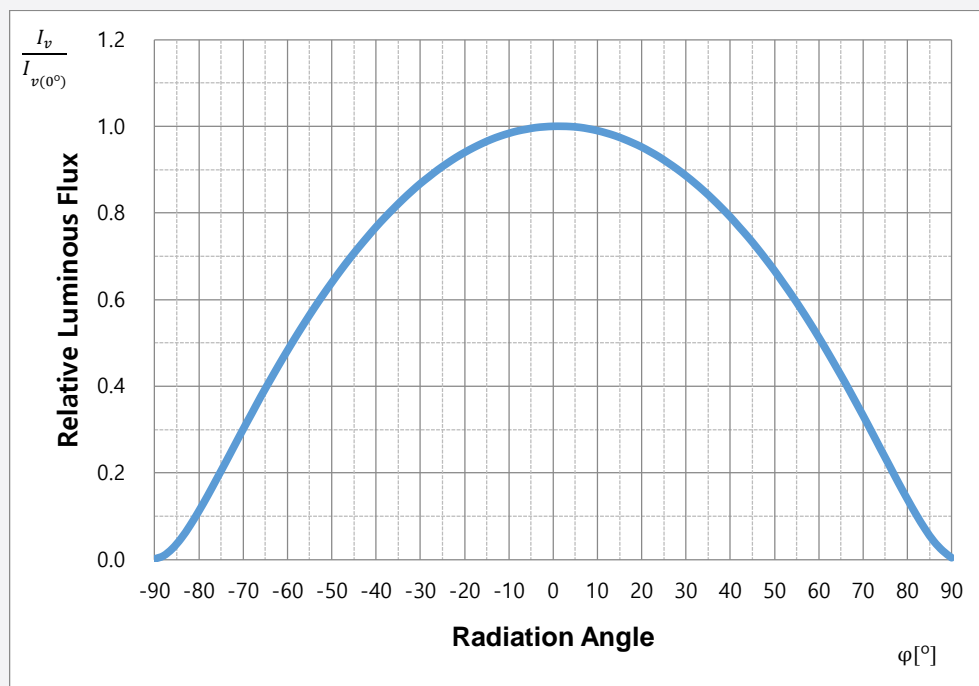
$T_s = 0 \sim 118^\circ\text{C}$



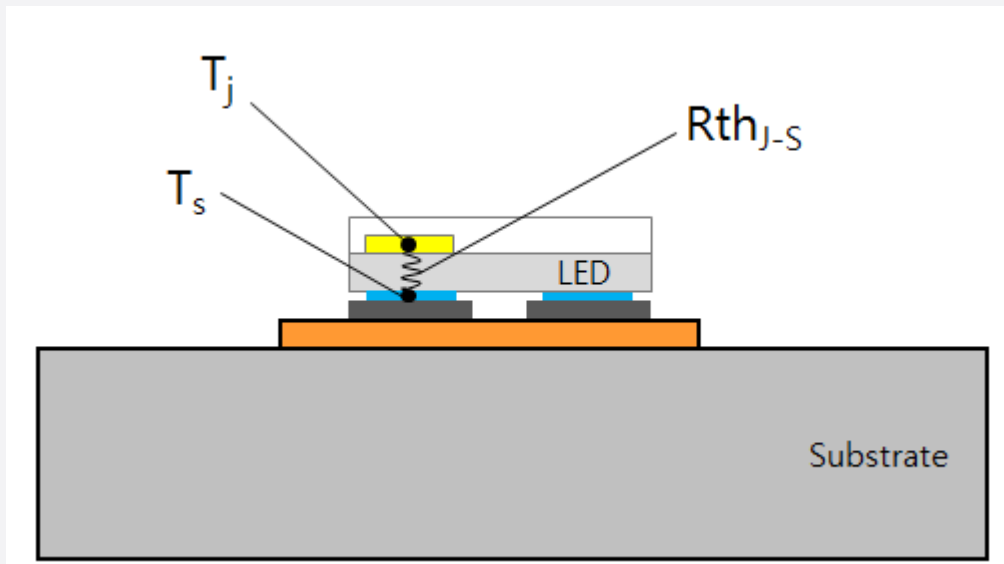
$T_s = 125^\circ\text{C}$



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



#### 4. Soldering Temperature Location

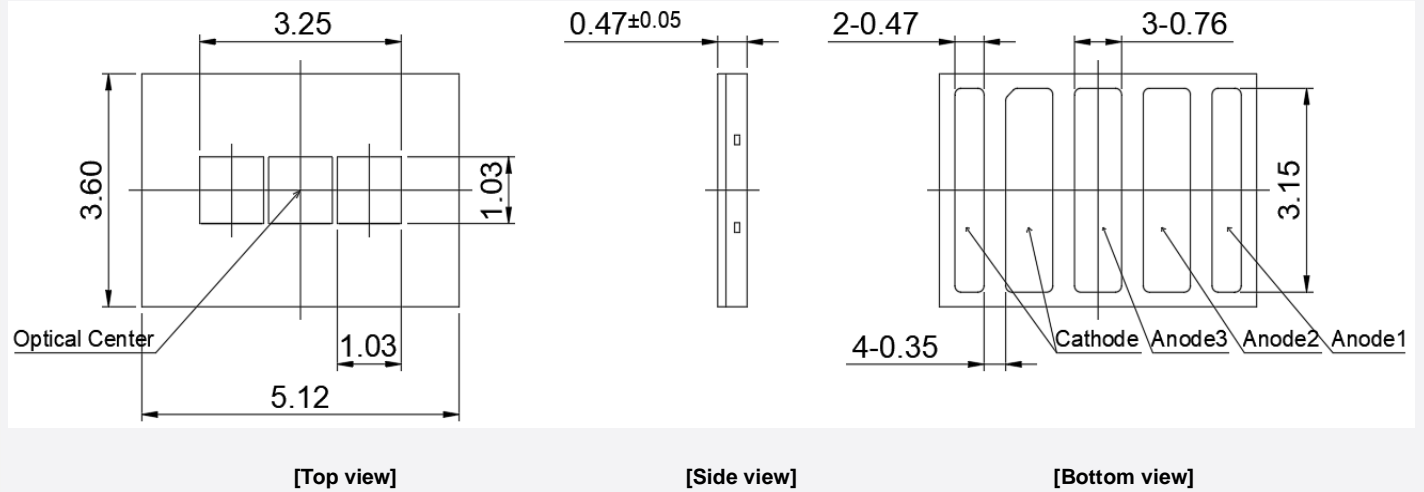


$T_j$  : Temperature of Junction

$T_s$  : 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 / Tolerance :  $\pm 0.1$  mm

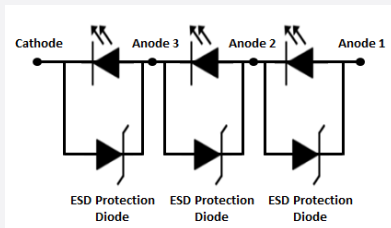
Approximate weight : 32mg

### a) Pick and Place

Do not place pressure on the resin molded part

It is recommended to use a pick & place nozzle CNT 3X5, etc.

### b) Electric Schematic Diagram

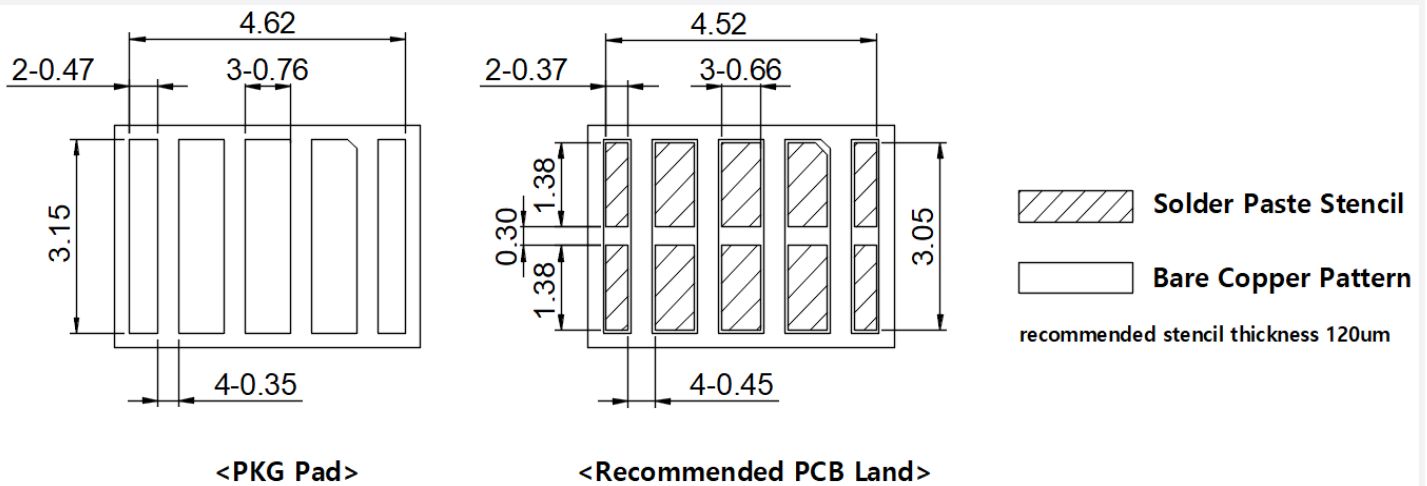


### c) Material Information

Description	Material
Substrate	Lead frame
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

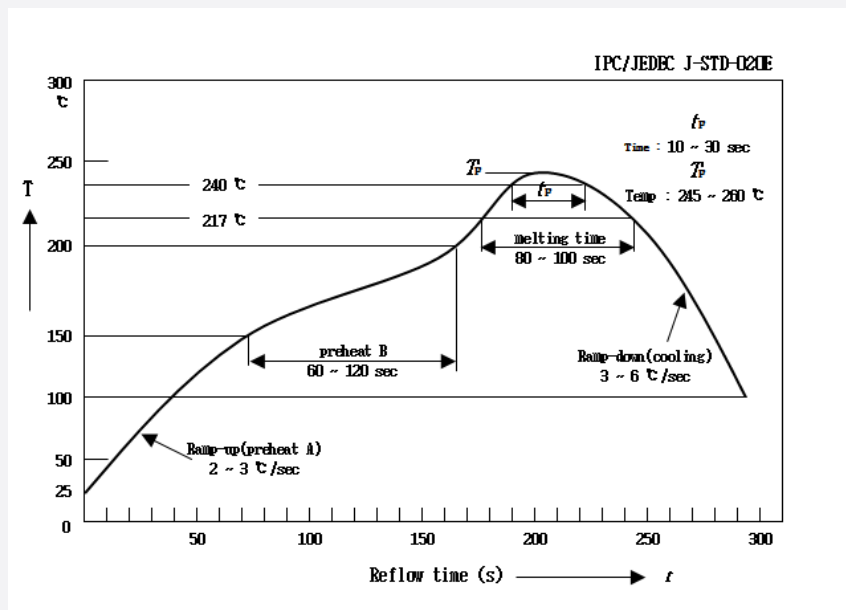


#### Notes:

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

### b) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



※ All temperature refer to the pad of package.

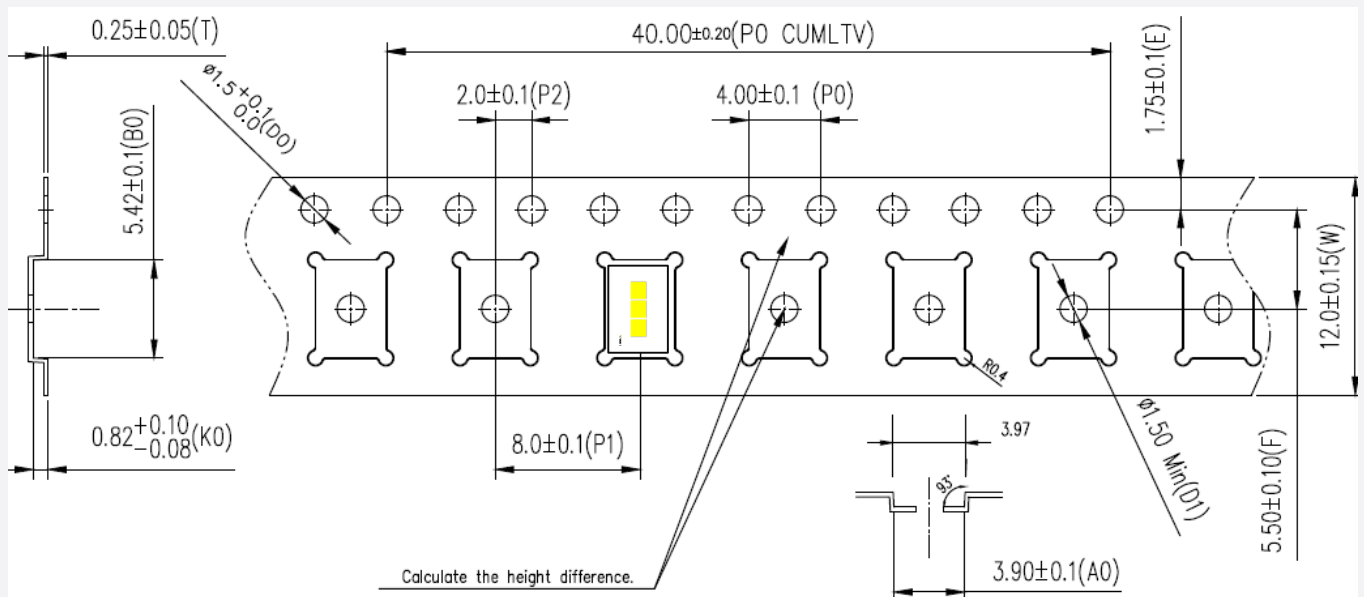
### c) Manual Soldering Conditions

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

## 7. Tape & Reel

### a) Taping Dimension

User feed direction →



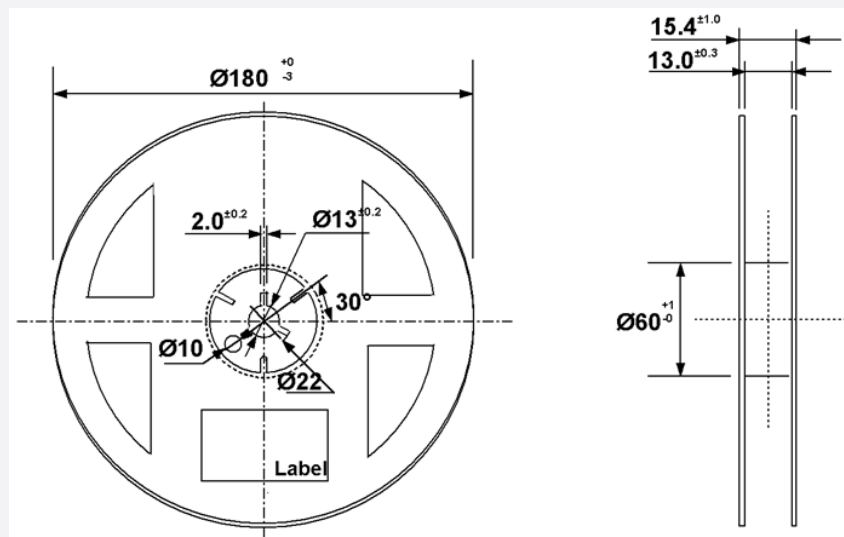
※ Package placement condition in a reel tape

Empty pocket (Min. 150mm)	LED mounting part	Empty pocket (Min. 300mm)
---------------------------	-------------------	---------------------------

Notes:

Unit: mm, LED taping quantity: 1,000ea (1Reel)

### b) Reel Dimension

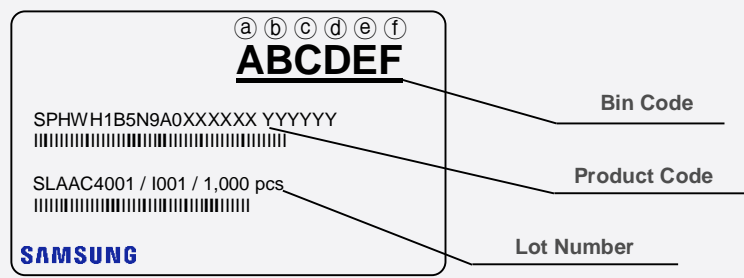


Notes:

Unit: mm, Tolerance:  $\pm 0.2$  mm

8. Label Structure

a) Label Structure



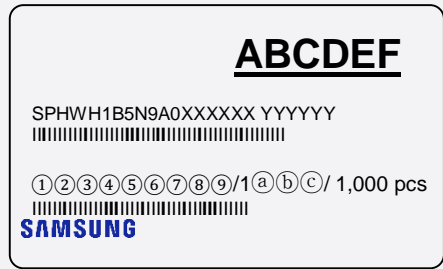
Note: Denoted bin code and product code above is only an example (see description on page 5)

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:



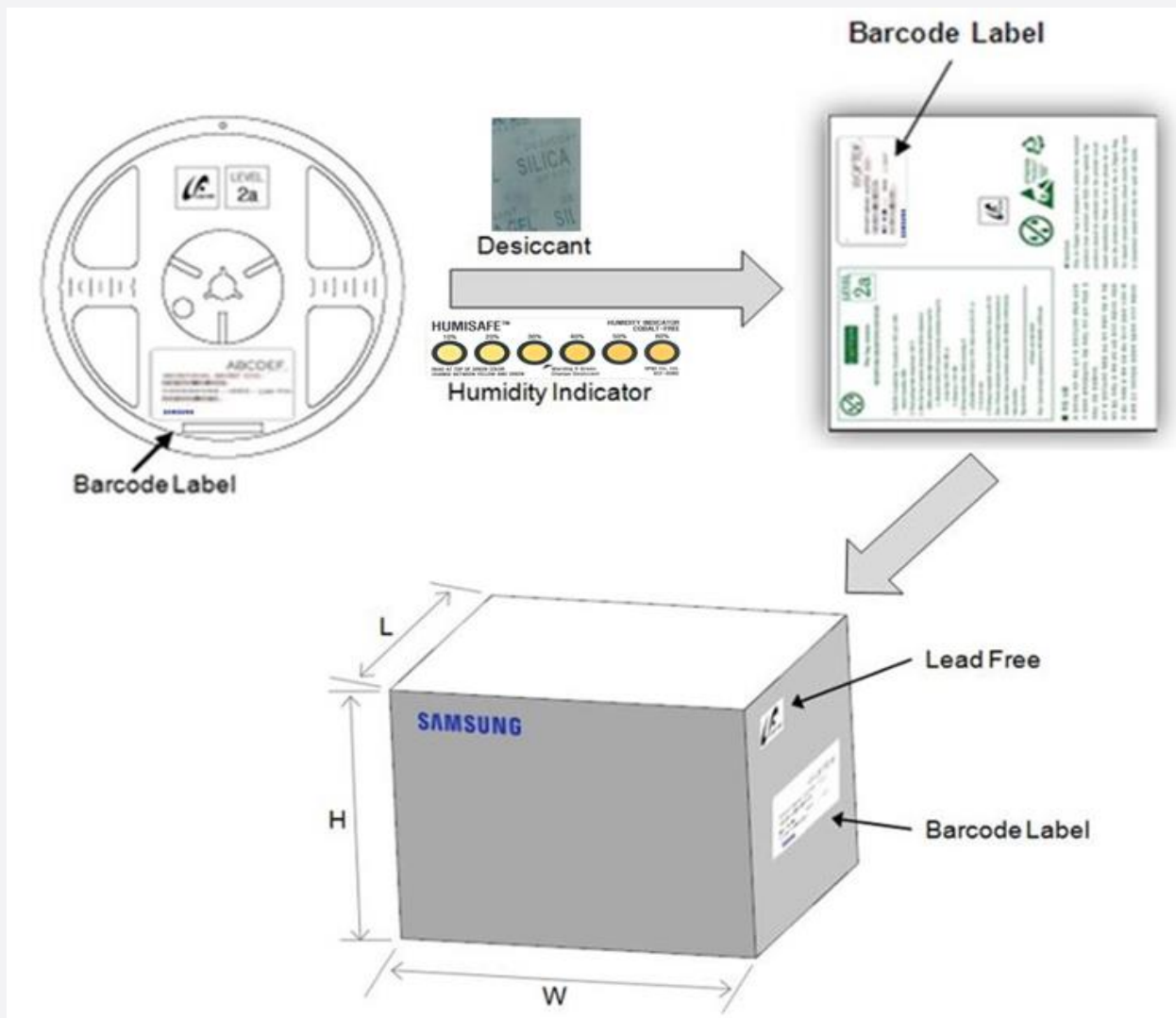
①②③③②③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / 1,000 pcs

①②	: Production site (Giheung)
③	: Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
④	: Year (E: 2020, F: 2021, G: 2022...)
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 1,000pcs)



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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