

High Power LED S-Series

# 1W Red

## SPHRDTS2N100



### Features

- Package : Lead frame package
- Dimension : 2.30 mm x 2.30 mm
- Chip Technology : Thin GaN
- ESD : 8 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM)
- Qualifications : AEC-Q102 Qualified with RV-level 0



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## 1. Characteristics

### a) Typical Characteristics

[T<sub>S</sub> = 25°C] [1]

Item	Symbol	Value	Unit
Luminous Flux (I <sub>F</sub> = 350 mA)	Φ <sub>V</sub>	Typ. 55	lm
Forward Voltage (I <sub>F</sub> = 350 mA)	V <sub>F</sub>	Typ. 3.0	V
Viewing Angle	Φ	Typ. 113	°
Reverse Current	I <sub>R</sub>	Not designed for reverse operation	
Real Thermal Resistance (Junction to Solder point)	R <sub>th_J-S (Real)</sub>	Typ. 4.0	K/W
		Max. 6.0	
Electrical Thermal Resistance (Junction to Solder point)	R <sub>th_J-S (Elec.)</sub>	Typ. 3.0	K/W
		Max. 5.0	
Radian Surface	A	1.35	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 <sub>a</sub>	-40 ~ +125	°C
Storage Temperature	T <sub>stg</sub>	-40 ~ +125	°C
LED Junction Temperature	T <sub>j</sub>	150	°C
Maximum Forward current <sup>[2]</sup> (T <sub>S</sub> :25°C) <sup>[3]</sup>	I <sub>F</sub>	600	mA
Minimum Forward current <sup>[2]</sup> (T <sub>S</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 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 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	R	D	T	S	2	N	1	0	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 (RD for automotive RED color)
6	LED PKG version (T for initial version)
7 8	Product configuration and type (S2 for automotive 2323 PKG type)
9	Lens configuration (N for no lens)
10	Max.power (Internal code)
11 12	Specific property (00 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
$\Phi_V$	A2	40	45
	B2	45	50
	C2	50	55
	D2	55	60
	E2	60	65

**Note:**

[5] Luminous flux measuring equipment : CAS140CT

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

**b) Voltage Bins ( $I_F = 350 \text{ mA}$ ,  $T_S = 25^\circ\text{C}$ )**

Symbol	Voltage Bin Code	Voltage Range (V)	
		Min	Max
$V_F$	F3	2.8	3.1
	J3	3.1	3.4

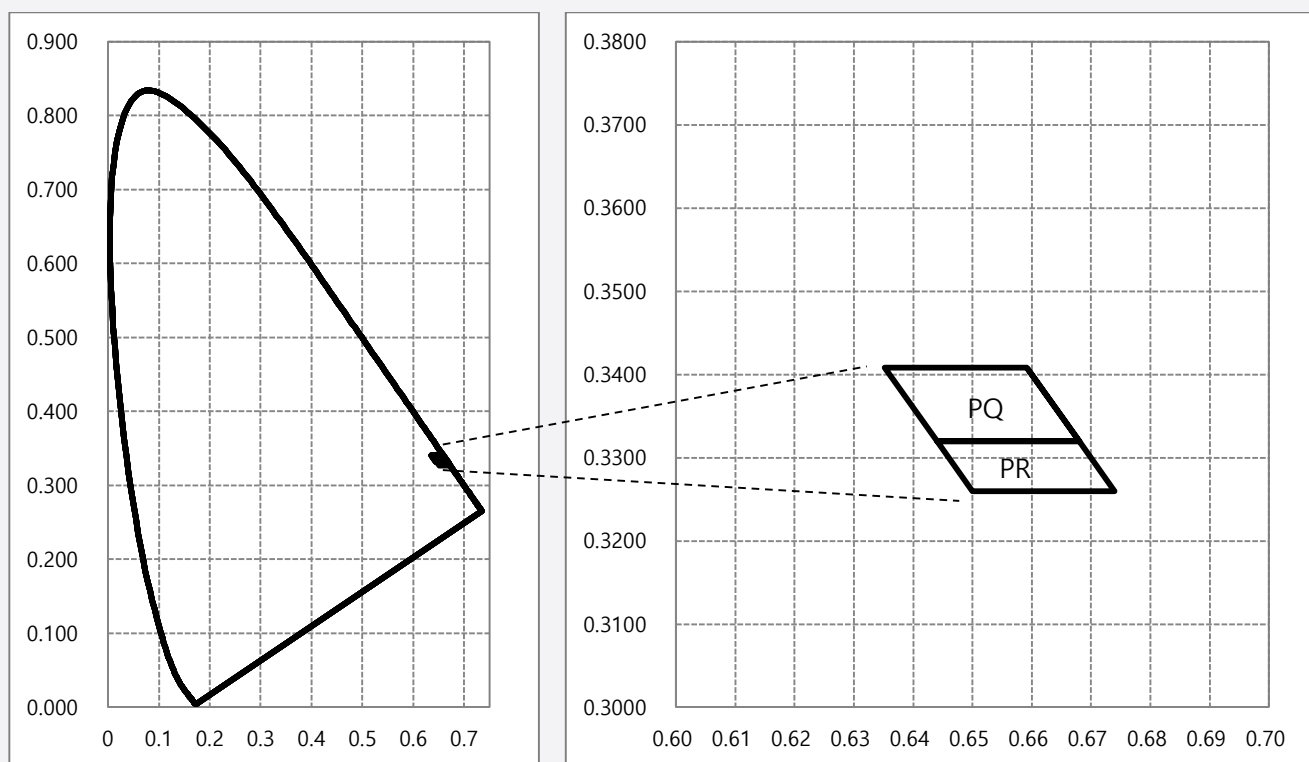
**c) Color Bins <sup>[6]</sup>( $I_F = 350 \text{ mA}$ )**

Symbol	Color Bin Code	Cx				Cy			
Cx, Cy	PQ	0.6592	0.6352	0.6440	0.6680	0.3408	0.3408	0.3320	0.3320
	PR	0.6680	0.6440	0.6500	0.6740	0.3320	0.3320	0.3260	0.3260

**Note**

[6] Luminous flux measuring equipment : CAS140CT

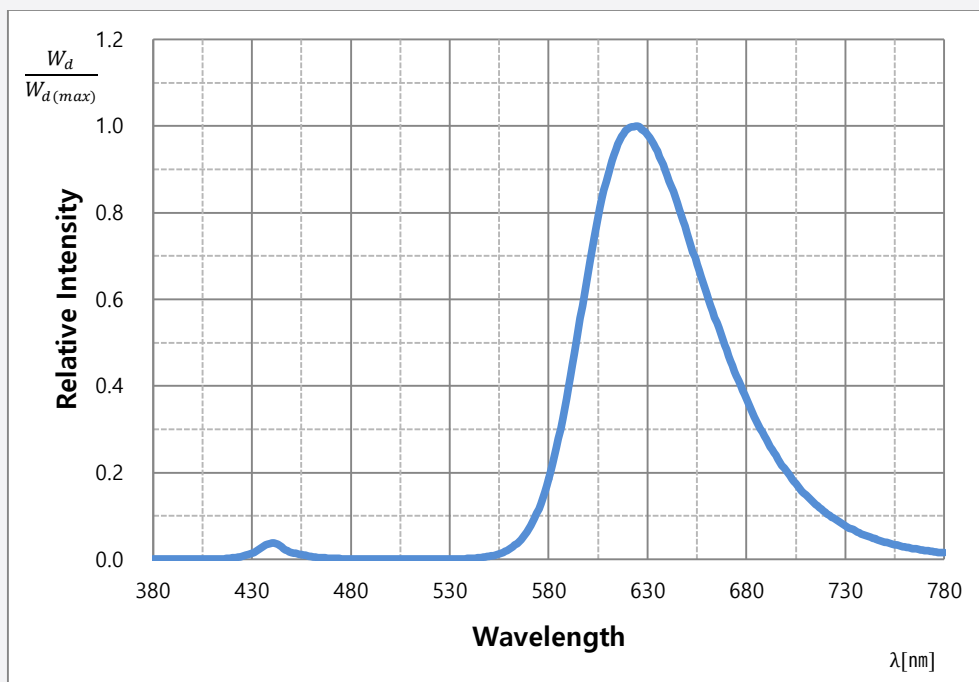
Chromaticity coordinates : Cx, Cy according to CIE 1931. Cx and Cy tolerances are  $\pm 0.005$ , respectively.


**d) Luminous Flux Bins according to Color Bin ( $I_F = 350 \text{ mA}$ ,  $T_s = 25 \text{ }^\circ\text{C}$ )**

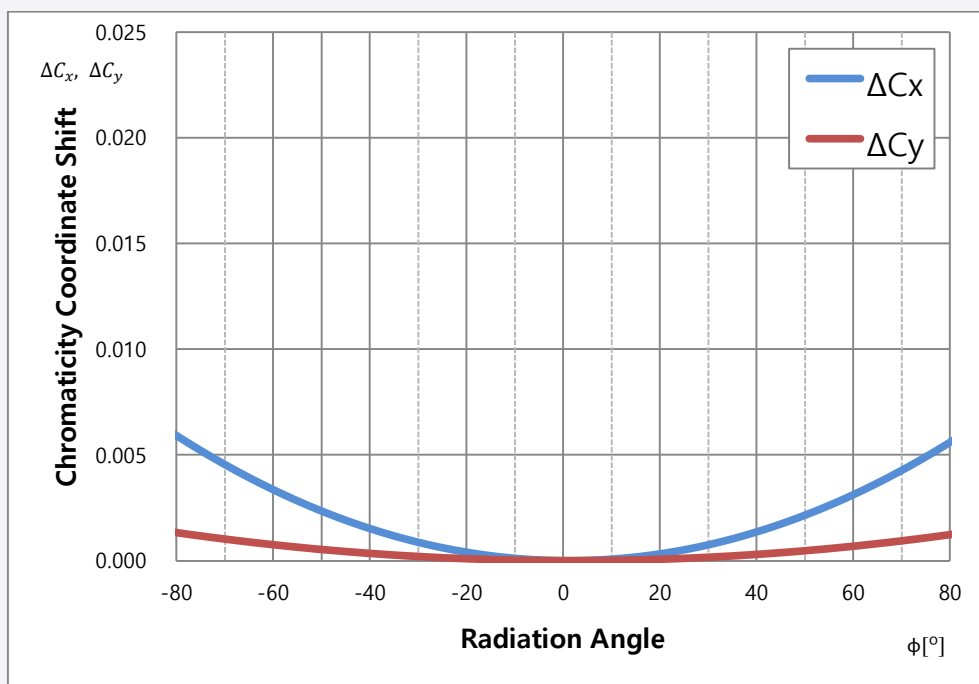
Symbol	Flux Bin Code	A <sub>2</sub>		B <sub>2</sub>		C <sub>2</sub>		D <sub>2</sub>		E <sub>2</sub>	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
		40	45	45	50	50	55	55	60	60	65
$\Phi_V$	PQ					O		O		O	
	PR	O		O		O					

### 3. Typical Characteristics Graphs

#### a) Spectrum Distribution ( $I_F = 350 \text{ mA}$ , $T_S = 25 \text{ }^\circ\text{C}$ )



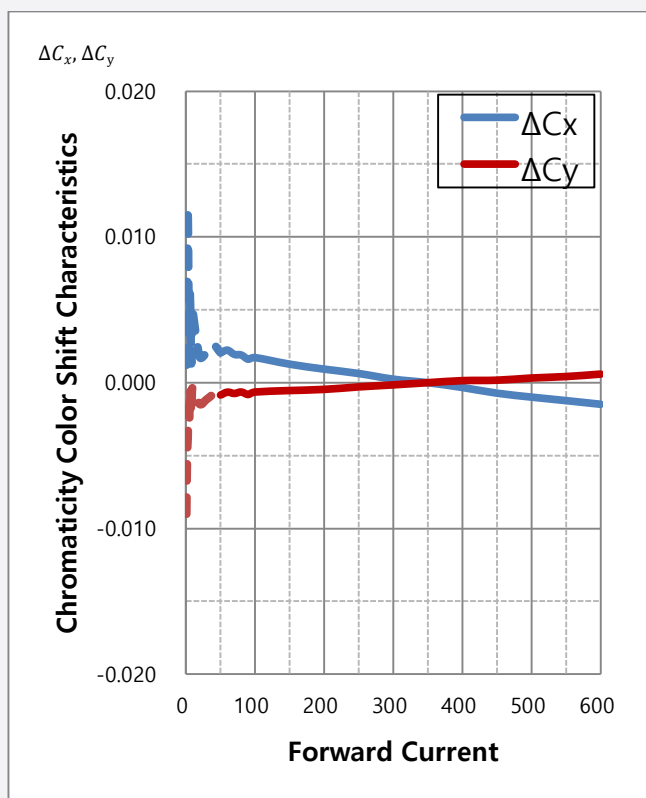
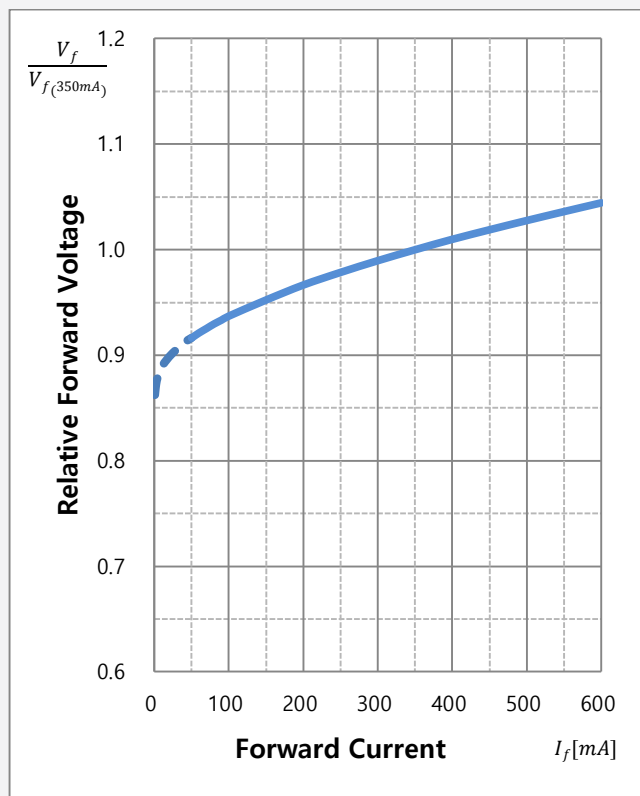
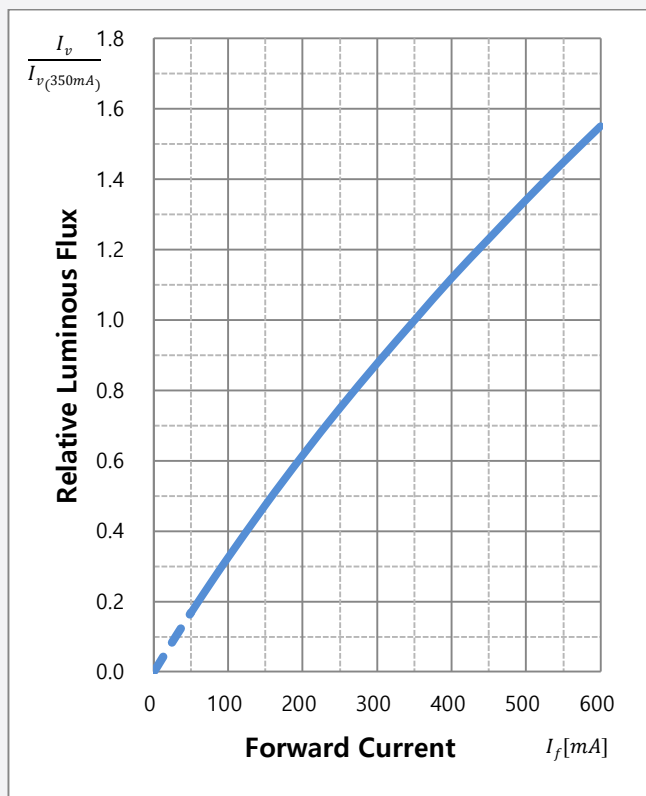
#### b) Typical Chromaticity Coordinate Shift vs Forward Current ( $I_F = 350 \text{ mA}$ , $T_S = 25 \text{ }^\circ\text{C}$ ) [7]



**Note:**

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

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

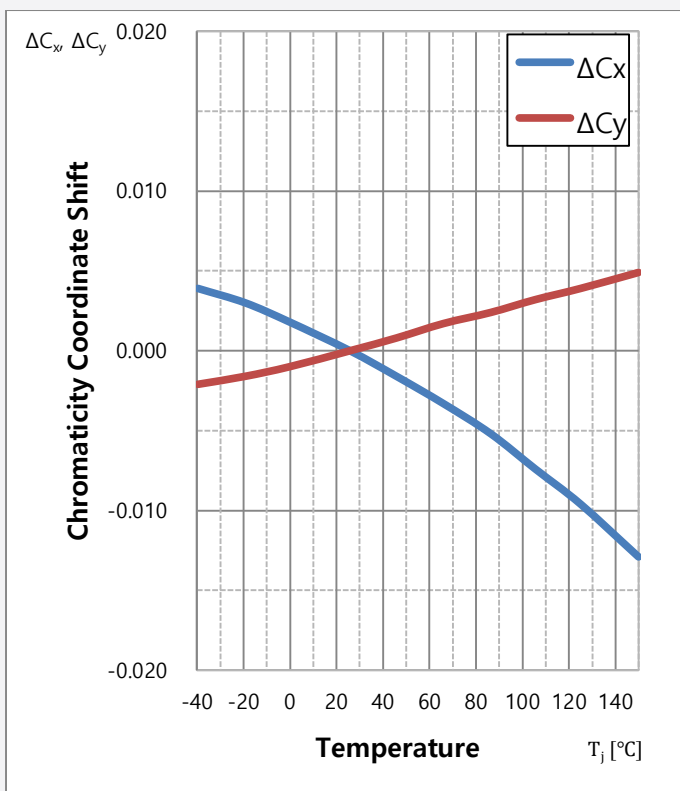
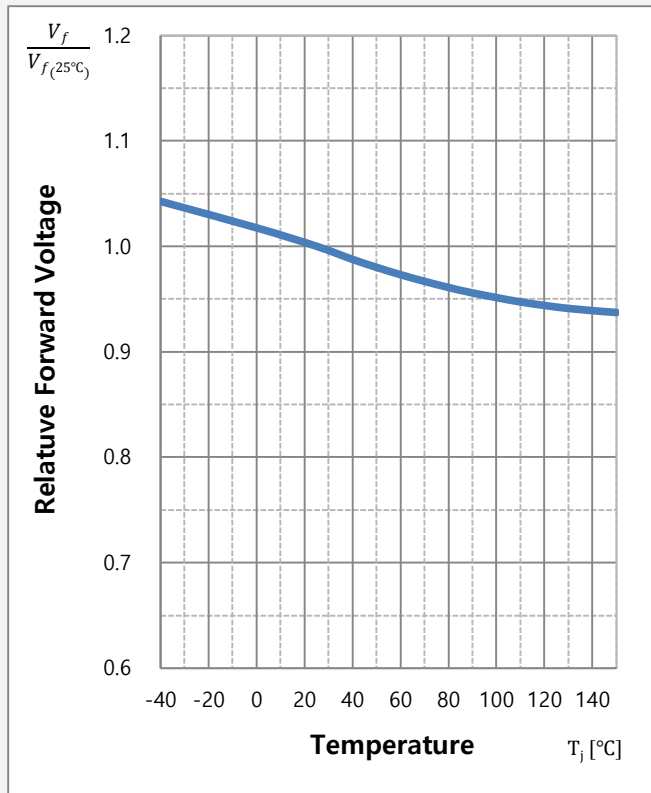
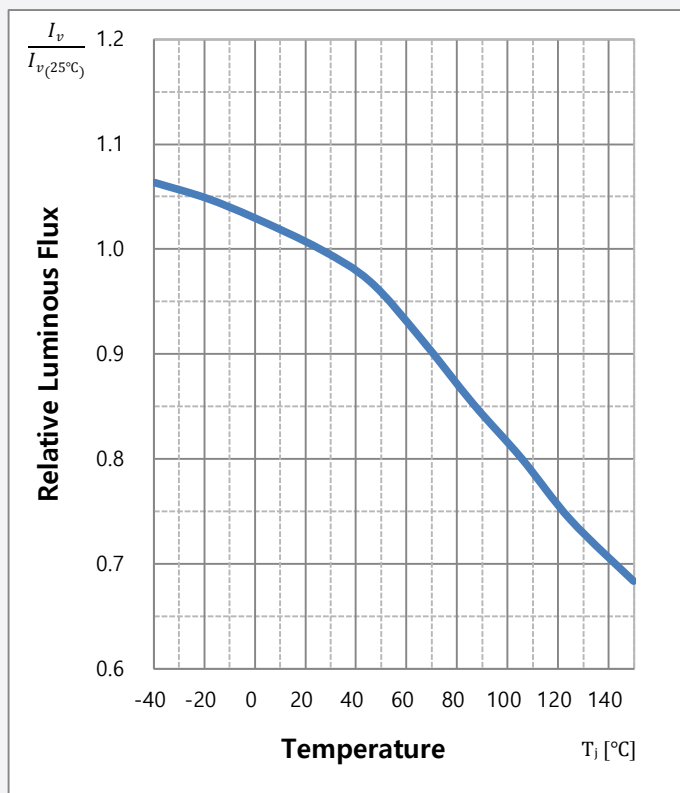


#### Note:

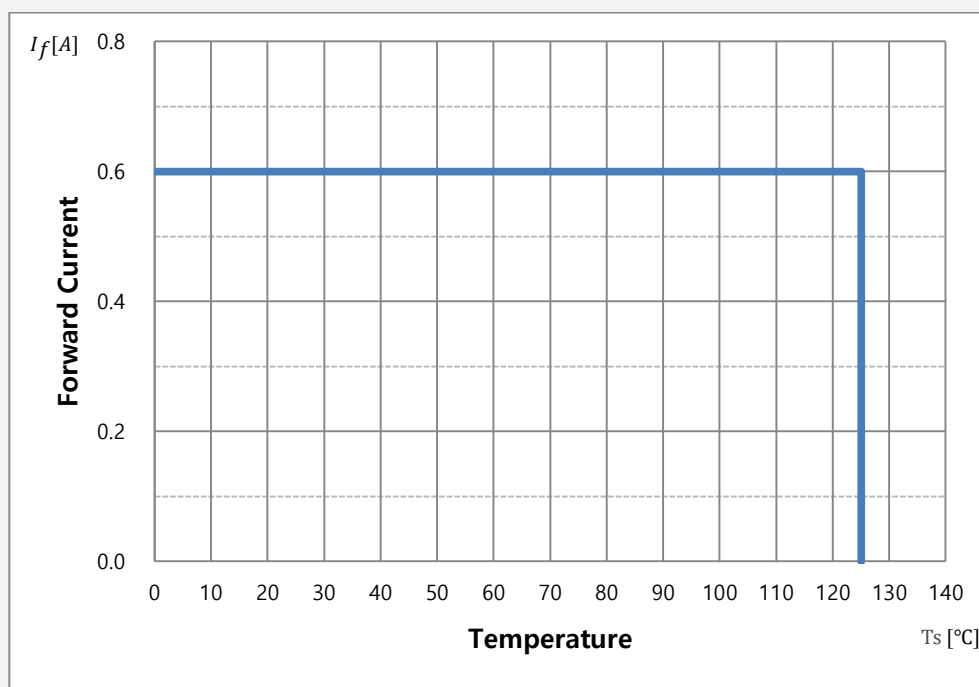
[8] The measurement condition means that temperature dependence is excluded by applying pulse current for typically 25 ms



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



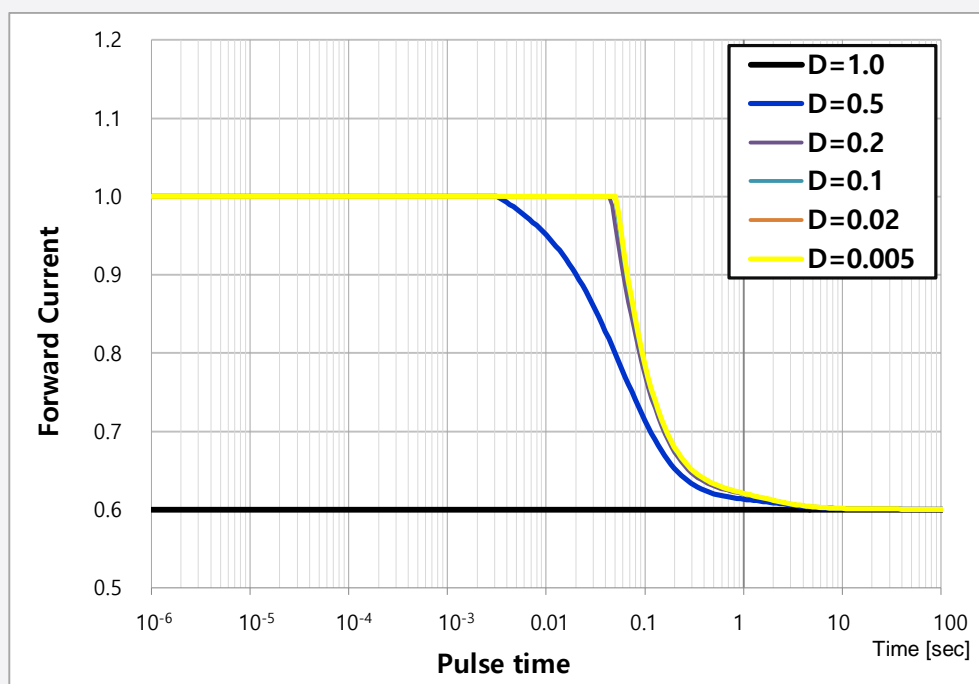
### e) Derating Curve<sup>[9]</sup>



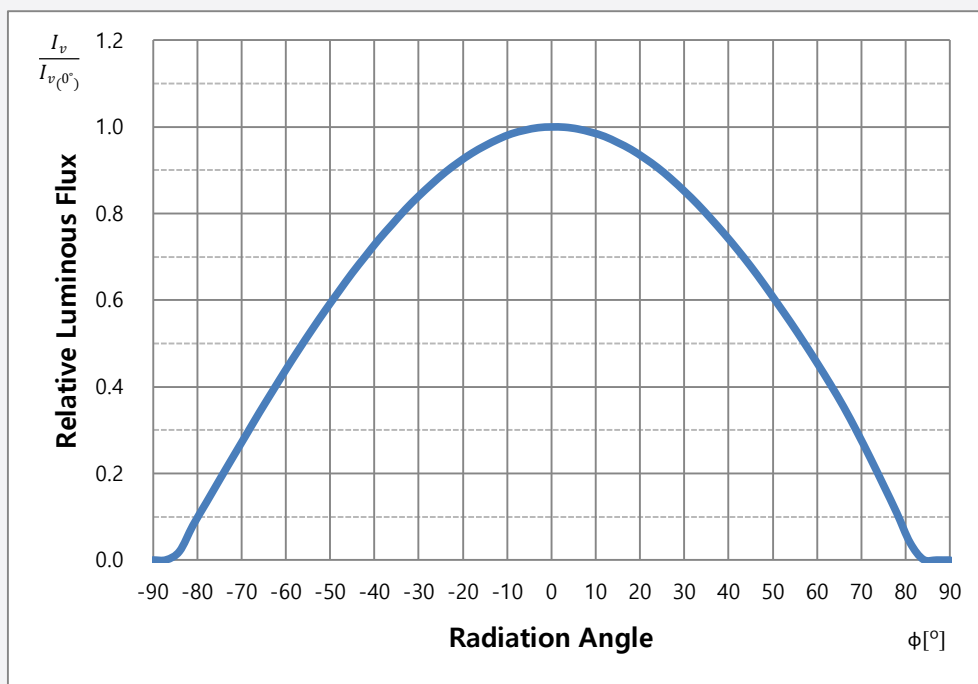
#### Note:

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

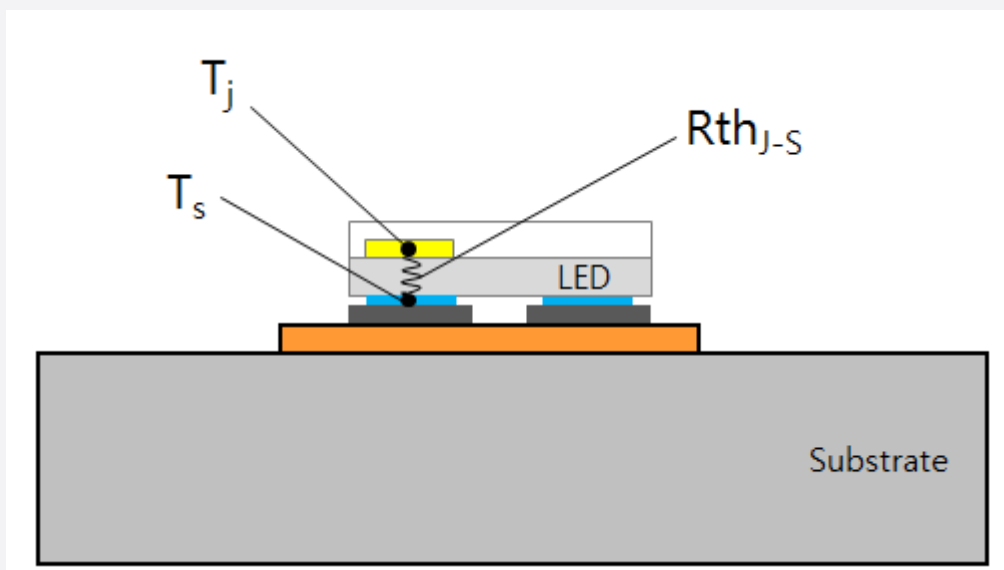
### f) Permissible Pulse Handling Capability ( $I_F = f(t_p)$ ; D: Duty cycle, $T_s = 125$ °C)



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



#### 4. Soldering Temperature Location



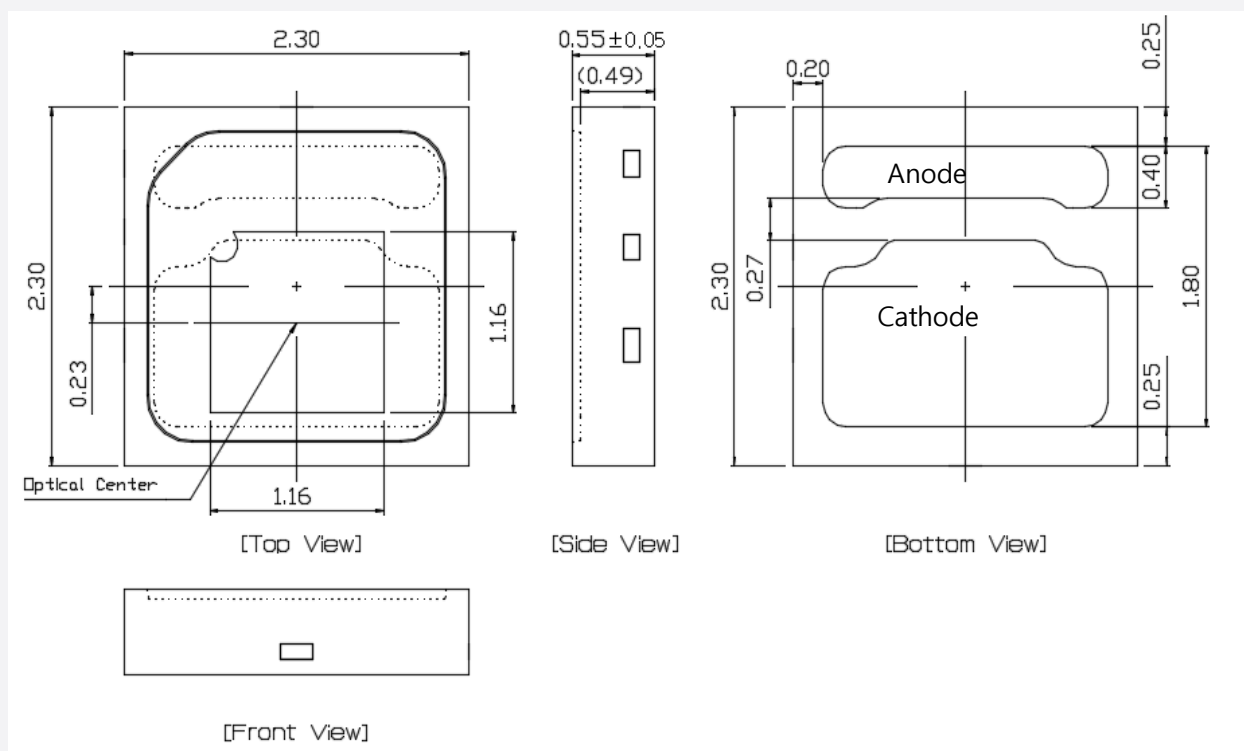
$T_j$  : Temperature of Junction

$T_s$  : Temperature of Solder Pad

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

## 5. Mechanical Dimension

Tolerance :  $\pm 0.1\text{mm}$



### Note:

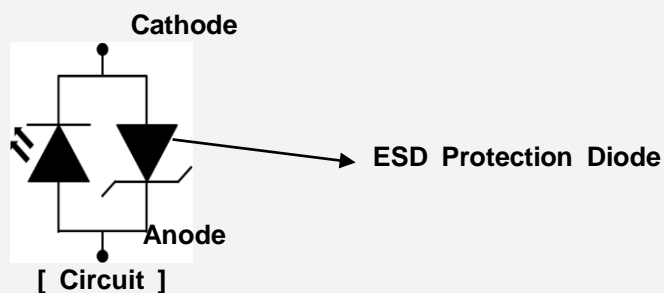
Approximate weight : 10.7mg

### a) Pick and Place

Do not place pressure on the resin molded part

It is recommended to use a pick & place nozzle CN140, etc..

### b) Electric Schematic Diagram

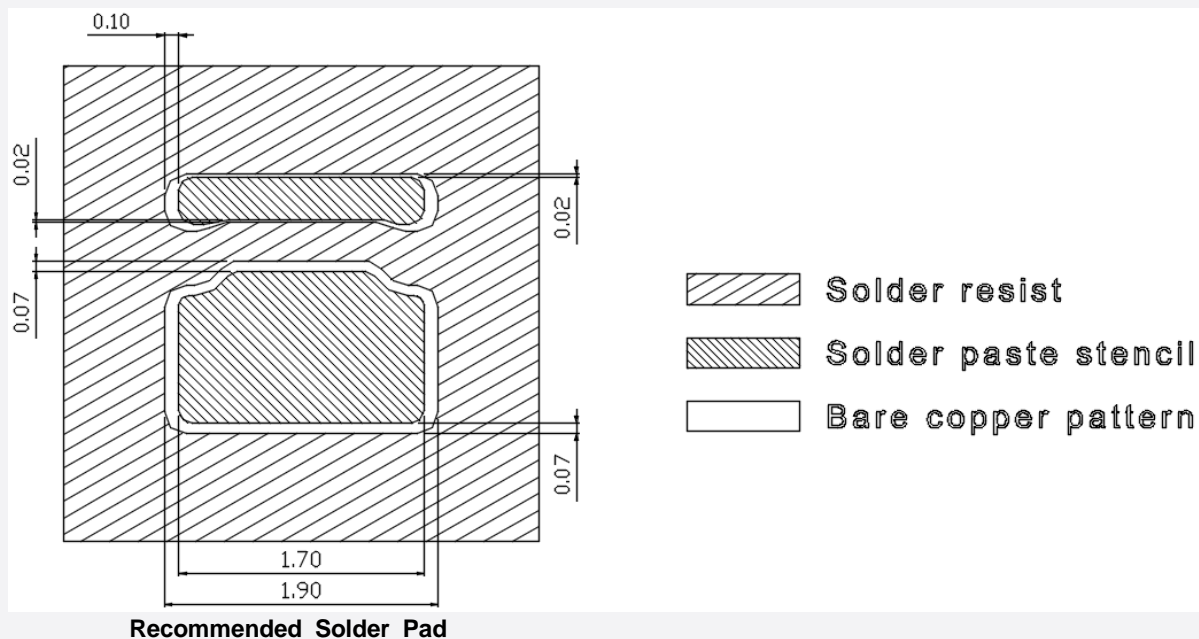


### c) Material Information

Description	Material
Substrate	SMC Cu Lead Frame
LED Die	Thin GaN
Phosphor	Phosphor
Zener Diode	Silicon
Wire	Au
Resin Mold	Silicone

## 6. Soldering Conditions

### a) Pad Configuration & Solder Pad Layout

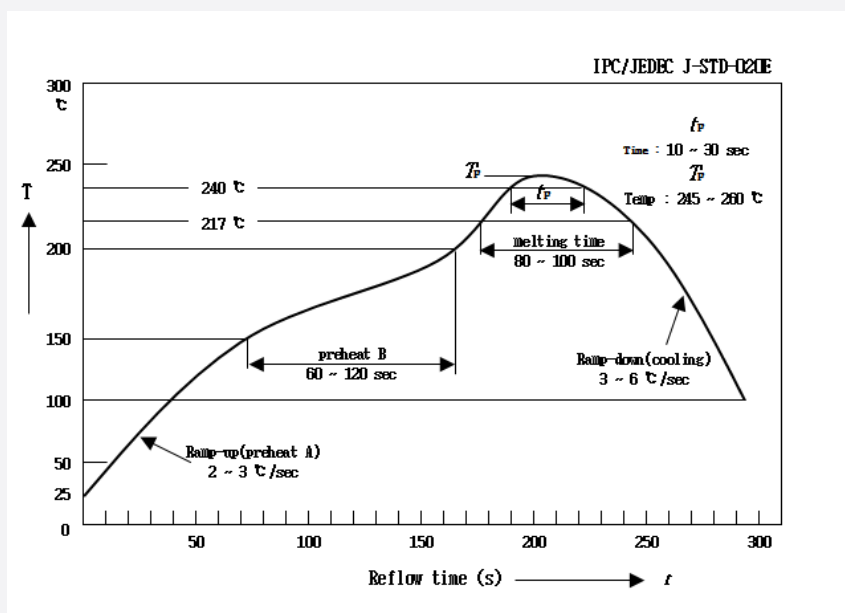


#### Notes:

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

### b) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



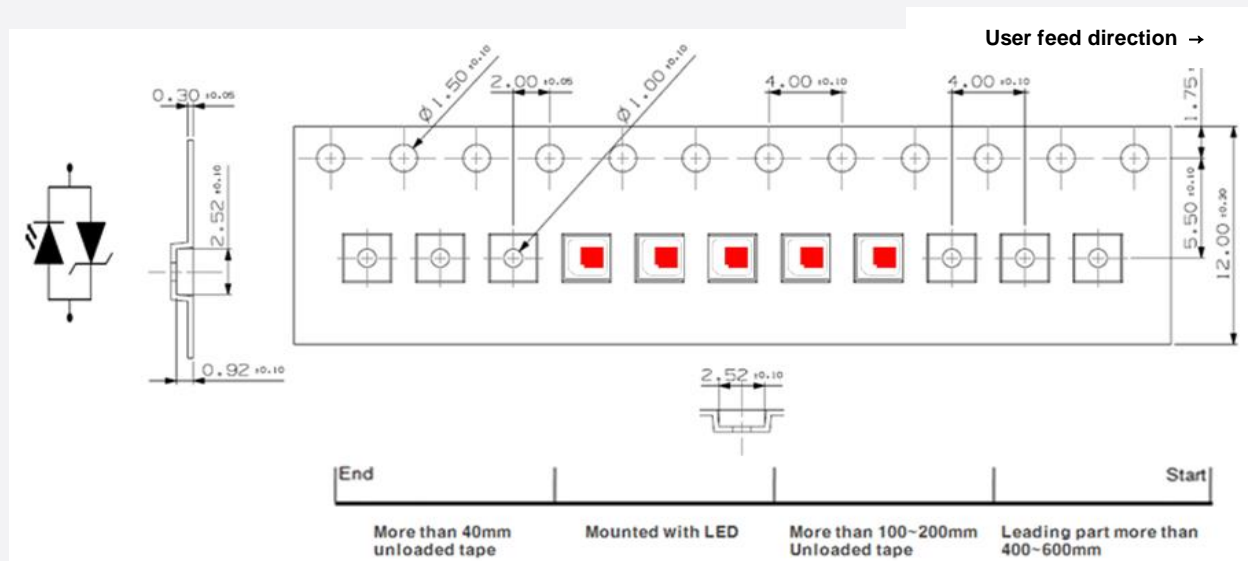
※ All temperature refer to the pad of package.

### c) Manual Soldering Conditions

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

## 7. Tape & Reel

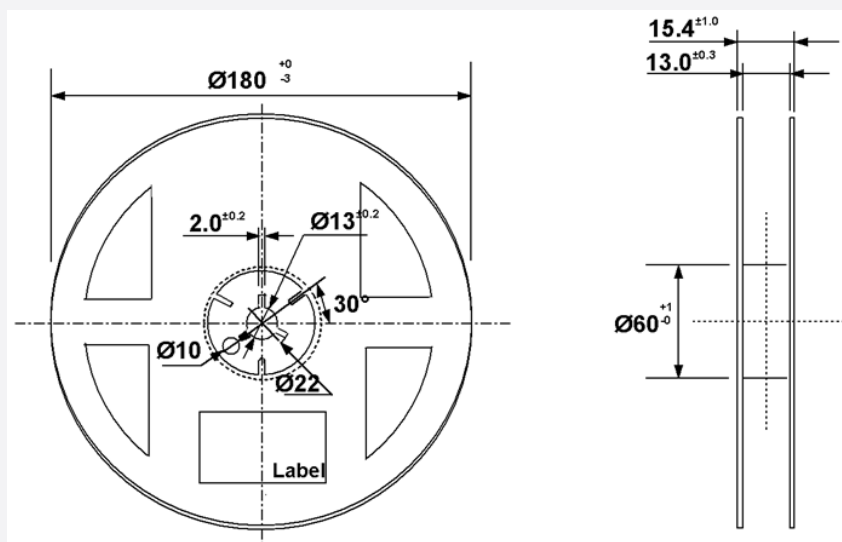
### a) Taping Dimension



#### Note:

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

### b) Reel Dimension

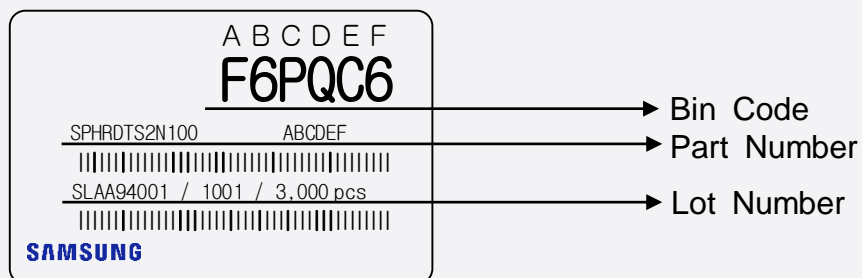


#### Notes:

Unit: mm, Tolerance :  $\pm 0.20$  mm

## 8. Label Structure

### a) Product Labeling Information



N.B) Denoted rank is the only example.

### b) Bin Code Structure

AB : Forward Voltage(VF) Bin (refer to page. 5)

CD : Color bin (Cx,Cy) (refer to page. 6)

EF : Luminous Flux(IV) Bin (refer to page. 5)

### c) Lot Number Structure

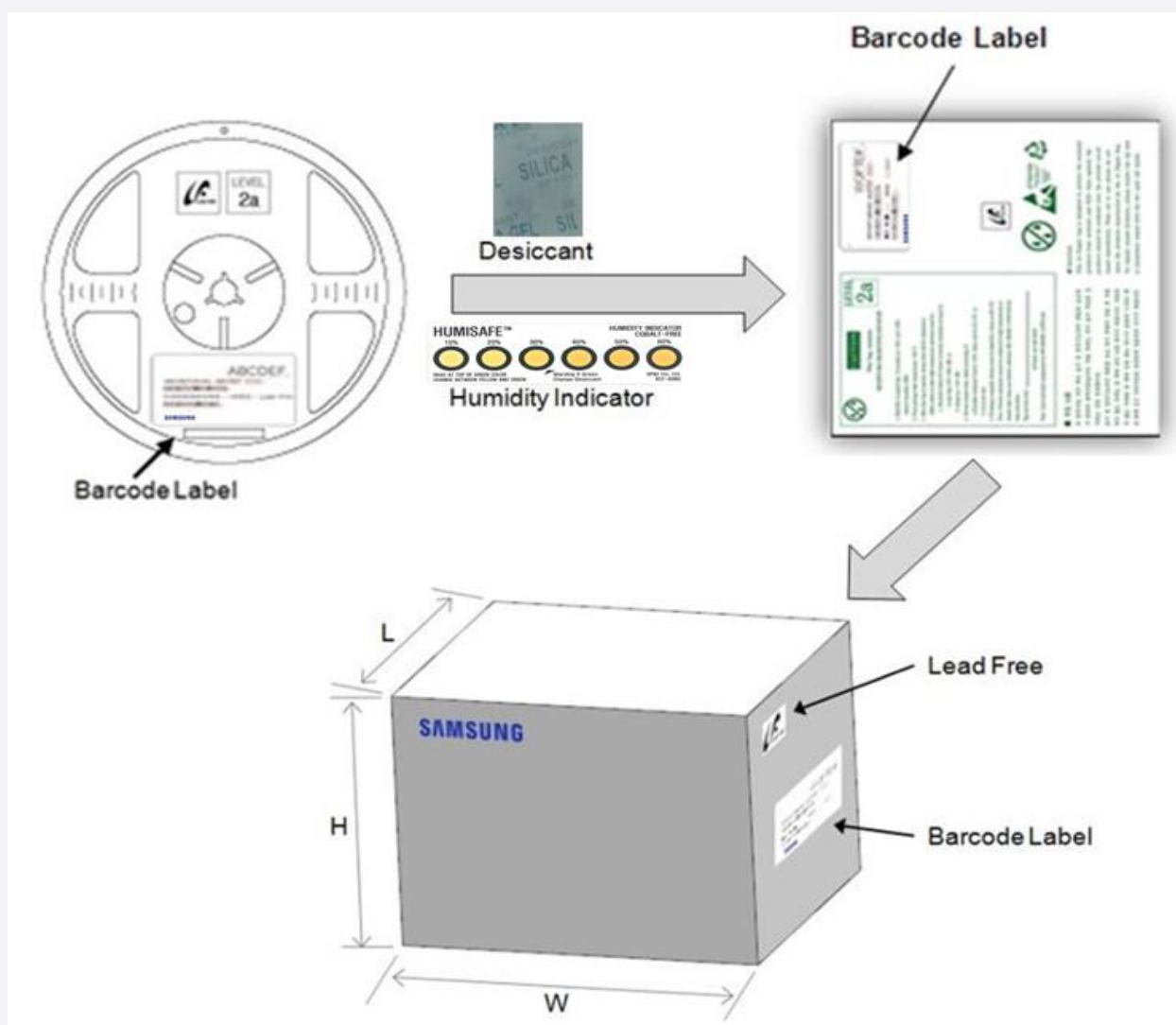
The lot number is composed of the following characters:

No.	Information
1	Production Site : S:SAMSUNG LED
2	LED
3	Product State A :Normality, B :Bulk, C :First Production, R :Reproduction, S :Sample
4	Year : G:2022, H:2022, I:2024 ...
5	Month : 1 ~ 9, A, B
6	Day : 1 ~ 9, A, B ~ V
789	Product number : 1 ~ 999
abc	Reel Number : 1 ~ 999



## 9. Packing Structure

### a) Packing Process



Dimension of Transportation Box in mm

Width	Length	Height
220	245	182

## 10. Handling and Use Precautions

- 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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