High Power LED C-Series Gen3

3W White

SPHWH1A1N3A0

Features

- Package : Ceramic package
- Dimension : 1.50 mm x 1.90 mm
- Chip Technology : Thin GaN
- ESD : 8 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM)
- Qualifications : AEC-Q102 Qualified with RV-level 2

SAMSUNG

Table of Contents

1. Characteristics

a) Typical Characteristics (T_S = 25℃)[1]

Item	Symbol	Value	Unit.
Chromaticity Coordinate	Cx Cy	0.32 0.33	
Luminous Flux (I_F = 1,000 mA)	Φ_V	Typ. 400	lm
Forward Voltage (I_F = 1,000 mA)	V_F	Typ. 3.0	V
Viewing Angle	Φ	Typ. 120	º
Reverse Current	I_R	Not designed for reverse operation	
Real Thermal Resistance (Junction to Solder point)	$R_{th\_J\text{-}S\ (Real)}$	Typ. 3.8 Max. 4.6	K/W
Electrical Thermal Resistance (Junction to Solder point)	$R_{th\_J\text{-}S\ (Elec.)}$	Typ. 2.5 Max. 3.0	K/W
Radiant Surface	A	1.06	㎟

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	ºC
Storage Temperature	T_{stg}	-40 ~ +125	ºC
LED Junction Temperature	T_j	150	ºC
Maximum Forward current[2] (T_S:25℃) [3]	I_F	1,500	㎃
Minimum Forward current[2] (T_S:25℃) [3]	I_F	50	㎃
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 ㎳

[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	3	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 first version up)
7 8	Product configuration and type (A1 for automotive 1XXX PKG type)
9	Lens configuration (N for no lens)
10	Typical power (3 for 3±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 = 1,000 mA, T_S= 25ºC)

Symbol	Flux Bin Code	Flux Range (lm)	
		Min	Max
Φ_V	DB	375	400
	EB	400	425
	FB	425	450
	GB	450	475

Note:

[5] Luminous flux measuring equipment : CAS140CT

Φ_V and V_F tolerances are ±7% and ±0.1V, respectively.

b) Voltage Bins (I_F = 1,000 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

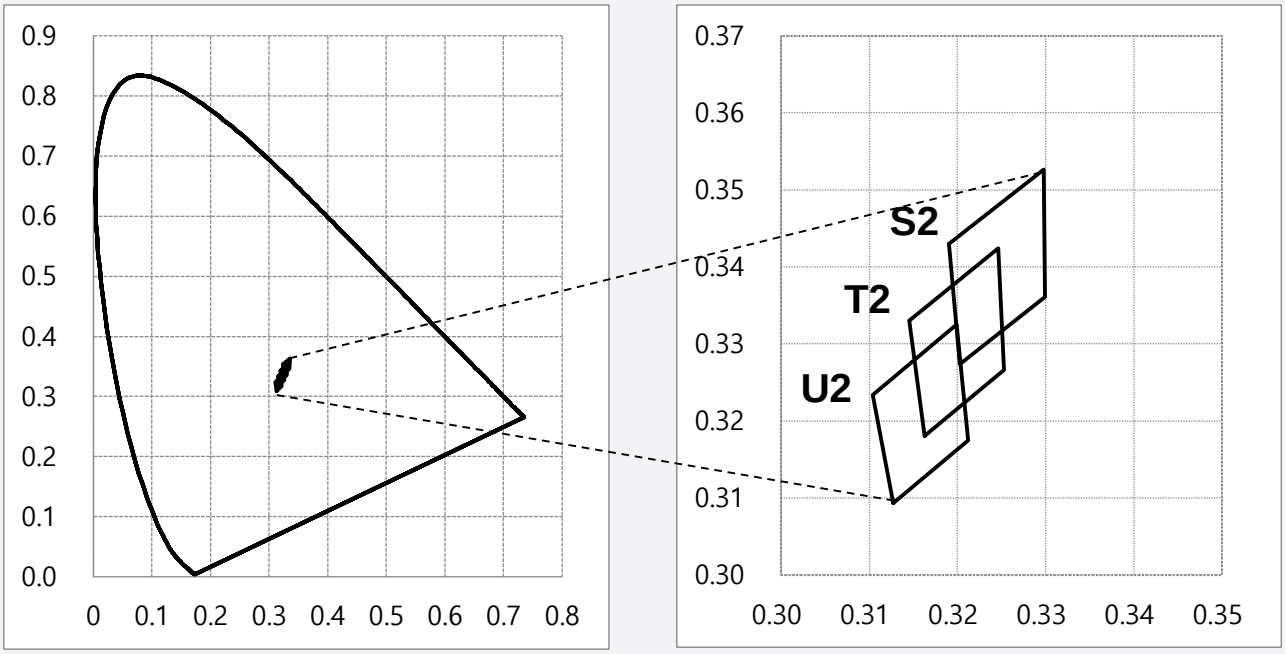
c) Color Bin [6](I$_F$ = 1,000 mA)

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 ±0.005, respectively.

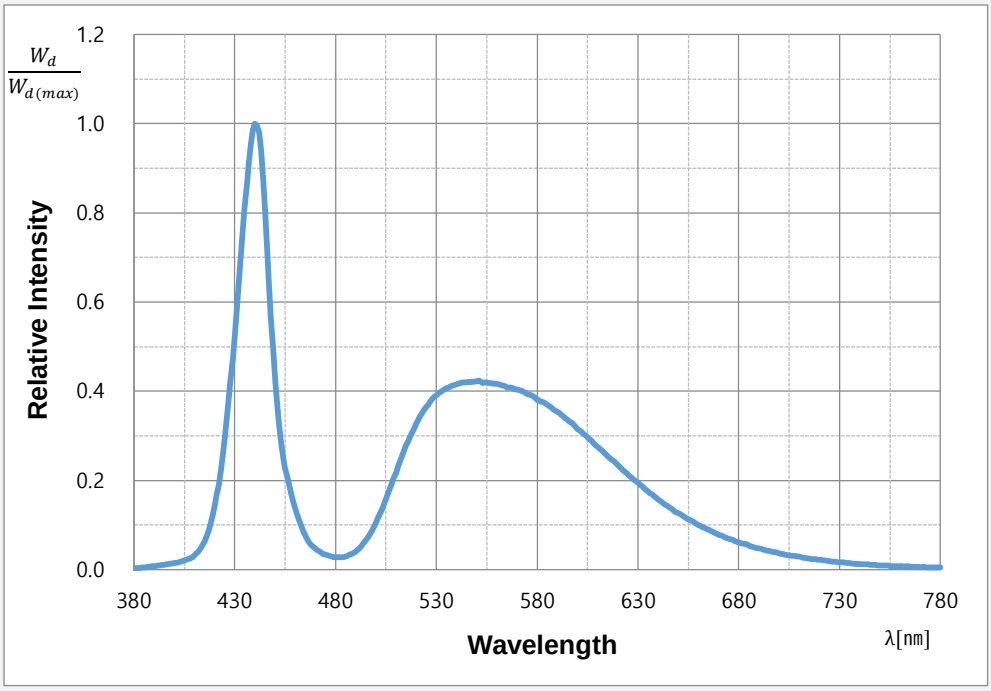


d) Luminous Flux Bins according to Color Bin (I$_F$ = 1,000 mA, T$_S$ = 25 ºC)

Symbol	Flux Bin Code	DB		EB	
		Min	Max	Min	Max
		375	400	400	425
Φ_V	S2	O		O	
	T2	O		O	
	U2	O		O	

3. Typical Characteristics Graphs

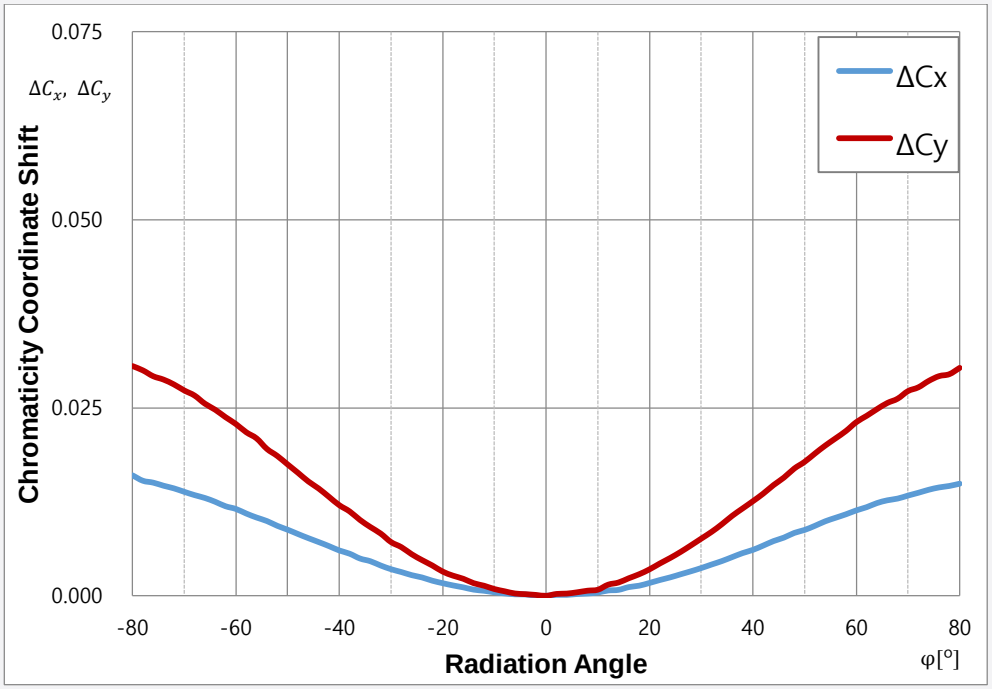
a) Spectrum Distribution (I_F = 1,000 mA, T_S= 25 ºC)



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

The UV radiation of the light (250~400nm) ≤10^{-5}W/lm according to ECE regulation

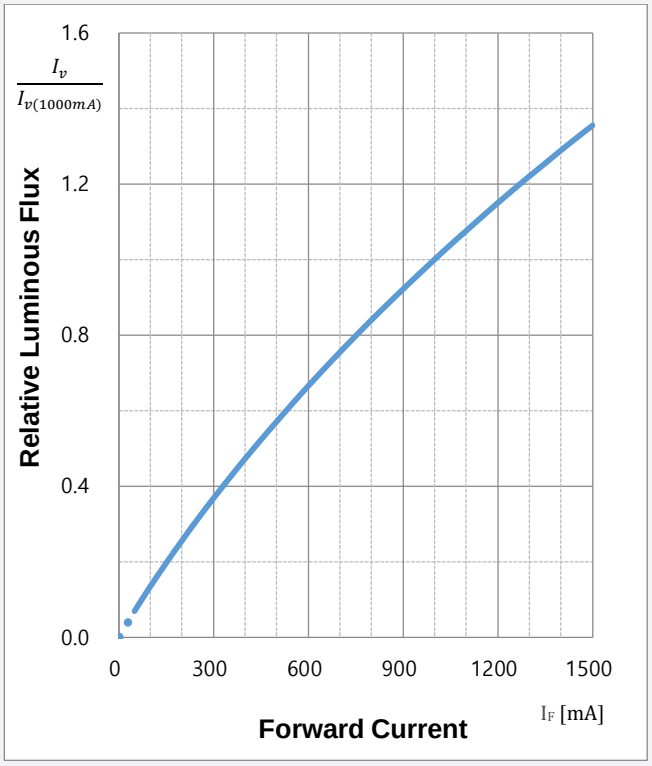
b) Typical Chromaticity Coordinate Shift vs Radiation Angle (I_F = 1,000 mA, T_S = 25 ºC) [7]

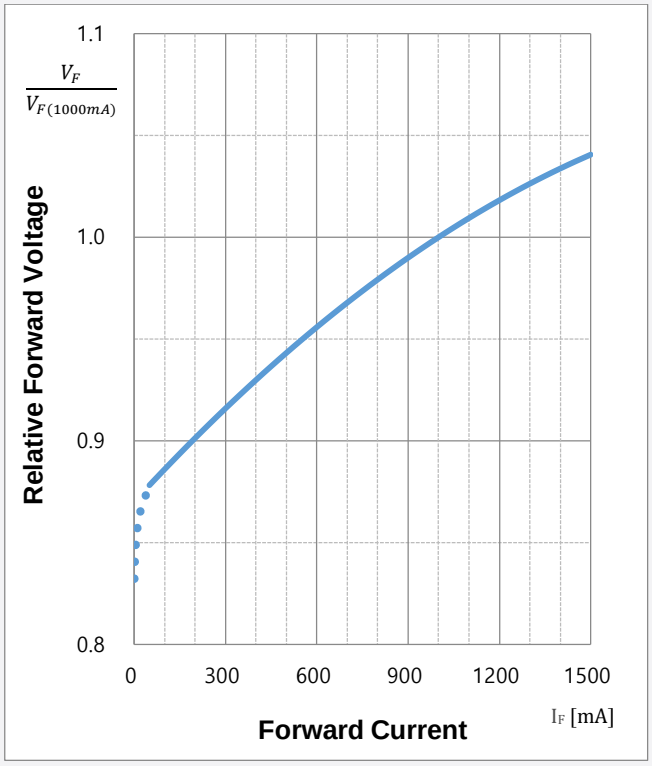


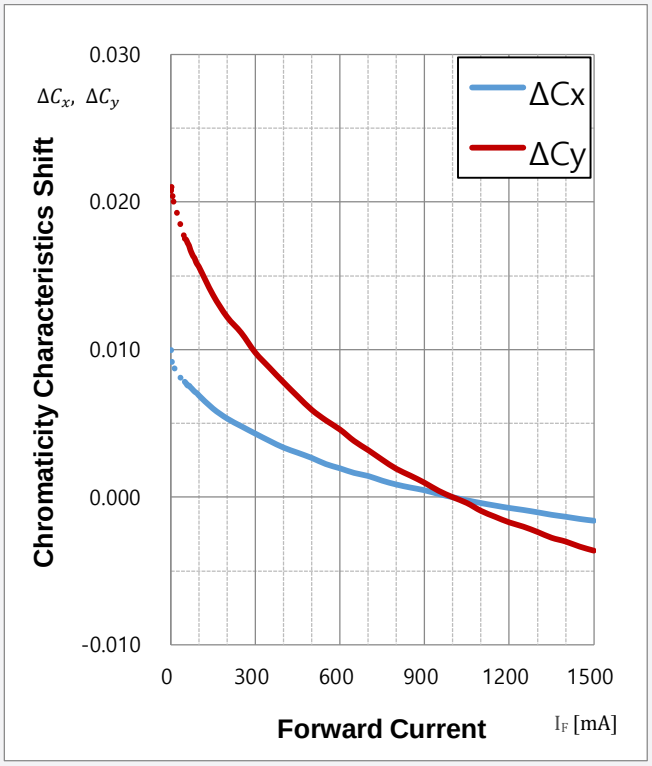
Note:

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

c) Forward Current Characteristics (T_S = 25 ºC) [8]



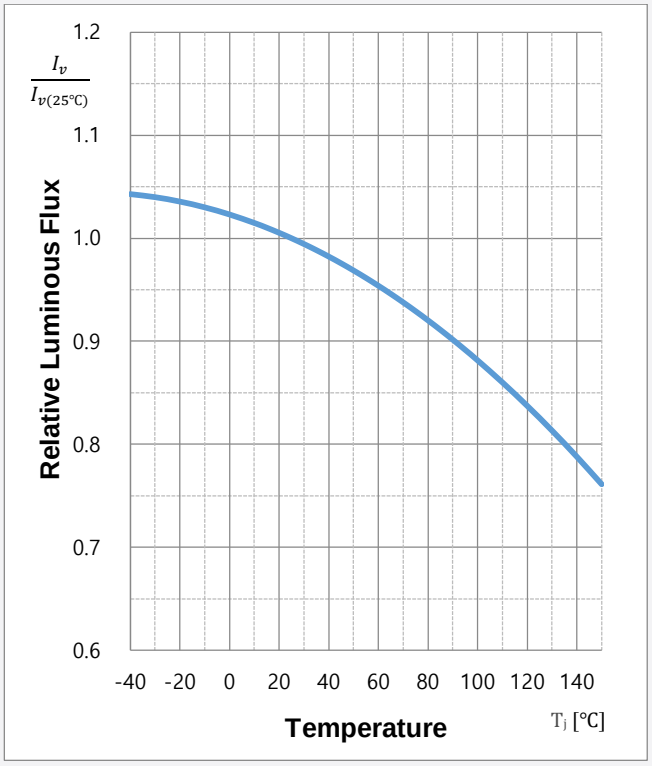


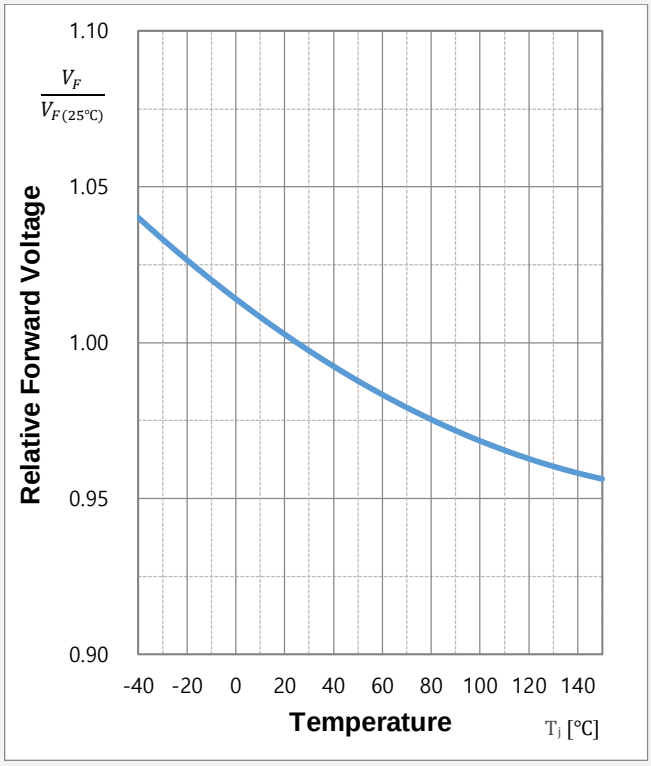


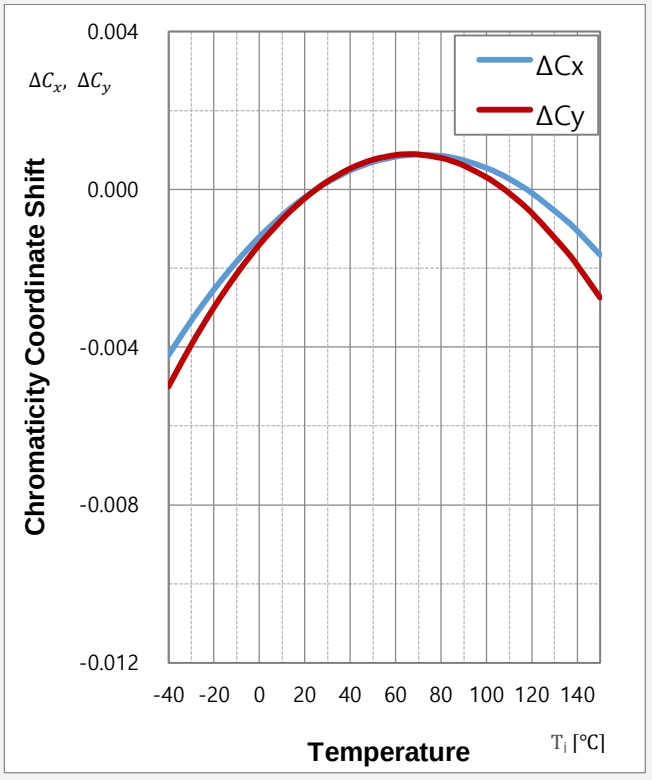
Note:

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

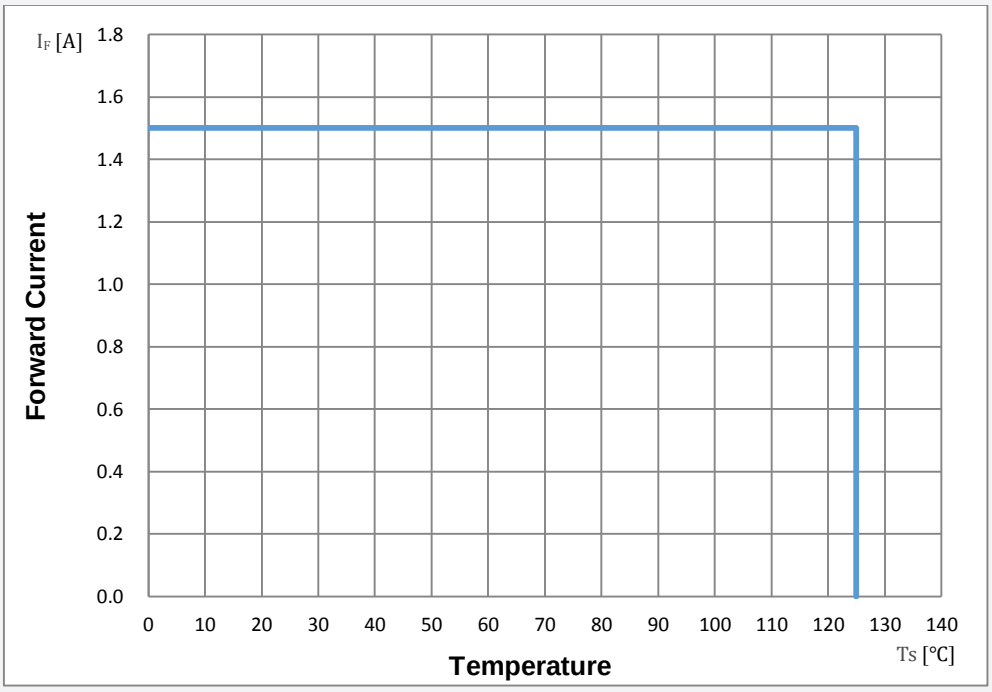
d) Temperature Characteristics (I_F= 1,000 mA)







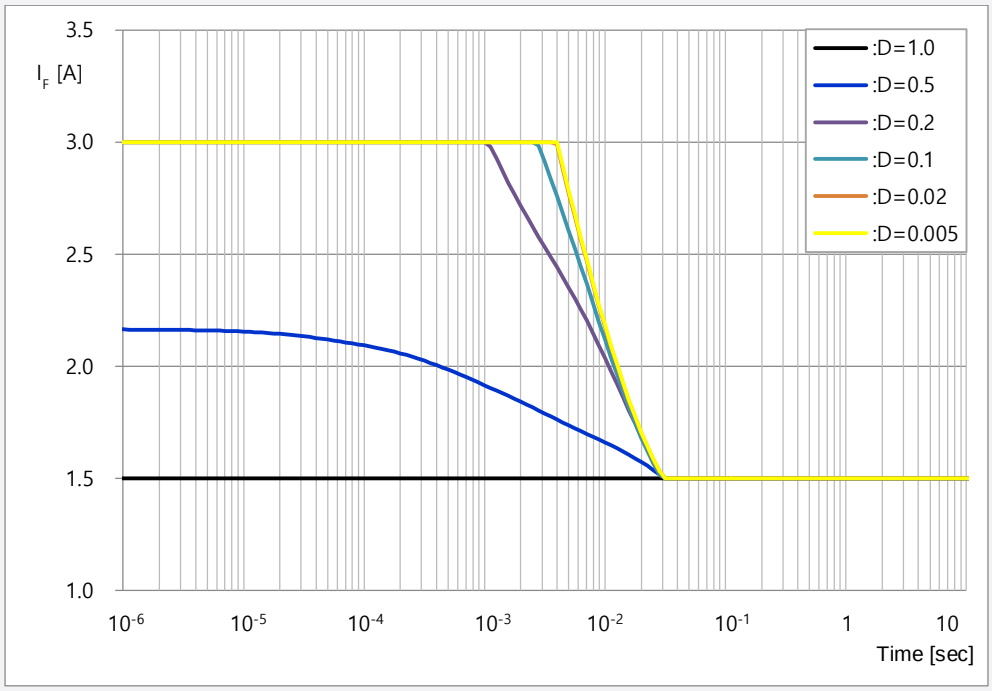
e) Derating Curve [9]



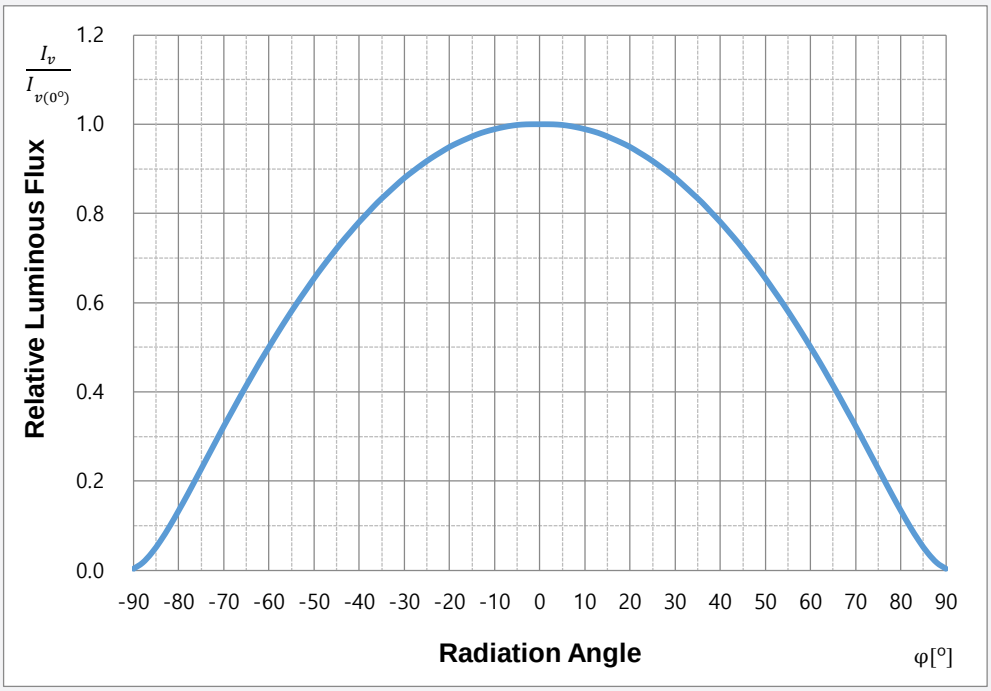
Note:

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

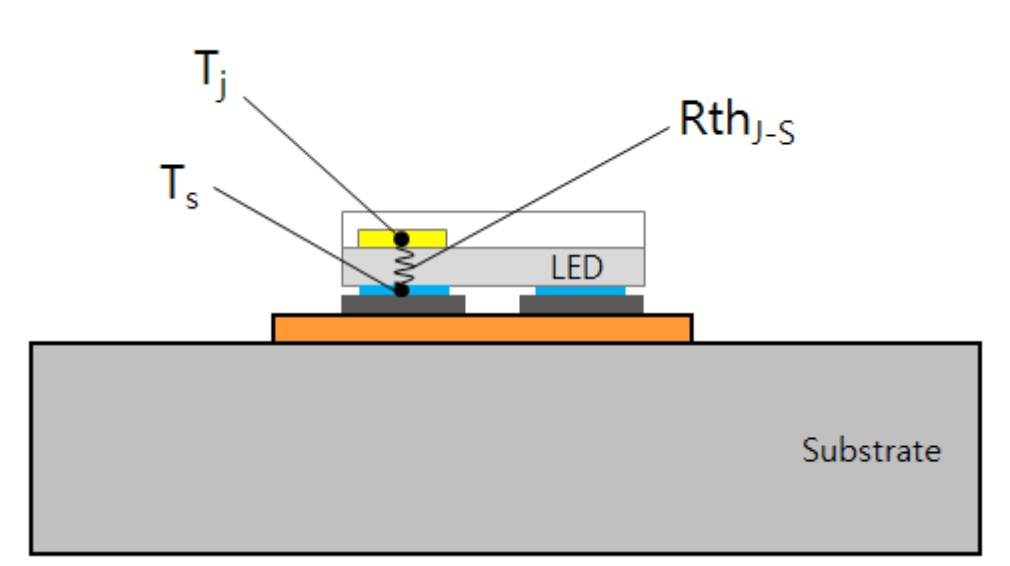
f) Permissible Pulse Handling Capacity ($I_F = f(t_P)$; D: Duty cycle, T_s = 125 ºC)



g) Beam Angle Characteristics (I_F = 1,000 mA, T_S = 25 ºC)



4. Soldering Temperature Location

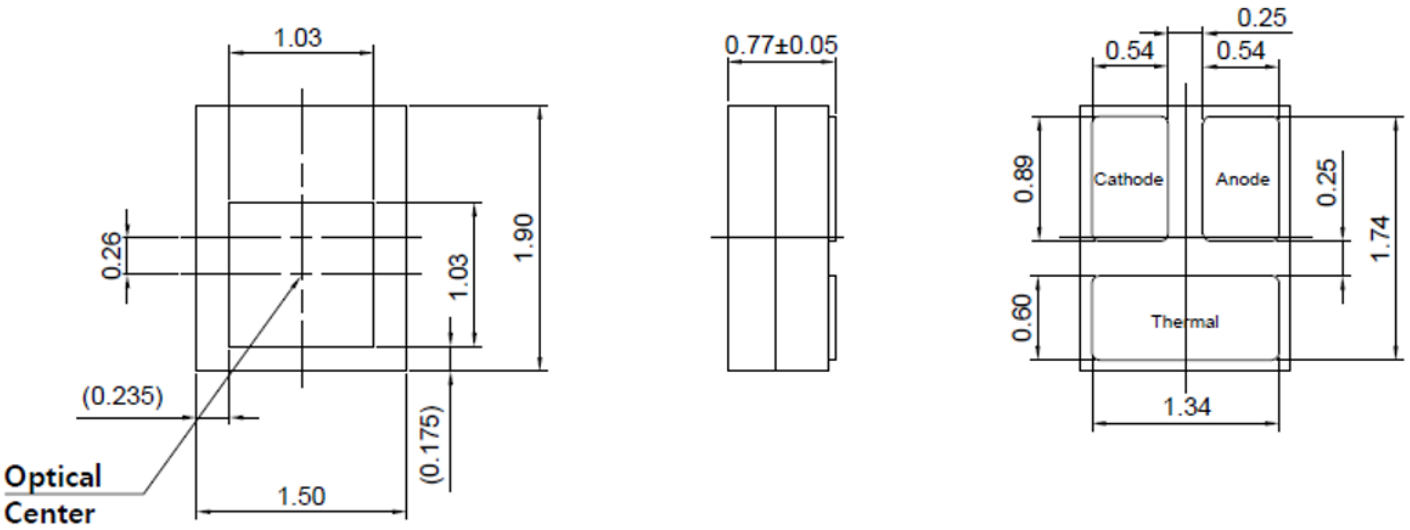


T_j : Temperature of Junction

T_S : Temperature of Solder Pad

R_{thJS} : Thermal Resistance from Junction to Solder Pad

5. Mechanical Dimension



[Top view] **[Side view]** **[Bottom view]**

Note:

The dimensions in parentheses are for reference purposes.

Unit: mm, Tolerance: ±0.1 ㎜

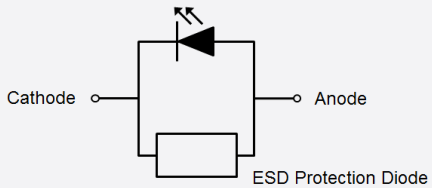
Approximate weight : 6.5mg

a) Pick and Place

Do not place pressure on the resin molded part

It is recommended to use a pick & place nozzle CN065, etc.

b) Electric Schematic Diagram

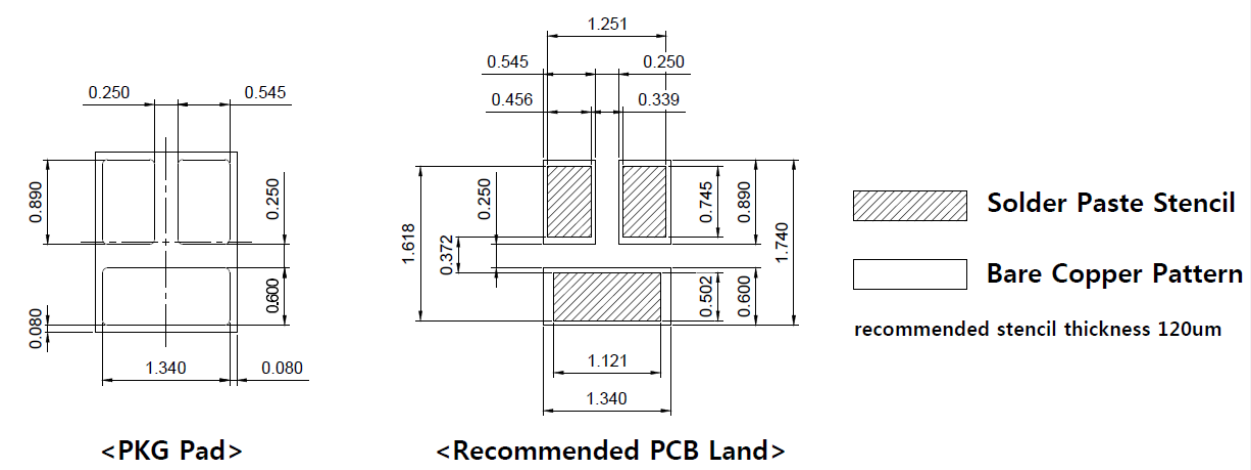


c) Material Information

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

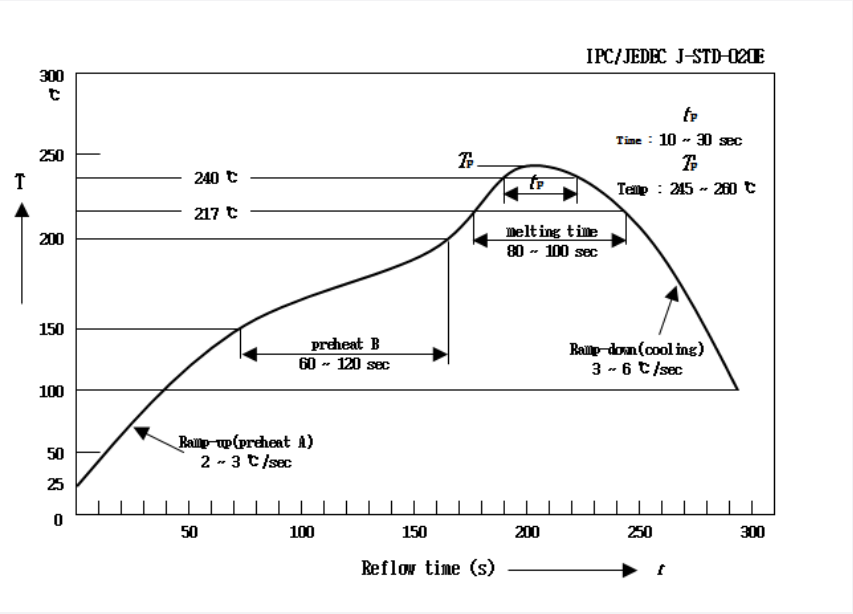


Notes:

Unit : ㎜, Tolerance : ±0.10 ㎜

b) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



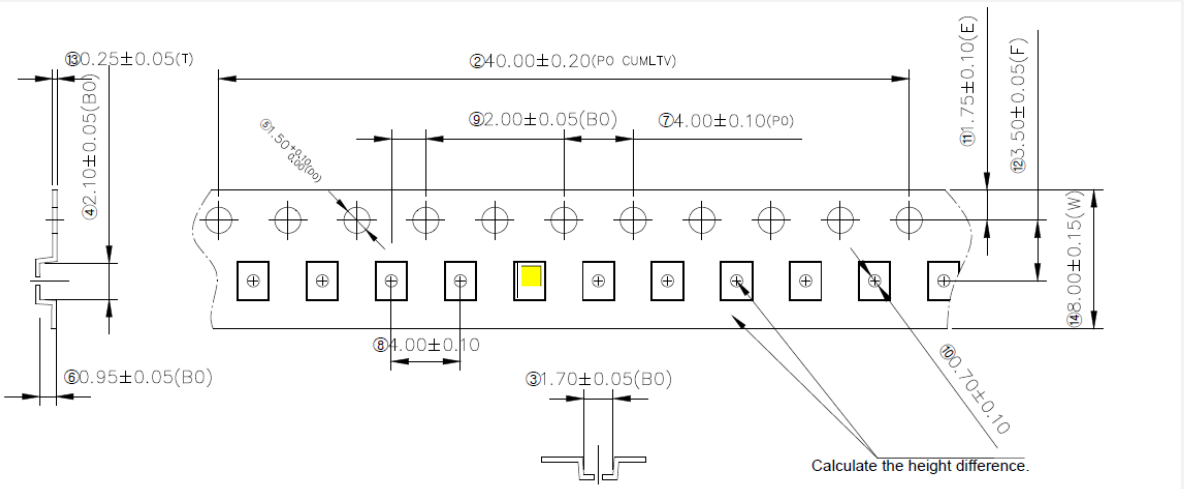
※ All temperature refer to the pad of package.

c) Manual Soldering Conditions

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

7. Tape & Reel

a) Taping Dimension



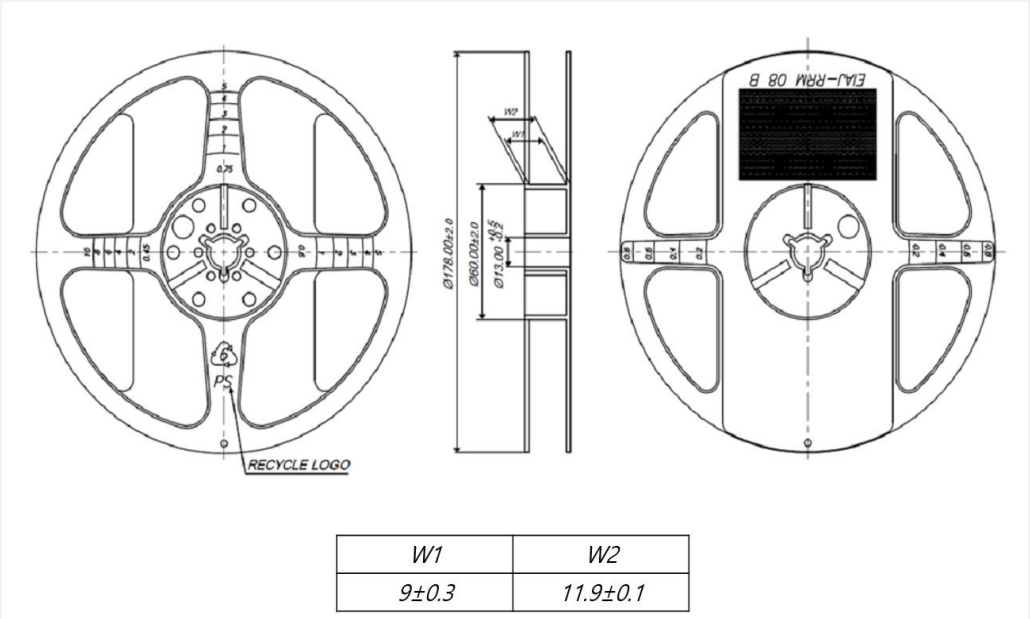
※ Package placement condition in a reel tape

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

Notes:

Unit: ㎜, LED taping quantity: 3,000ea (1Reel)

b) Reel Dimension



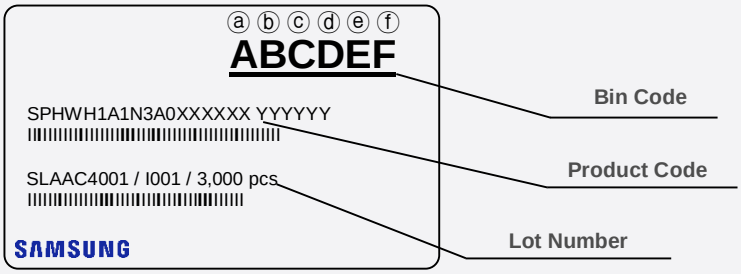
W1	*W2*
9±0.3	*11.9±0.1*

Notes:

Unit: ㎜, Tolerance: ±0.2 ㎜

8. Label Structure

a) Label Structure

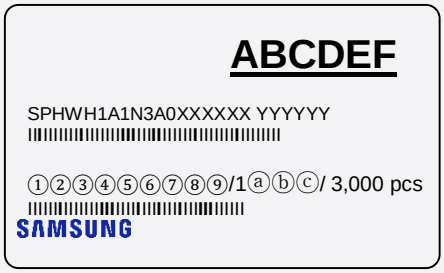


Note: Denoted bin code and product code above is only an example (see description on page 5)

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

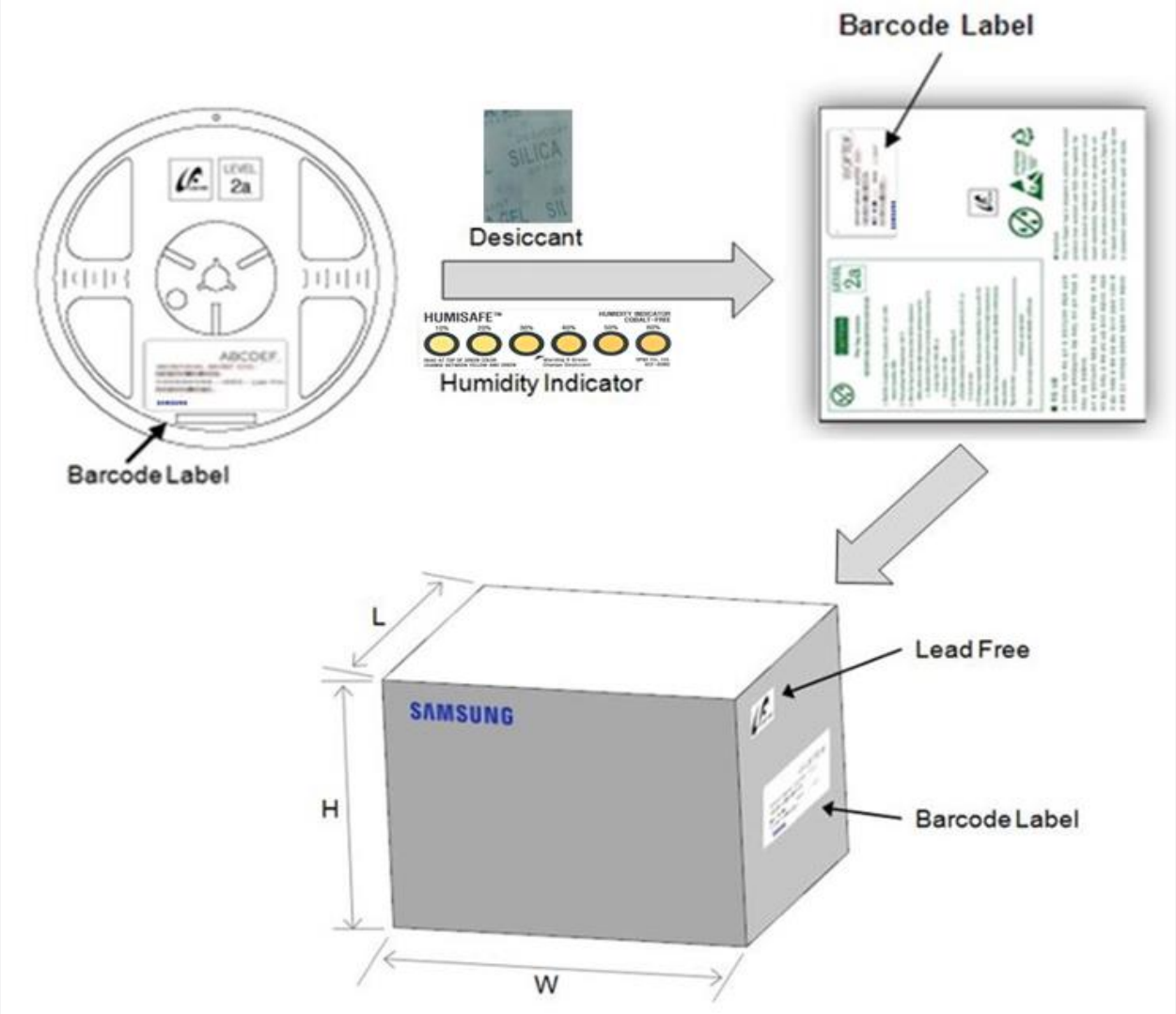
The lot number is composed of the following characters:



①②③③②③④⑤⑥⑦⑧⑨ / 1ⓐⓑⓒ / 3,000 pcs	
①②	: Production site (Giheung)
③	: Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
④	: Year (G: 2022, H: 2023, I: 2024…)
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 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. ~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. Company Information

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Legal and additional information.

About Samsung Electronics Co., Ltd.

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