Middle Power LED Series
2835

LM281B

SDCM3

Designed for better lm/$ (Ambient, Linear, Lamps)

Features & Benefits

- 0.5W Class mid power LED
- Standard form factor for design flexibility (2.8 × 3.5 mm)

Table of Contents

1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	Ta	-40 ~ +80	ºC	-
Storage Temperature	Tstg	-40 ~ +80	ºC	-
LED Junction Temperature	Tj	115	ºC	-
Forward Current	IF	160	mA	-
Peak Pulsed Forward Current	I_{Fp}	300	mA	Duty 1/10, pulse width 10ms
Assembly Process Temperature	-	260 <10	ºC s	-
ESD (HBM)	-	2	kV	-

Note:

Proper current derating must be observed to maintain junction temperature below the maximum at all time.

b) Electro-optical Characteristics (I_F = 150 mA, T_s = 25 °C)

Item	Unit	Rank	Bin	Min.	Typ.	Max.
Forward Voltage (VF)	V	WA	A2	2.9		3.0
			A3	3.0		3.1
			A4	3.1	-	3.2
			A5	3.2	-	3.3
Color Rendering Index (Ra)	-	5		80	-	-
Thermal Resistance (junction to solder point)	°C/W			-	25	-
Beam Angle	°			-	120	-

Note:

Samsung maintains measurement tolerance of: forward voltage = ±0.1 V, CRI = ±3

b) Electro-optical Characteristics (I_F = 150 mA, T_s = 25 °C)

Item	CRI (R_a) Min.	Nominal CCT (K)	Bin	150mA		Calculated value at 65mA	
				Min.	Max.	Min.	Max.
Luminous Flux (Φv)	80	2700	S2	53.3	57.3	26.0	28.0
			S3	57.3	61.3	28.0	30.0
			S4	61.3	65.3	30.0	32.0
		3000	S2	54.3	58.3	26.5	28.5
			S3	58.3	62.3	28.5	30.5
			S4	62.3	66.3	30.5	32.5
		3500	S2	55.3	59.3	27.0	29.0
			S3	59.3	63.3	29.0	31.0
			S4	63.3	67.3	31.0	33.0
		4000	S2	57.3	61.3	28.0	30.0
			S3	61.3	65.3	30.0	32.0
			S4	65.3	69.3	32.0	34.0
		5000	S2	59.3	63.3	29.0	31.0
			S3	63.3	67.3	31.0	33.0
			S4	67.3	71.3	33.0	37.0
		5700	S2	58.3	62.3	28.5	30.5
			S3	62.3	66.3	30.5	32.5
			S4	66.3	71.3	32.5	36.5
		6500	S2	57.3	61.3	28.0	30.0
			S3	61.3	65.3	30.0	32.0
			S4	65.3	69.3	32.0	34.0

Note:

Samsung maintains measurement tolerance of: forward voltage = ±0.1V, luminous flux = ±5 %, CRI = ±3

Calculated luminous flux values at 65mA are for reference only.

2. Product Code Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	P	M	W	H	1	2	2	8	F	D	5	W	A	R	U	S	0

Digit	PKG Information	Code	Specification		
1 2 3	Samsung Package Middle Power	SPM			
4 5	Color	WH	White		
6	Product Version	1			
7 8 9	Form Factor	228	2.8 x 3.5 x 0.65 mm; 2 pads; 1chip;		
10	Sorting Current (mA)	F	150 mA		
11	Chromaticity Coordinates	D	ANSI Standard		
12	CRI	5	Min. 80		
13 14	Forward Voltage (V)	WA	2.9~3.3	Bin Code	A2 2.9 ~ 3.0 A3 3.0 ~ 3.1 A4 3.1 ~ 3.2 A5 3.2 ~ 3.3
15 16	CCT (K)	WU	2700	Bin Code:	WU
		VU	3000		VU
		UU	3500		UU
		TU	4000		TU
		RU	5000		RU
		QU	5700		QU
		PU	6500		PU
17 18	Luminous Flux	S2		Bin Code:	S2
		S3			S3
		S4			S4

a) Luminous Flux Bins (I_F = 150 mA, T_s= 25°C)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Flux Bin	Flux Range (Φ_v, lm)
80	2700	SPMWH1228FD5WAWUS2	S2	53.3 ~ 57.3
		SPMWH1228FD5WAWUS3	S3	57.3 ~ 61.3
		SPMWH1228FD5WAWUS4	S4	61.3 ~ 65.3
	3000	SPMWH1228FD5WAVUS2	S2	54.3 ~ 58.3
		SPMWH1228FD5WAVUS3	S3	58.3 ~ 62.3
		SPMWH1228FD5WAVUS4	S4	62.3 ~ 66.3
	3500	SPMWH1228FD5WAUUS2	S2	55.3 ~ 59.3
		SPMWH1228FD5WAUUS3	S3	59.3 ~ 63.3
		SPMWH1228FD5WAUUS4	S4	63.3 ~ 67.3
	4000	SPMWH1228FD5WATUS2	S2	57.3 ~ 61.3
		SPMWH1228FD5WATUS3	S3	61.3 ~ 64.3
		SPMWH1228FD5WATUS4	S4	64.3 ~ 68.3
	5000	SPMWH1228FD5WARUS2	S2	59.3 ~ 63.3
		SPMWH1228FD5WARUS3	S3	63.3 ~ 67.3
		SPMWH1228FD5WARUS4	S4	67.3 ~ 71.3
	5700	SPMWH1228FD5WAQUS2	S2	58.3 ~ 62.3
		SPMWH1228FD5WAQUS3	S3	62.3 ~ 66.3
		SPMWH1228FD5WAQUS4	S4	66.3 ~ 70.3
	6500	SPMWH1228FD5WAPUS2	S2	57.3 ~ 61.3
		SPMWH1228FD5WAPUS3	S3	61.3 ~ 65.3
		SPMWH1228FD5WAPUS4	S4	65.3 ~ 69.3

c) Color Bins (I_F = 150 mA, T_s= 25 °C)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Color Rank	Chromaticity Bins
80	2700	SPMWH1228FD5WAWUS☆	WU	WU
	3000	SPMWH1228FD5WAVUS☆	VU	VU
	3500	SPMWH1228FD5WAUUS☆	UU	UU
	4000	SPMWH1228FD5WATUS☆	TU	TU
	5000	SPMWH1228FD5WARUS☆	RU	RU
	5700	SPMWH1228FD5WAQUS☆	QU	QU
	6500	SPMWH1228FD5WAPUS☆	PU	PU

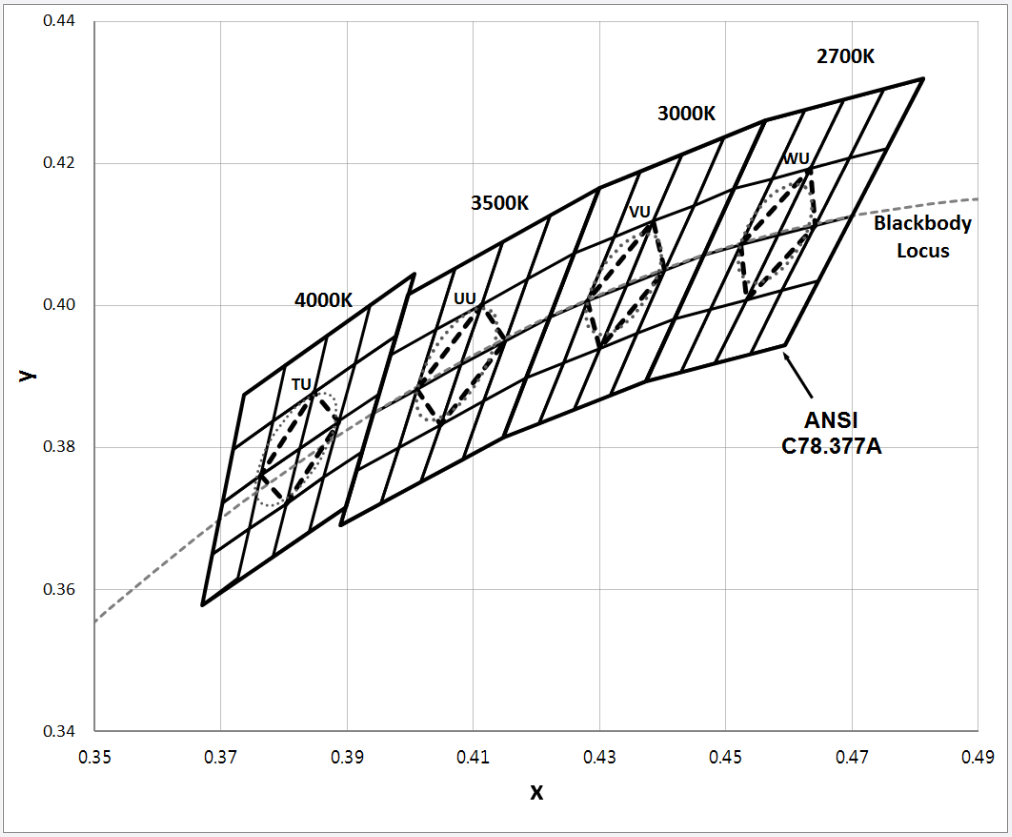
Note:

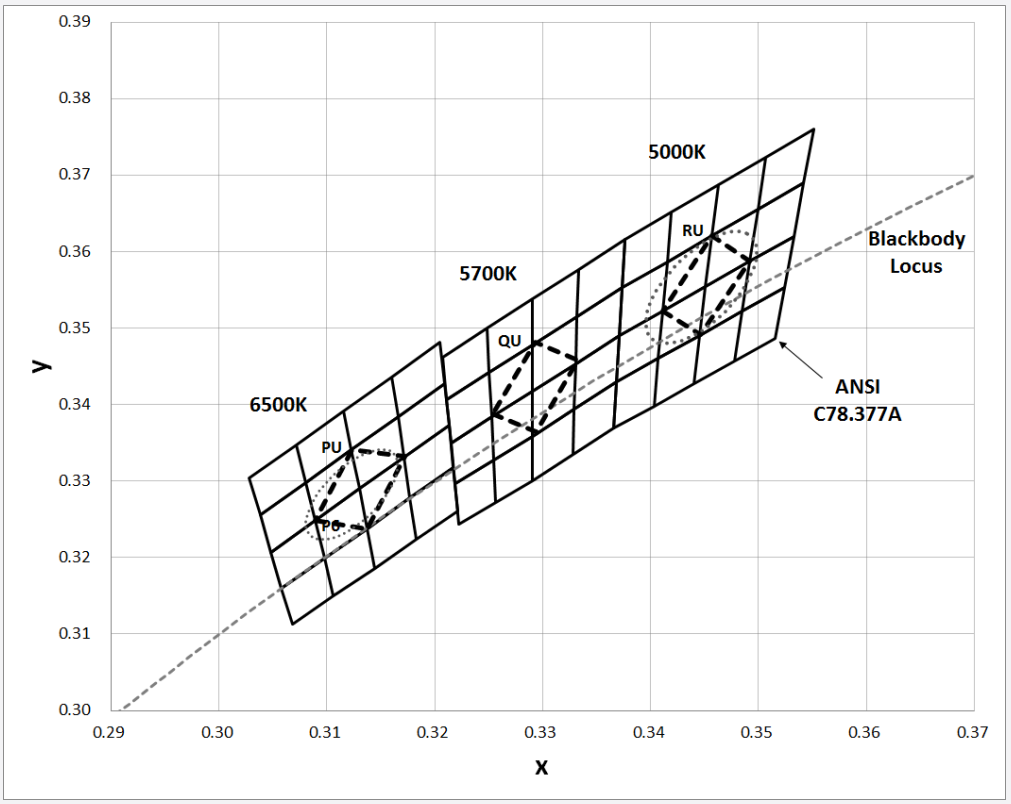
"☆" can be "S2", “S3” or “S4” of luminous flux bin

d) Voltage Bins (I_F = 150 mA, T_s = 25 °C)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	WA	A2	2.9 ~ 3.0
				A3	3.0 ~ 3.1
				A4	3.1 ~ 3.2
				A5	3.2 ~ 3.3

e) Chromaticity Region & Coordinates (I_F = 150 mA, T_S = 25 °C)





e) Chromaticity Region & Coordinates

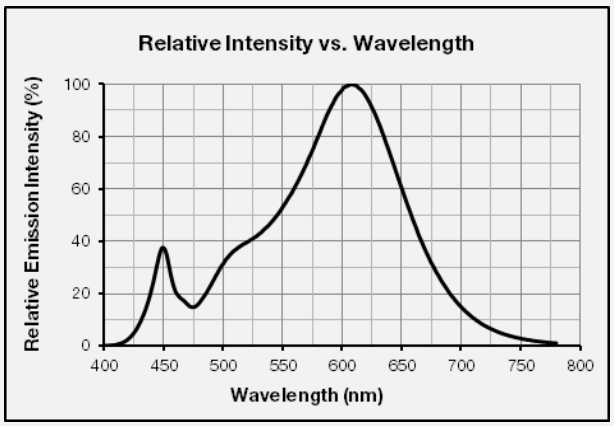
Region	CIE x	CIE y	Region	CIE x	CIE y
W rank (2700 K)			**V rank (3000 K)**		
WU	0.4523	0.4085	VU	0.4281	0.4006
	0.4532	0.4008		0.4300	0.3939
	0.4641	0.4112		0.4403	0.4049
	0.4634	0.4193		0.4385	0.4119
U rank (3500K)			T rank (4000K)		
UU	0.4010	0.3882	TU	0.3763	0.3760
	0.4048	0.3832		0.3804	0.3721
	0.4150	0.3950		0.3887	0.3836
	0.4113	0.4001		0.3847	0.3877
R rank (5000 K)			**Q rank (5700 K)**		
RU	0.3411	0.3522	QU	0.3254	0.3388
	0.3446	0.3491		0.3294	0.3364
	0.3492	0.3587		0.3332	0.3458
	0.3457	0.3621		0.3293	0.3481
P rank (6500K)					
PU	0.3089	0.3249			
	0.3137	0.3238			
	0.3172	0.3332			
	0.3123	0.3341			

Note: Samsung maintains measurement tolerance of: Cx, Cy = ±0.005

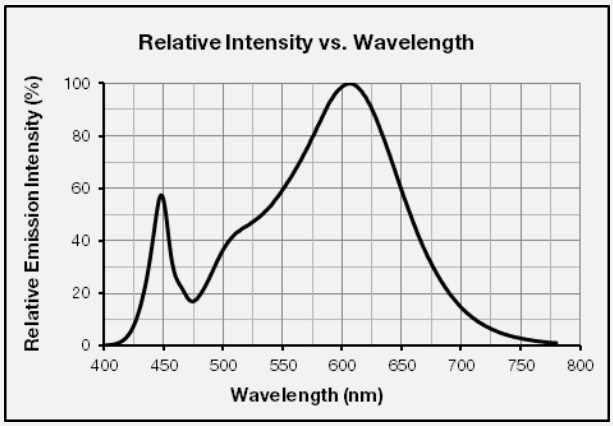
3. Typical Characteristics Graphs

a) Spectrum Distribution (I_F = 150 mA, T_s = 25 °C)

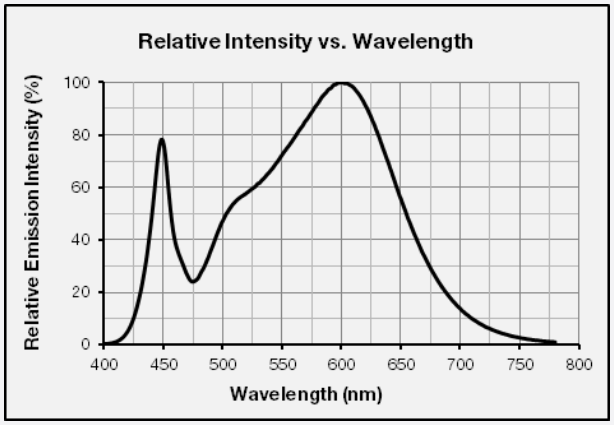
CCT: 2700 K (80 CRI)



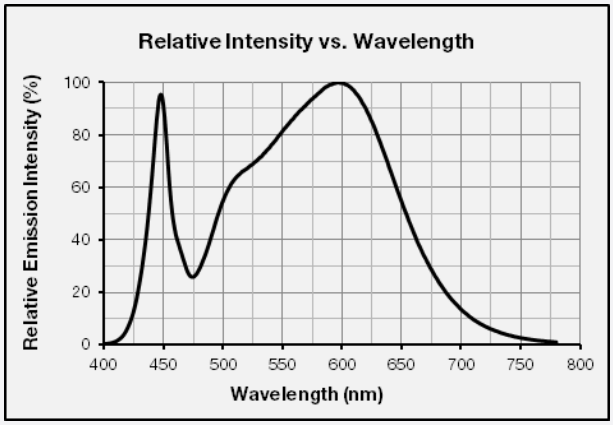
CCT: 3000 K (80 CRI)



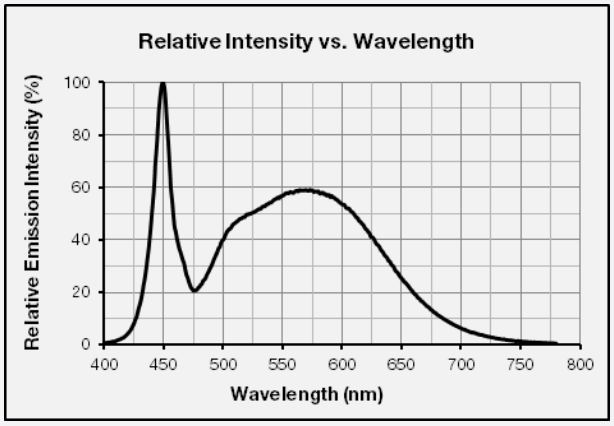
CCT: 3500 K (80 CRI)



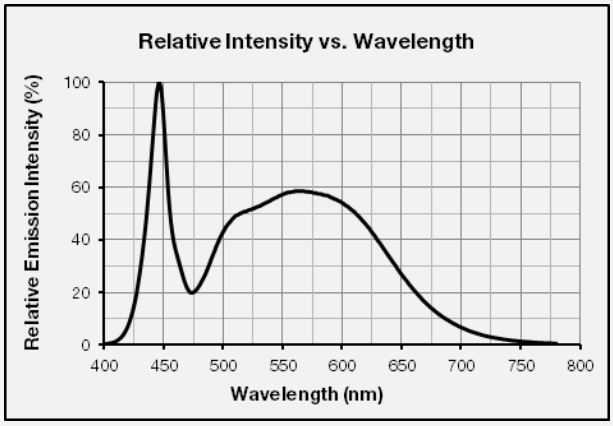
CCT: 4000 K (80 CRI)



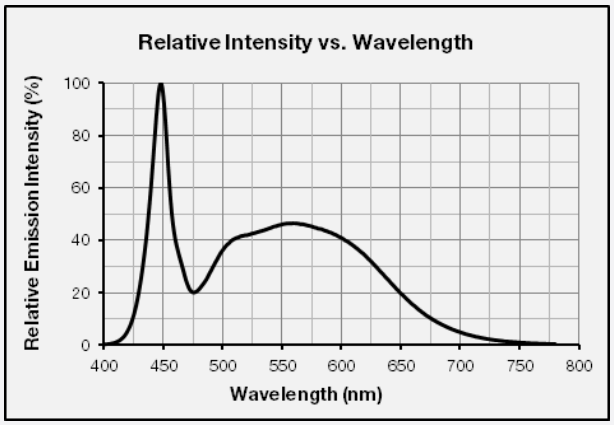
CCT: 5000 K (80 CRI)



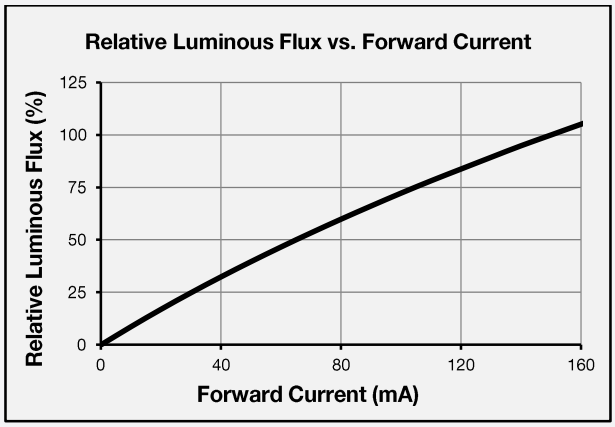
CCT: 5700 K (80 CRI)

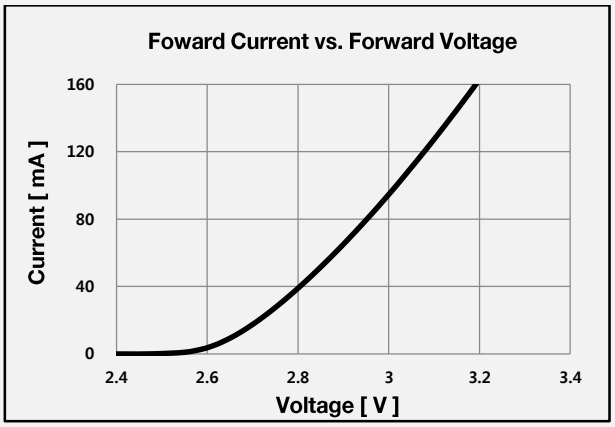


CCT: 6500 K (80 CRI)

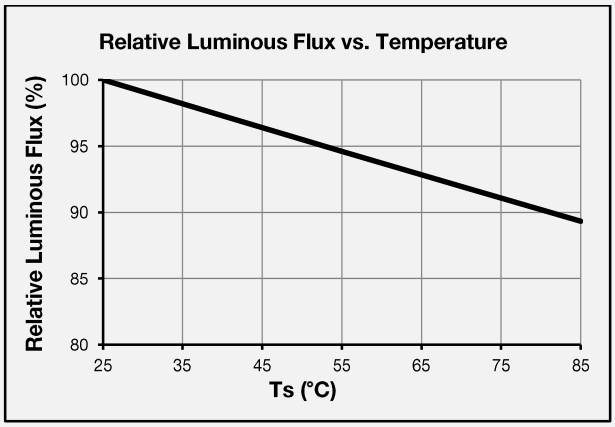


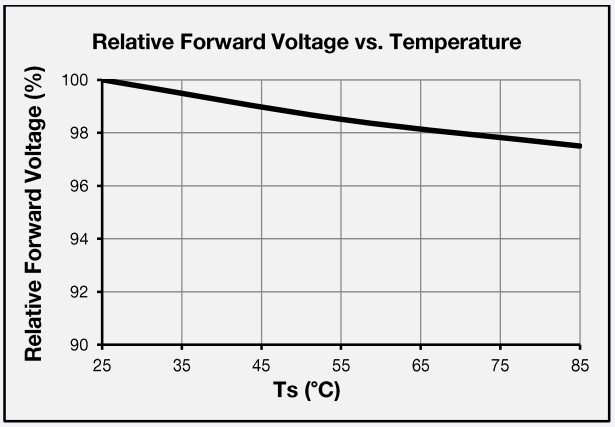
b) Forward Current Characteristics (T_s = 25 °C)



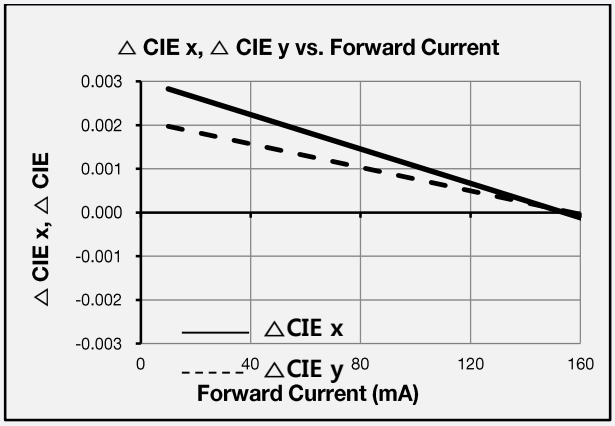


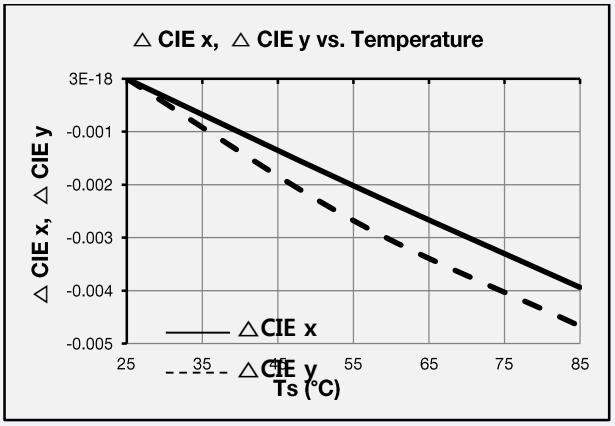
c) Temperature Characteristics (I_F = 150 mA)



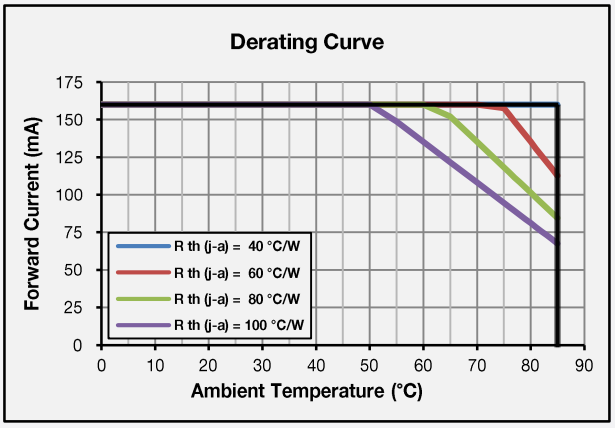


d) Color Shift Characteristics (I_F = 150 mA, T_s = 25 °C)

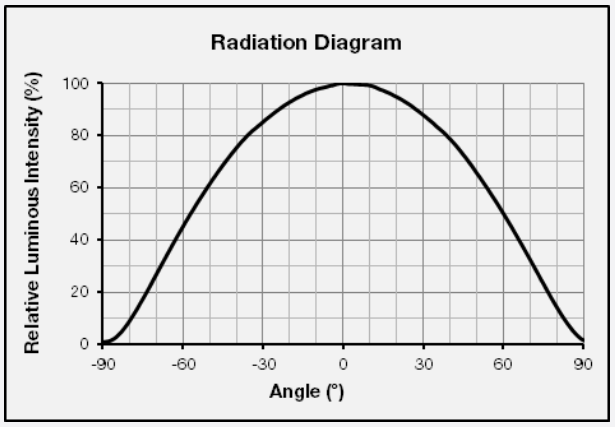




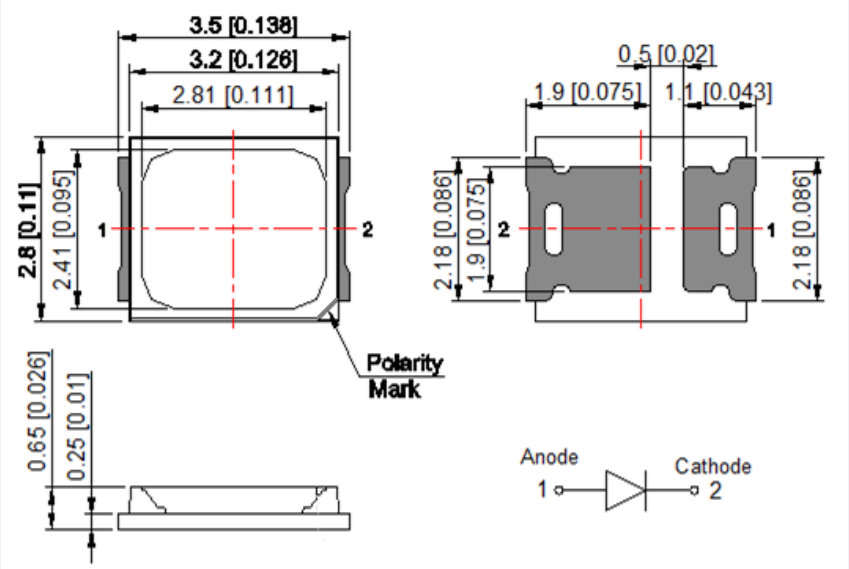
e) Derating Curve



f) Beam Angle Characteristics (I_F = 150 mA, T_s = 25 °C)

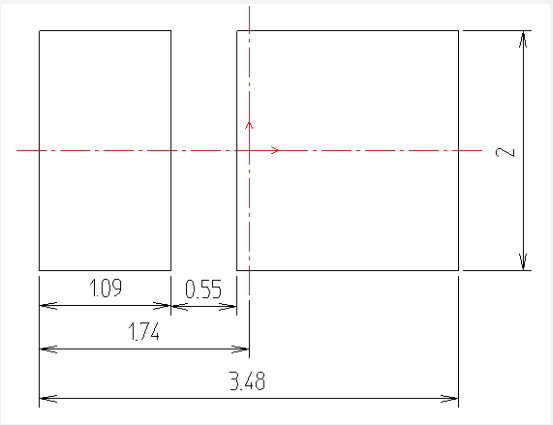


4. Outline Drawing & Dimension



- Measurement unit: mm
- Tolerance: ±0.1mm

[Recommended PCB Solder PAD]



Notes:

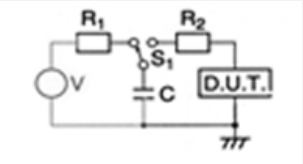
1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
2) T_s point and measurement method:
   ① Measure one point at the cathode pad, if necessary remove PSR of PCB to reach T_s point.
   ② All pads must be soldered to the PCB to dissipate heat properly, otherwise the LED can be damaged.

Precautions:

1) Pressure on the LEDs will influence to the reliability of the LEDs. Precautions should be taken to avoid strong pressure on the LEDs. Do not put stress on the LEDs during heating.
2) Re-soldering should not be done after the LEDs have been soldered. If re-soldering is unavoidable, LED`s characteristics should be carefully checked before and after such repair.
3) Do not stack assembled PCBs together. Since materials of LEDs is soft, abrasion between two PCB assembled with LED might cause catastrophic failure of the LEDs.

5. Reliability Test Items & Conditions

a) Test Items

Test Item	Test Condition	Test Hour / Cycle	Sample No.
Room Temperature Life Test	25 °C, DC 160 mA	1000 h	22
High Temperature Life Test	85 °C, DC 160 mA	1000 h	22
High Temperature Humidity Life Test	85 °C, 85 % RH, DC 160 mA	1000 h	22
Low Temperature Life Test	-40 °C, DC 160 mA	1000 h	22
Powered Temperature Cycle Test	-45 °C ~ 85 °C, each 20 min, on/off 5 min Temp. Change time 100min, DC 160 mA	100 cycles	22
Temperature Cycle	-40°C / 15 min ↔ 100 °C / 15 min	200 cycles	100
High Temperature Storage	120 °C	1000 h	11
Low Temperature Storage	-40 °C	1000 h	11
ESD (HBM)	 R_1: 10 MΩ R_2: 1.5 kΩ C: 100 pF V: ±2 kV	5 times	30

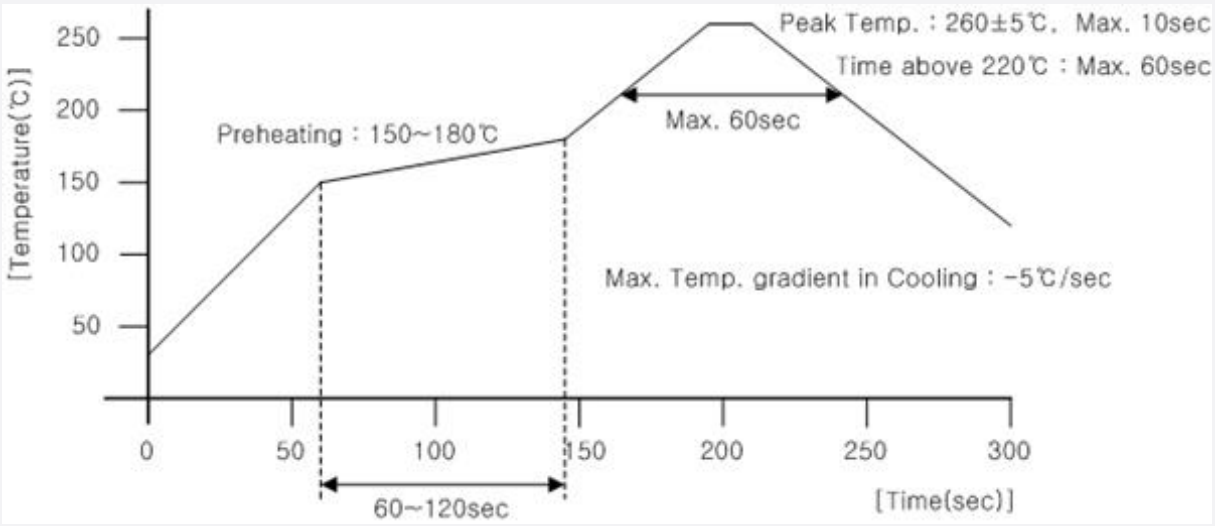
b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T_s = 25 °C)	Limit	
			Min	Max
Forward Voltage	V_F	I_F = 160 mA	Init. Value * 0.9	Init. Value * 1.1
Luminous Flux	Φ_v	I_F = 160 mA	Init. Value * 0.7	Init. Value * 1.1

6. Soldering Conditions

a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.

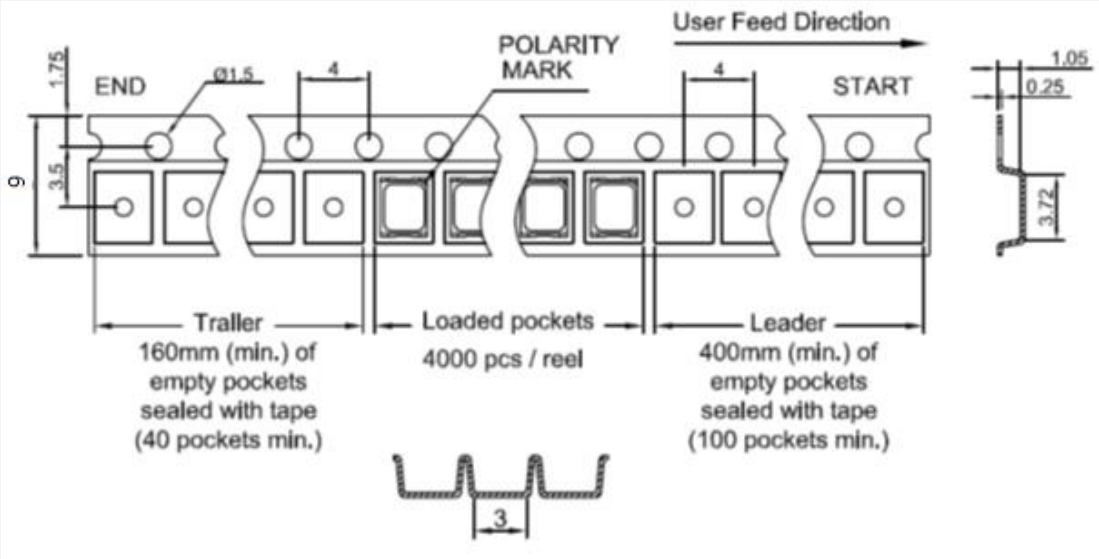


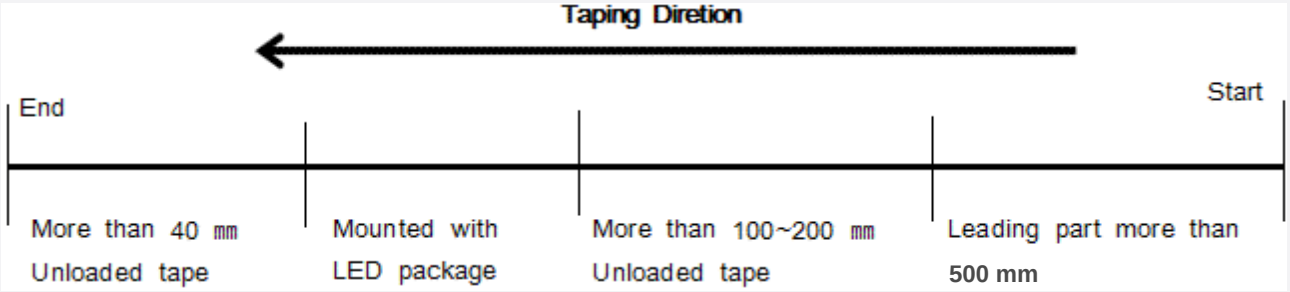
b) Manual Soldering Conditions

Not more than 5 seconds @ max. 300 °C, under soldering iron.

7. Tape & Reel

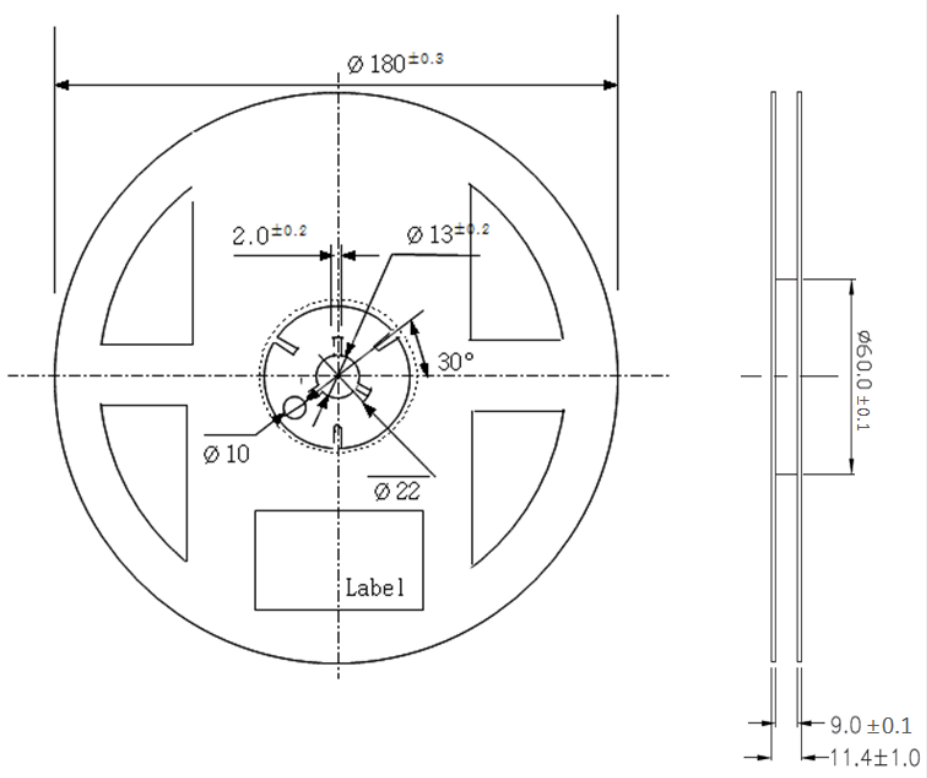
a) Taping Dimension





b) Reel Dimension

(unit: mm)

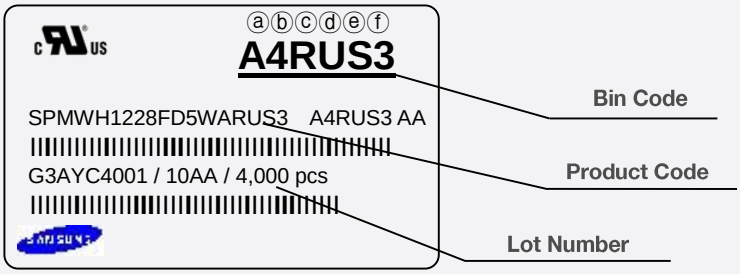


Notes:

1) Quantity: The quantity/reel is 4,000 pcs
2) All dimensions are millimeters (tolerance : ±0.2mm)
3) Packaging: P/N, Manufacturing data code no. and quantity are indicated on the aluminum packing bag

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:

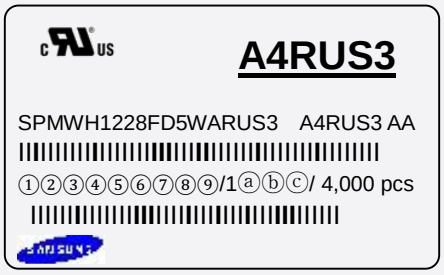
ⓐⓑ: Forward Voltage bin (refer to page 8)

ⓒⓓ: Chromaticity bin (refer to page 9-10)

ⓔⓕ: Luminous Flux bin (refer to page 7)

b) Lot Number

The lot number is composed of the following characters:



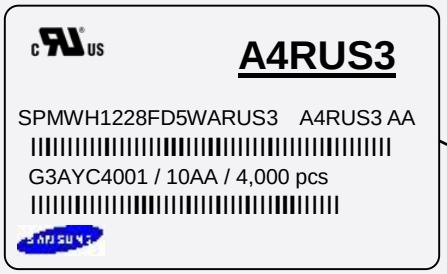
①②③④⑤⑥⑦⑧⑨ / 1ⓐⓑⓒ / 4,000 pcs

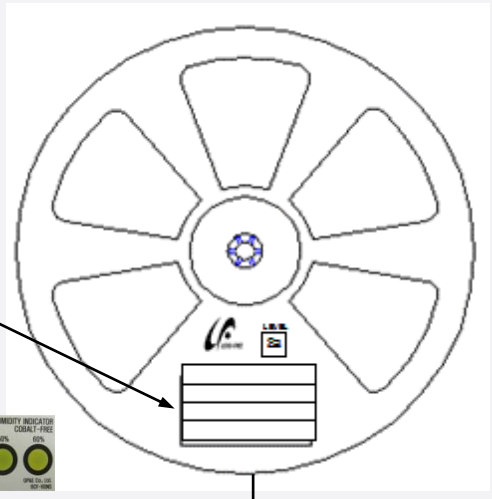
①	:	Production site (S: Giheung, Korea, G: Tianjin, China)
②	:	3 (LED)
③	:	Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
④	:	Year (Z: 2015, A: 2016, B: 2017…)
⑤	:	Month (1~9, A, B, C)
⑥⑦⑧⑨	:	Day (1~9, A, B~V)
ⓐⓑⓒ	:	Product serial number (001 ~ 999)

9. Packing Structure

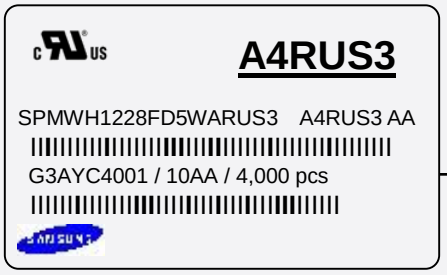
a) Packing Process

Reel





Aluminum Vinyl Packing Bag

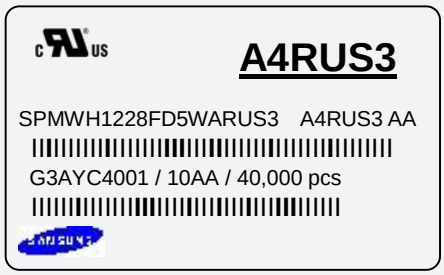


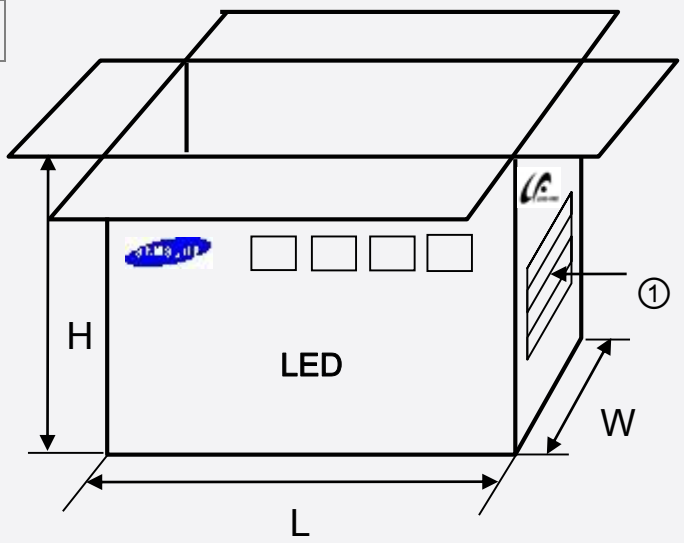
Outer Box

Material: Paper (SW3B(B))

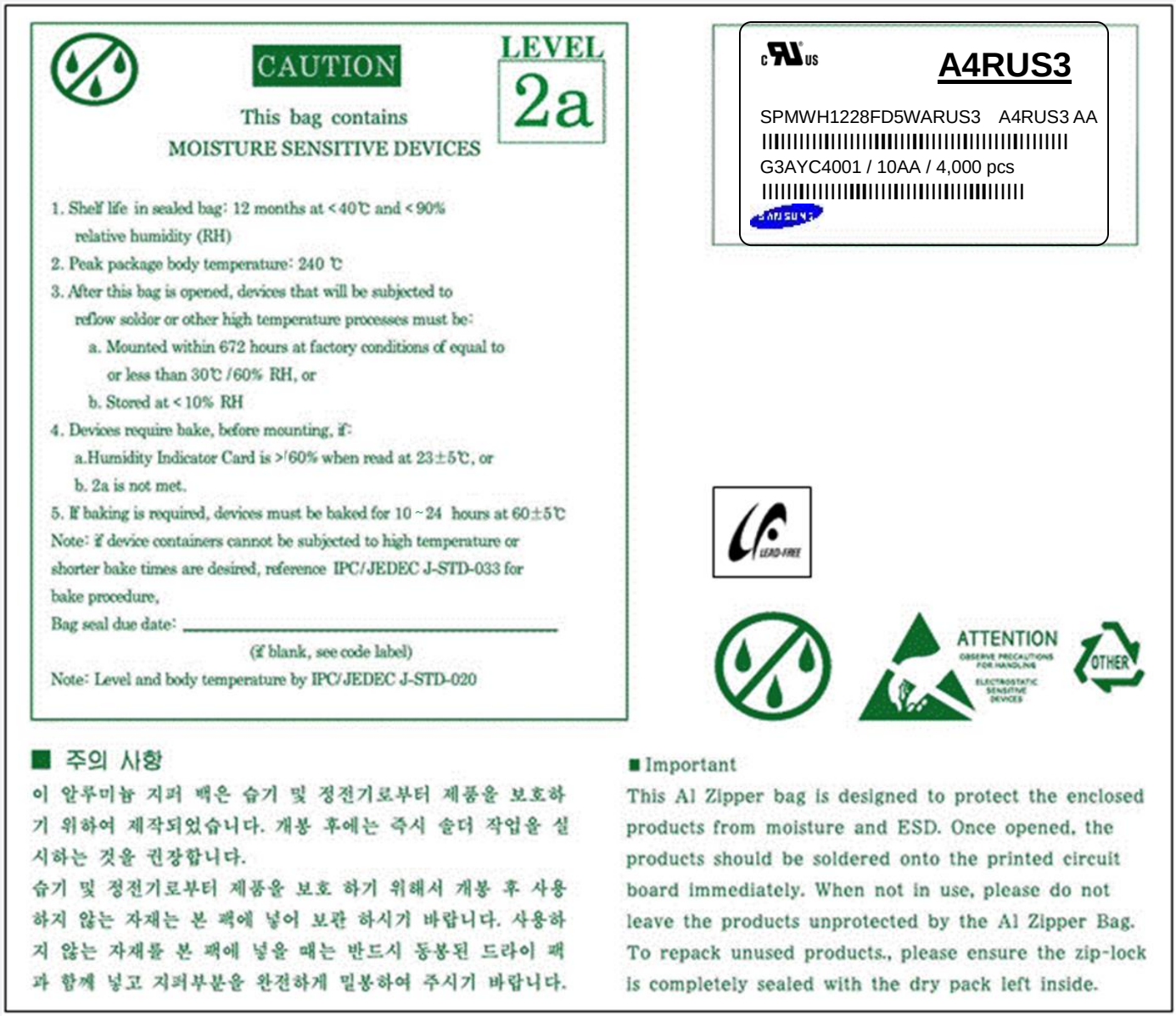
Type	Size (mm)			Note
	L	W	H	
7 inch L	245 ± 5	220 ± 5	182 ± 5	Up to 10 reels
7 inch S	245 ± 5	220 ± 5	86 ± 5	Up to 5 reels

① **Side Label**

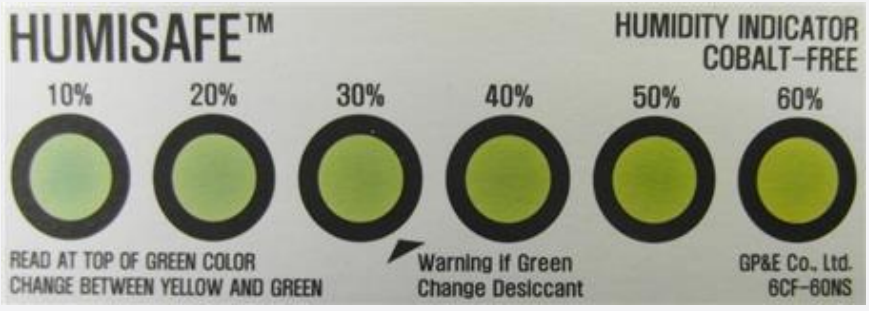




b) Aluminum Vinyl Packing Bag



c) Humidity Indicator Card inside Aluminum Vinyl Bag



10. Precautions in Handling & Use

1) For over-current protection, users are recommended to apply resistors connected in series with the LEDs to mitigate sudden change of the forward current caused by shift of forward voltage.
2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When cleaning is required, IPA is recommended as the cleaning agent. Some solvent-based cleaning agent may damage the silicone resins used in the device.
3) When the device is in operation, the forward current should be carefully determined considering the maximum ambient temperature and corresponding junction temperature.
4) LEDs must be stored in a clean environment. If the LEDs are to be stored for three months or more after being shipped from Samsung, they should be packed with a nitrogen-filled container (shelf life of sealed bags is 12 months at temperature 0~40 ºC, 0~90 % RH).
5) After storage bag is opened, device 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 ºC / 60 % RH, or
   b. Stored at <10 % RH
6) Repack unused devices with anti-moisture packing, fold to close any opening and then store in a dry place.
7) Devices require baking before mounting, if humidity card reading is >60 % at 23 ± 5 ºC.
8) Devices must be baked for 1 hour at 60 ± 5 ºC, if baking is required.
9) The LEDs are sensitive to the static electricity and surge current. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs. If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices. Damaged LEDs may show some unusual characteristics such as increase in leakage current, lowered turn-on voltage, or abnormal lighting of LEDs at low current.
10) VOCs (Volatile Organic Compounds) can be generated from adhesives, flux, hardener or organic additives used in luminaires (fixtures). Transparent LED silicone encapsulant is permeable to those chemicals and they may lead to a discoloration of encapsulant when they exposed to heat or light. This phenomenon can cause a significant loss of light emitted (output) from the luminaires. In order to prevent these problems, we recommend users to know the physical properties of materials used in luminaires and they must be carefully selected.
11) Risk of sulfurization (or tarnishing)
    The LED from Samsung uses a silver-plated lead frame and its surface color may change to black (or dark colored) when it is exposed to sulfur (S), chlorine (Cl) or other halogen compound. Sulfurization of lead frame may cause intensity degradation, change of chromaticity coordinates and, in extreme cases, open circuit. It requires caution. Due to possible sulfurization of lead frame, LED should not be used and stored together with oxidizing substances made of materials such as rubber, plain paper, lead solder cream, etc.

Legal and additional information.

About Samsung Electronics Co., Ltd.

Samsung Electronics Co., Ltd. is a global leader in technology, opening new possibilities for people everywhere. Through relentless innovation and discovery, we are transforming the worlds of TVs, smartphones, tablets, PCs, cameras, home appliances, printers, LTE systems, medical devices, semiconductors and LED solutions. We employ 286,000 people across 80 countries with annual sales of US$216.7 billion. To discover more, please visit www.samsungled.com.

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