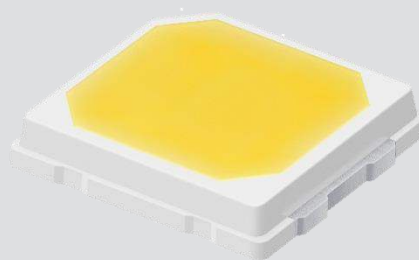


Middle Power LED Series  
2835

# LM281B

## Signage



LM281B leads lighting design trend with high performance and efficacy

### Features & Benefits

- 0.5 W Class middle-power LED
- Extremely wide viewing angle.
- Standard form factor for design flexibility
- Mid-performance and Mid-efficacy



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## 1. 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	N	4	W	A	A	0	S	0

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package Middle Power	SPM	
4 5	Color	WH	White
6	Product Version	1	1
7 8 9	Form Factor	228	2.8 x 3.5 x 0.65 mm; 2 pads
10	Sorting Current (mA)	F	150 mA
11	Chromaticity Coordinates	N	Signage
12	CRI& Sorting Temperature	4	Min.75 25 °C
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)	A0 A3 A4	10000 Bin Code A2, A3, A4 A3 A2, A4
17 18	Luminous Flux	S0	Bin Code S1, S2

**a) Luminous Flux Bins ( $I_F = 150 \text{ mA}$ ,  $T_s = 25^\circ\text{C}$ )**

Nominal CCT (K)	CRI ( $R_a$ ) Min.	Product Code	Flux Bin	Flux Range ( $\Phi_v$ , lm)
10000	75	SPMWH1228FN4WAA0S0	S1	60.0 ~ 65.0
			S2	65.0 ~ 70.0

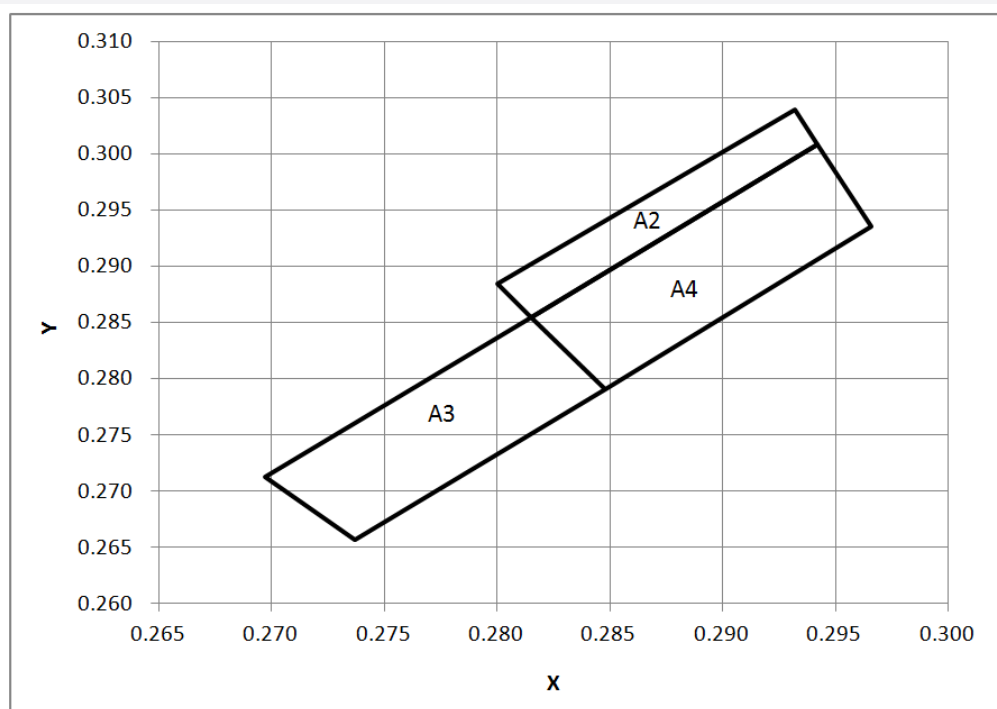
**b) Color Bins ( $I_F = 150 \text{ mA}$ ,  $T_s = 25^\circ\text{C}$ )**

Nominal CCT(K)	CRI ( $R_a$ ) Min.	Product Code	Color Rank	Chromaticity Bins
10000	75	SPMWH1228FN4WAA0S0	A0 (Whole bin)	A2, A3, A4
		SPMWH1228FN4WAA3S0	A3	A3
		SPMWH1228FN4WAA4S0	A4	A2, A4

**c) Voltage Bins ( $I_F = 150 \text{ mA}$ ,  $T_s = 25^\circ\text{C}$ )**

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

d) Chromaticity Region & Coordinates ( $I_f = 150 \text{ mA}$ ,  $T_s = 25 \text{ }^\circ\text{C}$ )



Region	CIE x	CIE y
<b>A rank (10000 K)</b>		
A2	0.2800	0.2884
	0.2932	0.3039
	0.2942	0.3008
	0.2815	0.2855
A3	0.2737	0.2657
	0.2848	0.2791
	0.2815	0.2855
	0.2697	0.2713
A4	0.2848	0.2791
	0.2966	0.2935
	0.2942	0.3008
	0.2815	0.2855

## 2. Characteristics

### a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Operating Temperature	$T_a$	-40 ~ +85	°C	-
Storage Temperature	$T_{stg}$	-40 ~ +100	°C	-
LED Junction Temperature	$T_j$	110	°C	-
Forward Current	$I_F$	160	mA	-
Peak Pulsed Forward Current	$I_{FP}$	300	mA	Duty 1/10, pulse width 10 ms
Assembly Process Temperature	-	260 <10	°C s	-

#### Note:

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

### b) Electro-optical Characteristics ( $I_F = 150 \text{ mA}$ , $T_s = 25 \text{ °C}$ )

Item	Unit	Nominal CCT (K)	CRI ( $R_a$ ) Min.	Rank	Bin	Min.	Typ.	Max.	cd.*
Forward Voltage (VF)	V	10000	75	WA	A2	2.9	-	3.0	-
					A3	3.0	-	3.1	-
					A4	3.1	-	3.2	-
					A5	3.2	-	3.3	-
Luminous Flux ( $\Phi_v$ )	lm	10000	75	S0	S1	60.0	-	65.0	13.0~14.5
					S2	65.0	-	70.0	14.5~16.0
Reverse Voltage (@ 10 $\mu$ A)	V	-	-	-	-	10.0	-	-	-
Thermal Resistance (junction to solder point)	°C/W	-	-	-	-	-	24	-	-
Beam Angle	°	-	-	-	-	-	120	-	-

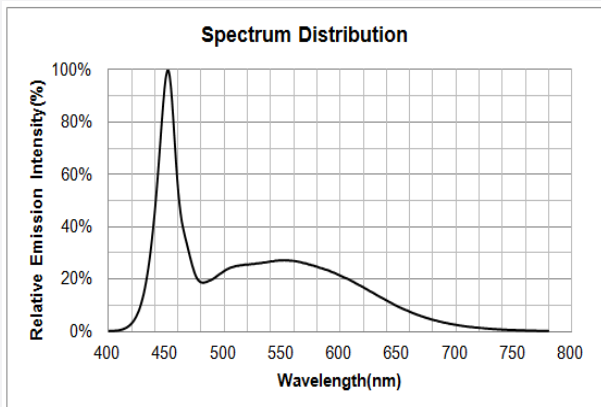
#### Note:

Samsung maintains measurement tolerance of: forward voltage =  $\pm 0.1 \text{ V}$ , luminous flux =  $\pm 5 \%$ , CRI =  $\pm 3$ .

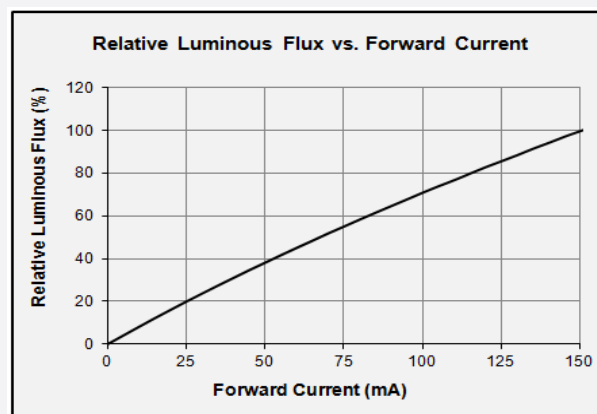
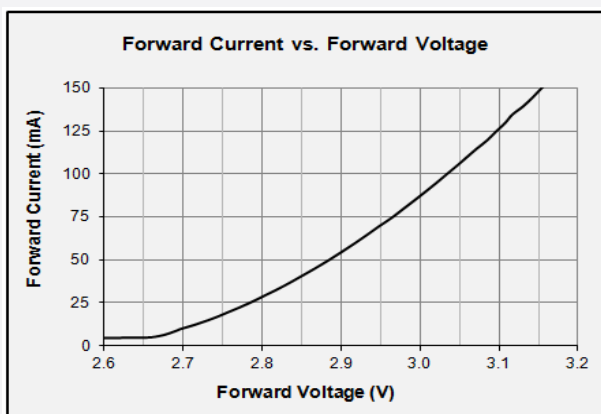
### 3. Typical Characteristics Graphs

#### a) Spectrum Distribution ( $I_f = 150 \text{ mA}$ , $T_s = 25 \text{ }^\circ\text{C}$ )

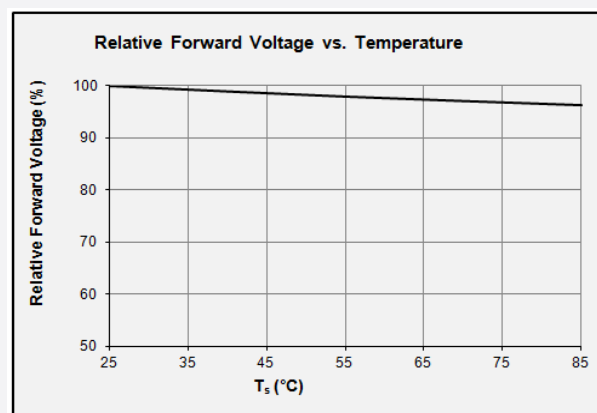
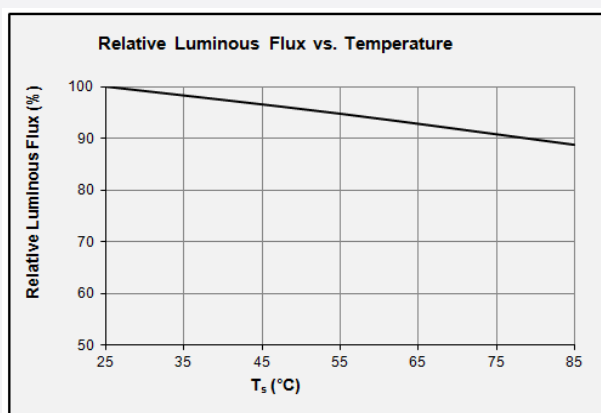
CCT: 10000 K(75 CRI)



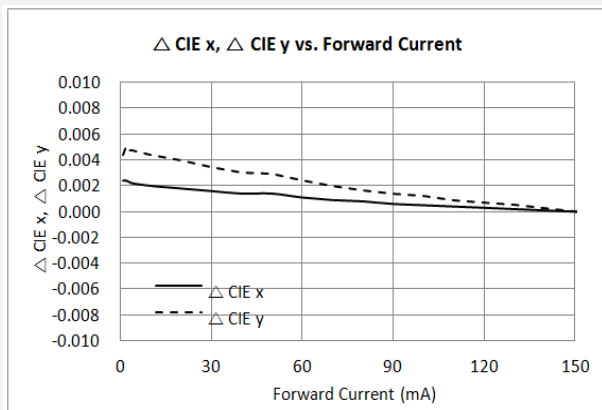
#### b) Forward Current Characteristics ( $T_s = 25 \text{ }^\circ\text{C}$ )



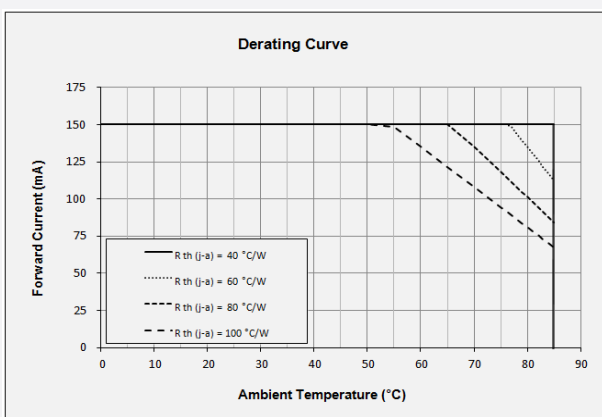
#### c) Temperature Characteristics ( $I_f = 150 \text{ mA}$ )



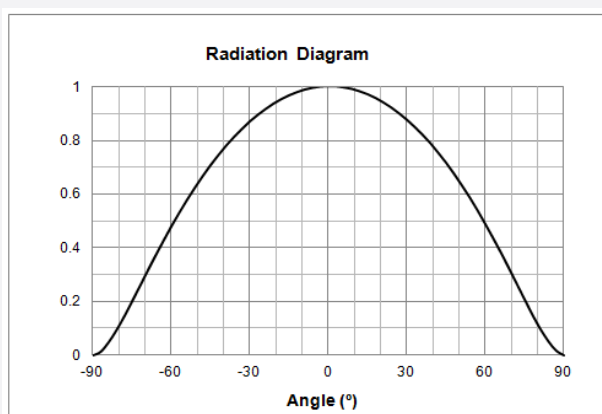
#### d) Color Shift Characteristics ( $T_s = 25\text{ }^\circ\text{C}$ , $I_f = 150\text{ mA}$ )



#### e) Derating Curve

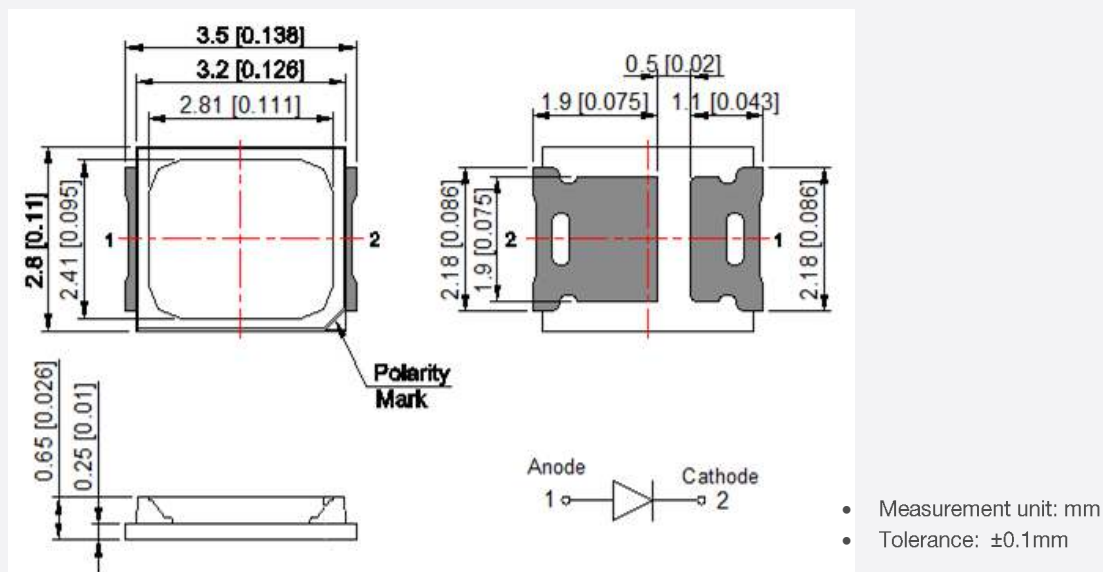


#### f) Beam Angle Characteristics ( $I_f = 150\text{ mA}$ , $T_s = 25\text{ }^\circ\text{C}$ )

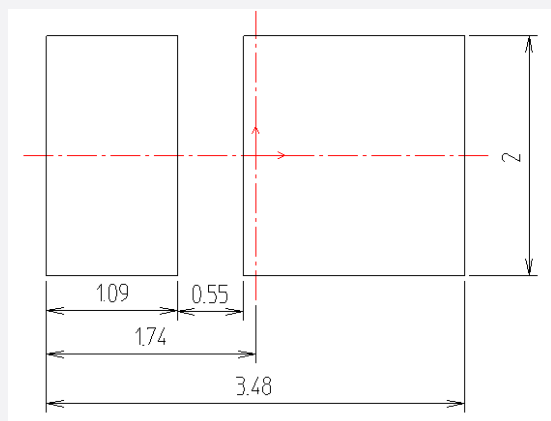




## 4. Outline Drawing & Dimension



[Recommended PCB Solder PAD]



### Notes:

1)  $T_s$  point and measurement method:

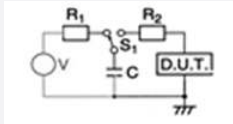
- ① Measure one point at the cathode pad. If necessary, remove PSR of PCB to reach  $T_s$  point.
- ② All pads must be soldered to the PCB to dissipate heat properly, otherwise the LED can be damaged.

### 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 Size
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 / 20 min ↔ 85 °C / 20 min, sweep 100 min cycle on/off: each 5 min, DC 160 mA	1000 h	22
Thermal Shock	-45 °C / 15 min ↔ 125 °C / 15 min → Hot plate 180 °C	500 cycles	100
High Temperature Storage	120 °C	1000 h	11
Low Temperature Storage	-40 °C	1000 h	11
ESD (HBM)	 <p> <math>R_1</math>: 10 M<math>\Omega</math>  <math>R_2</math>: 1.5 k<math>\Omega</math>  <math>C</math>: 100 pF  <math>V</math>: <math>\pm 2</math> kV         </p>	5 times	30
Vibration Test	20~2000~20 Hz, 200 m/s <sup>2</sup> , sweep 4 min X, Y, Z 3 direction, each 1 cycle	4 cycles	11
Mechanical Shock Test	1500 g, 0.5 ms 3 shocks each X-Y-Z axis	5 cycles	11

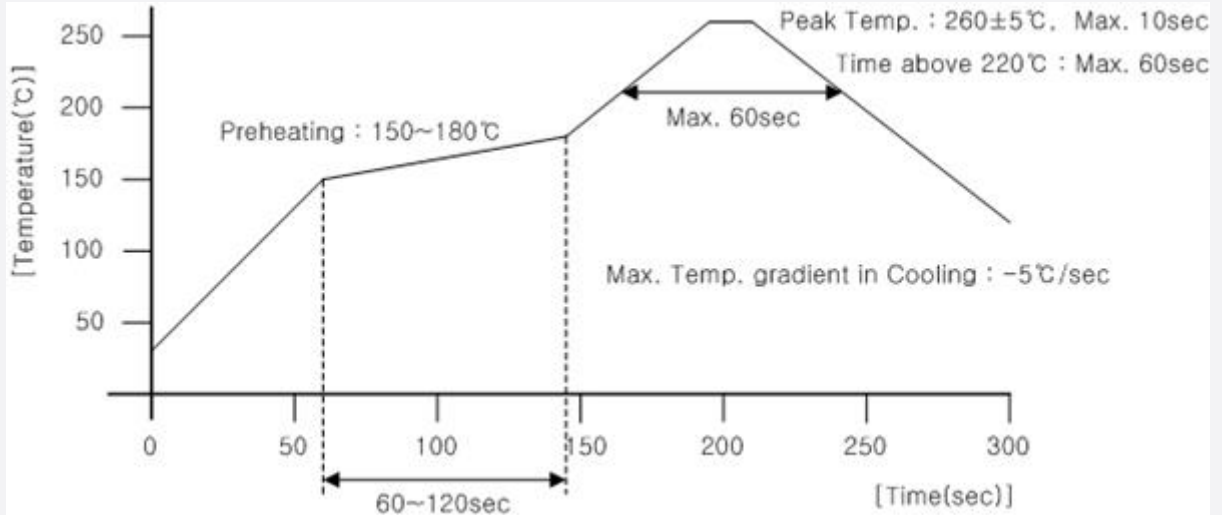
### b) Criteria for Judging the Damage

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	$\Phi_v$	$I_F = 160$ mA	Init. Value * 0.7	Init. Value * 1.1

## 6. Soldering Conditions

### a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



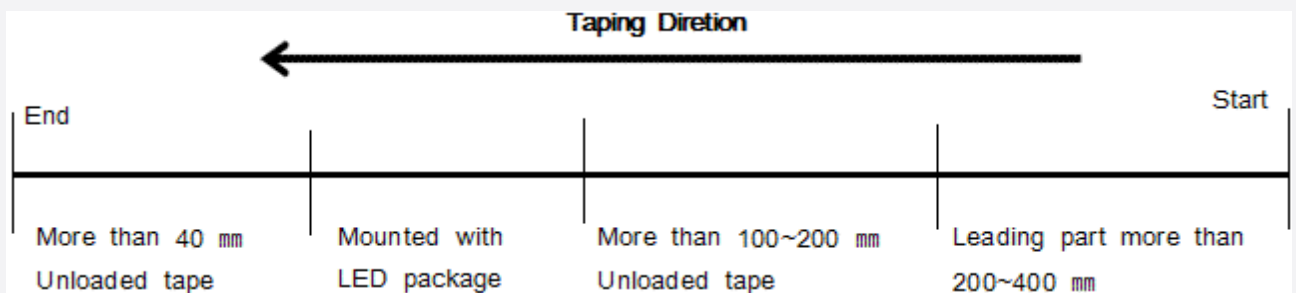
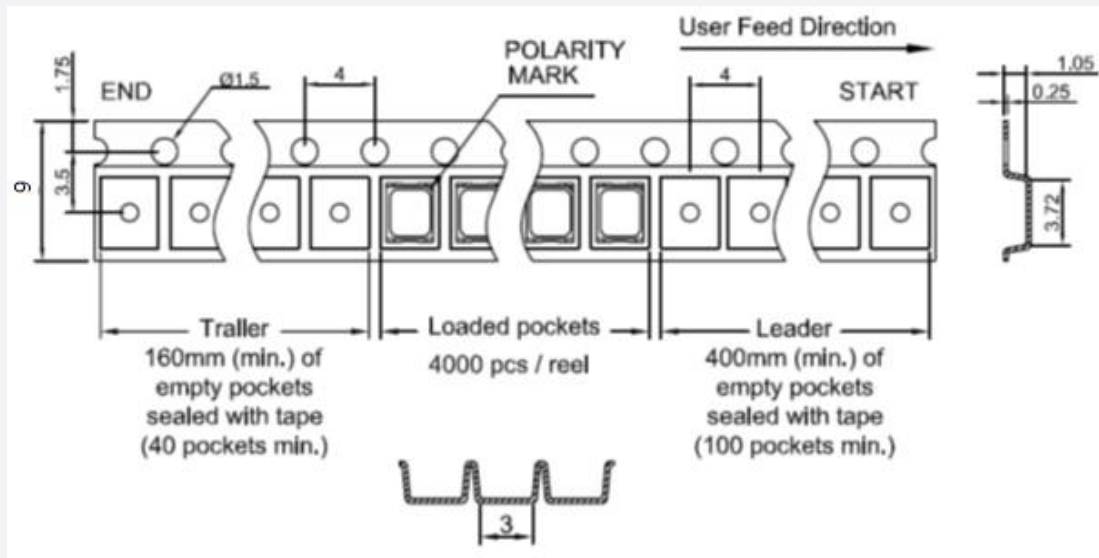
### b) Manual Soldering Conditions

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

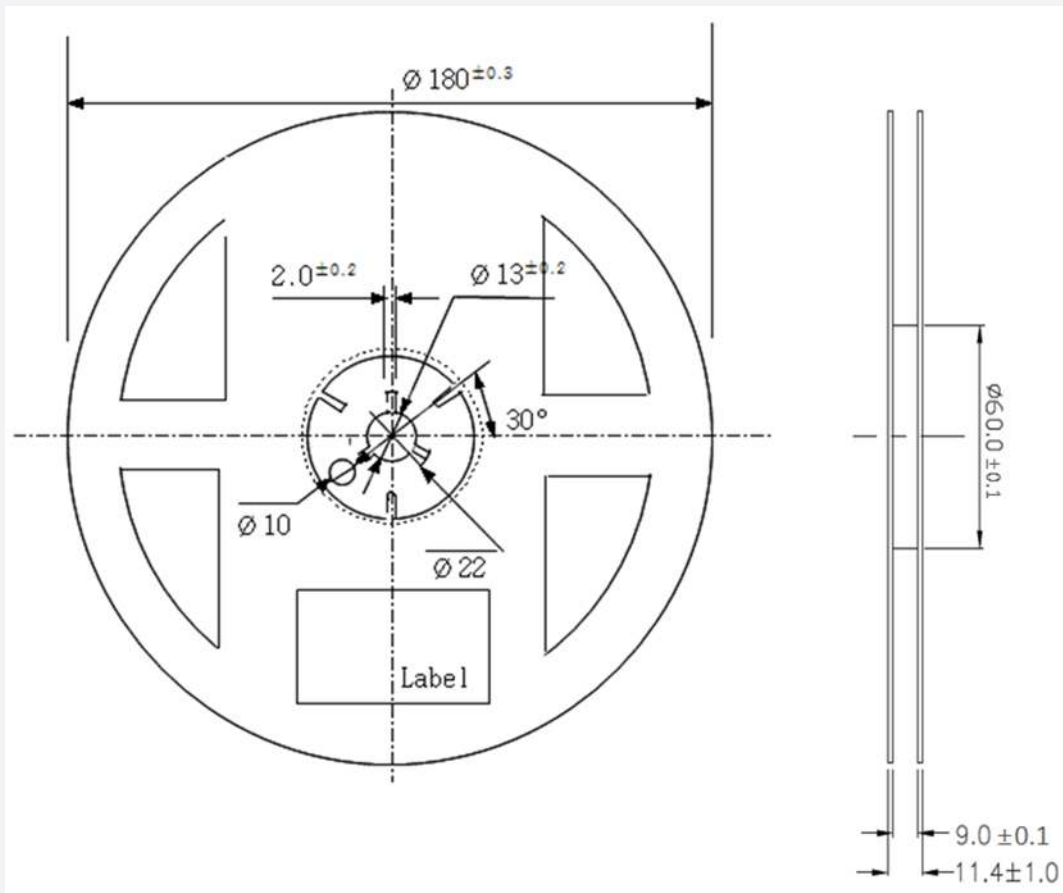
## 7. Tape & Reel

### a) Taping Dimension

(unit: mm)



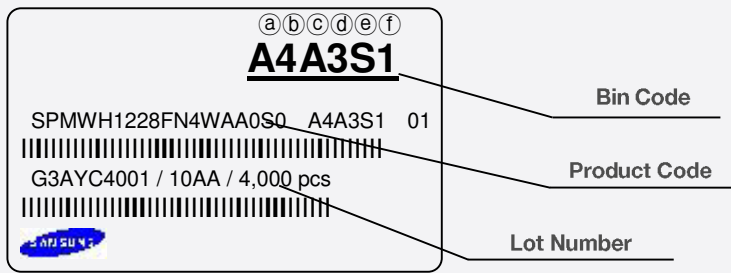
## b) Reel Dimension

**Notes:**

- 1) Quantity: The quantity/reel is 4,000 pcs
- 2) Cumulative tolerance: Cumulative tolerance / 10 pitches is  $\pm 0.2$  mm
- 3) Adhesion strength of cover tape: Adhesion strength is 0.1-0.7 N when the cover tape is turned off from the carrier tape at  $10^\circ$  angle to the carrier tape
- 4) 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 Sample

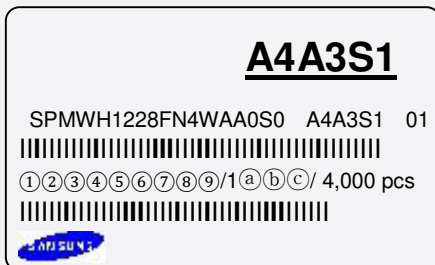
'★' means all kind of Chromaticity Coordinate Ranks

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page 4)
- ⓒⓓ: Chromaticity bin (refer to page 5)
- ⒺⒻ: Luminous Flux bin (refer to page 4)

### 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 (Y: 2014, Z: 2015, A: 2016,...)
- ⑤ : Month (1~9, A, B, C)
- ⑥ : Day (1~9, A, B~V)
- ⑦⑧⑨ : Product serial number (001 ~ 999)
- ⒶⒷⓒ : Reel number (001 ~ 999)

## 9. Packing Structure

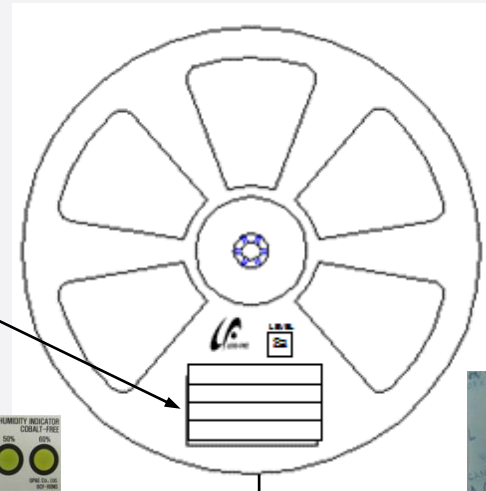
### a) Packing Process

Reel

**A4A3S1**

SPMWH1228FN4WAA0S0 A4A3S1 01

①②③④⑤⑥⑦⑧⑨/1a**b**c/ 4,000 pcs



Aluminum Vinyl Packing Bag

**A4A3S1**

SPMWH1228FN4WAA0S0 A4A3S1 01

G3AYC4001/10AA/ 4,000 pcs



Outer Box

Material: Paper (SW3B(B))

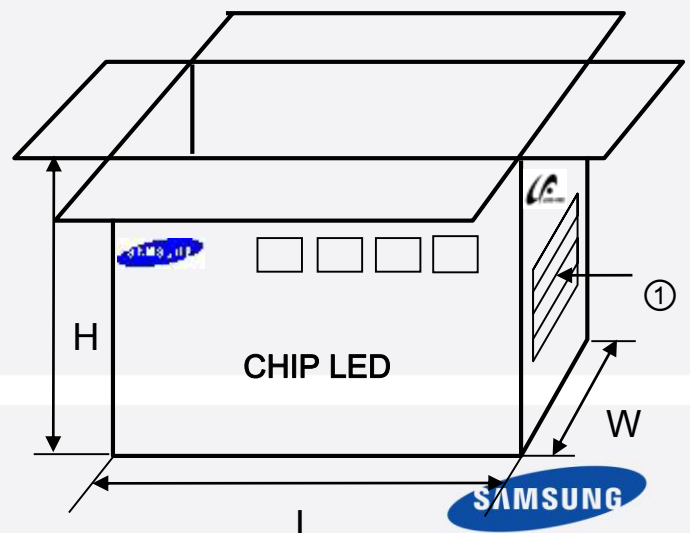
Type	Size (mm)			Note
	L	W	H	
7 inch L	245± 5	220± 5	182± 5	Up to 10reels
7 inch S	245 ± 5	220 ± 5	86 ± 5	Up to 5 reels

① Side Label

**A4A3S1**

SPMWH1228FN4WAA0S0 A4A3S1 01

G3AYC4001 / 10AA/ 40,000 pcs



b) Aluminum Vinyl Packing Bag



**CAUTION**

This bag contains  
**MOISTURE SENSITIVE DEVICES**

**LEVEL**

**2a**

**A4A3S1**

SPMWH1228FN4WAA0S0 A4A3S1 01

|||||

G3AYC4001/10AA/4,000 pcs

|||||

1. Shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)
2. Peak package body temperature: 240 °C
3. After this bag is opened, devices that will be subjected to reflow solder or other high temperature processes must be:
  - a. Mounted within 672 hours at factory conditions of equal to or less than 30°C / 60% RH, or
  - b. Stored at < 10% RH
4. Devices require bake, before mounting, if:
  - a. Humidity Indicator Card is > / 60% when read at 23 ± 5°C, or
  - b. 2a is not met.
5. If baking is required, devices must be baked for 10 ~ 24 hours at 60 ± 5°C

Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure.

Bag seal due date: \_\_\_\_\_

(If blank, see code label)

Note: Level and body temperature by IPC/JEDEC J-STD-020



LEAD-FREE



ATTENTION  
OBSERVE PRECAUTIONS  
FOR HANDLING  
ELECTROSTATIC  
SENSITIVE  
DEVICES



OTHER

**■ 주의 사항**

이 알루미늄 지퍼 백은 습기 및 정전기로부터 제품을 보호하기 위하여 제작되었습니다. 개봉 후에는 즉시 솔더 작업을 실시하는 것을 권장합니다.

습기 및 정전기로부터 제품을 보호 하기 위해서 개봉 후 사용하지 않는 자재는 본 팩에 넣어 보관 하시기 바랍니다. 사용하지 않는 자재를 본 팩에 넣을 때는 반드시 동봉된 드라이 팩과 함께 넣고 지퍼부분을 완전하게 밀봉하여 주시기 바랍니다.

**■ Important**

This Al Zipper bag is designed to protect the enclosed products from moisture and ESD. Once opened, the products should be soldered onto the printed circuit board immediately. When not in use, please do not leave the products unprotected by the Al Zipper Bag. To repack unused products., please ensure the zip-lock is completely sealed with the dry pack left inside.

c) Silica Gel & Humidity Indicator Card inside Aluminum Vinyl Bag



**HUMISAFE™**

10%    20%    30%    40%    50%    60%



READ AT TOP OF GREEN COLOR  
CHANGE BETWEEN YELLOW AND GREEN

Warning if Green Change Desiccant

GP&E Co., Ltd.  
6CF-60NS



## 10. Precautions in Handling & Use

- 1) For over-current-proof function, customers are recommended to apply resistors to prevent sudden change of the current caused by slight shift of the voltage.
- 2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When washing is required, IPA is recommended to use.
- 3) When the LEDs illuminate, operating current should be decided after considering the ambient maximum 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 by a sealed container with nitrogen gas injected (shelf life of sealed bags: 12 months, temperature  $\sim 40^{\circ}\text{C}$ ,  $\sim 90\%$  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  $30^{\circ}\text{C}$  /  $60\%$  RH, or
  - b. Stored at  $<10\%$  RH
- 6) Repack unused products 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  $23 \pm 5^{\circ}\text{C}$ .
- 8) Devices must be baked for 10~24 hours at  $60 \pm 5^{\circ}\text{C}$ , if baking is required.
- 9) The LEDs are sensitive to the static electricity and surge. 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 leak 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 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 (fixtures). In order to prevent these problems, we recommend users to know the physical properties of the materials used in luminaires, and they must be selected carefully.
- 11) Risk of sulfurization (or tarnishing)  
 The LED from Samsung Electronics Co., Ltd. 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.
- 12) This LED (Lighting area or Non lighting area) Particle or Dust size under  $50,000\mu\text{m}^2$  is permitted.

# Legal and additional information.

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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](http://www.samsungled.com).

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