S P E C I F I C A T I O N S

Middle Power LED Series
2835 0.5W 3V Signage
LM281B



LM281B leads lighting design trend with high performance and efficacy

Features & Benefits

- **0.5W Class mid power LED**
- **Standard form factor for design flexibility**

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Table of Contents

1	Product Code Information	.....	3
2	Characteristics	.....	4
3	Typical Characteristics Graphs	.....	7
4	Outline Drawing & Dimension	.....	9
5	Soldering Conditions	.....	10
6	Tape & Reel	.....	11
7	Label Structure	.....	13
8	Packing Structure	.....	15
9	Precautions in Handling & Use	.....	16

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	Dongbu Package Middle Power	SPM	Mddle power			
4 5	Color	WH	White			
6	Product Version	1	1st Version			
7 8 9	Form Factor	228	2.8 x 3.5 x 0.65 mm			
10	Sorting Current (mA)	F	150 mA			
11	Chromaticity Coordinates	N	Signage			
12	CRI	4	Min. 75			
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	10000	Bin Code	A2, A3, A4	
		A3			A3	
		A4			A2, A4	
17 18	Luminous Flux	S0		Bin Code	S1, S2	

2. Characteristics

(1) Absolute Maximum Ratings

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

* Note

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

(2) Electro-optical Characteristics (I_F = 150 mA, T_s = 25 ºC)

Item	Unit	Norminal 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 (Φv)	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 uA)	V					10.0	-		
Thermal Resistance (junction to solder point)	ºC/W					-	24	-	
Beam Angle	°					-	120	-	

* Note

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

(3) Luminous Flux Bins (I_F = 150 mA, T_s = 25ºC)

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

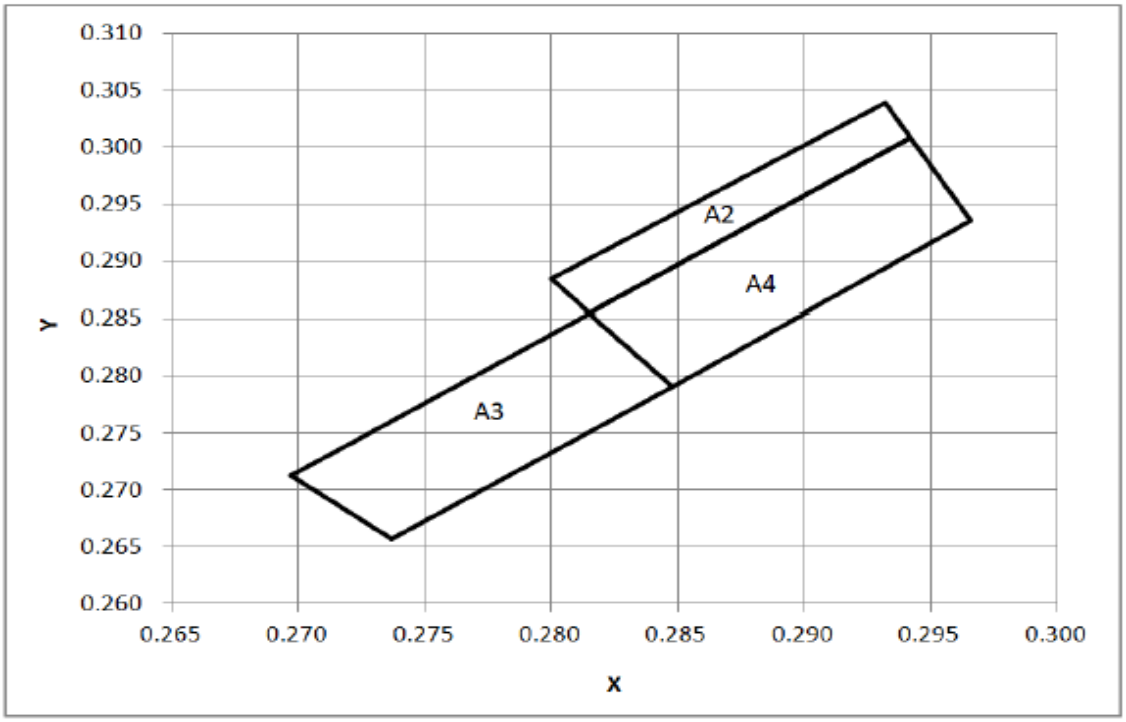
(4) Color Bins (I_F = 150 mA, T_s = 25ºC)

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

(5) Voltage Bins (I_F = 150 mA, T_s = 25 ºC)

CRI (Ra) 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

(6) Chromaticity Region & Coordinates (I_F = 150 mA, T_s = 25 ºC)



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

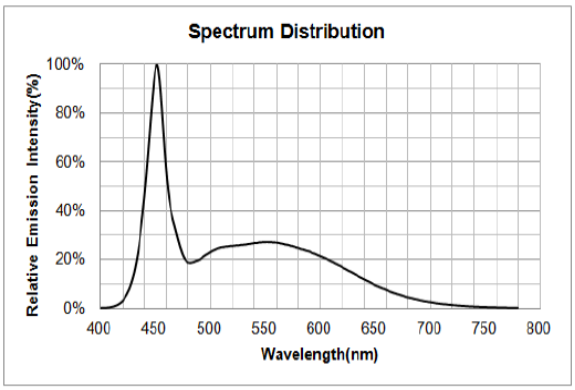
* Note :

DongbuLED maintains measurement tolerance of: Cx, Cy = ±0.005

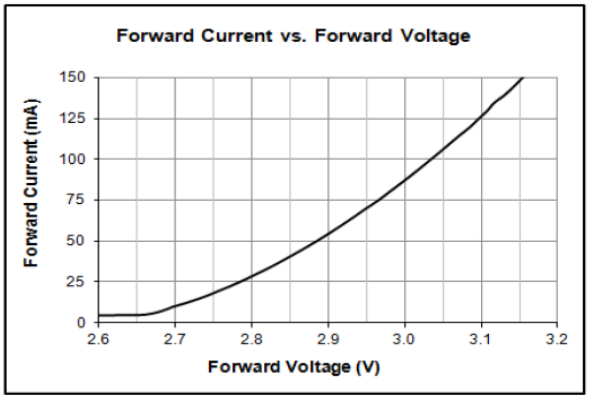
3. Typical Characteristics Graphs

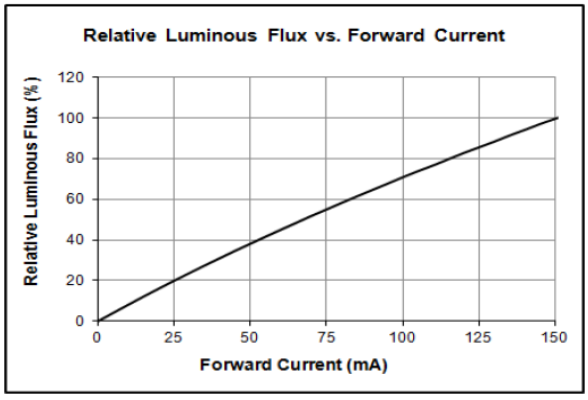
(1) Spectrum Distribution (I_F = 150 mA, T_s = 25 ºC)

CCT : 10000 K (80 CRI)

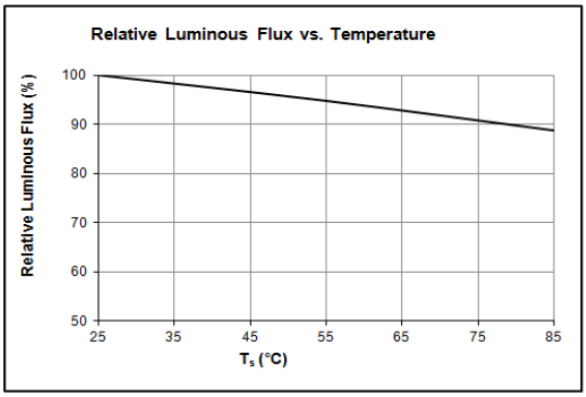


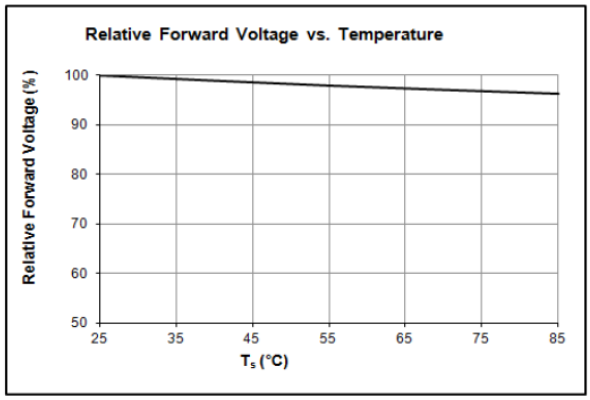
(2) Forward Current Characteristics (Ts=25 ºC)





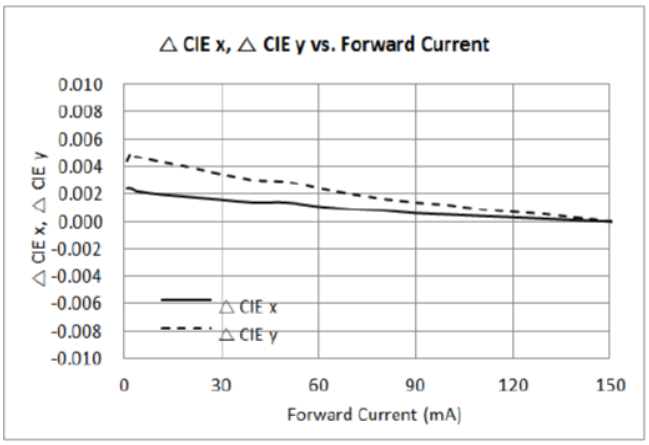
(3)Temperature Characteristics (I_F=150 mA)



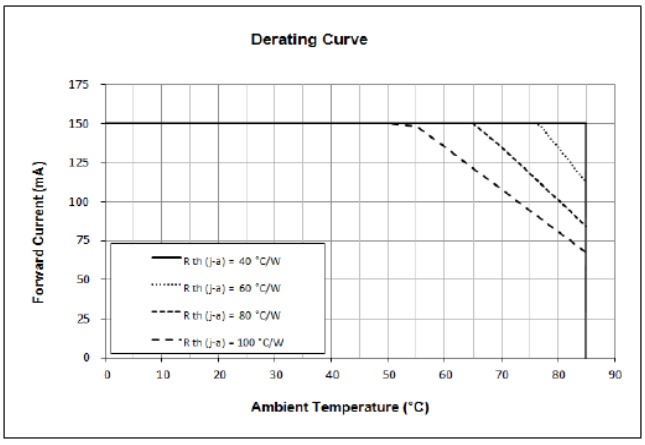


3. Typical Characteristics Graphs

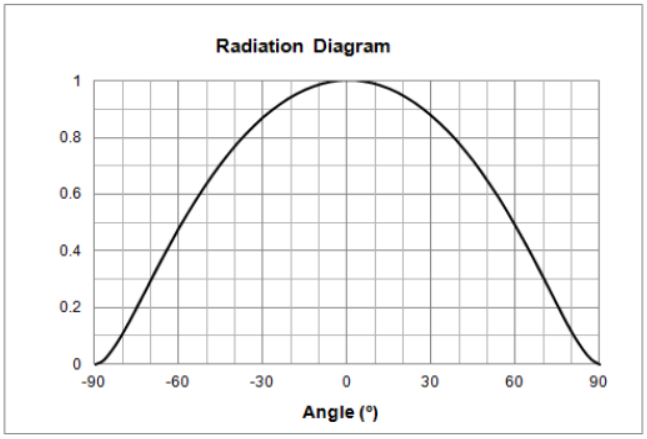
(4) Color Shift Characteristics (I_F=150 mA, T_s=25 ºC)



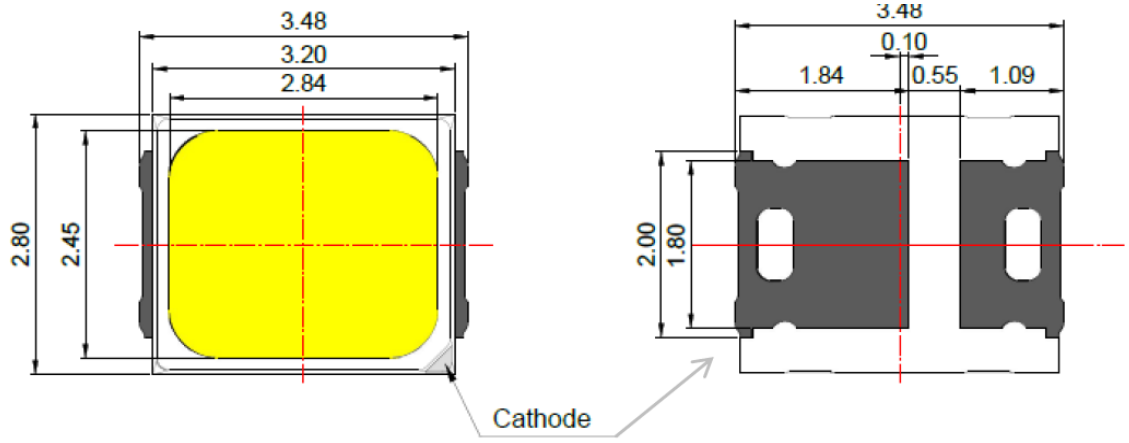
(5) Derating Curve



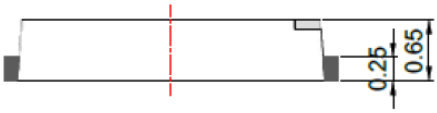
(6) Beam Angle Characteristics (I_F=150 mA, T_s=25 ºC)



4. Outline Drawing & Dimension

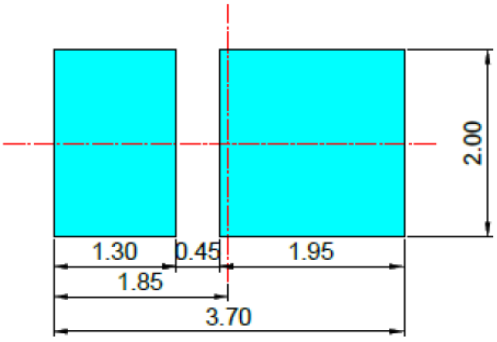


[Top View] **[Bottom View]**



[Side View]

[Recommended PCB Solder Pad]



- Measurement unit : mm
- Tolerance : ± 0.1mm

* Note :

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

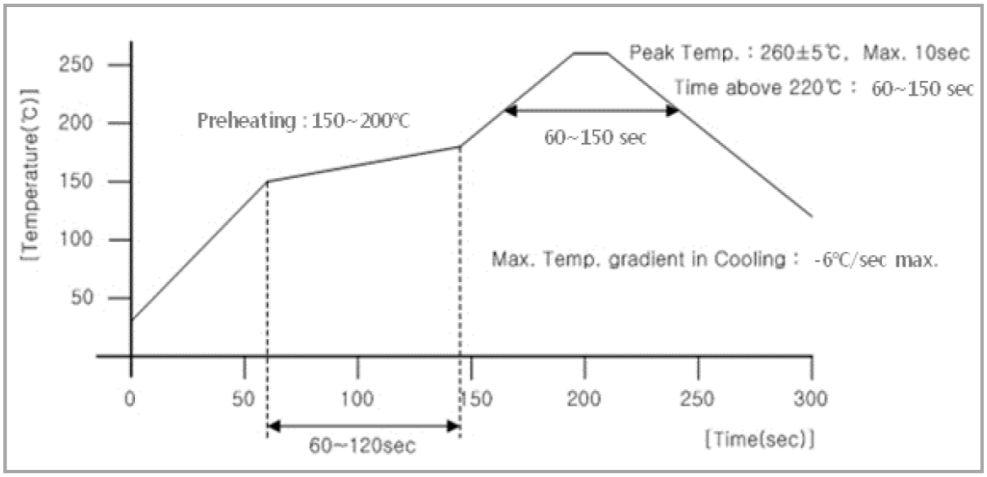
Precautions:

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. Soldering Conditions

(1) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



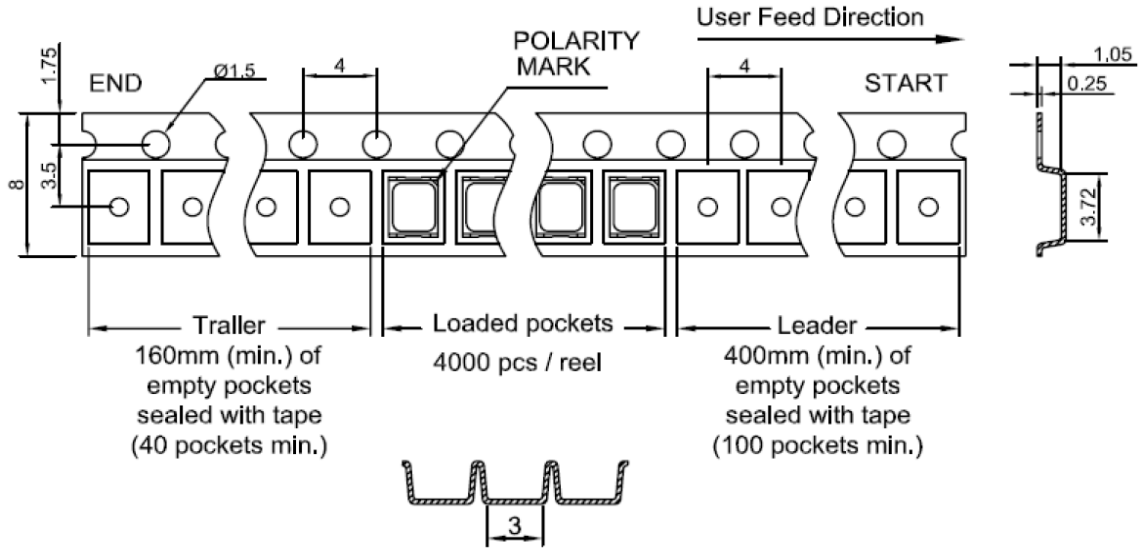
(2) Manual Soldering Conditions

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

6. Tape & Reel

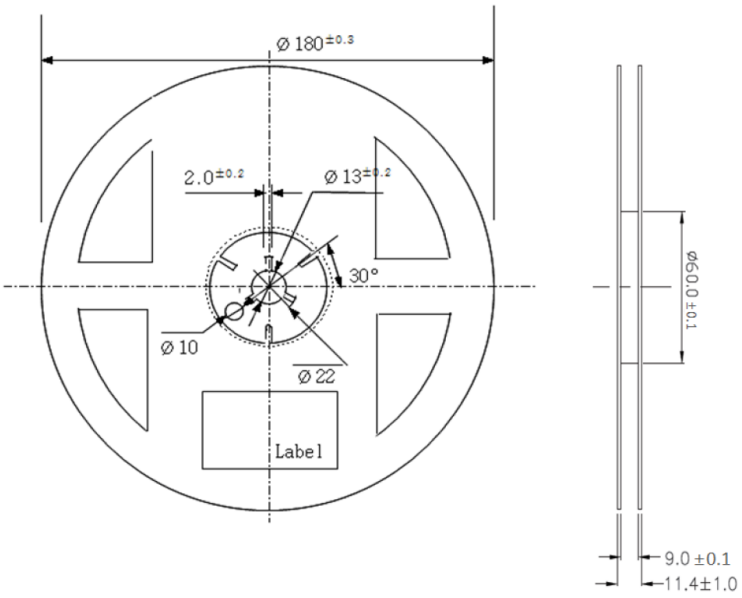
(1) Taping Dimension

(unit : mm)



(2) Reel Dimension (Max 4,000 pcs)

(unit : mm)

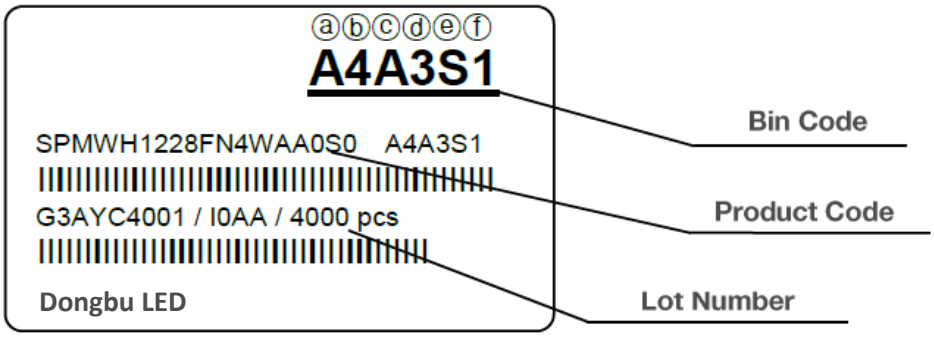


*** Note :**

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

7. Label Structure

(1) Label Structure



*** Note : Denoted bin code and product code above is only an example (see description on page 3)**

Bin Code

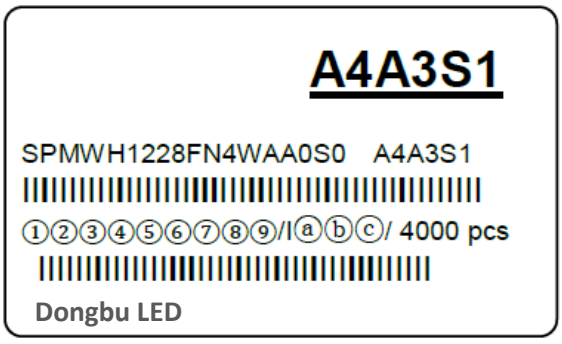
ⓐⓑ : Forward Voltage bin (refer to page 5)

ⓒⓓ : Chromaticity bin (refer to page 5)

ⓔⓕ : Luminous Flux bin (refer to page 5)

(2) Lot Number

The lot number is composed of the following characters:



①②③④⑤⑥⑦⑧⑨ / Ⅰⓐⓑⓒ / 4,000 pcs

①② : Production site (S:Giheung, Korea, G: Tianjin, China)

③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)

④ : Year (C: 2018, D: 2019, E: 2020, F: 2021, G: 2022…)

⑤ : Month (1~9, A, B, C)

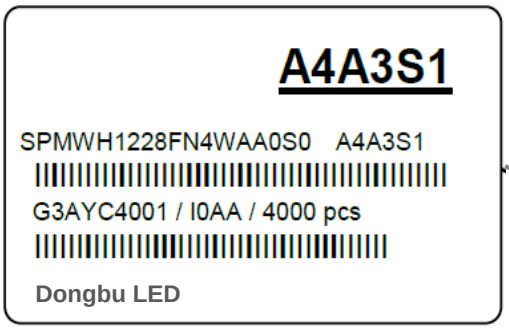
⑥ : Day (1~9, A, B~V)

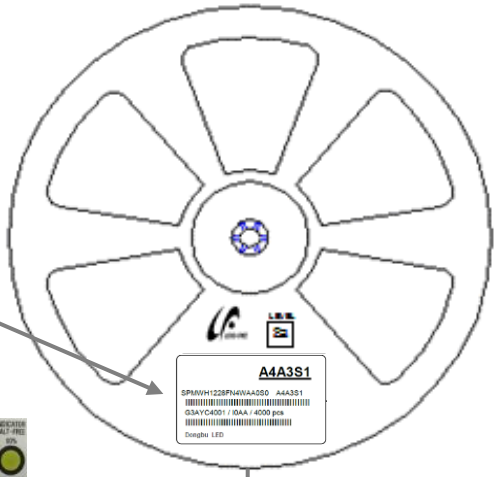
⑦⑧⑨ ⓐⓑⓒ : Product serial number

8. Packing Structure

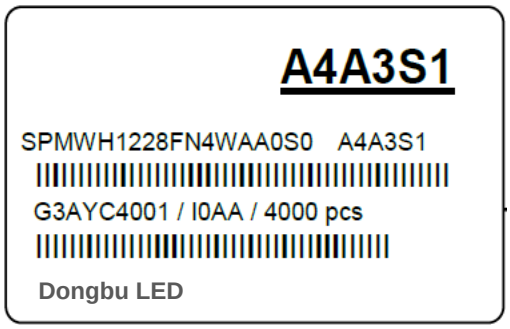
(1) Packing Process (The quantity of PKG on the Reel to be Max 4,000 pcs)

Reel





Aluminum Vinyl Packing Bag



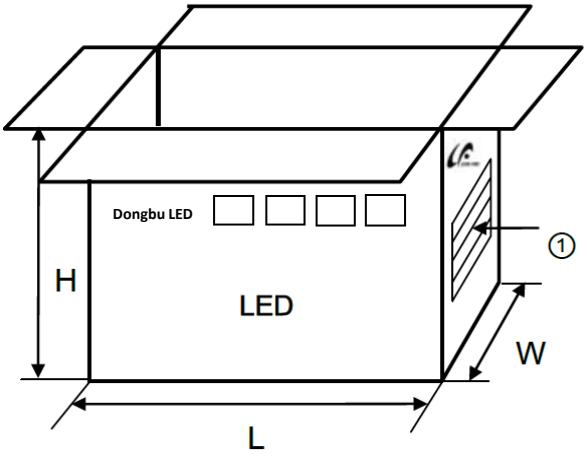




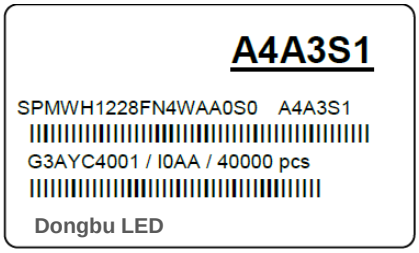
Outer Box

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



8. Packing Structure

(5) Aluminum Vinyl Packing Bag



(6) Example of Humidity Indicator Card inside Aluminum Vinyl Bag



9. 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.
(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*$_{Note\ 1}$, or
b. Mounted within 24 hours (1 day) at an assembly line with a condition of more than 30 ºC / 70 % RH*$_{Note\ 2}$, or
c. Stored at <10 % RH

*Note 1, 2: IPC/JEDEC J-STD-033A, Recommended Equivalent Total Floor Life Table

Package Type and Body Thickness	Moisture Sensitivity Level	Maximum Percent Relative Humity						Temperature
		40%	50%	60%	70%	80%	90%	
Body Thickness <2.1mm	Level2a	∞	∞	28	1	1	1	30℃
		∞	∞	∞	2	1	1	25℃
		∞	∞	∞	2	2	1	20℃

(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 10~24 hours 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.

9. Precautions in Handling & Use

(11) Risk of sulfurization (or tarnishing)

The LED from Dongbu 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.