

Middle Power LED Series
3030

LM302Z Plus CRI90



Features & Benefits

- 0.6 W class middle power LED
- EMC resin for high reliability
- Standard form factor for design flexibility (3.0 × 3.0 mm)



SAMSUNG

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1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Operating Solder Temperature	T_s	-40 ~ +105	°C	-
Storage Temperature	T_{stg}	-40 ~ +100	°C	-
LED Junction Temperature	T_j	125	°C	-
Forward Current	I_F	200	mA	-
Pulse Forward Current	I_{FP}	300	mA	Duty 1/10, pulse width 10 ms
Assembly Process Temperature	-	260 <10	°C s	-
ESD (HBM)	-	5	kV	-

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

Item	Nominal CCT (K)	Rank	Bin	Min.	Typ.	Max.	Unit
Forward Voltage (V_F)		GB	BZ	5.8	-	6.0	V
			B1	6.0	-	6.2	
			B2	6.2	-	6.4	
			B3	6.4	-	6.6	
Reverse Voltage (@ 5 mA)				0.7	-	1.2	V
Color Rendering Index (R_a)		7		90	-	-	-
Thermal Resistance (junction to solder point)				-	12	-	°C/W
Beam Angle				-	120	-	°

Note:

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

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	3	3	2	6	F	P	7	G	B	V	0	S	0

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package Middle Power	SPM	
4 5	Color	WH	White
6	Product Version	3	Zener version
7 8 9	Form Factor	326	3.0 x 3.0 x 0.65 mm; 2 pads
10	Sorting Current	F	150 mA
11	Chromaticity Coordinates	P	MacAdam
12	CRI	7	Min. 90
13 14	Forward Voltage (V)	GB	5.8~6.6 Bin Code: BZ 5.8~6.0 B1 6.0~6.2 B2 6.2~6.4 B3 6.4~6.6
15 16	CCT (K)	W☆ V☆ U☆ T☆ R☆ Q☆ P☆	2700 3000 3500 4000 5000 5700 6500 WN, WP, WQ, WR, WS, WT, WU VN, VP, VQ, VR, VS, VT, VU UN, UP, UQ, UR, US, UT, UU Bin Code TN, TP, TQ, TR, TS, TT, TU RN, RP, RQ, RR, RS, RT, RU QN, QP, QQ, QR, QS, QT, QU PN, PP, PQ, PR, PS, PT, PU ☆ : "0" (Whole Bin) "3" (MacAdam 3- step) "Y" (Kitting)
17 18	Luminous Flux (lm)	S0	Bin Code: SC 97~106 lm SD 106~115 lm SE 115~124 lm

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

Nominal CCT (K)	CRI Min.	Product Code	Flux Bin	Flux Range (Φ_v , lm)
2700	90	SPMWH3326FP7GBW☆S0	SC	97 – 106
			SD	106 – 115
3000	90	SPMWH3326FP7GBV☆S0	SD	106 – 115
			SE	115 – 124
3500	90	SPMWH3326FP7GBU☆S0	SD	106 – 115
			SE	115 – 124
4000	90	SPMWH3326FP7GBT☆S0	SE	115 – 124
			SF	124 – 133
5000	90	SPMWH3326FP7GBR☆S0	SE	115 – 124
			SF	124 – 133
5700	90	SPMWH3326FP7GBQ☆S0	SE	115 – 124
			SF	124 – 133
6500	90	SPMWH3326FP7GBP☆S0	SE	115 – 124
			SF	124 – 133

Note:

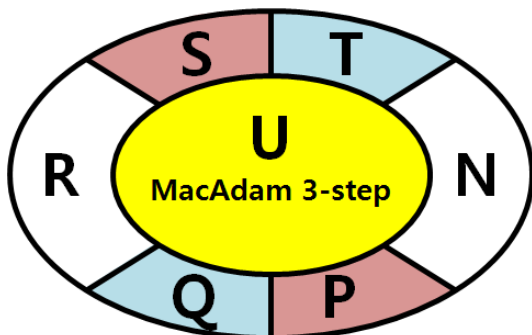
"☆" can be "0" (Whole Bin), "3" (MacAdam 3-step), "Y" (Kitting)

b) Kitting Rule

1) Y Kitting bin Concept

1. Under agreement between customer and SAMSUNG ELECTRONICS, SAMSUNG can supply kitting bin (Color).
2. A Chromaticity Coordinates of kitting bin is mixed by kitting procedure.(below kitting simulation)

[Kitting example]



[Binning Information]

		Bin #1	Bin #2
CIE		U	U
		N	R
		P	S
		Q	T
		SC	SC
IV		SC	SD
		SD	SD
		SD	SE
		SE	SE
		SE	SF
		SF	SF
		SF	SF

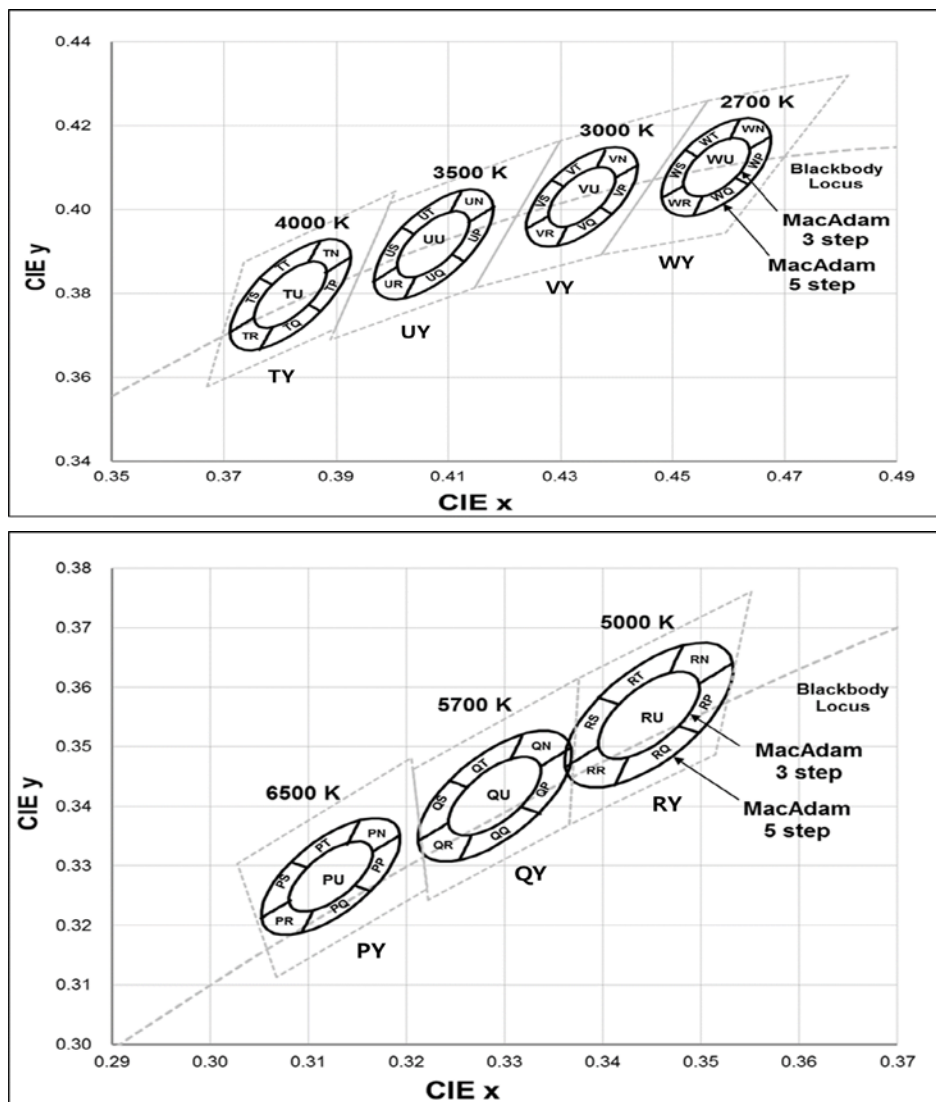
c) Color Bins ($I_F = 150 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

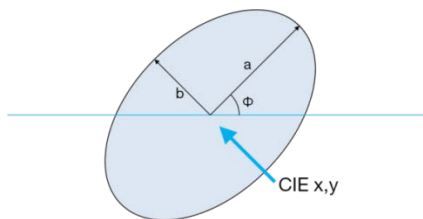
Nominal CCT (K)	CRI Min.	Product Code	Color Rank	Chromaticity Bins
2700	90	SPMWH3326FP7GBW0S0	W0 (Whole Bin)	WN, WP, WQ, WR, WS, WT, WU
		SPMWH3326FP7GBW3S0	W3 (MacAdam 3-step)	WU
		SPMWH3326FP7GBWYS0	WY (Kitting)	WN, WP, WQ, WR, WS, WT, WU
3000	90	SPMWH3326FP7GBV0S0	V0 (Whole Bin)	VN, VP, VQ, VR, VS, VT, VU
		SPMWH3326FP7GBV3S0	V3 (MacAdam 3-step)	VU
		SPMWH3326FP7GBVYS0	VY (Kitting)	VN, VP, VQ, VR, VS, VT, VU
3500	90	SPMWH3326FP7GBU0S0	U0 (Whole Bin)	UN, UP, UQ, UR, US, UT, UU
		SPMWH3326FP7GBU3S0	U3 (MacAdam 3-step)	UU
		SPMWH3326FP7GBUYS0	UY (Kitting)	UN, UP, UQ, UR, US, UT, UU
4000	90	SPMWH3326FP7GBT0S0	T0 (Whole Bin)	TN, TP, TQ, TR, TS, TT, TU
		SPMWH3326FP7GBT3S0	T3 (MacAdam 3-step)	TU
		SPMWH3326FP7GBTYS0	TY (Kitting)	TN, TP, TQ, TR, TS, TT, TU
5000	90	SPMWH3326FP7GBR0S0	R0 (Whole Bin)	RN, RP, RQ, RR, RS, RT, RU
		SPMWH3326FP7GBR3S0	R3 (MacAdam 3-step)	RU
		SPMWH3326FP7GBRYS0	RY (Kitting)	RN, RP, RQ, RR, RS, RT, RU
5700	90	SPMWH3326FP7GBQ0S0	Q0 (Whole Bin)	QN, QP, QQ, QR, QS, QT, QU
		SPMWH3326FP7GBQ3S0	Q3 (MacAdam 3-step)	QU
		SPMWH3326FP7GBQYS0	QY (Kitting)	QN, QP, QQ, QR, QS, QT, QU
6500	90	SPMWH3326FP7GBP0S0	P0 (Whole Bin)	PN, PP, PQ, PR, PS, PT, PU
		SPMWH3326FP7GBP3S0	P3 (MacAdam 3-step)	PU
		SPMWH3326FP7GBPYS0	PY (Kitting)	PN, PP, PQ, PR, PS, PT, PU

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

Nominal CCT (K)	CRI Min	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	GB	BZ	5.8 ~ 6.0
				B1	6.0 ~ 6.2
				B2	6.2 ~ 6.4
				B3	6.4 ~ 6.6

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

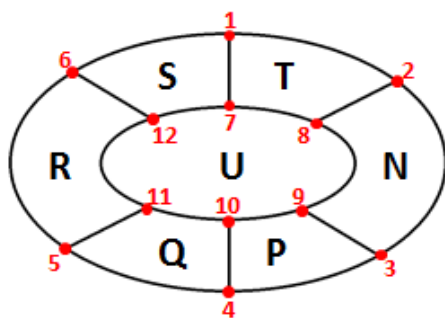


f) Chromaticity Region & Coordinates ($I_F = 150 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)


MacAdam	CCT (K)	Center point		Major-axis	Minor-axis	Rotation
		CIE x	CIE y	a	b	Φ
3 step	2700	0.4578	0.4101	0.0081	0.0042	53.70
	3000	0.4338	0.4030	0.0083	0.0041	53.22
	3500	0.4073	0.3917	0.0093	0.0041	54.00
	4000	0.3818	0.3797	0.0094	0.0040	53.72
	5000	0.3447	0.3553	0.0082	0.0035	59.62
	5700	0.3287	0.3417	0.0075	0.0032	59.10
	6500	0.3123	0.3282	0.0067	0.0029	58.57
5 step	2700	0.4578	0.4101	0.0135	0.0070	53.70
	3000	0.4338	0.4030	0.0138	0.0068	53.22
	3500	0.4073	0.3917	0.0155	0.0068	54.00
	4000	0.3818	0.3797	0.0157	0.0067	53.72
	5000	0.3447	0.3553	0.0137	0.0058	59.62
	5700	0.3287	0.3417	0.0125	0.0053	59.10
	6500	0.3123	0.3282	0.0112	0.0048	58.57

Note: Samsung maintains measurement tolerance of: $C_x, C_y = \pm 0.005$

e) Chromaticity Region & Coordinates



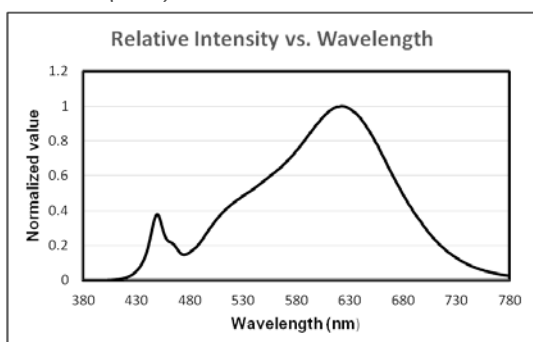
Region	2700K		3000K		3500K		4000K	
	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
1	0.4521	0.4142	0.4283	0.4071	0.4018	0.3957	0.3764	0.3837
2	0.4619	0.4216	0.4382	0.4146	0.4125	0.4046	0.3871	0.3926
3	0.4675	0.4175	0.4437	0.4105	0.418	0.4005	0.3925	0.3887
4	0.4634	0.4059	0.4393	0.3989	0.4128	0.3877	0.3872	0.3758
5	0.4537	0.3986	0.4293	0.3913	0.4022	0.3788	0.3765	0.3668
6	0.4481	0.4028	0.4239	0.3954	0.3966	0.3828	0.3711	0.3707
7	0.4544	0.4126	0.4305	0.4054	0.404	0.3941	0.3786	0.3821
8	0.4603	0.417	0.4364	0.41	0.4104	0.3994	0.385	0.3874
9	0.4636	0.4145	0.4397	0.4075	0.4137	0.397	0.3882	0.3851
10	0.4612	0.4076	0.4371	0.4005	0.4106	0.3893	0.385	0.3773
11	0.4553	0.4032	0.4311	0.396	0.4042	0.384	0.3786	0.372
12	0.452	0.4057	0.4279	0.3984	0.4009	0.3864	0.3754	0.3743

Region	5000K		5700K		6500K	
	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
1	0.3397	0.3583	0.3242	0.3445	0.3082	0.3307
2	0.3482	0.367	0.332	0.3524	0.3153	0.3377
3	0.3532	0.364	0.3365	0.3496	0.3194	0.3352
4	0.3497	0.3524	0.3333	0.339	0.3164	0.3257
5	0.3412	0.3436	0.3254	0.331	0.3093	0.3187
6	0.3362	0.3465	0.3209	0.3338	0.3052	0.3212
7	0.3417	0.3571	0.326	0.3434	0.3098	0.3297
8	0.3468	0.3623	0.3307	0.3481	0.3141	0.3339
9	0.3498	0.3605	0.3334	0.3464	0.3166	0.3324
10	0.3477	0.3535	0.3314	0.3401	0.3148	0.3267
11	0.3426	0.3483	0.3267	0.3353	0.3105	0.3225
12	0.3396	0.35	0.324	0.3369	0.308	0.324

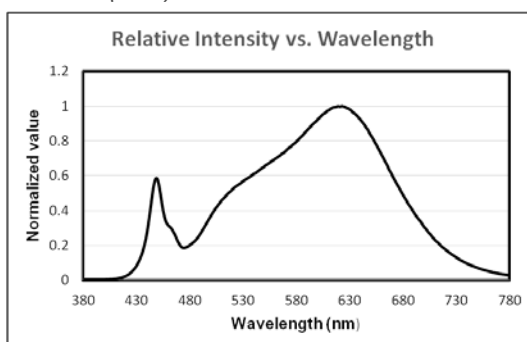
3. Typical Characteristics Graphs

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

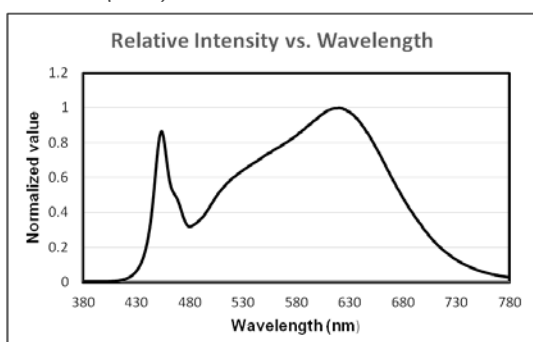
CCT : 2700K (90 CRI)



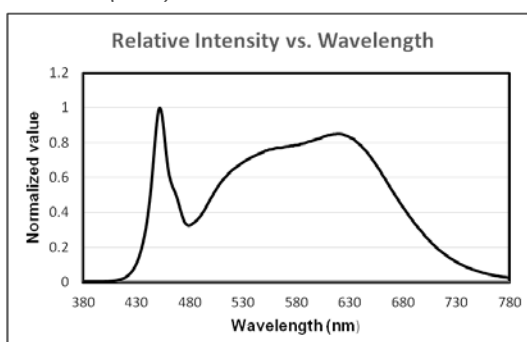
CCT : 3000K (90 CRI)



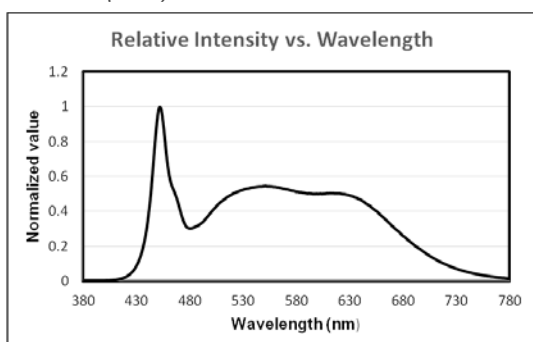
CCT : 3500K (90 CRI)



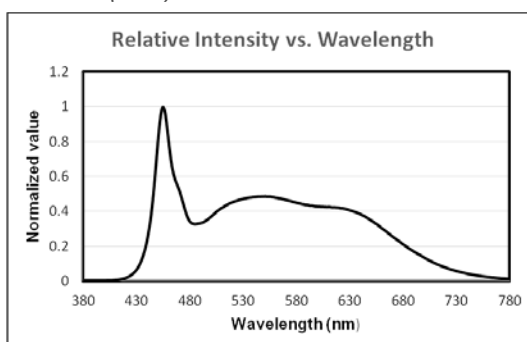
CCT : 4000K (90 CRI)



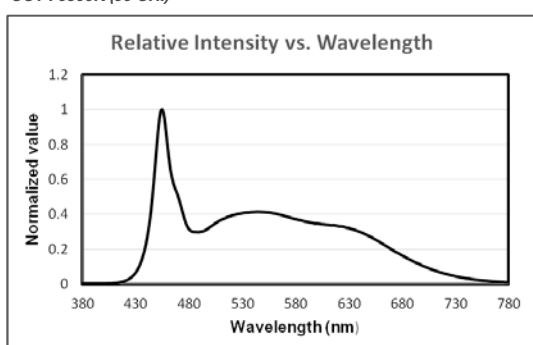
CCT : 5000K (90 CRI)



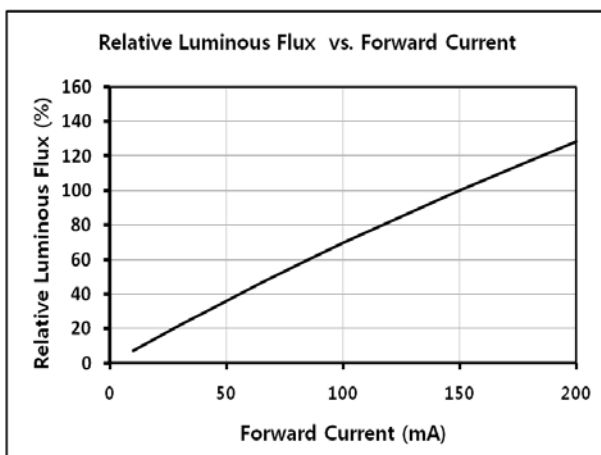
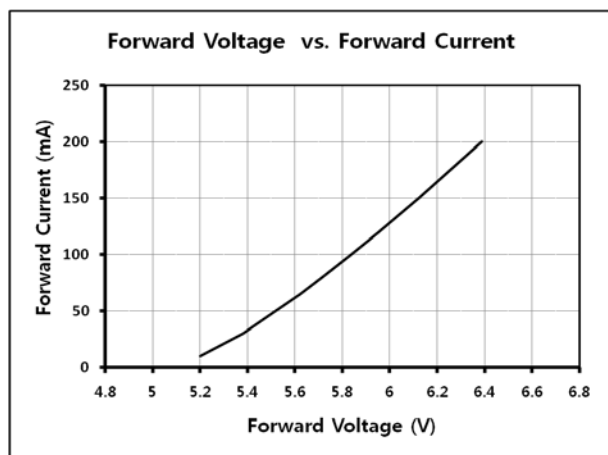
CCT : 5700K (90 CRI)



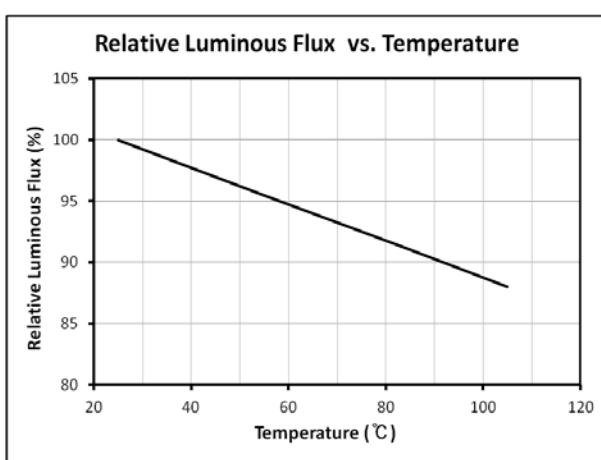
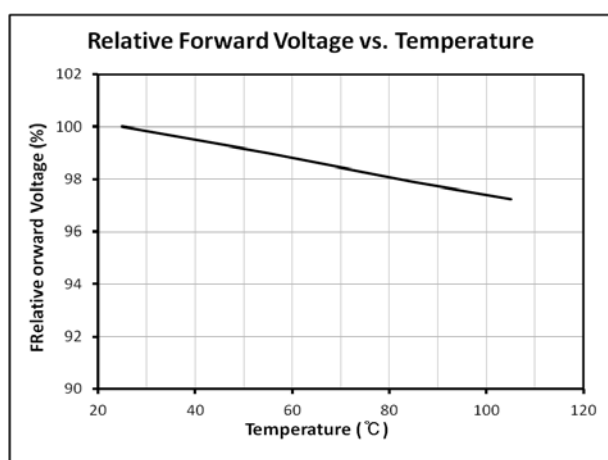
CCT : 6500K (90 CRI)



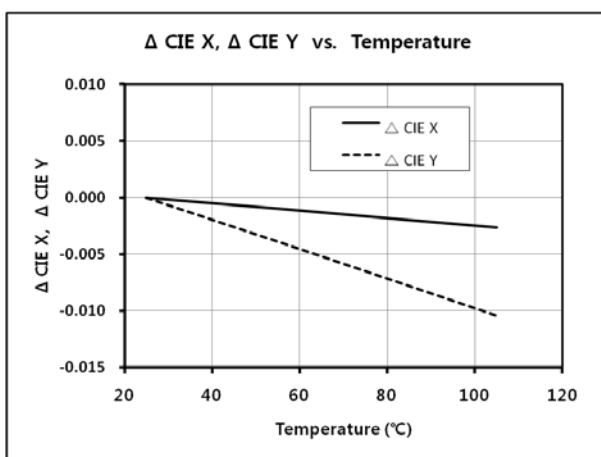
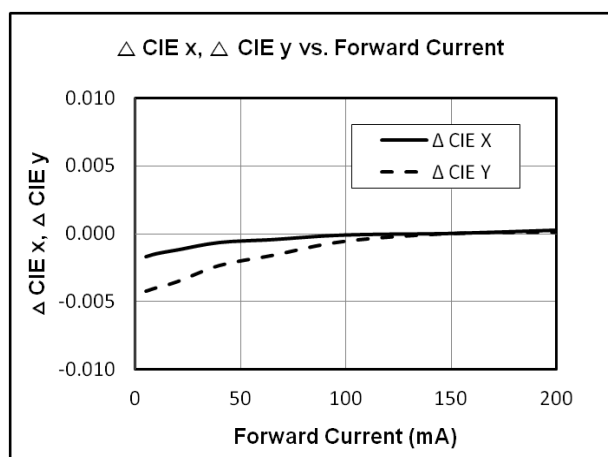
b) Forward Current Characteristics ($T_s = 25^\circ\text{C}$)



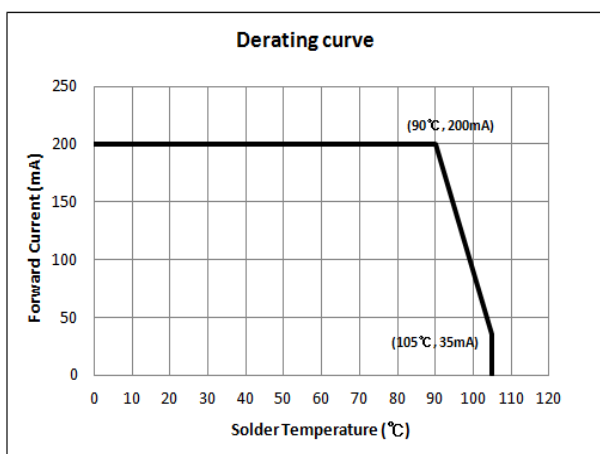
c) Temperature Characteristics ($I_F = 150\text{ mA}$)



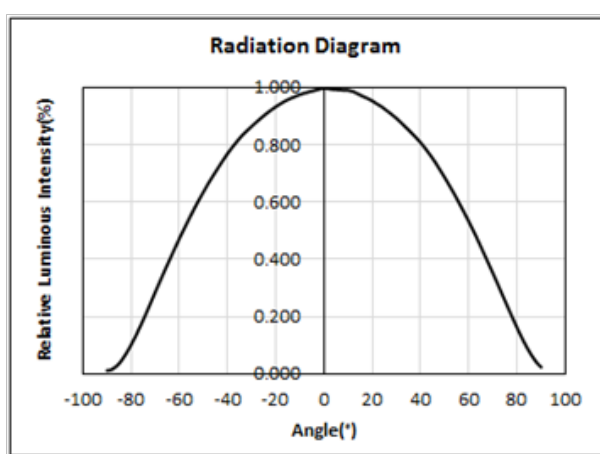
c) Color Shift Characteristics ($T_a = 25^\circ\text{C}$, $I_F = 150\text{ mA}$)



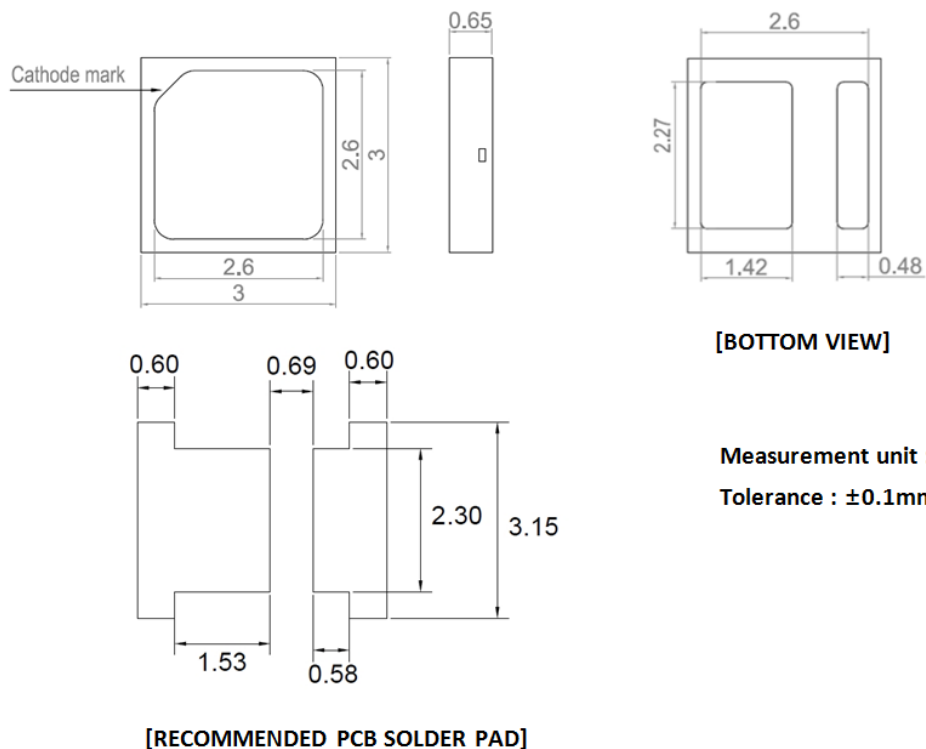
d) Derating curve



e) Beam angle Characteristics



4. Outline Drawing & Dimension



Notes:

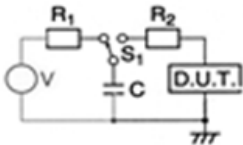
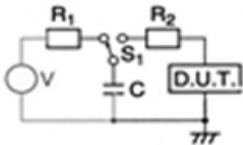
- 1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
- 2) T_s point and measurement method:
 - ① Measure one point at the cathode pad, if necessary remove PSR of PCB to reach T_s point.
 - ② All pads must be soldered to the PCB to dissipate heat properly, otherwise 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 150 mA	1000 h	22
High Temperature Life Test	85 °C, DC 150 mA	1000 h	22
High Temperature Humidity Life Test	60 °C, 90 % RH, DC 150 mA	1000 h	22
Low Temperature Life Test	-40 °C, DC 150 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 150 mA	100 cycles	22
Thermal Cycle	-40 °C / 15 min ↔ 100 °C / 15 min → Hot plate 180 °C	500 cycles	100
High Temperature Storage	100 °C	1000 h	11
Low Temperature Storage	-40 °C	1000 h	11
ESD (HBM)	 R₁: 10 MΩ R₂: 1.5 kΩ C: 100 pF V: ±5 kV	5 times	30
ESD (MM)	 R₁: 10 MΩ R₂: 0 C: 200 pF V: ±0.5 kV	5 times	30
Vibration Test	20~2000~20 Hz, 200 m/s ² , 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

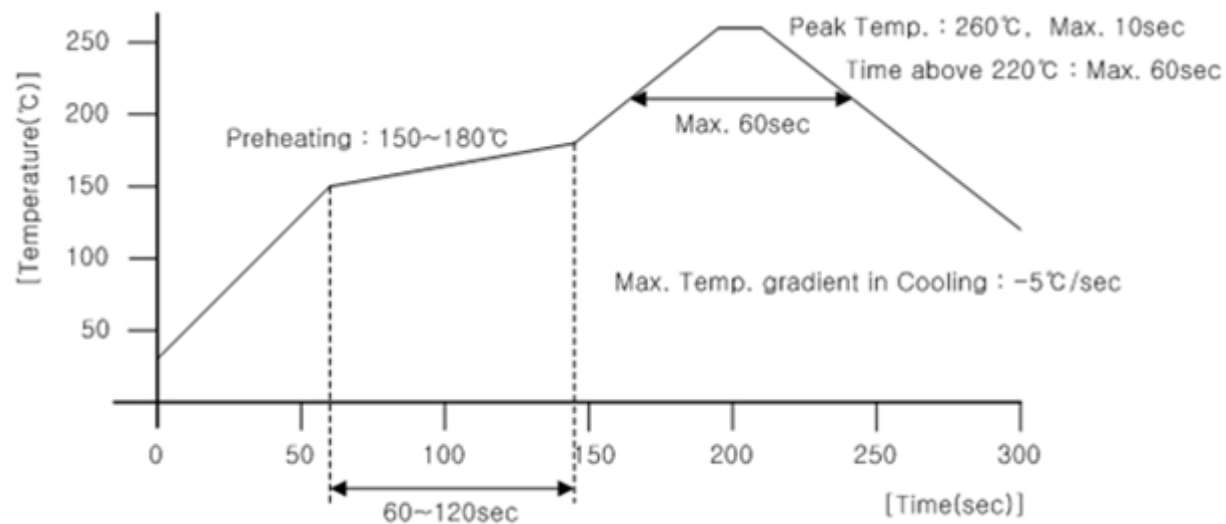
b) Criteria for Judging the Damage

Item	Symbol	Test Condition ($T_s = 25$ °C)	Limit	
			Min	Max
Forward Voltage	V_F	$I_F = 150$ mA	Init. Value * 0.9	Init. Value * 1.1
Luminous Flux	Φ_v	$I_F = 150$ mA	Init. Value * 0.7	Init. Value * 1.1

6. Soldering Conditions

a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.

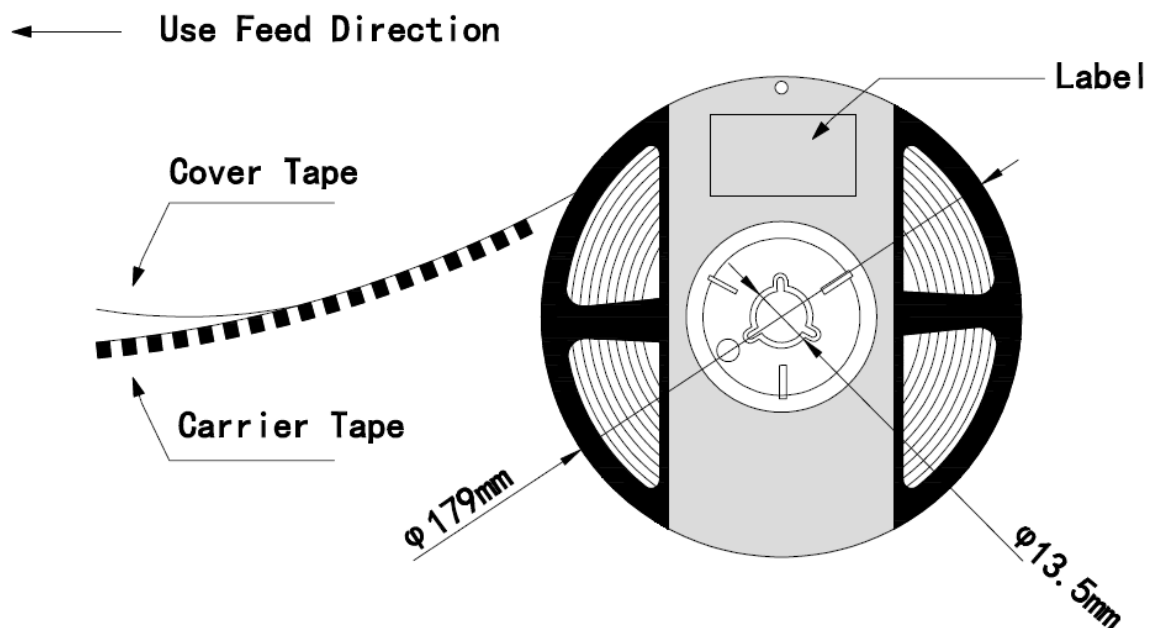


b) Manual Soldering Conditions

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

b) Reel Dimension

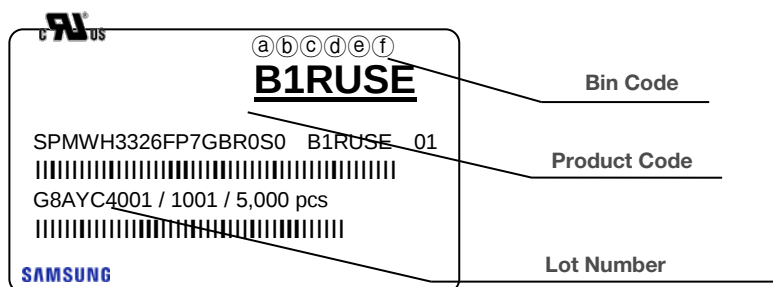
(unit: mm)

**Notes:**

- 1) Quantity: The quantity/reel is 5,000 pcs
- 2) Cumulative Tolerance: Cumulative tolerance / 10 pitches is $\pm 0.2\text{ mm}$
- 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° 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



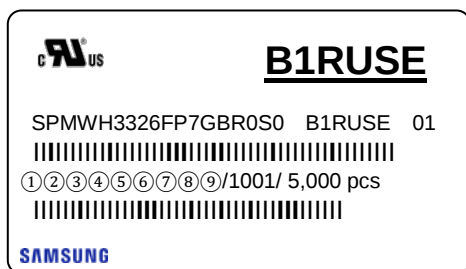
Note: Denoted bin code and product code above is only an example (see description on page 4)

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page 7)
- ⒸⒹ: Chromaticity bin (refer to page 8-10)
- ⒺⒻ: Luminous Flux bin (refer to page 5)

b) Lot Number

The lot number is composed of the following characters:

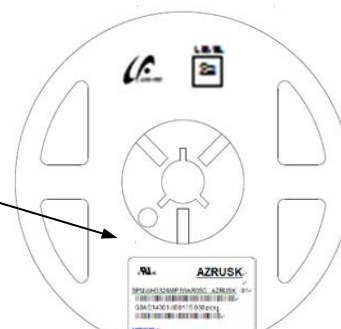
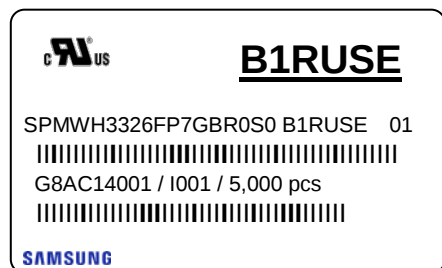


- ①② : Production site (G8 : China Xiamen)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (C: 2018, D: 2019, E: 2020...)
- ⑤ : Month (1~9, A, B, C)
- ⑥ : Day (1~9, A, B~V)
- ⑦⑧⑨ : Product serial number (001 ~ 999)

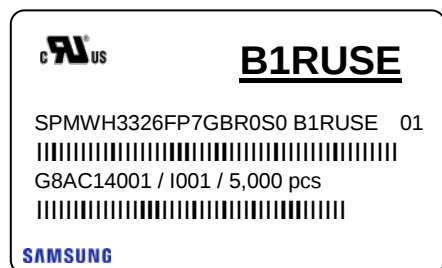
9. Packing Structure

a) Packing Process (The quantity of PKG on the Reel to be Max 5,000pcs)

Reel



Aluminum Vinyl Packing Bag

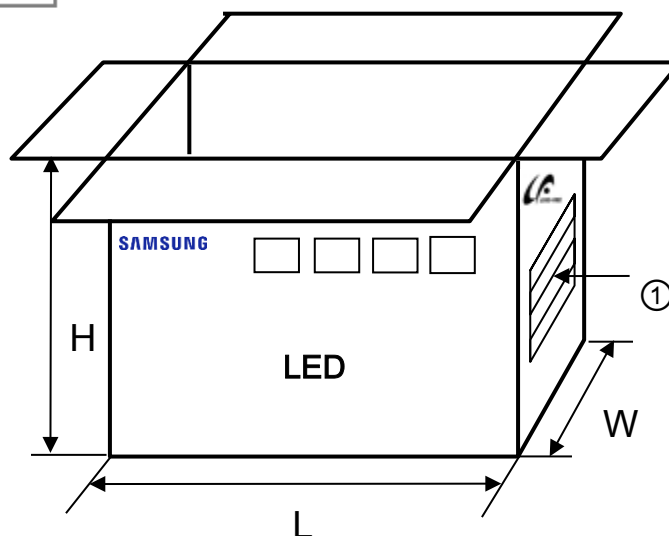
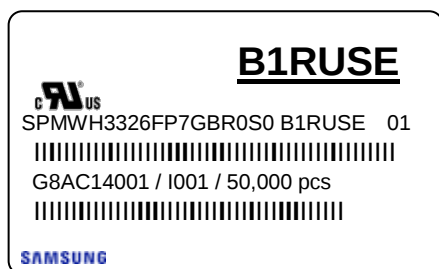


Outer Box

Material: Paper (SW3B(B))

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

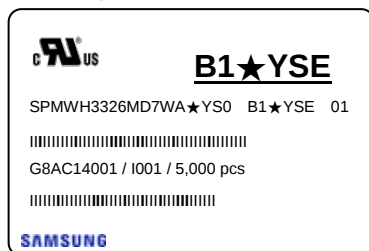
① Side Label



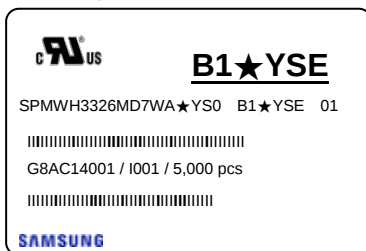
b) Packing Process for kitting (The quantity of PKG on the Reel to be Max 5,000pcs)

Reel

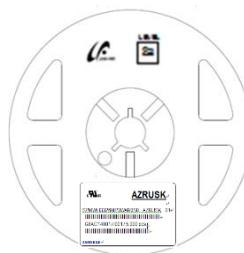
Kitting 'A'



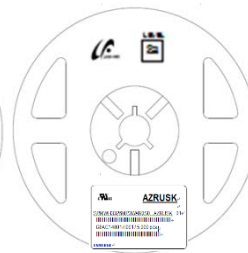
Kitting 'B'



Kitting 'A'

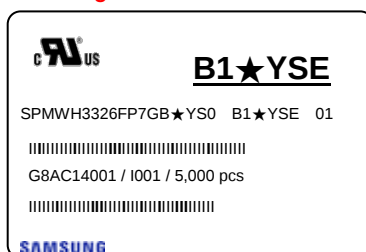


Kitting 'B'

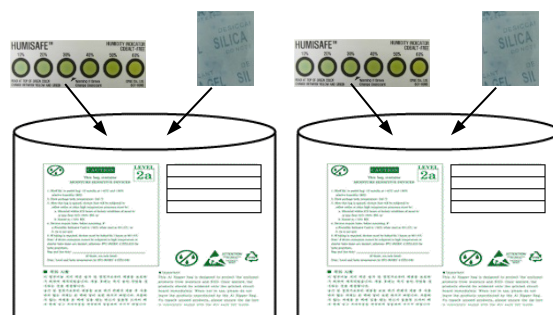
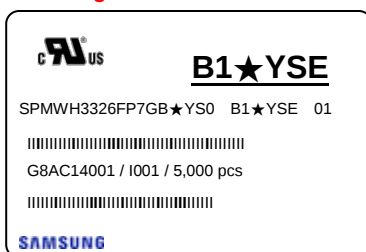


Aluminum Vinyl Packing Bag

Kitting 'A'

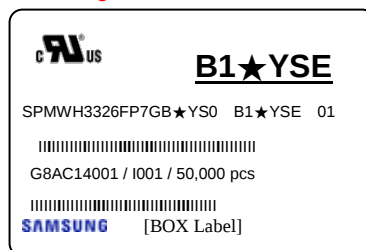


Kitting 'B'

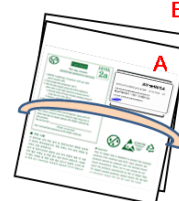
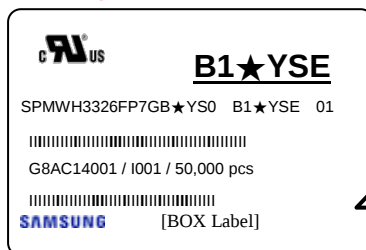


Outer Box

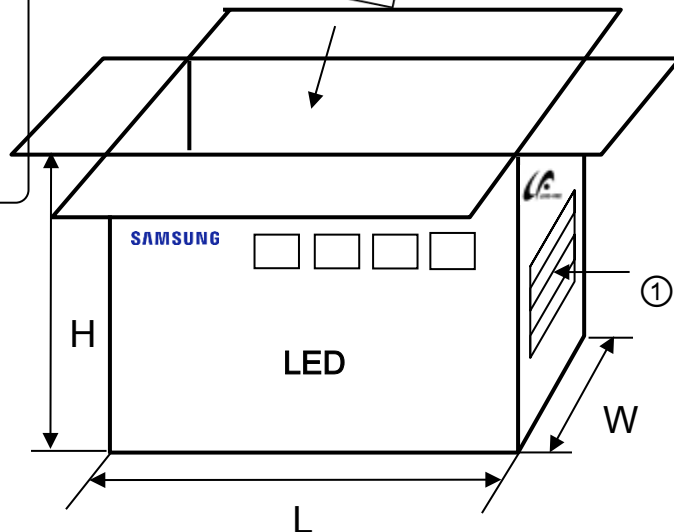
Kitting 'A'



Kitting 'B'



Tie A and B



Note: "★" can be Nominal CCT code.

Material: Paper (SW3B(B))

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

c) Aluminum Vinyl Packing Bag



CAUTION

This bag contains
MOISTURE SENSITIVE DEVICES

**LEVEL
2a**

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



B1RUSE

SPMWH3326FP7GBR0S0 B1RUSE 01
 |||||
 G8AC14001 / I001 / 5,000 pcs
 |||||

SAMSUNG







ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES



■ 주의 사항

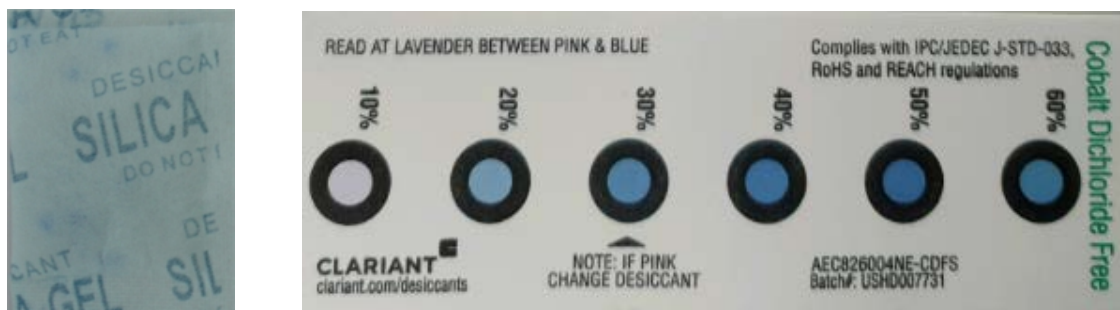
이 알루미늄 지퍼 백은 습기 및 정전기로부터 제품을 보호하기 위하여 제작되었습니다. 개봉 후에는 즉시 솔더 작업을 실시하는 것을 권장합니다.

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



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°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.

Legal and additional information.

[About Samsung Electronics Co., Ltd.](#)

Samsung inspires the world and shapes the future with transformative ideas and technologies.

The company is redefining the worlds of TVs, smartphones, wearable devices, tablets, digital appliances, network systems, and memory, system LSI, foundry and LED solutions. For the latest news, please visit the Samsung Newsroom at news.samsung.com.

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KOREA

www.samsungled.com

The Samsung logo, consisting of the word "SAMSUNG" in a bold, blue, sans-serif font.