Middle Power LED Series 3030

LM302N DAY

Features & Benefits

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

SAMSUNG

Table of Contents

1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-40 ~ +85	℃	-
Storage Temperature	T_{stg}	-40 ~ +100	℃	-
LED Junction Temperature	T_j	125	℃	-
Forward Current	I_F	200	mA	-
Pulse Forward Current	I_{FP}	300	mA	Duty 1/10, pulse width 10ms
Assembly Process Temperature	-	260 <10	℃ s	-
ESD (HBM)	-	5	kV	-

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

Item	Unit	Rank	Bin	Min.	Typ.	Max.
Forward Voltage (VF)	V	FA	AX	5.8	-	5.9
			AY	5.9	-	6.0
			AZ	6.0		6.1
			A1	6.1		6.2
Reverse Voltage (@ 5 mA)	V			0.7	-	1.2
Color Rendering Index (R_a)	-	5		80	-	-
Thermal Resistance (junction to solder point)	℃/W			-	12	-
Beam Angle	°			-	120	-

Note:

Samsung maintains measurement tolerance of: forward voltage = ±0.1 V, luminous flux = ±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	C	5	F	A	T	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	Special specification	**C**	Human-centric Day
12	CRI	**5**	Min. 80
13 14	Forward Voltage (V)	**FA**	5.8~6.2 Bin Code: **AX** 5.8~5.9, **AY** 5.9~6.0, **AZ** 6.0~6.1, **A1** 6.1~6.2
15 16	CCT (K)	**V☆**	3000 Bin Code: VN, VP, VQ, VR, VS, VT, VU
		U☆	3500 UN, UP, UQ, UR, US, UT, UU
		T☆	4000 TN, TP, TQ, TR, TS, TT, TU
		R☆	5000 RN, RP, RQ, RR, RS, RT, RU
		Q☆	5700 QN, QP, QQ, QR, QS, QT, QU
		P☆	6500 PN, PP, PQ, PR, PS, PT, PU
			☆ : "0" (MacAdam 5- step) "3" (MacAdam 3- step) "Y" (Kitting)
17 18	Luminous Flux (lm)	**S0**	Bin Code: S0

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

Nominal CCT (K)	CRI Min.	Product Code	Flux Bin	Flux Range (Φ_v, lm)
3000	80	SPMWH3326FC5FAV☆S0	S0	110-125
3500	80	SPMWH3326FC5FAU☆S0	S0	110-125
4000	80	SPMWH3326FC5FAT☆S0	S0	115-130
5000	80	SPMWH3326FC5FAR☆S0	S0	115-130
5700	80	SPMWH3326FC5FAQ☆S0	S0	115-130
6500	80	SPMWH3326FC5FAP☆S0	S0	115-130

Note:

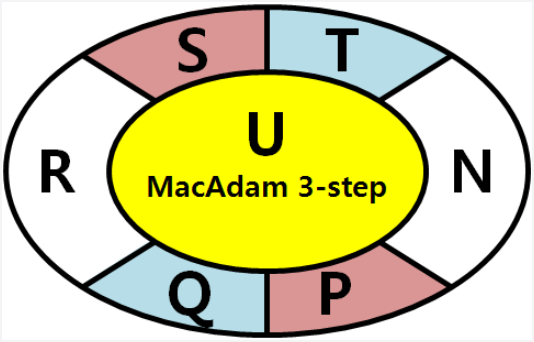
"☆" can be "0" (MacAdam 5-step), “3” (MacAdam 3-step), "Y" (Kitting)

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
IV	S0	S0

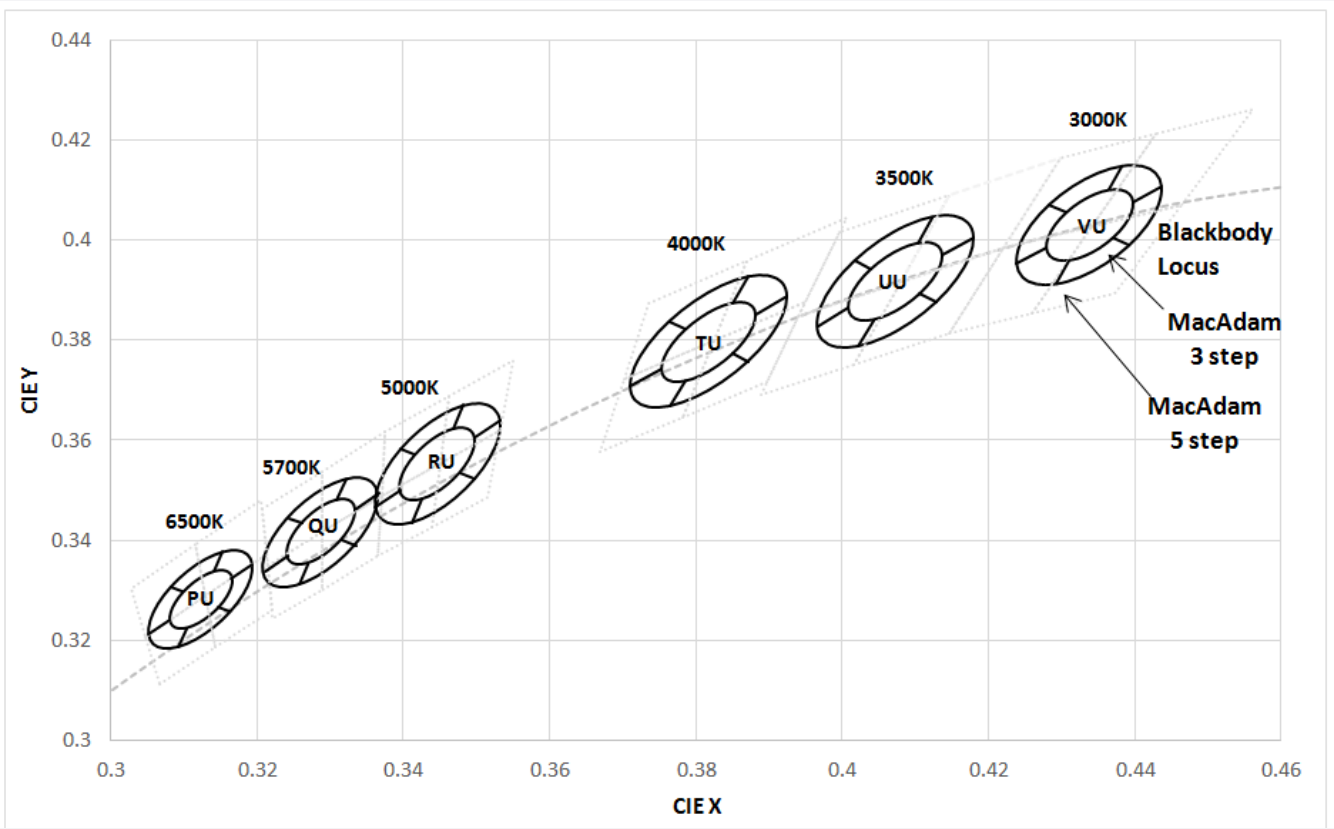
c) Color Bins (I_F = 150 mA, T_s = 25 ºC)

Nominal CCT (K)	CRI Min.	Product Code	Color Rank	Chromaticity Bins
3000	80	SPMWH3326FC5FAV0S0	V0 (MacAdam 5-step)	VN, VP, VQ, VR, VS, VT, VU
		SPMWH3326FC5FAV3S0	V3 (MacAdam 3-step)	VU
		SPMWH3326FC5FAVYS0	VY (Kitting)	VN, VP, VQ, VR, VS, VT, VU
3500	80	SPMWH3326FC5FAU0S0	U0 (MacAdam 5-step)	UN, UP, UQ, UR, US, UT, UU
		SPMWH3326FC5FAU3S0	U3 (MacAdam 3-step)	UU
		SPMWH3326FC5FAUYS0	UY (Kitting)	UN, UP, UQ, UR, US, UT, UU
4000	80	SPMWH3326FC5FAT0S0	T0 (MacAdam 5-step)	TN, TP, TQ, TR, TS, TT, TU
		SPMWH3326FC5FAT3S0	T3 (MacAdam 3-step)	TU
		SPMWH3326FC5FATYS0	TY (Kitting)	TN, TP, TQ, TR, TS, TT, TU
5000	80	SPMWH3326FC5FAR0S0	R0 (MacAdam 5-step)	RN, RP, RQ, RR, RS, RT, RU
		SPMWH3326FC5FAR3S0	R3 (MacAdam 3-step)	RU
		SPMWH3326FC5FARYS0	RY (Kitting)	RN, RP, RQ, RR, RS, RT, RU
5700	80	SPMWH3326FC5FAQ0S0	Q0 (MacAdam 5-step)	QN, QP, QQ, QR, QS, QT, QU
		SPMWH3326FC5FAQ3S0	Q3 (MacAdam 3-step)	QU
		SPMWH3326FC5FAQYS0	QY (Kitting)	QN, QP, QQ, QR, QS, QT, QU
6500	80	SPMWH3326FC5FAP0S0	P0 (MacAdam 5-step)	PN, PP, PQ, PR, PS, PT, PU
		SPMWH3326FC5FAP3S0	P3 (MacAdam 3-step)	PU
		SPMWH3326FC5FAPYS0	PY (Kitting)	PN, PP, PQ, PR, PS, PT, PU

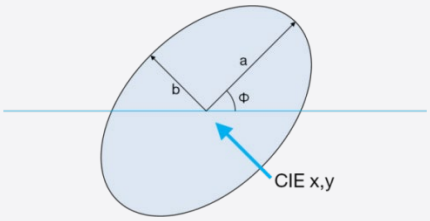
d) Voltage Bins (I_F = 150 mA, T_s = 25 ºC)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	FA	AX	5.8 ~ 5.9
				AY	5.9~6.0
				AZ	6.0~6.1
				A1	6.1~6.2

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



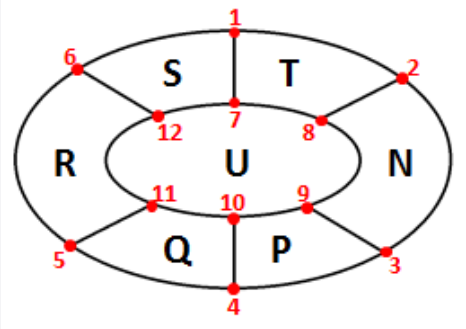
f) Chromaticity Region & Coordinates (I_F = 150 mA, T_s = 25 ºC)



MacAdam	CCT (K)	Center point		Major-axis	Minor-axis	Rotation
		CIE x	CIE y	a	b	Φ
3 step	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	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: Cx, Cy = ±0.005

g) Chromaticity Region & Coordinates



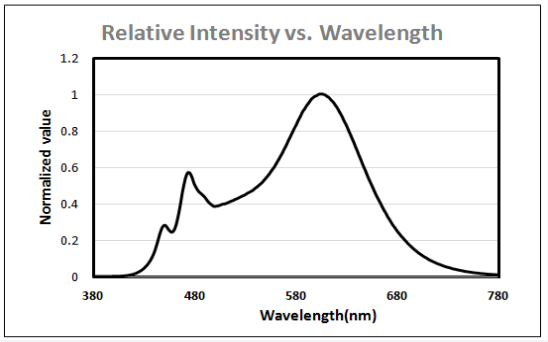
Region	3000K		3500K	
	CIE x	CIE y	CIE x	CIE y
1	0.4283	0.4071	0.4018	0.3957
2	0.4382	0.4146	0.4125	0.4046
3	0.4437	0.4105	0.4180	0.4005
4	0.4393	0.3989	0.4128	0.3877
5	0.4293	0.3913	0.4022	0.3788
6	0.4239	0.3954	0.3966	0.3828
7	0.4305	0.4054	0.4040	0.3941
8	0.4364	0.4100	0.4104	0.3994
9	0.4397	0.4075	0.4137	0.3970
10	0.4371	0.4005	0.4106	0.3893
11	0.4311	0.3960	0.4042	0.3840
12	0.4279	0.3984	0.4009	0.3864

Region	4000K		5000K		5700K		6500K	
	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
1	0.3764	0.3837	0.3397	0.3583	0.3242	0.3445	0.3082	0.3307
2	0.3871	0.3926	0.3482	0.3670	0.3320	0.3524	0.3153	0.3377
3	0.3925	0.3887	0.3532	0.3640	0.3365	0.3496	0.3194	0.3352
4	0.3872	0.3758	0.3497	0.3524	0.3333	0.3390	0.3164	0.3257
5	0.3765	0.3668	0.3412	0.3436	0.3254	0.3310	0.3093	0.3187
6	0.3711	0.3707	0.3362	0.3465	0.3209	0.3338	0.3052	0.3212
7	0.3786	0.3821	0.3417	0.3571	0.3260	0.3434	0.3098	0.3297
8	0.3850	0.3874	0.3468	0.3623	0.3307	0.3481	0.3141	0.3339
9	0.3882	0.3851	0.3498	0.3605	0.3334	0.3464	0.3166	0.3324
10	0.3850	0.3773	0.3477	0.3535	0.3314	0.3401	0.3148	0.3267
11	0.3786	0.3720	0.3426	0.3483	0.3267	0.3353	0.3105	0.3225
12	0.3754	0.3743	0.3396	0.3500	0.3240	0.3369	0.3080	0.3240

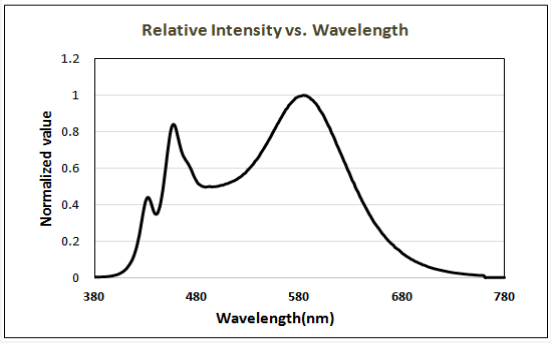
3. Typical Characteristics Graphs

a) Spectrum Distribution (I_F = 150 mA, T_S = 25 ºC)

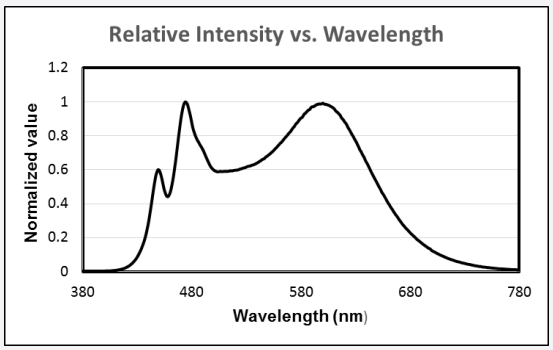
CCT : 3000K (80 CRI)



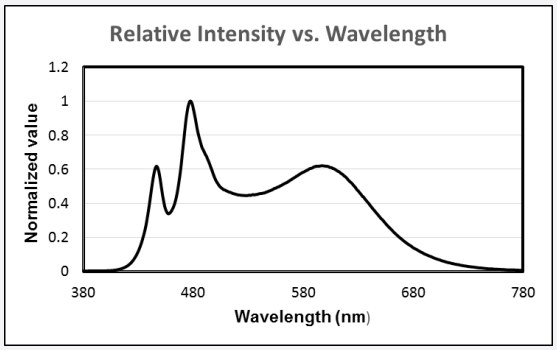
CCT : 3500K (80 CRI)



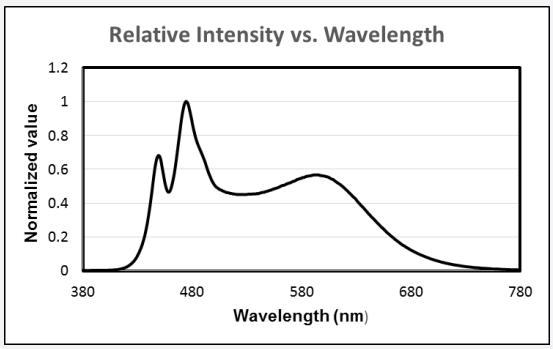
CCT : 4000K (80 CRI)



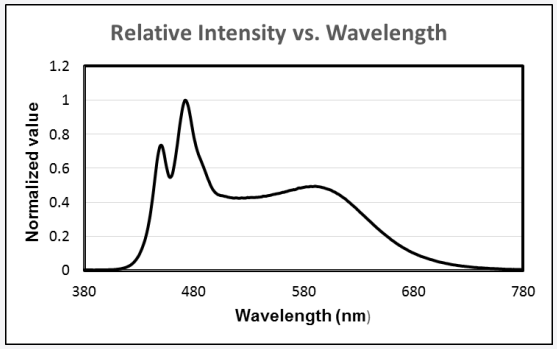
CCT : 5000K (80 CRI)



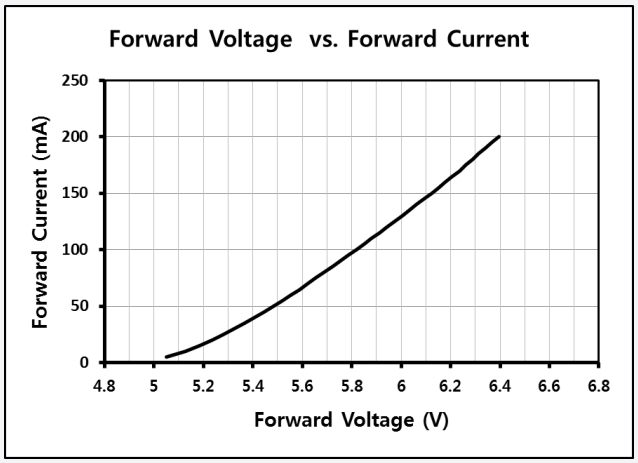
CCT : 5700K (80 CRI)

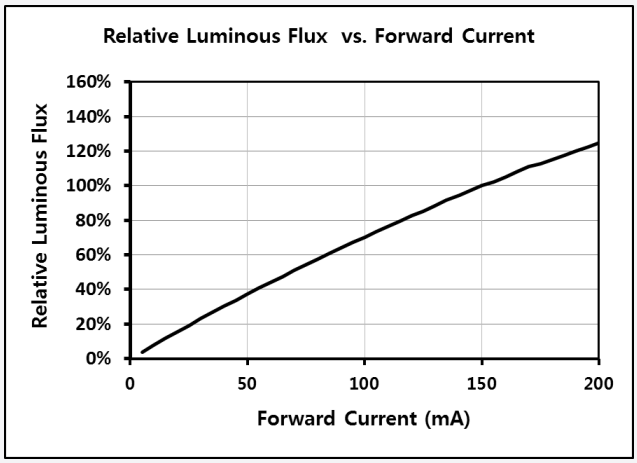


CCT : 6500K (80 CRI)

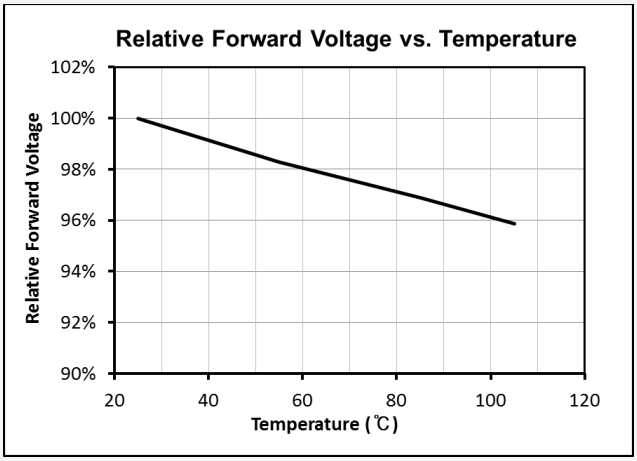


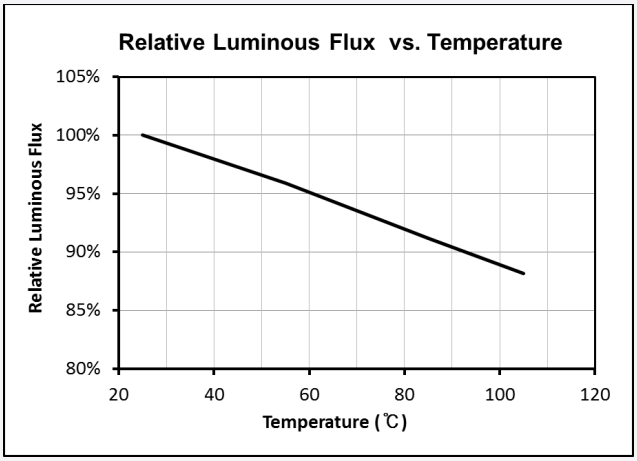
b) Forward Current Characteristics (T_s = 25 °C)



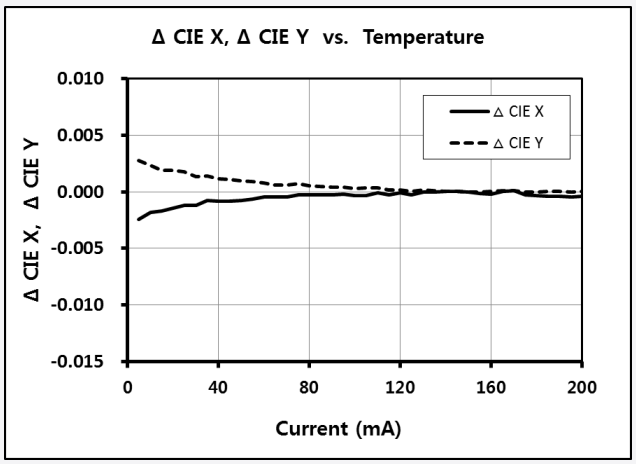


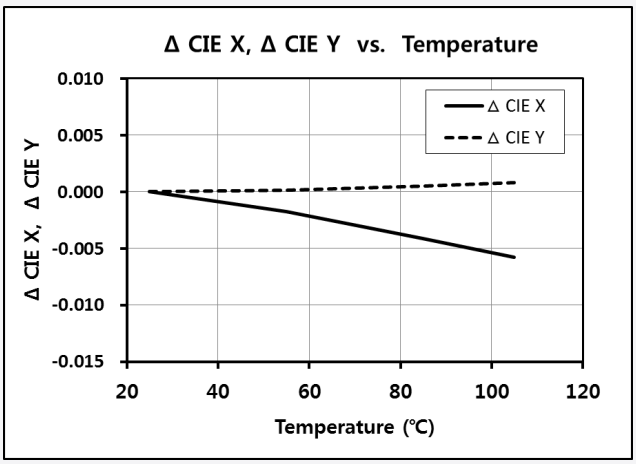
c) Temperature Characteristics (I_F = 150 mA)



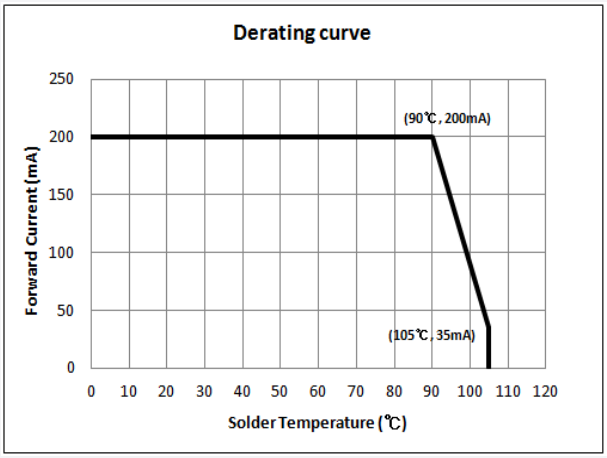


d) Color Shift Characteristics (Ta=25℃, IF=150mA)



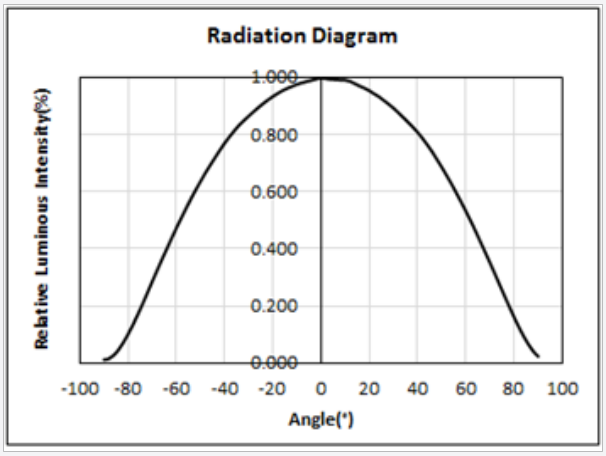


e) Derating curve



Note: All characteristics shown are for reference only.
Derating characteristics will meet the criteria as detailed in the Reliability section within this specification.

f) Beam angle Characteristics



g) Melanopic ratio (T_s = 25 °C)

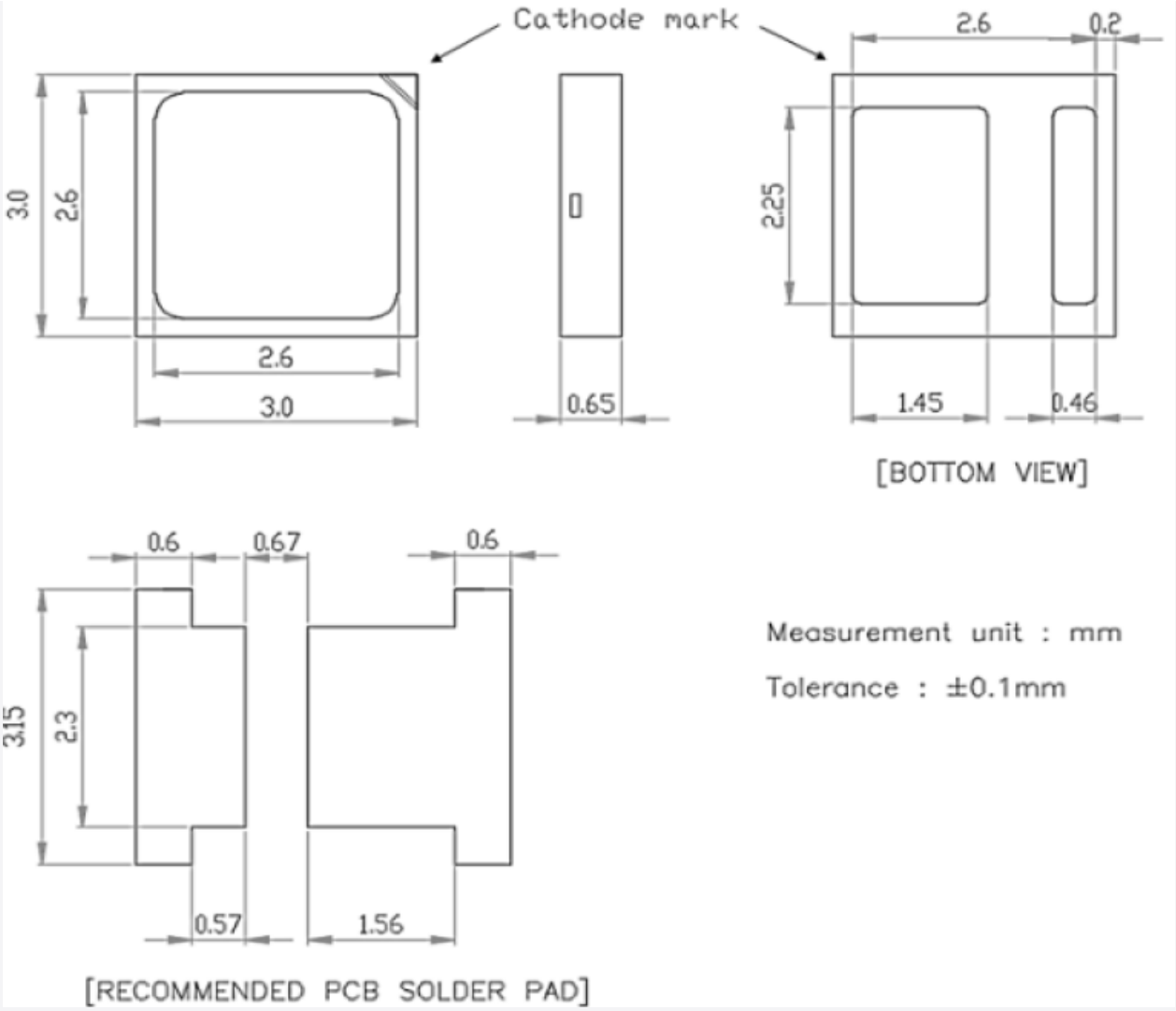
CRI Min	Nominal CCT(K)	MDER* (Typical, 150mA)	M/P Ratio** (Typical, 150mA)
80	3000	0.59	0.65
	3500	0.67	0.74
	4000	0.76	0.84
	5000	0.93	1.03
	5700	1.03	1.14
	6500	1.12	1.24

Note: The provision melanopic ratio is for design reference only. There can be production variations associated with each individual LED.

* MDER stands for Melanopic Daylight Efficacy Ratio following the definition in CIE S 0.25:2018.

** M/P Ratio stands for Melanopic Photopic Ratio, also Known as MEER, Melanopic Equal-Energy Efficacy Ratio.

4. Outline Drawing & Dimension



Notes:

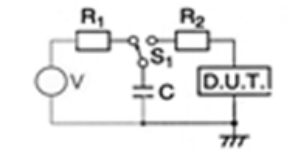
1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
2) T_s point and measurement method:
   ① Measure one point at the cathode pad, if necessary remove PSR of PCB to reach T_s point.
   ② All pads must be soldered to the PCB to dissipate heat properly, otherwise the 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.
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
Thermal Cycle	-45 °C / 15 min ↔ 125 °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)	 R_1: 10 MΩ R_2: 1.5 kΩ C: 100 pF V: ±5 kV	5 times	30

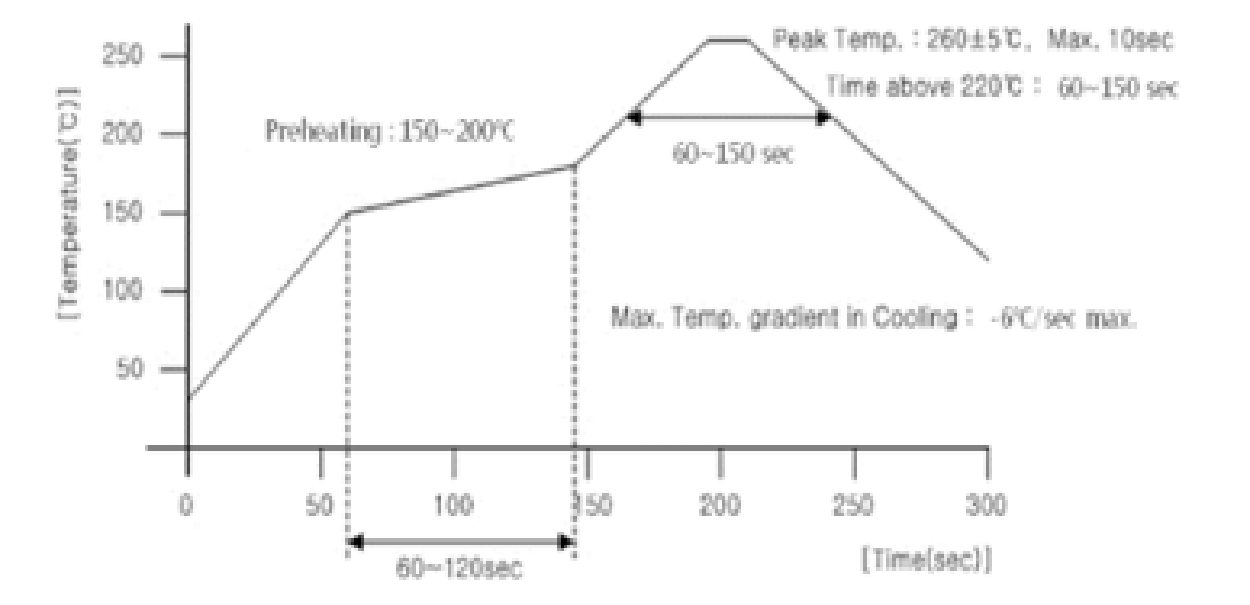
b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T_s = 25 °C)	Limit	
			Min	Max
Forward Voltage	V_F	I_F = 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.



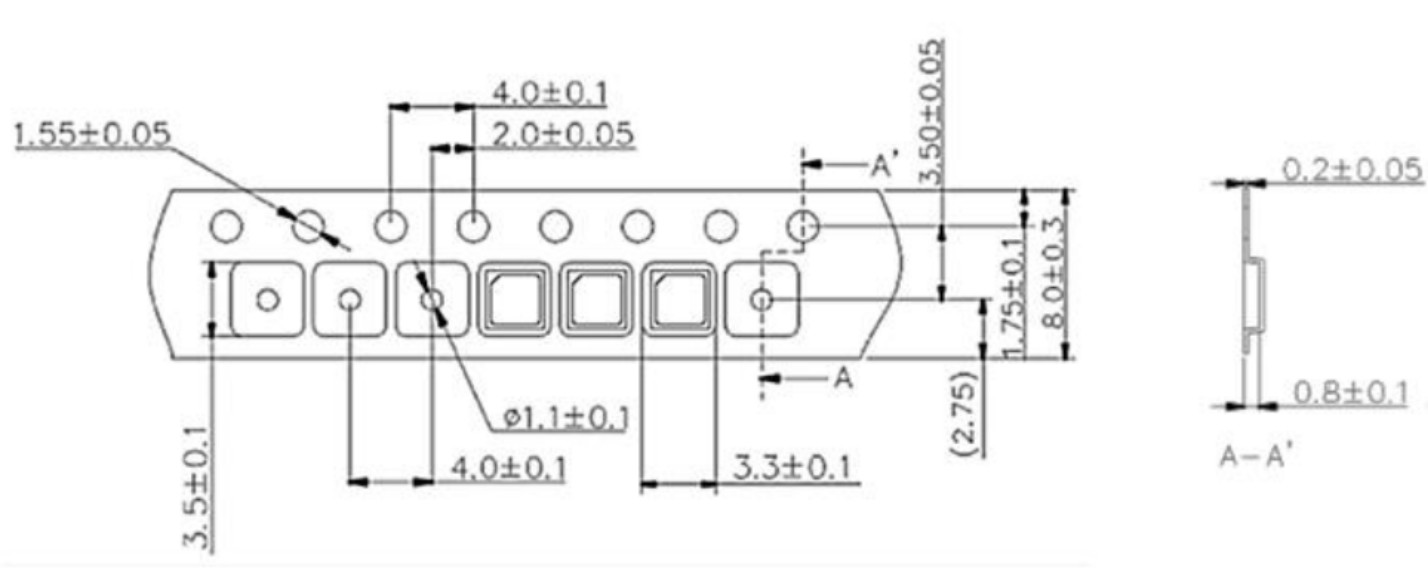
b) Manual Soldering Conditions

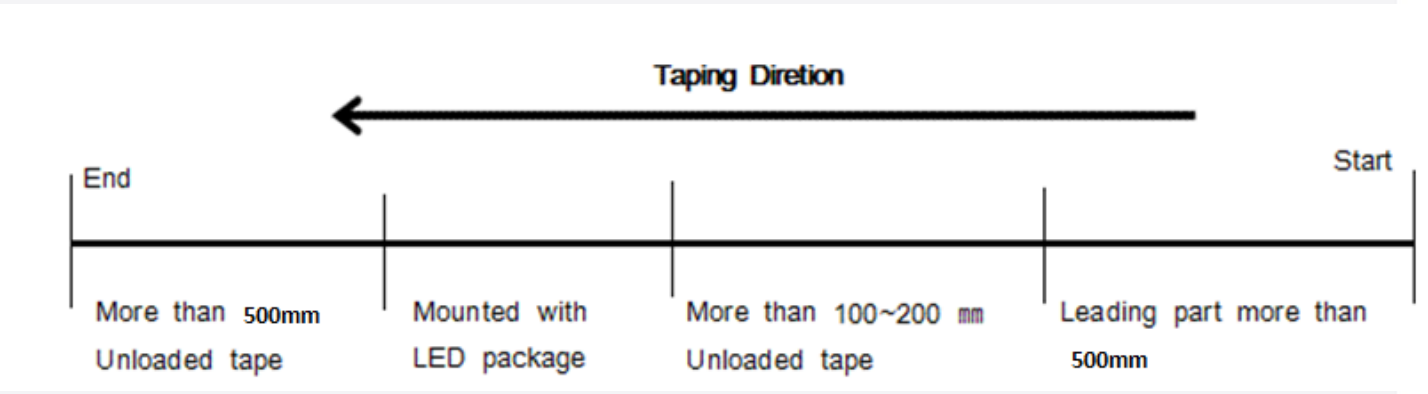
Not more than 5 seconds @ max. 300 ºC, under soldering iron.

7. Tape & Reel

a) Taping Dimension

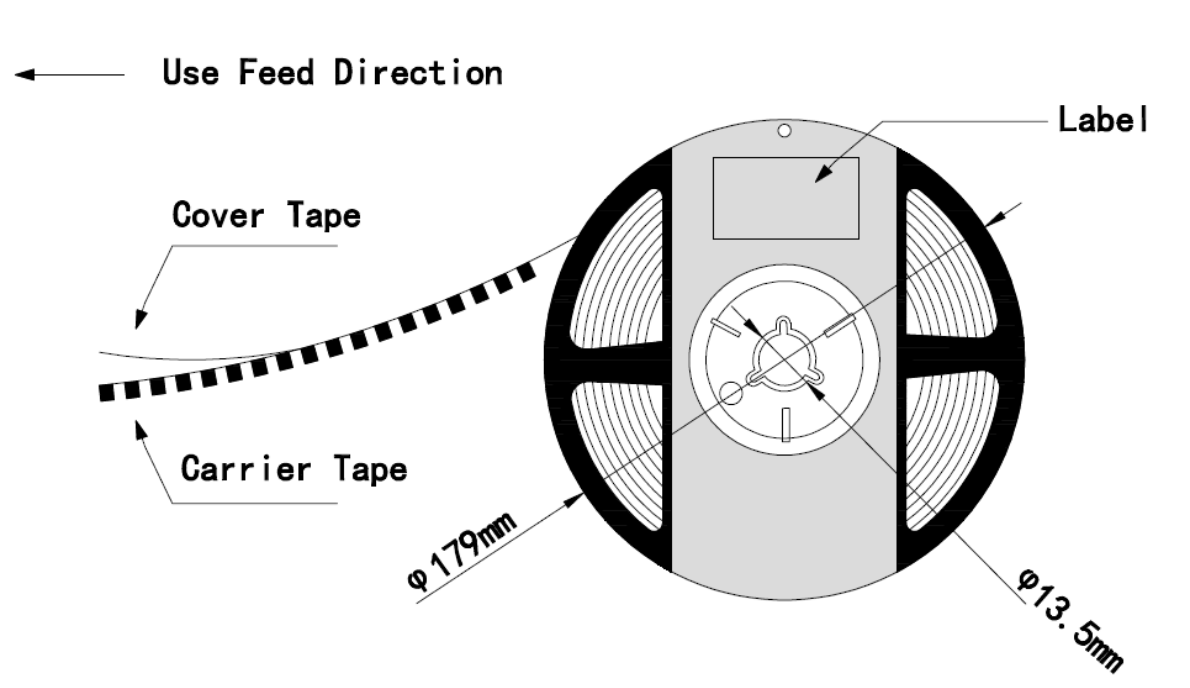
(unit: mm)





b) Reel Dimension

(unit: mm)

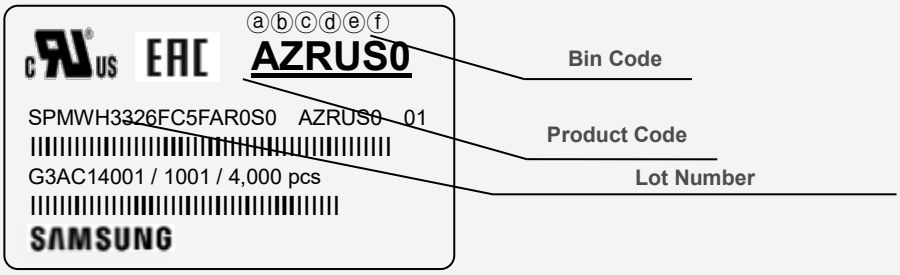


Notes:

1) Quantity: The quantity/reel is 4,000 pcs
2) Cumulative Tolerance: Cumulative tolerance / 10 pitches is ±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° 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:

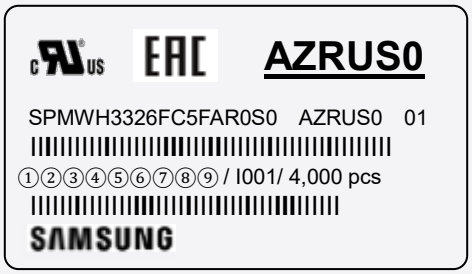
ⓐⓑ: Forward Voltage bin (refer to page 7)

ⓒⓓ: 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 (G3 : Shenzhen,China)

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)

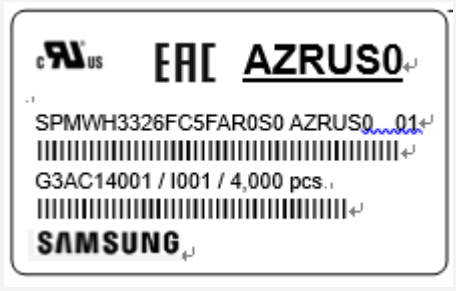
⑥ : Day (1~9, A, B~V)

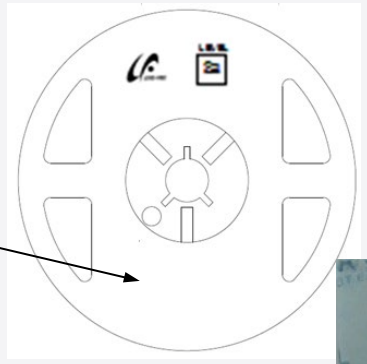
⑦⑧⑨ : Product serial number (001 ~ 999)

9. Packing Structure

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

Reel





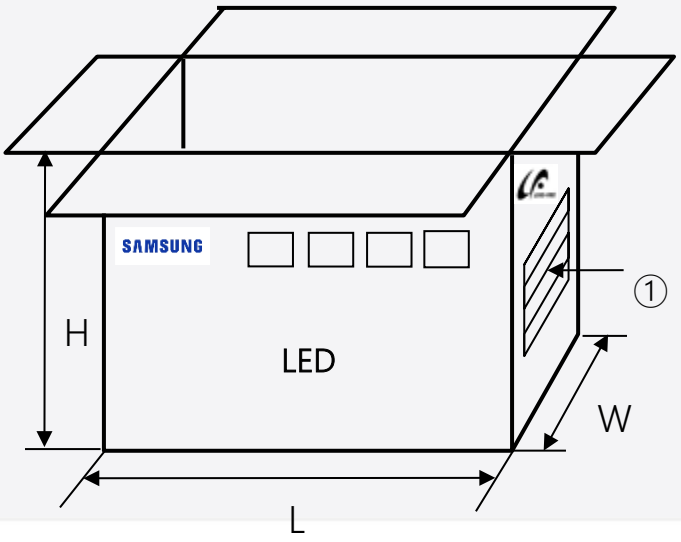
Aluminum Vinyl Packing Bag

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
7 inch S	245±5	220±5	86±5	Up to 5 reels

① **Side Label**



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

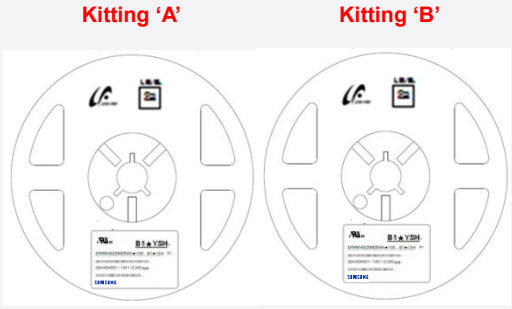
Reel

Kitting 'A'

AZ★NS0
SPMWH3326FC5FA★YS0 AZ★NS0 01
G3AC14001 / I001 / 4,000 pcs
SAMSUNG

Kitting 'B'

AZ★RS0
SPMWH3326FC5FA★YS0 AZ★RS0 01
G3AC14001 / I001 /4,000 pcs
SAMSUNG



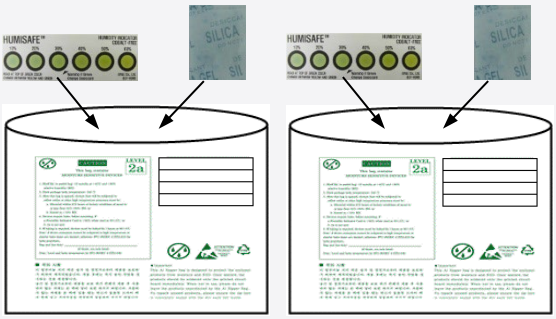
Aluminum Vinyl Packing Bag

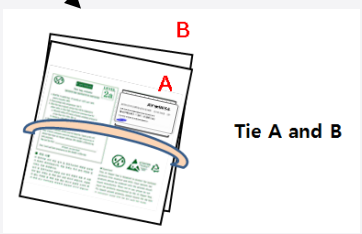
Kitting 'A'

AZ★NS0
SPMWH3326FC5FA★YS0 AZ★NS0 01
G3AC14001 / I001 / 4,000 pcs
SAMSUNG

Kitting 'B'

AZ★RS0
SPMWH3326FC5FA★YS0 AZ★RS0 01
G3AC14001 / I001 / 4,000 pcs
SAMSUNG





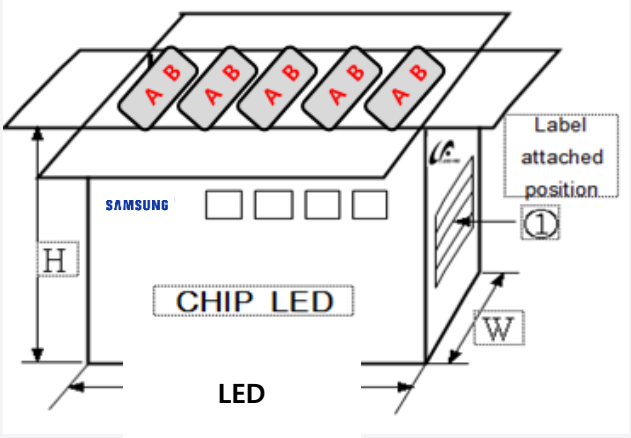
Outer Box

Kitting 'A'

AZ★NS0
SPMWH3326FC5FA★YS0 AZ★NS0 01
G3AC14001 / I001 /20,000 pcs
SAMSUNG
[BOX Label]

Kitting 'B'

AZ★RS0
SPMWH3326FC5FA★YS0 AZ★RS0 01
G3AC14001 / I001 / 20,000 pcs
SAMSUNG
[BOX Label]



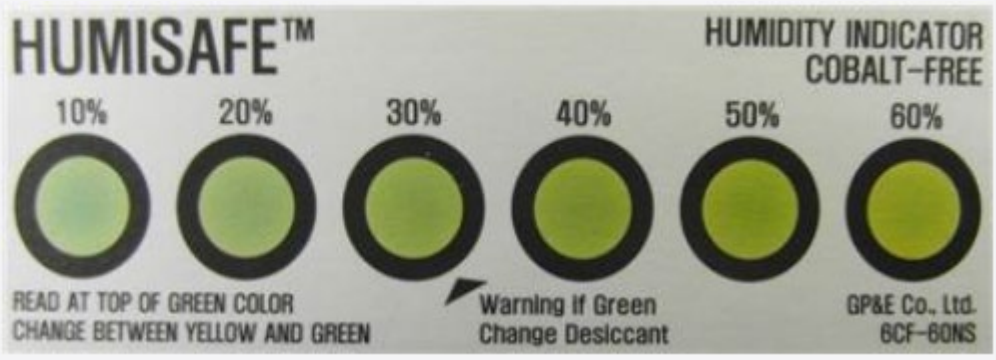
Note: "★" can be Nominal CCT code.

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

c) Aluminum Vinyl Packing Bag

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

(This image is for reference only. Silicagel and humidity indicator shapes maybe different)



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. Shelf life of sealed bags: 12 months, temperature ~40 ºC, ~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

   *Note 1, 2:IPC/JEFEC J-STD-033A, Recommended Equivalnet Total Floor Lift Table

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

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 ± 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. 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.

Samsung provides limited warranty for its LED products, the full text of which is available at https://www.samsung.com/led/support/warranties

Samsung Electronics Co., Ltd.
95, Samsung 2-ro
Giheung-gu
Yongin-si, Gyeonggi-do, 446-711
KOREA

www.samsungled.com

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