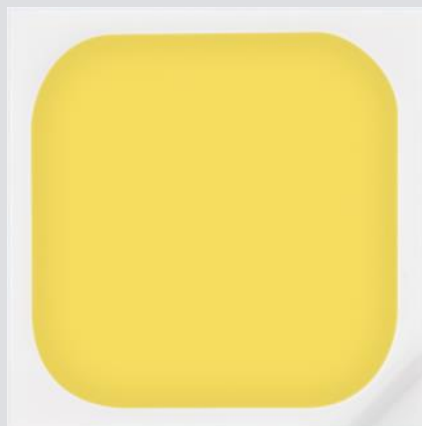


Middle Power LED Series 3030

LM302N DAY S90



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



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1. Characteristics

a) Absolute Maximum Rating

Item	Symbol	Rating	Unit	Condition
Ambient / Operating Temperature	T_a	-40 ~ +85	°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}	200	mA	Duty 1/10, pulse width 10ms
Assembly Process Temperature	-	260 <10	°C s	-
ESD (HBM)	-	5	kV	-

b) Electro-optical Characteristics ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ °C}$)

Item	Unit	Rank	Bin	Min.	Typ.	Max.
Forward Voltage (VF)	V	FA	AU	5.45	-	5.55
			AV	5.55	-	5.65
			AW	5.65	-	5.75
Reverse Voltage (@ 5 mA)	V			0.7	-	1.2
Color Rendering Index (R_a)	-	K		90	-	-
R9	-			50		
Thermal Resistance (junction to solder point)	°C/W			-	23	-
Beam Angle	°			-	120	-

Note:

Samsung maintains measurement tolerance of: forward voltage = $\pm 0.1 \text{ V}$, luminous flux = $\pm 5 \%$, CRI = ± 3 , R9 = ± 6.5

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	M	C	5	F	A	T	0	S	0

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package Middle Power	SPM	Middle power
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	M	65 mA
11	Special specification	C	Human-centric Day
12	CRI	K	Min. 90
13 14	Forward Voltage (V)	FA	AU 5.45 ~ 5.55 5.8~6.2 Bin Code AV 5.55 ~ 5.65 AW 5.65 ~ 5.75
15 16	CCT (K)	W ○ 2700 V ○ 3000 U ○ 3500 T ○ 4000 Bin Code 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 ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

Nominal CCT (K)	CRI Min.	Product Code	Flux Bin	Flux Range (Φ_v , lm)
2700	90	SPMWH3326MCKFAW○S0	S0	50 - 65
3000	90	SPMWH3326MCKFAV○S0	S0	50 - 65
3500	90	SPMWH3326MCKFAU○S0	S0	50 - 65
4000	90	SPMWH3326MCKFAT○S0	S0	50 - 65
5000	90	SPMWH3326MCKFAR○S0	S0	55 - 70
5700	90	SPMWH3326MCKFAQ○S0	S0	55 - 70
6500	90	SPMWH3326MCKFAP○S0	S0	55 - 70

Note:

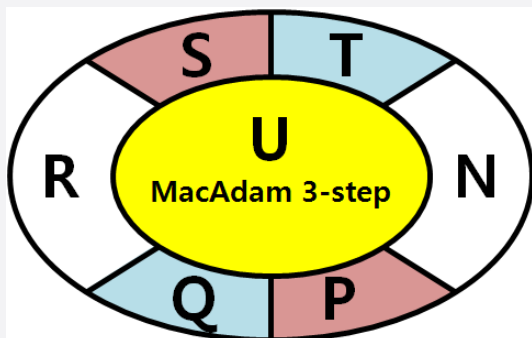
"○" can be "0" (MacAdam 5-step), "3" (MacAdam 3-step), "Y" (Kitting)

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
VF	AU	AU
	AV	AV
	AW	AW
CIE	U	U
	N	R
	P	S
	Q	T
IV	S0	S0

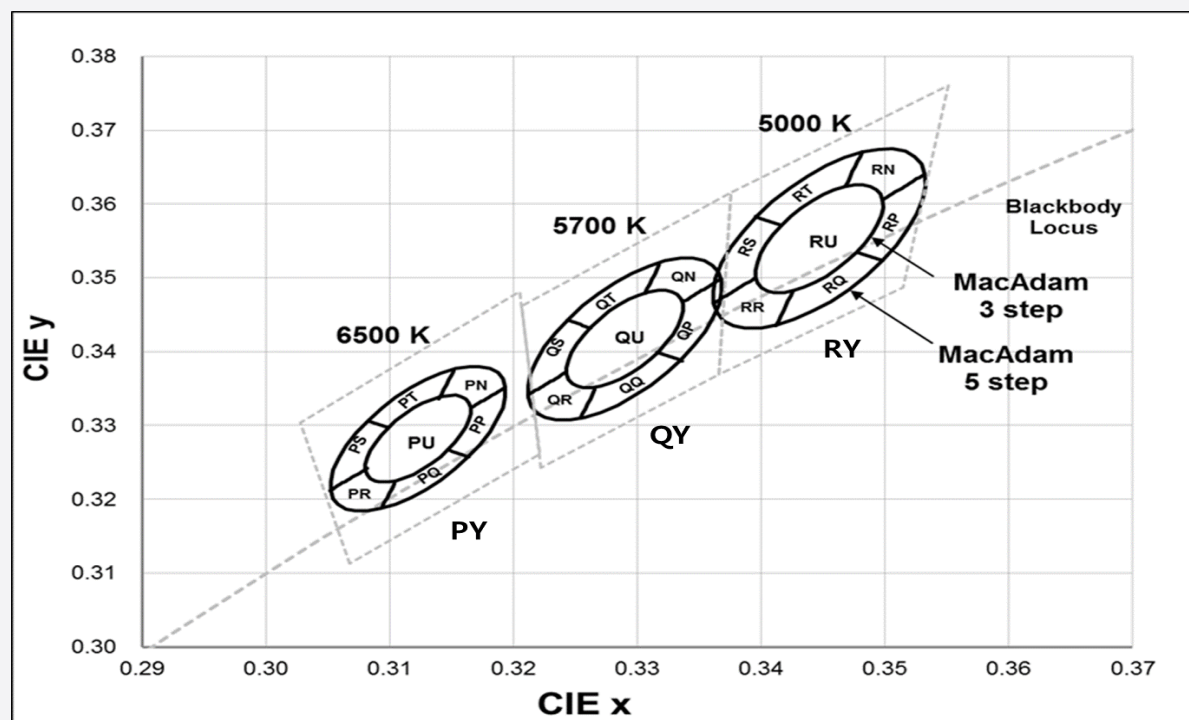
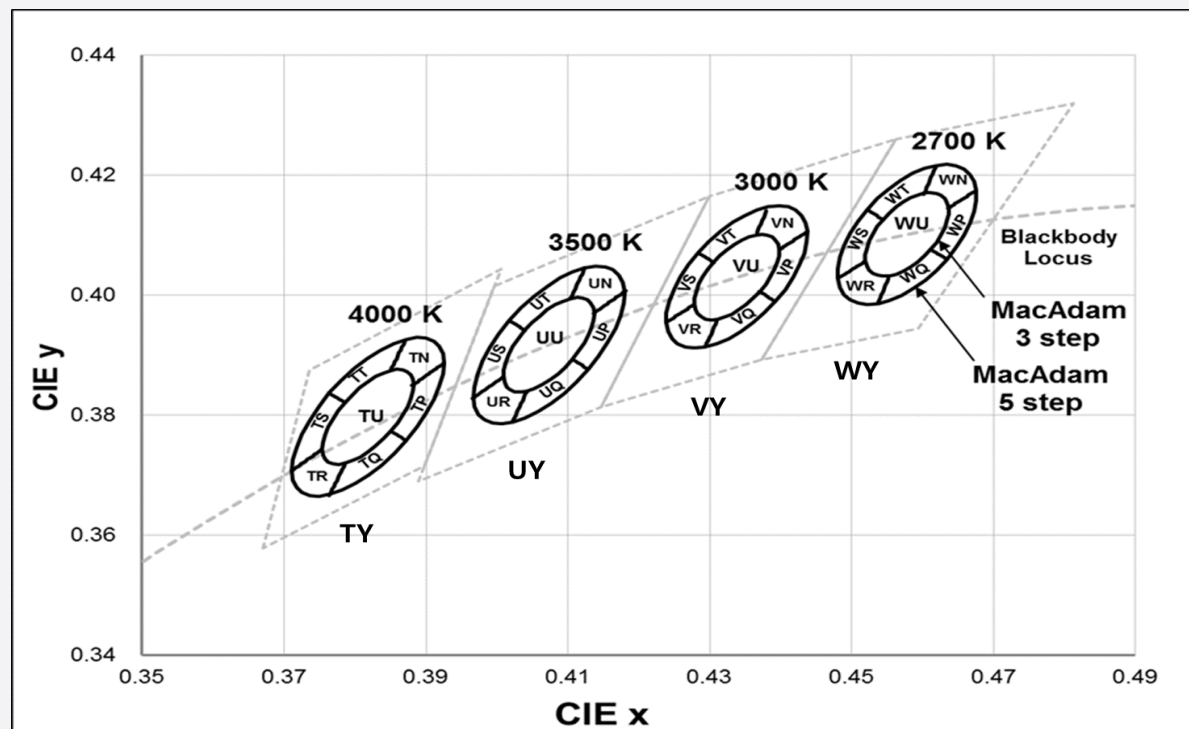
c) Color Bins ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

Nominal CCT (K)	CRI Min.	Product Code	Color Rank	Chromaticity Bins
2700	90	SPMWH3326MCKFAW0S0	W0 (MacAdam 5-step)	WN, WP, WQ, WR, WS, WT, WU
		SPMWH3326MCKFAW3S0	W3 (MacAdam 3-step)	WU
		SPMWH3326MCKFAWYS0	WY (Kitting)	WN, WP, WQ, WR, WS, WT, WU
3000	90	SPMWH3326MCKFAV0S0	V0 (MacAdam 5-step)	VN, VP, VQ, VR, VS, VT, VU
		SPMWH3326MCKFAV3S0	V3 (MacAdam 3-step)	VU
		SPMWH3326MCKFAVYS0	VY (Kitting)	VN, VP, VQ, VR, VS, VT, VU
3500	90	SPMWH3326MCKFAU0S0	U0 (MacAdam 5-step)	UN, UP, UQ, UR, US, UT, UU
		SPMWH3326MCKFAU3S0	U3 (MacAdam 3-step)	UU
		SPMWH3326MCKFAUYS0	UY (Kitting)	UN, UP, UQ, UR, US, UT, UU
4000	90	SPMWH3326MCKFAT0S0	T0 (MacAdam 5-step)	TN, TP, TQ, TR, TS, TT, TU
		SPMWH3326MCKFAT3S0	T3 (MacAdam 3-step)	TU
		SPMWH3326MCKFATYS0	TY (Kitting)	TN, TP, TQ, TR, TS, TT, TU
5000	90	SPMWH3326MCKFAR0S0	R0 (MacAdam 5-step)	RN, RP, RQ, RR, RS, RT, RU
		SPMWH3326MCKFAR3S0	R3 (MacAdam 3-step)	RU
		SPMWH3326MCKFARYS0	RY (Kitting)	RN, RP, RQ, RR, RS, RT, RU
5700	90	SPMWH3326MCKFAQ0S0	Q0 (MacAdam 5-step)	QN, QP, QQ, QR, QS, QT, QU
		SPMWH3326MCKFAQ3S0	Q3 (MacAdam 3-step)	QU
		SPMWH3326MCKFAQYS0	QY (Kitting)	QN, QP, QQ, QR, QS, QT, QU
6500	90	SPMWH3326MCKFAP0S0	P0 (MacAdam 5-step)	PN, PP, PQ, PR, PS, PT, PU
		SPMWH3326MCKFAP3S0	P3 (MacAdam 3-step)	PU
		SPMWH3326MCKFAPYS0	PY (Kitting)	PN, PP, PQ, PR, PS, PT, PU

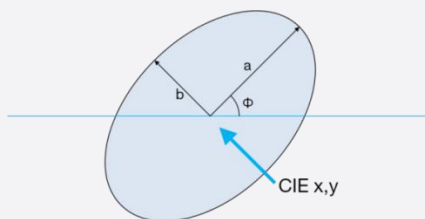
d) Voltage Bins ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	FA	AU	5.45 ~ 5.55
				AV	5.55 ~ 5.65
				AW	5.65 ~ 5.75

e) Chromaticity Region & Coordinates ($I_F = 65 \text{ mA}$, $T_s = 25^\circ \text{C}$)



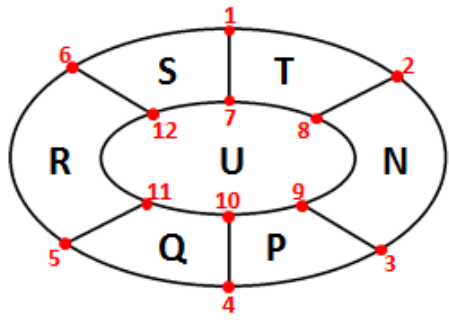
f) Chromaticity Region & Coordinates ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ }^\circ\text{C}$)



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: $C_x, C_y = \pm 0.005$

g) Chromaticity Region & Coordinates



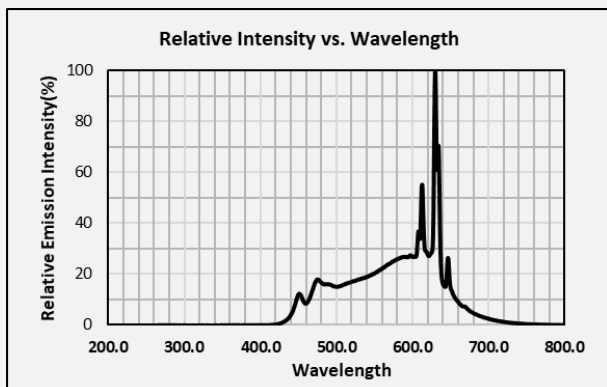
Region	2700K		3000K		3500K	
	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
1	0.4521	0.4142	0.4283	0.4071	0.4018	0.3957
2	0.4619	0.4216	0.4382	0.4146	0.4125	0.4046
3	0.4675	0.4175	0.4437	0.4105	0.4180	0.4005
4	0.4634	0.4059	0.4393	0.3989	0.4128	0.3877
5	0.4537	0.3986	0.4293	0.3913	0.4022	0.3788
6	0.4481	0.4028	0.4239	0.3954	0.3966	0.3828
7	0.4544	0.4126	0.4305	0.4054	0.4040	0.3941
8	0.4603	0.4170	0.4364	0.4100	0.4104	0.3994
9	0.4636	0.4145	0.4397	0.4075	0.4137	0.3970
10	0.4612	0.4076	0.4371	0.4005	0.4106	0.3893
11	0.4553	0.4032	0.4311	0.3960	0.4042	0.3840
12	0.4520	0.4057	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

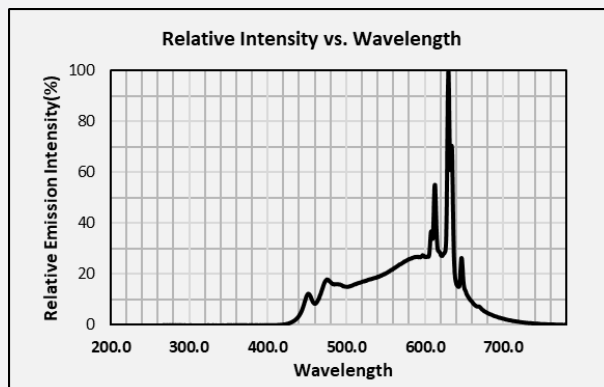
3. Typical Characteristics Graphs

a) Spectrum Distribution ($I_f = 65 \text{ mA}$, $T_s = 25^\circ \text{C}$)

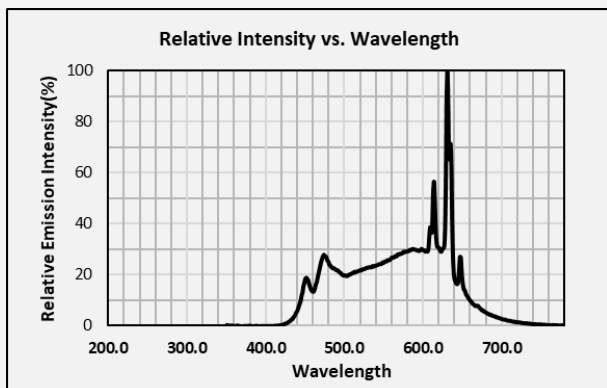
CCT : 2700K (90 CRI)



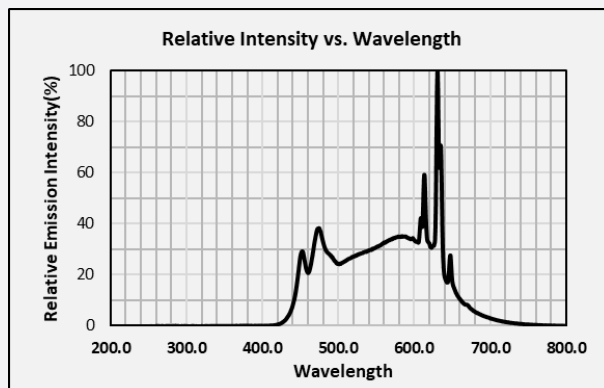
CCT : 3000K (90 CRI)



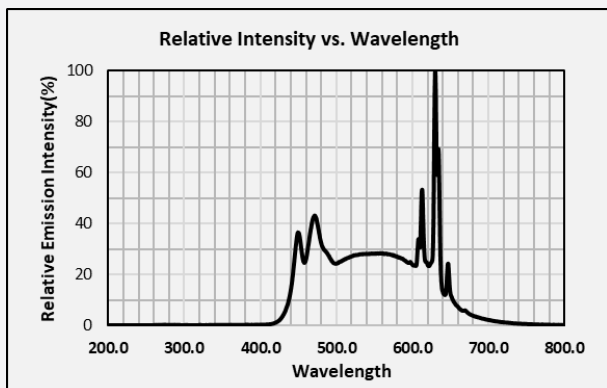
CCT : 3500K (90 CRI)



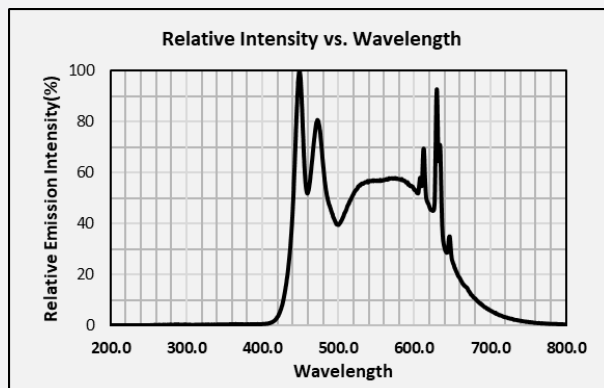
CCT : 4000K (90 CRI)



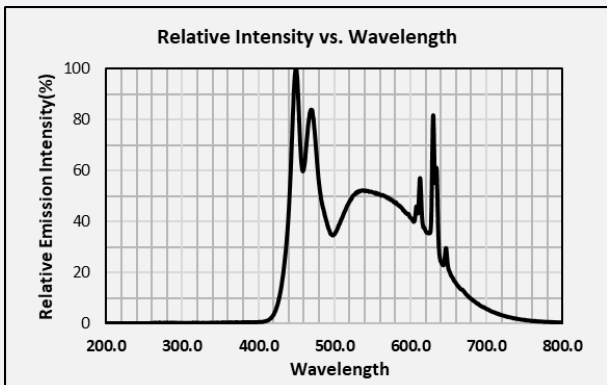
CCT : 5000K (90 CRI)



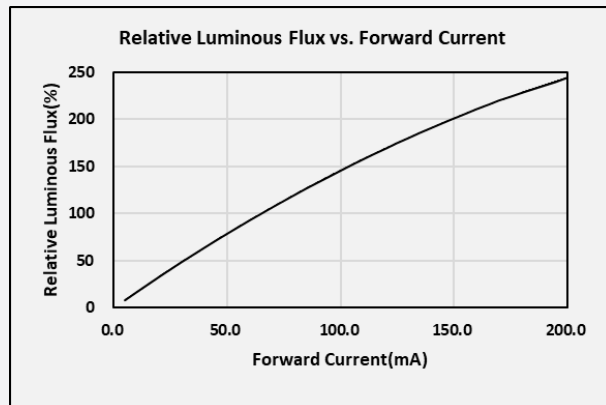
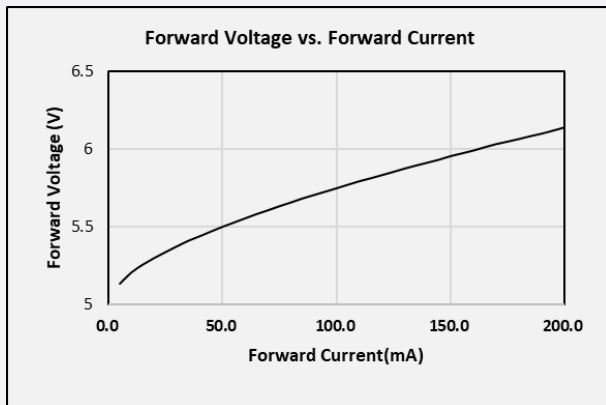
CCT : 5700K (90 CRI)



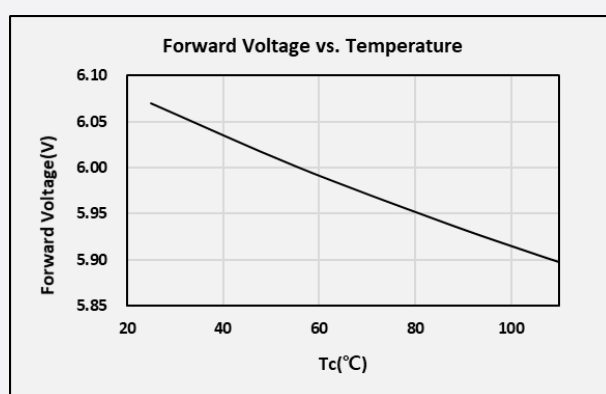
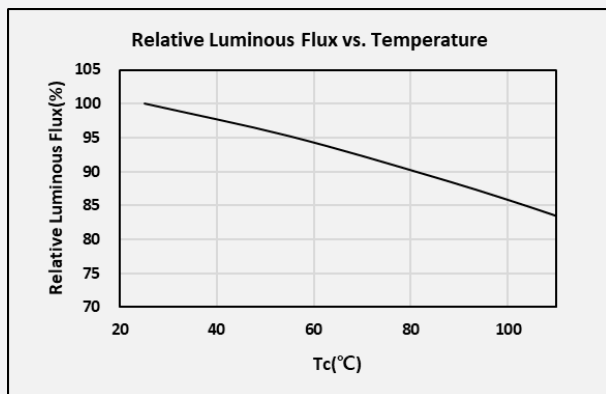
CCT : 6500K (90 CRI)



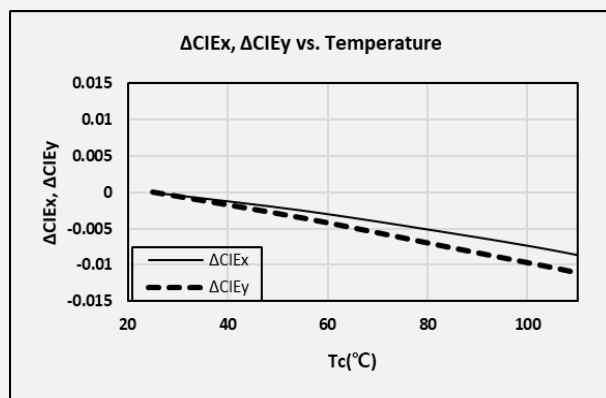
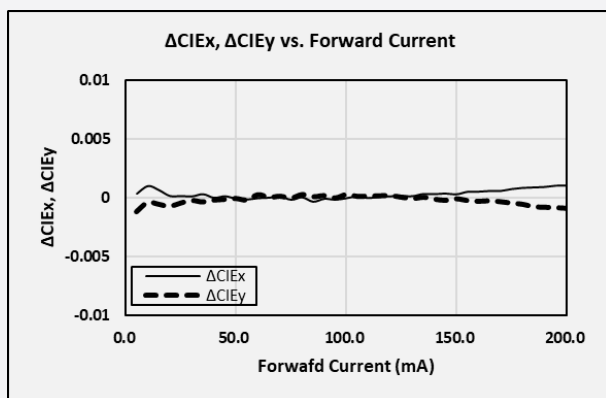
b) Forward Current Characteristics ($T_s = 25^\circ\text{C}$)



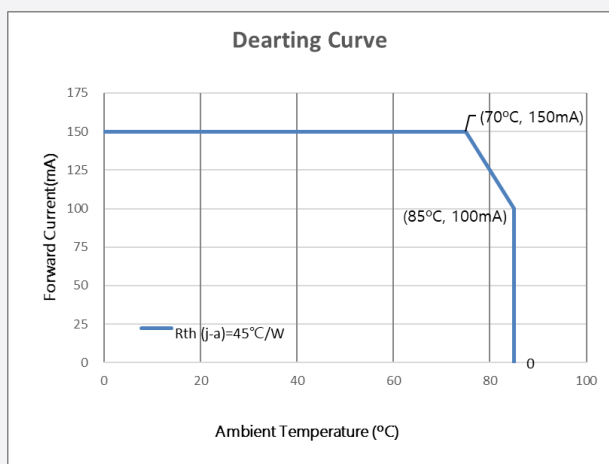
c) Temperature Characteristics ($I_f = 65\text{ mA}$)



d) Color Shift Characteristics ($T_a=25^\circ\text{C}$, $I_f=65\text{mA}$)



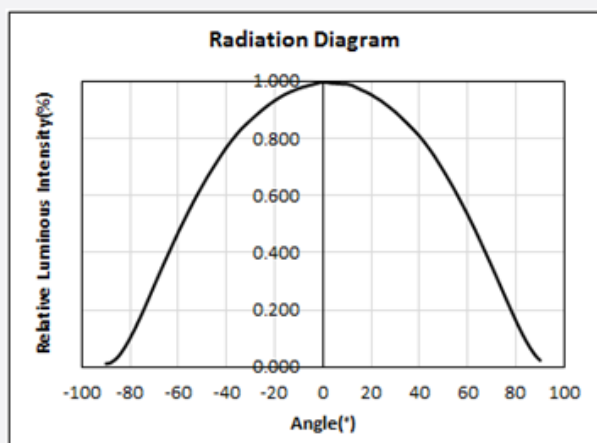
e) Derating curve



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 ($T_s = 25^{\circ}\text{C}$)

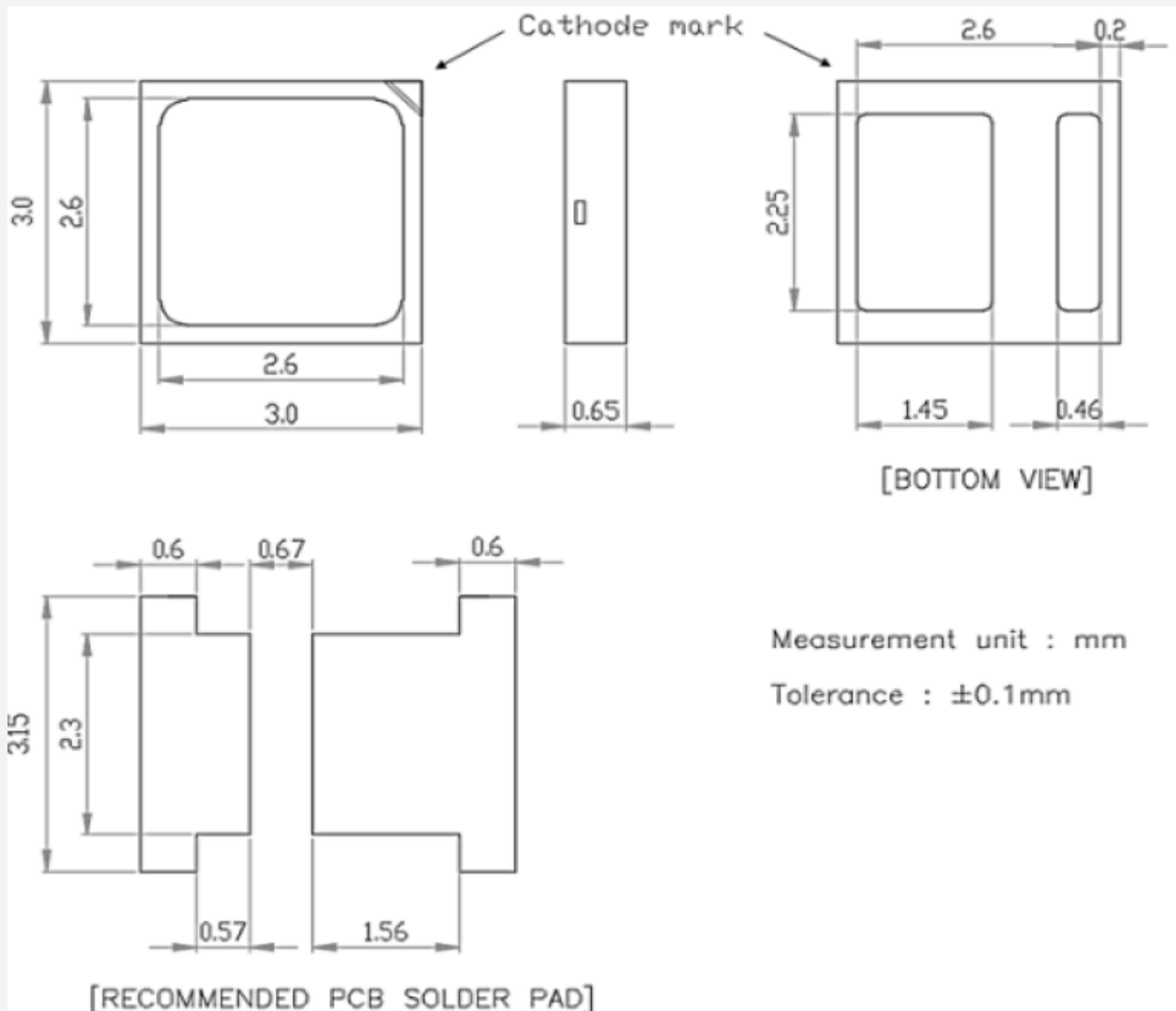
CRI Min	Nominal CCT(K)	MDER* (Typical, 65mA)	M/P Ratio** (Typical, 65mA)
90	2700	0.455	0.502
	3000	0.571	0.630
	3500	0.659	0.727
	4000	0.729	0.805
	5000	0.865	0.955
	5700	0.927	1.023
	6500	1.028	1.135

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:

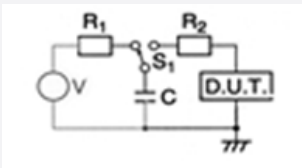
- 1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
- 2) T_s point and measurement method:
 - ① Measure one point at the cathode pad, if necessary remove PSR of PCB to reach T_s point.
 - ② All pads must be soldered to the PCB to dissipate heat properly, otherwise 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 100 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 100 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)	 <div> R₁: 10 MΩ R₂: 1.5 kΩ C: 100 pF V: ±5 kV </div>	5 times	30

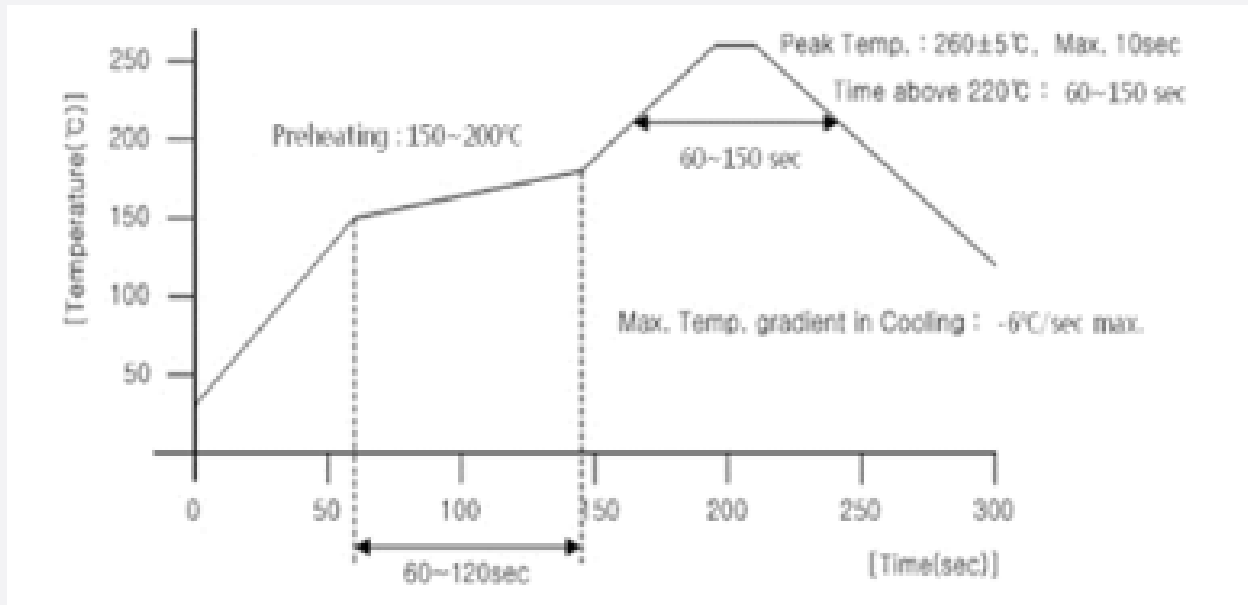
b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T _s = 25 °C)	Limit	
			Min	Max
Forward Voltage	V _F	I _F = 65 mA	Init. Value * 0.9	Init. Value * 1.1
Luminous Flux	Φ _v	I _F = 65 mA	Init. Value * 0.7	Init. Value * 1.1

6. Soldering Conditions

a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



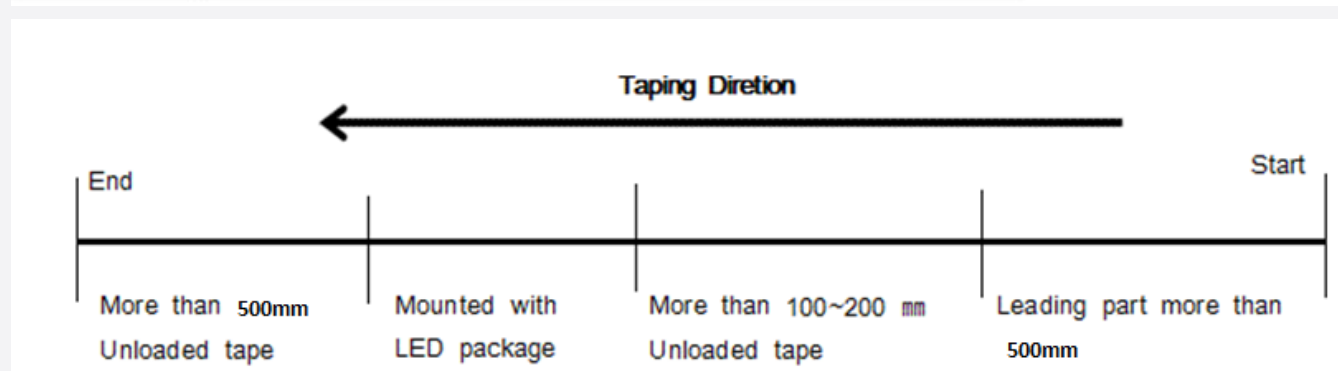
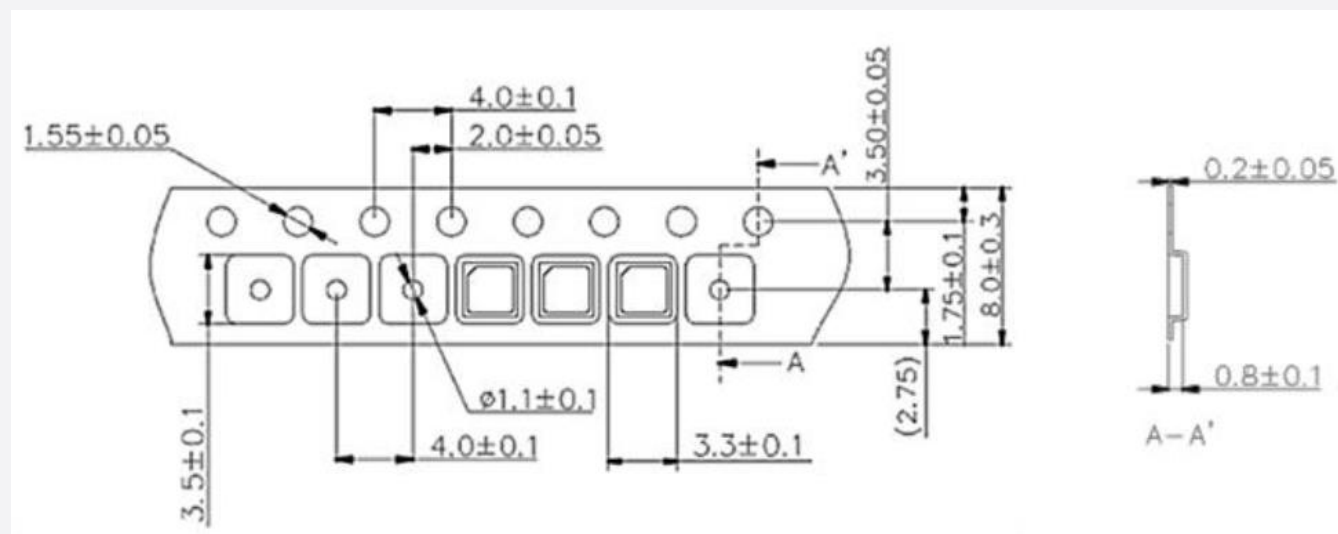
b) Manual Soldering Conditions

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

7. Tape & Reel

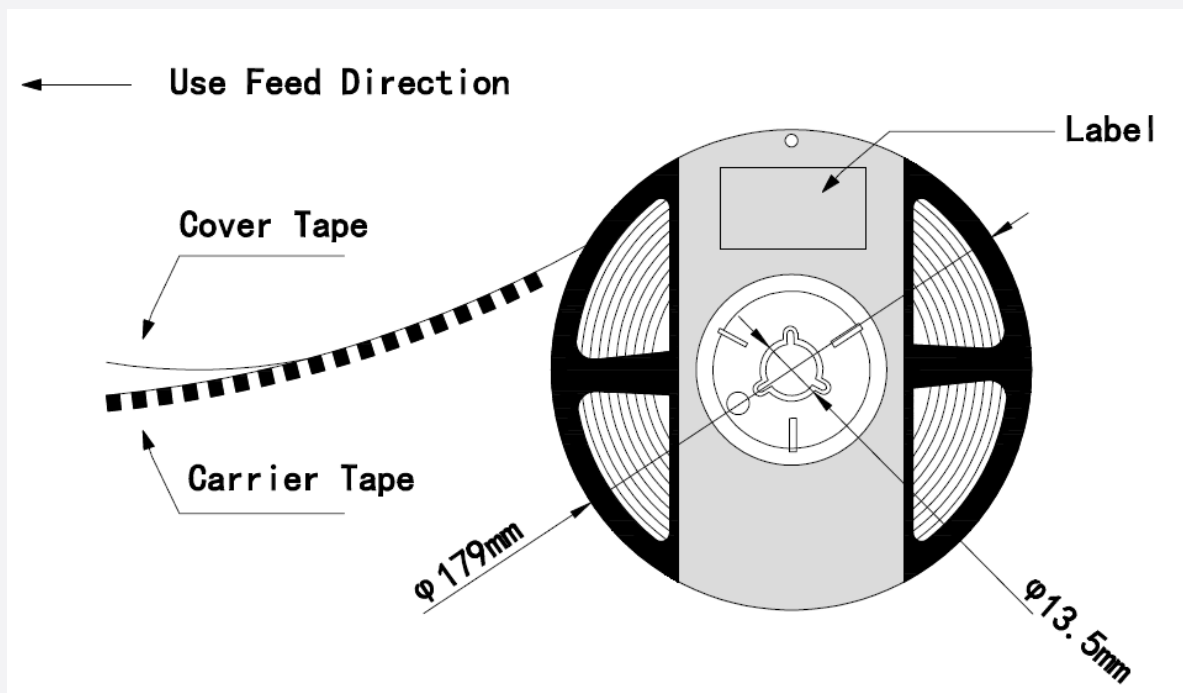
a) Taping Dimension

(unit: mm)



b) Reel Dimension

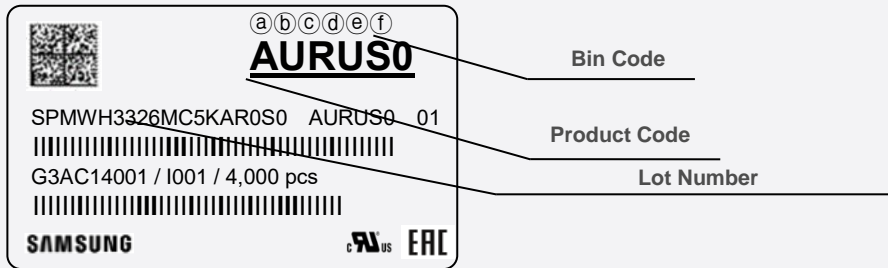
(unit: mm)

**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



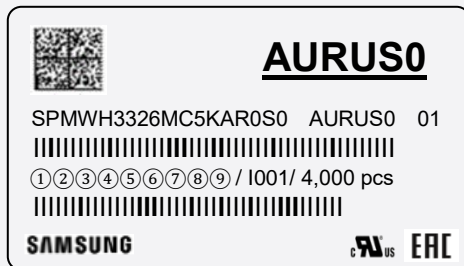
Note: Denoted bin code and product code above is only an example (see description on page 4)

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:

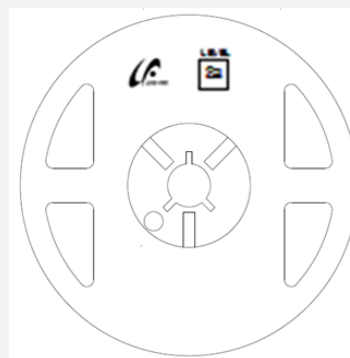


- ①② : Production site (G3 : Nanchang, China)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (G: 2022, H:2023...)
- ⑤ : Month (1~9, A, B, C)
- ⑥ : Day (1~9, A, B~V)
- ⑦⑧⑨ : Product serial number (001 ~ 999)

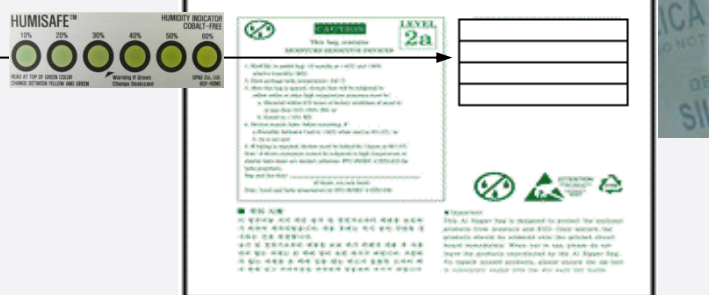
9. Packing Structure

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

Reel



Aluminum Vinyl Packing Bag

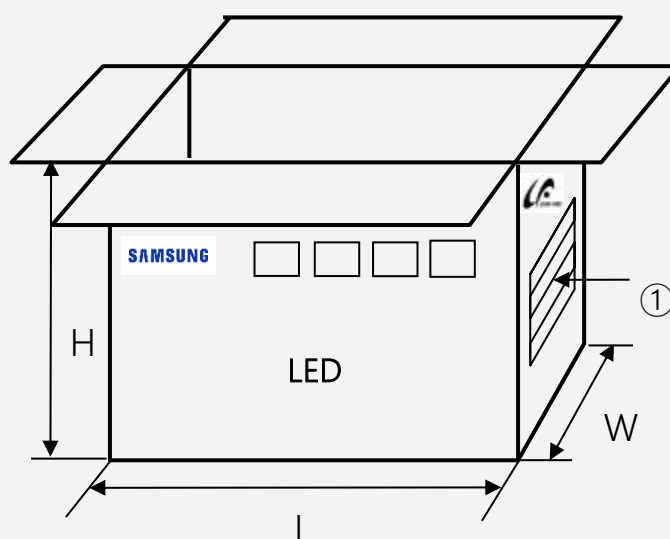


Outer Box

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'



Kitting 'B'



Aluminum Vinyl Packing Bag

Kitting 'A'



Kitting 'B'



Outer Box

Kitting 'A'



Kitting 'B'

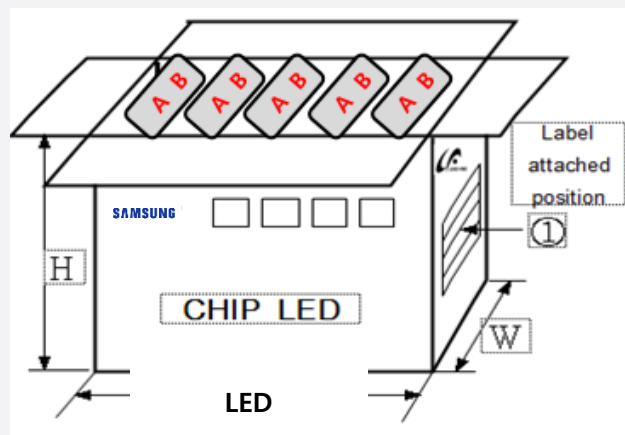
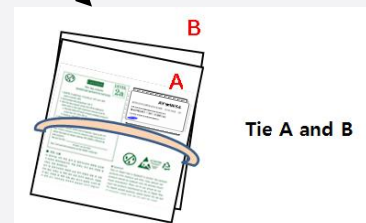
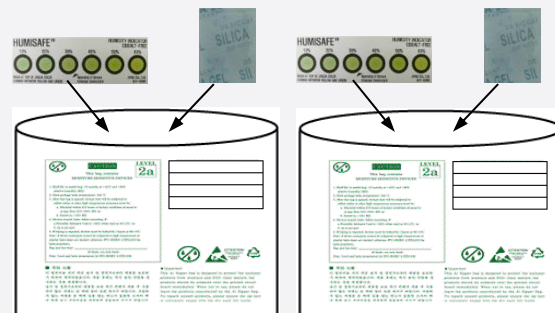


Note: "★" can be Nominal CCT code.

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

Kitting 'A'

Kitting 'B'



c) Aluminum Vinyl Packing Bag



CAUTION
 This bag contains
MOISTURE SENSITIVE DEVICES

LEVEL
2a

1. Shelf life in sealed bag: 12 months at <40℃ and <90% relative humidity (RH)
2. Peak package body temperature: 240 ℃
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℃ / 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℃, or
 - b. 2a is not met.
5. If baking is required, devices must be baked for 10 ~ 24 hours at 60±5℃

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



AURUS0

SPMWH3326MCKFAR0S0 AURUS0 01

|||||

G3AC14001 / I001 / 4,000 pcs

|||||

SAMSUNG
US EAC







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.

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■ 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

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



10. Precautions in Handling & Use

- 1) This product should be used in the field of commercial fixture and commercial lamp applications in general illumination that excludes sold into channels intended for incorporation in the consumer lamp products as well as sold for use in the field of use of display products.
- 2) 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.
- 3) 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.
- 4) When the device is in operation, the forward current should be carefully determined considering the maximum ambient temperature and corresponding junction temperature.
- 5) LEDs must be stored in a clean environment. Shelf life of sealed bags is 12 months at temperature 0~40 °C, 0~90 % RH.
- 6) 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^{*Note 1}, or
 - b. Mounted within 24 hours (1 day) at an assembly line with a condition of more than 30 °C / 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 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

- 7) Repack unused devices with anti-moisture packing, fold to close any opening and then store in a dry place.
- 8) Devices require baking before mounting, if humidity card reading is >60 % at 23 ± 5 °C.
- 9) Devices must be baked for 10~24 hours at 60 ± 5 °C, if baking is required.
- 10) 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.
- 11) 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.

12) 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,

Legal and additional information.

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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>

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