

Middle Power LED Series
3030

LM301H EVO



Features & Benefits

- High efficacy and reliability LED package for Horticultural lighting.
- Mold resin for high reliability
- Standard form factor for design flexibility (3.0 × 3.0 mm)



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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 ~ +120	°C	-
LED Junction Temperature	T_j	110	°C	-
Forward Current	I_F	200	mA	-
Pulse Forward Current	I_{FP}	300	mA	Duty 1/10, pulse width 10ms
Assembly Process Temperature	-	260 <10	°C s	-
ESD (HBM)	-	5	kV	-

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

Item	Unit	Rank	Bin	Min.	Typ.	Max.
Forward Voltage (V_F)	V	XA	AY	2.6	-	2.7
			AZ	2.7	-	2.8
			A1	2.8	-	2.9
PPF	$\mu\text{mol/s}$		3000K	0.494	-	0.557
			4000K	0.507	-	0.572
			5000K	0.520	-	0.587
			6500K	0.520	-	0.587
			Mint White(MA)	0.520	-	0.587
			Mint White(MB)	0.528	-	0.595
Reverse Voltage (@ 5 mA)	V			0.7	-	1.2
Thermal Resistance (junction to solder point)	°C/W			-	7.5	-
Beam Angle	°			-	120	-

Note: Samsung maintains measurement tolerance of: forward voltage = $\pm 0.1 \text{ V}$, PPF = $\pm 5 \%$,

c) Electro-optical Characteristics ($I_F = 65 \text{ mA}$, $T_s = 25^\circ\text{C}$)

Item	Nominal CCT (K)	Min	Max	Current
PPF ($\mu\text{mol/s}$)	3000K	0.494	0.557	65mA
	4000K	0.507	0.572	
	5000K	0.520	0.587	
	6500K	0.520	0.587	
	Mint white (MA)	0.520	0.587	
	Mint white (MB)	0.528	0.595	

Note: Samsung maintains measurement tolerance of: forward voltage = PPF = $\pm 5\%$

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	D	3	2	A	M	H	0	X	A	R	0	P	R

Digit	PKG Information	Code	Specification				
1 2 3	Samsung Package Middle Power	SPM					
4 5	Color	WH	White				
6	Product Version	D	Dispensing				
7 8 9	Form Factor	32A	3.0 x 3.0 x 0.8 mm; 2 pads;				
10	Sorting Current (mA)	M	65 mA				
11	Chromaticity Coordinates	H	Horticulture				
12	CRI	0	Free				
13 14	Forward Voltage (V)	XA	2.6~2.9V	AY 2.6 ~ 2.7			
				AZ 2.7 ~ 2.8			
				A1 2.8 ~ 2.9			
15 16	CCT	V0	3000K	Bin Code:	VE, VF, VG, VH, VJ, VK, VL, VM		
		TO	4000K		TE, TF, TG, TH, TJ, TK, TL, TM		
		RO	5000K		RE, RF, RG, RH, RJ, RK, RL, RM		
		PO	6500K		PE, PF, PG, PH, PJ, PK, PL, PM		
		MA	Mint White		M1		
		MB			M2		
17 18	PPF (μmol/s)	PV	3000K	Bin Code	PV 0.494 ~ 0.557		
		PT	4000K		PT 0.507 ~ 0.572		
		PR	5000K		PR 0.520 ~ 0.587		
		PP	6500K		PR 0.520 ~ 0.587		
		PL	Mint White		PL 0.520 ~ 0.587		
		PM	Mint White		PM 0.528 ~ 0.595		

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

Nominal CCT (K)	Product Code	PPF Bin	PPF Range (μmol/s)
3000K	SPMWHD32AMH0XAV0PV	PV	0.494 ~ 0.557
4000K	SPMWHD32AMH0XAT0PT	PT	0.507 ~ 0.572
5000K	SPMWHD32AMH0XAR0PR	PR	0.520 ~ 0.587
6500K	SPMWHD32AMH0XAP0PP	PP	0.520 ~ 0.587
Mint White	SPMWHD32AMH0XAMAPL	PL	0.520 ~ 0.587
	SPMWHD32AMH0XAMBPM	PM	0.528 ~ 0.595

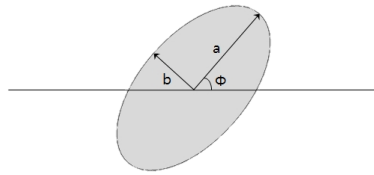
b) Color Bins ($I_f = 65 \text{ mA}$, $T_s = 25^\circ\text{C}$)

Nominal CCT (K)	Product Code	Color Rank	
3000K	SPMWHD32AMH0XAV0PV	V0 (Whole bin)	VE, VF, VG, VH, VJ, VK, VL, VM
4000K	SPMWHD32AMH0XAT0PT	T0 (Whole bin)	TE, TF, TG, TH, TJ, TK, TL, TM
5000K	SPMWHD32AMH0XAR0PR	R0 (Whole bin)	RE, RF, RG, RH, RJ, RK, RL, RM
6500K	SPMWHD32AMH0XAP0PP	P0 (Whole bin)	PE, PF, PG, PH, PJ, PK, PL, PM
Mint White	SPMWHD32AMH0XAMAPL	MA	M1, M2
	SPMWHD32AMH0XAMBPM	MB	M3, M4

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

Nominal CCT	Product Code	Voltage Rank	Voltage Bin	Voltage Range
3000K 4000K 5000K 6500K Mint white	SPMWHD32AMH0XAV0PV SPMWHD32AMH0XAT0PT SPMWHD32AMH0XAR0PR SPMWHD32AMH0XAP0PP SPMWHD32AMH0XAMAPL SPMWHD32AMH0XAMBPM	XA	AY	2.6~2.7
			AZ	2.7~2.8
			A1	2.8~2.9

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



MacAdam Ellipse (V5)					
Step	CIE x	CIE y	θ	a	b
5-step	0.4338	0.4030	53.22	0.01390	0.00680

MacAdam Ellipse (R5)					
Step	CIE x	CIE y	θ	a	b
5-step	0.3447	0.3553	59.62	0.01370	0.00590

MacAdam Ellipse (T5)					
Step	CIE x	CIE y	θ	a	b
5-step	0.3818	0.3797	53.72	0.01565	0.00670

MacAdam Ellipse (P5)					
Step	CIE x	CIE y	θ	a	b
5-step	0.3123	0.3282	58.57	0.01115	0.00475

	Rank	X1	Y1	X2	Y2	X3	Y3	X4	Y4
V 3000K	VW	0.4221	0.3984	0.4299	0.4165	0.4430	0.4212	0.4342	0.4028
	VX	0.4342	0.4028	0.4430	0.4212	0.4562	0.4260	0.4465	0.4071
	VY	0.4259	0.3853	0.4342	0.4028	0.4465	0.4071	0.4373	0.3893
	VZ	0.4147	0.3814	0.4221	0.3984	0.4342	0.4028	0.4259	0.3853
T 4000K	TW	0.3702	0.3722	0.3825	0.3798	0.3869	0.3958	0.3736	0.3874
	TX	0.3825	0.3798	0.3950	0.3875	0.4006	0.4044	0.3869	0.3958
	TY	0.3783	0.3646	0.3898	0.3716	0.3950	0.3875	0.3825	0.3798
	TZ	0.3670	0.3578	0.3783	0.3646	0.3825	0.3798	0.3702	0.3722
R 5000K	RW	0.3376	0.3616	0.3463	0.3687	0.3451	0.3554	0.3371	0.3490
	RX	0.3463	0.3687	0.3551	0.3760	0.3533	0.3620	0.3451	0.3554
	RY	0.3451	0.3554	0.3533	0.3620	0.3515	0.3487	0.3440	0.3427
	RZ	0.3371	0.3490	0.3451	0.3554	0.3440	0.3427	0.3366	0.3369
P 6500K	PW	0.3048	0.3207	0.3130	0.3290	0.3115	0.3391	0.3028	0.3304
	PX	0.3130	0.3290	0.3213	0.3373	0.3205	0.3481	0.3115	0.3391
	PY	0.3144	0.3186	0.3221	0.3261	0.3213	0.3373	0.3130	0.3290
	PZ	0.3068	0.3113	0.3144	0.3186	0.3130	0.3290	0.3048	0.3207
	VW	0.4221	0.3984	0.4299	0.4165	0.4430	0.4212	0.4342	0.4028

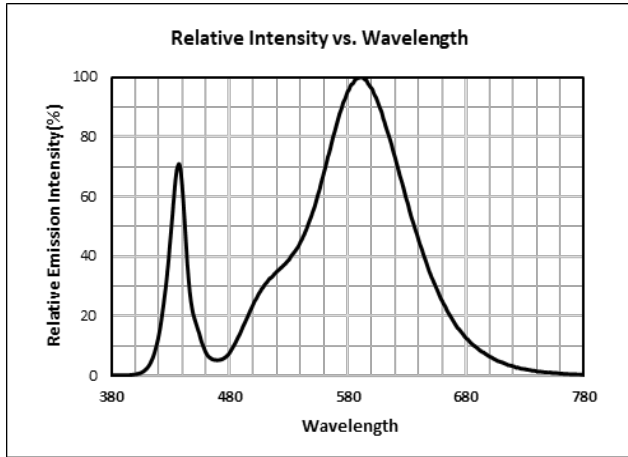
	Rank	X1	Y1	X2	Y2	X3	Y3	X4	Y4
M Mint	M1	0.3064	0.4403	0.3236	0.4337	0.3104	0.3994	0.2933	0.4060
	M2	0.2933	0.4060	0.3104	0.3994	0.2973	0.3651	0.2801	0.3717
	M3	0.2801	0.3717	0.2973	0.3651	0.2841	0.3307	0.2669	0.3373
	M4	0.2669	0.3373	0.2841	0.3307	0.2709	0.2964	0.2538	0.3030

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

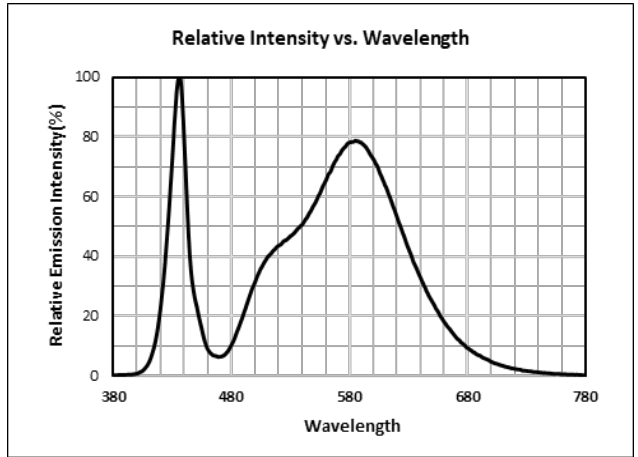
3. Typical Characteristics Graphs

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

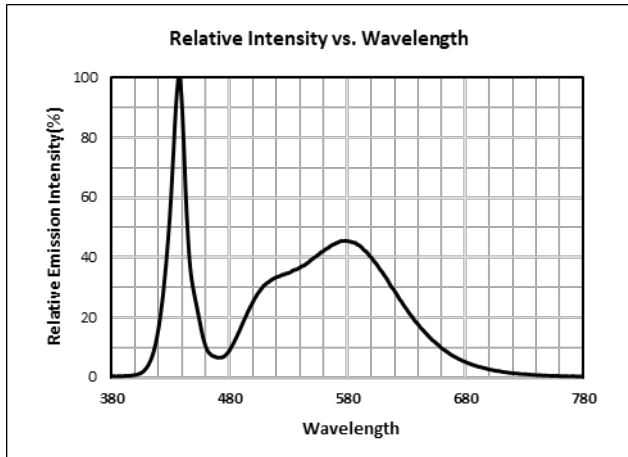
CCT : 3000K



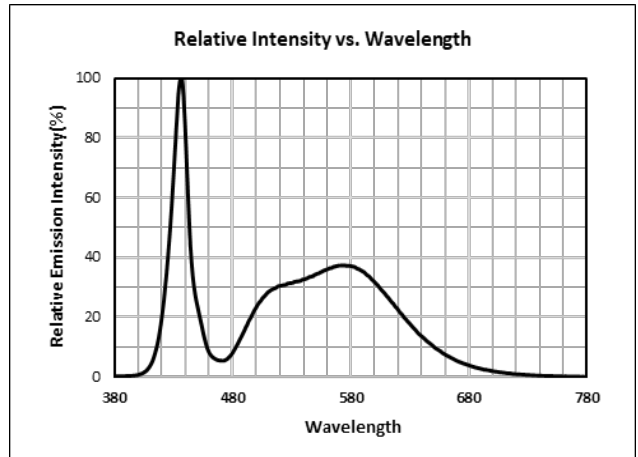
CCT : 4000K



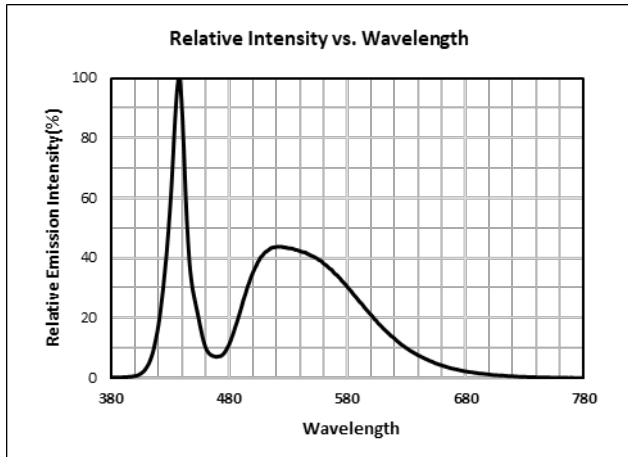
CCT : 5000K



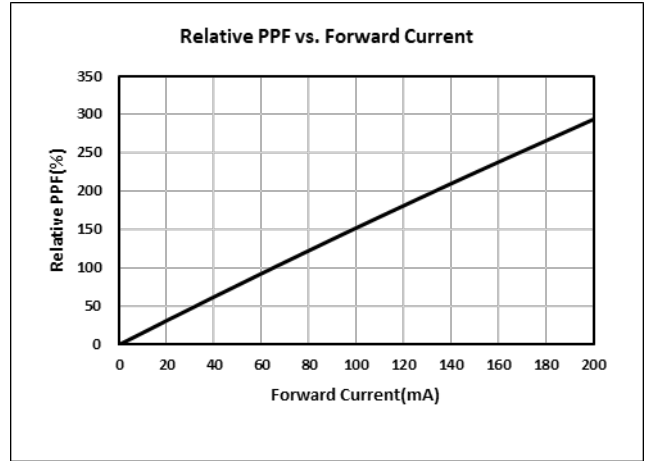
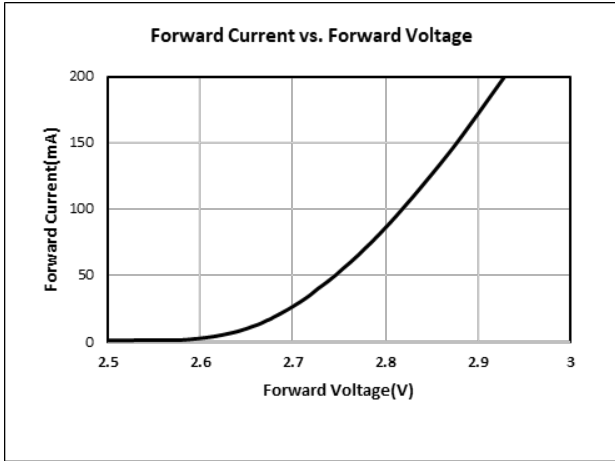
CCT : 6500K



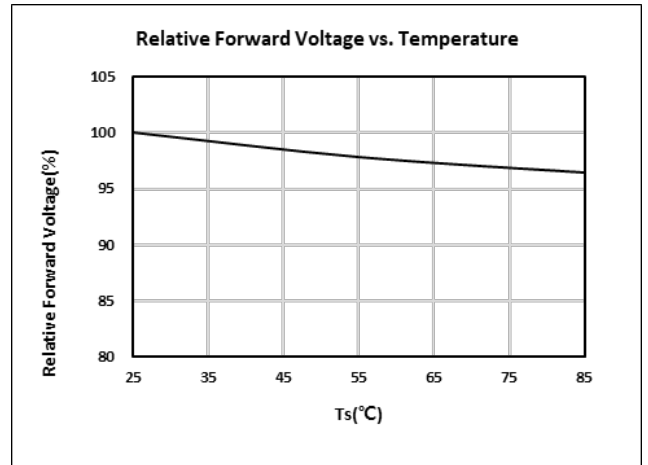
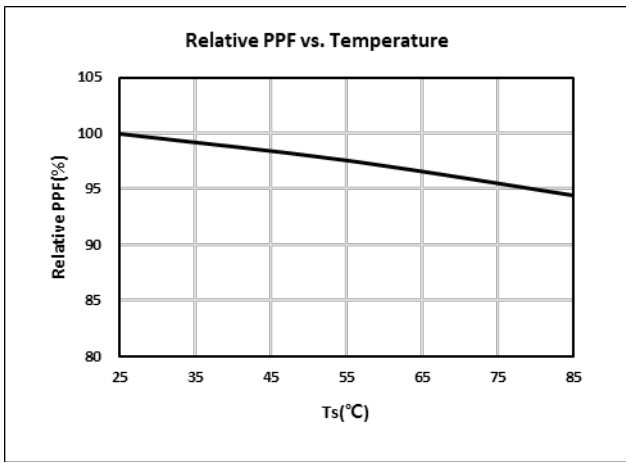
CCT : Mint White



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

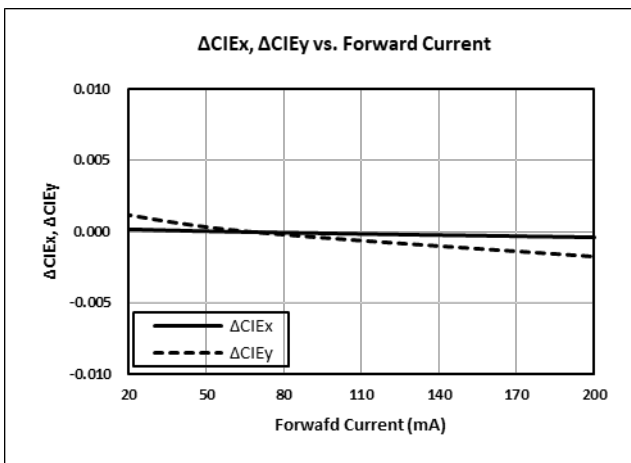


c) Temperature Characteristics ($I_f = 65\text{ mA}$)

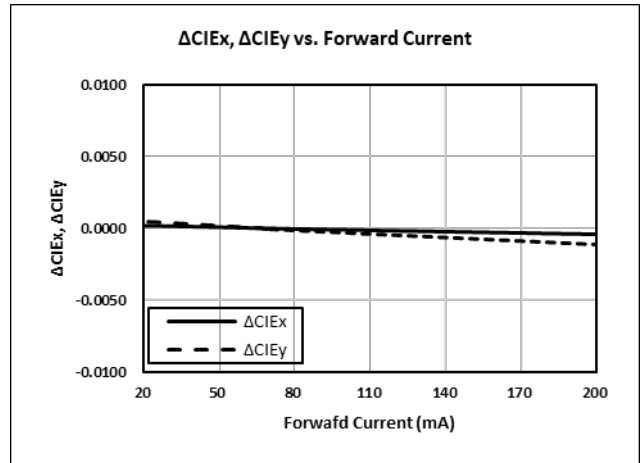


d) Color Shift Characteristics, $T_s = 25^\circ\text{C}$, $I_f = 65\text{ mA}$

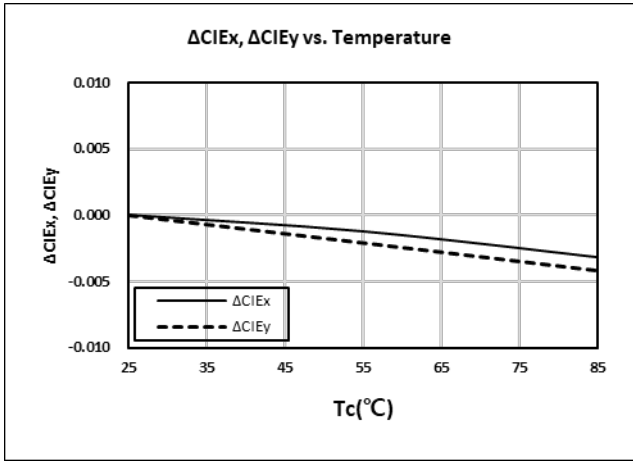
CCT : Full White



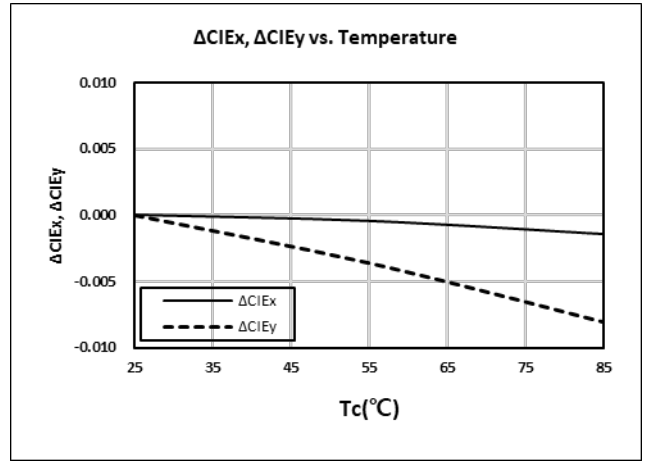
CCT : Mint White



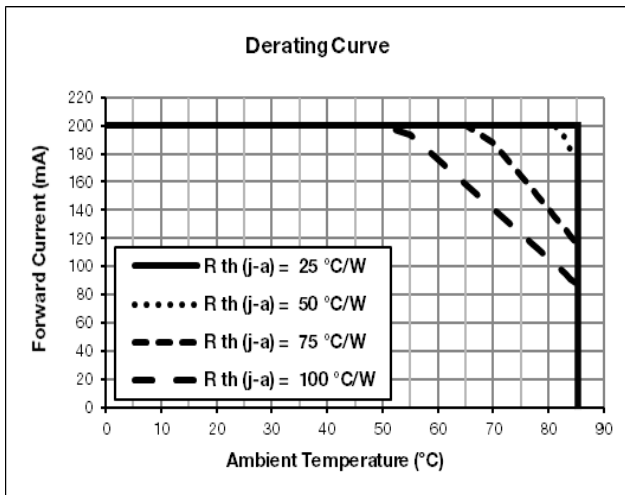
CCT : Full White



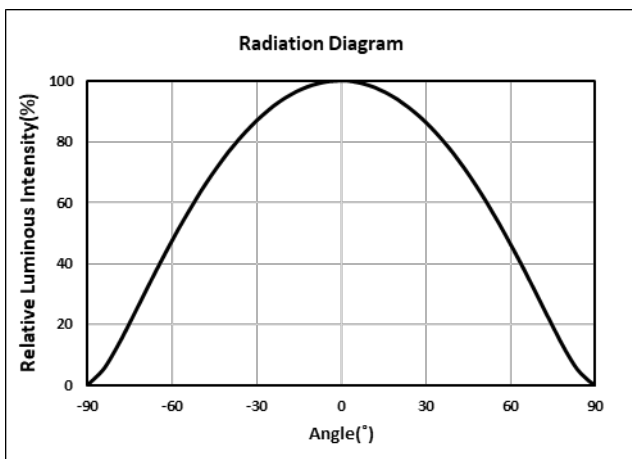
CCT : Mint White



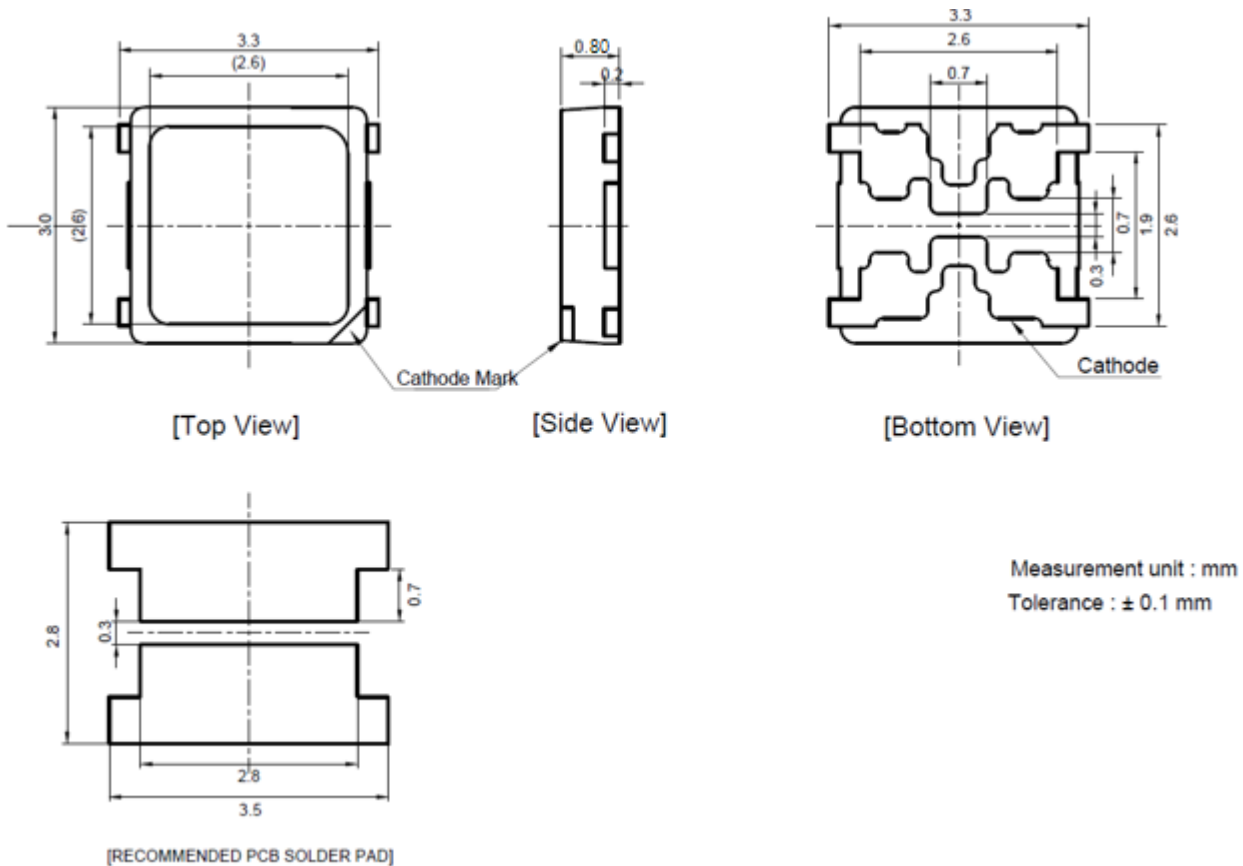
e) Derating Curve



f) Beam Angle Characteristics (T_s = 25°C, I_f = 65 mA)



4. Outline Drawing & Dimension



Notes:

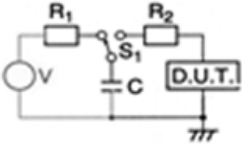
- 1) This LED has built-in ESD protection device(s) connected in parallel to LED chip(s).
- 2) T_s point and measurement method:
 - ① Measure one point at the cathode pad, if necessary remove PSR of PCB to reach T_s point.
 - ② All pads must be soldered to the PCB to dissipate heat properly, otherwise 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 200 mA	1000 h	22
High Temperature Humidity Life Test	85°C, 85 % RH, DC 200 mA	1000 h	22
Low Temperature Life Test	-40°C, DC 200 mA	1000 h	22
Thermal Cycle	-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> R_1: 10 MΩ R_2: 1.5 kΩ C: 100 pF V: ± 5 kV </p>	5 times	30

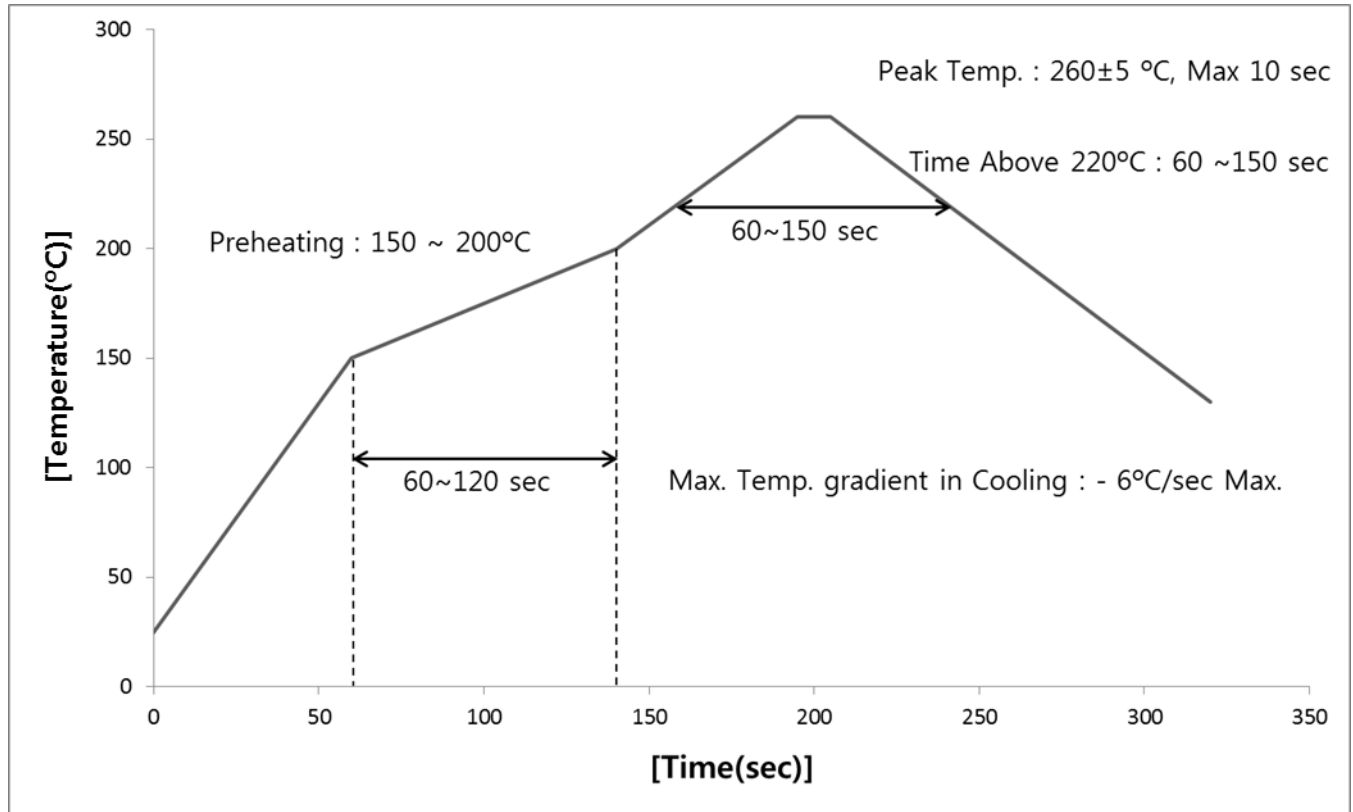
b) Criteria for Judging the Damage

Item	Symbol	Test Condition ($T_s = 25^\circ\text{C}$)	Limit	
			Min	Max
Forward Voltage	V_F	$I_F = 65$ mA	Init. Value * 0.9	Init. Value * 1.1
PPF	$\mu\text{mol/s}$	$I_F = 65$ mA	Init. Value * 0.7	Init. Value * 1.1

6. Soldering Conditions

a) Reflow Conditions (Pb free)

Reflow frequency: 2 times max.



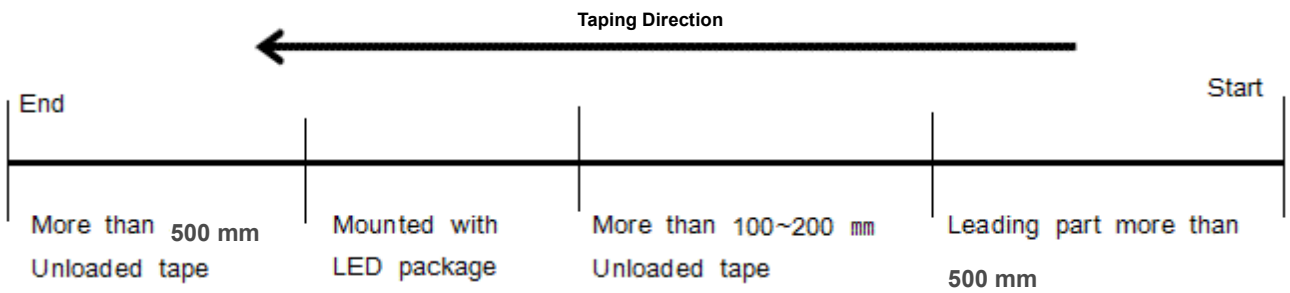
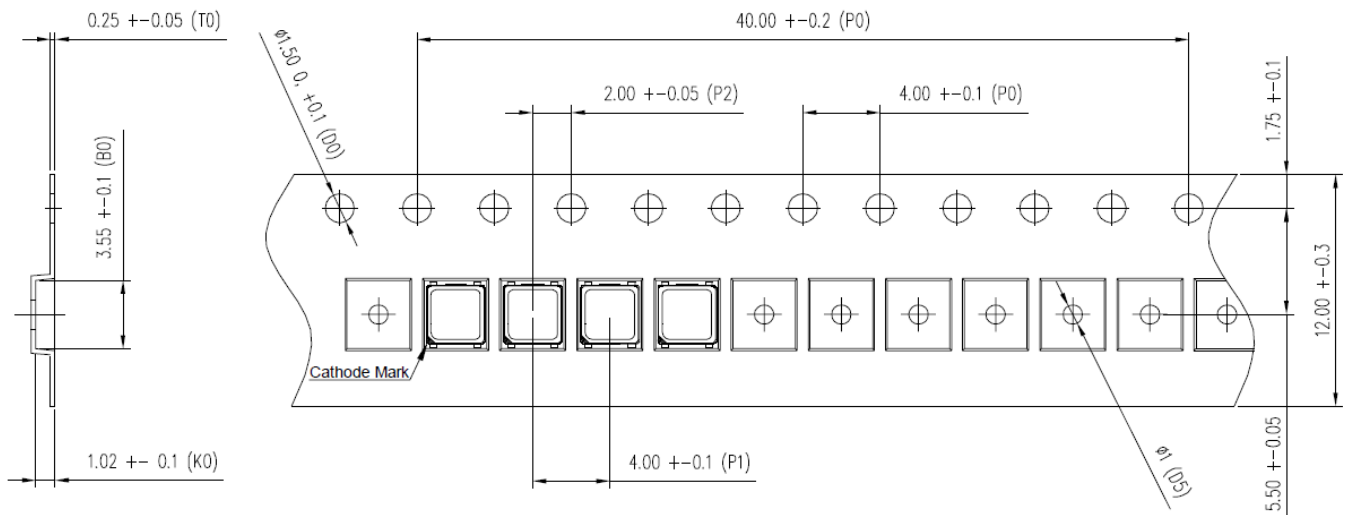
b) Manual Soldering Conditions

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

7. Tape & Reel

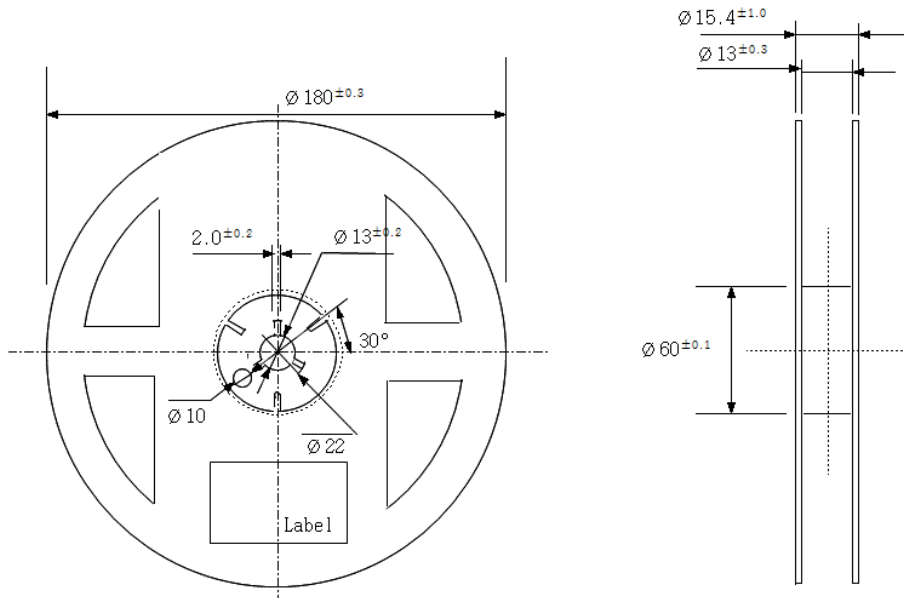
a) Taping Dimension

(unit: mm)



b) Reel Dimension

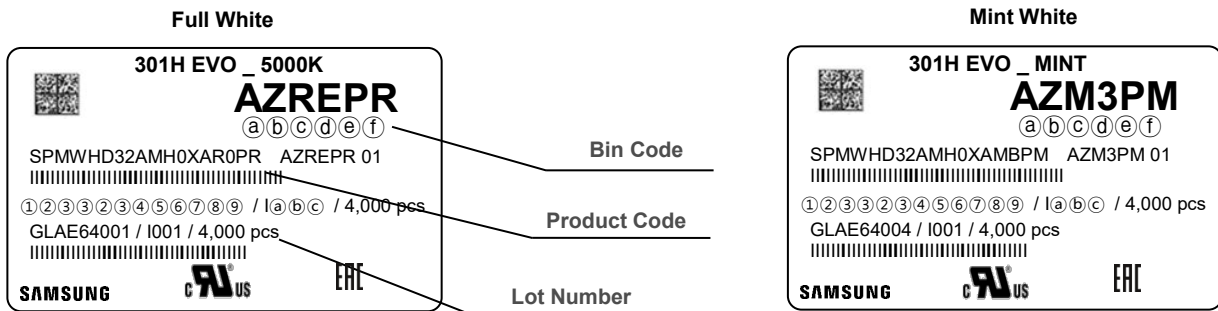
(unit: mm)

**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 5)

Bin Code:

- ①②: Forward Voltage bin
- ③④: Chromaticity bin
- ⑤⑥: PPF BIN

b) Lot Number

The lot number is composed of the following characters:



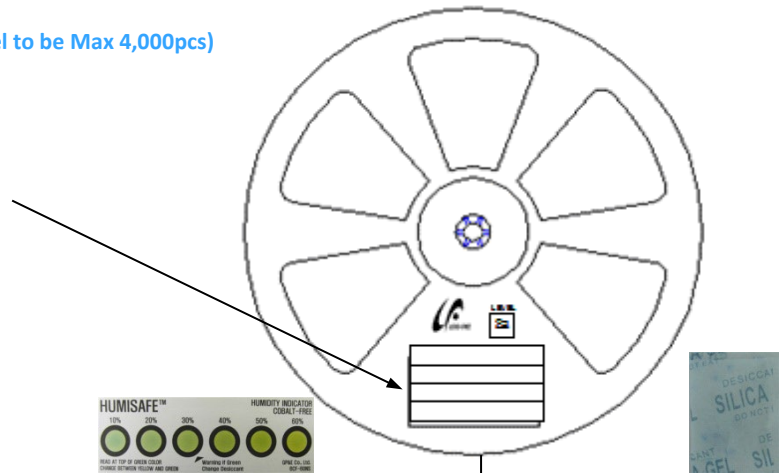
①②③③②③④⑤⑥⑦⑧⑨ / l a b c / 4,000 pcs

- ①② : Production site (GL: Tianjin, China, G4: Guangzhou, China, EH : Hanoi, Vietnam)
※ Sample product (SL: Kiheung, Korea)
- 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 : Serial number (001 ~ 999)
- a b c : Reel number (001 ~ 999)

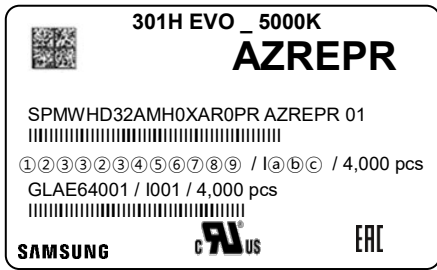
9. Packing Structure

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

Reel



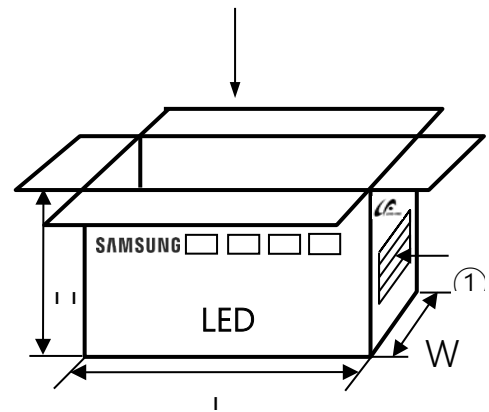
Aluminum Vinyl Packing Bag



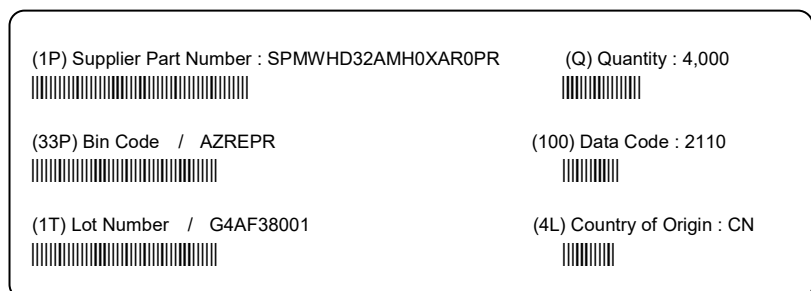
Outer Box

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) 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

301H EVO_ 5000K



AZREPR

SPMWH32AMH0XAR0PR AZREPR 01
 ①②③③②③④⑤⑥⑦⑧⑨ / I(a)(b)(c) / 4,000 pcs
 GLAE64001 / I001 / 4,000 pcs

SAMSUNG

US

ERC




ATTENTION

OBSEVE 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

(This image is for reference only. Silica gel and humidity indicator shapes may be different.)



HUMISAFE™

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



READ AT TOP OF GREEN COLOR
CHANGE BETWEEN YELLOW AND GREEN

**HUMIDITY INDICATOR
COBALT-FREE**

Warning If Green
Change Desiccant

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

10. 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 °C, 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 °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

- 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 °C.
- 8) Devices must be baked for 10~24 hours at 60 ± 5 °C, 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.
- 11) 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, etc.

Legal and additional information.

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“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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