

Middle Power LED Series
3030

LM301B

CRI 80 for EURO



Features & Benefits

- 0.3 W class middle power LED
- 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 ($I_F = 65 \text{ mA}$, $T_s = 25 \text{ °C}$)

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
Reverse Voltage (@ 5 mA)	V			0.7	-	1.2
Color Rendering Index (R_a)	-			80	-	-
Thermal Resistance (junction to solder point)	°C/W			-	7.5	-
Beam Angle	°			-	120	-

Note:

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

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

Item	CRI	Nominal CCT (K)	SH		SJ		SK		SL		SM		Current
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
			32	34	34	36	36	38	38	40	40	42	65mA
Luminous Flux (Φ_v)	80	2700											
		3000											
		3500											
		4000											
		5000											
		5700											
		6500											

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	D	3	2	A	M	D	5	X	A	R	M	S	0

Digit	PKG Information	Code	Specification
1 2 3	Samsung Package Middle Power	SPM	
4 5	Color	WH	White
6	Product Version	D	D : Dispensing
7 8 9	Form Factor	32A	3.0 x 3.0 x 0.7 mm; 2 pads;
10	Sorting Current (mA)	M	65 mA
11	Chromaticity Coordinates	D	ANSI Standard
12	CRI	5	Min. 80
13 14	Forward Voltage (V)	XA	2.6~2.9 Bin Code: AY 2.6~2.7 AZ 2.7~2.8 A1 2.8~2.9
15 16	CCT (K)	WM	2700 W6, W7, W8, W9
		VM	3000 V6, V7, V8, V9
		UM	3500 U6, U7, U8, U9
		TM	4000 T6, T7, T8, T9
		RM	5000 R6, R7, R8, R9
		QM	5700 Q6, Q7, Q8, Q9
		PM	6500 P6, P7, P8, P9
		M : ANSI Quarter	
17 18	Luminous Flux	S0 SH SJ SK SL	SH, SJ, SK, SL, SM SH Bin Code: SJ SK SL

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

CRI (R_a) Min.	Nominal CCT (K)	Product Code	Flux Bin	Flux Range (Φ_v , lm)
80	2700	SPMWH32AMD5XAWMS0	SH	32.0~34.0
			SJ	34.0 ~36.0
			SK	36.0 ~38.0
		SPMWH32AMD5XAWMSH	SH	32.0~34.0
			SJ	34.0 ~36.0
			SK	36.0 ~38.0
	3000	SPMWH32AMD5XAVMS0	SJ	34.0 ~36.0
			SK	36.0 ~38.0
			SL	38.0 ~ 40.0
		SPMWH32AMD5XAVMSJ	SJ	34.0 ~36.0
			SK	36.0 ~38.0
			SL	38.0 ~ 40.0
	3500	SPMWH32AMD5XAUMS0	SJ	34.0 ~36.0
			SK	36.0 ~38.0
			SL	38.0 ~ 40.0
		SPMWH32AMD5XAUMSK	SK	36.0 ~38.0
			SL	38.0 ~ 40.0
			SK	36.0 ~38.0
	4000	SPMWH32AMD5XATMS0	SK	36.0 ~38.0
			SL	38.0 ~ 40.0
			SM	40.0 ~ 42.0
		SPMWH32AMD5XATMSK	SK	36.0 ~38.0
			SL	38.0 ~ 40.0
			SK	36.0 ~38.0
5000	SPMWH32AMD5XARMS0	SK	36.0 ~38.0	
		SL	38.0 ~ 40.0	
		SM	40.0 ~ 42.0	
	SPMWH32AMD5XARMSK	SK	36.0 ~38.0	
		SL	38.0 ~ 40.0	
		SK	36.0 ~38.0	
5700	SPMWH32AMD5XAQMS0	SK	36.0 ~38.0	
		SL	38.0 ~ 40.0	
		SM	40.0 ~ 42.0	
	SPMWH32AMD5XAQMSK	SK	36.0 ~38.0	
		SL	38.0 ~ 40.0	
		SK	36.0 ~38.0	
6500	SPMWH32AMD5XAPMS0	SK	36.0 ~38.0	
		SL	38.0 ~ 40.0	
		SM	40.0 ~ 42.0	
	SPMWH32AMD5XAPMSK	SK	36.0 ~38.0	
		SL	38.0 ~ 40.0	
		SK	36.0 ~38.0	

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

CRI (Ra) Min.	Nominal CCT (K)	Product Code	Color Rank	Chromaticity Bins
80	2700	SPMWHD32AMD5XAWMS●	WM (Quarter bin)	W6, W7, W8, W9
	3000	SPMWHD32AMD5XAVMS●	VM (Quarter bin)	V6, V7, V8, V9
	3500	SPMWHD32AMD5XAUMS●	UM (Quarter bin)	U6, U7, U8, U9
	4000	SPMWHD32AMD5XATMS●	TM (Quarter bin)	T6, T7, T8, T9
	5000	SPMWHD32AMD5XARMS●	RM (Quarter bin)	R6, R7, R8, R9
	5700	SPMWHD32AMD5XAQMS●	QM (Quarter bin)	Q6, Q7, Q8, Q9
	6500	SPMWHD32AMD5XAPMS●	PM (Quarter bin)	P6, P7, P8, P9

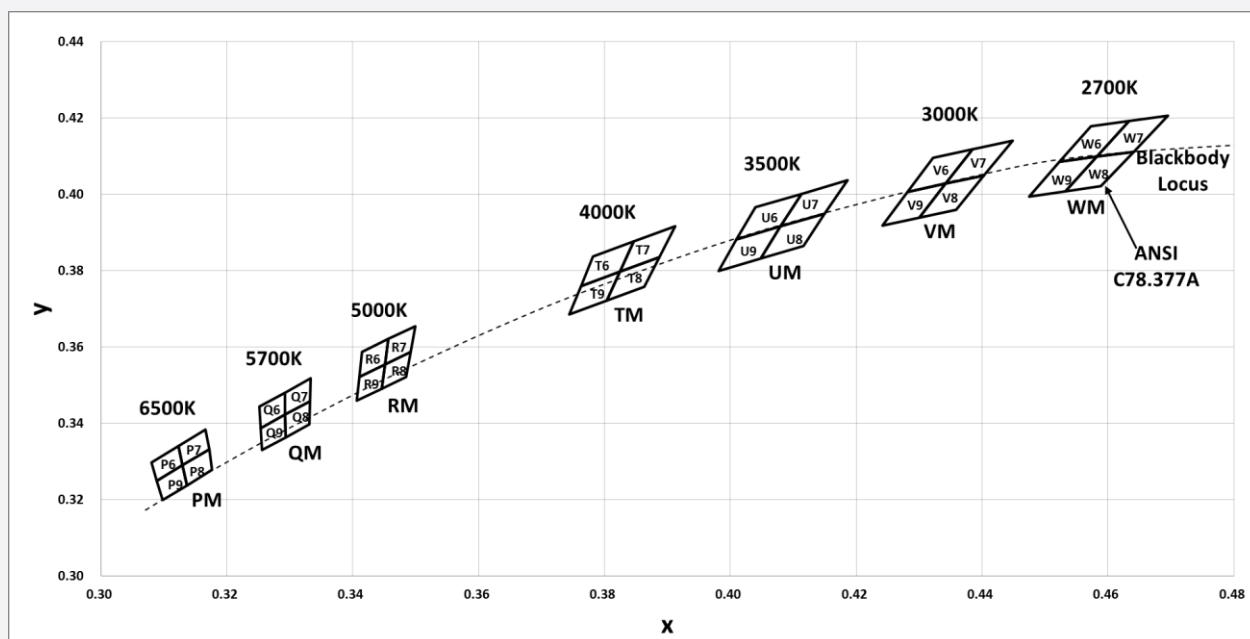
Note:

● can be "0", "H", "J", "K" or "L" of the luminous flux

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

CRI (Ra) Min.	Nominal CCT (K)	Product Code	Voltage Rank	Voltage Bin	Voltage Range (V)
-	-	-	-	AY	2.6 ~ 2.7
-	-	-	XA	AZ	2.7 ~ 2.8
-	-	-	-	A1	2.8 ~ 2.9

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



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

Region	CIE x	CIE y	Region	CIE x	CIE y
W rank (2700 K)					
W6	0.4523	0.4085	W7	0.4582	0.4099
	0.4573	0.4178		0.4634	0.4193
	0.4634	0.4193		0.4695	0.4207
	0.4582	0.4099		0.4641	0.4112
W9	0.4475	0.3994	W8	0.4532	0.4008
	0.4523	0.4085		0.4582	0.4099
	0.4582	0.4099		0.4641	0.4112
	0.4532	0.4008		0.4589	0.4021

Region	CIE x	CIE y	Region	CIE x	CIE y
T rank (4000 K)					
T6	0.3763	0.376	T7	0.3825	0.3798
	0.3825	0.3798		0.3887	0.3836
	0.3847	0.3877		0.3912	0.3917
	0.3782	0.3837		0.3847	0.3877
T9	0.3744	0.3685	T8	0.3804	0.3721
	0.3804	0.3721		0.3863	0.3758
	0.3825	0.3798		0.3887	0.3836
	0.3763	0.376		0.3825	0.3798

Region	CIE x	CIE y	Region	CIE x	CIE y
V rank (3000 K)					
V6	0.4281	0.4006	V7	0.4342	0.4028
	0.4322	0.4096		0.4385	0.4119
	0.4385	0.4119		0.4449	0.4141
	0.4342	0.4028		0.4403	0.4049
V9	0.4242	0.3919	V8	0.43	0.3939
	0.4281	0.4006		0.4342	0.4028
	0.4342	0.4028		0.4403	0.4049
	0.43	0.3939		0.4359	0.396

Region	CIE x	CIE y	Region	CIE x	CIE y
R rank (5000 K)					
R6	0.3415	0.3587	R7	0.3451	0.3554
	0.3411	0.3522		0.3457	0.3621
	0.3451	0.3554		0.35	0.3655
	0.3457	0.3621		0.3492	0.3587
R9	0.3407	0.346	R8	0.3446	0.3491
	0.3411	0.3522		0.3451	0.3554
	0.3451	0.3554		0.3492	0.3587
	0.3446	0.3491		0.3485	0.3522

Region	CIE x	CIE y	Region	CIE x	CIE y
U rank (3500 K)					
U6	0.401	0.3882	U7	0.408	0.3916
	0.404	0.3966		0.4113	0.4001
	0.4113	0.4001		0.4186	0.4037
	0.408	0.3916		0.415	0.395
U9	0.3981	0.38	U8	0.4048	0.3832
	0.401	0.3882		0.408	0.3916
	0.408	0.3916		0.415	0.395
	0.4048	0.3832		0.4116	0.3865

Region	CIE x	CIE y	Region	CIE x	CIE y
Q rank (5700 K)					
Q6	0.3252	0.3444	Q7	0.3293	0.3481
	0.3254	0.3388		0.3293	0.3423
	0.3293	0.3423		0.3332	0.3458
	0.3293	0.3481		0.3333	0.3518
Q9	0.3254	0.3388	Q8	0.3293	0.3423
	0.3256	0.3331		0.3294	0.3364
	0.3294	0.3364		0.3331	0.3398
	0.3293	0.3423		0.3332	0.3458

Region	CIE x	CIE y	Region	CIE x	CIE y
P rank (6500 K)					
P6	0.3089	0.3249	P7	0.313	0.329
	0.313	0.329		0.3172	0.3332
	0.3123	0.3341		0.3166	0.3384
	0.308	0.3298		0.3123	0.3341
P9	0.3098	0.3199	P8	0.3137	0.3238
	0.3137	0.3238		0.3177	0.3278
	0.313	0.329		0.3172	0.3332
	0.3089	0.3249		0.313	0.329

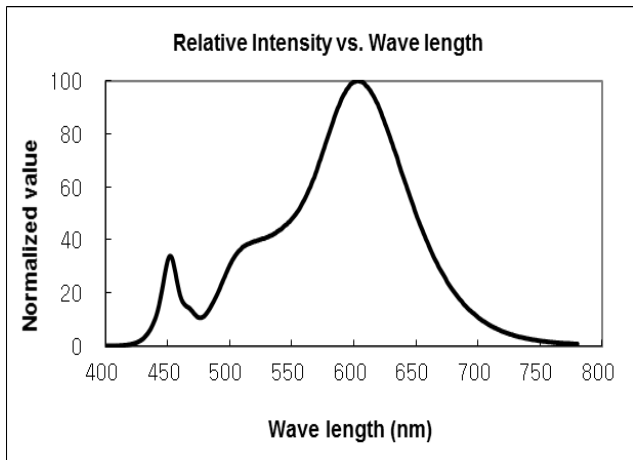
Note:

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

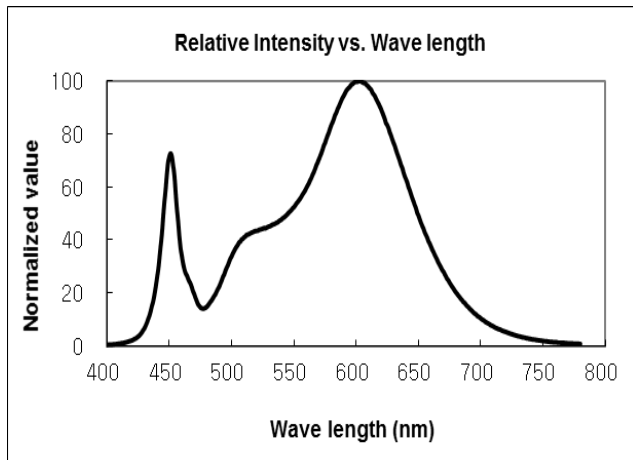
3. Typical Characteristics Graphs

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

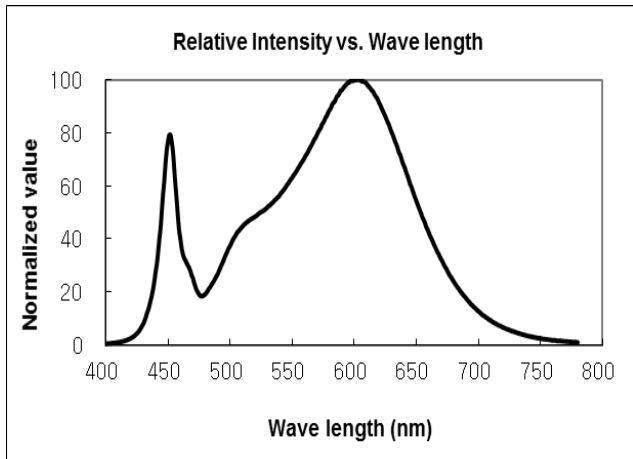
CCT : 2700K (80 CRI)



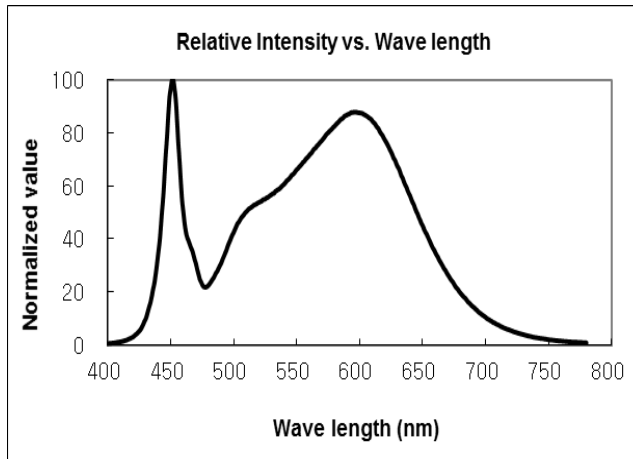
CCT : 3000K (80 CRI)



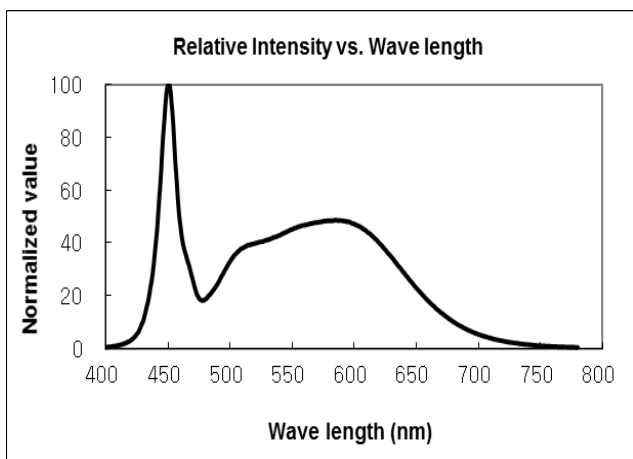
CCT : 3500K (80 CRI)



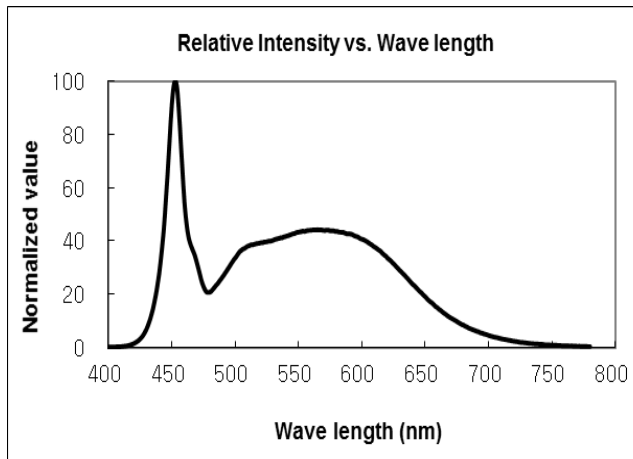
CCT : 4000K (80 CRI)



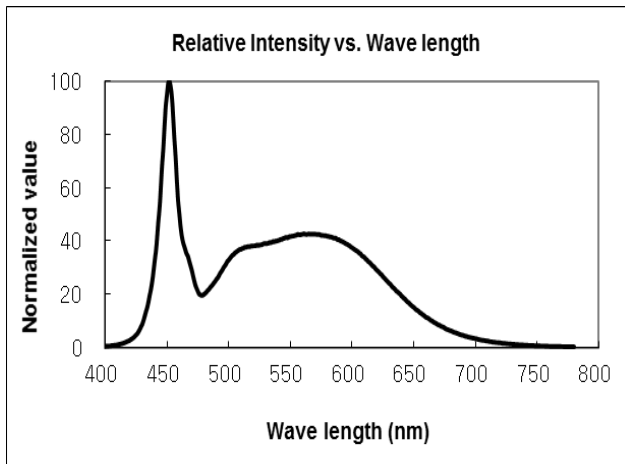
CCT : 5000K (80 CRI)



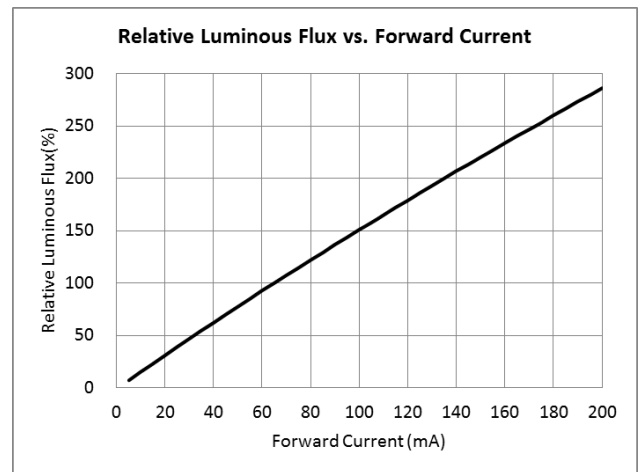
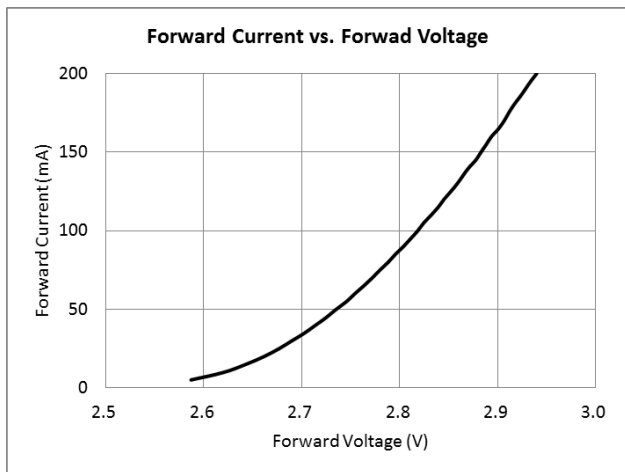
CCT : 5700K (80 CRI)



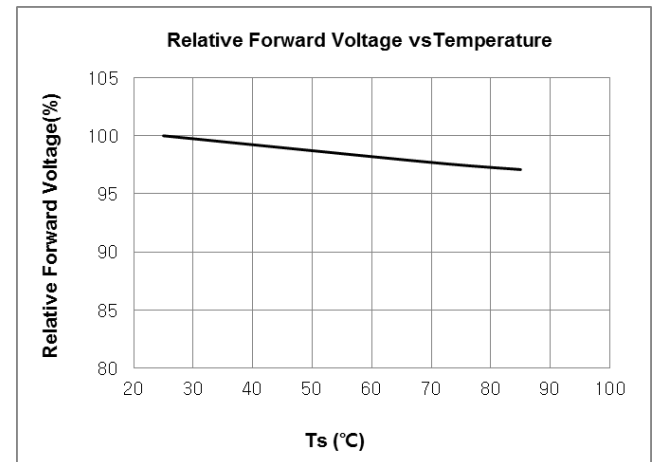
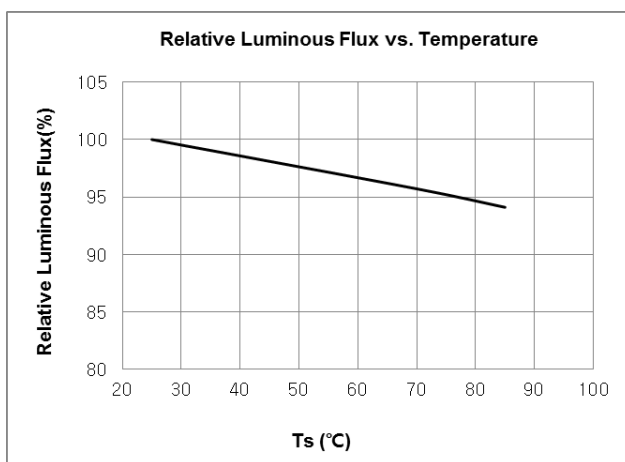
CCT : 6500K (80 CRI)



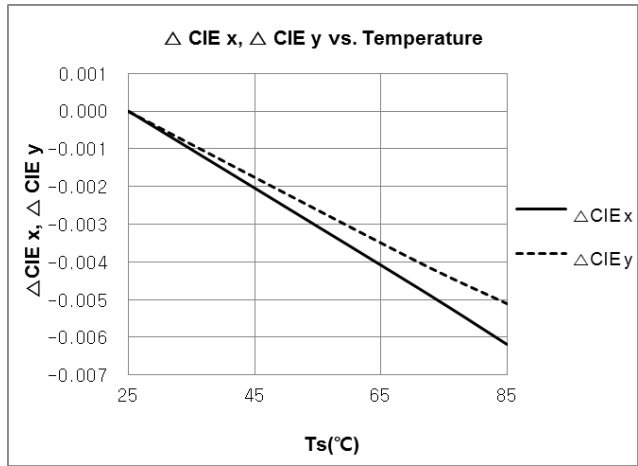
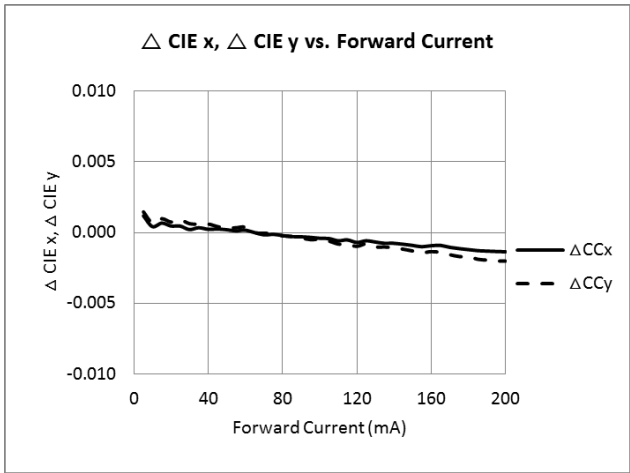
b) Forward Current Characteristics ($T_s = 25\text{ }^\circ\text{C}$)



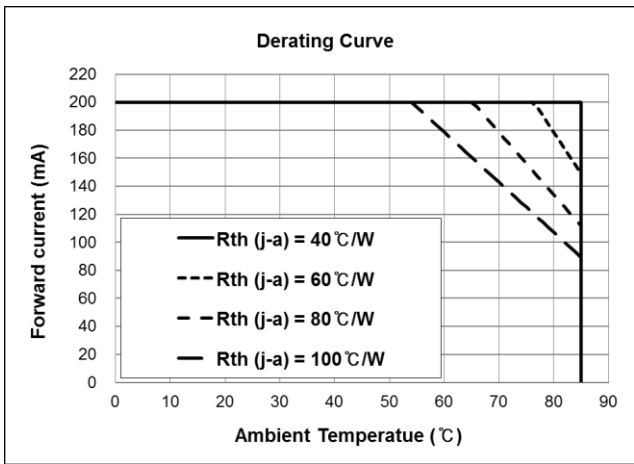
c) Temperature Characteristics ($I_F = 65\text{ mA}$)



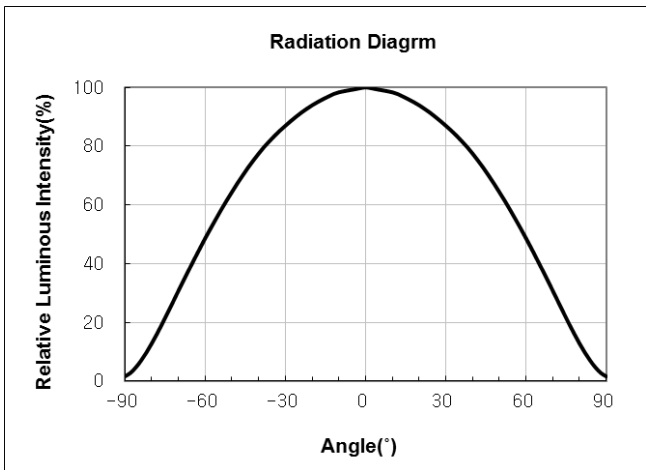
d) Color Shift Characteristics, $T_s = 25\text{ }^\circ\text{C}$, $I_F = 65\text{ mA}$



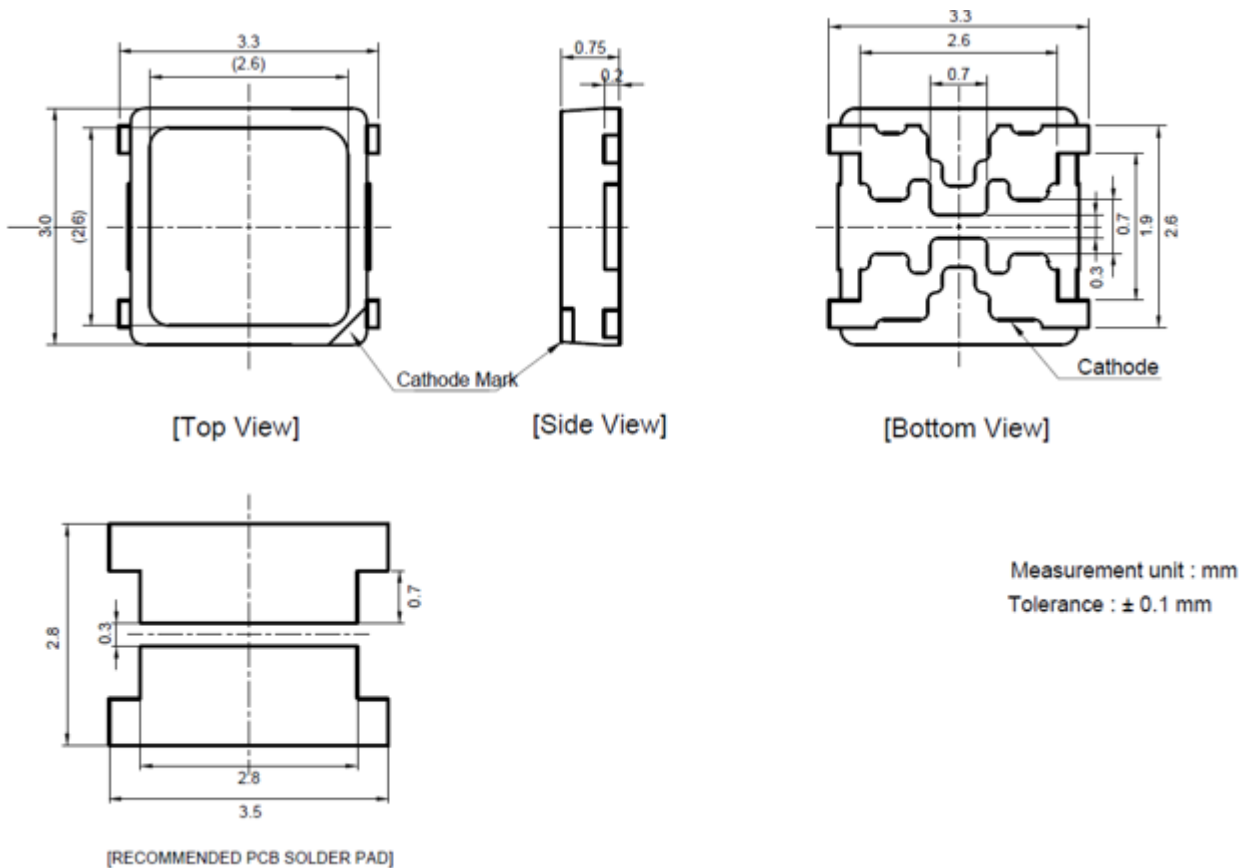
e) Derating Curve



f) Beam Angle Characteristics (Ts = 25 °C, If = 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.	
Room Temperature Life Test	25 °C, DC 200 mA	1000 h	22	
High Temperature Life Test	85 °C, DC 200 mA	1000 h	22	
High Temperature Humidity Life Test	85 °C, 85 % RH, DC 180 mA	1000 h	22	
Low Temperature Life Test	-40 °C, DC 200 mA	1000 h	22	
Powered Temperature Cycle Test	-40 °C ~ 85 °C, each 10 min, On/Off 5min , Temp. Change Time 20min, DC 200 mA	100 cycles	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)		R ₁ : 10 MΩ R ₂ : 1.5 kΩ C: 100 pF V: ±5 kV	5 times	30
ESD (MM)				
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	

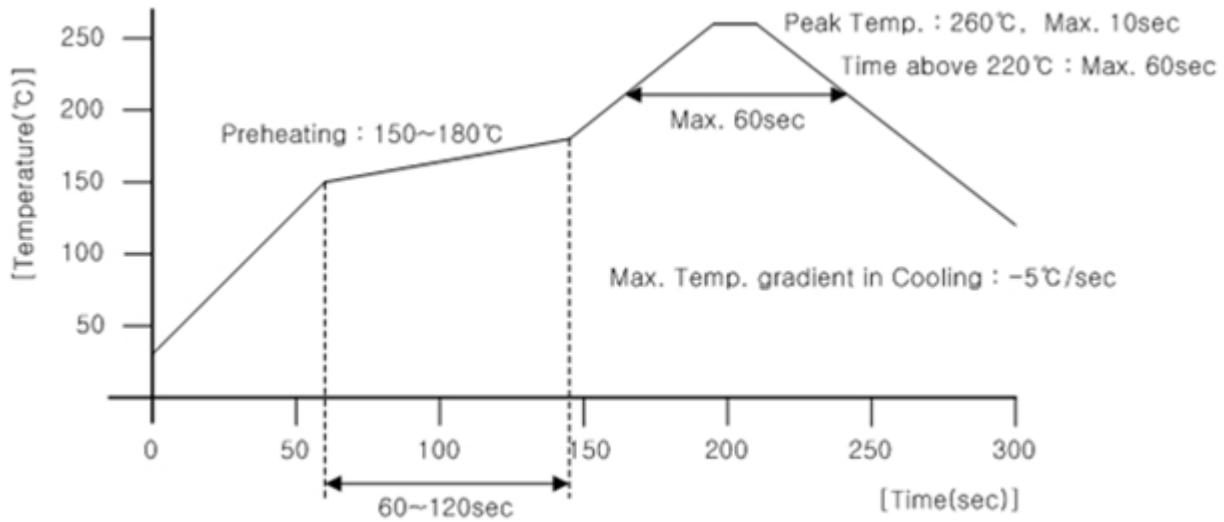
b) Criteria for Judging the Damage

Item	Symbol	Test Condition (T _s = 25 °C)	Limit	
			Min	Max
Forward Voltage	V _F	I _F = 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.



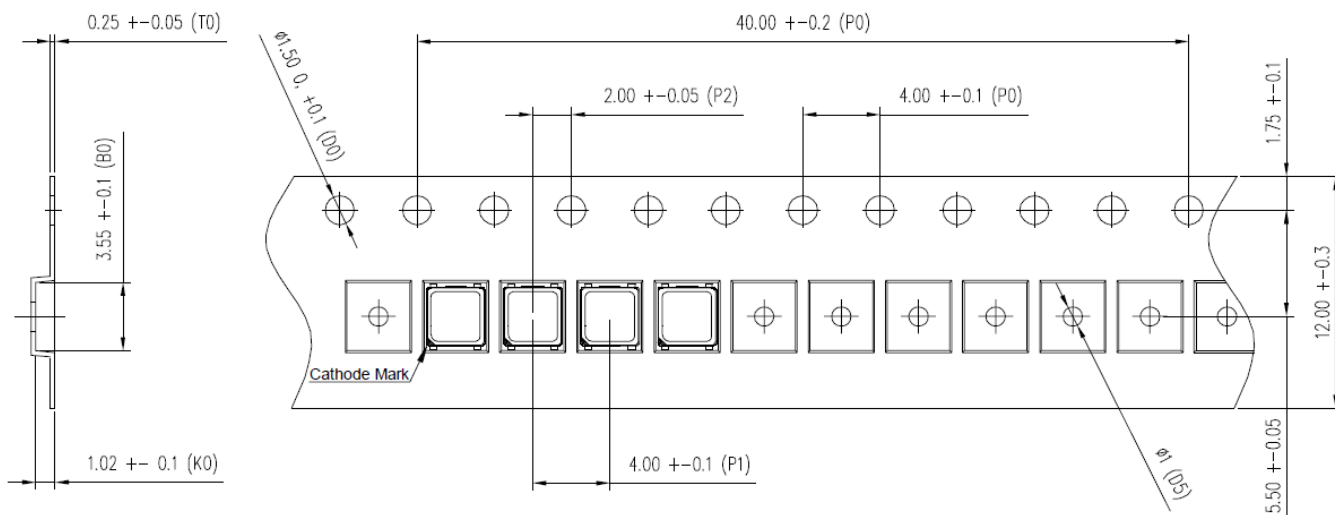
b) Manual Soldering Conditions

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

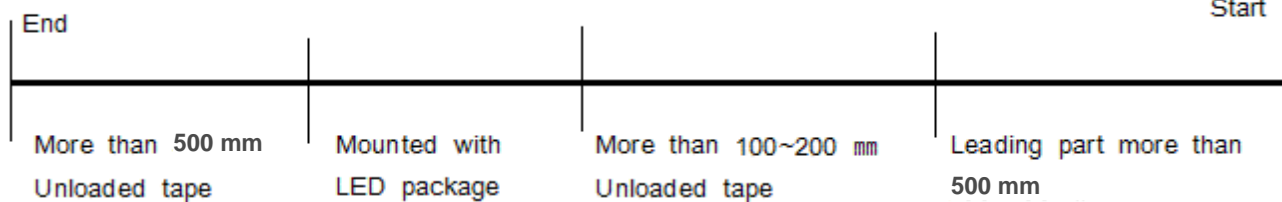
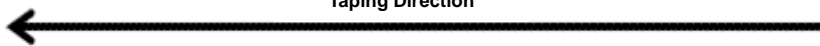
7. Tape & Reel

a) Taping Dimension

(unit: mm)

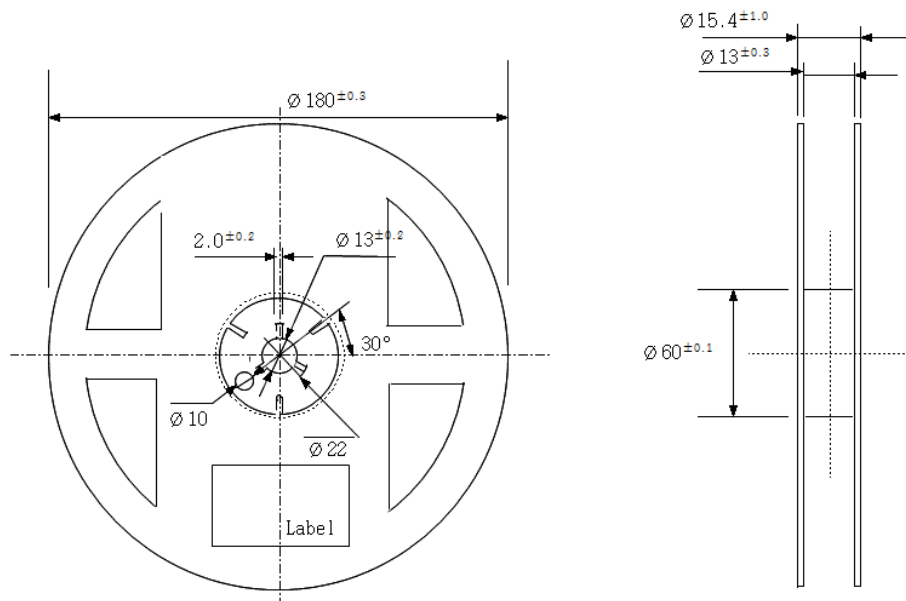


Taping Direction



b) Reel Dimension

(unit: mm)

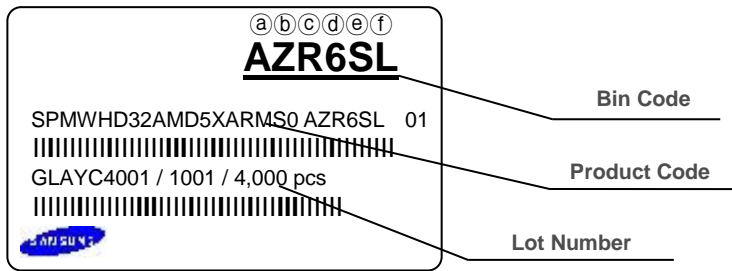


Notes:

- 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



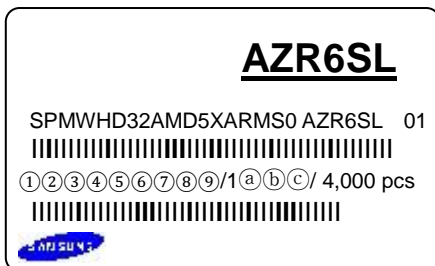
Note: Denoted bin code and product code above is only an example (see description on page 5)

Bin Code:

- ⒶⒷ: Forward Voltage bin (refer to page 8)
- ⒸⒹ: Chromaticity bin (refer to page 10-13)
- ⒺⒻ: Luminous Flux bin (refer to page 8)

b) Lot Number

The lot number is composed of the following characters:



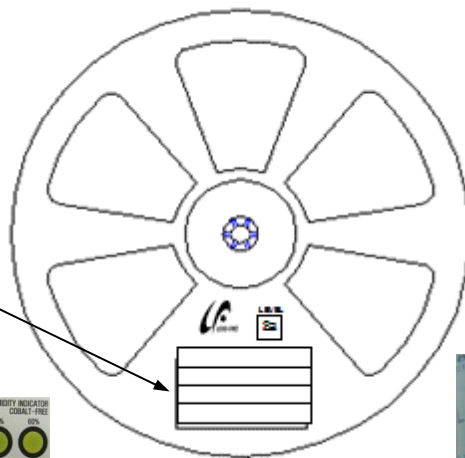
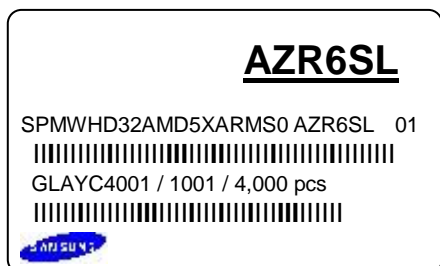
① ②③④⑤⑥⑦⑧⑨ / 1ⒶⒷⒸ / 4,000 pcs

- ①② : Production site (GL: Tianjin, China, G4: Guangzhou, China)
※ Sample product (SL: Kiheung, Korea)
- ③ : Product state (A: Normal, B: Bulk, C: First Production, R: Reproduction, S: Sample)
- ④ : Year (Z: 2015, A: 2016, B: 2017...)
- ⑤ : Month (1~9, A, B, C)
- ⑥⑦⑧⑨ : Day (1~9, A, B~V)
- ⒶⒷⒸ : Product serial number (001 ~ 999)

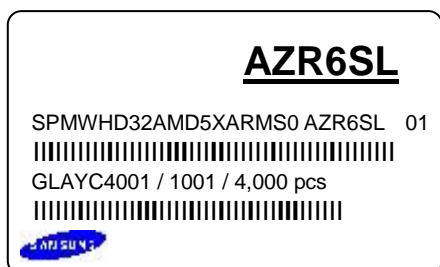
9. Packing Structure

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

Reel



Aluminum Vinyl Packing Bag

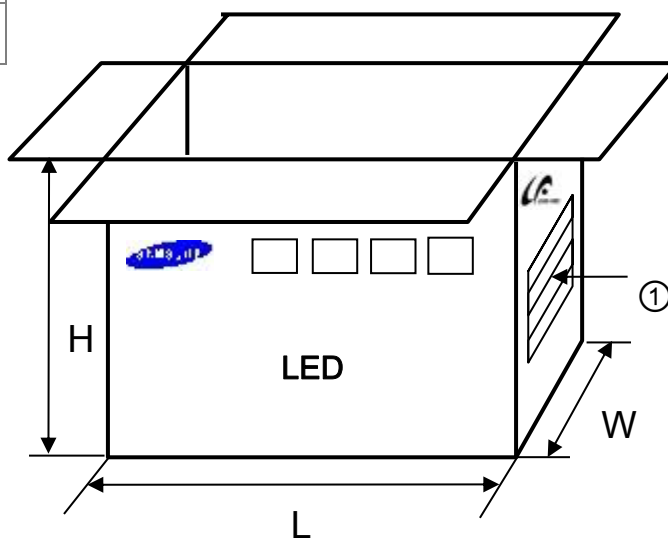
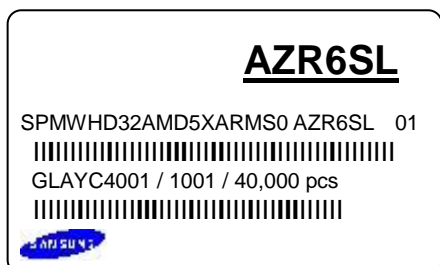


Outer Box


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) Aluminum Vinyl Packing Bag



CAUTION

This bag contains
MOISTURE SENSITIVE DEVICES

LEVEL
2a

AZR6SL

SPMWH32AMD5XARMS0 AZR6SL 01
 |||
 GLAYC4001 / 1001 / 4,000 pcs
 |||





SATSUMI

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

주의 사항

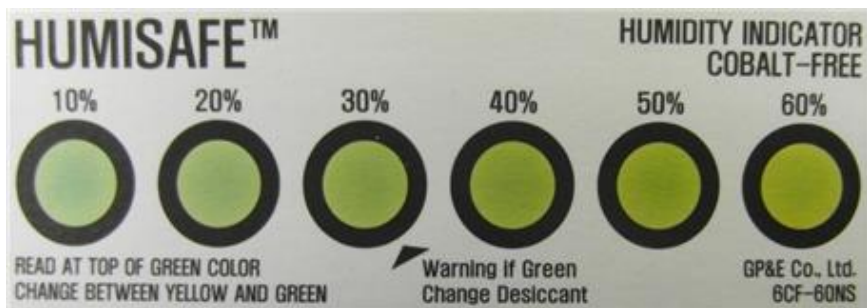
이 알루미늄 지퍼 백은 습기 및 정전기로부터 제품을 보호하기 위하여 제작되었습니다. 개봉 후에는 즉시 솔더 작업을 실시하는 것을 권장합니다.

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.

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



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. If the LEDs are to be stored for three months or more after being shipped from Samsung, they should be packed with a nitrogen-filled container (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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