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# LM362A – CRI 90




## Introduction

### Features

- Beam Angle: 120°
- Precondition : JEDEC Level 2a
- Dimension : 3.6 x 2.3 x 0.6 mm
- ESD withstand Voltage : up to  $\pm 5\text{KV}$  [HBM]
- Reliability Test : Refer to page 25

## SAMSUNG ELECTRONICS

95, Samsung2-Ro, Giheung-Gu,  
Yongin-City, Gyeonggi-Do 446-711, KOREA

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# 1. Product Code Information

## 1) Luminous Flux Bins ( $T_s = 25^\circ\text{C}$ )

Nominal CCT	Product Code	Flux Rank	Sorting Condition $I_m @100\text{mA}$	
			Flux Bin	Intensity Range (cd)
				Flux Range ( $\Phi_v, I_m$ )
2700K	SPMWHT325AD7YBW0S0	S0	S1	48.00 ~ 53.00
			S2	53.00 ~ 58.00
			S3	58.00 ~ 63.00
3000K	SPMWHT325AD7YBV0S0	S0	S1	50.00 ~ 55.00
			S2	55.00 ~ 60.00
			S3	60.00 ~ 65.00
3500K	SPMWHT325AD7YBU0S0	S0	S1	52.00 ~ 57.00
			S2	57.00 ~ 62.00
			S3	62.00 ~ 67.00
4000K	SPMWHT325AD7YBT0S0	S0	S1	54.00 ~ 59.00
			S2	59.00 ~ 64.00
			S3	64.00 ~ 69.00

**Notes:**

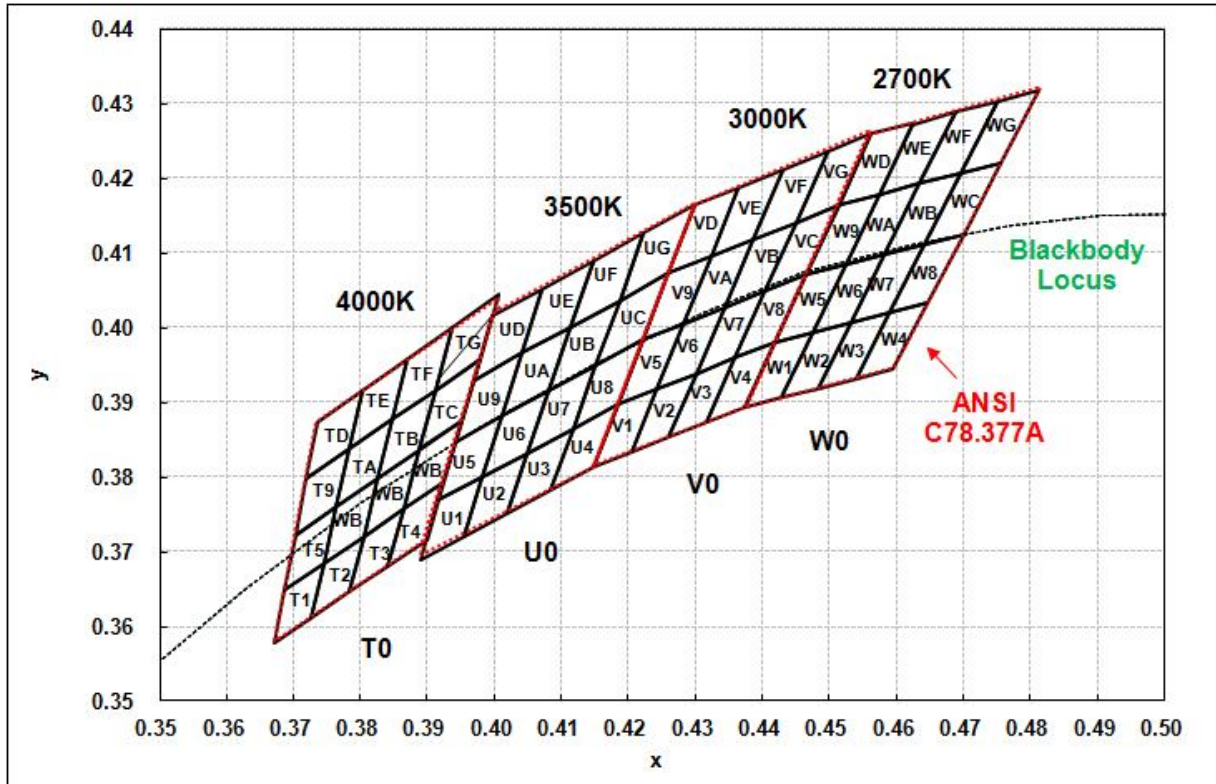
- 1) Luminous Intensity( $I_v$ , cd) values are for representative reference only
- 2) SAMSUNG ELECTRONICS maintains a tolerance of  $\pm 5\%$  on Luminous Flux measurement

## 2) Color Bins ( $T_s = 25^\circ\text{C}$ )

### 1) Color Binning

Nominal CCT	Product Code	Color Rank	Chromaticity Bins
2700K	SPMWHT325AD7YBW0S0	W0 (Whole Bin)	W1,W2,W3,W4,W5,W6,W7,W8, W9,WA,WB,WC,WD,WE,WF,WG
3000K	SPMWHT325AD7YBV0S0	V0 (Whole Bin)	V1,V2,V3,V4,V5,V6,V7,V8, V9,VA,VB,VC,VD,VE,VF,VG
3500K	SPMWHT325AD7YBU0S0	U0 (Whole Bin)	U1,U2,U3,U4,U5,U6,U7,U8, U9,UA,UB,UC,UD,UE,UF,UG
4000K	SPMWHT325AD7YBT0S0	T0 (Whole Bin)	T1,T2,T3,T4,T5,T6,T7,T8, T9,TA,TB,TC,TD,TE,TF,TG

## 2) Chromaticity Region & Coordinates





## 2) Chromaticity Region & Coordinates (Continued)

Region	CIE X	CIE Y	Region	CIE X	CIE Y
W rank (2700K)					
W1	0.4373	0.3893	W9	0.4465	0.4071
	0.4418	0.3981		0.4513	0.4164
	0.4475	0.3994		0.4573	0.4178
	0.4428	0.3906		0.4523	0.4085
W2	0.4428	0.3906	WA	0.4523	0.4085
	0.4475	0.3994		0.4573	0.4178
	0.4532	0.4008		0.4634	0.4193
	0.4483	0.3919		0.4582	0.4099
W3	0.4483	0.3919	WB	0.4582	0.4099
	0.4532	0.4008		0.4634	0.4193
	0.4589	0.4021		0.4695	0.4207
	0.4538	0.3931		0.4641	0.4112
W4	0.4538	0.3931	WC	0.4641	0.4112
	0.4589	0.4021		0.4695	0.4207
	0.4646	0.4034		0.4756	0.4221
	0.4593	0.3944		0.4700	0.4126
W5	0.4418	0.3981	WD	0.4513	0.4164
	0.4465	0.4071		0.4562	0.4260
	0.4523	0.4085		0.4624	0.4274
	0.4475	0.3994		0.4573	0.4178
W6	0.4475	0.3994	WE	0.4573	0.4178
	0.4523	0.4085		0.4624	0.4274
	0.4582	0.4099		0.4687	0.4289
	0.4532	0.4008		0.4634	0.4193
W7	0.4532	0.4008	WF	0.4634	0.4193
	0.4582	0.4099		0.4687	0.4289
	0.4641	0.4112		0.4750	0.4304
	0.4589	0.4021		0.4695	0.4207
W8	0.4589	0.4021	WG	0.4695	0.4207
	0.4641	0.4112		0.4750	0.4304
	0.4700	0.4126		0.4813	0.4319
	0.4646	0.4034		0.4756	0.4221

Region	CIE X	CIE Y	Region	CIE X	CIE Y
V rank (3000K)					
V1	0.4147	0.3814	V9	0.4221	0.3984
	0.4183	0.3898		0.4259	0.4073
	0.4242	0.3919		0.4322	0.4096
	0.4203	0.3833		0.4281	0.4006
V2	0.4203	0.3833	VA	0.4281	0.4006
	0.4242	0.3919		0.4322	0.4096
	0.4300	0.3939		0.4385	0.4119
	0.4259	0.3853		0.4342	0.4028
V3	0.4259	0.3853	VB	0.4342	0.4028
	0.4300	0.3939		0.4385	0.4119
	0.4359	0.3960		0.4449	0.4141
	0.4316	0.3873		0.4403	0.4049
V4	0.4316	0.3873	VC	0.4403	0.4049
	0.4359	0.3960		0.4449	0.4141
	0.4418	0.3981		0.4513	0.4164
	0.4373	0.3893		0.4465	0.4071
V5	0.4183	0.3898	VD	0.4259	0.4073
	0.4221	0.3984		0.4299	0.4165
	0.4281	0.4006		0.4364	0.4188
	0.4242	0.3919		0.4322	0.4096
V6	0.4242	0.3919	VE	0.4322	0.4096
	0.4281	0.4006		0.4364	0.4188
	0.4342	0.4028		0.4430	0.4212
	0.4300	0.3939		0.4385	0.4119
V7	0.4300	0.3939	VF	0.4385	0.4119
	0.4342	0.4028		0.4430	0.4212
	0.4403	0.4049		0.4496	0.4236
	0.4359	0.3960		0.4449	0.4141
V8	0.4359	0.3960	VG	0.4449	0.4141
	0.4403	0.4049		0.4496	0.4236
	0.4465	0.4071		0.4562	0.4260
	0.4418	0.3981		0.4513	0.4164

## 2) Chromaticity Region & Coordinates (Continued)

Region	CIE X	CIE Y	Region	CIE X	CIE Y
U rank (3500K)					
U1	0.3889	0.3690	U9	0.3941	0.3848
	0.3953	0.3720		0.4010	0.3882
	0.3981	0.3800		0.4040	0.3966
	0.3915	0.3768		0.3968	0.3930
U2	0.3953	0.3720	UA	0.4010	0.3882
	0.4017	0.3751		0.4080	0.3916
	0.4048	0.3832		0.4113	0.4001
	0.3981	0.380		0.4040	0.3966
U3	0.4017	0.3751	UB	0.4080	0.3916
	0.4082	0.3782		0.4150	0.3950
	0.4116	0.3865		0.4186	0.4037
	0.4048	0.3832		0.4113	0.4001
U4	0.4082	0.3782	UC	0.4150	0.3950
	0.4147	0.3814		0.4221	0.3984
	0.4183	0.3898		0.4259	0.4073
	0.4116	0.3865		0.4186	0.4037
U5	0.3915	0.3768	UD	0.3968	0.3930
	0.3981	0.3800		0.4040	0.3966
	0.4010	0.3882		0.4071	0.4052
	0.3941	0.3848		0.3996	0.4015
U6	0.3981	0.3800	UE	0.4040	0.3966
	0.4048	0.3832		0.4113	0.4001
	0.4080	0.3916		0.4146	0.4089
	0.4011	0.3882		0.4071	0.4052
U7	0.4048	0.3832	UF	0.4113	0.4001
	0.4116	0.3865		0.4186	0.4037
	0.4150	0.3950		0.4222	0.4127
	0.4080	0.3916		0.4146	0.4089
U8	0.4116	0.3865	UG	0.4186	0.4037
	0.4183	0.3898		0.4259	0.4073
	0.4221	0.3984		0.4299	0.4165
	0.4150	0.3950		0.4222	0.4127

Region	CIE X	CIE Y	Region	CIE X	CIE Y
T rank (4000K)					
T1	0.3670	0.3578	T9	0.3702	0.3722
	0.3726	0.3612		0.3763	0.3760
	0.3744	0.3685		0.3782	0.3837
	0.3686	0.3649		0.3719	0.3797
T2	0.3726	0.3612	TA	0.3763	0.3760
	0.3783	0.3646		0.3825	0.3798
	0.3804	0.3721		0.3847	0.3877
	0.3744	0.3685		0.3782	0.3837
T3	0.3783	0.3646	TB	0.3825	0.3798
	0.3840	0.3681		0.3887	0.3836
	0.3863	0.3758		0.3912	0.3917
	0.3804	0.3721		0.3847	0.3877
T4	0.3840	0.3681	TC	0.3887	0.3837
	0.3898	0.3716		0.3950	0.3875
	0.3924	0.3794		0.3978	0.3958
	0.3863	0.3758		0.3912	0.3917
T5	0.3686	0.3649	TD	0.3719	0.3797
	0.3744	0.3685		0.3782	0.3837
	0.3763	0.3760		0.3802	0.3916
	0.3702	0.3722		0.3736	0.3874
T6	0.3744	0.3685	TE	0.3782	0.3837
	0.3804	0.3721		0.3847	0.3877
	0.3825	0.3798		0.3869	0.3958
	0.3763	0.3760		0.3802	0.3916
T7	0.3804	0.3721	TF	0.3847	0.3877
	0.3863	0.3758		0.3912	0.3917
	0.3887	0.3836		0.3937	0.4001
	0.3825	0.3798		0.3869	0.3958
T8	0.3863	0.3758	TG	0.3912	0.3917
	0.3924	0.3794		0.3978	0.3958
	0.3950	0.3875		0.4006	0.4044
	0.3887	0.3836		0.3937	0.4001



## 2. Luminous Flux Characteristics (Ts = 25°C)

Nominal CCT	Minimum CRI <sup>(1)</sup>	If(mA)	Vf(V)	Power(W)	Flux(lm)	lm/W
2700K	90	50	5.71	0.29	32	109
		100	5.96	0.60	58	96
		110	5.99	0.66	62	94
		120	6.03	0.72	67	93
		130	6.06	0.79	71	90
		140	6.09	0.85	75	86
		150	6.11	0.92	79	85
		160	6.14	0.98	83	83
		170	6.17	1.05	87	81
		180	6.20	1.12	91	80
		190	6.23	1.18	94	80
		200	6.27	1.25	98	78
3000K	90	50	5.71	0.29	33	112
		100	5.96	0.60	59	99
		110	5.99	0.66	64	97
		120	6.03	0.72	69	95
		130	6.06	0.79	73	93
		140	6.09	0.85	77	91
		150	6.11	0.92	81	88
		160	6.14	0.98	86	87
		170	6.17	1.05	90	85
		180	6.20	1.12	94	84
		190	6.23	1.18	97	82
		200	6.27	1.25	101	80



## 2. Luminous Flux Characteristics (Ts = 25°C)

Nominal CCT	Minimum CRI <sup>(1)</sup>	If(mA)	Vf(V)	Power(W)	Flux(lm)	lm/W
3500K	90	50	5.71	0.29	34	116
		100	5.96	0.60	61	102
		110	5.99	0.66	66	100
		120	6.03	0.72	71	98
		130	6.06	0.79	75	95
		140	6.09	0.85	80	94
		150	6.11	0.92	84	91
		160	6.14	0.98	88	90
		170	6.17	1.05	92	88
		180	6.20	1.12	96	86
		190	6.23	1.18	100	85
		200	6.27	1.25	104	83
4000K	90	50	5.71	0.29	35	119
		100	5.96	0.60	63	105
		110	5.99	0.66	68	103
		120	6.03	0.72	73	101
		130	6.06	0.79	78	98
		140	6.09	0.85	72	97
		150	6.11	0.92	76	94
		160	6.14	0.98	91	93
		170	6.17	1.05	95	91
		180	6.20	1.12	99	89
		190	6.23	1.18	103	87
		200	6.27	1.25	107	85

### 3. Characteristics

#### 1) Absolute Maximum Rating

Item	Symbol	Rating	Condition
Operating temperature range	$T_{op}$	-40 °C ~ +85 °C	-
Storage temperature range	$T_{stg}$	-40 °C ~ +100 °C	-
LED junction temperature	$T_J$	125 °C	-
Forward Current	$I_F$	200 mA	-
Peak Pulsed Forward Current	$I_{FP}$	400 mA	Duty 1/10 pulse width 10ms
Thermal resistance	$R_{th, j-s}$	15 °C/W	Junction to solder point
Assembly Process Temperature	-	260 °C, < 10sec	-
ESD	-	5kV	HBM

#### 2) Electro-optical Characteristics – Voltage and CRI

Item	Unit	Rank	Min	Typ	Max	
Forward Voltage (@100 mA, $T_j = 25^\circ\text{C}$ )	V	YB	A1	5.6	-	5.8
			A2	5.8	-	6.0
			A3	6.0	-	6.2
			A4	6.2	-	6.4
			A5	6.4	-	6.6
Reverse Voltage (@5 mA, $T_j = 25^\circ\text{C}$ )	V	-	0.7	-	1.2	
Color Rendering Index	$R_a$	7	90	-	-	
Special CRI <sup>4)</sup> (R9)	-	-	50	-	-	

**Notes:**

1)~2) SAMSUNG ELECTRONICS maintains a tolerance of  $V_F:\pm 0.1$  V,  $R_a:\pm 3.0$  on measurements

#### 3) Electro-optical Characteristics – Luminous Intensity and Flux

Item	Unit	CCT	Rank	Min	Typ	Max	
Luminous Flux (@100 mA, $T_s = 25^\circ\text{C}$ )	lm	2700K	S0	S1	48.0	-	53.0
				S2	53.0	-	58.0
				S3	58.0	-	63.0
		3000K	S0	S1	50.0	-	55.0
				S2	55.0	-	60.0
				S3	60.0	-	65.0
		3500K	S0	S1	52.0	-	57.0
				S2	57.0	-	62.0
				S3	62.0	-	67.0
		4000K	S0	S1	54.0	-	59.0
				S2	59.0	-	64.0
				S3	64.0	-	69.0

**Notes:**

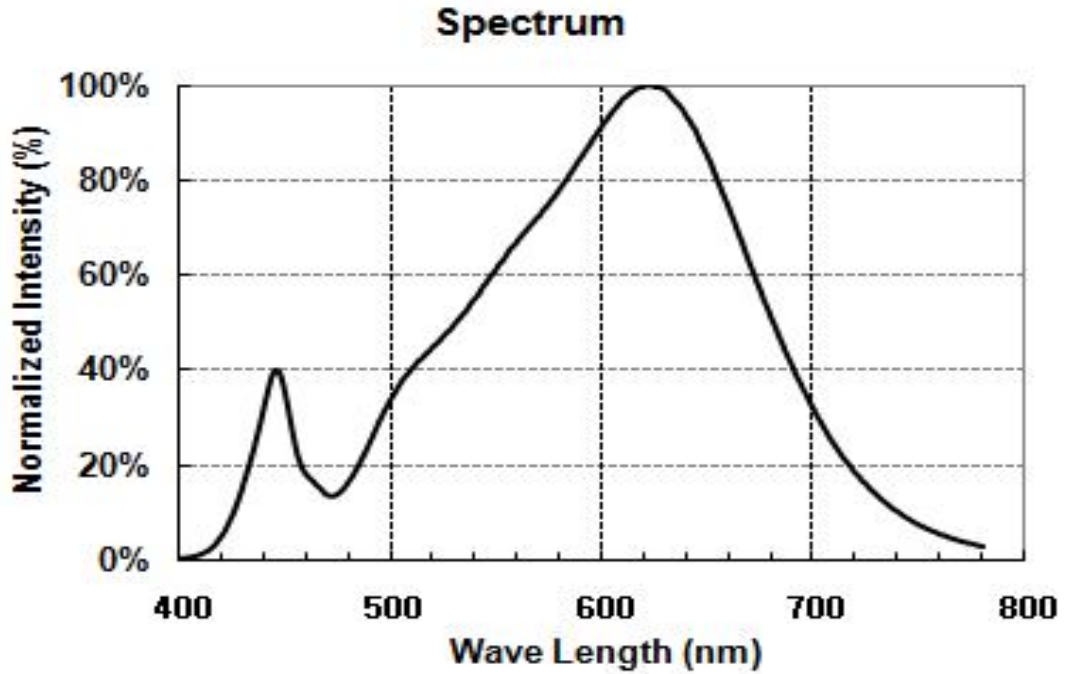
Luminous Intensity( $I_v$ , cd) values are for representative reference only

# 4. Typical Characteristics Graph

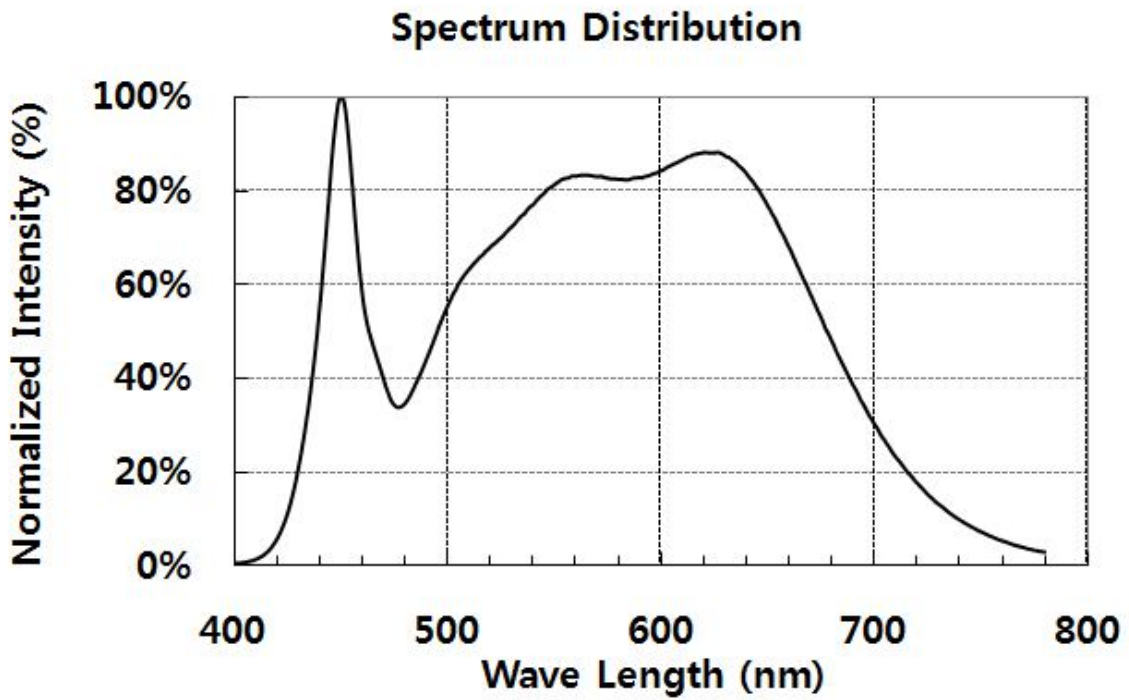
## 1) Spectrum Distribution

(Ts = 25°C)

2700K & 3000K



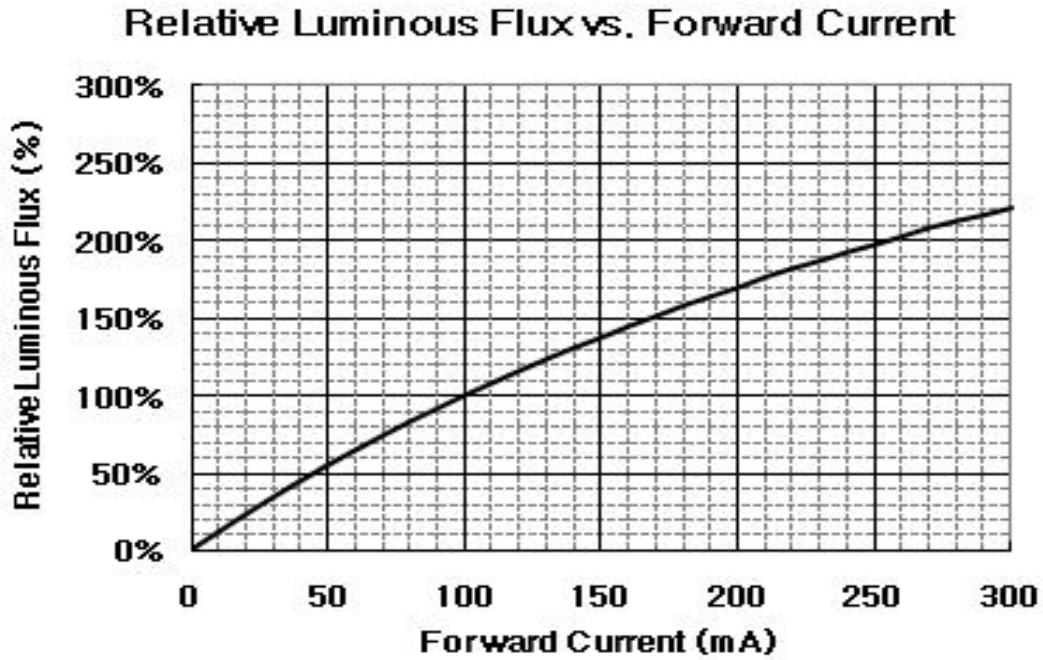
3500K & 4000K



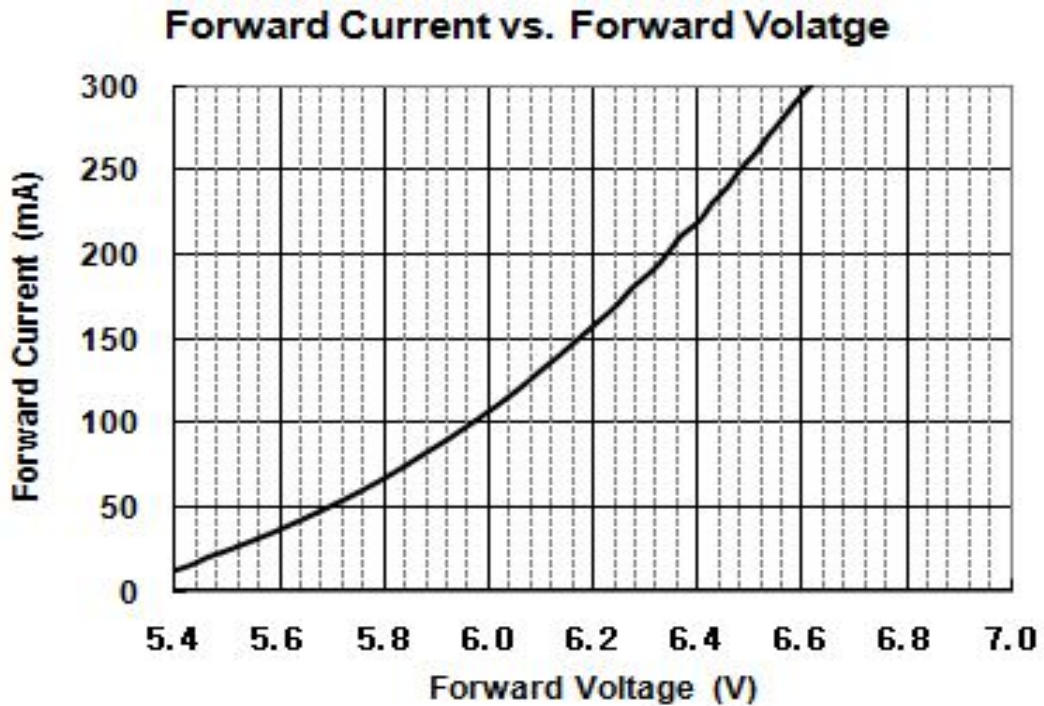
## 2) Forward Current Characteristics

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

Relative Flux vs. Forward Current

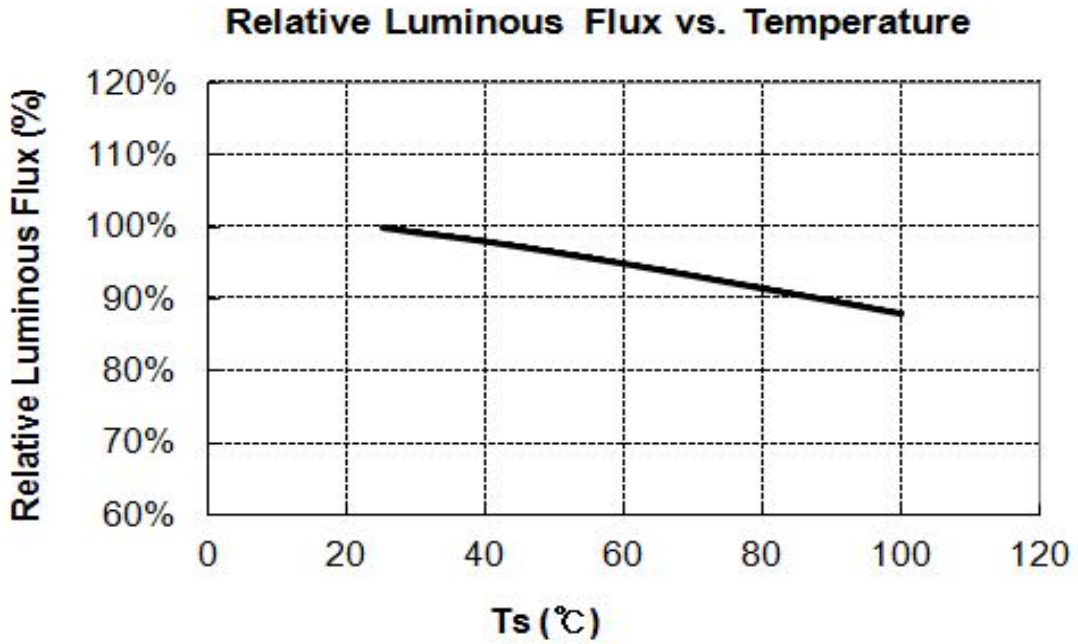


Forward Current vs. Forward Voltage

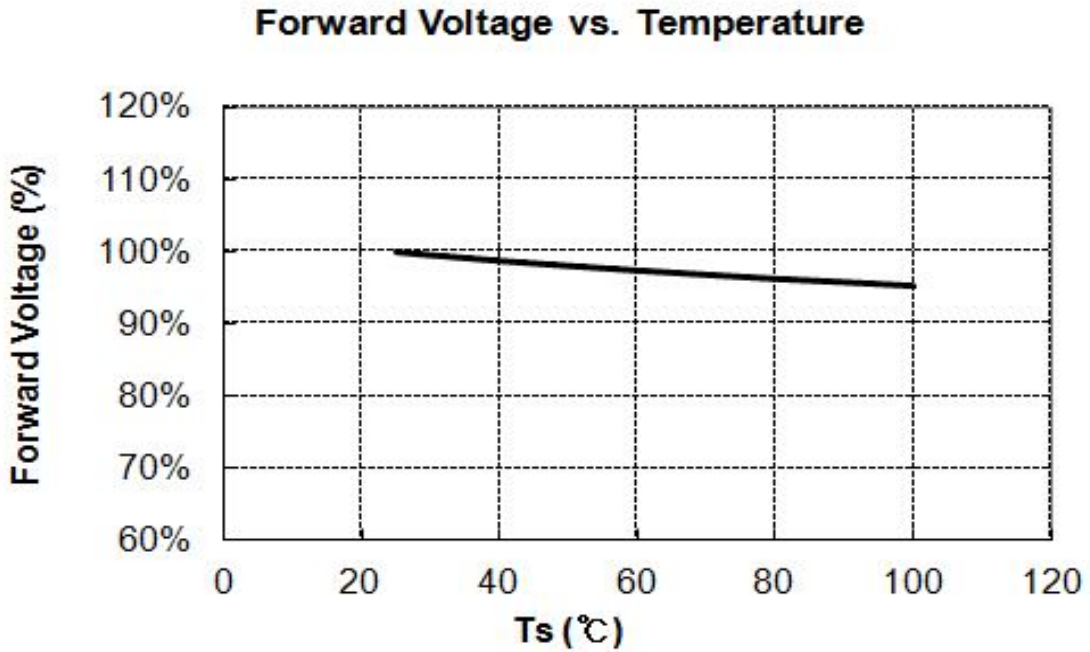


### 3) Temperature Characteristics

Relative Flux vs.  $T_s$ (solder temp.) @ 100mA

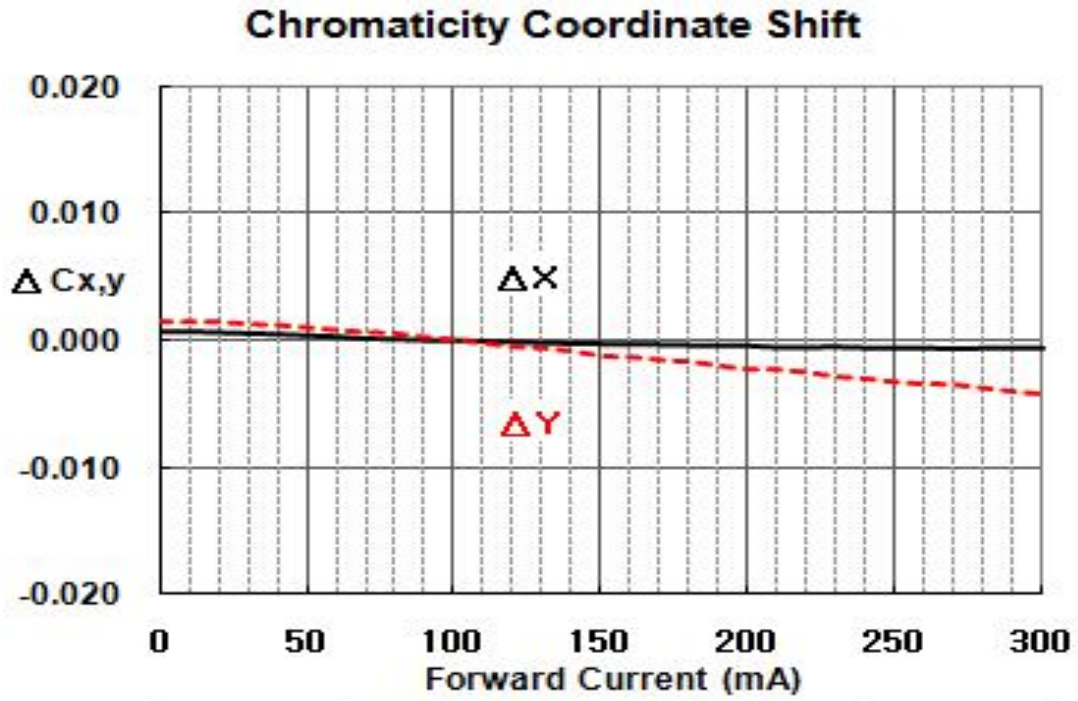


Forward Voltage vs.  $T_s$ (solder temp.) @ 100mA



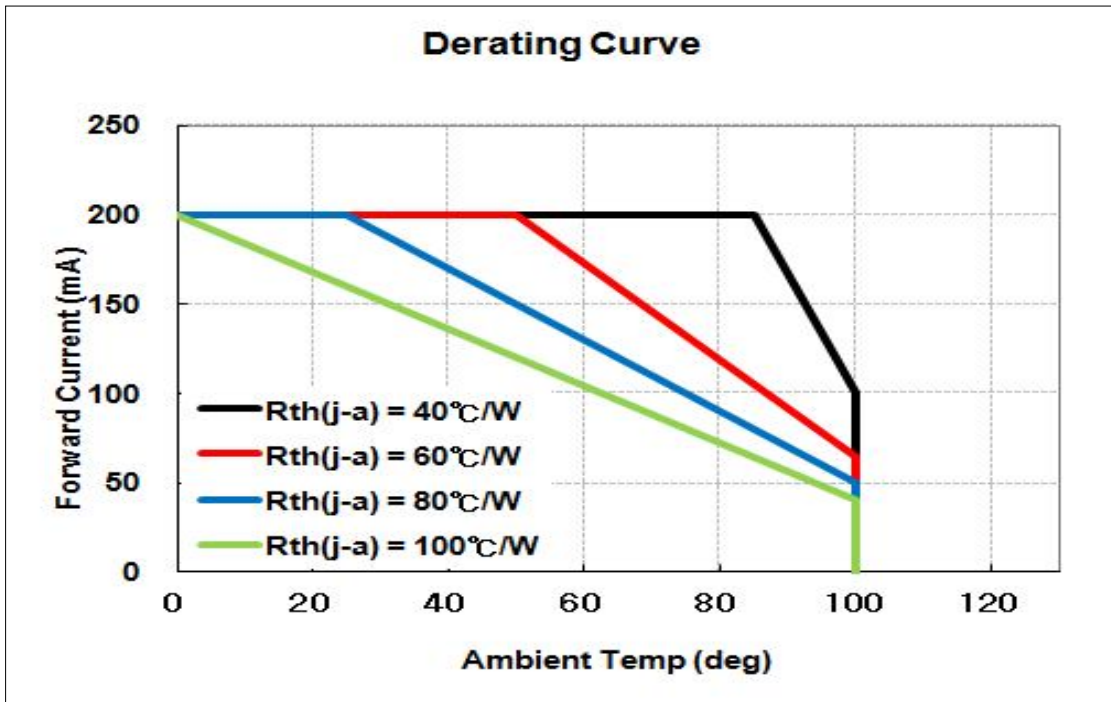
#### 4) Color shift Characteristics

Color x,y vs. Forward Current



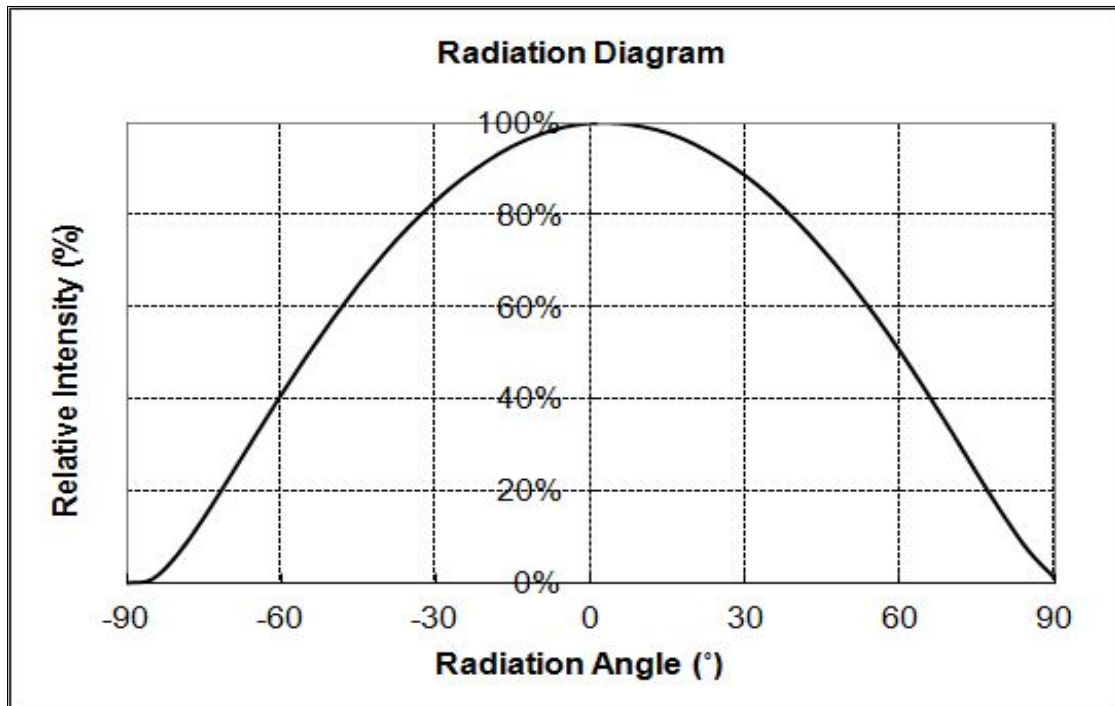
### 5) Derating Curve

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

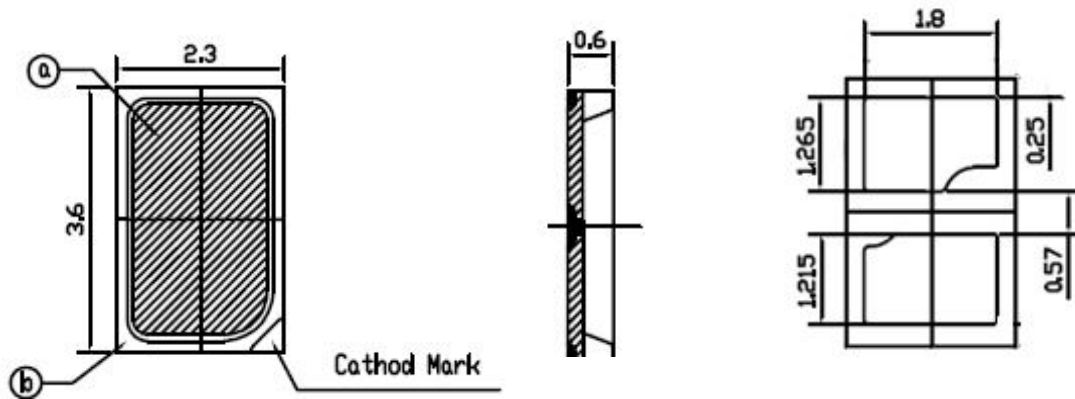


### 6) Viewing Angle Characteristics

Viewing Angle

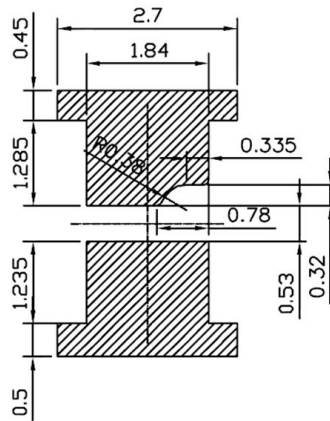


## 5. Outline Drawing and Dimension



1. Tolerance is  $\pm 0.1$  mm
2. The maximum compressing force is 15N on the silicone (a)
3. Do not place pressure on the encapsulation resin (b)

### Recommended Land Pattern



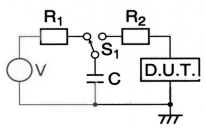
#### Notes:

- 1) This LED has built-in ESD protection device(s) connected in parallel to LED Chip(s).
- 2) Ts point & measurement method
  - ① Measure the nearest point to the thermal pad as shown above. If necessary, remove PSR of PCB to reach Ts point.
  - ② Thermal pad must be soldered to the PCB to dissipate heat properly. Otherwise, LED can be damaged.
- 3) Precautions
  - ① The pressure on the LEDs will influence to the reliability of the LEDs. Precautions should be taken to avoid the 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.



## 6. Reliability Test Items and Conditions

### 1) Test Items and Results

Test Item	Test Conditions	Test Hours/Cycles	Sample No	
MSL Test	125 °C 24hrs drying → 60 °C, 60 %RH 120hrs → 260 °C 10sec 3 cycles	1 cycle	11	
Room Temperature life test	25 °C±3 °C, DC200mA	1,000 hrs	22	
High Temperature life test	85 °C±3 °C, DC200 mA	1,000 hrs	22	
High Temperature humidity life test	85°C±3 °C, 85 %±2 %RH, DC200 mA	1,000 hrs	22	
Low Temperature life test	-40 °C±3 °C, DC200 mA	1,000 hrs	22	
Power Temperature Cycle	-40 °C/20 min ↔ 85 °C/20 min, Temp. change within 100min, on/off 5 min	100 cycles	50	
Thermal Shock	-45 °C/15 min ↔ 125 °C/15 min, Temp. change within 5min → Hot plate 180 °C	200 cycles	100	
High Temperature Storage	Ta=120 °C±3 °C	1000 hrs	11	
Low Temperature Storage	Ta=-40 °C±3 °C	1000 hrs	11	
ESD(HBM)		R1:10 MΩ, R2:1.5 kΩ, C:100 pF, V = ±5 kV	5 times	10
ESD(MM)		R1:10 MΩ, R2:0, C:200 pF, V = ±0.5 kV	5 times	10
Vibration Test	100~2000~100 Hz, 200 m/s <sup>2</sup> , Sweep 4 min, X, Y, Z 3 direction, each 1 cycle	4 cycles	11	
Mechanical Shock Test	1500G, 0.5 ms,	5 cycles	11	

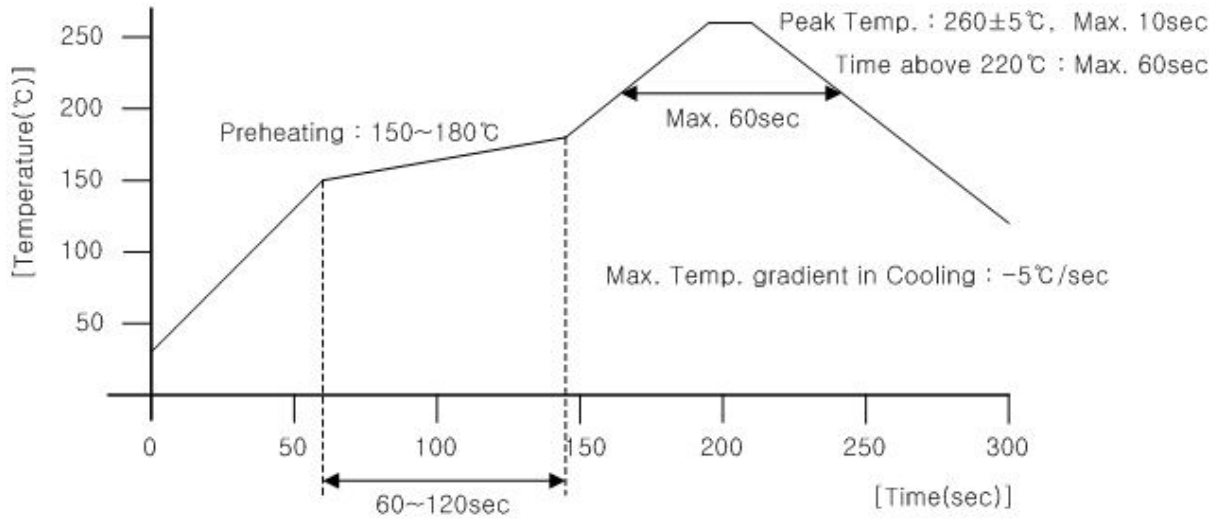
### 2) Criteria for Judging the Damage

Item	Symbol	Test Condition	Limit	
			Min	Max
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 100 mA	Init. Value*0.9	Init. Value*1.1
Luminous Flux	Im	I <sub>F</sub> = 100 mA	Init. Value*0.8	Init. Value*1.2

## 7. Solder Conditions

### 1) Reflow Conditions ( Pb Free )

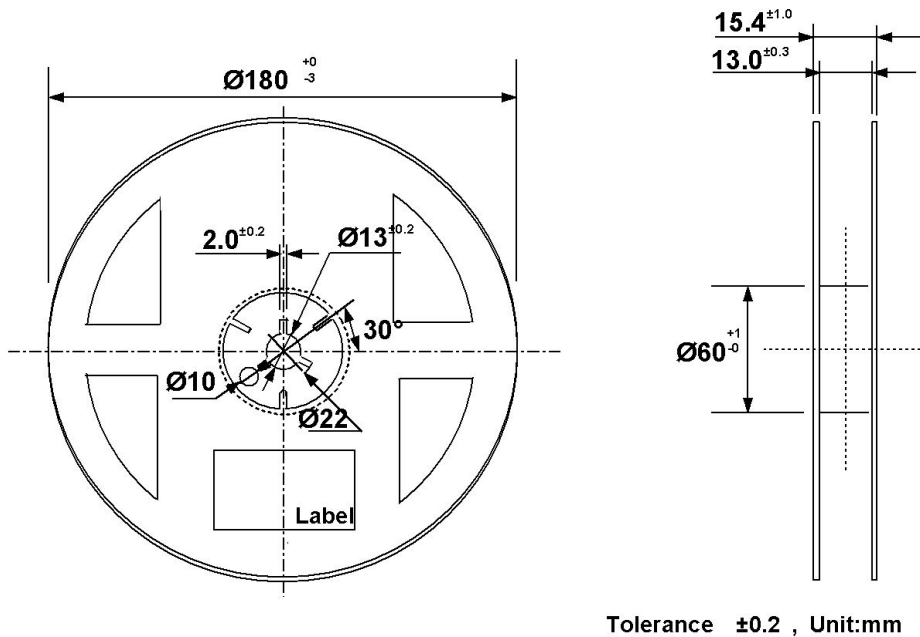
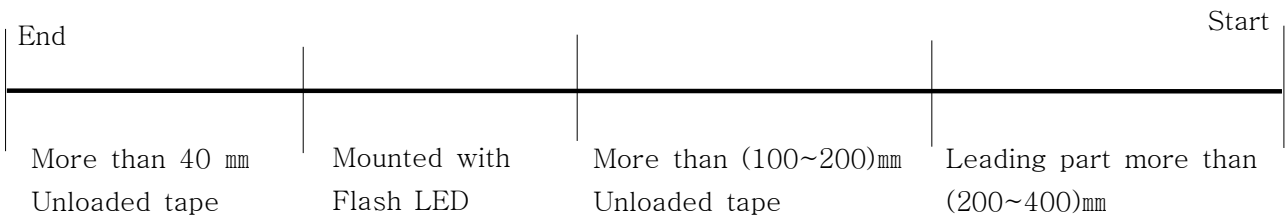
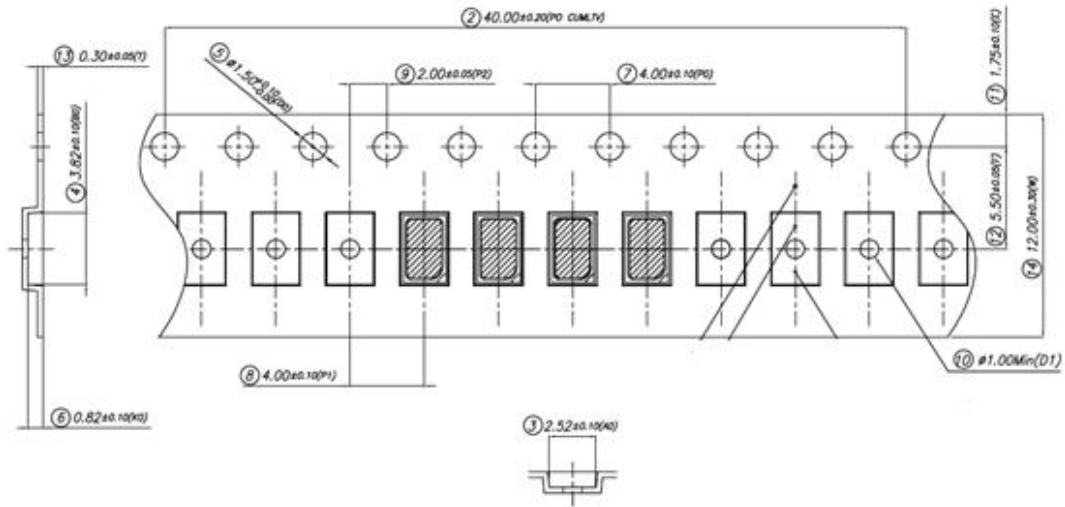
Reflow Frequency : 2 times max.



### 2) For Manual Soldering

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

## 8. Tape And Reel

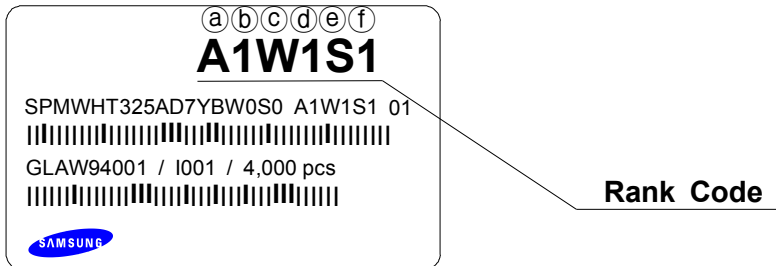


- (1) Quantity : The quantity/reel to be 4,000 pcs.
- (2) Cumulative Tolerance : Cumulative tolerance/10 pitches to be  $\pm 0.2$  mm
- (3) Adhesion Strength of Cover Tape : Adhesion strength to be 0.1-0.7N when the cover tape is turned off from the carrier tape at  $10^\circ$  angle to be the carrier tape.
- (4) Packaging : P/N, Manufacturing data code no. and quantity to be indicated on a damp proof package.



## 9. Label Structure

### 1) Label Structure

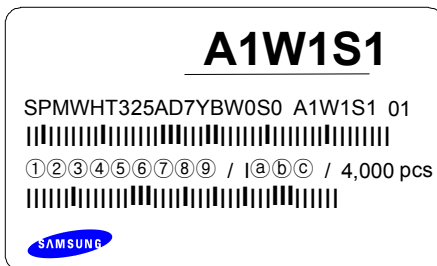


### Rank Code

- ⒶⒷ : Forward Voltage Rank
- ⒸⒹ : Chromaticity Coordinate Rank
- ⒺⒻ : Luminous Intensity Rank

### 2) LOT Number

The Lot number is composed of the following characters



①②③④⑤⑥⑦⑧⑨ / IⒶⒷⒸ / 4,000 PCS

- ① : Production Site (S:SAMSUNG LED, G:GOSIN CHINA)
- ② : L (LED)
- ③ : Product State (A:Normality, B:Bulk, C:First Production, R:Reproduction, S:Sample)
- ④ : Year (V:2011, W:2012, X:2013...)
- ⑤ : Month (1 ~ 9, A, B)
- ⑥ : Day (1 ~ 9, A, B ~ V)
- ⑦⑧⑨ : SAMSUNG Electronics LED Product number (1 ~ 999)
- ⒶⒷⒸ : Reel Number (1 ~ 999)

# 10. Packing Structure

## 1) Packing Process

### Reel

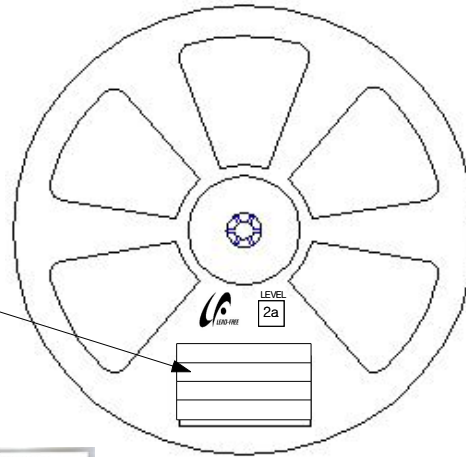
**A1W1S1**

SPMWHT325AD7YBW0S0 A1W1S1 01

|||||

GLAV94001 / 1001 / 4,000 pcs

|||||



### Aluminum Vinyl Bag



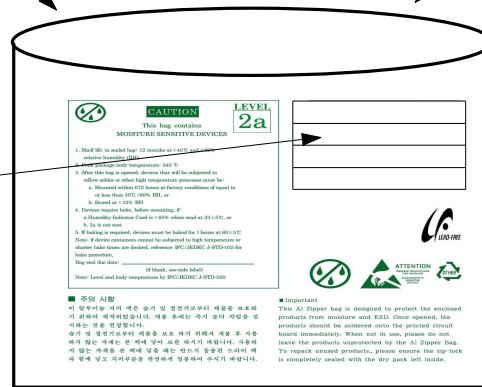
**A1W1S1**

SPMWHT325AD7YBW0S0 A1W1S1 01

|||||

GLAV94001 / 1001 / 4,000 pcs

|||||



Material : Paper(SW3B(B))

TYPE	SIZE(mm)			Reels/ box
	a	b	c	
7inch	245	220	182	Up to 10 Reels
	245	220	86	Up to 5 Reels

### ① SIDE

**A1W1S1**

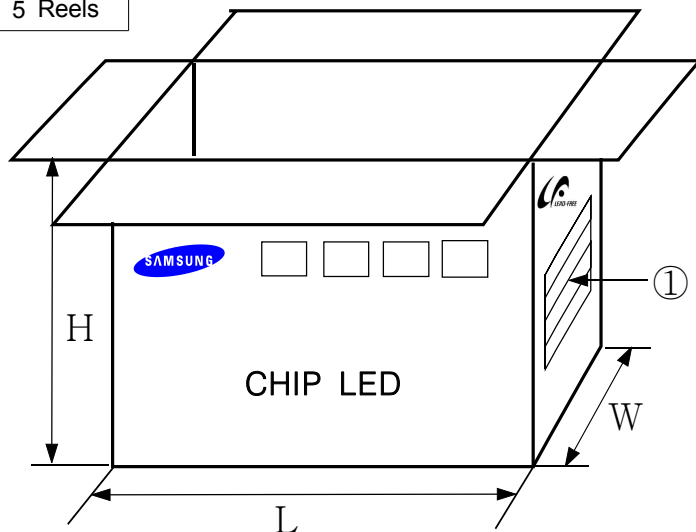
SPMWHT325AD7YBW0S0 A1W1S1 01

|||||

GLAV94001 / 1001 / 40,000 pcs

|||||

[Box Label]





## 11. Precaution for 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.

과전류 방지를 위해 전압의 미세한 이동에 의해 야기되는 전류의 순간 변화를 방지하기 위해 저항 등의 설치를 권장함.

- 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.

제품은 물, 오일, 유기물과 같은 액체 타입에서의 사용은 제한되며, 세정이 필요할 시에는 IPA 사용을 권장함.

- 3) When the LEDs illuminate, operating current should be decided after considering the ambient maximum temperature.

LED의 발광 시, 동작 전류는 주변 최고온도를 고려하여 결정되어야 함.

- 4) LEDs must be stored in a clean environment.

If the LEDs are to be stored for 3 months or more after being shipped from Samsung Electronics, they should be packed by a sealed container with nitrogen gas injected. (Shelf life of sealed bags: 12 months, temp.  $\sim 40^{\circ}\text{C}$ ,  $\sim 90\% \text{RH}$ )

LED의 보관은 청정한 환경에서 보존되어야 하며, 만약 삼성전자로부터 공급받는 후 3개월 또는 그 이상 보관이 필요하다면 질소 가스를 동봉한 보존용기에 보관되어야 함. (보존 bag의 수명 : 12 개월, 보존 온도  $\sim 40^{\circ}\text{C}$ , 습도  $\sim 90\% \text{RH}$ )

- 5) After storage bag is open, device subjected to soldering, solder reflow, or other high temperature processes must be:

보존 Bag이 개봉된 후에, 납땀이나 reflow 등의 높은 온도에 노출되는 제품은 다음의 사항에 부합되어야 함.

- a. Mounted within 672 hours(28 days) at an assembly line with a condition of no more than  $30^{\circ}\text{C}/60\% \text{RH}$ ,

a. 제품은  $30^{\circ}\text{C}/60\% \text{RH}$ 보다 같거나 낮은 조립조건에서 672시간(28일)이내에 조립해야 함.

- b. Stored at  $<10\% \text{RH}$ .

b. 10% 이하의 상대습도에서 보관되어야 함.

- 6) Repack unused Products with anti-moisture packing, fold to close any opening and then store in a dry place.

사용하지 않은 제품은 방습팩에 넣어 개봉 부위를 닫아서 다시 포장한 후, 건조한 장소에서 보관할 것을 권장함.

7) Devices require baking before mounting, if humidity card reading is  $>60\%$  at  $23\pm 5^{\circ}\text{C}$ .  
만약 습도표시카드의 수치가  $23\pm 5^{\circ}\text{C}$ 에서  $60\%$  이상이라면, 제품 실장 전 baking해야 함.

8) Devices must be baked for 1 hour at  $60\pm 5^{\circ}\text{C}$ , if baking is required.  
만약 baking이 필요하다면, 제품은  $60\pm 5^{\circ}\text{C}$ 에서 1시간 정도 baking 되어야 함.

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.  
LED는 정전기 및 서지에 민감한 제품이므로, LED 제품을 다룰 시에는 정전기 방지장갑이나 손목밴드를 사용하기를 권장함.

If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices.

만약 절대 허용치를 초과하는 전압이 LED에 가해지면, LED 소자는 파괴되거나 손상될 수 있음.

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.

손상된 제품은 누설전류의 증가, Turn on 전압의 저하, 저 전류에서의 점등불량 등의 이상 거동을 보일 수 있음.

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 expose to heat or light.

VOCs(휘발성 유기 화합물)는 등기구에 사용되는 접착제, Flux, 경화제, 유기물 첨가제에서 발생하여 LED 실리콘 봉지체를 투과하고, 빛 또는 열에 노출되었을 때 변색이 발생 할 수 있음.

This phenomenon can cause a significant loss of light emitted(output) from the luminaires(fixture).

이러한 현상은 등기구로부터 나오는 빛의 중대한 손실을 줄 수 있음.

In order to prevent these problems, we recommend you to know the physical properties of the materials used in luminaires, They must be selected carefully.

이러한 문제 발생 방지를 위해서, 등기구에 사용되는 자재에 대한 물성을 알고 주의하여 선택 되어야함.



### 11) Risk of Sulfurization (or Tarnishing)

The LED from Samsung Electronics 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.

삼성전자의 LED는 Ag(은)을 도금한 리드프레임을 사용함. 이 리드프레임의 표면이 황(S), 염소(Cl), 또는 다른 할로겐 화합물들에 노출시 Ag(은)은 검정(또는 어두운색)으로 바뀔 수 있음.

Sulfurization of lead frame may cause intensity degradation, change of chromaticity coordinates and, in extreme cases, open circuit. It requires caution.

리드 프레임의 황화(Sulfurization)는 광량 저하, 색좌표 변화 및 심한 경우 LED 무등(Open) 불량을 일으킬 수도 있으니 주의가 필요함.

Due to possible sulfurization of lead frame, LED should not be used and stored together with oxidizing substances made of materials in a following list,  
: Rubber, plain paper, lead solder cream and so on.

리드 프레임 황화(Sulfurization)의 근원이 될 수 있으니 LED는 아래의 목록으로 만들어진 산화성 물질들과 함께 저장, 사용이 불가함 : 고무, 일반 종이, 납땀 크림 등

# 12. Hazard Substance Analysis Report



**Test Report No.** F690101/LF-CTSAYAA13-52929

Issued Date: 2013. 11. 27 Page 1 of 6

To: **SAMSUNG ELECTRONICS CO., LTD.**  
San #24,Nongseo-dong  
Giheung-gu  
Yongin-si  
Gyeonggi-do  
Korea

The following merchandise was submitted and identified by the client as :

**SGS File No.** : AYAA13-52929  
**Product Name** : 3623 White PKG  
**Item No./Part No.** : N/A  
**Received Date** : 2013. 11. 20  
**Test Period** : 2013. 11. 21 to 2013. 11. 27  
**Test Results** : For further details, please refer to following page(s)  
**Test Performed** : SGS Korea tested the sample(s) selected by applicant with following results.  
**Job Comments** : By the applicant's specific request, the sampling and testing was performed only for the part indicated in the photo without disassembly.

Timothy Jeon  
Jinhee Kim  
Cindy Park  
Jerry Jung/ Testing Person

SGS Korea Co., Ltd.

Jeff Jang / Chemical Lab Mgr

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.