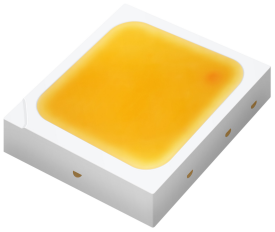
ISSUE NO :

Rev:

Product Family Data Sheet

LM302A – 3030 Middle Power LED



Introduction

Features

- Beam Angle : 120˚
- Precondition : JEDEC Level 2a
- Dimension : 3.00 x 3.00 x 0.65 mm
- ESD withstand Voltage : up to ± 5KV [HBM]

Applications

- INDOOR LIGHTING : Down light, LED bulb, MR/Par and Ceiling Light

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

Contents

1. Product Code Information

1) Luminous Flux Bins (T_s = 25℃)

Nominal CCT	Product Code	Flux Rank	Sorting Condition Im @150mA	
			Flux Bin	Flux Range (Φ_v, lm)
2700K	SPMWHT327FD5GBW0S0	S0	S1	*94.0 ~ 102.0*
			S2	*102.0 ~ 110.0*
			S3	*110.0 ~ 118.0*
3000K	SPMWHT327FD5GBV0S0	S0	S1	*96.0 ~ 104.0*
			S2	*104.0 ~ 112.0*
			S3	*112.0 ~ 120.0*
3500K	SPMWHT327FD5GBU0S0	S0	S1	*99.0 ~ 107.0*
			S2	*107.0 ~ 115.0*
			S3	*115.0 ~ 123.0*
4000K	SPMWHT327FD5GBT0S0	S0	S1	*101.0 ~ 109.0*
			S2	*109.0 ~ 117.0*
			S3	*117.0 ~ 125.0*
5000K	SPMWHT327FD5GBR0S0	S0	S1	*107.0 ~ 115.0*
			S2	*115.0 ~ 123.0*
			S3	*123.0 ~ 131.0*
5700K	SPMWHT327FD5GBQ0S0	S0	S1	*103.0 ~ 111.0*
			S2	*111.0 ~ 119.0*
			S3	*119.0 ~ 127.0*
6500K	SPMWHT327FD5GBP0S0	S0	S1	*101.0 ~ 109.0*
			S2	*109.0 ~ 117.0*
			S3	*117.0 ~ 125.0*

Notes:

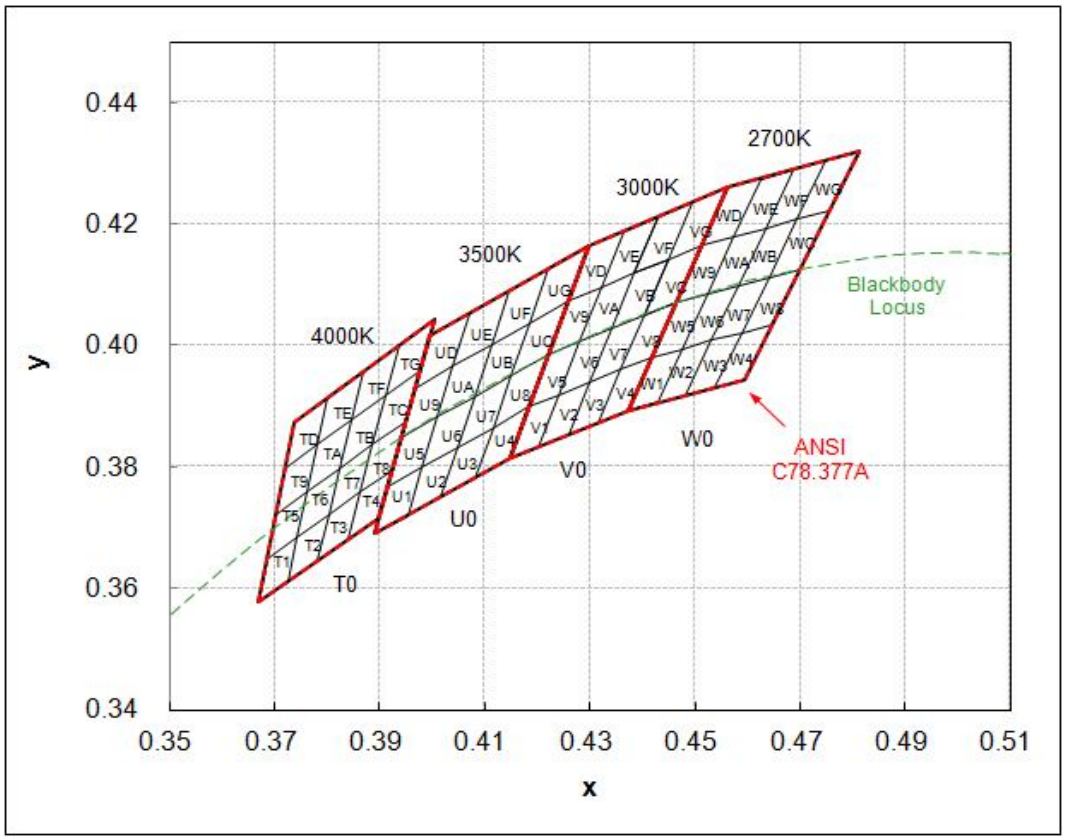
SAMSUNG ELECTRONICS maintains a tolerance of ±5% on Luminous Flux measurements

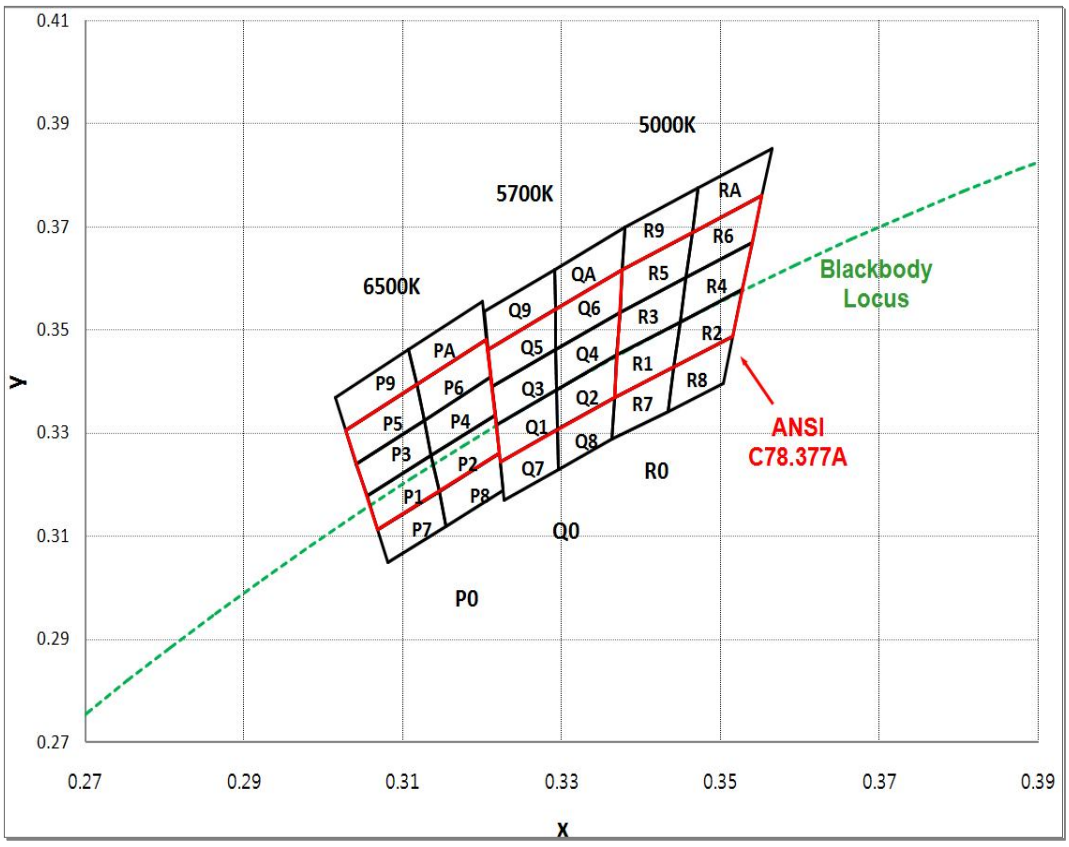
2) Color Bins (T_s = 25℃)

(1) Color Binning

Nominal CCT	Product Code	Color Rank	Chromaticity Bins
2700K	SPMWHT327FD5GBW0S0	W0	W1, W2, W3, W4, W5, W6, W7, W8, W9, WA, WB, WC, WD, WE, WF, WG
3000K	SPMWHT327FD5GBV0S0	V0	V1, V2, V3, V4, V5, V6, V7, V8, V9, VA, VB, VC, VD, VE, VF, VG
3500K	SPMWHT327FD5GBU0S0	U0	U1, U2, U3, U4, U5, U6, U7, U8, U9, UA, UB, UC, UD, UE, UF, UG
4000K	SPMWHT327FD5GBT0S0	T0	T1, T2, T3, T4, T5, T6, T7, T8, T9, TA, TB, TC, TD, TE, TF, TG
5000K	SPMWHT327FD5GBR0S0	R0	R1, R2, R3, R4, R5, R6, R7, R8, R9, RA
5700K	SPMWHT327FD5GBQ0S0	Q0	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, QA
6500K	SPMWHT327FD5GBP0S0	P0	P1, P2, P3, P4, P5, P6, P7, P8, P9, PA,

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

Region	CIE X	CIE Y	Region	CIE X	CIE Y
T rank (4000K)					
T1	0.367	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	0.384	0.3681	TC	0.3887	0.3837
	0.3898	0.3716		0.395	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	0.376		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	0.376		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
	0.395	0.3875		0.4006	0.4044
	0.3887	0.3836		0.3937	0.4001

(2) Chromaticity Region & Coordinates (Continued)

Region	CIE X	CIE Y	Region	CIE X	CIE Y
R rank (5000K)					
R1	0.3366	0.3369	R6	0.3456	0.3601
	0.3441	0.3428		0.3539	0.3669
	0.3449	0.3515		0.3551	0.3760
	0.3369	0.3451		0.3464	0.3688
R2	0.3441	0.3428	R7	0.3363	0.3287
	0.3515	0.3487		0.3433	0.3341
	0.3527	0.3578		0.3441	0.3428
	0.3449	0.3515		0.3366	0.3369
R3	0.3369	0.3451	R8	0.3433	0.3341
	0.3449	0.3515		0.3503	0.3396
	0.3456	0.3601		0.3515	0.3487
	0.3373	0.3534		0.3441	0.3428
R4	0.3449	0.3515	R9	0.3376	0.3616
	0.3527	0.3578		0.3464	0.3688
	0.3539	0.3669		0.3471	0.3775
	0.3456	0.3601		0.3379	0.3698
R5	0.3373	0.3534	RA	0.3464	0.3688
	0.3456	0.3601		0.3551	0.3760
	0.3464	0.3688		0.3564	0.3851
	0.3376	0.3616		0.3471	0.3775
Q rank (5700K)					
Q1	0.3222	0.3243	Q6	0.3292	0.3461
	0.3294	0.3306		0.3373	0.3534
	0.3293	0.3384		0.3376	0.3616
	0.3217	0.3316		0.3292	0.3539
Q2	0.3294	0.3306	Q7	0.3227	0.3170
	0.3366	0.3369		0.3295	0.3228
	0.3369	0.3451		0.3294	0.3306
	0.3293	0.3384		0.3222	0.3243
Q3	0.3217	0.3316	Q8	0.3295	0.3228
	0.3293	0.3384		0.3363	0.3287
	0.3292	0.3461		0.3366	0.3369
	0.3212	0.3389		0.3294	0.3306
Q4	0.3293	0.3384	Q9	0.3207	0.3462
	0.3369	0.3451		0.3292	0.3539
	0.3373	0.3534		0.3291	0.3617
	0.3292	0.3461		0.3202	0.3535
Q5	0.3212	0.3389	QA	0.3292	0.3539
	0.3292	0.3461		0.3376	0.3616
	0.3292	0.3539		0.3379	0.3698
	0.3207	0.3462		0.3291	0.3617

Region	CIE X	CIE Y	Region	CIE X	CIE Y
P rank (6500K)					
P1	0.3068	0.3113	P6	0.3126	0.3324
	0.3145	0.3187		0.3210	0.3408
	0.3135	0.3256		0.3205	0.3481
	0.3055	0.3177		0.3117	0.3393
P2	0.3145	0.3187	P7	0.3081	0.3049
	0.3221	0.3261		0.3154	0.3119
	0.3216	0.3334		0.3145	0.3187
	0.3135	0.3256		0.3068	0.3113
P3	0.3055	0.3177	P8	0.3154	0.3119
	0.3135	0.3256		0.3226	0.3188
	0.3126	0.3324		0.3221	0.3261
	0.3041	0.3240		0.3145	0.3187
P4	0.3135	0.3256	P9	0.3028	0.3304
	0.3216	0.3334		0.3117	0.3393
	0.3210	0.3408		0.3107	0.3461
	0.3126	0.3324		0.3015	0.3368
P5	0.3041	0.3240	PA	0.3117	0.3393
	0.3126	0.3324		0.3205	0.3481
	0.3117	0.3393		0.3200	0.3554
	0.3028	0.3304		0.3107	0.3461

Notes: SAMSUNG ELECTRONICS maintains ±0.005 tolerance of Cx, Cy

2. Characteristics

1) Absolute Maximum Rating

Item	Symbol	Rating	Condition
Operating temperature range	T_{op}	-40℃ ~ +85℃	-
Storage temperature range	T_{stg}	-40℃ ~ +100℃	-
LED junction temperature	T_J	120℃	-
Forward Current	I_F	200 mA	-
Peak Pulsed Forward Current	I_{FP}	400 mA	Duty 1/10 pulse width 10ms
Assembly Process Temperature	-	260℃, < 10sec	-
ESD	-	5kV	HBM

2) Electro-optical Characteristics

Item	Unit	Nominal CCT	Rank	Min	Typ	Max
Forward Voltage[1] (V_F) (@150 mA, Ts = 25℃)	V	-	GB	*6.0*	*6.5*	*7.0*
Luminous Flux[2] (Φ_v) (@150 mA, Ts = 25℃)	lm	2700K	S0	*94.0*	*106.0*	*118.0*
		3000K	S0	*96.0*	*108.0*	*120.0*
		3500K	S0	*99.0*	*111.0*	*123.0*
		4000K	S0	*101.0*	*113.0*	*125.0*
		5000K	S0	*107.0*	*119.0*	*131.0*
		5700K	S0	*103.0*	*115.0*	*127.0*
		6500K	S0	*101.0*	*113.0*	*125.0*
Reverse Voltage (@5 mA, Ts = 25℃)	V	-	-	0.7	-	1.2
Color Rendering Index[3](R_a)	-	-	5	80	-	-
Special CRI[4] (R9)	-	-	-	0	-	-
Thermal resistance (Junction to solder point)	'C/W	-	-	-	11	-

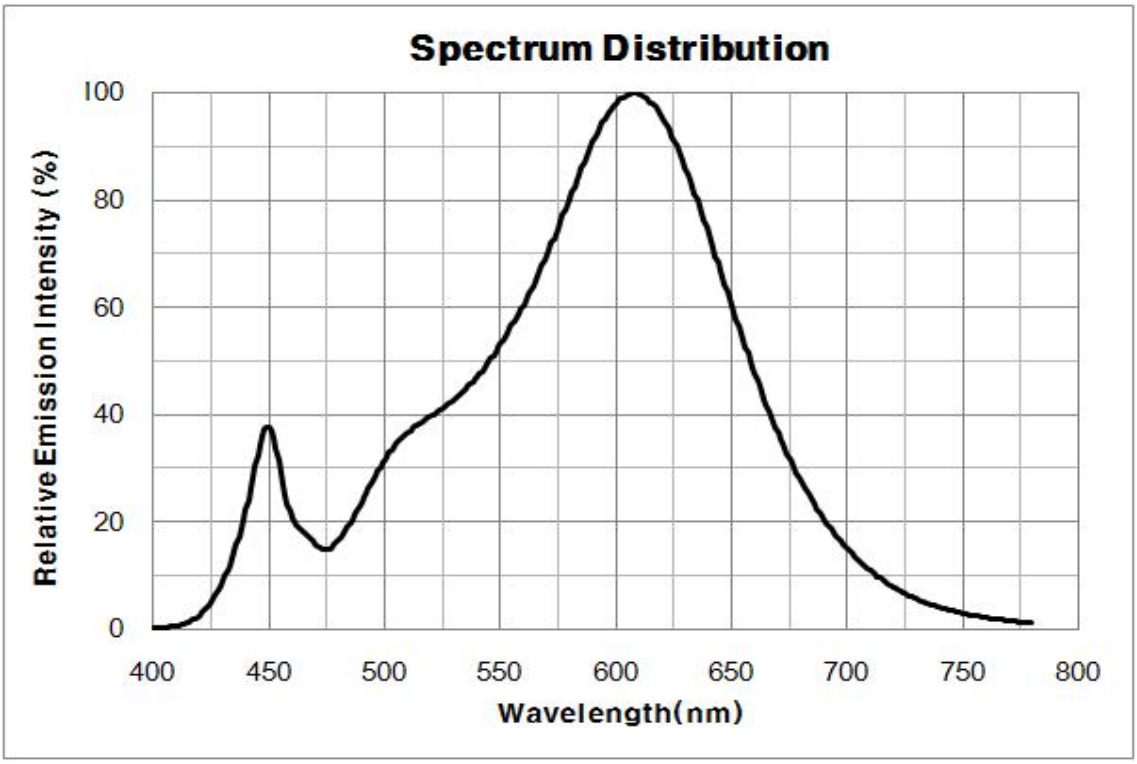
Notes:

1)~4) SAMSUNG ELECTRONICS maintains a tolerance of V_F:±0.1 V, Φ_v:±5 %, R_a :±3.0, R9 :±6.5 on measurements

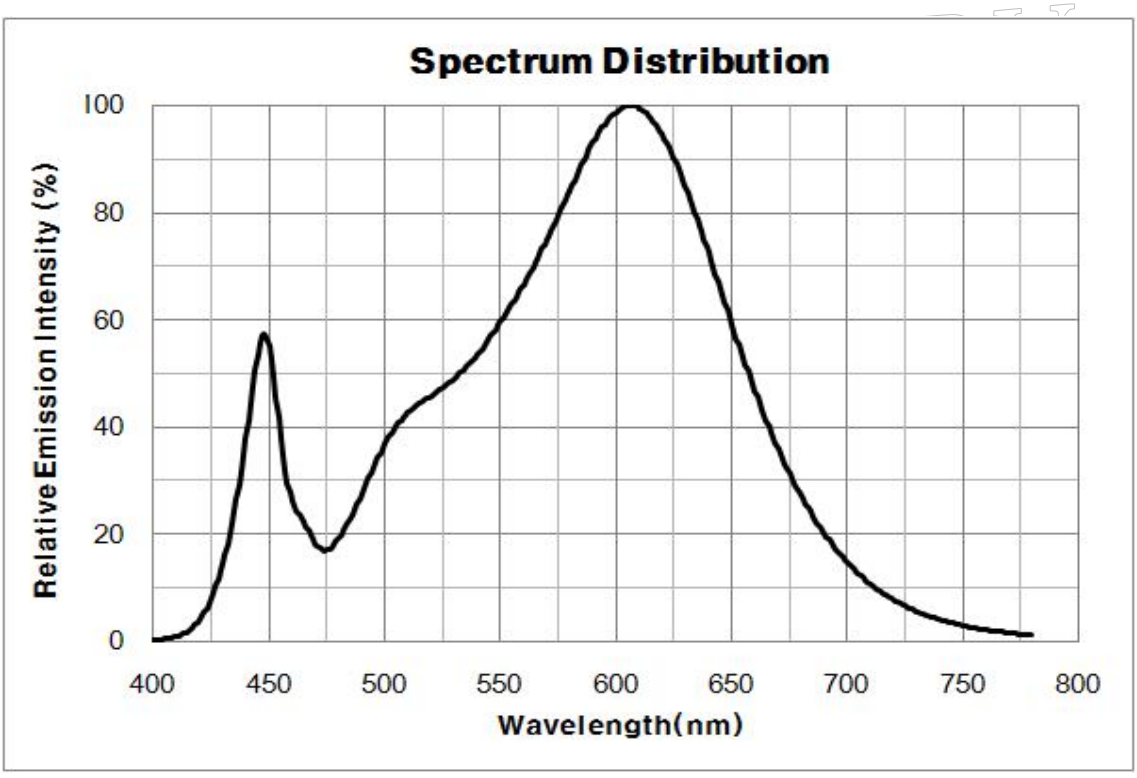
3. Typical Characteristics Graph

1) Spectrum Distribution (I_F = 150mA, T_s = 25℃)

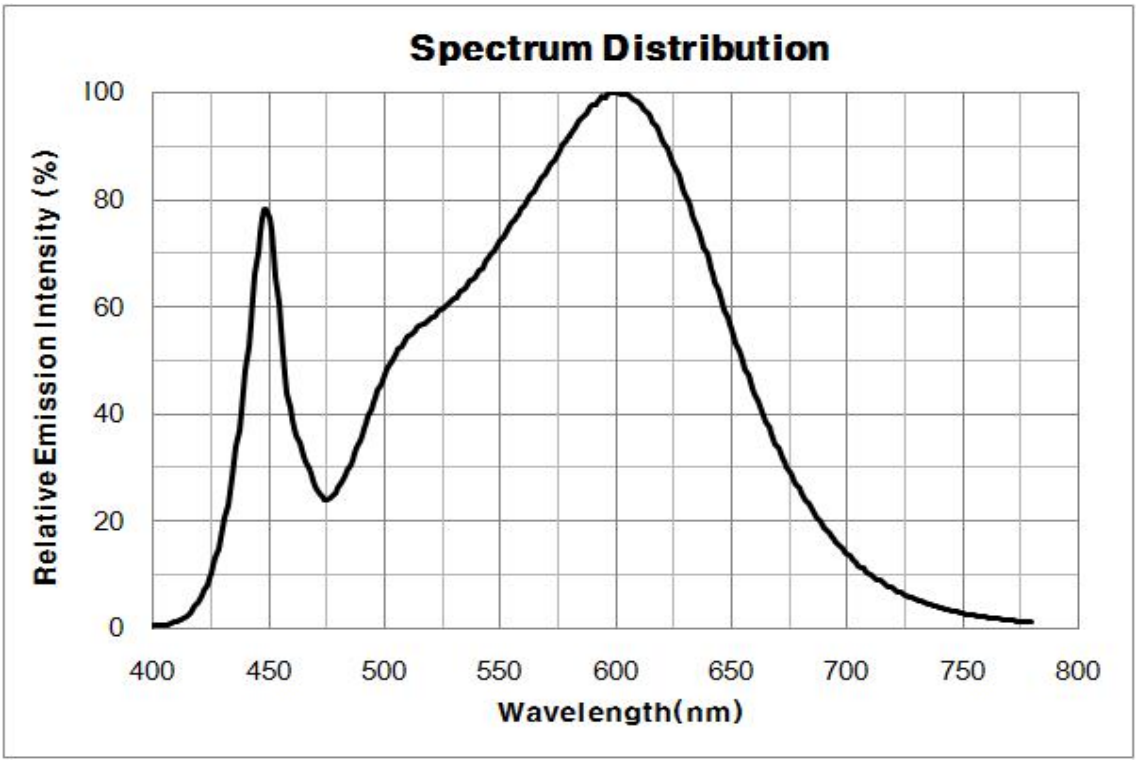
(1) CCT : 2700K



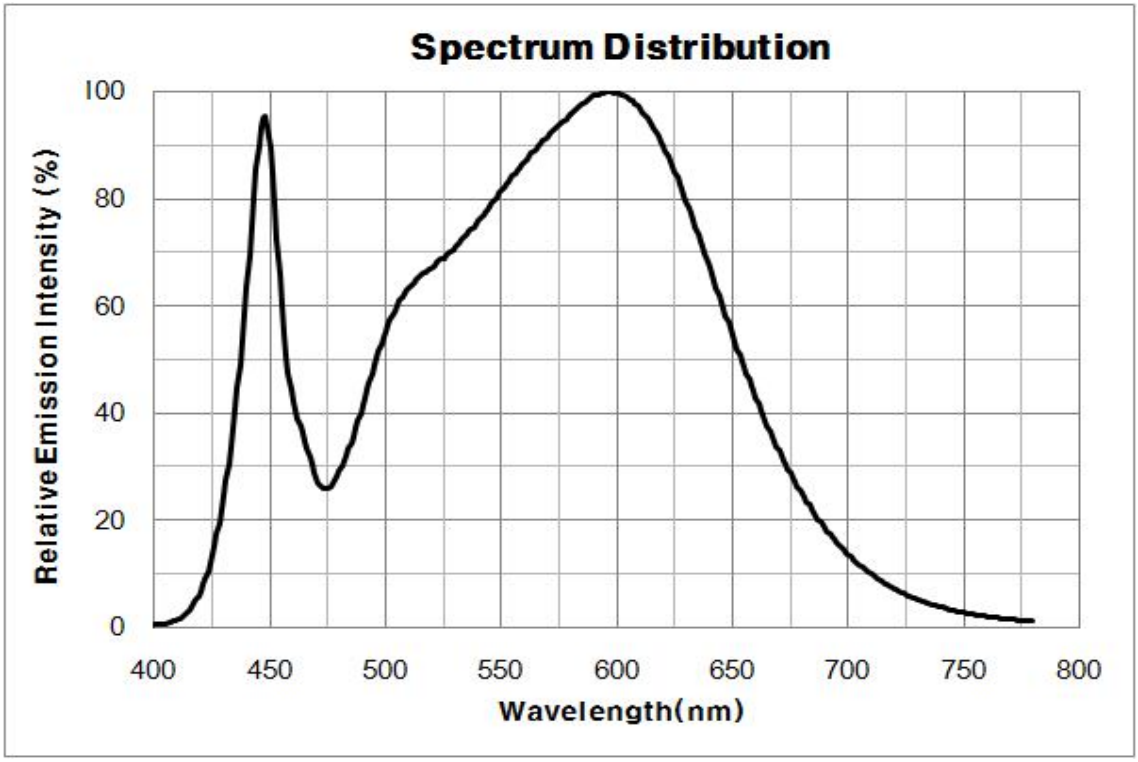
(2) CCT : 3000K



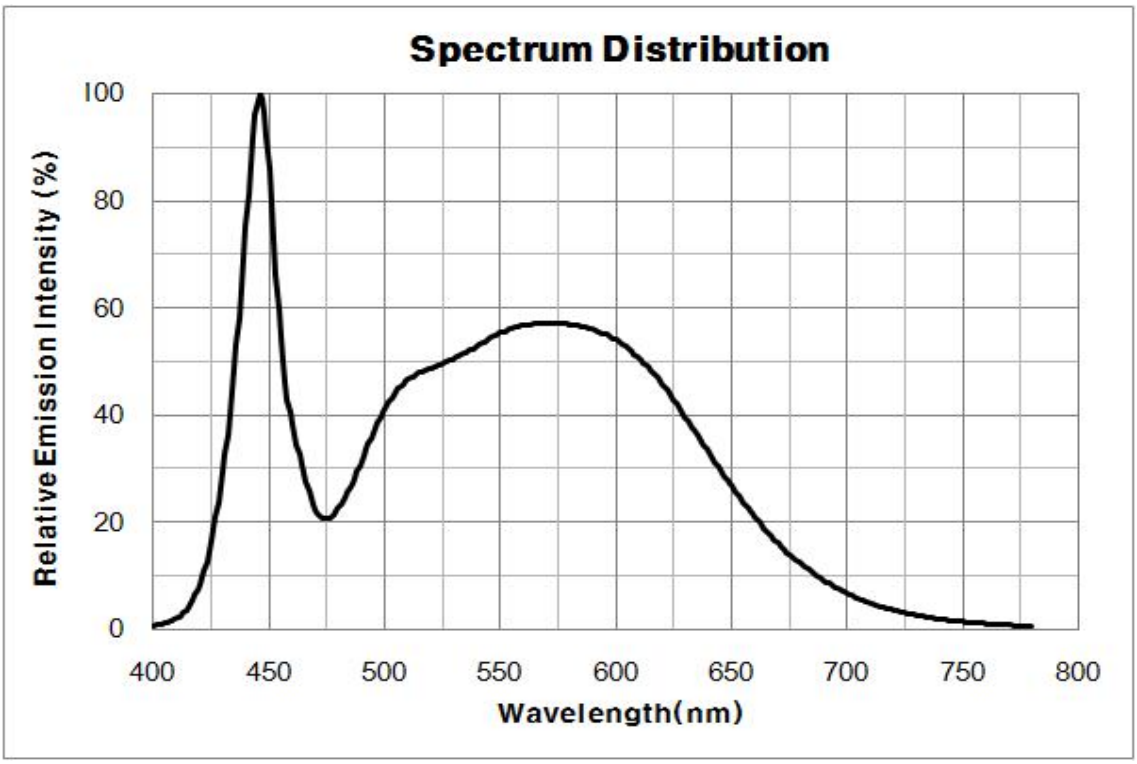
(3) CCT : 3500K



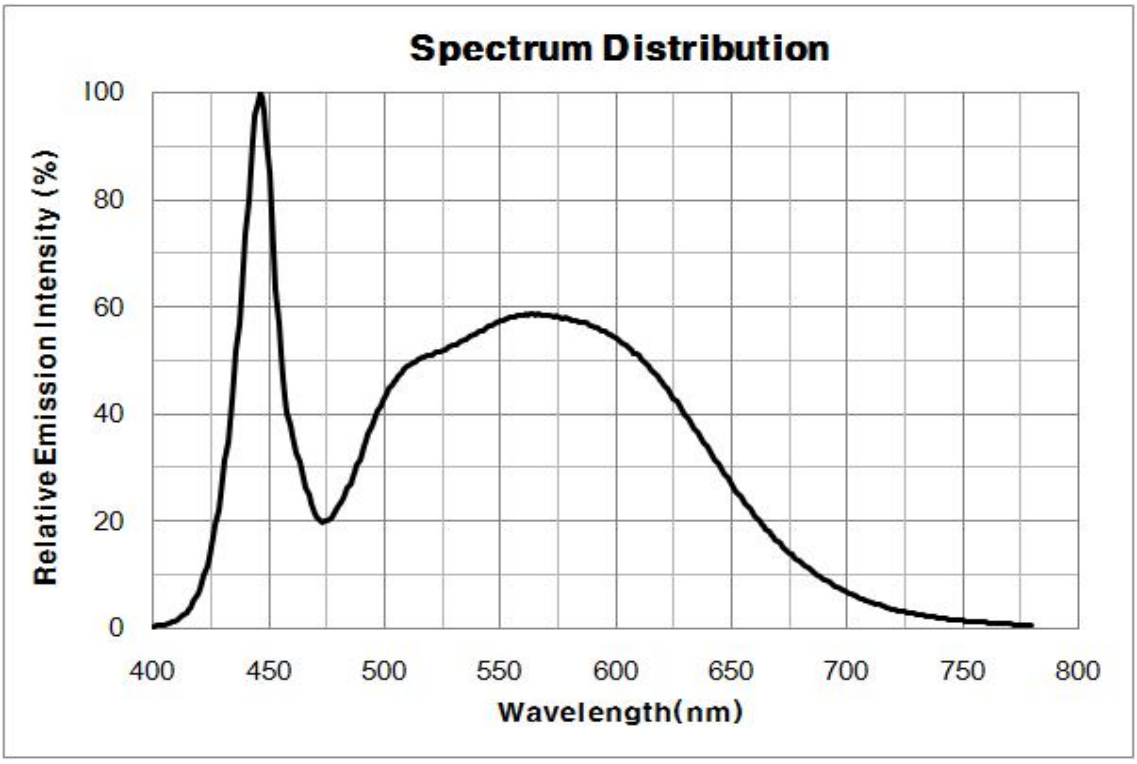
(4) CCT : 4000K



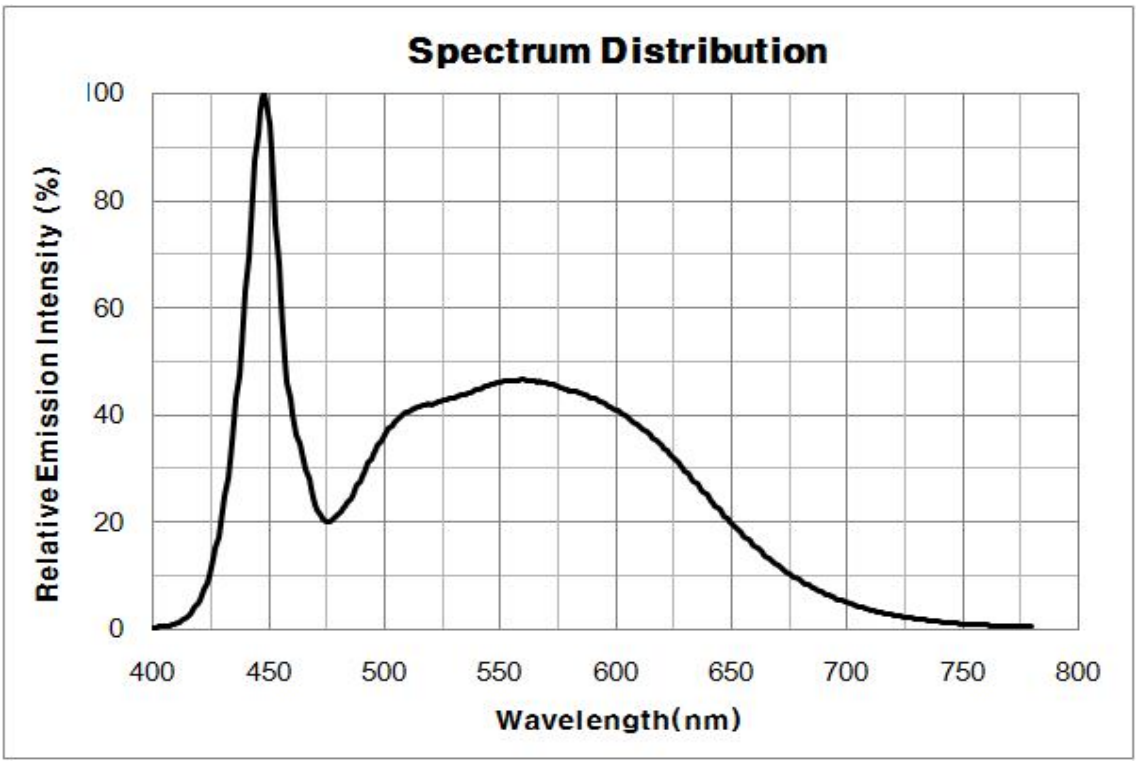
(5) CCT : 5000K



(6) CCT : 5700K

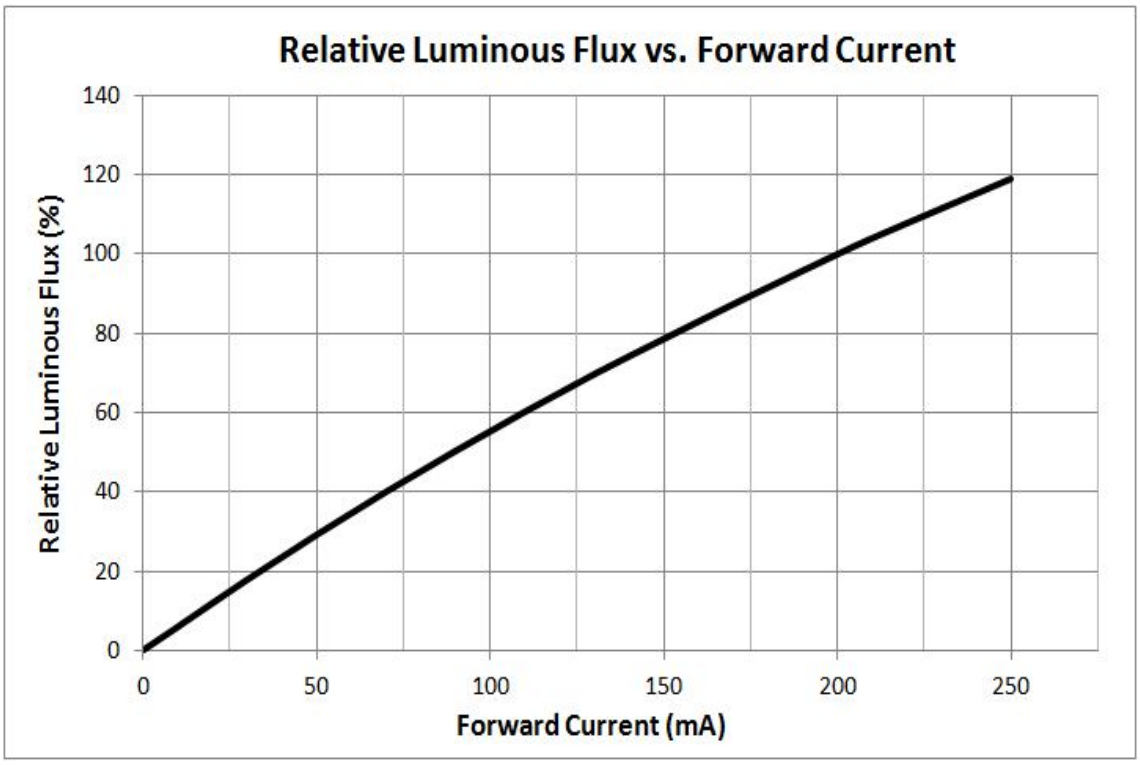


(4) CCT :6500K

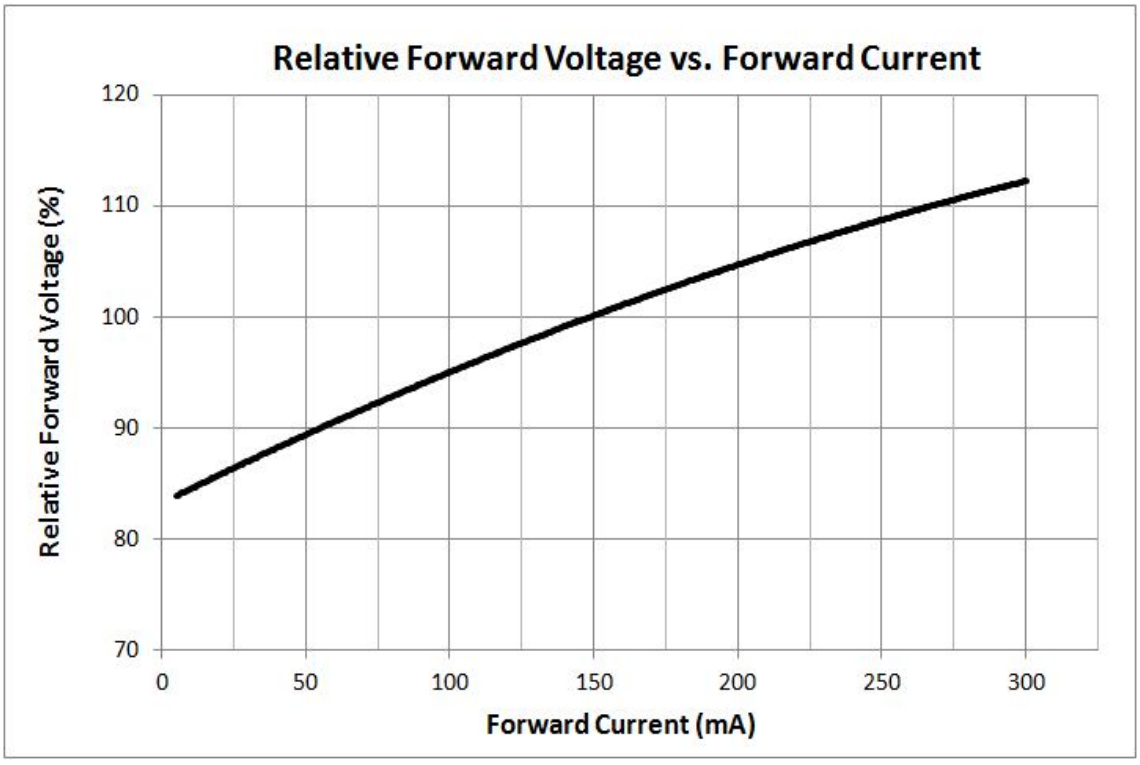


2) Forward Current Characteristics (T_s = 25℃)

(1) Relative Luminous Flux vs. Forward Current



(2) Relative Forward Voltage vs. Forward Current



3) Temperature Characteristics (I_F = 150mA)

(1) Relative Luminous Flux vs. Ts

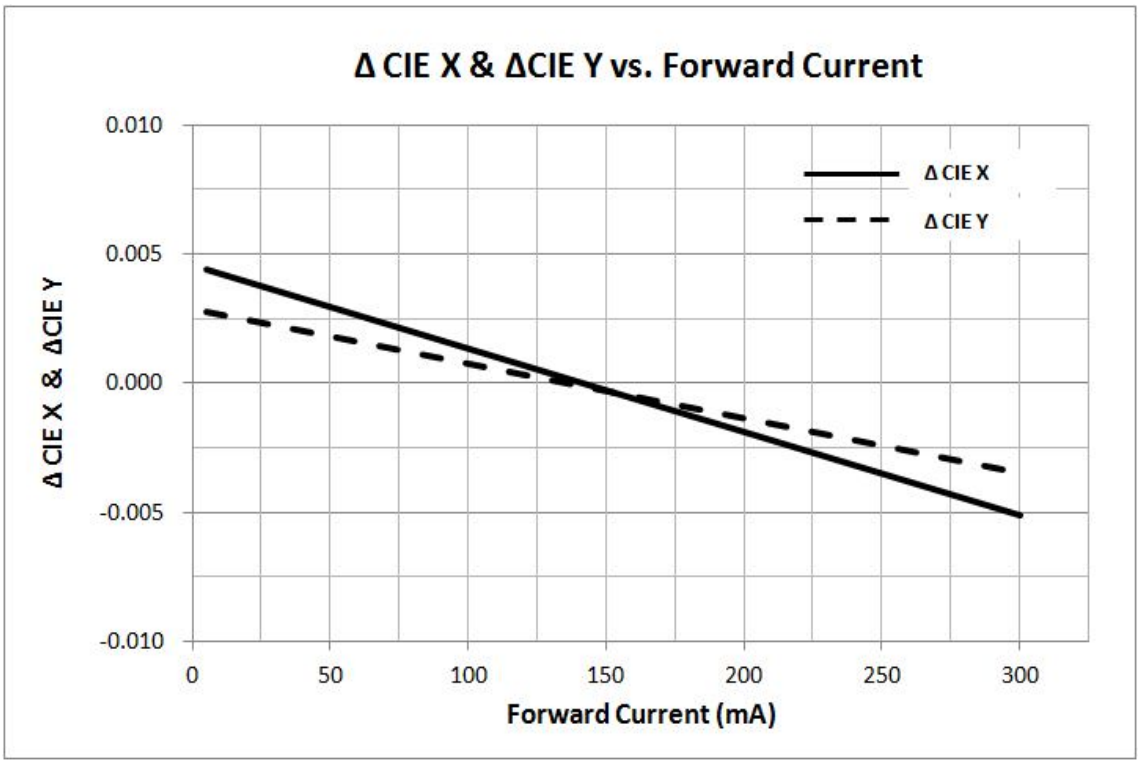
T.B.D

(2) Relative Forward Voltage vs. Ts

T.B.D

4-1) Color Shift Characteristics (T_S = 25℃)

(1) △CIE X & △CIE Y vs. Forward Current



4-2) Color Shift Characteristics (I_F = 150mA)

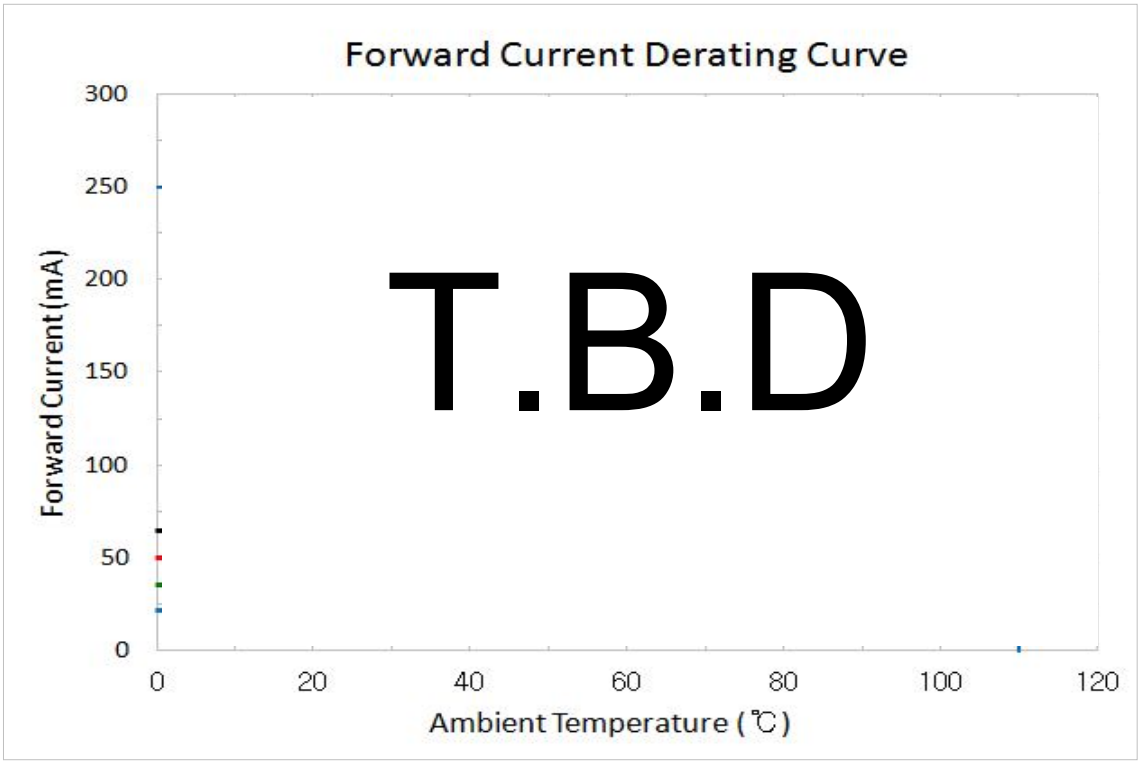
(1) △CIE X & △CIE Y vs. Ts

T.B.D

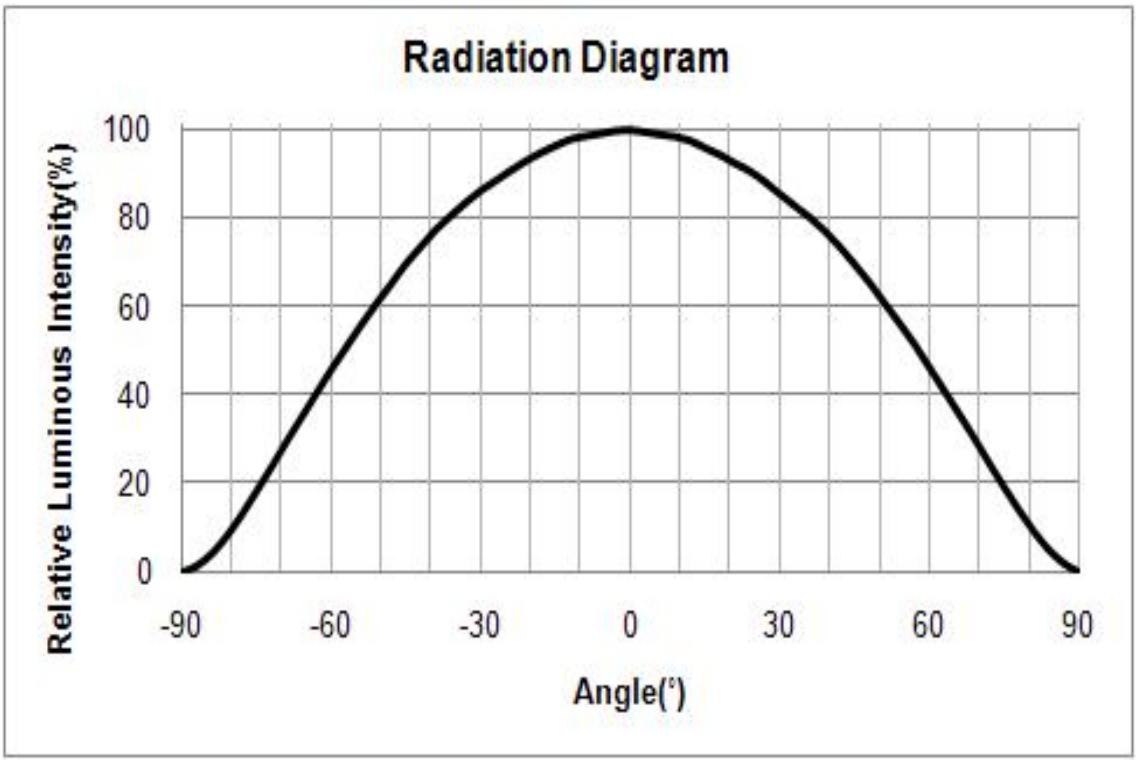
(2) CIE X & CIE Y vs. Ts

T.B.D

5) Derating Curve

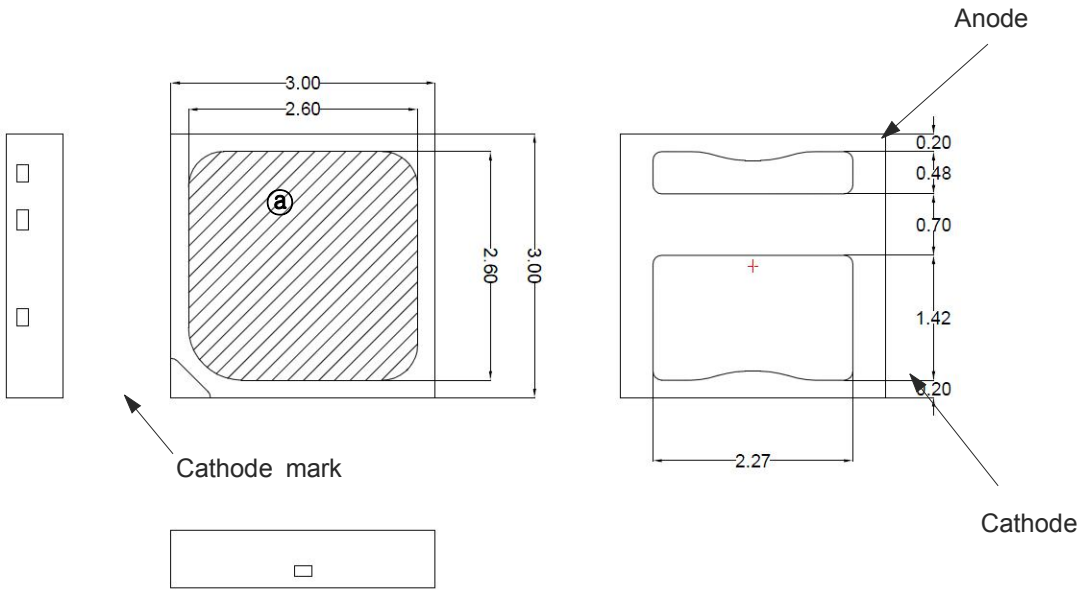


6) Beam Angle Characteristics (I_F = 150mA, T_s = 25℃)

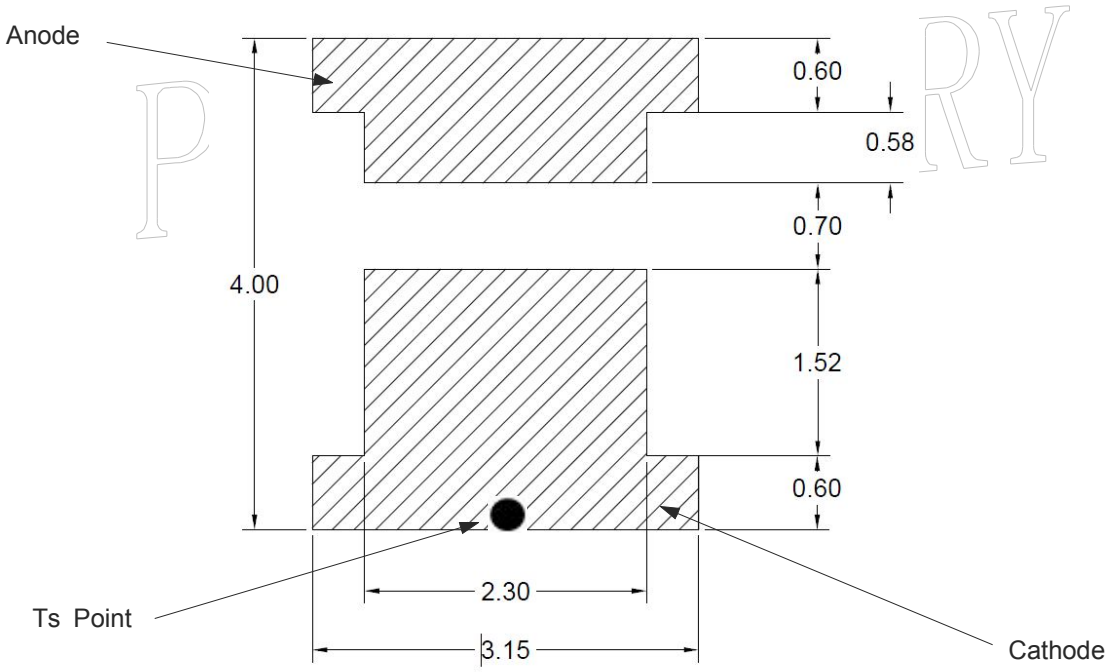


4. Outline Drawing & Dimension

Left Side View **Top View** **Bottom View**



1. Tolerance is ±0.1 mm
2. Do not place pressure on the encapsulation resin ⓐ



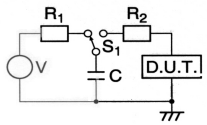
Recommended Land Pattern

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. 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) The thermal pad is electrically connected to the cathode contact pads
4) 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.

5. Reliability Test Items & Conditions

1) Test Items and Results

Test Item	Test Conditions		Test Hours/Cycles	Sample Size
Room Temperature Life Test	25℃±3℃, DC 200mA		1,000 hrs	22
High Temperature Life Test	85℃±3℃, DC 200mA		1,000 hrs	22
High Temperature Humidity Life Test	85℃±3℃, 85%±2%RH, DC 200mA		1,000 hrs	22
Low Temperature Life Test	-40℃±3℃, DC 200mA		1,000 hrs	22
Powered Temperature Cycle Test	-45℃/20min ↔ 85℃/20min, Sweep 100min cycle on/off: each 5min, DC 200mA		100 cycles	22
Thermal Shock	-45℃/15min ↔ 125℃/15min, → Hot plate 180℃		500 cycles	100
High Temperature Storage	Ta=120℃±3℃		1,000 hrs	11
Low Temperature Storage	Ta=-40℃±3℃		1,000 hrs	11
ESD(HBM)		R1 : 10MΩ, R2 : 1.5KΩ, C : 100pF, V = ±5kV	5 times	30
ESD(MM)		R1 : 10MΩ, R2 : 0, C : 200pF, V = ±0.5kV	5 times	30
Vibration Test	20~2000~20 Hz 200 m/s², Sweep 4 min X, Y, Z 3 direction, each 1 cycle		4 cycles	11
Mechanical Shock Test	1500G, 0.5ms, 3 shocks each X-Y-Z axis		5 cycles	11

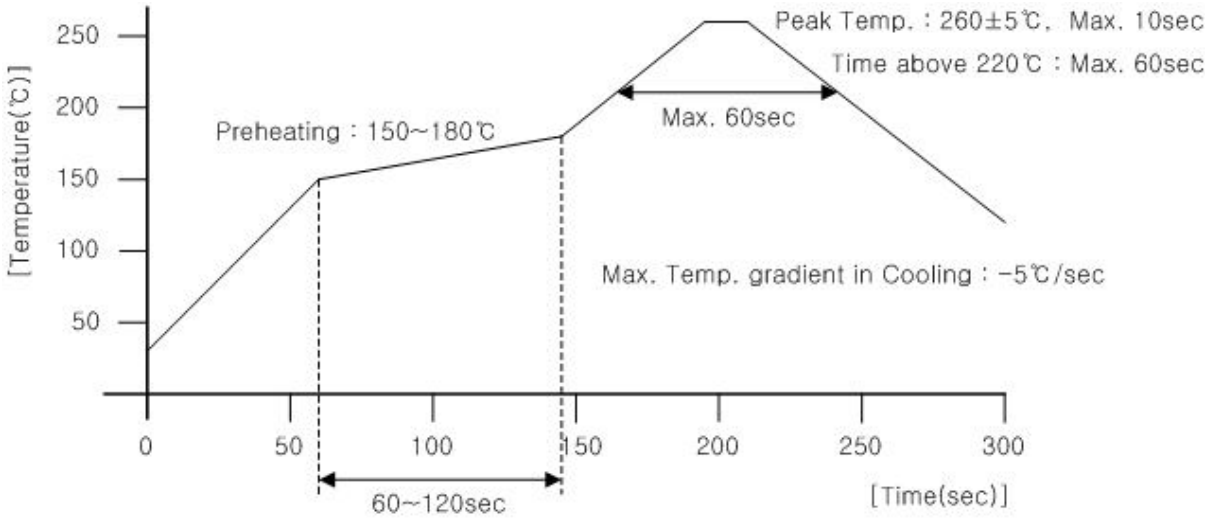
2) Criteria for Judging the Damage

Item	Symbol	Test Condition	Limit	
			Min	Max
Forward Voltage	V_F	I_F = 150 ㎃	Init. Value*0.9	Init. Value*1.1
Luminous Flux	Φ_v	I_F = 150 ㎃	Init. Value*0.7	Init. Value*1.1

6. Solder Conditions

1) Reflow Conditions (Pb Free)

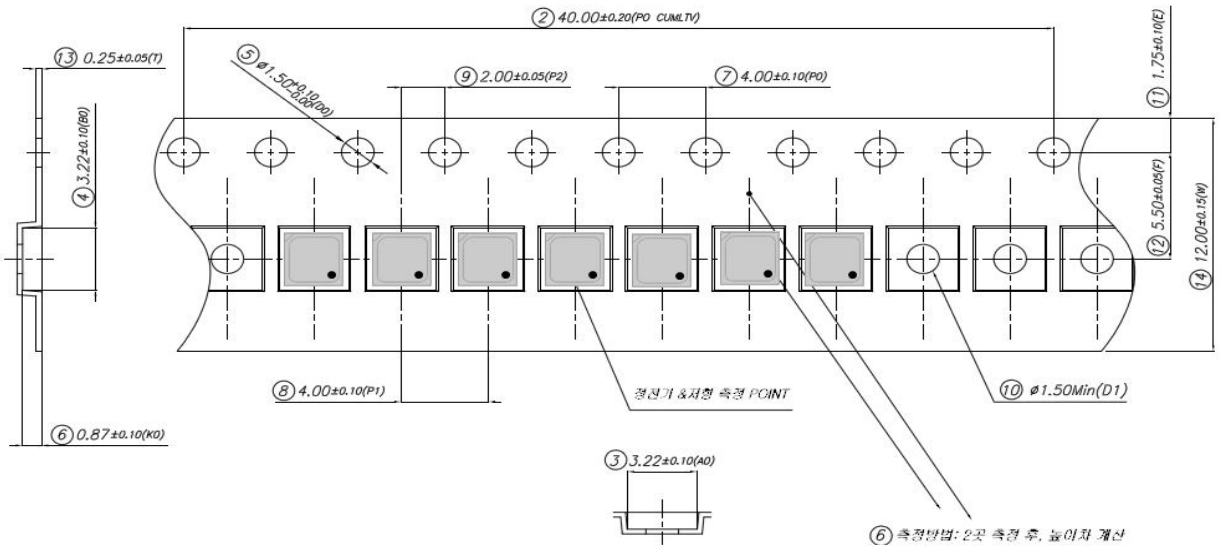
Reflow Frequency : 2 times max.

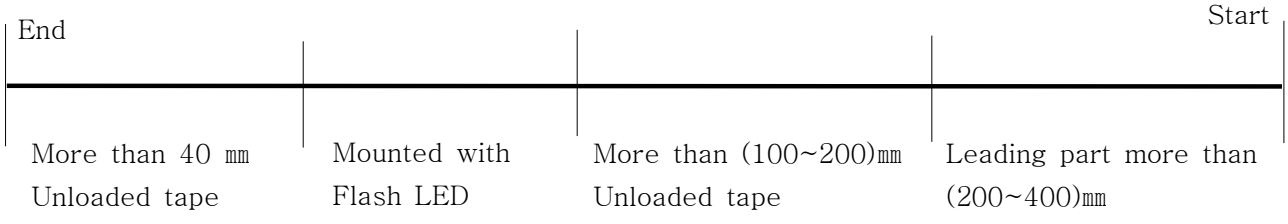


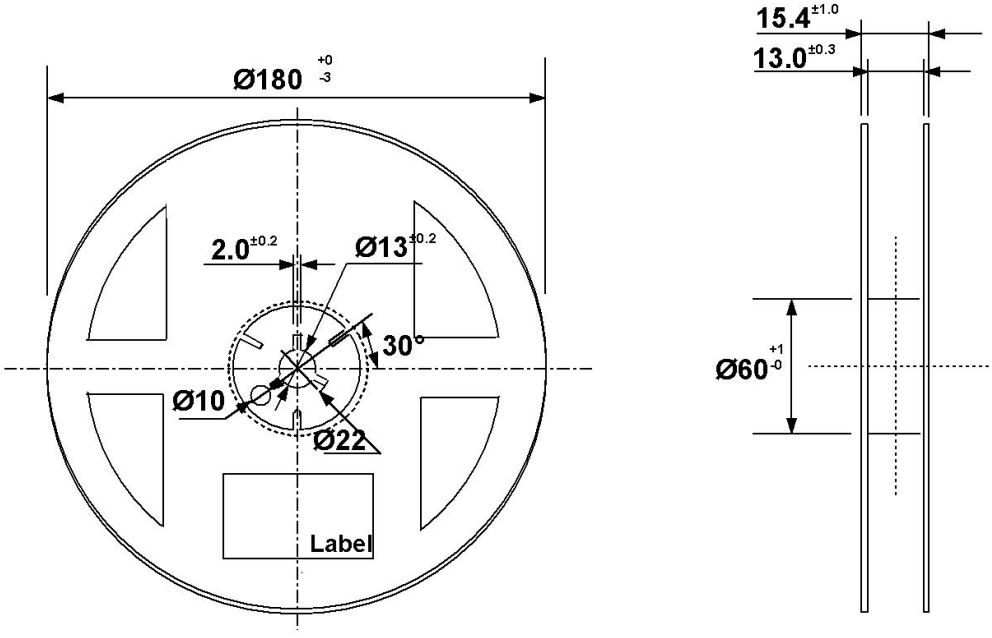
2) For Manual Soldering

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

7. Tape & Reel







Tolerance ±0.2 , Unit:mm

(1) Quantity : The quantity/reel to be 4,000 pcs.

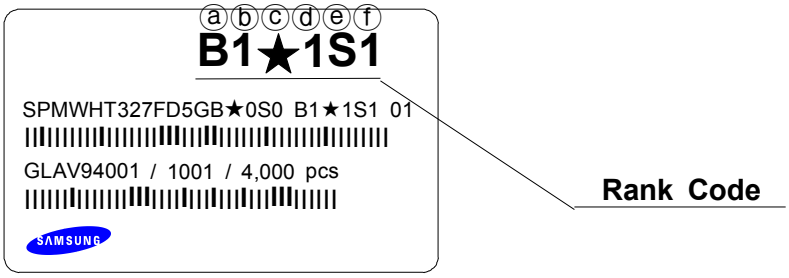
(2) Cumulative Tolerance : Cumulative tolerance/10 pitches to be ±0.2 ㎜

(3) Adhesion Strength of Cover Tape : Adhesion strength to be 0.1-0.7 N when the cover tape is turned off from the carrier tape at 10 ℃ angle to be the carrier tape.

(4) Packaging : P/N, Manufacturing data code no. and quantity to be indicated on a damp proof package.

8. Label Structure

1) Label Structure



N.B) Denoted rank is the only example.

'★' means All kind of Chromaticity Coordinate Rank.

Rank Code

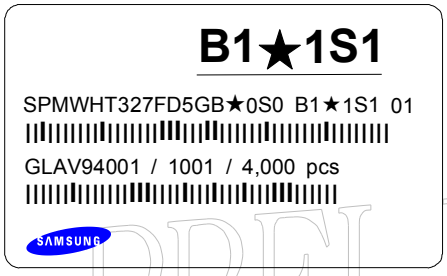
ⓐⓑ : Forward Voltage(V_F) Rank (refer to page. 12)

ⓒⓓ : Chromaticity Coordinate Rank (refer to page. 7~9)

ⓔⓕ : Luminous Intensity(cd) Rank (refer to page. 3 and 4)

2) LOT Number

The Lot number is composed of the following characters



①②③④⑤⑥⑦⑧⑨ / 1ⓐⓑⓒ / 4,000 PCS

① : Production Site (S:SAMSUNG ELECTRONICS, G:TIANJIN CHINA)

② : L (LED)

③ : Product State (A:Normality, B:Bulk, C:First Production, R:Reproduction, S:Sample)

④ : Year (Y:2014, Z:2015...)

⑤ : Month (1 ~ 9, A, B, C)

⑥ : Day (1 ~ 9, A, B ~ V)

⑦⑧⑨ : SAMSUNG ELECTRONICS LED Product number (1 ~ 999)

ⓐⓑⓒ : Reel Number (1 ~ 999)

9. Packing Structure

1) Packing Process

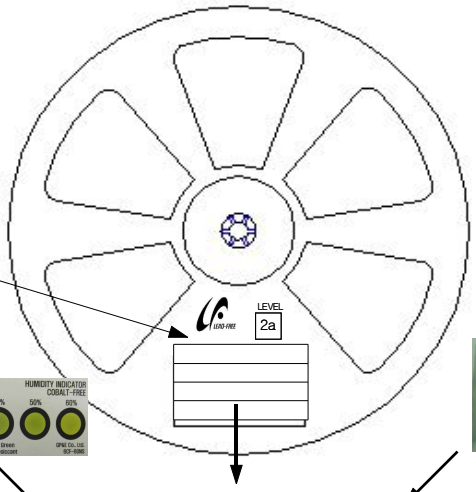
Reel

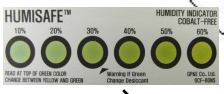
B1★1S1

SPMWHT327FD5GB★0S0 B1★1S1 01

GLAV94001 / 1001 / 4,000 pcs

SAMSUNG





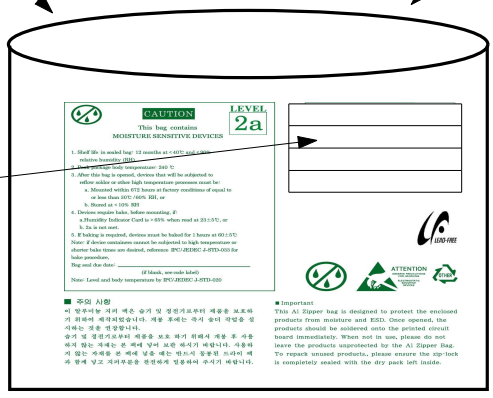
Aluminum Vinyl Bag

B1★1S1

SPMWHT327FD5GB★0S0 B1★1S1 01

GLAV94001 / 1001 / 4,000 pcs

SAMSUNG



Material : Paper(SW3B(B))

TYPE	SIZE(mm)			Note
	L	W	H	
7inch L	245±5	220±5	182±5	Up to 10 Reels
7inch S	245±5	220±5	86±5	Up to 5 Reels

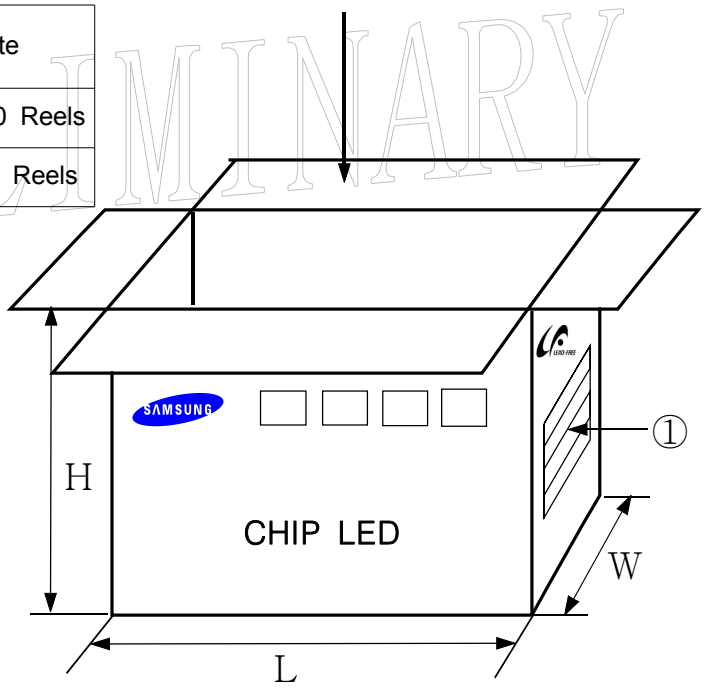
① SIDE

B1★1S1

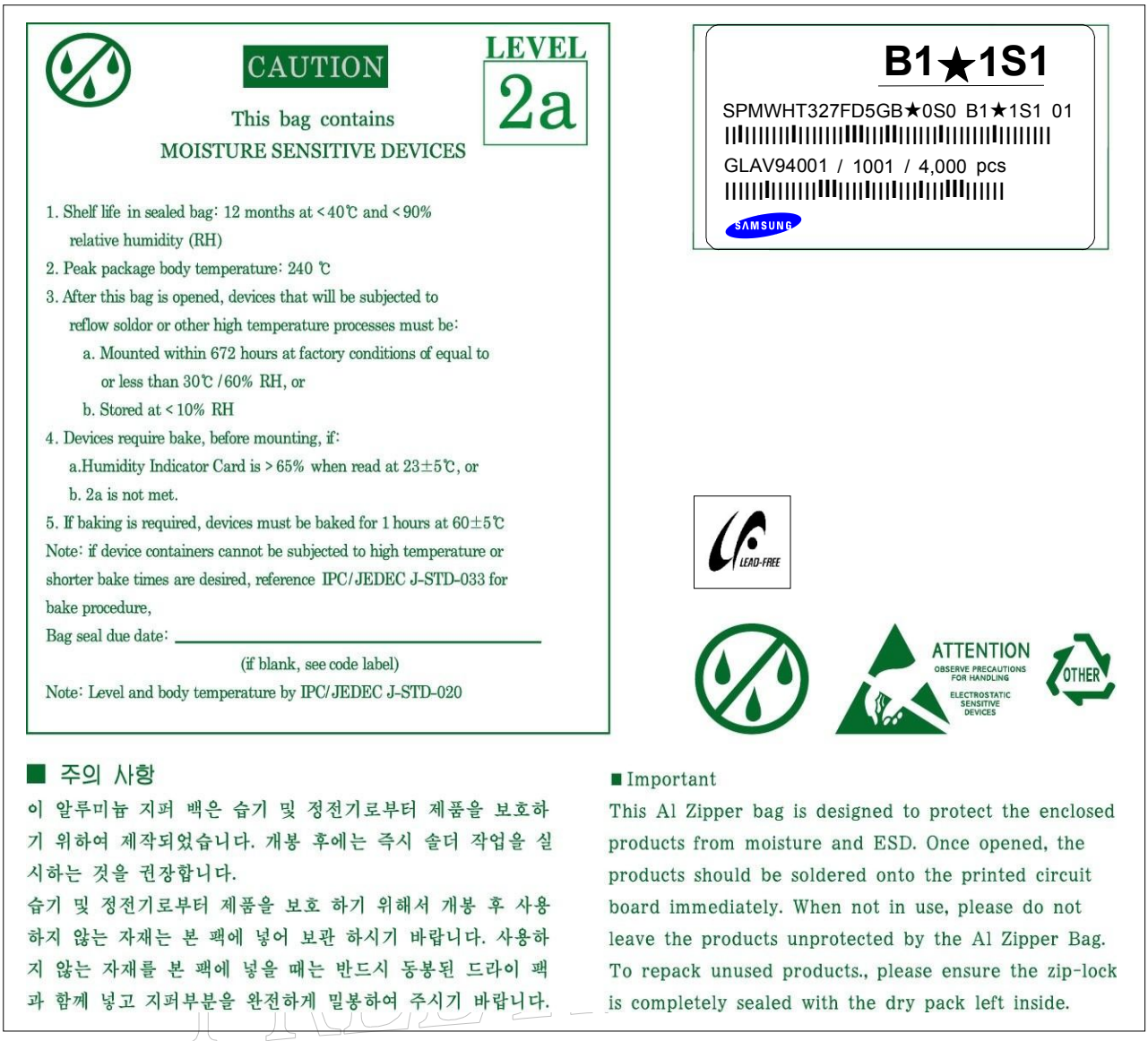
SPMWHT327FD5GB★0S0 B1★1S1 01

GLAV94001 / 1001 / 40,000 pcs

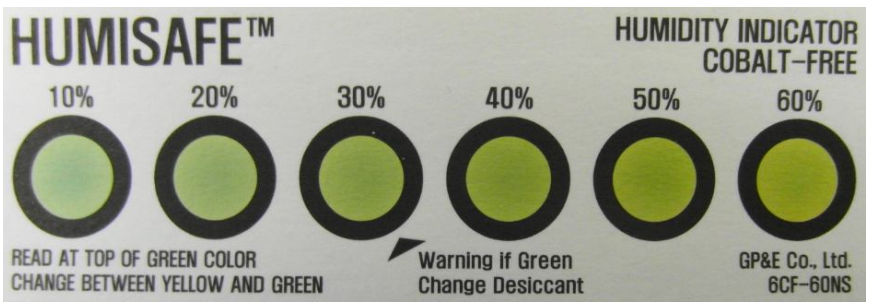
SAMSUNG [Box Label]



2) Aluminum Packing Bag



Silica gel & Humidity Indicator Card in Aluminum Vinyl Bag



10. 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.

2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When washing is required, IPA is recommended to use.

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

4) LEDs must be stored in a clean environment.
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. ~40℃, ~90%RH)

5) After storage bag is open, 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℃/60%RH,
b. Stored at <10%RH.

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

7) Devices require baking before mounting, if humidity card reading is >60% at 23±5℃.

8) Devices must be baked for 1 hour at 65±5℃, if baking is required.

9) The LEDs are sensitive to the static electricity and surge. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs.
If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices.
Damaged LEDs may show some unusual characteristics such as increase in leak current, lowered turn-on voltage, or abnormal lighting of LEDs at low current.

10) VOCs (volatile organic compounds) can be generated from adhesives, flux, hardener or organic additives used in luminaires (fixtures). Transparent LED silicone encapsulant is permeable to those chemicals and they may lead a discoloration of encapsulant when they expose to heat or light.
This phenomenon can cause a significant loss of light emitted(output) from the luminaires(fixtures).
In order to prevent these problems, we recommend you to know the physical properties of materials used in luminaires, They must be selected carefully.

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
Sulfurization of the 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 in a following list,
: Rubber, Plain paper, lead solder cream and so on.

Revision History

Date	No	Revision History	Writer	
			Drawn	Approved
2014.06.03	000	New version	T.J Kim	M.Y Son