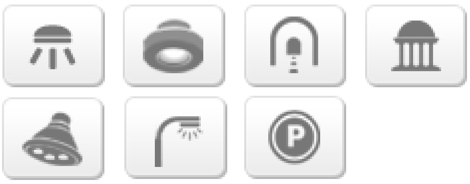
Superior high Flux for High Voltage System

Acrich MJT– 5050 Series

S1WM-5050xx18-00000000-00001



LM-80 RoHS

Product Brief

Description

- This White Colored surface-mount LED comes in standard package dimension. Package Size : 5.0x5.0x0.70mm
- The MJT series of LEDs are designed for AC & DC(High Voltage) operation and high flux output applications.
- The MJT is ideal light sources for general illumination applications and custom designed solutions
- The package design coupled with careful selection of component materials allow these products to perform with high reliability

Features and Benefits

- High Intensity output and high luminance
- Designed for high voltage operation
- High Color Quality with CRI Min.70&80
- SMT solderable
- RoHS compliant

Key Applications

- General lighting
- Architectural lighting
- LED Bulbs
- Decorative / Pathway lighting

Table 1-1. Product Selection Table

Reference Code	Color	Nominal CCT	Part Number	CRI Min
SAW0L60A	Cool White	6500K	S1WM-5050657018-00000000-00001	70
		5700K	S1WM-5050577018-00000000-00001	
		5000K	S1WM-5050507018-00000000-00001	
	Neutral White	4500K	S1WM-5050457018-00000000-00001	
		4000K	S1WM-5050407018-00000000-00001	
	Warm White	3500K	S1WM-5050357018-00000000-00001	
		3000K	S1WM-5050307018-00000000-00001	
		2700K	S1WM-5050277018-00000000-00001	

Table 1-2. Product Selection Table

Reference Code	Color	Nominal CCT	Part Number	CRI Min
SAW8L60A	Cool White	6500K	S1WM-5050658018-00000000-00001	80
		5700K	S1WM-5050578018-00000000-00001	
		5000K	S1WM-5050508018-00000000-00001	
	Neutral White	4500K	S1WM-5050458018-00000000-00001	
		4000K	S1WM-5050408018-00000000-00001	
	Warm White	3500K	S1WM-5050358018-00000000-00001	
		3000K	S1WM-5050308018-00000000-00001	
		2700K	S1WM-5050278018-00000000-00001	

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Table 2. Product Selection Guide, I_F = 60mA, T_j = 25ºC, RH30%

Min. CRI, R_a [4]	Nominal CCT [K] [1]	Min. Flux [lm]	Typ. Luminous Flux Φ_V [2,3] [lm] @60mA	Typ. Luminous Efficacy [lm/W] @60mA	Part Number
70	6500	171	196	198	S1WM-5050657018-00000000-00001
	5700	171	196	198	S1WM-5050577018-00000000-00001
	5000	171	200	202	S1WM-5050507018-00000000-00001
	4500	171	200	202	S1WM-5050457018-00000000-00001
	4000	171	200	202	S1WM-5050407018-00000000-00001
	3500	171	195	197	S1WM-5050357018-00000000-00001
	3000	171	195	197	S1WM-5050307018-00000000-00001
	2700	171	193	195	S1WM-5050277018-00000000-00001
80	6500	155	183	185	S1WM-5050658018-00000000-00001
	5700	155	183	185	S1WM-5050578018-00000000-00001
	5000	155	187	189	S1WM-5050508018-00000000-00001
	4500	155	187	189	S1WM-5050458018-00000000-00001
	4000	155	187	189	S1WM-5050408018-00000000-00001
	3500	155	182	184	S1WM-5050358018-00000000-00001
	3000	155	182	184	S1WM-5050308018-00000000-00001
	2700	155	180	182	S1WM-5050278018-00000000-00001

Notes :

(1) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.

CCT ±5% tolerance.

(2) Seoul Semiconductor maintains a tolerance of ±7% on flux and power measurements.

(3) Φ_V is the total luminous flux output as measured with an integrating sphere.

(4) Tolerance is ±2.0 on CRI measurements.

Product Performance & Characterization Guide

Table 2. Characteristics, I_F=60mA, T_j=25ºC

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Forward Voltage	V_F	15.0	16.5	18.0	V
Luminous Flux[1] (5000K, CRI70) [3,4]	Φ_V[2]	-	200	-	lm
Luminous Flux[1] (3000K, CRI70) [3,4]		-	195	-	
Luminous Flux[1] (5000K, CRI80) [3,4]	Φ_V[2]	-	187	-	lm
Luminous Flux[1] (3000K, CRI80) [3,4]		-	182	-	
Correlated Color Temperature[3]	CCT	2,700	-	7,000	K
Viewing Angle	2Θ1/2	-	120	-	deg.
Thermal resistance (J to S)[5]	$R\theta_{j-s}$	-	1.8	-	K/W
ESD Sensitivity(HBM) [6]	-	JEDEC JS-001-2017			

Table 3. Electro-Optical Characteristics, T_j=25ºC, CCT=5000K, CRI70

I_F [mA]	V_F [V]	Power [W]	Φ_V [lm]	Efficacy [lm/W]
60	16.5	1.0	200	202
220	18.0	4.0	682	172
320	18.9	6.0	955	158

Table 4. Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Forward Current	I_F	320	mA
Power Dissipation	P_D	6.0	W
Junction Temperature	T_j	125	ºC
Storage Temperature	T_{stg}	-40 ~ + 100	ºC

Notes :

(1) Seoul Semiconductor maintains a tolerance of ±7% on flux and power measurements.

(2) Φ_V is the total luminous flux output as measured with an integrating sphere.

(3) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram. Color coordinate : ±0.005, CCT ±5% tolerance.

(4) Tolerance is ±2.0 on CRI measurements.

(5) Thermal resistance: Rth_{JS} (Junction to Solder)

- Calculated performance values are for reference only.
- Thermal resistance can be increased substantially depending on the heat sink design/operating condition, and the maximum possible driving current will decrease accordingly.

Characteristics Graph

Fig 1-1. Color Spectrum, T_j=25℃, I_F=60mA (CRI70)

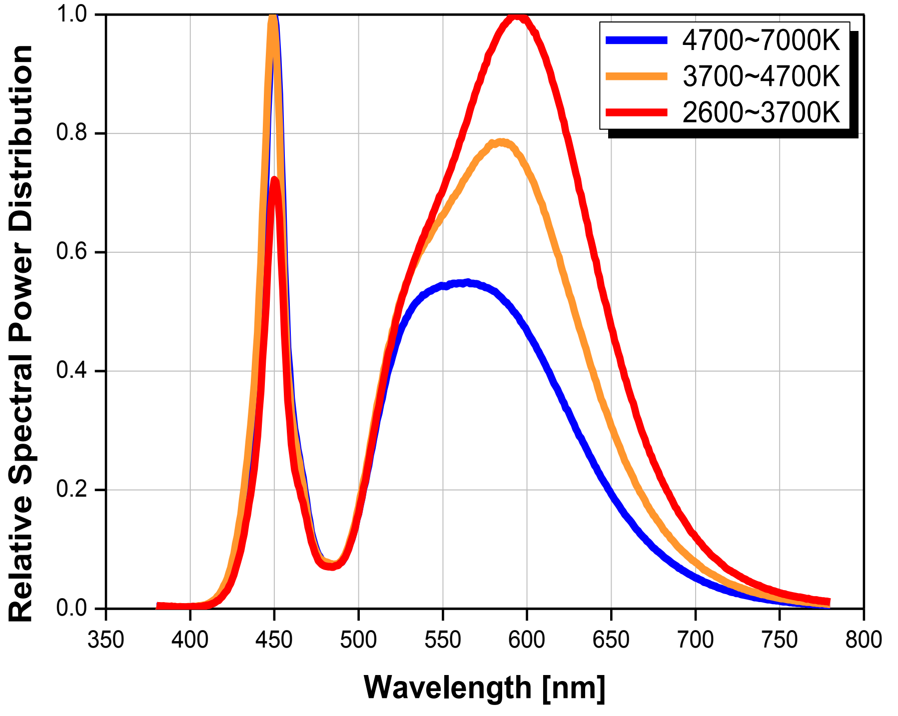
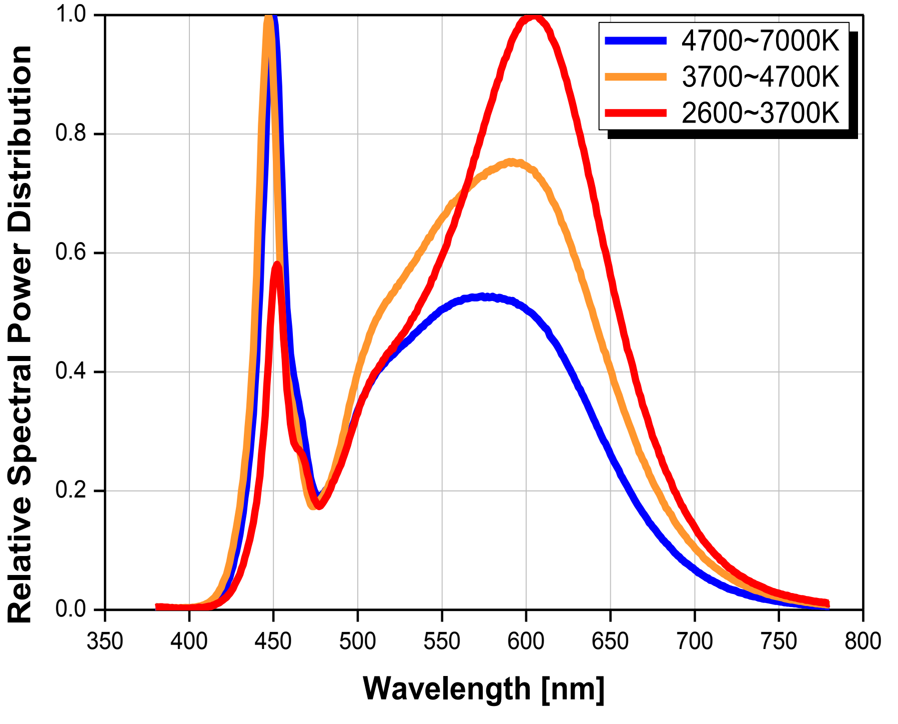


Fig 1-2. Color Spectrum, T_j=25℃, I_F=60mA (CRI80)



Characteristics Graph

Fig 2. Radiant pattern, T_j=25℃, I_F=60mA

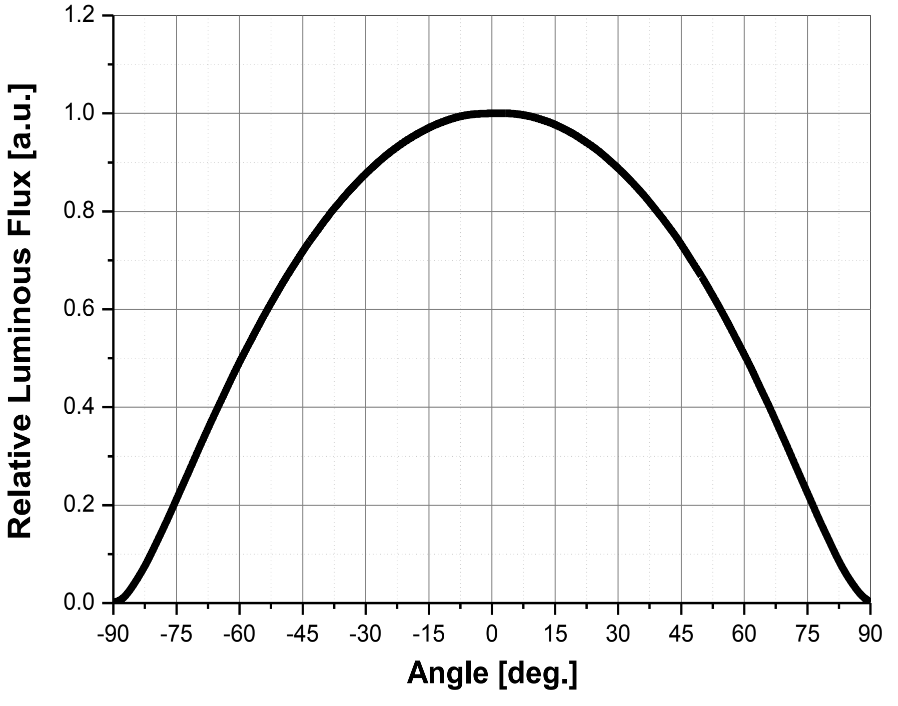
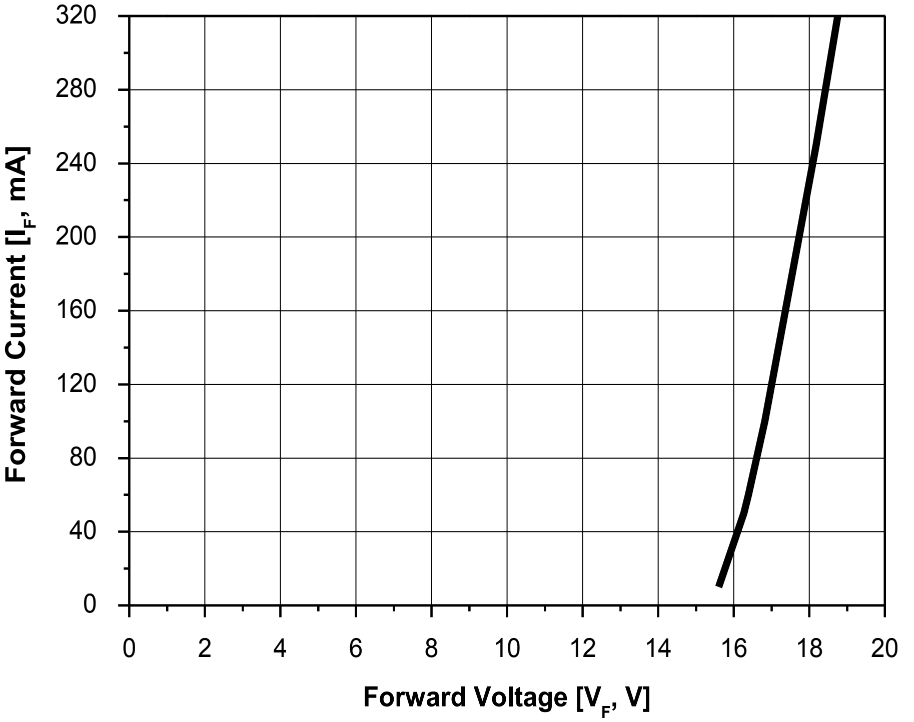
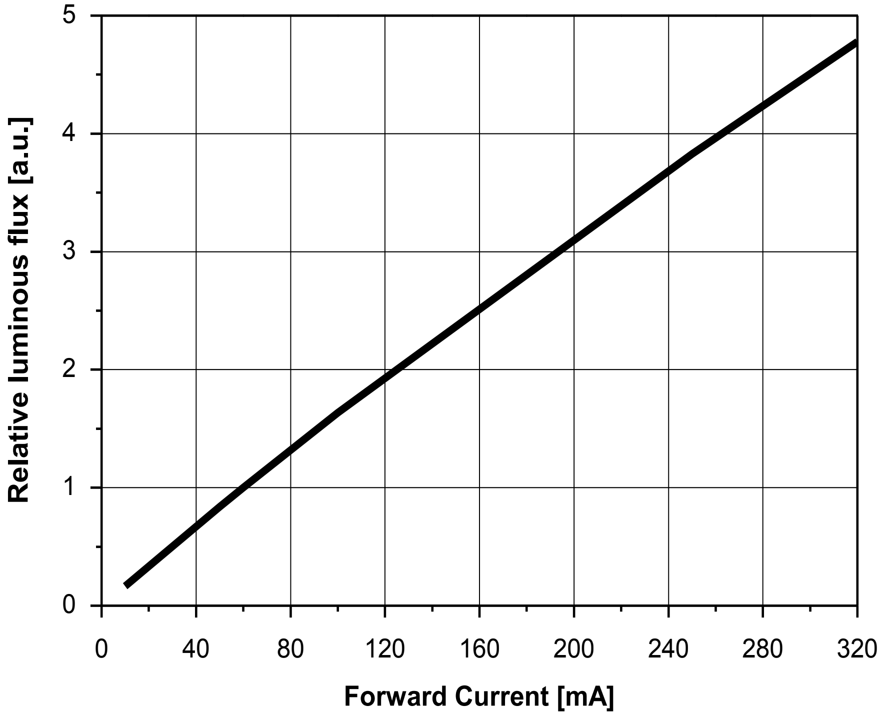


Fig 3. Forward Voltage vs. Forward Current, T_j=25℃



Characteristics Graph

Fig 4. Forward Current vs. Relative Luminous Flux, T_j=25℃



Characteristics Graph

Fig 5-1. Forward Current vs. CIE X, Y Shift , T_j=25℃ (CRI70)

(4700K~7000K)

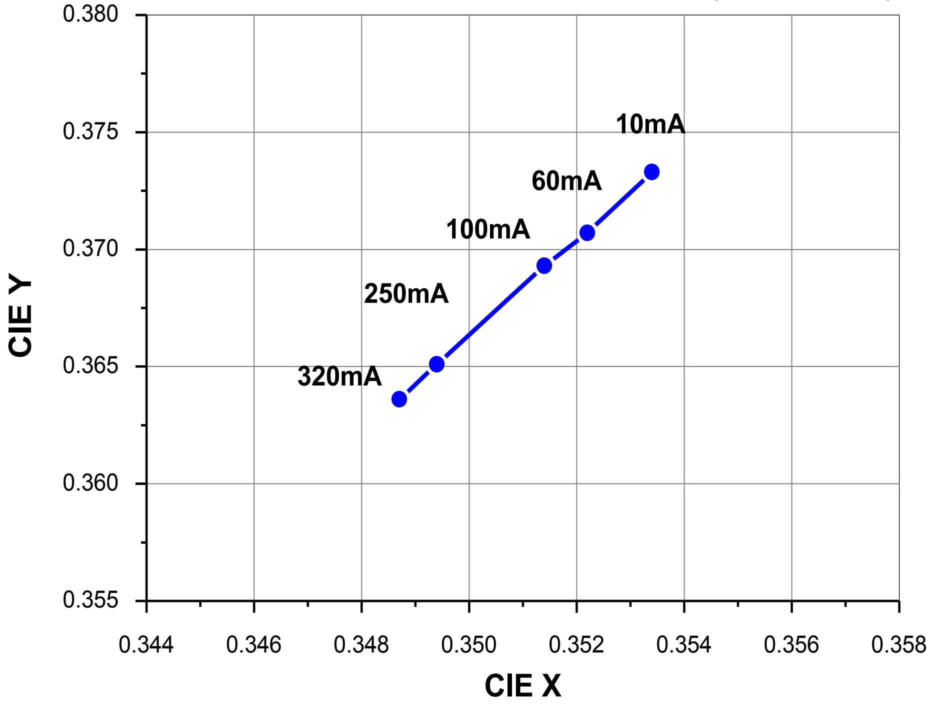
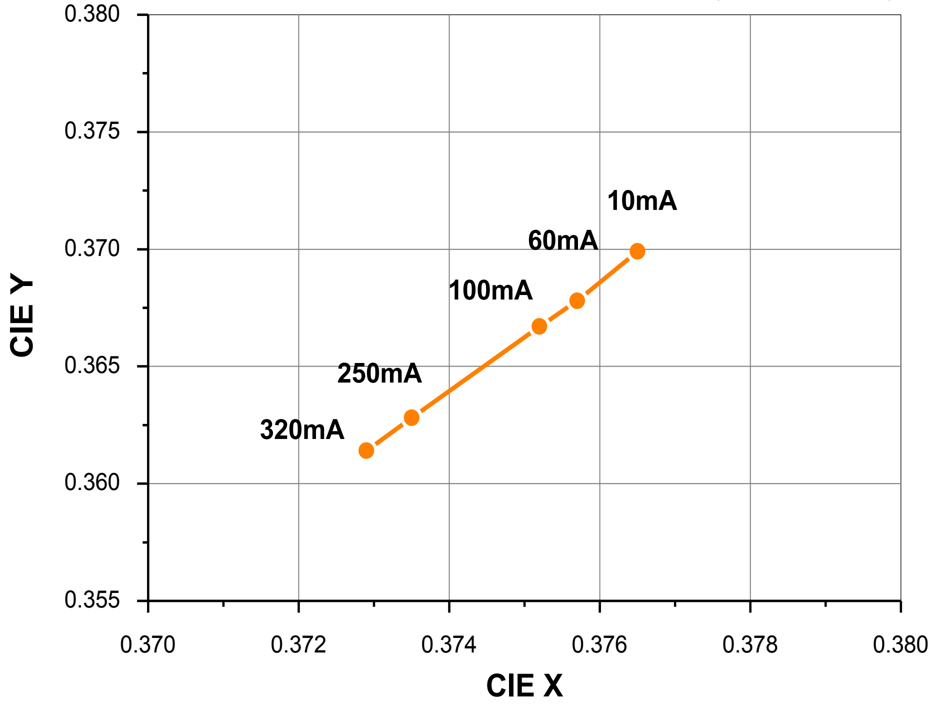


Fig 5-1. Forward Current vs. CIE X, Y Shift , T_j=25℃ (CRI70)

(3700K~4700K)



Characteristics Graph

Fig 5-1. Forward Current vs. CIE X, Y Shift , T_j=25℃ (CRI70)

(2600K~3700K)

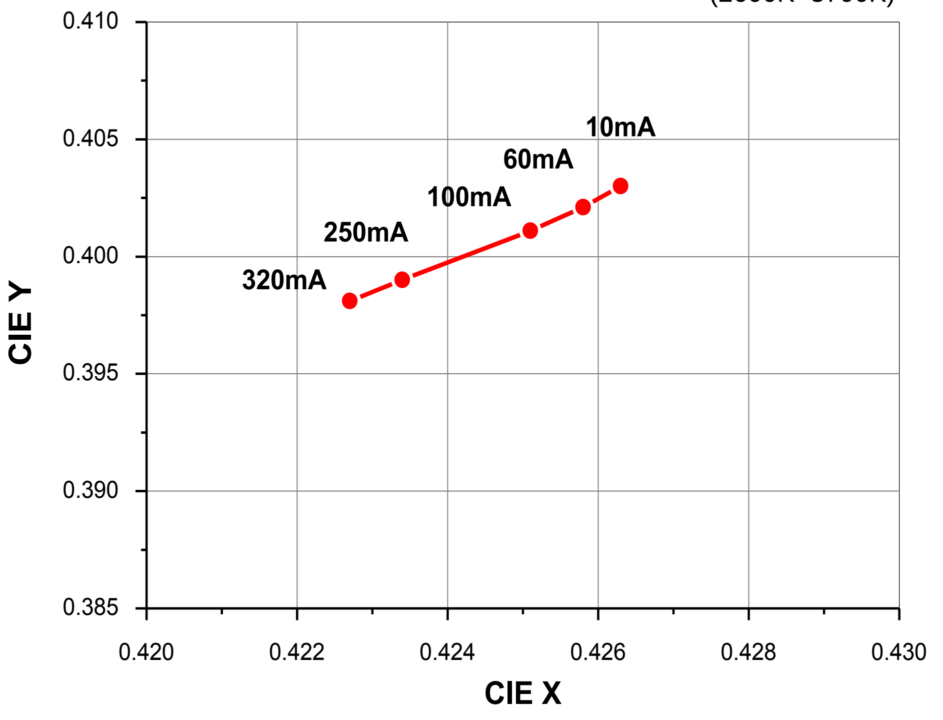
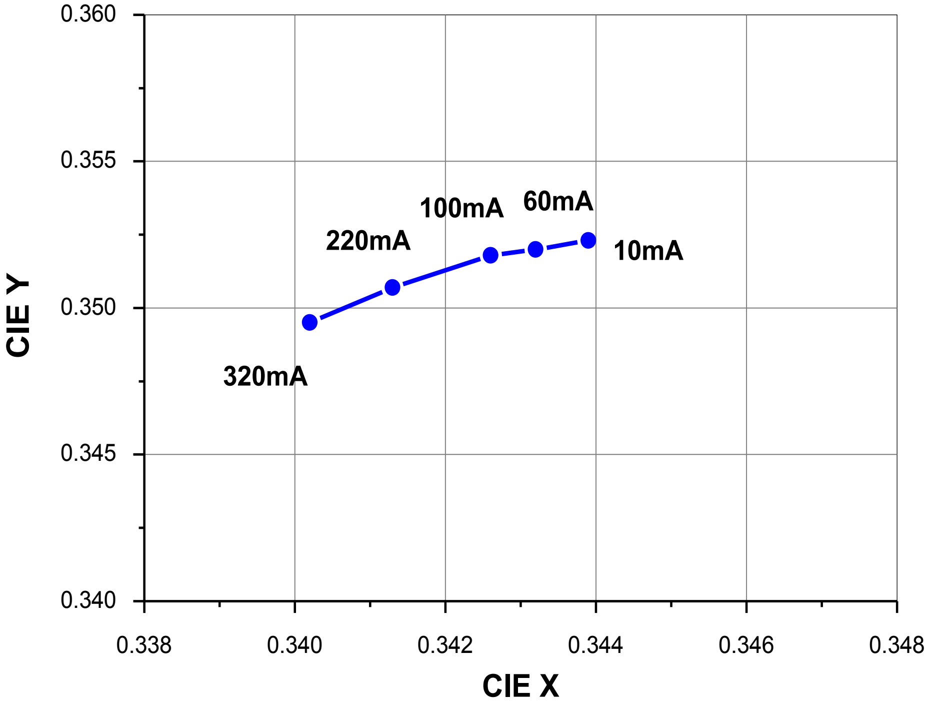


Fig 5-2. Forward Current vs. CIE X, Y Shift , T_j=25℃ (CRI80)

(4700K~7000K)



Characteristics Graph

Fig 5-2. Forward Current vs. CIE X, Y Shift , T_j=25℃ (CRI80)

(3700K~4700K)

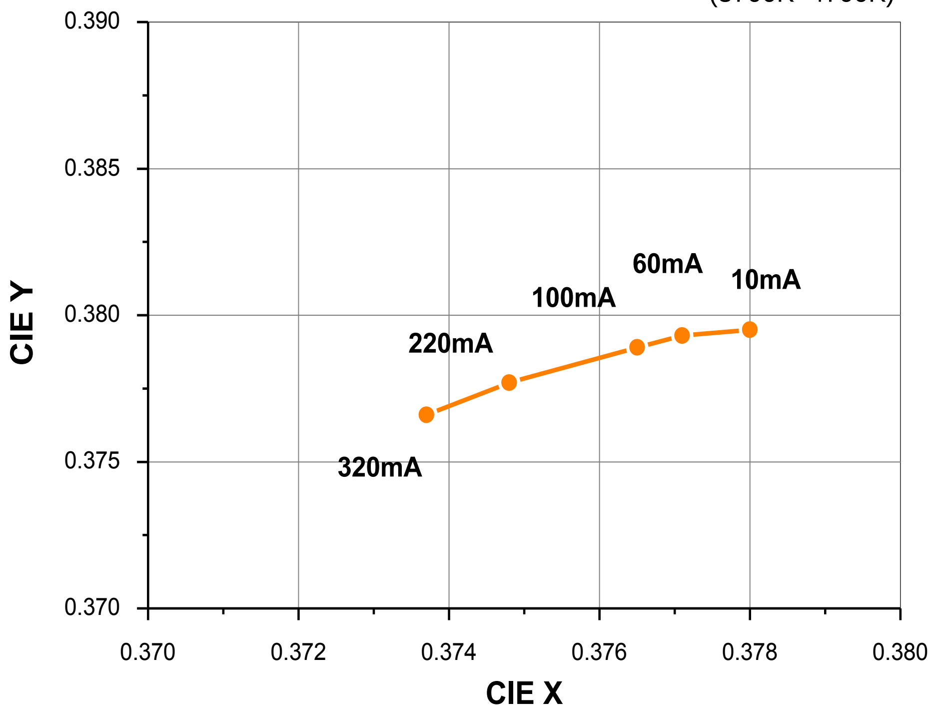
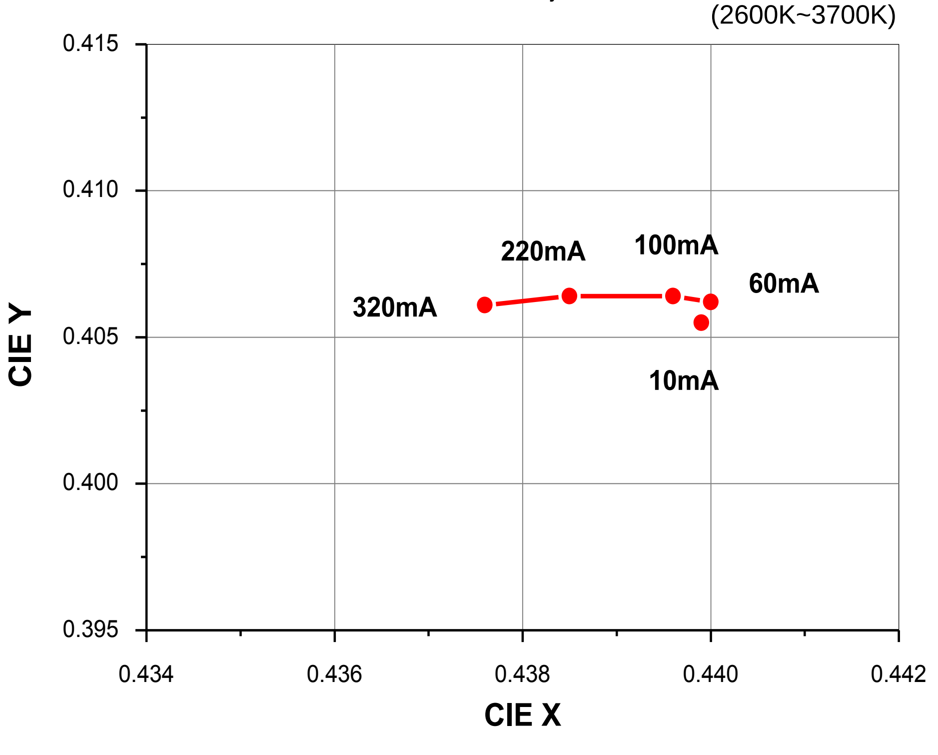


Fig 5-2. Forward Current vs. CIE X, Y Shift , T_j=25℃ (CRI80)

(2600K~3700K)



Characteristics Graph

Fig 6. Relative Light Output vs. Junction Temperature, I_F=60mA

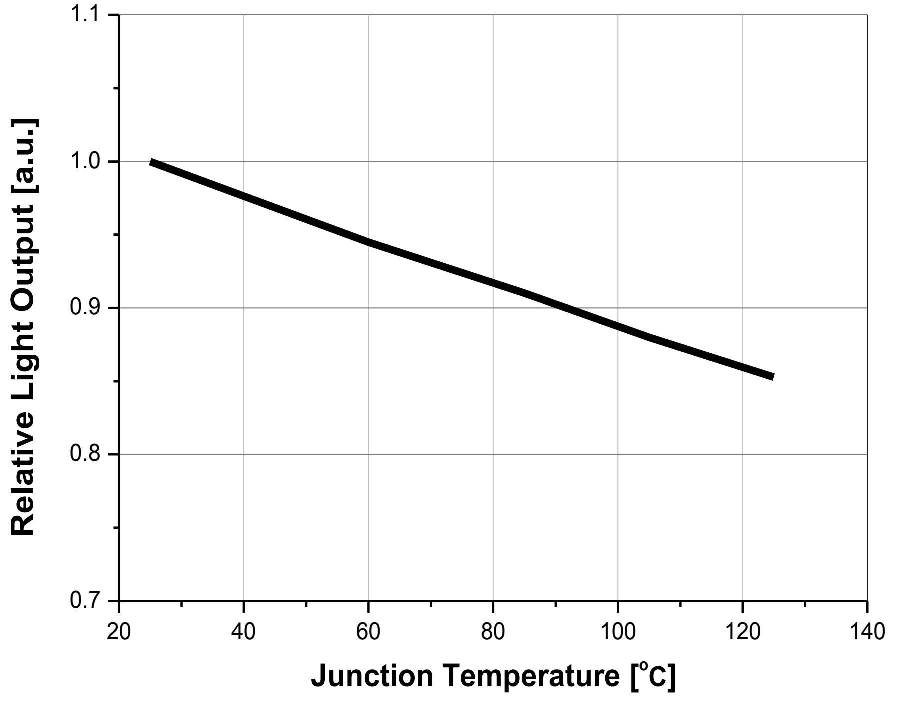
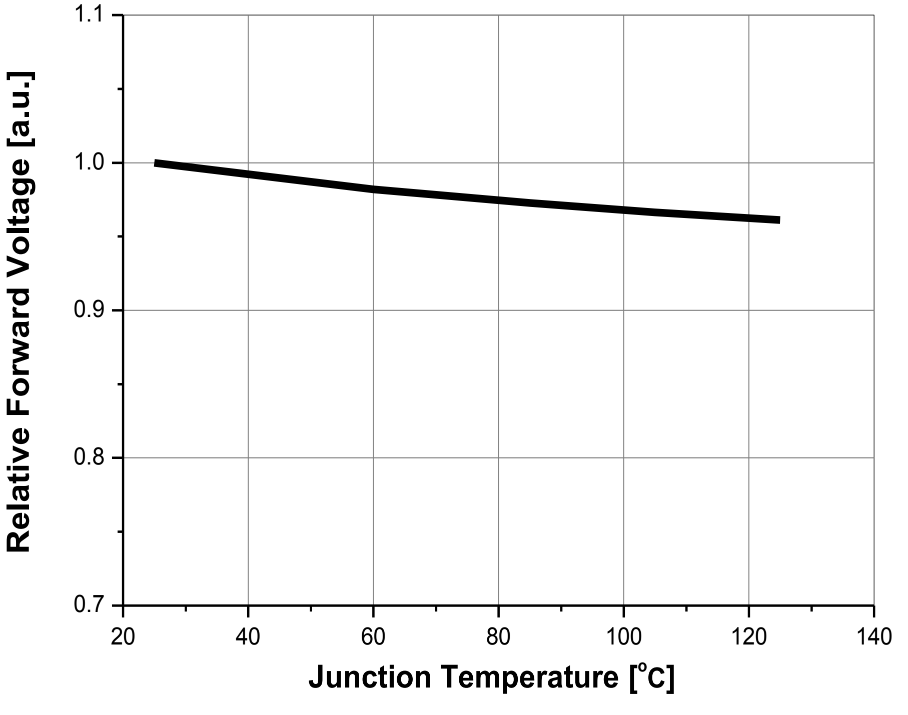


Fig 7. Relative Forward Voltage vs. Junction Temperature, I_F=60mA



Characteristics Graph

Fig 8-1. Junction Temp. vs. CIE X, Y Shift, I_F=60mA (CRI70)

(4700K~7000K)

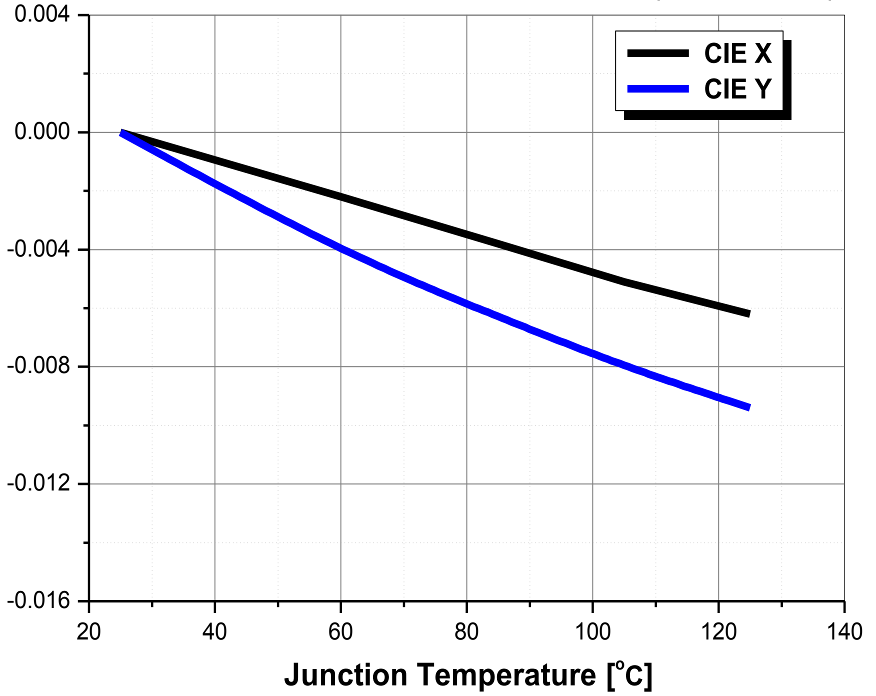
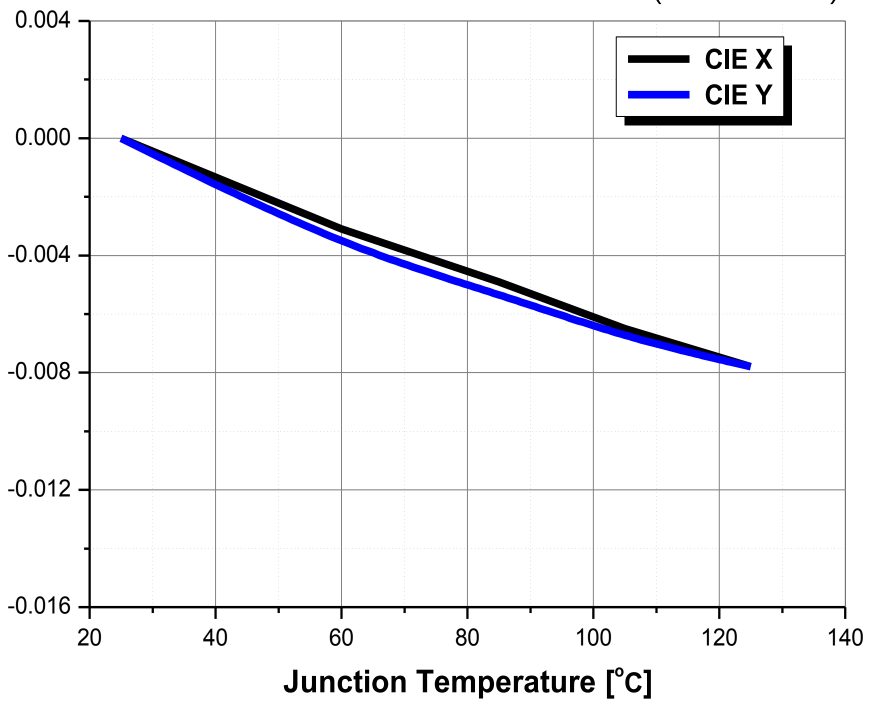


Fig 8-1. Junction Temp. vs. CIE X, Y Shift, I_F=60mA (CRI70)

(3700K~4700K)



Characteristics Graph

Fig 8-1. Junction Temp. vs. CIE X, Y Shift, I_F=60mA (CRI70)

(2600K~3700K)

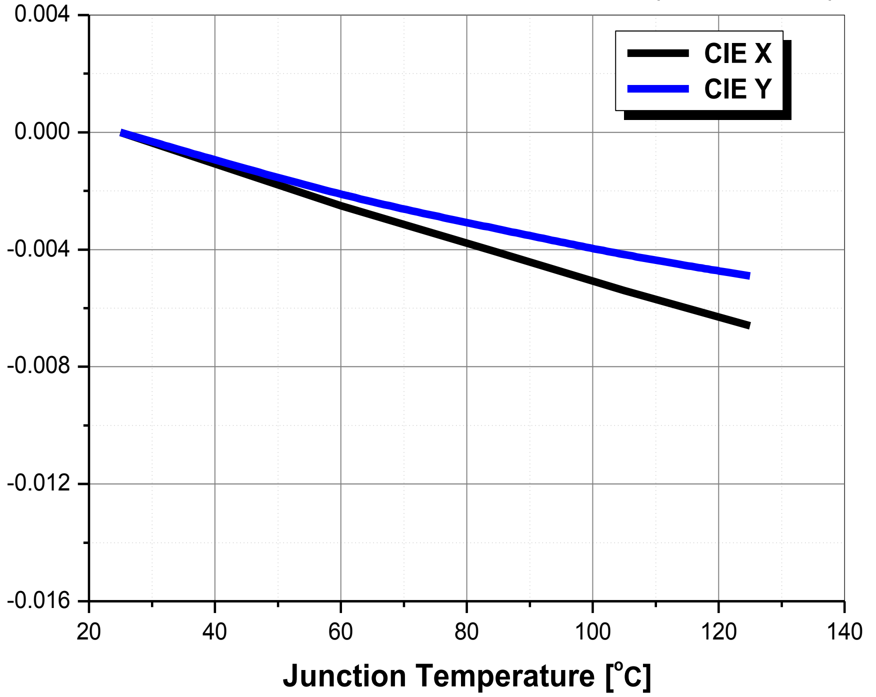
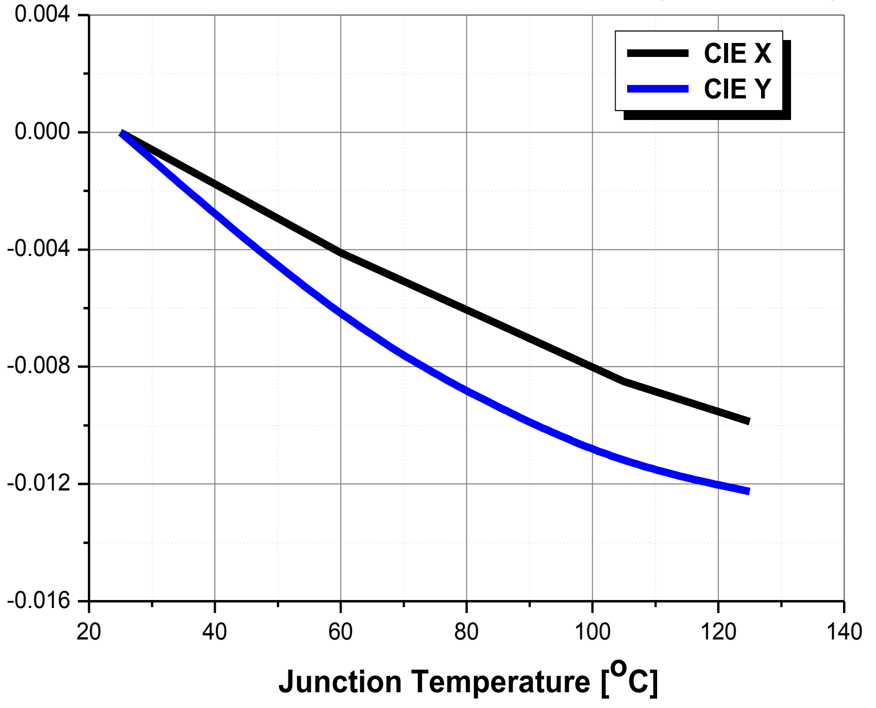


Fig 8-2. Junction Temp. vs. CIE X, Y Shift, I_F=60mA (CRI80)

(4700K~7000K)



Characteristics Graph

Fig 8-2. Junction Temp. vs. CIE X, Y Shift, I_F=60mA (CRI80)

(3700K~4700K)

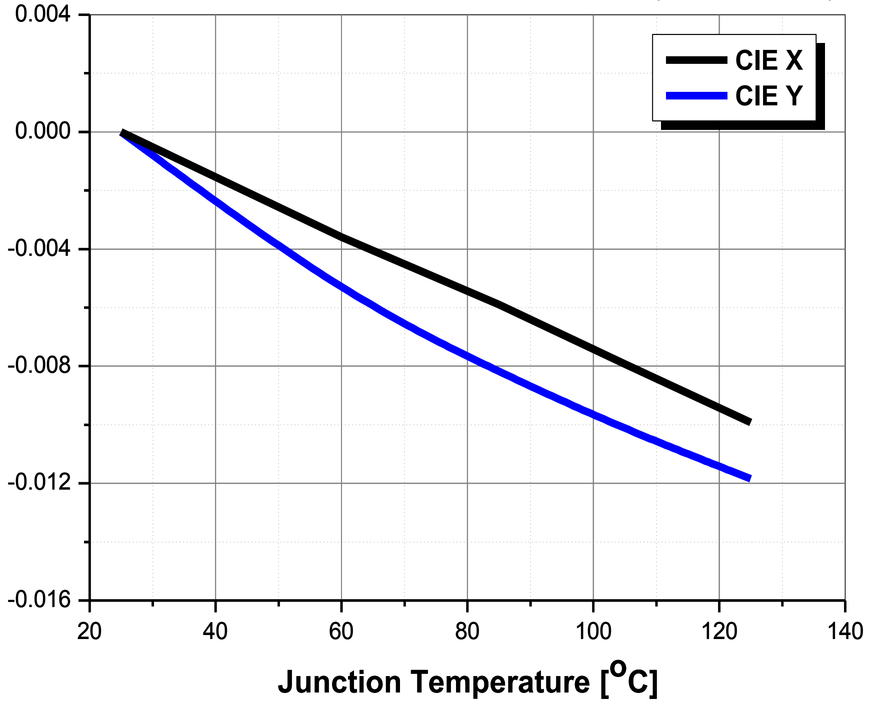
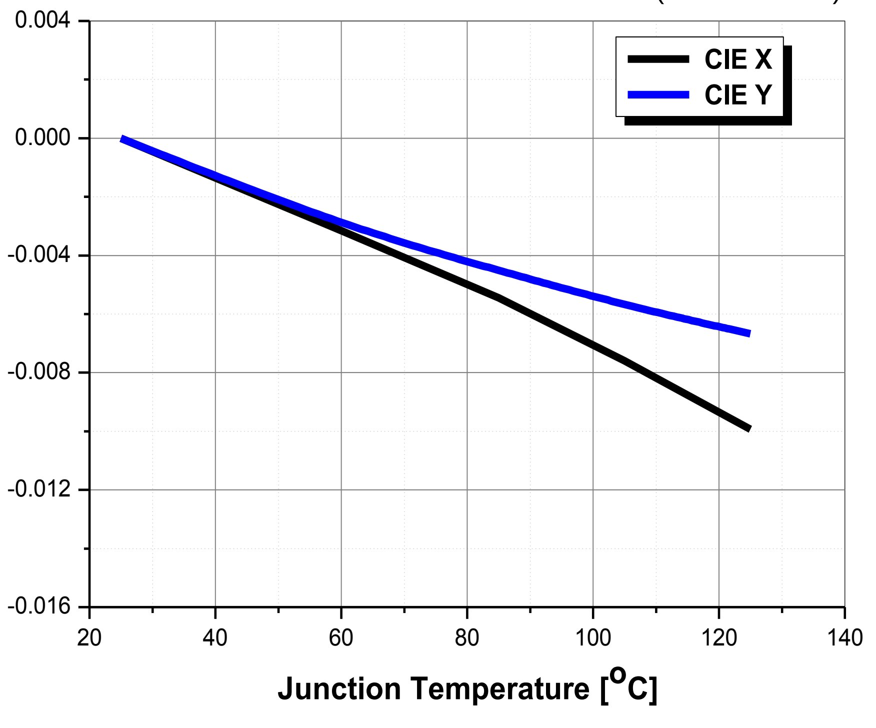


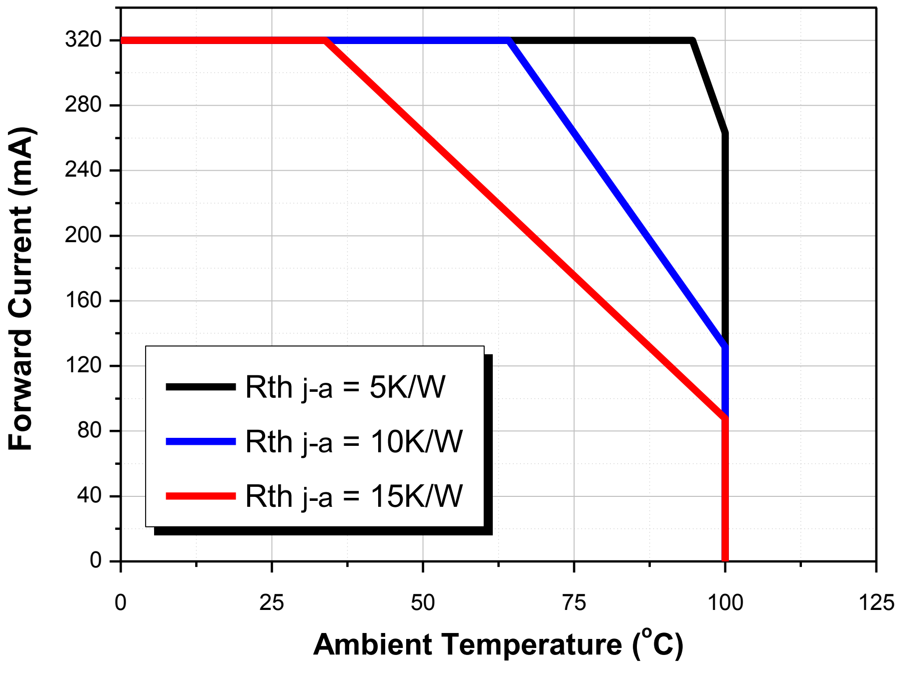
Fig 8-2. Junction Temp. vs. CIE X, Y Shift, I_F=60mA (CRI80)

(2600K~3700K)



Characteristics Graph

Fig 9. Maximum Forward Current vs. Ambient Temperature, T_j(max.)=125℃, I_F=320mA



Color Bin Structure

Table 5. Bin Code description, T_j=25℃, I_F=60mA

Part Number	Luminous Flux (lm) I_F=60mA			Color Chromaticity Coordinate	Forward Voltage (V_f) I_F=60mA		
	Bin Code	Min.	Max.		Bin Code	Min.	Max.
S1WM-5050xxxx18-00000000-00001	W1	155	171	Refer to page.18~20	A	16.0	17.0
	W2	171	186		B	17.0	18.0
	X1	186	202				
	X2	202	217				

Table 6. Luminous Flux rank distribution

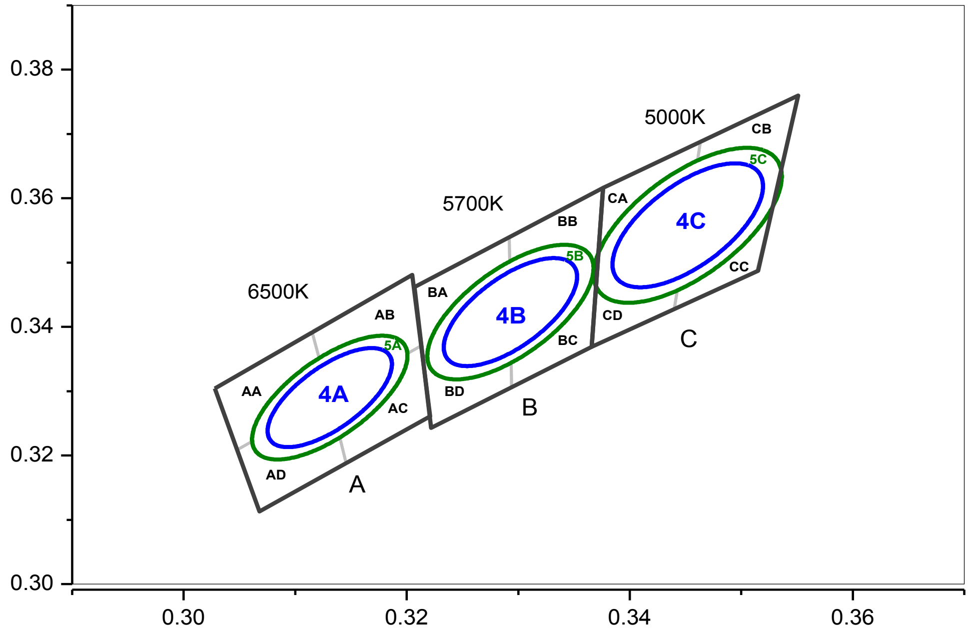
CRI	CCT[K]	CIE	Flux Rank			
70	6500	A	W1	W2	X1	X2
	5700	B	W1	W2	X1	X2
	5000	C	W1	W2	X1	X2
	4500	D	W1	W2	X1	X2
	4000	E	W1	W2	X1	X2
	3500	F	W1	W2	X1	X2
	3000	G	W1	W2	X1	X2
	2700	H	W1	W2	X1	X2
80	6500	A	W1	W2	X1	X2
	5700	B	W1	W2	X1	X2
	5000	C	W1	W2	X1	X2
	4500	D	W1	W2	X1	X2
	4000	E	W1	W2	X1	X2
	3500	F	W1	W2	X1	X2
	3000	G	W1	W2	X1	X2
	2700	H	W1	W2	X1	X2

Available ranks
Not yet available ranks

- All measurements were made under the standardized environment of Seoul Semiconductor.

Color Bin Structure

CIE Chromaticity Diagram (Cool White), T_j=25℃, I_F=60mA



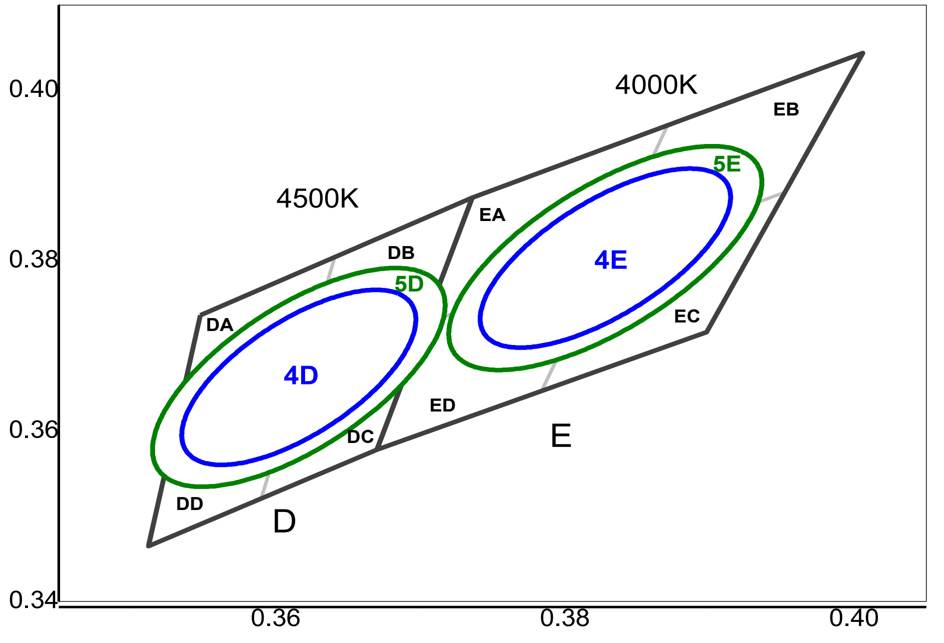
6500K 4Step		5700K 4Step		5000K 4Step	
4A		4B		4C	
Center point	0.3123 : 0.3282	Center point	0.3287 : 0.3417	Center point	0.3447 : 0.3553
Major Axis a	0.0088	Major Axis a	0.0095	Major Axis a	0.0108
Minor Axis b	0.0036	Minor Axis b	0.0040	Minor Axis b	0.0047
Ellipse Rotation Angle	58	Ellipse Rotation Angle	59	Ellipse Rotation Angle	60

6500K 5Step		5700K 5Step		5000K 5Step	
5A		5B		5C	
Center point	0.3123 : 0.3282	Center point	0.3287 : 0.3417	Center point	0.3447 : 0.3553
Major Axis a	0.0110	Major Axis a	0.0118	Major Axis a	0.0135
Minor Axis b	0.0045	Minor Axis b	0.0050	Minor Axis b	0.0058
Ellipse Rotation Angle	58	Ellipse Rotation Angle	59	Ellipse Rotation Angle	60

AA		AB		AC		AD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3028	0.3304	0.3115	0.3393	0.3131	0.329	0.3048	0.3209
0.3048	0.3209	0.3131	0.329	0.3146	0.3187	0.3068	0.3113
0.3131	0.329	0.3213	0.3371	0.3221	0.3261	0.3146	0.3187
0.3115	0.3393	0.3205	0.3481	0.3213	0.3371	0.3131	0.329
BA		BB		BC		BD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3207	0.3462	0.3292	0.3539	0.3293	0.3423	0.3215	0.3353
0.3215	0.3353	0.3293	0.3423	0.3294	0.3306	0.3222	0.3243
0.3293	0.3423	0.3371	0.3493	0.3366	0.3369	0.3294	0.3306
0.3292	0.3539	0.3376	0.3616	0.3371	0.3493	0.3293	0.3423
CA		CB		CC		CD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3376	0.3616	0.3463	0.3687	0.3452	0.3558	0.3371	0.3493
0.3371	0.3493	0.3452	0.3558	0.344	0.3428	0.3366	0.3369
0.3452	0.3558	0.3533	0.3624	0.3514	0.3487	0.344	0.3428
0.3463	0.3687	0.3551	0.376	0.3533	0.3624	0.3452	0.3558

Color Bin Structure

CIE Chromaticity Diagram (Neutral White), T_j=25℃, I_F=60mA



4500K 4Step

4D	
Center point	0.3611 : 0.3658
Major Axis a	0.0120
Minor Axis b	0.0052
Ellipse Rotation Angle	55

4000K 4Step

4E	
Center point	0.3818 : 0.3797
Major Axis a	0.0125
Minor Axis b	0.0053
Ellipse Rotation Angle	53

4500K 5Step

5D	
Center point	0.3611 : 0.3658
Major Axis a	0.0150
Minor Axis b	0.0065
Ellipse Rotation Angle	55

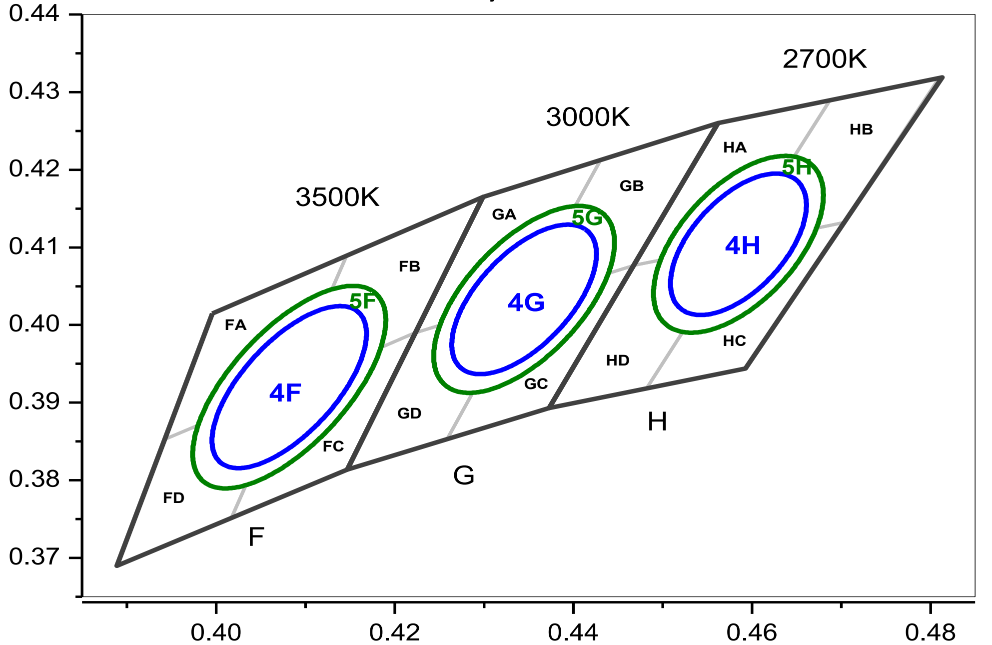
4000K 5Step

5E	
Center point	0.3818 : 0.3797
Major Axis a	0.0157
Minor Axis b	0.0067
Ellipse Rotation Angle	53

DA		DB		DC		DD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3548	0.3736	0.3641	0.3804	0.3616	0.3663	0.353	0.3601
0.353	0.3601	0.3616	0.3663	0.359	0.3521	0.3511	0.3465
0.3616	0.3663	0.3703	0.3726	0.367	0.3578	0.359	0.3521
0.3641	0.3804	0.3736	0.3874	0.3703	0.3726	0.3616	0.3663
EA		**EB**		**EC**		**ED**	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3736	0.3874	0.3871	0.3959	0.3828	0.3803	0.3703	0.3726
0.3703	0.3726	0.3828	0.3803	0.3784	0.3647	0.367	0.3578
0.3828	0.3803	0.3952	0.388	0.3898	0.3716	0.3784	0.3647
0.3871	0.3959	0.4006	0.4044	0.3952	0.388	0.3828	0.3803

Color Bin Structure

CIE Chromaticity Diagram (Warm White), T_j=25℃, I_F=60mA



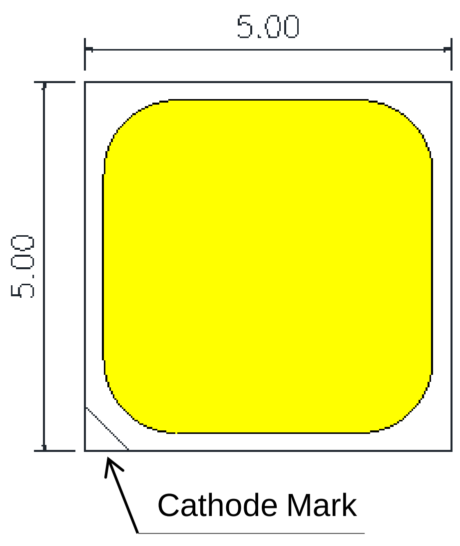
3500K 4Step		3000K 4Step		2700K 4Step	
4F		4G		4H	
Center point	0.4073 : 0.3917	Center point	0.4338 : 0.4030	Center point	0.4578 : 0.4101
Major Axis a	0.0124	Major Axis a	0.0113	Major Axis a	0.0105
Minor Axis b	0.0055	Minor Axis b	0.0055	Minor Axis b	0.0055
Ellipse Rotation Angle	53	Ellipse Rotation Angle	53	Ellipse Rotation Angle	54

3500K 5Step		3000K 5Step		2700K 5Step	
5F		5G		5H	
Center point	0.4073 : 0.3917	Center point	0.4338 : 0.4030	Center point	0.4578 : 0.4101
Major Axis a	0.0155	Major Axis a	0.0142	Major Axis a	0.0132
Minor Axis b	0.0068	Minor Axis b	0.0068	Minor Axis b	0.0068
Ellipse Rotation Angle	53	Ellipse Rotation Angle	53	Ellipse Rotation Angle	54

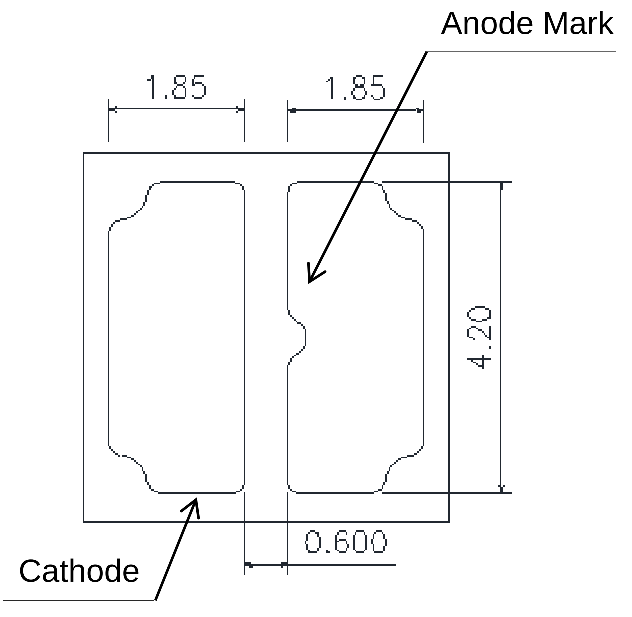
FA		FB		FC		FD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3996	0.4015	0.4146	0.4089	0.4082	0.392	0.3943	0.3853
0.3943	0.3853	0.4082	0.392	0.4017	0.3751	0.3889	0.369
0.4082	0.392	0.4223	0.399	0.4147	0.3814	0.4017	0.3751
0.4146	0.4089	0.4299	0.4165	0.4223	0.399	0.4082	0.392
GA		GB		GC		GD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4299	0.4165	0.443	0.4212	0.4345	0.4033	0.4223	0.399
0.4223	0.399	0.4345	0.4033	0.4259	0.3853	0.4147	0.3814
0.4345	0.4033	0.4468	0.4077	0.4373	0.3893	0.4259	0.3853
0.443	0.4212	0.4562	0.426	0.4468	0.4077	0.4345	0.4033
HA		HB		HC		HD	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.4562	0.426	0.4687	0.4289	0.4585	0.4104	0.4468	0.4077
0.4468	0.4077	0.4585	0.4104	0.4483	0.3919	0.4373	0.3893
0.4585	0.4104	0.4703	0.4132	0.4593	0.3944	0.4483	0.3919
0.4687	0.4289	0.481	0.4319	0.4703	0.4132	0.4585	0.4104

Mechanical Dimensions

< Top View >



< Bottom View >

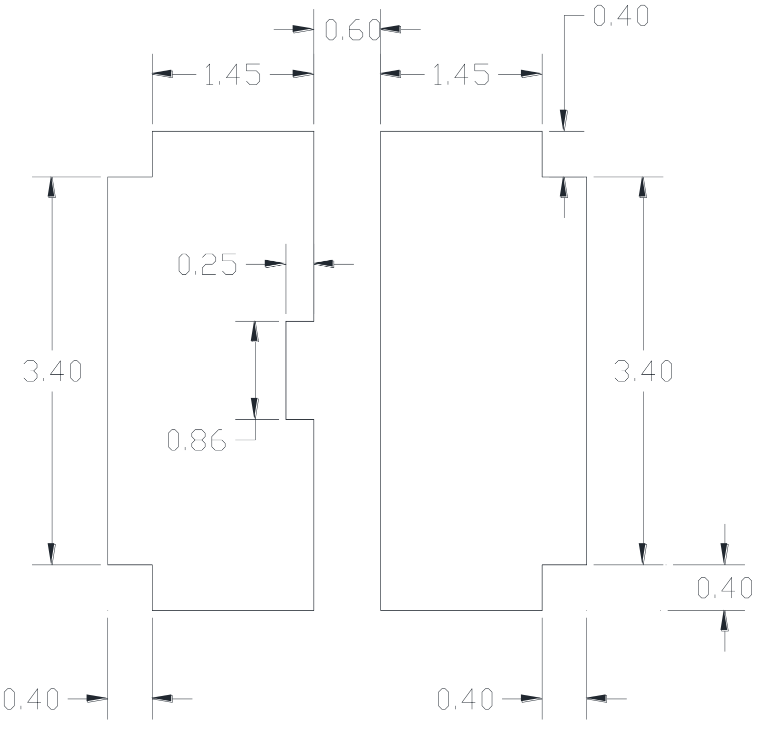


< Side view>

Notes :

(1) All dimensions are in millimeters.
(2) Scale : none
(3) Undefined tolerance is ±0.2mm

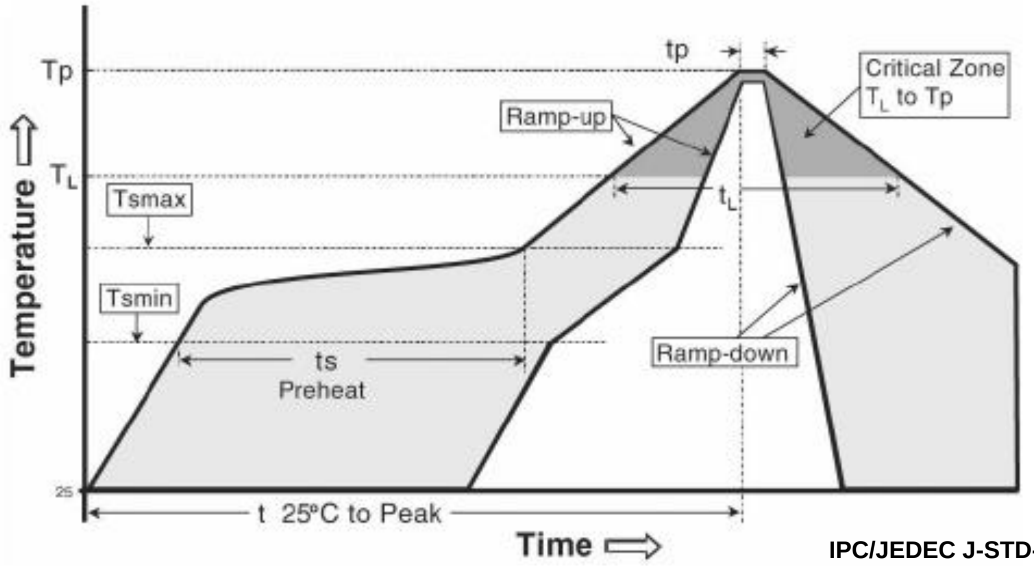
Recommended Solder Pad



Notes :

(1) All dimensions are in millimeters.
(2) Scale : none
(3) Undefined tolerance is ±0.2mm
(4) This drawing without tolerances are for reference only.

Reflow Soldering Characteristics



IPC/JEDEC J-STD-020

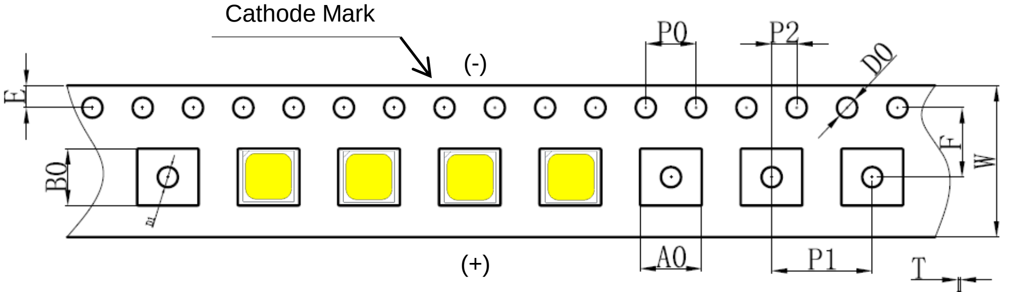
Table 7.

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_{smax} to T_p)	3° C/second max.	3° C/second max.
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (T_{smin} to T_{smax}) (t_s)	 100 °C 150 °C 60-120 seconds	 150 °C 200 °C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	 183 °C 60-150 seconds	 217 °C 60-150 seconds
Peak Temperature (T_p)	215℃	260℃
Time within 5°C of actual Peak Temperature (t_p)2	10-30 seconds	20-40 seconds
Ramp-down Rate	6 °C/second max.	6 °C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

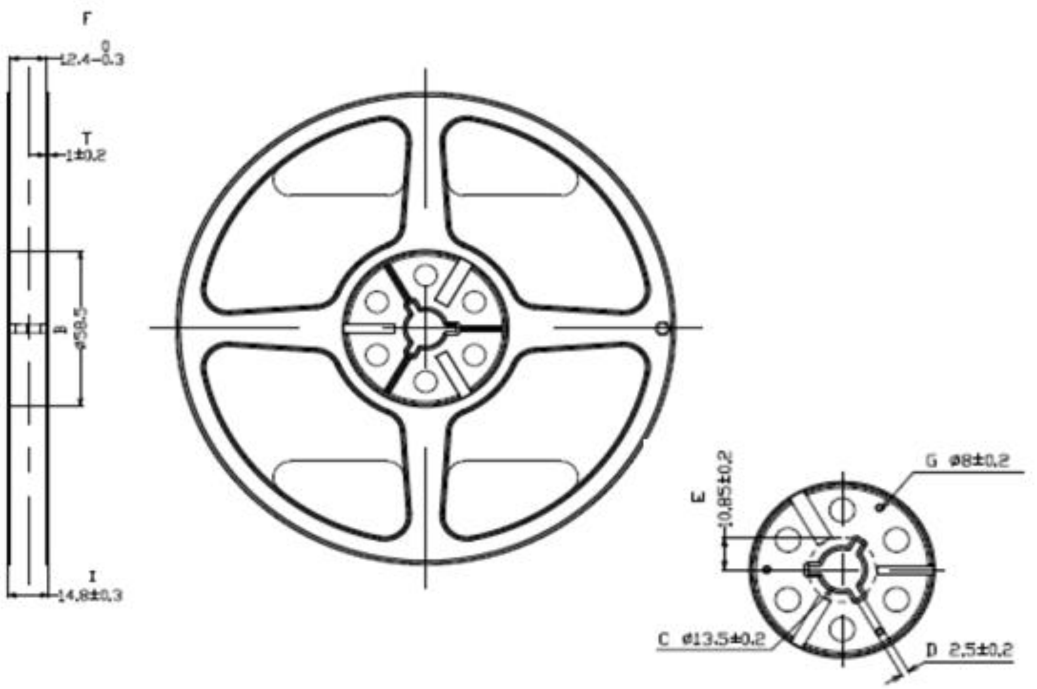
Caution

(1) Reflow soldering is recommended not to be done more than two times. In the case of more than 24 hours passed soldering after first, LEDs will be damaged.
(2) Repairs should not be done after the LEDs have been soldered. When repair is unavoidable, suitable tools must be used.
(3) Die slug is to be soldered.
(4) When soldering, do not put stress on the LEDs during heating.
(5) After soldering, do not warp the circuit board.

Emitter Tape & Reel Packaging



Symbol	W	T	K0	A0	B0	E
Dimension (mm)	12.00 ±0.10	0.30 ±0.30	0.95 ±0.10	5.30 ±0.10	5.30 ±0.10	1.75 ±0.10
Symbol	F	D0	D1	P0	P1	P2
Dimension (mm)	5.50 ±0.10	1.60 ±0.10	1.60 ±0.10	4.00 ±0.10	8.00 ±0.10	2.00 ±0.10



Notes :

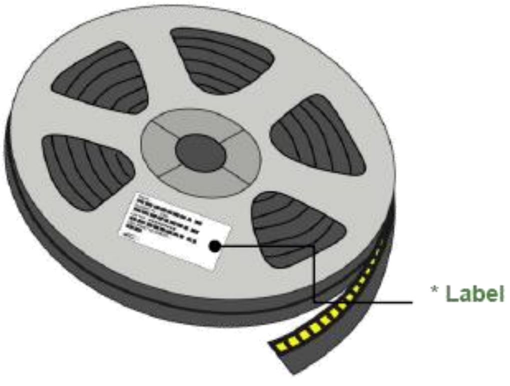
(1) Quantity : 7 inch reel type (1,000 pcs / Reel ± 1pcs)

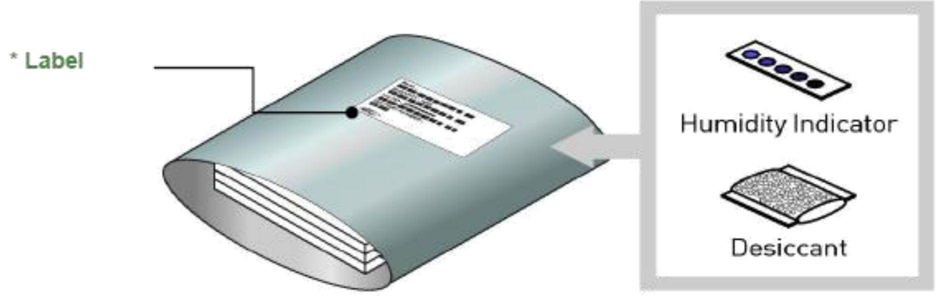
(2) Cumulative Tolerance : Cumulative Tolerance/10 pitches to be ±0.2mm

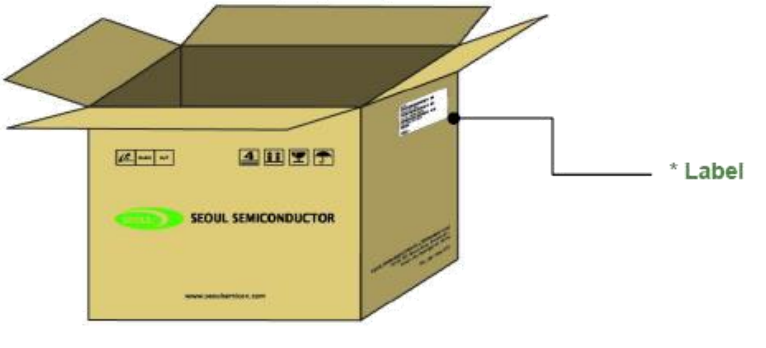
(3) Adhesion Strength of Cover Tape : Adhesion strength to be 0.1-0.7N when the cover tape is turned off from the carrier tape at the angle of 10º to the carrier tape

(4) Package : P/N, Manufacturing data Code No. and quantity to be indicated on a damp proof Package.

Emitter Tape & Reel Packaging







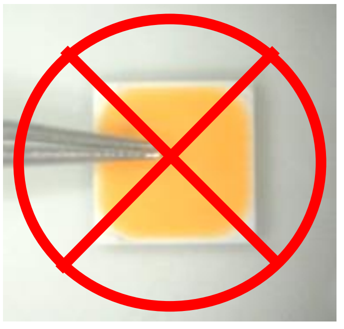
Product Nomenclature

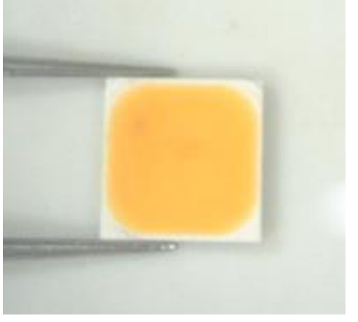
Table 8. Part Numbering System

Part Number Code	Description	Part Number	Value
X_1	Company	S	Seoul Semiconductor
X_2	Level of Integration	1	Discrete LED
X_3X_4	Technology	WM	White MJT
$X_5X_6X_7X_8$	Dimension	5050	5.0x5.0mm
X_9X_{10}	CCT	XX	65: 6500K 57: 5700K 50: 5000K 45: 4500K 40: 4000K 35: 3500K 30: 3000K 27: 2700K
$X_{11}X_{12}$	CRI	XX	70: CRI70 80: CRI80
$X_{13}X_{14}$	Vf	18	
$X_{15}X_{16}X_{17}$	Characteristic code Flux Rank	000	
$X_{18}X_{19}X_{20}$	Characteristic code Vf Rank	000	
$X_{21}X_{22}$	Characteristic code Color Step	00	
$X_{23}X_{24}$	Type	00	
$X_{25}X_{26}X_{27}$	Internal code	001	

Handling of Silicone Resin for LEDs

(1) During processing, mechanical stress on the surface should be minimized as much as possible. Sharp objects of all types should not be used to pierce the sealing compound.





(2) In general, LEDs should only be handled from the side. By the way, this also applies to LEDs without a silicone sealant, since the surface can also become scratched.

(3) When populating boards in SMT production, there are basically no restrictions regarding the form of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented. This is assured by choosing a pick and place nozzle which is larger than the LED's reflector area.

(4) Silicone differs from materials conventionally used for the manufacturing of LEDs. These conditions must be considered during the handling of such devices. Compared to standard encapsulants, silicone is generally softer, and the surface is more likely to attract dust.

As mentioned previously, the increased sensitivity to dust requires special care during processing. In cases where a minimal level of dirt and dust particles cannot be guaranteed, a suitable cleaning solution must be applied to the surface after the soldering of components.

(5) SSC suggests using isopropyl alcohol for cleaning. In case other solvents are used, it must be assured that these solvents do not dissolve the package or resin.
Ultrasonic cleaning is not recommended. Ultrasonic cleaning may cause damage to the LED.

(6) Please do not mold this product into another resin (epoxy, urethane, etc) and do not handle this. product with acid or sulfur material in sealed space.

Precaution for Use

(1) Storage

To avoid the moisture penetration, we recommend store in a dry box with a desiccant . The recommended storage temperature range is 5℃ to 30℃ and a maximum humidity of RH50%.

(2) Use Precaution after Opening the Packaging

Use SMT techniques properly when you solder the LED as separation of the lens may affect the light output efficiency.

Pay attention to the following:

a. Recommend conditions after opening the package

- Sealing / Temperature : 5 ~ 40℃ Humidity : less than RH30%

b. If the package has been opened more than 4 week(MSL_2a) or the color of the desiccant changes, components should be dried for 10-12hr at 60±5℃

(3) Do not apply mechanical force or excess vibration during the cooling process to normal temperature after soldering.

(4) Do not rapidly cool device after soldering.

(5) Components should not be mounted on warped (non coplanar) portion of PCB.

(6) Radioactive exposure is not considered for the products listed here in.

(7) Gallium arsenide is used in some of the products listed in this publication. These products are dangerous if they are burned or shredded in the process of disposal. It is also dangerous to drink the liquid or inhale the gas generated by such products when chemically disposed of.

(8) This device should not be used in any type of fluid such as water, oil, organic solvent and etc. When washing is required, IPA (Isopropyl Alcohol) should be used.

(9) When the LEDs are in operation the maximum current should be decided after measuring the package temperature.

(10) LEDs must be stored properly to maintain the device. If the LEDs are stored for 3 months or more after being shipped from Seoul Semiconductor. A sealed container with a nitrogen atmosphere should be used for storage.

(11) The appearance and specifications of the product may be modified for improvement without notice.

(12) Long time exposure of sunlight or occasional UV exposure will cause lens discoloration.

Precaution for Use

(13) VOCs (Volatile organic compounds) emitted from materials used in the construction of fixtures can penetrate silicone encapsulants of LEDs and discolor when exposed to heat and photonic energy. The result can be a significant loss of light output from the fixture. Knowledge of the properties of the materials selected to be used in the construction of fixtures can help prevent these issues.

(14) Attaching LEDs, do not use adhesives that outgas organic vapor.

(15) The driving circuit must be designed to allow forward voltage only when it is ON or OFF. If the reverse voltage is applied to LED, migration can be generated resulting in LED damage.

(16) LEDs are sensitive to Electro-Static Discharge (ESD) and Electrical Over Stress (EOS). Below is a list of suggestions that Seoul Semiconductor purposes to minimize these effects.

a. ESD (Electro Static Discharge)

Electrostatic discharge (ESD) is the defined as the release of static electricity when two objects come into contact. While most ESD events are considered harmless, it can be an expensive problem in many industrial environments during production and storage. The damage from ESD to an LEDs may cause the product to demonstrate unusual characteristics such as:

- Increase in reverse leakage current lowered turn-on voltage
- Abnormal emissions from the LED at low current

The following recommendations are suggested to help minimize the potential for an ESD event.
One or more recommended work area suggestions:

- Ionizing fan setup
- ESD table/shelf mat made of conductive materials
- ESD safe storage containers

One or more personnel suggestion options:
- Antistatic wrist-strap
- Antistatic material shoes
- Antistatic clothes

Environmental controls:
- Humidity control (ESD gets worse in a dry environment)

Precaution for Use

b. EOS (Electrical Over Stress)

Electrical Over-Stress (EOS) is defined as damage that may occur when an electronic device is subjected to a current or voltage that is beyond the maximum specification limits of the device. The effects from an EOS event can be noticed through product performance like:

- Changes to the performance of the LED package
  (If the damage is around the bond pad area and since the package is completely encapsulated the package may turn on but flicker show severe performance degradation.)
- Changes to the light output of the luminaire from component failure
- Components on the board not operating at determined drive power

Failure of performance from entire fixture due to changes in circuit voltage and current across total circuit causing trickle down failures. It is impossible to predict the failure mode of every LED exposed to electrical overstress as the failure modes have been investigated to vary, but there are some common signs that will indicate an EOS event has occurred:

- Damaged may be noticed to the bond wires (appearing similar to a blown fuse)
- Damage to the bond pads located on the emission surface of the LED package
  (shadowing can be noticed around the bond pads while viewing through a microscope)
- Anomalies noticed in the encapsulation and phosphor around the bond wires.
- This damage usually appears due to the thermal stress produced during the EOS event.

c. To help minimize the damage from an EOS event Seoul Semiconductor recommends utilizing:

- A surge protection circuit
- An appropriately rated over voltage protection device
- A current limiting device

Company Information

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Company Information

Seoul Semiconductor (www.SeoulSemicon.com) manufacturers and packages a wide selection of light emitting diodes (LEDs) for the automotive, general illumination/lighting, Home appliance, signage and back lighting markets. The company is the world's fifth largest LED supplier, holding more than 10,000 patents globally, while offering a wide range of LED technology and production capacity in areas such as “nPola”, "Acrich", the world's first commercially produced AC LED, and "Acrich MJT - Multi-Junction Technology" a proprietary family of high-voltage LEDs.

The company's broad product portfolio includes a wide array of package and device choices such as Acrich and Acirch2, high-brightness LEDs, mid-power LEDs, side-view LEDs, and through-hole type LEDs as well as custom modules, displays, and sensors.

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