Superior high Flux for High Voltage System

Acrich MJT– 5050 Series

SAW0L60A (Cool, Neutral, Warm)

LM-80 RoHS

Product Brief

Description

- This White Colored surface-mount LED comes in standard package dimension. Package Size : 5.0x5.0x0.7mm
- 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
- SMT solderable
- RoHS compliant
- Sulfur-resistant

Key Applications

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

Table 1. Product Selection Table

Part Number	CCT				CRI
	Color	Min.	Typ.	Max.	
SAW0L60A	Cool White	4700K	5600K	7000K	70
	Neutral White	3700K	4200K	4700K	70
	Warm White	2600K	3000K	3700K	70

Table of Contents

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) [3]	$Φ_V$[2]	-	200	-	lm
Luminous Flux[1] (3000K) [3]		-	195	-	
Correlated Color Temperature [3]	CCT	2,700	-	7,000	K
CRI[4]	Ra	70	-	80	-
PPF [5] (5000K)	Φp	-	2.49	-	μmol/s
PPF [5] (3000K)		-	2.46	-	μmol/s
PPE [6] (5000K)	K_P	-	2.51	-	μmol/J
PPE [6] (3000K)		-	2.49	-	μmol/J
Viewing Angle	2Θ1/2	-	120	-	deg.
Thermal resistance (J to S) [7]	$Rθ_{j-s}$	-	1.8	-	K/W
ESD Sensitivity(HBM)	-	Class2 JESD22-A114E			

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

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	10 … 320	mA
Power Dissipation	P_D	6.0	W
Junction Temperature	T_j	125	ºC
Operating Temperature	T_{opr}	-40 ~ + 100	ºC
Storage Temperature	T_{stg}	-40 ~ + 100	ºC

(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) Photosynthetic Photon Flux (PPF) includes wavelengths between 400 and 700nm.
(6) Photosynthetic Photon Efficacy (PPE) includes wavelengths between 400 and 700nm.
(7) Thermal resistance: Rth_{JS} (Junction to Solder)

- Calculated performance values are for reference only.
- All measurements were made under the standardized environment of Seoul Semiconductor.
- 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. Color Spectrum, T_j=25℃, I_F=60mA

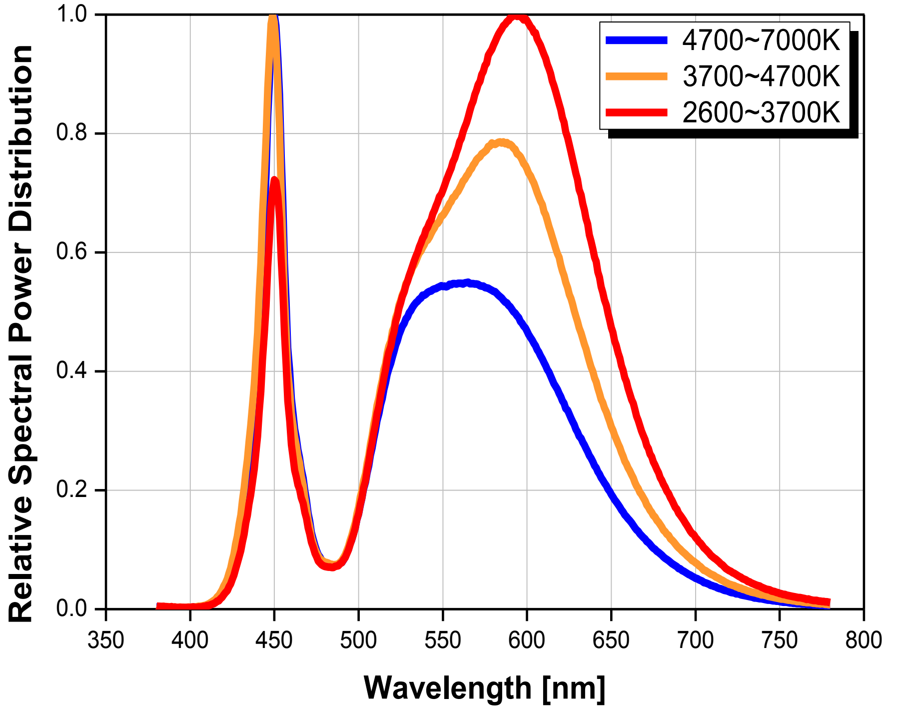
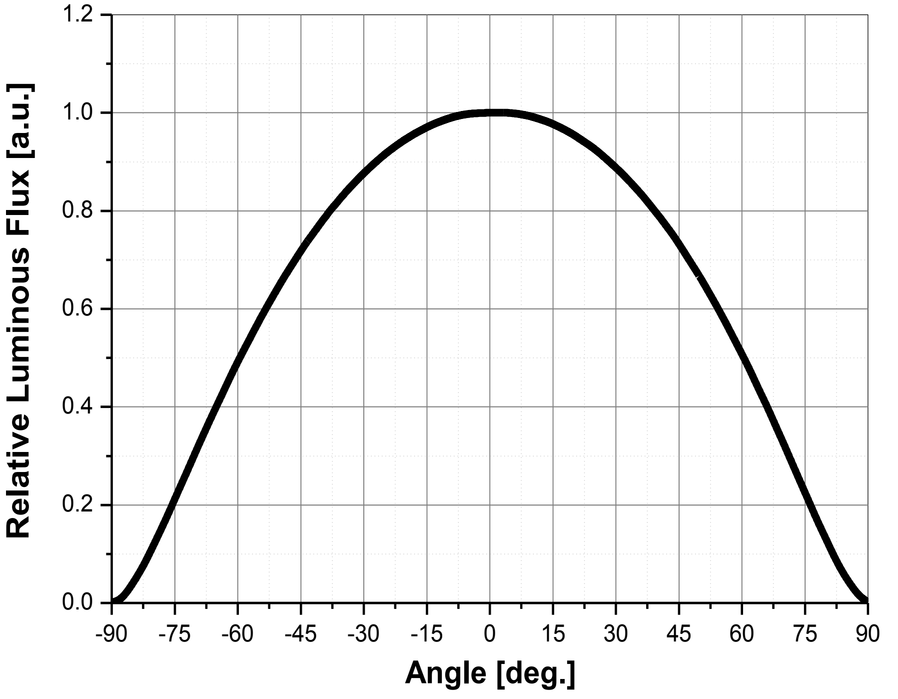


Fig 2. Radiant pattern, T_j=25℃, I_F=60mA



Characteristics Graph

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

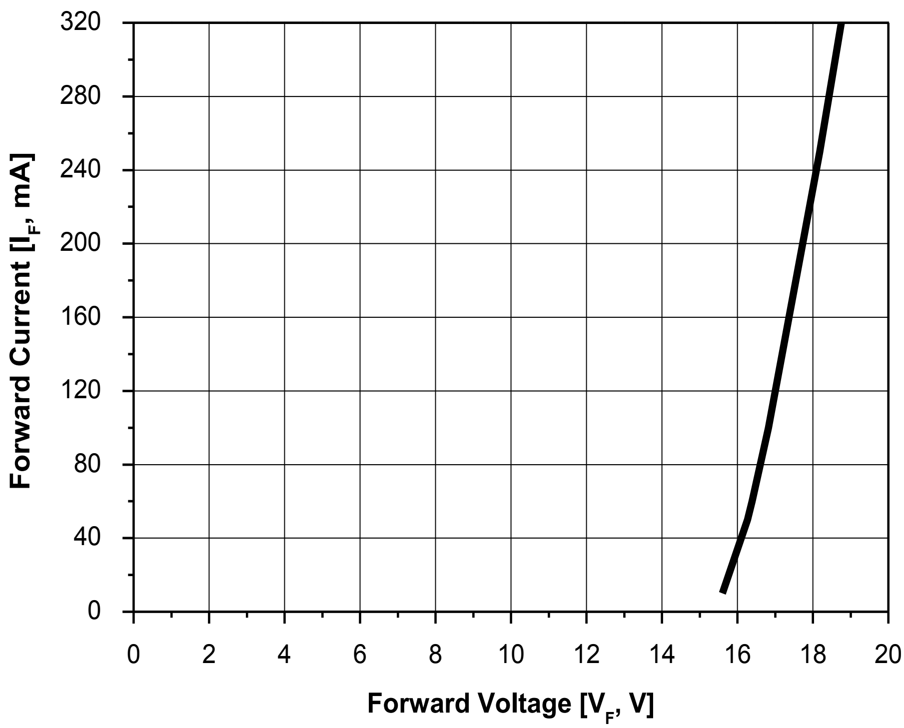
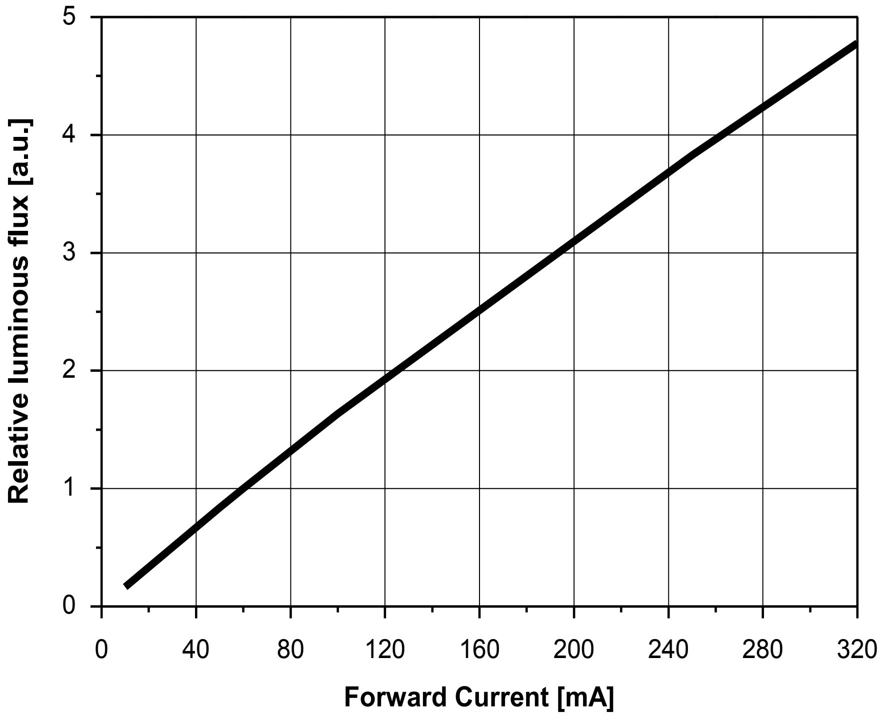
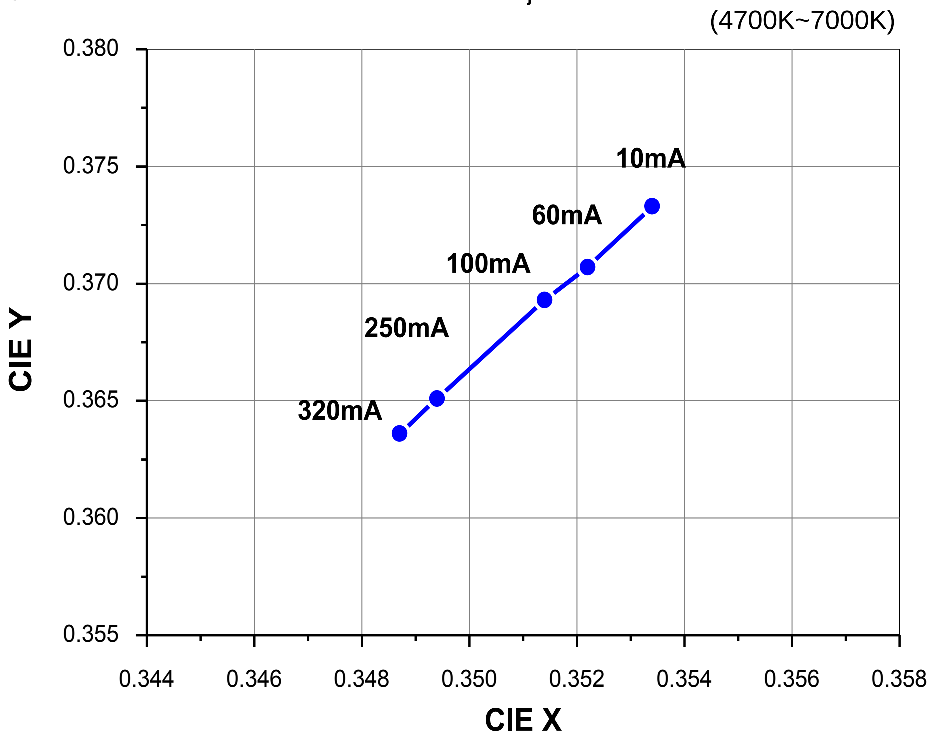


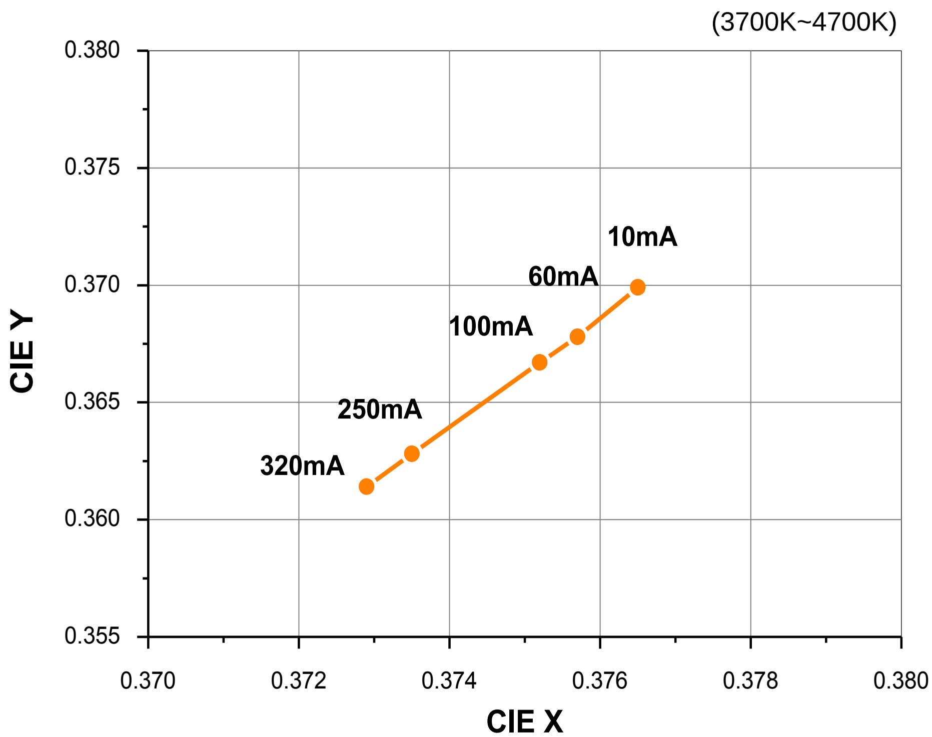
Fig 4. Forward Current vs. Relative Luminous Flux, T_j=25℃



Characteristics Graph

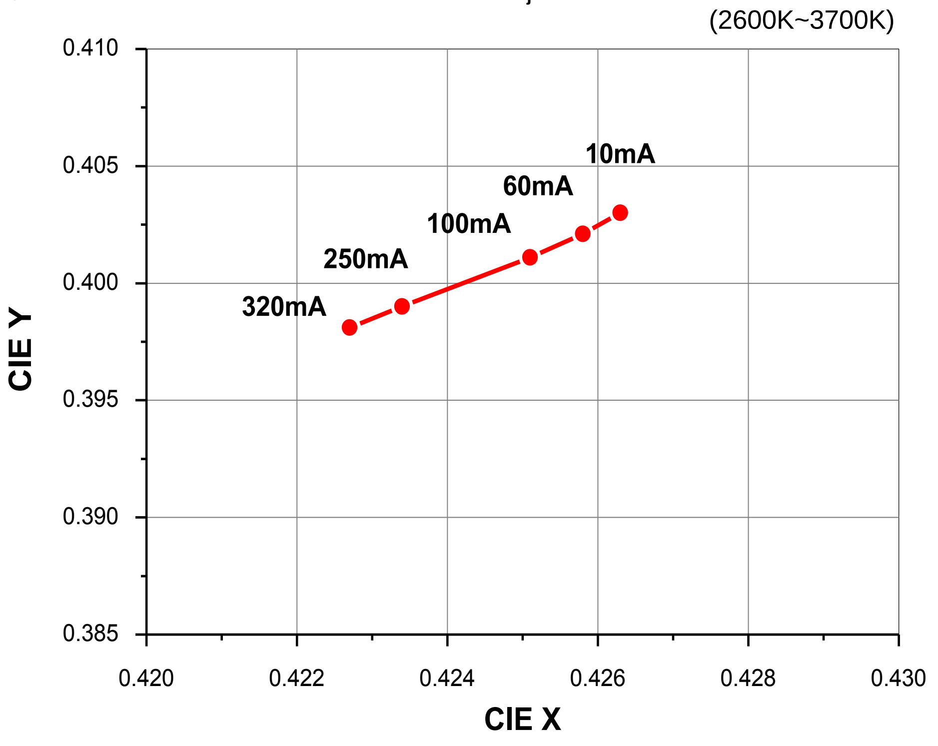
Fig 5. Forward Current vs. CIE X, Y Shift , T_j=25℃





Characteristics Graph

Fig 5. Forward Current vs. CIE X, Y Shift , T_j=25℃



Characteristics Graph

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

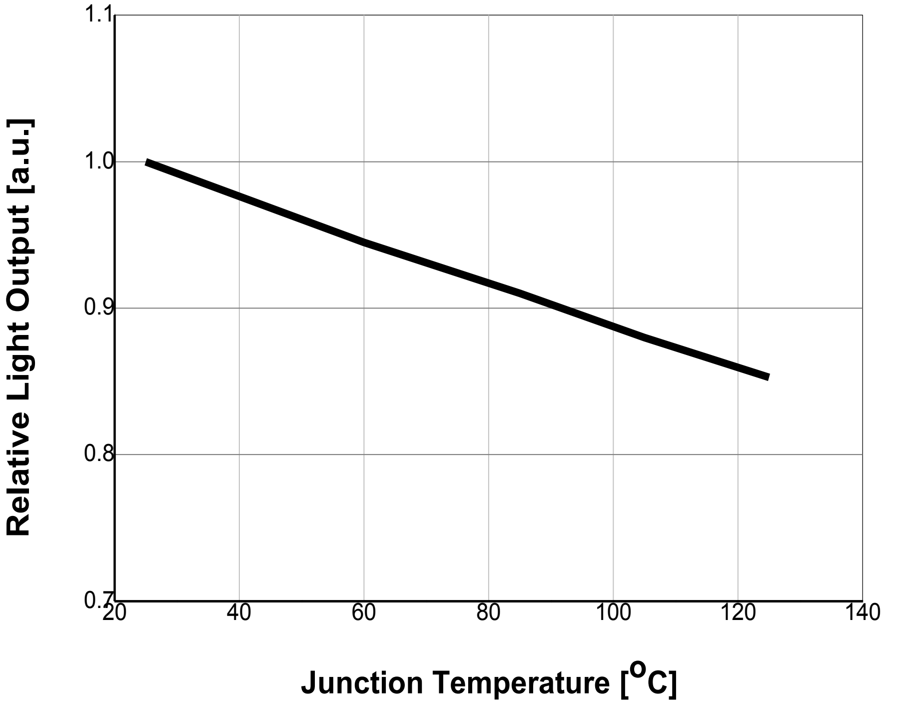
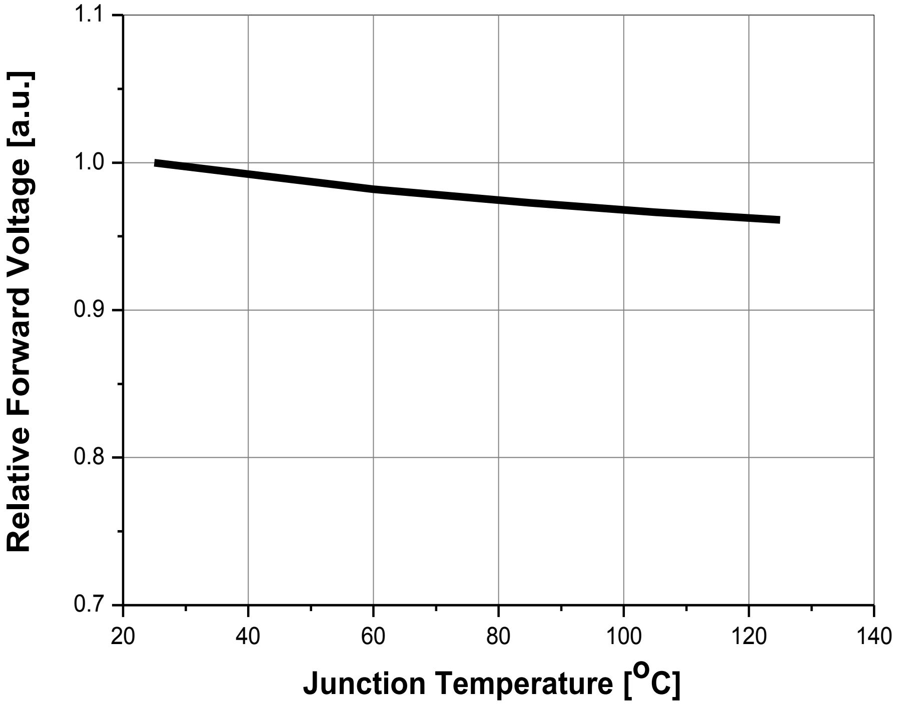
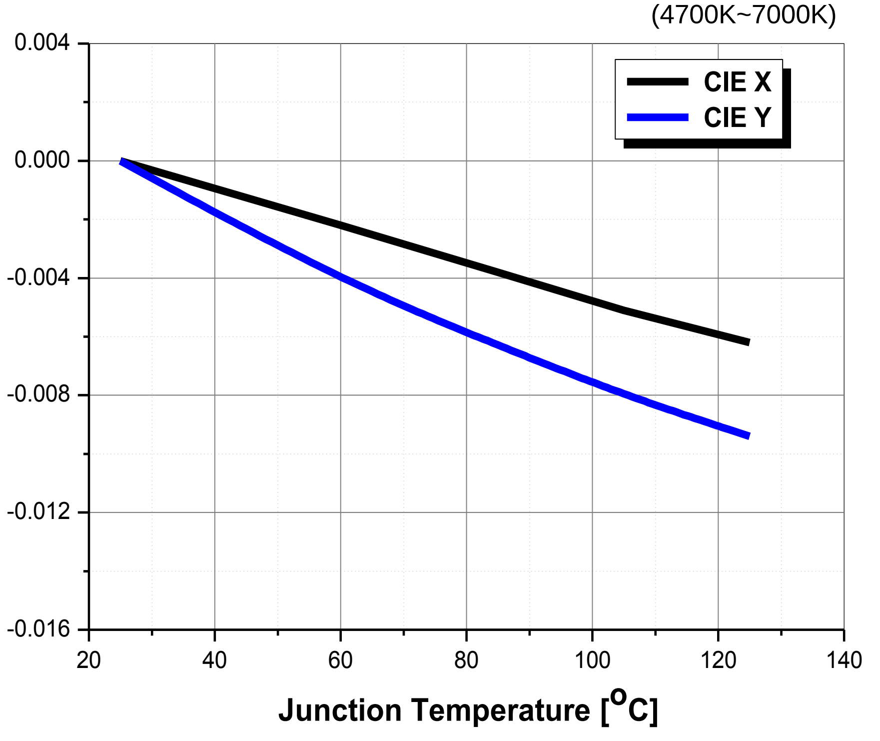


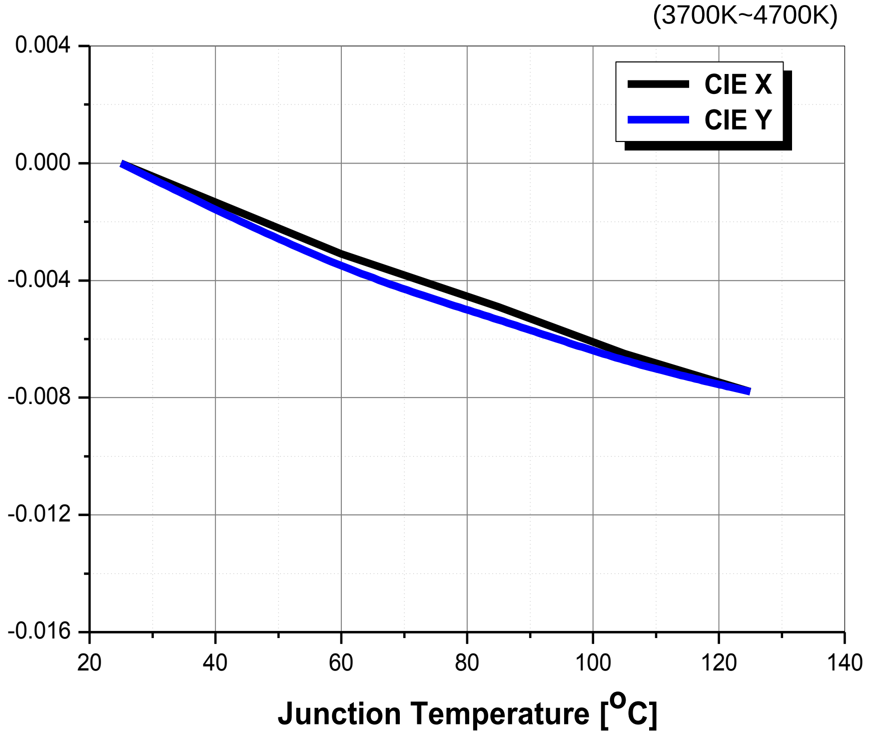
Fig 7. Relative Forward Voltage vs. Junction Temperature, I_F=60mA



Characteristics Graph

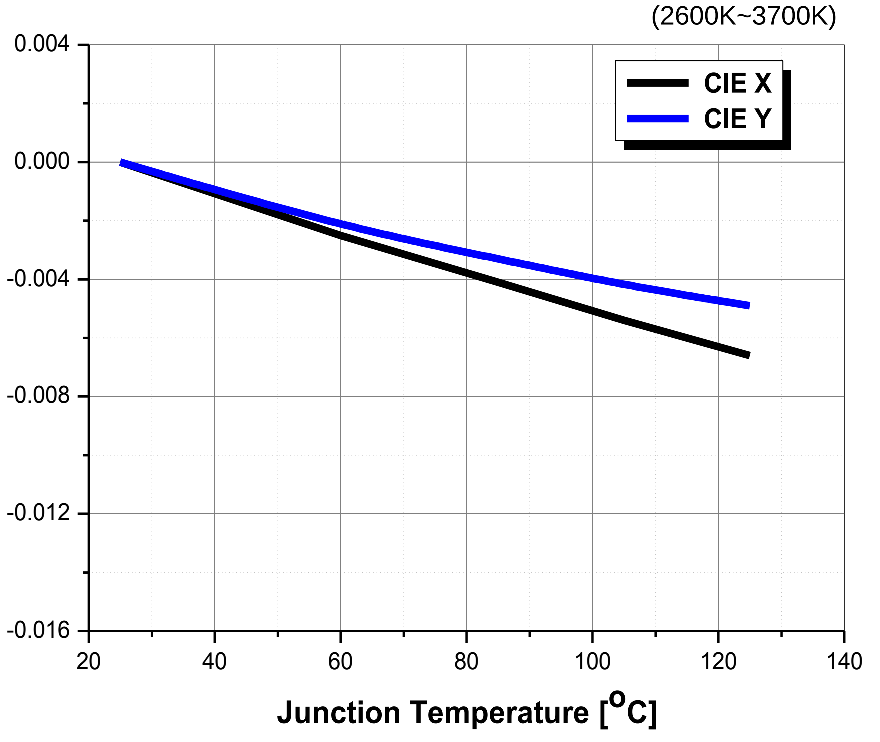
Fig 8. Junction Temp. vs. CIE X, Y Shift, I_F=60mA





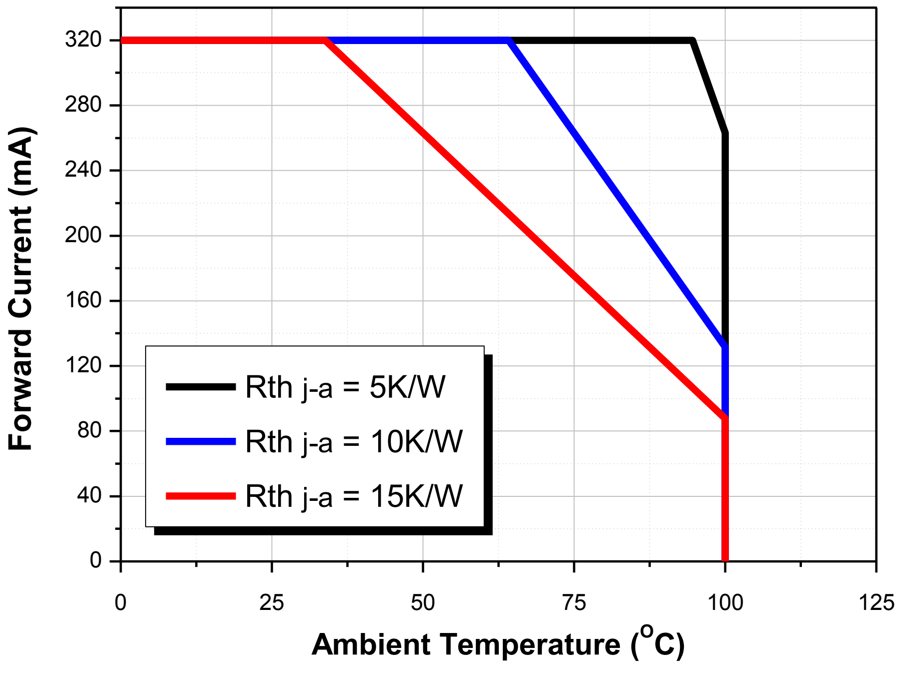
Characteristics Graph

Fig 8. Junction Temp. vs. CIE X, Y Shift, I_F=60mA



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.
SAW0L60A	W2	171	186	Refer to page.13~16	Z	15.0	16.0
	X1	186	202		A	16.0	17.0
	X2	202	217		B	17.0	18.0

Table 6. Luminous Flux rank distribution

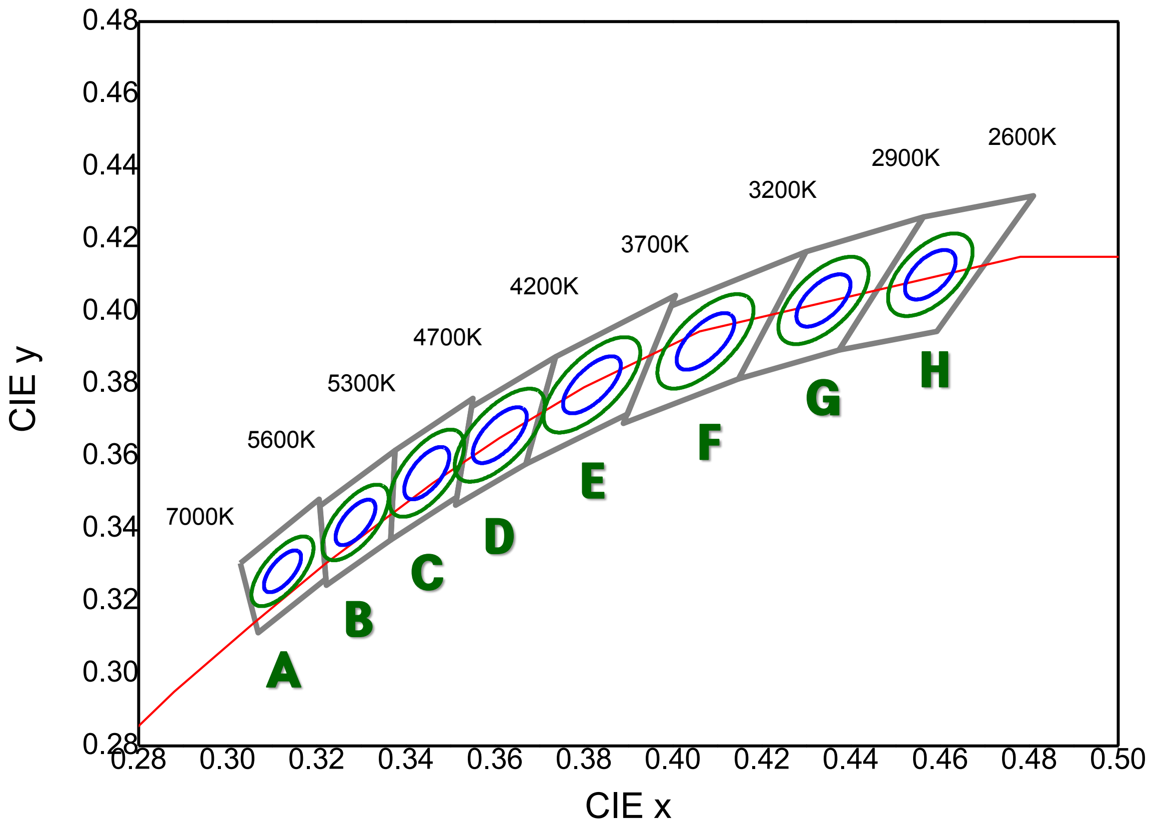
CCT	CIE	Flux Rank		
7000 ~ 6000K	A	W2	X1	X2
6000 ~ 5300K	B	W2	X1	X2
5300 ~ 4700K	C	W2	X1	X2
4700 ~ 4200K	D	W2	X1	X2
4200 ~ 3700K	E	W2	X1	X2
3700 ~ 3200K	F	W2	X1	X2
3200 ~ 2900K	G	W2	X1	X2
2900 ~ 2600K	H	W2	X1	X2

Available ranks
Not yet available ranks

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

Color Bin Structure

CIE Chromaticity Diagram T_j=25℃, I_F=60mA

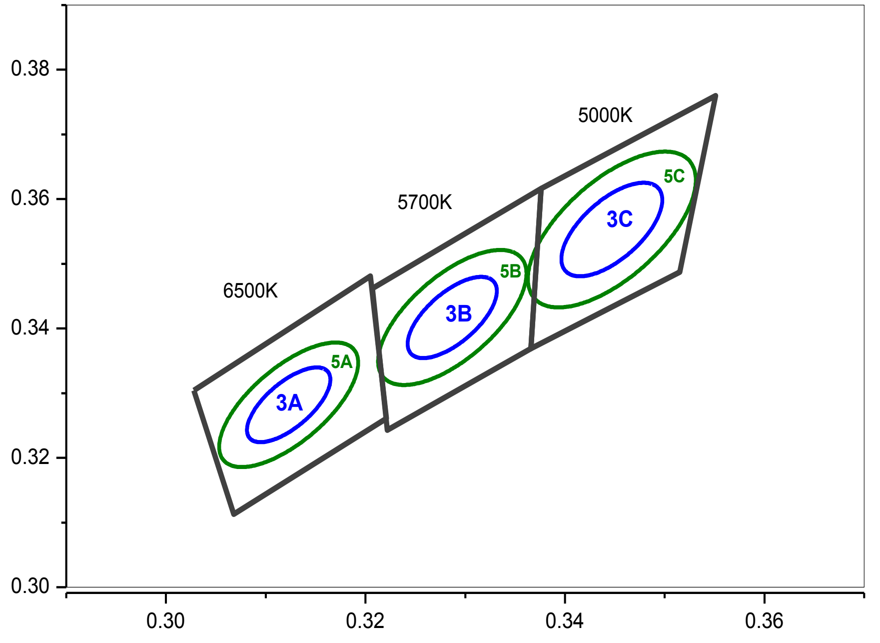


***Notes :**

- Energy Star binning applied to all 2600~7000K.
- Measurement Uncertainty of the Color Coordinates : ± 0.005

Color Bin Structure

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



6500K 3Step

3A	
Center point	0.3123 : 0.3282
Major Axis a	0.0066
Minor Axis b	0.0027
Ellipse Rotation Angle	58

5700K 3Step

3B	
Center point	0.3287 : 0.3417
Major Axis a	0.0071
Minor Axis b	0.003
Ellipse Rotation Angle	59

5000K 3Step

3C	
Center point	0.3447 : 0.3553
Major Axis a	0.0081
Minor Axis b	0.0035
Ellipse Rotation Angle	60

6500K 5Step

5A	
Center point	0.3123 : 0.3282
Major Axis a	0.0110
Minor Axis b	0.0045
Ellipse Rotation Angle	58

5700K 5Step

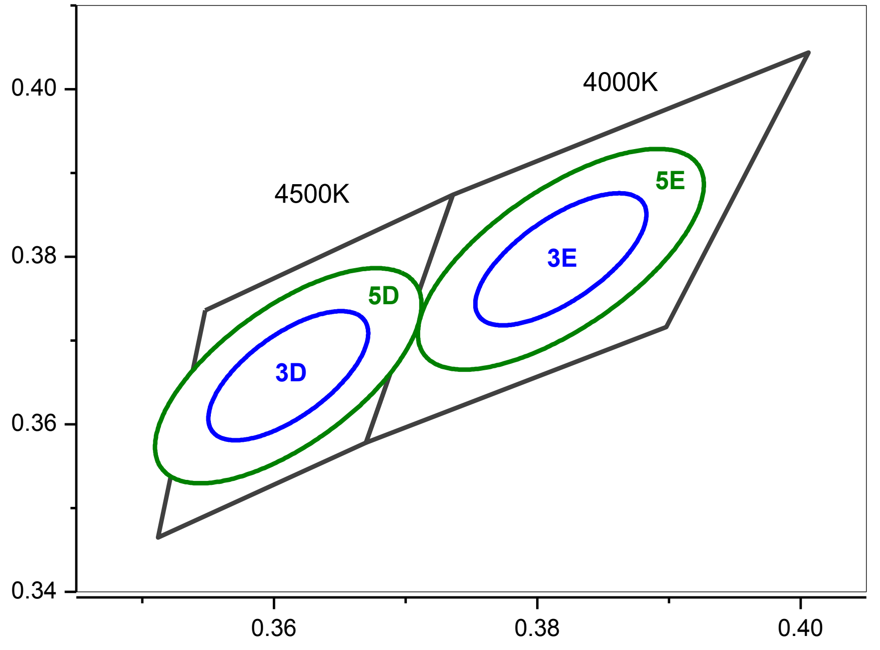
5B	
Center point	0.3287 : 0.3417
Major Axis a	0.0118
Minor Axis b	0.0050
Ellipse Rotation Angle	59

5000K 5Step

5C	
Center point	0.3447 : 0.3553
Major Axis a	0.0135
Minor Axis b	0.0058
Ellipse Rotation Angle	60

Color Bin Structure

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



4500K 3Step

3D	
Center point	0.3611 : 0.3658
Major Axis a	0.00900
Minor Axis b	0.00390
Ellipse Rotation Angle	55

4000K 3Step

3E	
Center point	0.3818 : 0.3797
Major Axis a	0.00940
Minor Axis b	0.00400
Ellipse Rotation Angle	53

4500K 5Step

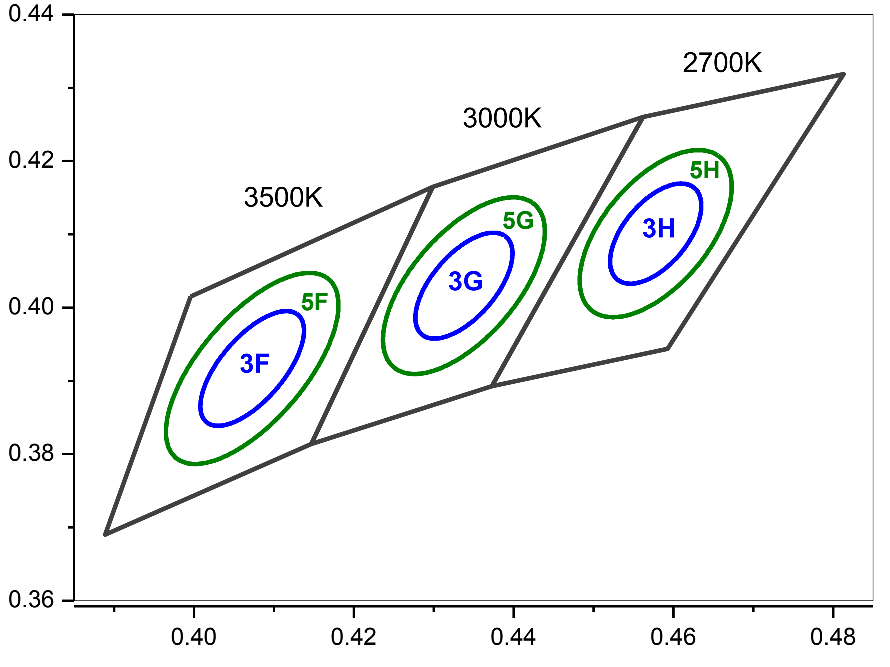
5D	
Center point	0.3611 : 0.3658
Major Axis a	0.0150
Minor Axis b	0.0065
Ellipse Rotation Angle	55

4000K 5Step

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

Color Bin Structure

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



3500K 3Step

3F	
Center point	0.4073 : 0.3917
Major Axis a	0.0093
Minor Axis b	0.0041
Ellipse Rotation Angle	53

3000K 3Step

3G	
Center point	0.4338 : 0.4030
Major Axis a	0.0085
Minor Axis b	0.0041
Ellipse Rotation Angle	53

2700K 3Step

3H	
Center point	0.4578 : 0.4101
Major Axis a	0.0079
Minor Axis b	0.0041
Ellipse Rotation Angle	54

3500K 5Step

5F	
Center point	0.4073 : 0.3917
Major Axis a	0.0155
Minor Axis b	0.0068
Ellipse Rotation Angle	53

3000K 5Step

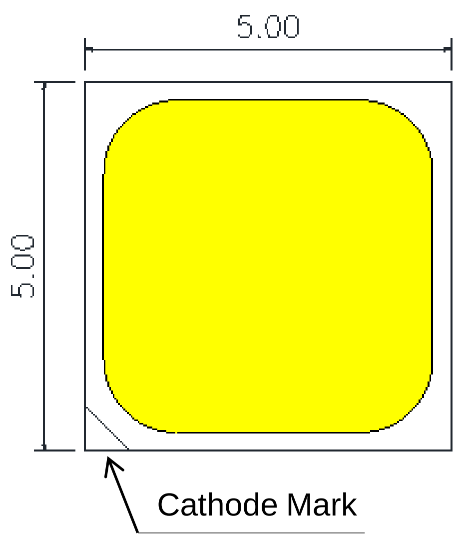
5G	
Center point	0.4338 : 0.4030
Major Axis a	0.0142
Minor Axis b	0.0068
Ellipse Rotation Angle	53

2700K 5Step

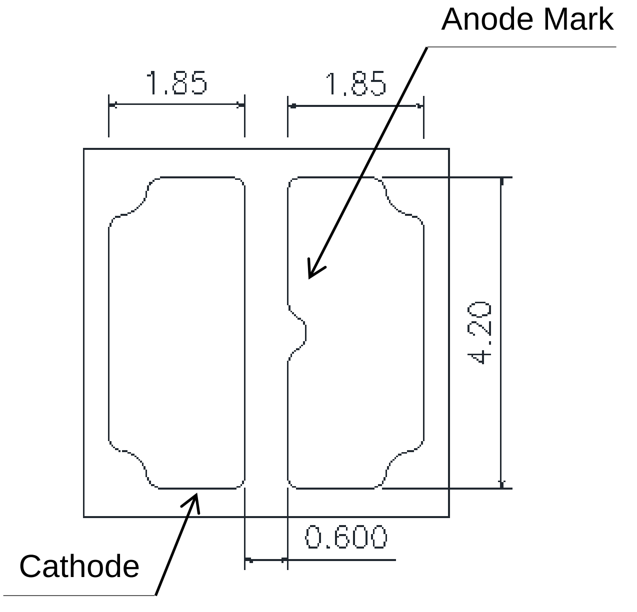
5H	
Center point	0.4578 : 0.4101
Major Axis a	0.0132
Minor Axis b	0.0068
Ellipse Rotation Angle	54

Mechanical Dimensions

< Top View >



< Bottom View >

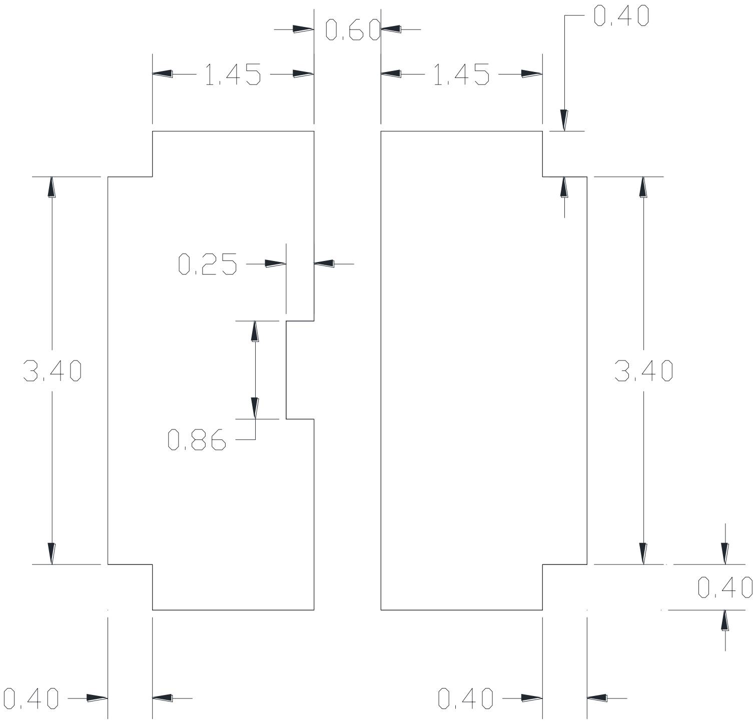


< Side view>

Notes :

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

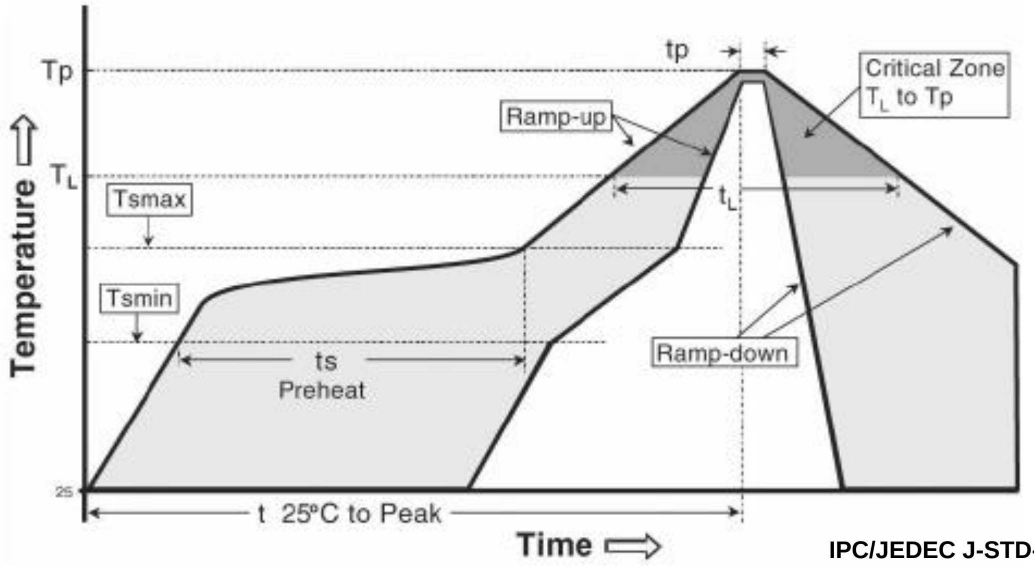
Recommended Solder Pad



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

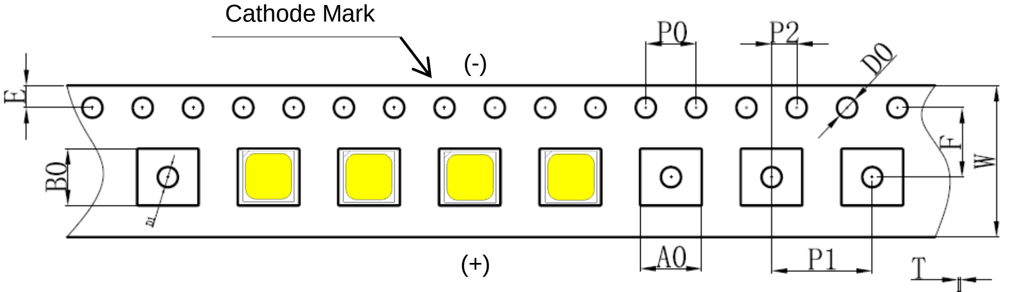
Table 7.

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.

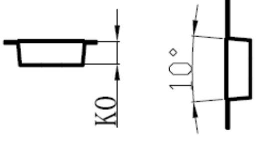
Caution

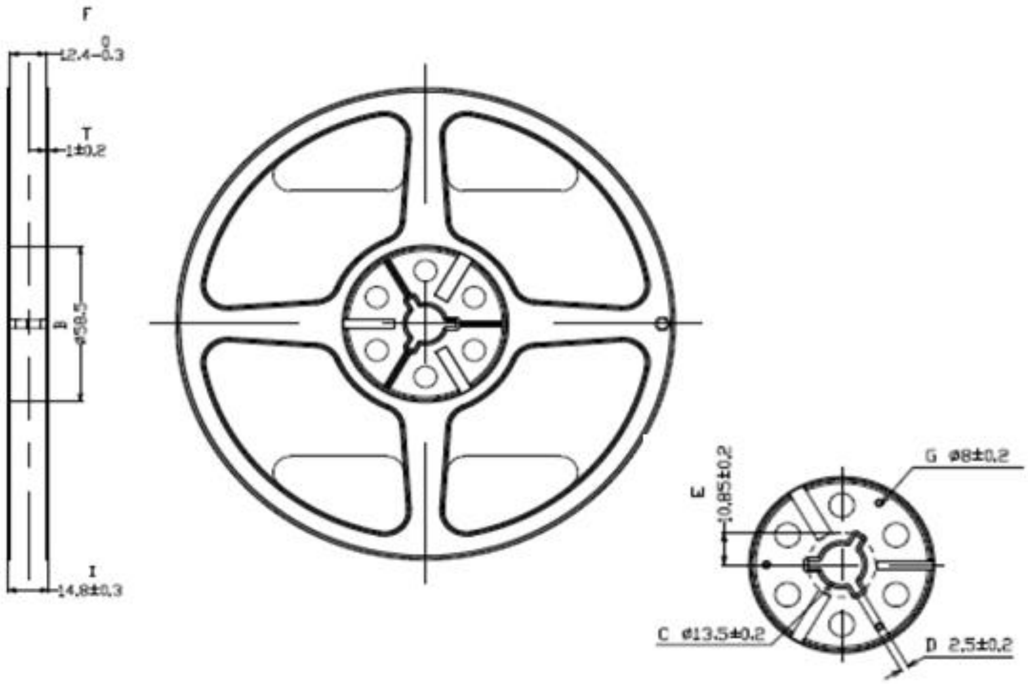
(1) Reflow soldering is recommended not to be done more than two times. In the case of more than 24 hours passed soldering after first, LEDs will be damaged.
(2) Repairs should not be done after the LEDs have been soldered. When repair is unavoidable, suitable tools must be used.
(3) Die slug is to be 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

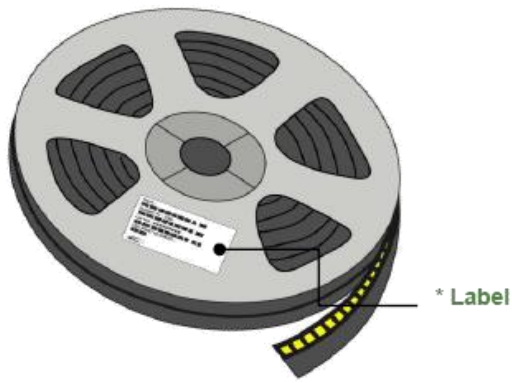


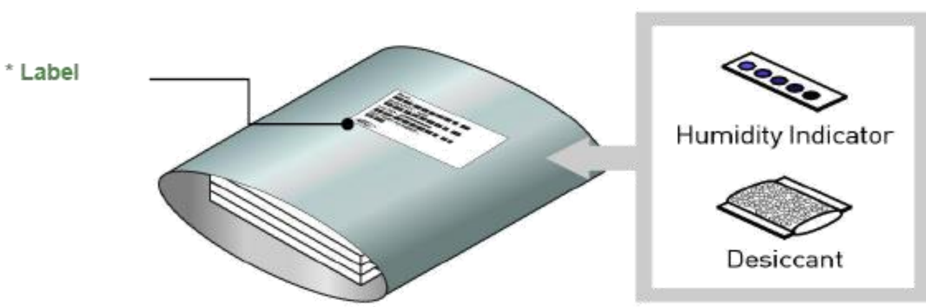


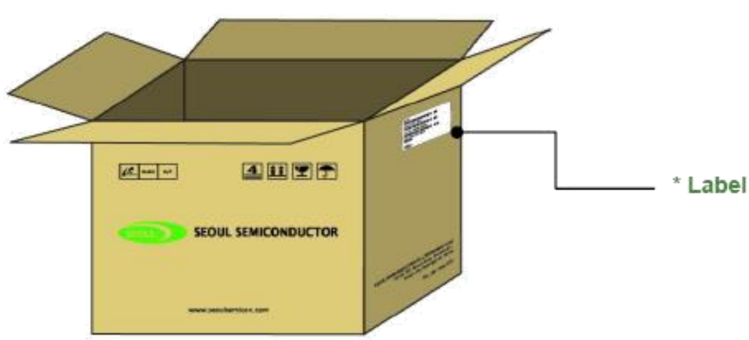
Notes :

(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 : $X_1X_2X_3X_4X_5X_6X_7X_8$

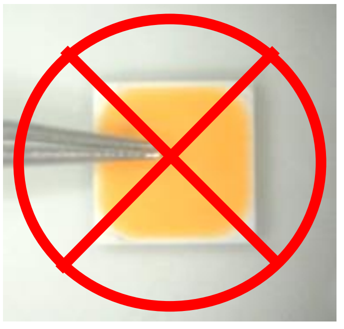
Part Number Code	Description	Part Number	Value
X_1	Company	S	SSC
X_2	Acrich LED series	A	Acrich LED
X_3X_4	Color Specification	W0	CRI70
X_5	Package series	L	L series
X_6	Chip	6	6 series
X_7	PCB type	0	Emitter
X_8	Revision	A	rev0

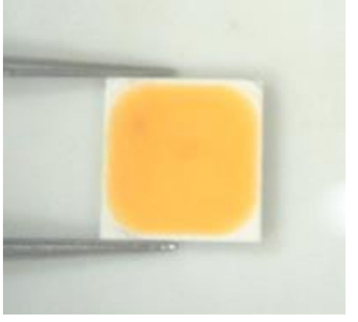
Table 9. Lot Numbering System :$Y_1Y_2Y_3Y_4Y_5Y_6Y_7Y_8Y_9Y_{10}–Y_{11}Y_{12}Y_{13}Y_{14}Y_{15}Y_{16}Y_{17}$

Lot Number Code	Description	Lot Number	Value
Y_1Y_2	Year		
Y_3	Month		
Y_4Y_5	Day		
Y_6	Top View LED series		
$Y_7Y_8Y_9Y_{10}$	Mass order		
$Y_{11}Y_{12}Y_{13}Y_{14}Y_{15}Y_{16}Y_{17}$	Internal Number		

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) The slug is electrically isolated.

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

(16) 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.

(17) 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

Published by

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.

Legal Disclaimer

Information in this document is provided in connection with Seoul Semiconductor products. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Seoul Semiconductor hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party. The appearance and specifications of the product can be changed to improve the quality and/or performance without notice.