

Enable High Flux and Cost Efficient System

Z Power Chip on board – ZC series

SAW81F1D



Product Brief

Description

- The ZC series are LED arrays which provide High Flux and High Efficacy.
- Especially it is designed for easy assembly of lighting fixtures by eliminating reflow soldering process.
- It's thermal management is better than other power LED solutions with wide Metal area.
- ZC series are ideal light sources for general lighting applications including Replacement Lamps, Industrial & Commercial Lightings and other high lumen required applications.

Features and Benefits

- Size 10.8mm * 10.8mm
- Power dissipation 3.7W
- ErP 6-step binning
- High Color quality with CRI Min.80(R9>0)
- Uniformed Shadow
- Excellent Thermal management
- RoHS compliant

Key Applications

- Replacement Lamps – Bulb, MR16, PAR
- Commercial – Downlight
- Residential

Table 1. Product Selection Table

Part Number	CCT [K]			
	Color	Min.	Typ.	Max.
SAW81F1D	Cool White	4,700K	5,600K	7,000K
	Neutral White	3,700K	4,200K	4,700K
	Warm White	2,600K	3,000K	3,700K

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Performance Characteristics

Table 2. Electro Optical Characteristics, $I_F=20mA$

Part Number	CCT (K) ^[1]	Typical Luminous Flux ^[2] Φ_v ^[3] [lm]		Typical Forward Voltage [V]		CRI ^[5] , R_a	Viewing Angle [degrees] $2\theta_{1/2}$
	Typ.	T _j =25 °C	T _j =85 °C	T _j =25 °C	T _j =85 °C	Min.	Typ.
SAW81F1D	6500	485	439	185	175	80	120
	4000	510	462			80	120
	3000	475	430			80	120

Notes for Table 2:

1. Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram. Color coordinate(x, y) : ± 0.005 , CCT $\pm 5\%$ tolerance.
2. Seoul Semiconductor maintains a tolerance of $\pm 5\%$ on flux and power measurements.
3. Φ_v is the total luminous flux output as measured with an integrating sphere.
4. Tolerance is $\pm 3\%$ on forward voltage measurements.
5. Tolerance is ± 2 on CRI measurements.

* No values are provided by real measurement. Only for reference purpose.

Performance Characteristics

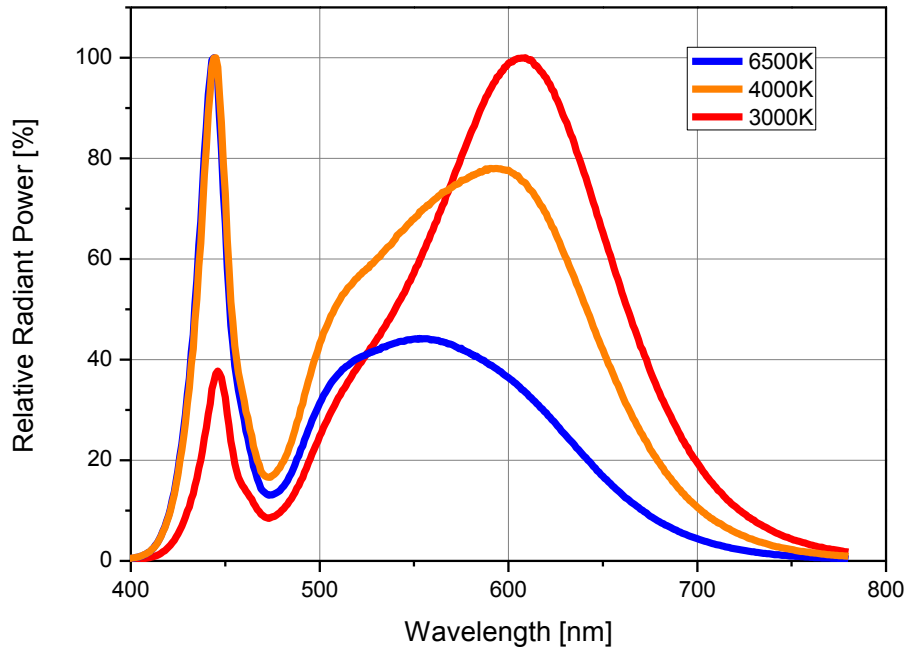
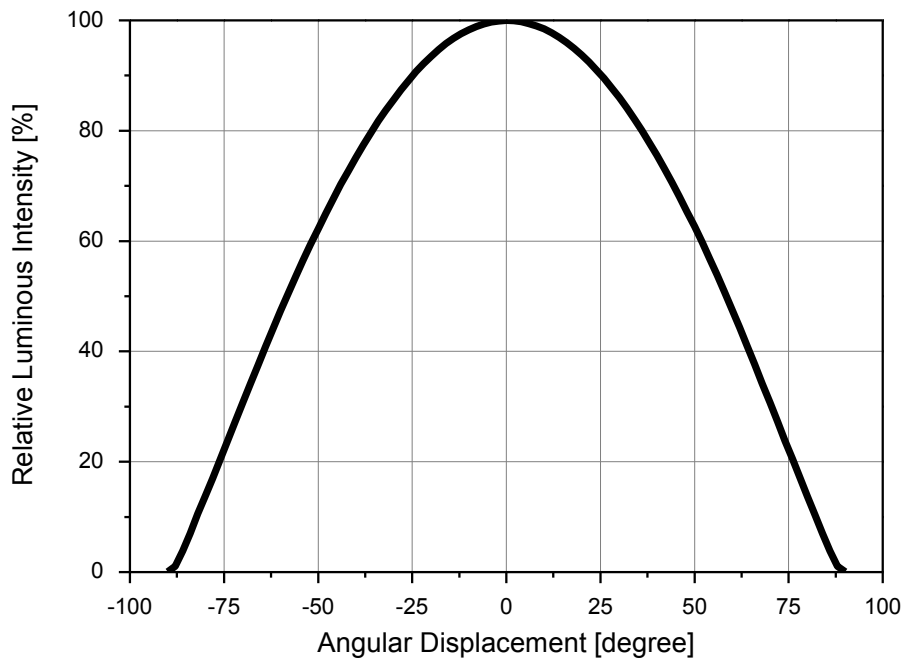
Table 3. Absolute Maximum Characteristics, $T_j=25^{\circ}\text{C}$

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Forward Current	I_F	-	20	40	mA
Power Dissipation	P_d	-	3.7	7.6	W
Junction Temperature ^[1]	T_j	-	-	125	$^{\circ}\text{C}$
Operating Temperature	T_{opr}	-40	-	85	$^{\circ}\text{C}$
Surface Temperature	T_s	-	-	100	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-40	-	100	$^{\circ}\text{C}$
Thermal resistance (J to S)	$R_{th_{JS}}$	-	2.9	-	K/W
ESD Sensitivity(HBM) ^[2]	-	Class 2A JESD22-A114-E			

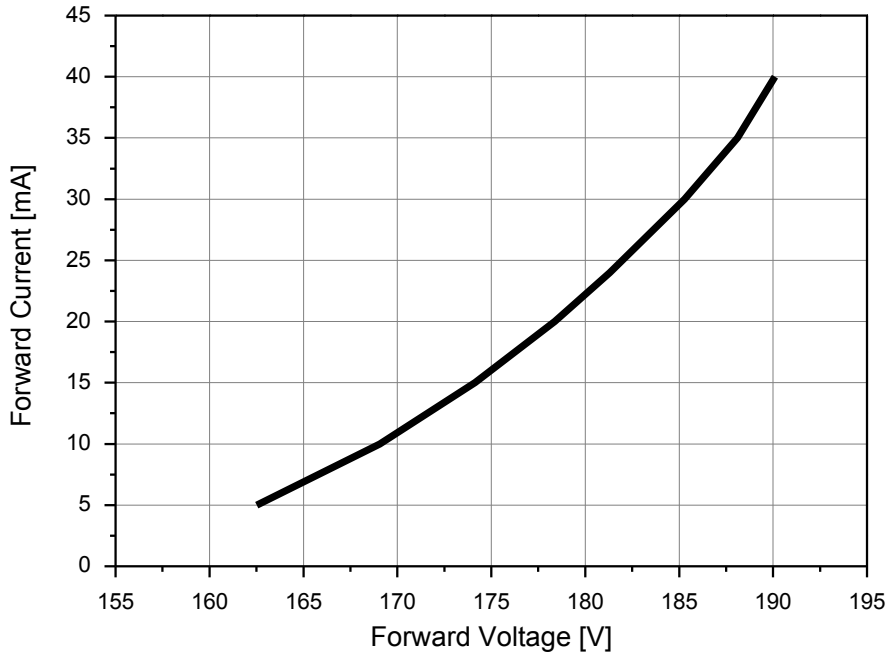
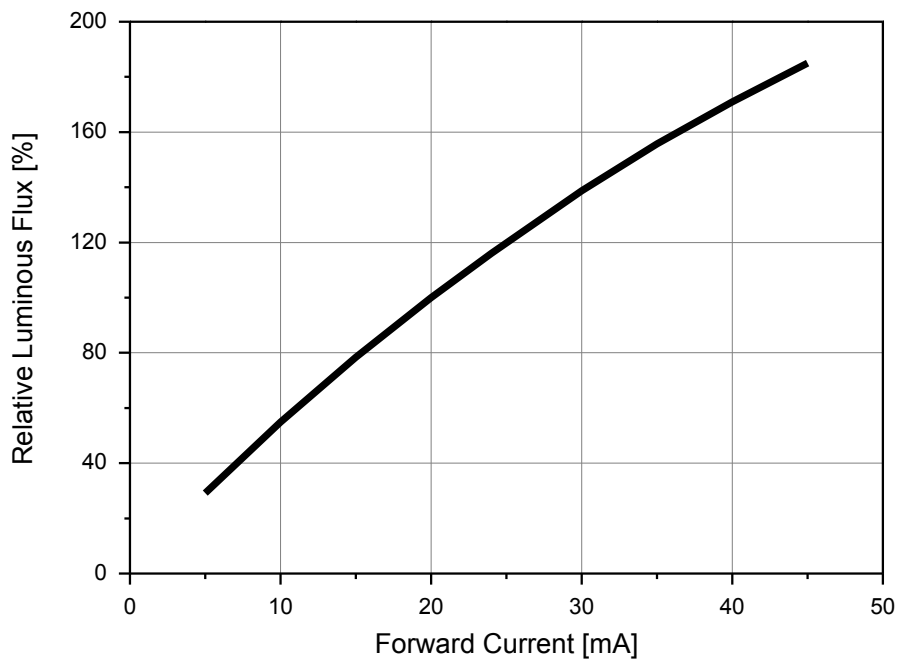
Notes for Table 3 :

1. At thermal Resistance, J to S means junction to COB's metal PCB bottom.
2. At ESD Sensitivity, Class 2 is voltage level between 2000V and 4000V.
3. Thermal resistance : $R_{th_{JS}}$ (Junction / solder)
 - LED's properties might be different from suggested values like above and below tables if operation condition will be exceeded our parameter range. Care is to be taken that power *dissipation does not* exceed the absolute maximum rating of the product.
 - Thermal resistance can be increased substantially depending on the heat sink design/operating condition, and the maximum possible driving current will decrease accordingly.
 - All measurements were made under the standardized environment of Seoul Semiconductor.

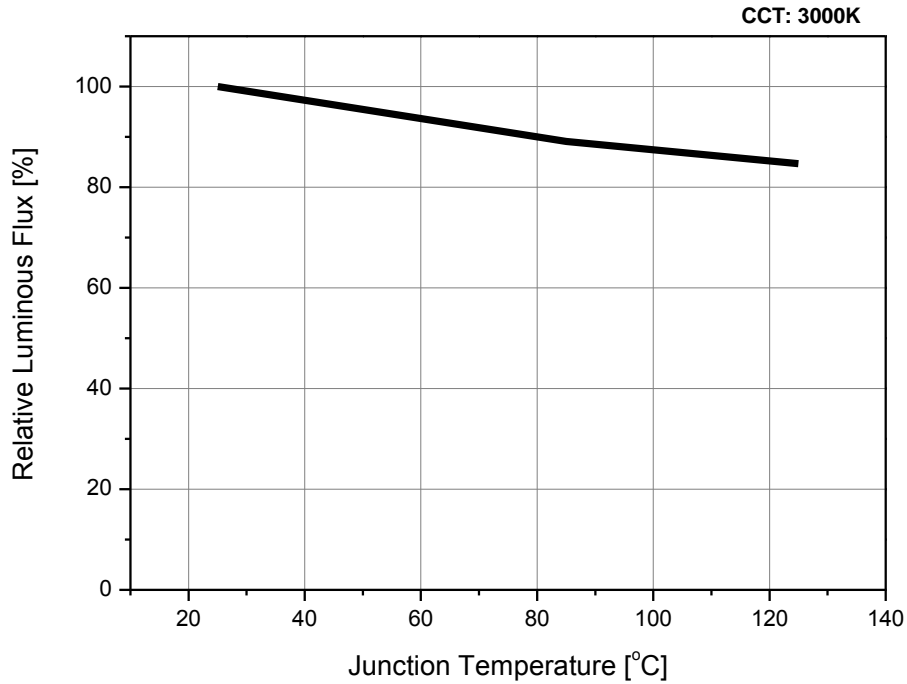
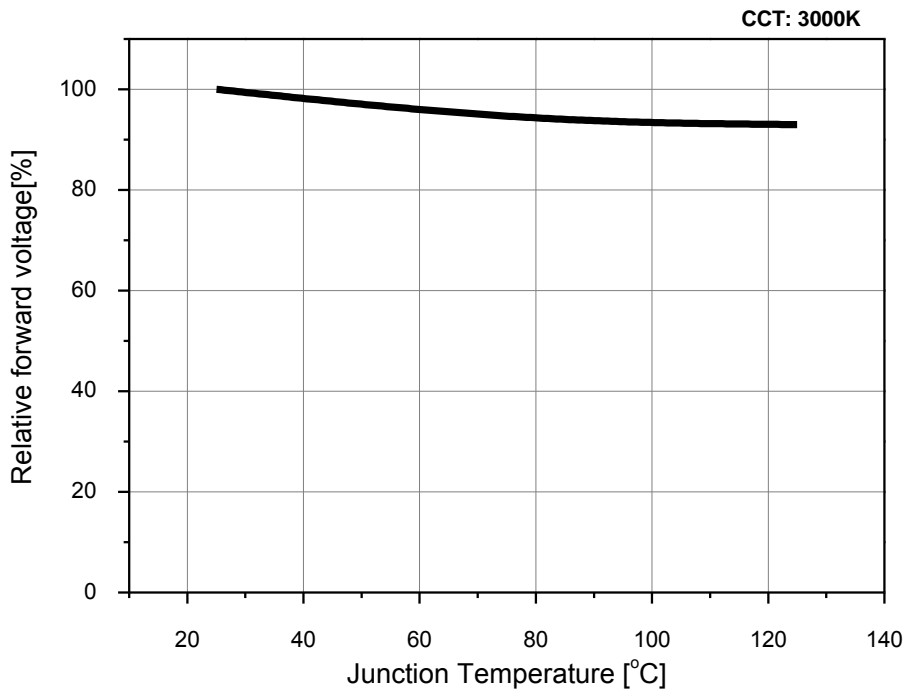
Characteristics Graph

Fig 1. Color Spectrum, $I_F=20\text{mA}$, $T_J=25^\circ\text{C}$

Fig 2. Radiant pattern, $I_F=20\text{mA}$, $T_J=25^\circ\text{C}$


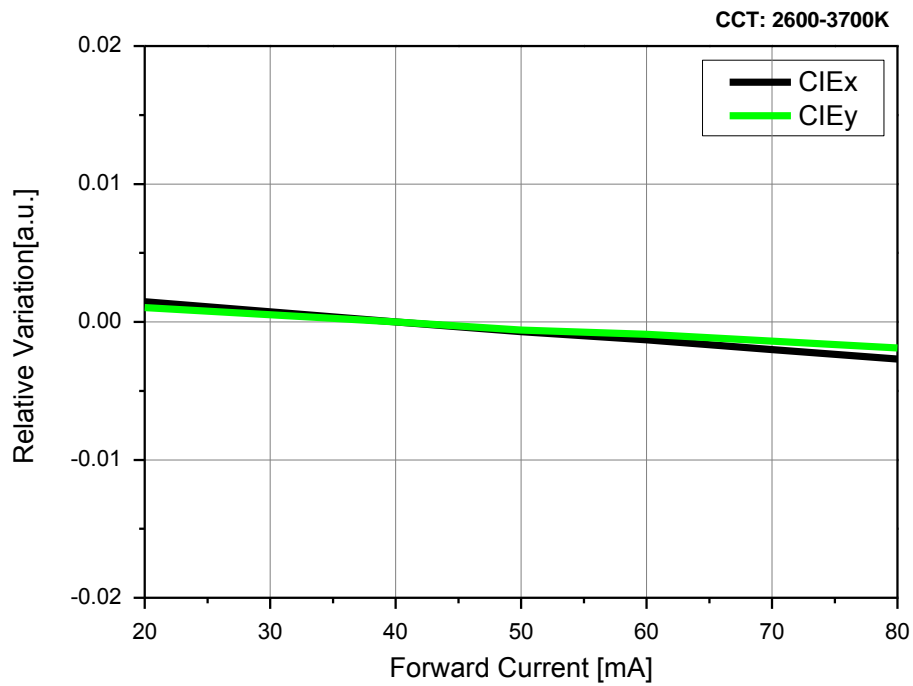
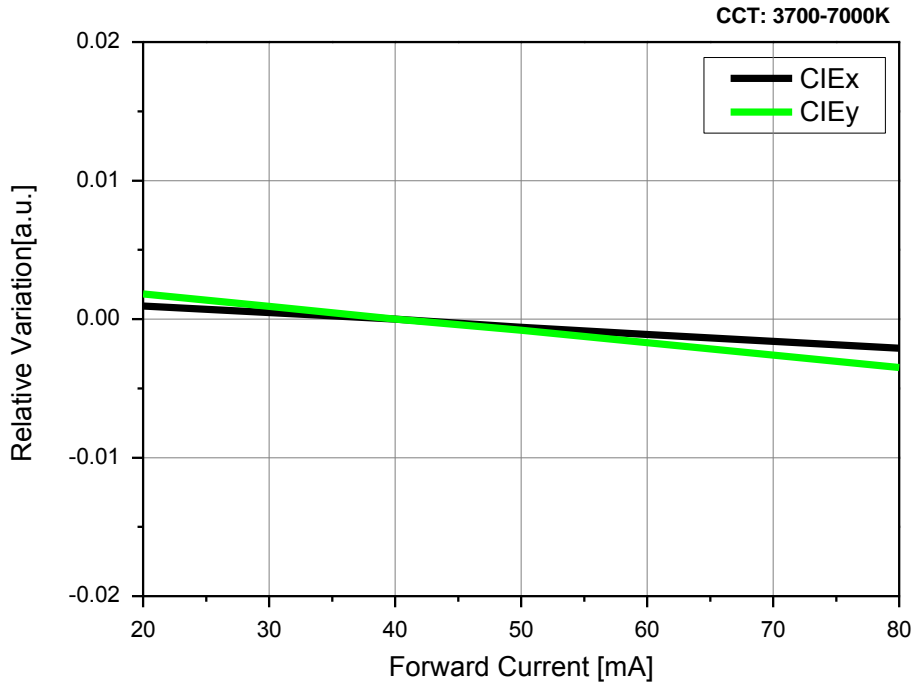
Characteristics Graph

Fig 3. Forward Voltage vs. Forward Current, $T_j=85^\circ\text{C}$

Fig 4. Forward Current vs. Relative Luminous Flux, $T_j=85^\circ\text{C}$


Characteristics Graph

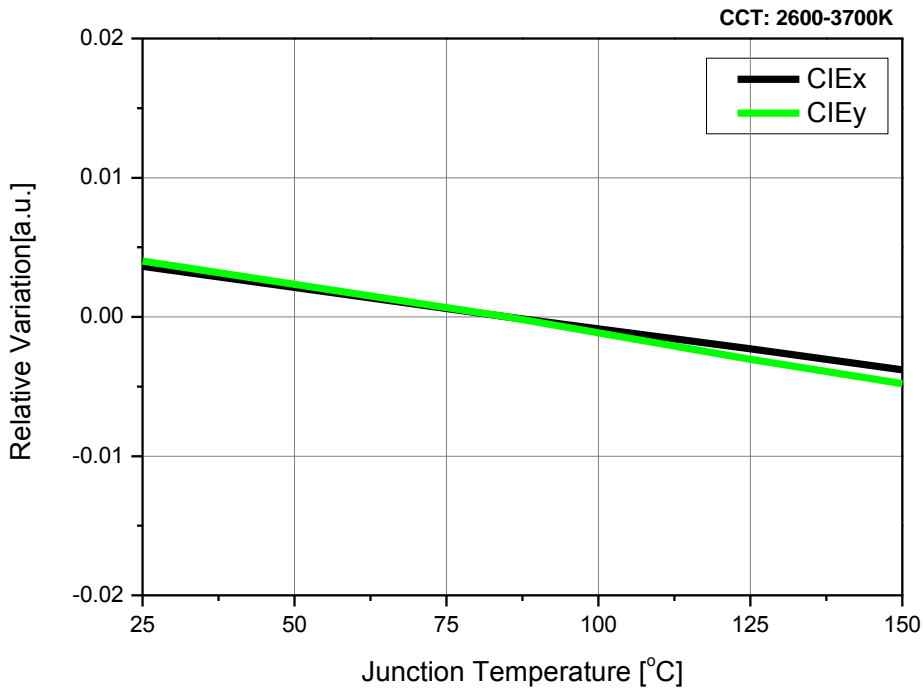
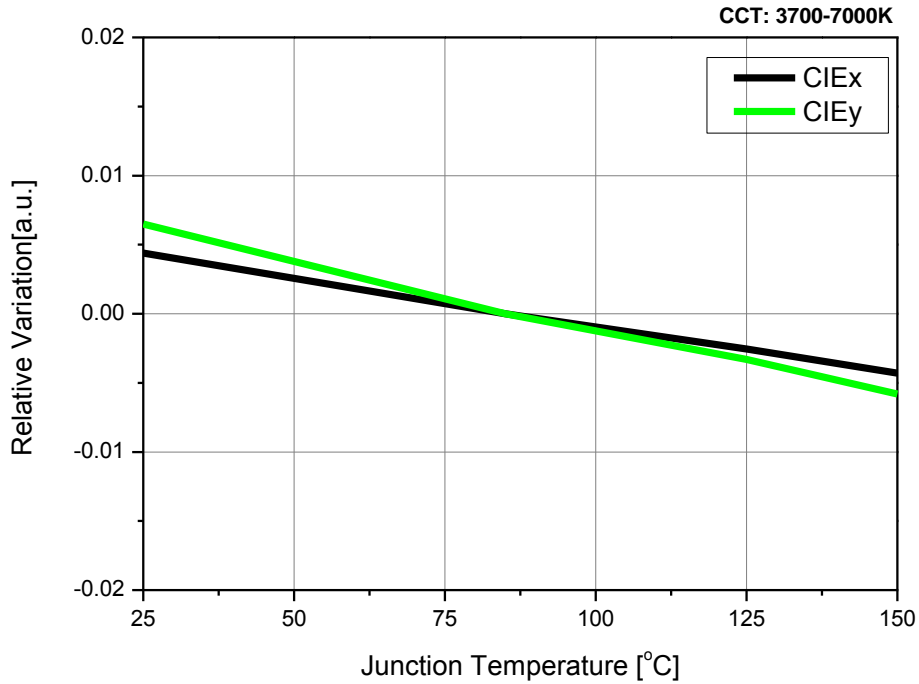
Fig 5. Relative Light Output vs. Junction Temperature, $I_F=20\text{mA}$

Fig 6. Forward Voltage vs. Junction Temperature, $I_F=20\text{mA}$


Characteristics Graph

Fig 7. Forward Current vs. CIE x, y Shift, $T_j = 85^\circ\text{C}$


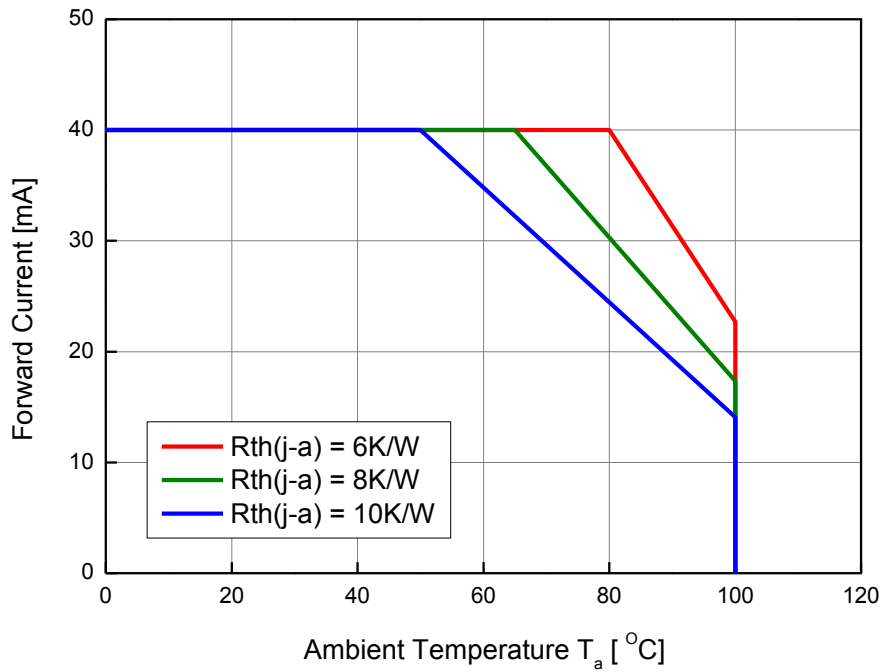
Characteristics Graph

Fig 8. Junction Temperature vs. CIE x, y Shift, $I_F=20mA$



Characteristics Graph

Fig 9. Ambient Temperature vs. Maximum Forward Current, $T_j(\text{max.})=125^\circ\text{C}$



Product Nomenclature

Table 4. Part Numbering System : X₁X₂X₃ X₄X₅ X₆X₇ X₈

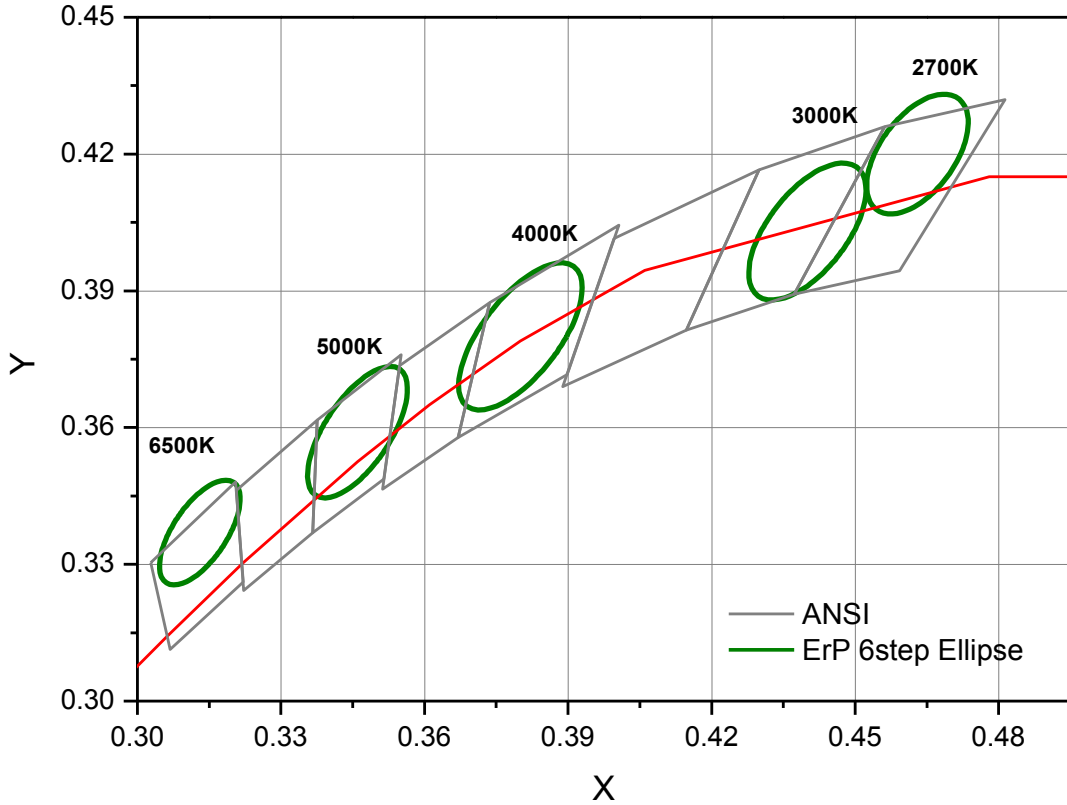
Part Number Code	Description	Part Number	Value
X ₁	Company	S	
X ₂	Package series	A	
X ₃ X ₄	Color Specification	W8	CRI 80
X ₅	Series number	1	
X ₆	Lens type	F	Flat
X ₇	PCB type	1	PCB
X ₈	Revision number	D	

Table 5. Lot Numbering System : Y₁Y₂Y₃Y₄Y₅Y₆ – Y₇Y₈Y₉Y₁₀ – Y₁₁Y₁₂Y₁₃

Lot Number Code	Description	Lot Number	Value
Y ₁ Y ₂	Year		
Y ₃ Y ₄	Month		
Y ₅ Y ₆	Day		
Y ₇ Y ₈ Y ₉ Y ₁₀	Mass order		
Y ₁₁ Y ₁₂ Y ₁₃	Tray No.		

Color Bin Structure

CIE Chromaticity Diagram, $I_f = 20\text{mA}$, $T_s = 85^\circ\text{C}$



CCT	Rank	Center Point		a	b	Ellipse Rotation Angle(degrees)
		Cx	Cy			
6,500K	AE6	0.3130	0.3370	0.02622	0.01136	57.46
5,000K	CE6	0.3460	0.3590	0.03273	0.01397	57.48
4,000K	EE6	0.3800	0.3800	0.03786	0.01642	53.92
3,000K	GE6	0.4400	0.4030	0.03492	0.01678	53.85
2,700K	HE6	0.4630	0.4200	0.02985	0.01598	57.59

Notes :

1. Cx and Cy are the center coordinates of the ellipse, a the length of the major axis, b the length of the minor axis and Θ the angle of the major axis as defined in IEC 60081.

Color Bin Structure

Table 6. Bin Code description, $I_f = 20\text{mA}$

Part Number	Luminous Flux (lm) ^[1]					Color Chromaticity Coordinate $T_j=85^\circ\text{C}$	Typical Forward Voltage (V)				
	Bin No.	$T_j=25^\circ\text{C}$		$T_j=85^\circ\text{C}$			Bin No.	$T_j=25^\circ\text{C}$		$T_j=85^\circ\text{C}$	
		Min.	Max.	Min.	Max.			Min.	Max.	Min.	Max.
SAW81F1D	A3	420	460	374	410	Refer to page.12	X5	180	190	170	180
	A4	460	500	410	440		X6	190	200	180	190

Table 7. Ordering Information(Bin Code)

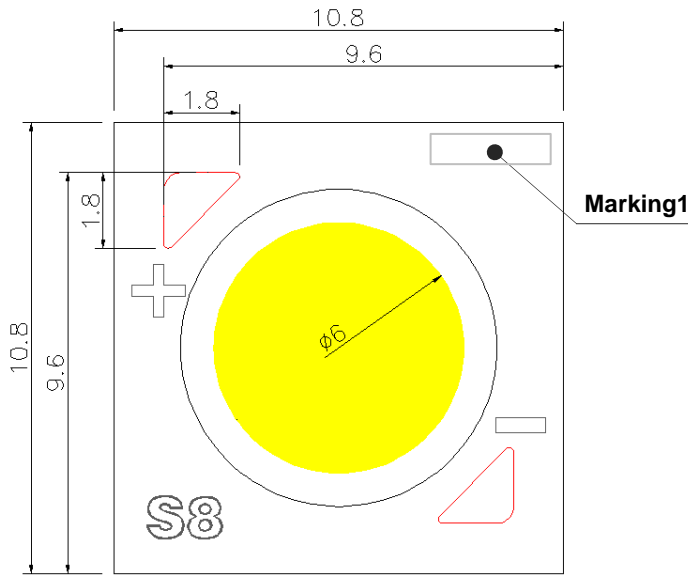
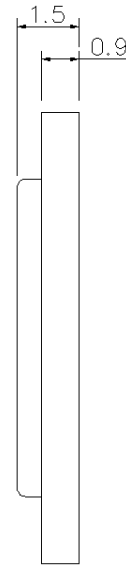
Available ranks

Part Number	CCT	CIE	LF rank		VF rank	
SAW81F1D	6000~7000K	A	A3	A4	X5	X6
	5300~6000K	B	A3	A4	X5	X6
	4700~5300K	C	A3	A4	X5	X6
	3700~4200K	D	A3	A4	X5	X6
	3700~4200K	E	A3	A4	X5	X6
	3100~3700K	F	A3	A4	X5	X6
	2900~3100K	G	A3	A4	X5	X6
	2600~2900K	H	A3	A4	X5	X6

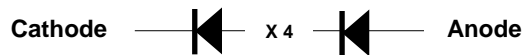
Notes for Table 6:

1. Flux values @ 85°C are calculated and for reference only.

Mechanical Dimensions

Top view

Side view


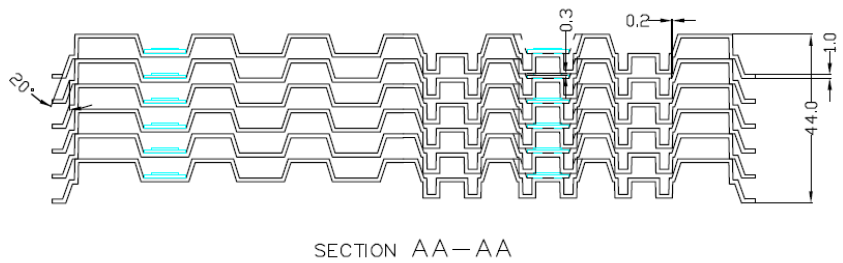
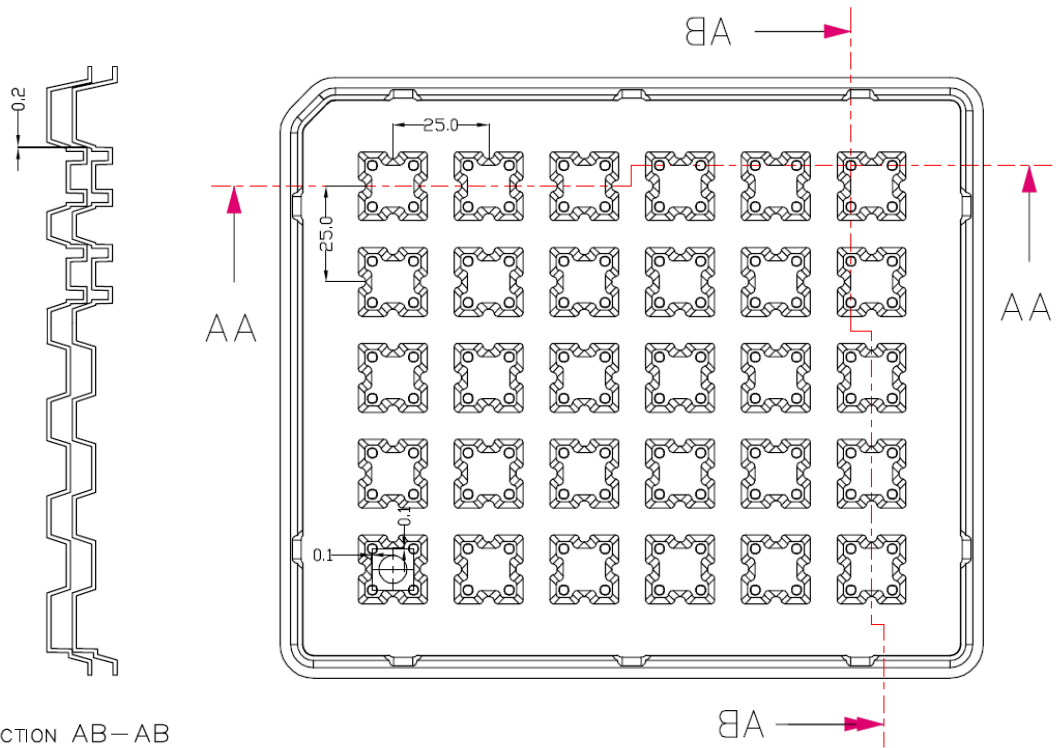
< Inner Circuit Diagram >


Notes :

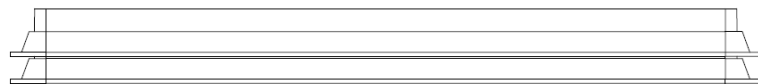
1. All dimensions are in millimeters.
2. Scale : none
3. Undefined tolerance is $\pm 0.2\text{mm}$

Packaging Specification

Top view



Side view



Notes :

1. Quantity : 30pcs/Tray
2. All dimensions are in millimeters (tolerance : ± 0.3)
3. Scale none

Packaging Specification

Aluminum Bag



Outer Box

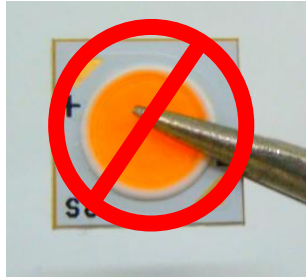


Notes :

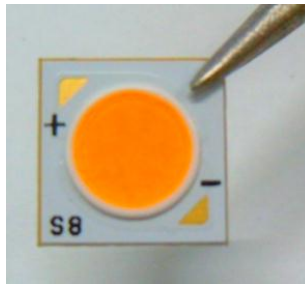
1. Heat Sealed after packing (Use Zipper Bag)
2. Quantity : 3Tray(90pcs) /Bag

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) 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 wire.
- (4) Seoul Semiconductor 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.
- (5) 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.
- (6) Avoid leaving fingerprints on silicone resin parts.

Precaution for Use

(1) Storage

To avoid the moisture penetration, we recommend storing Power LEDs in a dry box with a desiccant.

The recommended storage temperature range is 5C to 30C and a maximum humidity of 50%.

(2) Use Precaution after Opening the Packaging. 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 or the color of the desiccant changes.

(3) For manual soldering

Seoul Semiconductor recommends the soldering condition

(ZC series product is not adaptable to reflow process)

a. Use lead-free soldering

b. Soldering should be implemented using a soldering equipment at temperature lower than 350°C.

c. Before proceeding the next step, product temperature must be stabilized at room temperature.

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

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

(6) It is dangerous to drink the liquid or inhale the gas generated by such products when chemically disposed of.

(7) 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.

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

(9) 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 vacuum atmosphere should be used for storage.

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

Precaution for Use

- (11) Long time exposure of sun light or occasional UV exposure will cause silicone discoloration.
- (12) Attaching LEDs, do not use adhesive that outgas organic vapor.
- (13) 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.
- (14) Please do not touch any of the circuit board, components or terminals with bare hands or metal while circuit is electrically active.
- (15) 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.
- (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 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 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 (SeoulSemicon.com) manufactures and packages a wide selection of light emitting diodes (LEDs) for the automotive, general illumination/lighting, 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", deep UV LEDs, "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, high-brightness LEDs, mid-power LEDs, side-view LEDs, through-hole type LED lamps, custom displays, and sensors. The company is vertically integrated from epitaxial growth and chip manufacture in its fully owned subsidiary, Seoul Viosys, through packaged LEDs and LED modules in three Seoul Semiconductor manufacturing facilities. Seoul Viosys also manufactures a wide range of unique deep-UV wavelength devices.

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