Mid-Power LED - 2835 Series

STW9A2SD-H3

RoHS

Product Brief

Description

- This White Colored surface-mount LED comes in standard package dimension. Package Size: 3.5x2.8x0.7mm
- It has a substrate made up of a molded plastic reflector sitting on top of a lead fr ame.
- The die is attached within the reflector c avity and the cavity is encapsulated by s ilicone.
- The package design coupled with caref ul selection of component materials allo w these products to perform with high re liability.

Features and Benefits

- Market Standard 2835 Package Size
- High Color Quality, CRI Min. 90
- RoHS compliant

Key Applications

- Interior lighting
- General lighting
- Indoor and outdoor displays
- Architectural / Decorative lighting

Table 1. Product Selection Table

Part Number	CCT			
	Color	Min.	Typ.	Max.
STW9A2SD-H3	Cool White	4700K	5600K	7000K
STW9A2SD-H3	Neutral White	3700K	4000K	4700K
STW9A2SD-H3	Warm White	2600K	3000K	3700K

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Performance Characteristics

Table 2. Product Selection Guide, I_F = 150mA, T_j = 25ºC, RH30%

Part Number	CCT (K) [1]	IF=150mA			CRI
	Typ.	RANK	Luminous Flux [3]		
			ΦV (lm)		R_a
			Min	Max	Min.
STW9A2SD-H3	2200	L95	95	105	90
	2700	L110	110	120	90
	3000	L120	120	130	90
	3500	L120	120	130	90
	4000	L125	125	135	90
	5000	L125	125	135	90
	5700	L125	125	135	90
	6500	L125	125	135	90

Notes :

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

(2) Seoul Semiconductor maintains a tolerance of ±7% on Flux and power measurements. The luminous Flux was measured at the peak of the spatial pattern which may not be aligned with the mechanical axis of the LED package.

Performance Characteristics

Table 3. Characteristics, I_F=150mA, T_j= 25ºC, RH30%

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Forward Current	I_F	-	150	-	mA
Forward Voltage	V_F	5.8	-	6.4	V
Luminous Flux[1] (5,000K)[2]	I_v	125	-	135	lm
CRI [3]	R_a	90	-	100	
Viewing Angle	$2\Theta_{1/2}$	-	120	-	Deg.
Thermal resistance (J to S) [4]	$R\theta_{J-S}$	-	20	-	℃/W
ESD Sensitivity(HBM)	-	Class 2 JESD22-A114-E			

Table 4. Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Forward Current	I_F	180	mA
Power Dissipation	P_D	1.08	W
Junction Temperature	T_j	125	ºC
Operating Temperature	T_{opr}	-40 ~ + 85	ºC
Storage Temperature	T_{stg}	-40 ~ + 100	ºC
Pulse Forward Current	I_{FP}	180	mA
Reverse Voltage	Vr	9	V

Notes :

(1) Seoul Semiconductor maintains a tolerance of ±10% on Flux and power measurements.

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

Color coordinate : ±0.01, CCT ±5% tolerance.

(3) Tolerance is ±3.0 on CRI , ±0.3 on VF measurements.

(4) Thermal resistance is junction to Solder.

(5) I_{FP} conditions with pulse width ≤10ms and duty cycle ≤10%

(6) The products are sensitive to static electricity and must be carefully taken when handling products

- **Calculated performance values are for reference only.**
- **All measurements were made under the standardized environment of Seoul Semiconductor.**

Characteristics Graph

Fig 1. Color Spectrum, T_j = 25ºC, I_F=150mA

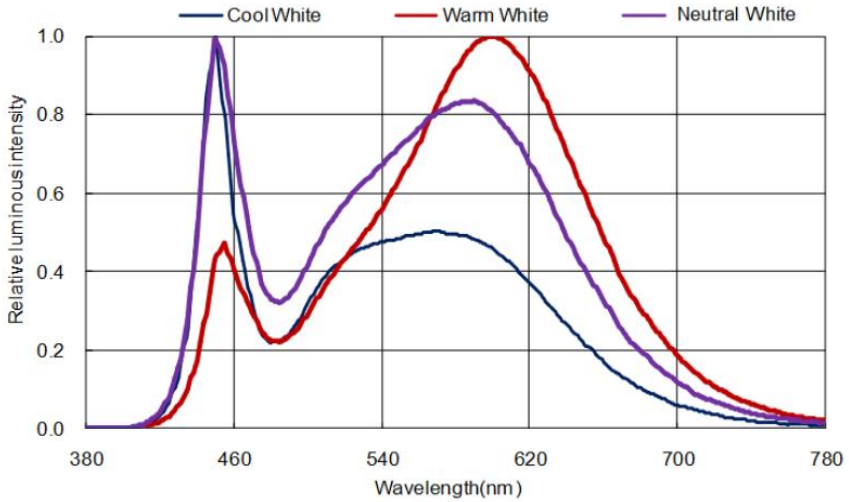
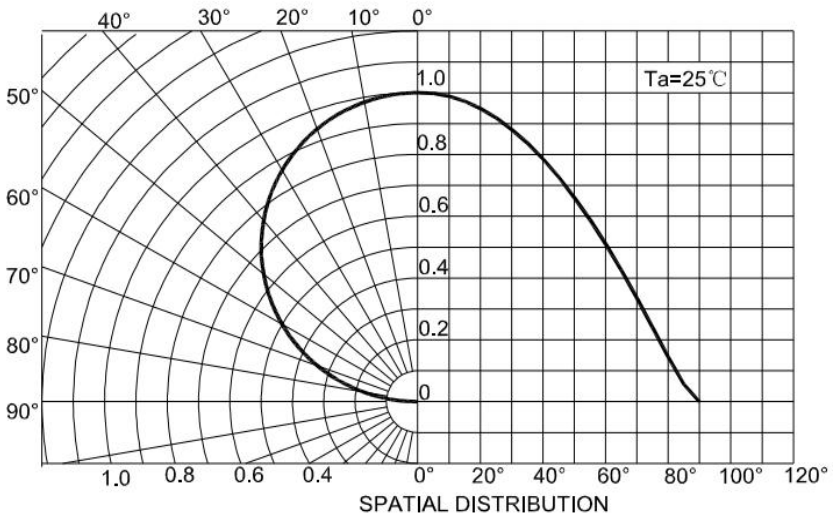


Fig 2. Radiant Pattern, T_j = 25ºC, I_F=150mA



Characteristics Graph

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

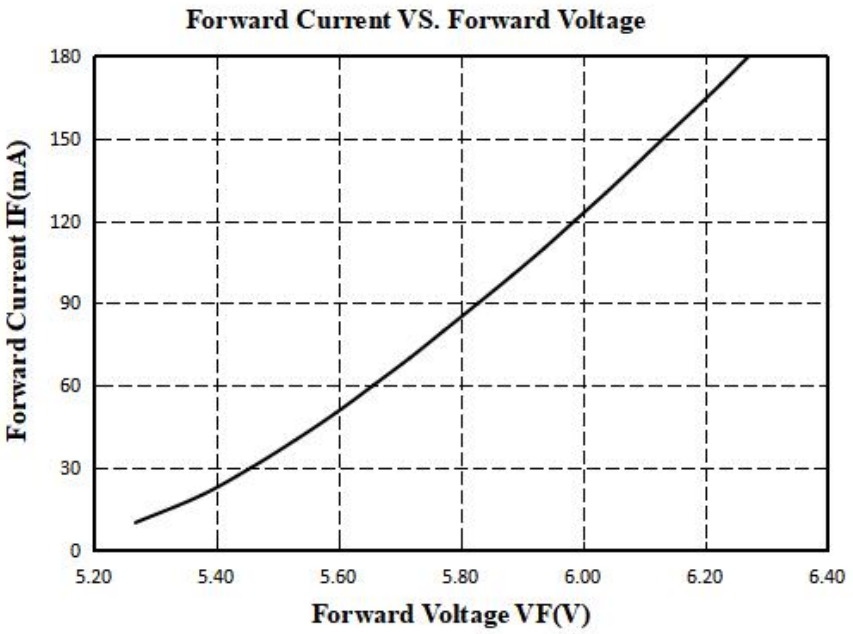
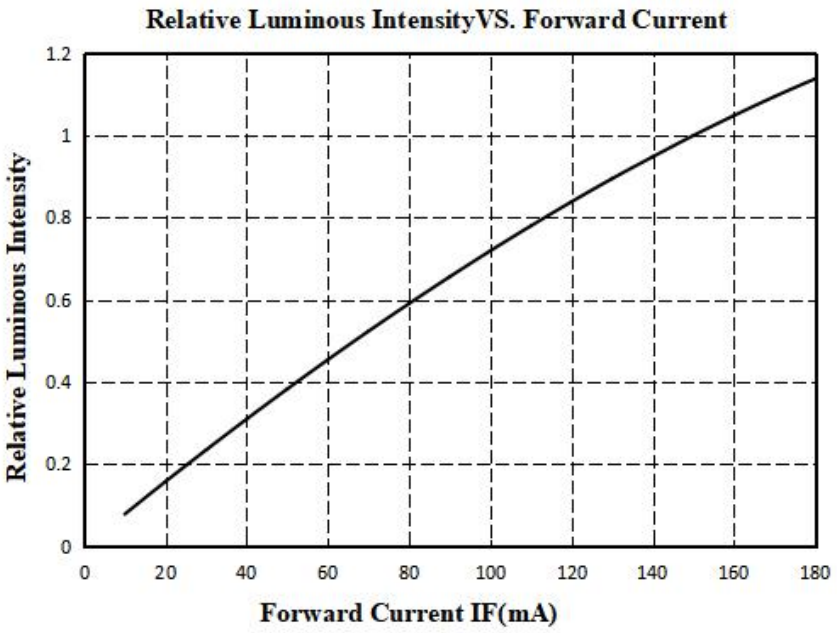


Fig 4. Forward Current vs. Relative Luminous Flux, T_j = 25ºC



Characteristics Graph

Fig 5. Solder Temp.v/s Forward current (Derating curve)

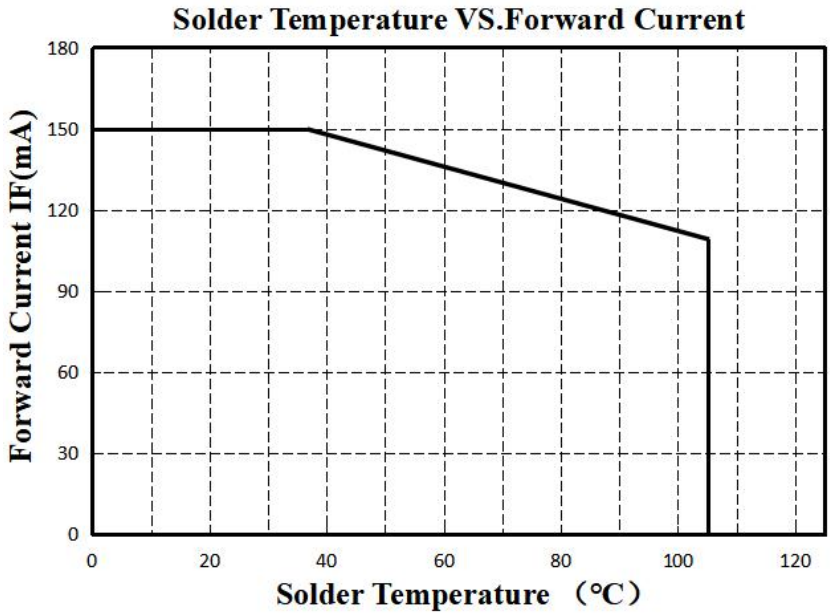
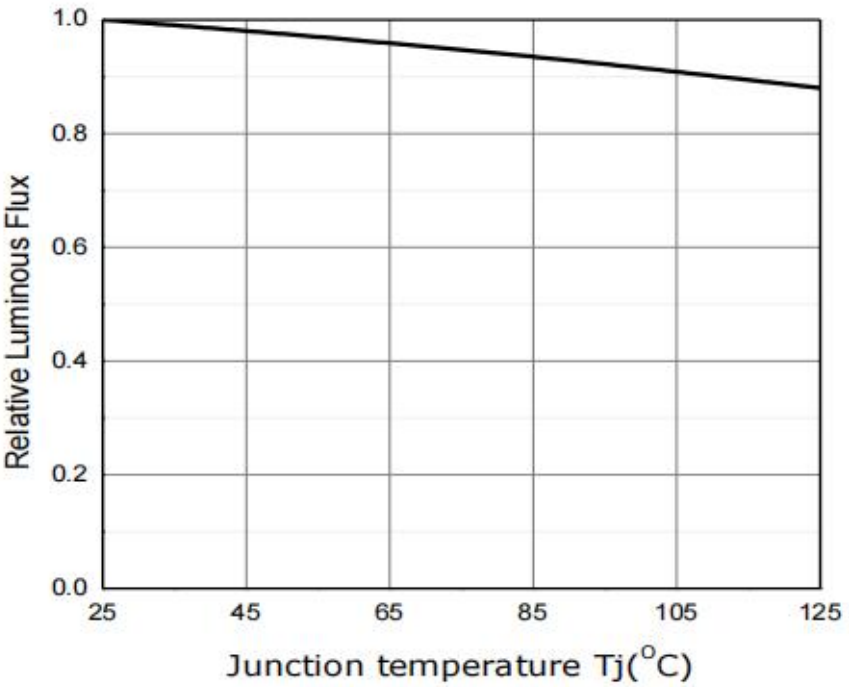
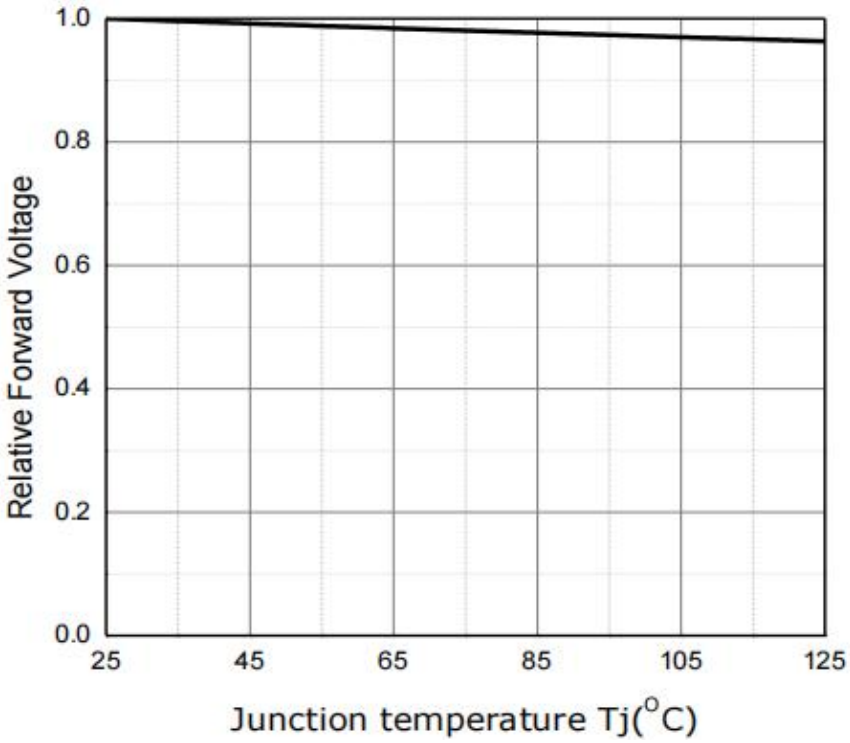


Fig 6. Junction Temperature vs. Relative Luminous Flux, IF=150mA



Characteristics Graph

Fig 7. Junction Temperature vs. Relative Forward Voltage, IF=150mA



Color Bin Structure

Table 5. Bin Code description, T_j=25℃, I_F=150mA

Part Number	Luminous Flux (lm)			Color Chromaticity Coordinate	Typical Forward Voltage (V)		
	Bin Code	Min.	Max.		Bin Code	Min.	Max.
STW9A2SD-H3	L95	95	105	Refer to Page. 10	0	5.8	6.0
	L110	110	120		1	6.0	6.2
	L120	120	130		2	6.2	6.4
	L125	125	135				

***Notes :**

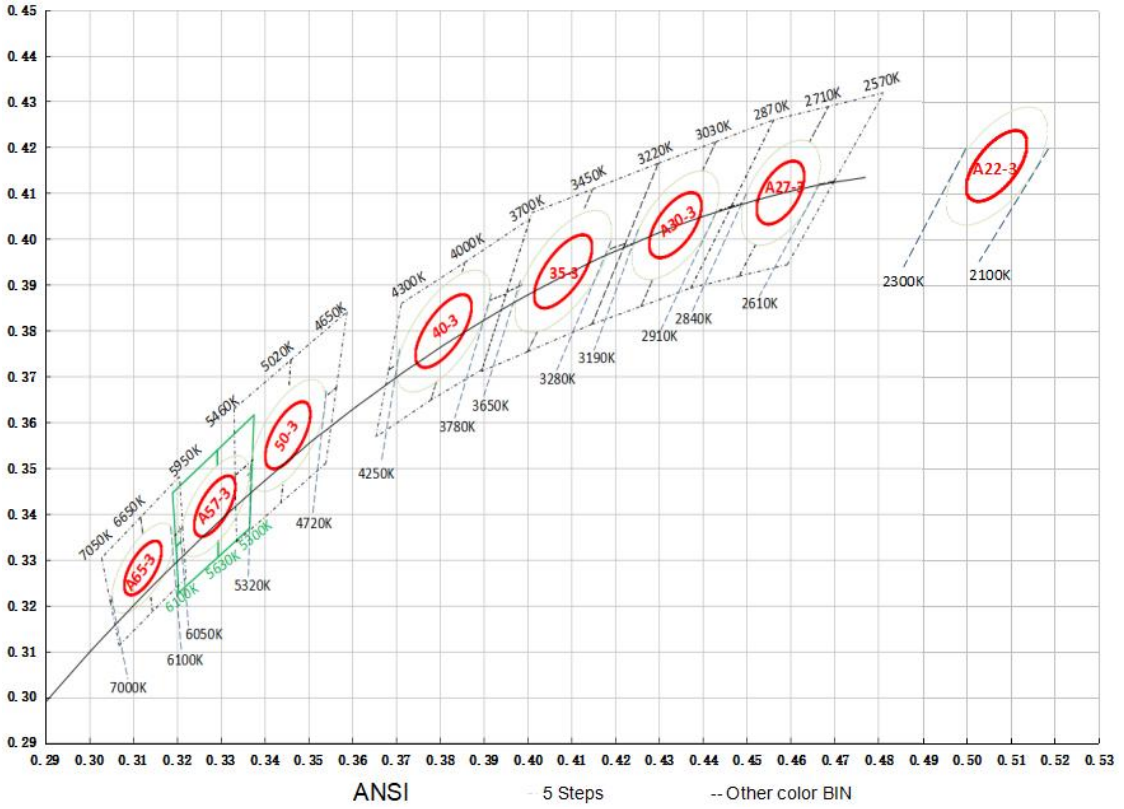
(1) Calculated performance values are for reference only.

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

  In order to ensure availability, single color rank will not be orderable.

Color Bin Structure

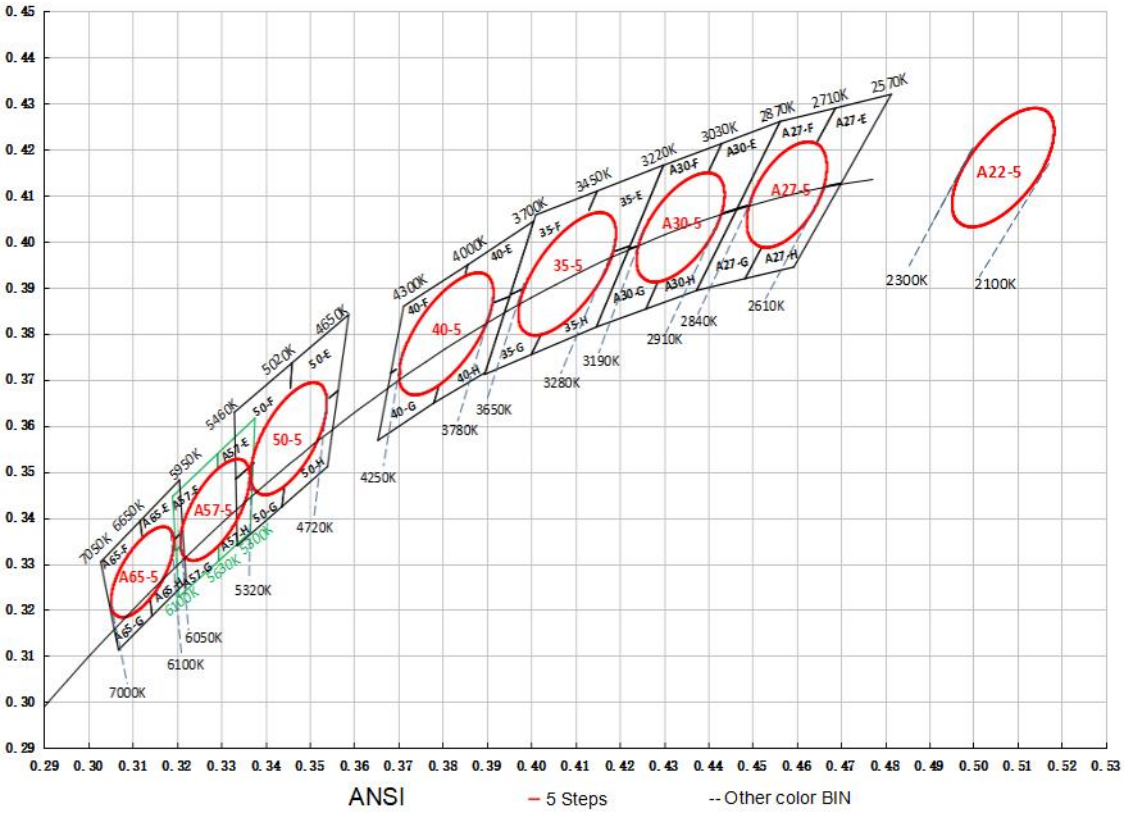
CIE Chromaticity Diagram, T_j=25℃, I_F=150mA



Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT
A65-3	0.3123	0.3282	0.00223	0.00095	58.38	3	6280-6820K
A57-3	0.3287	0.3417	0.002486	0.001066	59.09	3	5450-5890K
50-3	0.3454	0.3572	0.00274	0.00118	59.62	3	4830-5190K
40-3	0.3809	0.3799	0.00313	0.00134	54.00	3	3870-4150K
35-3	0.4082	0.3929	0.00317	0.00139	52.97	3	3350-3570K
A30-3	0.4338	0.4030	0.00278	0.00136	53.17	3	2960-3130K
A27-3	0.4578	0.4101	0.00258	0.00137	57.28	3	2650-2790K
A22-3	0.5069	0.4160	0.00312	0.0015	50.00	3	2130-2250K

Color Bin Structure

CIE Chromaticity Diagram, T_j=25℃, I_F=150mA



Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
A65-5	0.3123	0.3282	0.00223	0.00095	58.38	5	6100-7050K	
Other color BIN	x1	y1	x2	y2	x3	y3	x4	y4
A65-E	0.3206	0.3482	0.3117	0.3393	0.3131	0.3290	0.3213	0.3371
A65-F	0.3117	0.3393	0.3028	0.3304	0.3048	0.3209	0.3131	0.3290
A65-G	0.3131	0.3290	0.3048	0.3209	0.3068	0.3113	0.3144	0.3187
A65-H	0.3221	0.3261	0.3144	0.3187	0.3131	0.3290	0.3213	0.3371

Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
A57-5	0.3287	0.3417	0.002486	0.001066	59.09	5	5300-6050K	
Other color BIN	x1	y1	x2	y2	x3	y3	x4	y4
A57-E	0.3376	0.3616	0.3292	0.3539	0.3293	0.3419	0.3371	0.3493
A57-F	0.3190	0.3446	0.3198	0.3329	0.3293	0.3419	0.3292	0.3539
A57-G	0.3204	0.3228	0.3294	0.3306	0.3293	0.3419	0.3198	0.3329
A57-H	0.3293	0.3419	0.3294	03306	0.3366	0.3369	0.3371	0.3493

Color Bin Structure

CIE Chromaticity Diagram, T_j=25℃, I_F=150mA

Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
50-5	0.3454	0.3572	0.00274	0.00118	59.62	5	4720-5320K	
Other color BIN	x1	y1	x2	y2	x3	y3	x4	y4
50-E	0.3449	0.3581	0.3460	0.3736	0.3588	0.3841	0.3564	0.3676
50-F	0.3333	0.3484	0.3330	0.3629	0.3460	0.3736	0.3449	0.3581
50-G	0.3333	0.3484	0.3336	0.3339	0.3437	0.3424	0.3449	0.3581
50-H	0.3437	0.3424	0.3449	0.3581	0.3564	0.3676	0.3540	0.3511

Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
40-5	0.3809	0.3799	0.00313	0.00134	54.00	5	3780-4250K	
Other color BIN	x1	y1	x2	y2	x3	y3	x4	y4
40-E	0.3818	0.3793	0.3857	0.3949	0.4006	0.4044	0.3951	0.3880
40-F	0.3683	0.3714	0.3712	0.3859	0.3857	0.3949	0.3818	0.3793
40-G	0.3654	0.3568	0.3683	0.3714	0.3818	0.3793	0.3780	0.3649
40-H	0.3780	0.3649	0.3818	0.3793	0.3951	0.3880	0.3896	0.3715

Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
35-5	0.4082	0.3929	0.00317	0.00139	52.97	5	3280-3650K	
Other color BIN	x1	y1	x2	y2	x3	y3	x4	y4
35-E	0.4075	0.3932	0.4149	0.4109	0.4298	0.4165	0.4223	0.3990
35-F	0.3953	0.3884	0.4010	0.4057	0.4149	0.4109	0.4075	0.3932
35-G	0.3895	0.3711	0.3953	0.3884	0.4075	0.3932	0.4000	0.3754
35-H	0.4000	0.3754	0.4075	0.3932	0.4223	0.3990	0.4147	0.3814

Color Bin Structure

CIE Chromaticity Diagram, T_j=25℃, I_F=150mA

Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
A30-5	0.4338	0.4030	0.00278	0.00136	53.17	5	2910-3190K	
Other color BIN	x1	y1	x2	y2	x3	y3	x4	y4
A30-E	0.4342	0.4027	0.4430	0.4212	0.4562	0.4260	0.4465	0.4071
A30-F	0.4221	0.3984	0.4299	0.4165	0.4430	0.4212	0.4342	0.4027
A30-G	0.4221	0.3984	0.4147	0.3814	0.4259	0.3853	0.4342	0.4027
A30-H	0.4342	0.4027	0.4259	0.3853	0.4373	0.3893	0.4465	0.4071
Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
A27-5	0.4578	0.4101	0.00258	0.00137	57.28	5	2610-2840K	
Other color BIN	x1	y1	x2	y2	x3	y3	x4	y4
A27-E	0.4813	0.4319	0.4687	0.4289	0.4582	0.4098	0.4700	0.4126
A27-F	0.4687	0.4289	0.4562	0.4260	0.4465	0.4071	0.4582	0.4098
A27-G	0.4373	0.3893	0.4465	0.4071	0.4582	0.4098	0.4483	0.3919
A27-H	0.4700	0.4126	0.4582	0.4098	0.4483	0.3919	0.4593	0.3944
Main color BIN	x	y	a	b	θ	SDCM	Refer to CCT	
A22-5	0.5069	0.4160	0.00312	0.0015	50.00	5	2100-2300K	

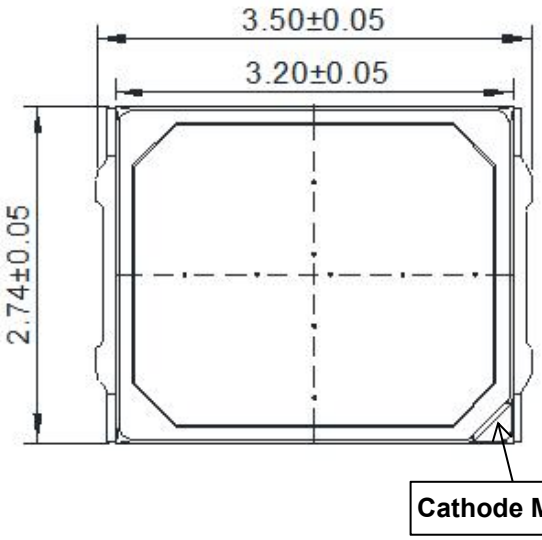
***Notes :**

(1) Energy Star binning applied to all 2600~7000K.
(2) Measurement Uncertainty of the Color Coordinates : ± 0.01

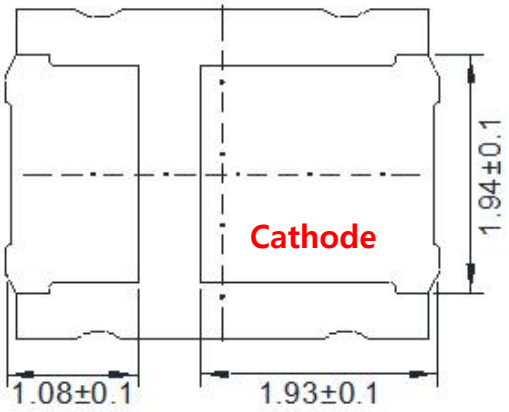
Mechanical Dimensions

Mechanical Dimensions : Unit (mm)

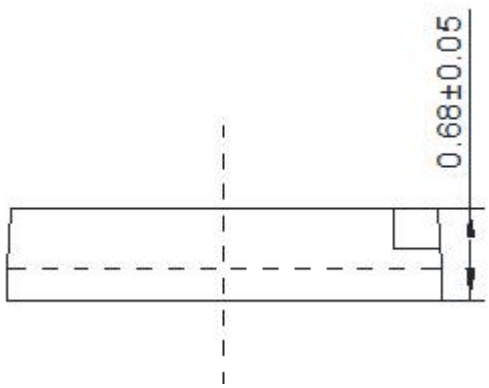
Top View



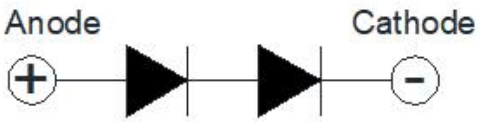
Bottom View



Side View

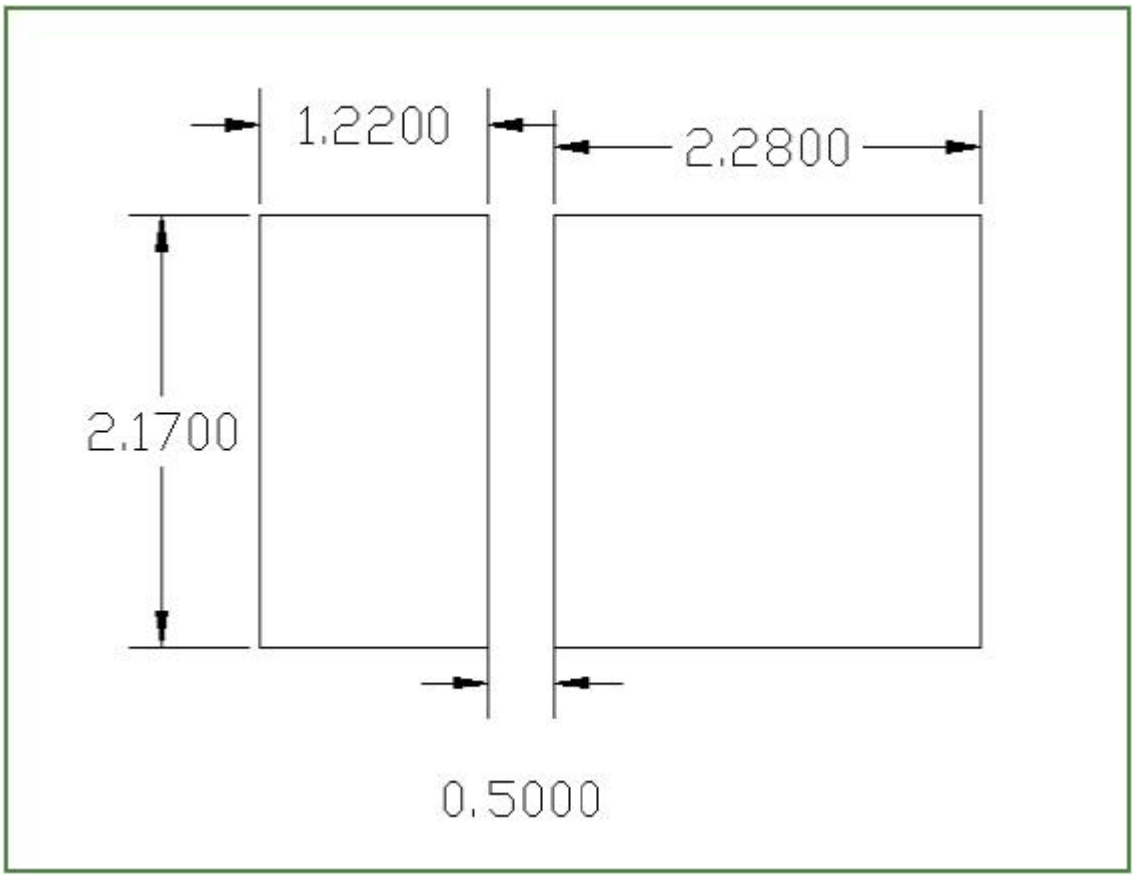


Circuit



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

Recommended Solder Pad



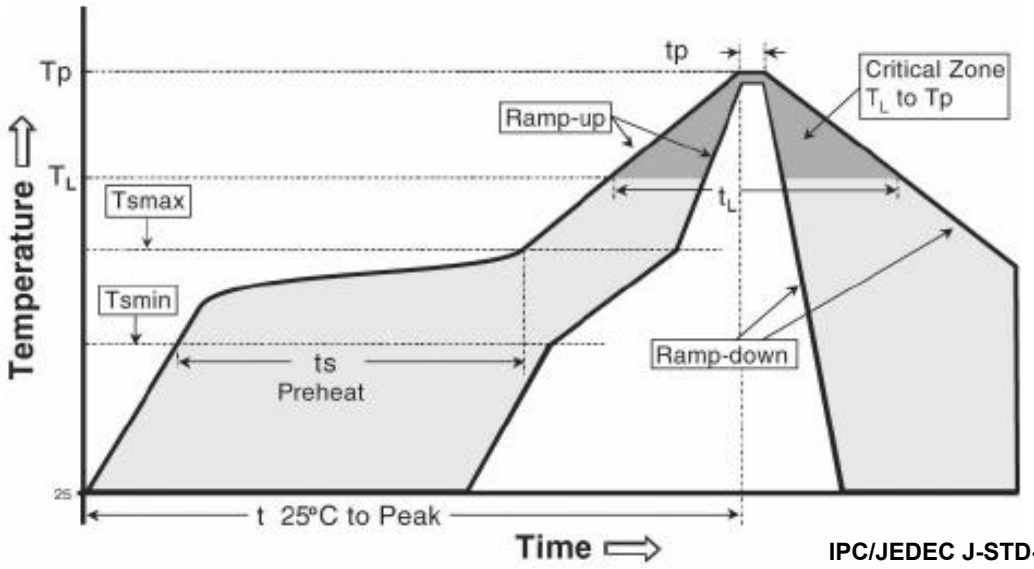
Notes :

(1) All dimensions are in millimeters.
(2) Scale : none
(3) This drawing without tolerances are for reference only
(4) Undefined tolerance is ±0.1mm
(5) The appearance and specifications of the product may be changed for improvement without notice.

Reliability Test Items and Condition

Test Item	Ref.Standard	Test Conditions	Time	Quantity(pcs)
High Temperature storage	JESD22-A103	Temp : 100℃ ±5℃	1000hrs	22
Low Temperature Storage	JESD22-A119	Temp : -40℃ ±5℃	1000hrs	22
Temperature Cycle	JESD22-A104	100℃ ±5℃ 30min ↑↓5min -40℃ ±5℃ 30min	300Cycle	22
Reflow	JESD22-B106	Temp:max260℃ Time : 10sec 8min/cycle	3Cycle	22
Life Test	JESD22-A108	Ta=25℃ ±5℃ IF=150mA	1000hrs	22
High Temperature High Humidity Life Test	JESD22-A101	85℃ ±5℃/85%RH IF=150mA	1000hrs	22

Reflow Soldering Characteristics



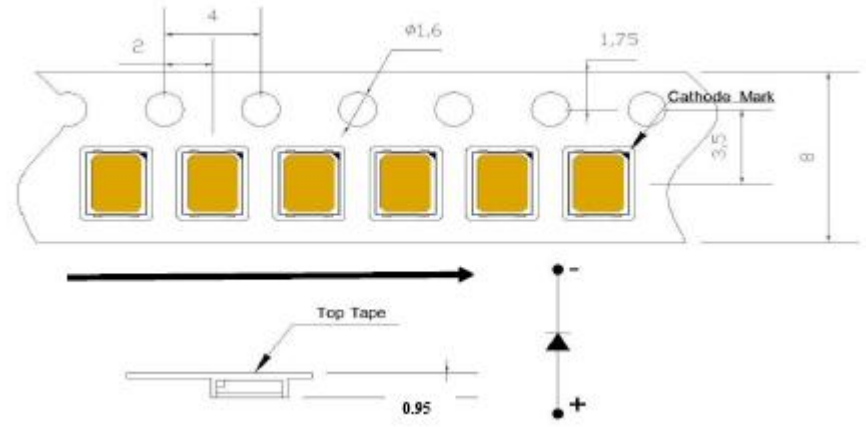
IPC/JEDEC J-STD-020

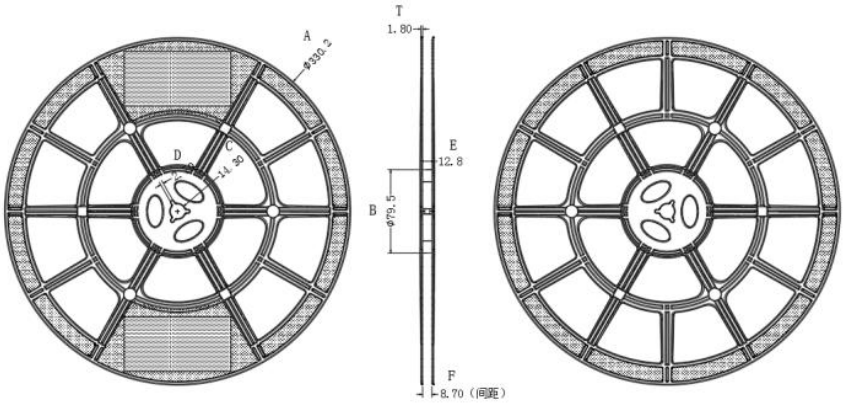
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_{s_max} to T_p)	3° C/second max.	3° C/second max.
Preheat - Temperature Min (T_{s_min}) - Temperature Max (T_{s_max}) - Time (T_{s_min} to T_{s_max}) (t_s)	 100 °C 150 °C 60-120 seconds	 150 °C 200 °C 60-180 seconds
Time 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 :

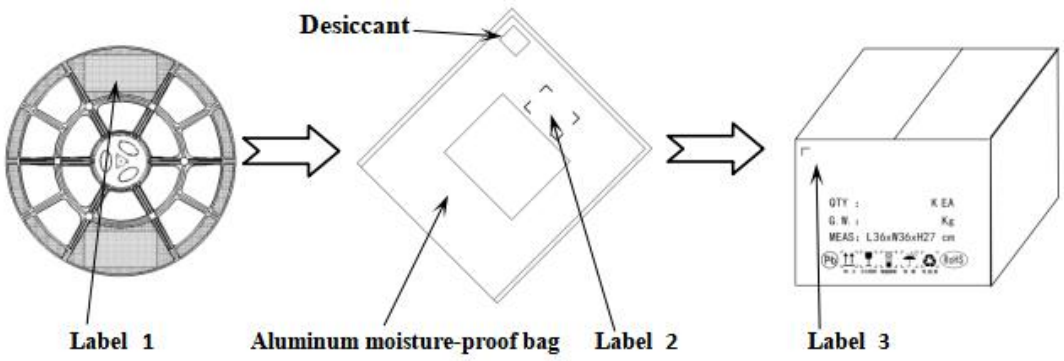
(1) Reflow soldering is recommended not to be done more than two times
In the case of more than 24 hours passed soldering after first, LEDs will be damaged.
(2) Repairs should not be done after the LEDs have been soldered
When repair is unavoidable, suitable tools must be used.
(3) Die slug is to be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





A±2	B±0.5	C±0.2	D±0.2	E±0.5	F±0.3	T±0.2
Ø330.2	Ø79.5	Ø14.3	2.7	12.8	8.7	1.8



Label 1: 17K Aluminum moisture proof bag Label 2: 34K Label 3: 340K

NOTES :
Empty component pockets are sealed with top cover tape;
The maximum number of missing lamps is two;
The cathode is oriented towards the tape sprocket hole in accordance with ANSI/EIA RS-481 specifications.
17,000 pcs / Reel.

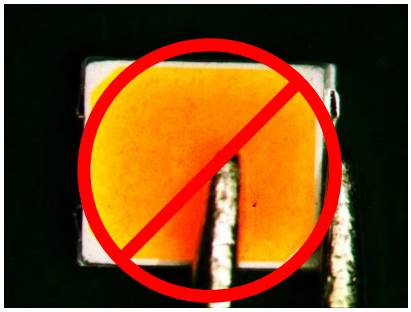
Product Nomenclature

Table 6. Part Numbering System :$X_1X_2X_3X_4X_5X_6X_7X_8$ - X_9X_{10}

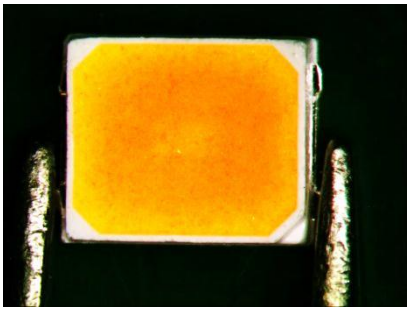
Part Number Code	Description	Part Number	Value
X_1	Company	S	SSC
X_2	Acrich chip	T	
X_3X_4	Color Specification	W9	CRI 90
X_5	Package series	A	A series
X_6X_7	Characteristic code	2S	
X_8	Version	D	
X_9X_{10}	Product code	H3	

Handling of Silicone Resin for LEDs

(1) During processing, mechanical stress on the surface should be minimized as much as possible. Sh arp 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 with out 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 pr evented. 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 conditio ns must be considered during the handling of such devices. Compared to standard encapsulants, sil icone 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 s olution 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 as sured 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 maximum storage temperature range is 40℃ and a maximum humidity of RH90%.

(2) Use Precaution after Opening the Packaging

Use proper SMT techniques when the LED is to be soldered dipped 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 : 30℃ Humidity : less than RH60%

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 10-24hr at 65±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.

Precaution for Use

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

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

(12) 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.

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

(14) 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.

(15) Similar to most Solid state devices;
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 i nto contact. While most ESD events are considered harmless, it can be an expensive problem in man y industrial environments during production and storage. The damage from ESD to an LEDs may caus e 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 subje cted 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 circ uit causing trickle down failures. It is impossible to predict the failure mode of every LED exposed to e lectrical overstress as the failure modes have been investigated to vary, but there are some common s igns 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