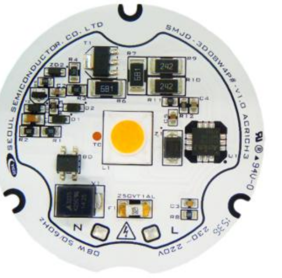
Integrated AC LED Solution

Acrich3 – 8.5W

SMJD-XD08W4PF



RoHS

Product Brief

Description

- The Acrich3 COB series of products are designed to be small LES. and driven directly off of AC line voltage, therefore they do not need the standard converter essential for conventional general lighting products.
- The converter or driver found in most general lighting products can limit the overall life of the product, but with the Acrich3 series of products the life of the product can more closely be estimated from the LED itself. This will also allow for a much smaller form factor from an overall fixture design allowing for higher creativity in the fixture.
- The modules have a high power factor which can contribute to a higher energy savings in the end application.

Features and Benefits

- Small LES
- Connects directly to AC line voltage
- Low THD
- Long Life Time
- Simple BOM
- Miniaturization
- Lead Free Product
- RoHS Compliant
- TRIAC Dimming

Key Applications

- Down Llight

Table 1. Product Selection (CCT)

Part No.	Vin [Vac]	P [W]	Color	CCT [K]	CRI Min.
SMJD-2D08W4PF SMJD-3D08W4PF	120 220	8.5	Cool	4700 – 7000	80
			Neutral	3700 – 4700	
			Warm	2600 – 3700	

Table 2. Product Selection (Flux)

Part No.	Vin [Vac]	P [W]	Flux [lm]		Remark
			Min.	Typ.	
SMJD-2D08W4PF SMJD-3D08W4PF	120 220	8.5	660	740	08b
			770	870	08c

Table of Contents

Performance Characteristics

Table 3. Electro Optical Characteristics, T_a = 25ºC

Parameter	Symbol	Value			Unit	Mark
		Min.	Typ.	Max.		
Luminous Flux	Φ_V [2]	660	740	-	lm	08b
		770	870			08c
Correlated Color Temperature [3]	CCT	6000	6500	7000	K	A
		5300	5700	6000		B
		4700	5000	5300		C
		4200	4500	4700		D
		3700	4000	4200		E
		3200	3500	3700		F
		2900	3000	3200		G
		2600	2700	2900		H
CRI	Ra	80	-	-	-	F
Input Voltage [4]	V_{in}		120		Vac	2D
			220			3D
Power Consumption	P	7.6	8.5	9.4	W	08W
Operating Frequency	F		50 / 60		Hz	
Power Factor	PF		Over 0.9		-	
Viewing Angle	$2\Theta_{1/2}$		120		deg.	
Tolerance of Surge [5]	V_s	500	-	-	V	

Notes :

(1) At 120 or 220Vac, T_a = 25ºC

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

(3) Integrated sphere measure tolerance : ± 5%

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

(5) Operating Voltage doesn't indicate the maximum voltage which customers use but means tolerable voltage according to each country's voltage variation rate. It is recommended that the solder pad temperature should be below 70℃.

(6) Surge withstand in accordance with IEC61000-4-5

Performance Characteristics

Table 4. Absolute Maximum Ratings, T_a = 25ºC

Parameter	Symbol	Unit	Value
Maximum Input Voltage	V_{in}	Vac	144 (@120V) 264 (@220V)
Power Consumption	P	W	9.4
Operating Temperature	T_c	ºC	<90
Storage Temperature	T_{stg}	ºC	-40 ~ 100
ESD Sensitivity	-	-	±4,000V HBM

Thermal Resistance

Part	Package Power Dissipation [W]	Maximum Junction Temperature [℃]	$R\theta_{j-s}$ [℃/W]
Acrich3 LED	SAW85F1B Max 12.5	140	0.83

Notes :

The MJT COB has a thermal resistance of 0.83℃/W from junction of the COB to the COB slug.

The maximum junction temperature of the MJT COB package is 140℃, therefore the maximum lead temperature T_{s_max} is

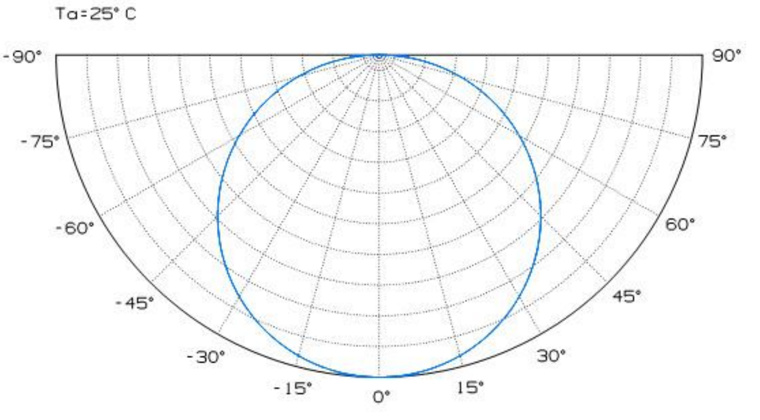
$T_{s\_max} = T_{j\_max} - (R\theta_{j-s} * P_d)$

$= 140℃ - (0.83℃/W * 1.5W) = 130℃$

Although this is the maximum lead temperature, it is recommended to keep the COB slug under 90℃.

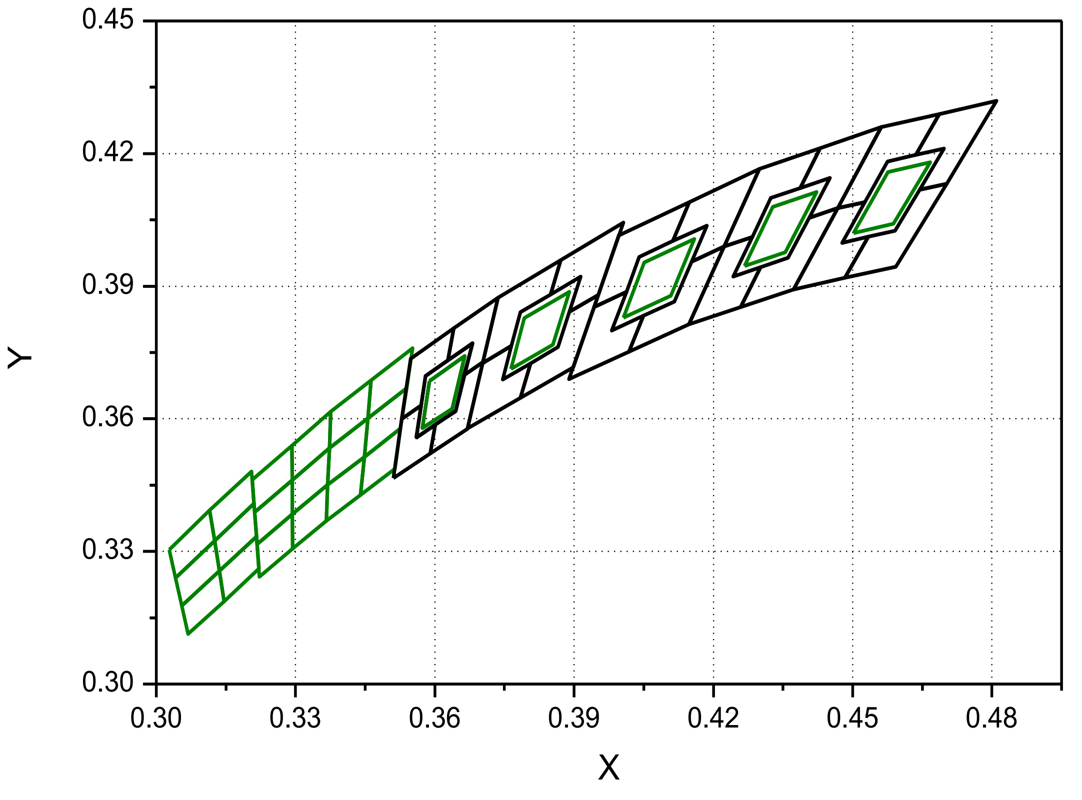
Characteristics Graph

Fig 1. Radiant Pattern, T_a =25℃



Color Bin Structure

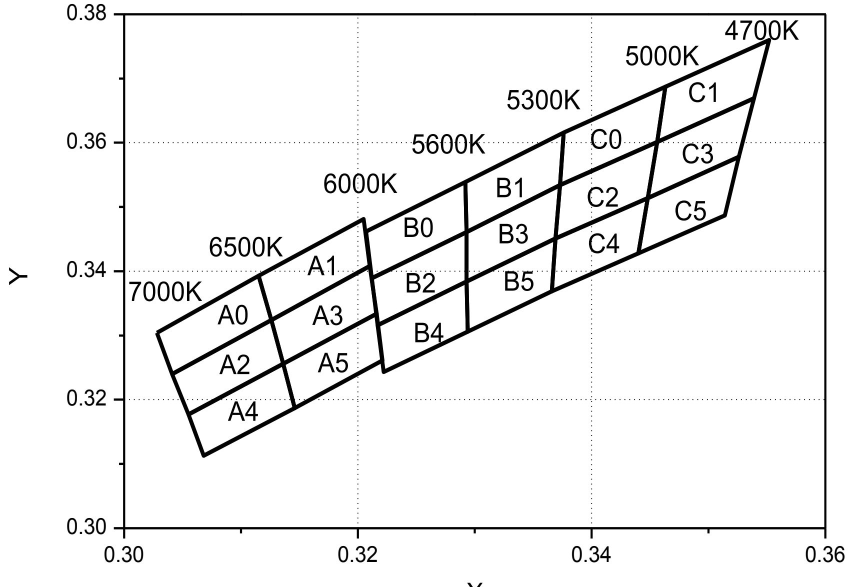
CIE Chromaticity Diagram, T_a = 25℃



1. Energy Star binning applied to all 2600~7000K.
2. Measurement uncertainty of the Color Coordinates: ±0.005

Color Bin Structure

CIE Chromaticity Diagram, T_j=85℃, I_F=20mA

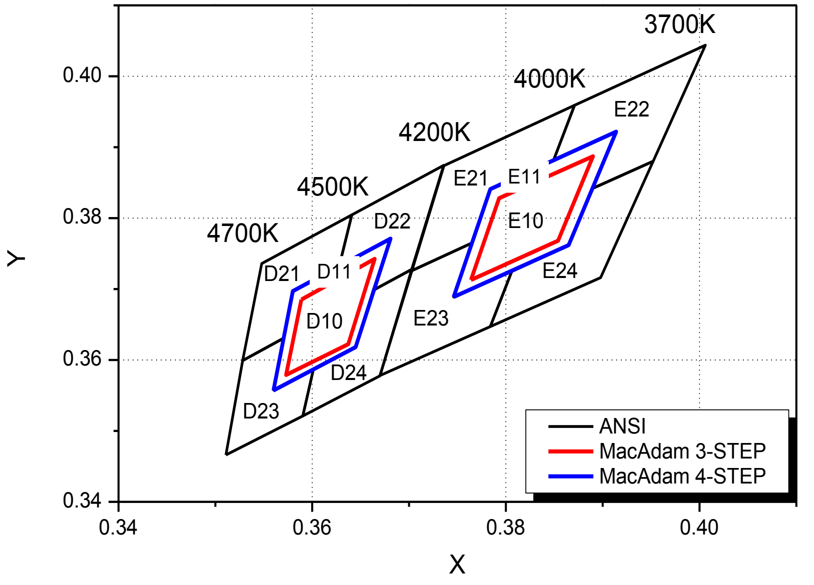


A0		A1		A2	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.3028	0.3304	0.3115	0.3393	0.3041	0.324
0.3041	0.324	0.3126	0.3324	0.3055	0.3177
0.3126	0.3324	0.321	0.3408	0.3136	0.3256
0.3115	0.3393	0.3205	0.3481	0.3126	0.3324
A3		**A4**		**A5**	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.3126	0.3324	0.3055	0.3177	0.3136	0.3256
0.3136	0.3256	0.3068	0.3113	0.3146	0.3187
0.3216	0.3334	0.3146	0.3187	0.3221	0.3261
0.321	0.3408	0.3136	0.3256	0.3216	0.3334
C0		**C1**		**C2**	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.3376	0.3616	0.3463	0.3687	0.3373	0.3534
0.3373	0.3534	0.3456	0.3601	0.3369	0.3451
0.3456	0.3601	0.3539	0.3669	0.3448	0.3514
0.3463	0.3687	0.3552	0.3760	0.3456	0.3601
C3		**C4**		**C5**	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.3456	0.3601	0.3369	0.3451	0.3448	0.3514
0.3448	0.3514	0.3366	0.3369	0.3440	0.3428
0.3526	0.3578	0.3440	0.3428	0.3514	0.3487
0.3539	0.3669	0.3448	0.3514	0.3526	0.3578

C0		C1		C2	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.3376	0.3616	0.3463	0.3687	0.3373	0.3534
0.3373	0.3534	0.3456	0.3601	0.3369	0.3451
0.3456	0.3601	0.3539	0.3669	0.3448	0.3514
0.3463	0.3687	0.3552	0.3760	0.3456	0.3601
C3		**C4**		**C5**	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.3456	0.3601	0.3369	0.3451	0.3448	0.3514
0.3448	0.3514	0.3366	0.3369	0.3440	0.3428
0.3526	0.3578	0.3440	0.3428	0.3514	0.3487
0.3539	0.3669	0.3448	0.3514	0.3526	0.3578

Color Bin Structure

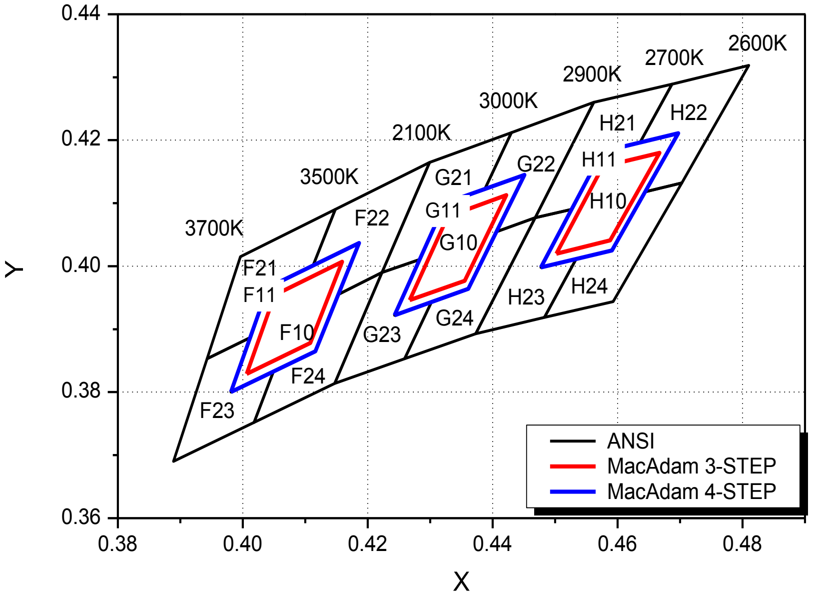
CIE Chromaticity Diagram, T_j=85℃, I_F=20mA



3-STEP				4-STEP			
D10		E10		D11		E11	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.3589	0.3685	0.3764	0.3713	0.3560	0.3557	0.3746	0.3689
0.3665	0.3742	0.3793	0.3828	0.3580	0.3697	0.3784	0.3841
0.3637	0.3622	0.3890	0.3887	0.3681	0.3771	0.3914	0.3922
0.3573	0.3579	0.3854	0.3768	0.3645	0.3618	0.3865	0.3762

Color Bin Structure

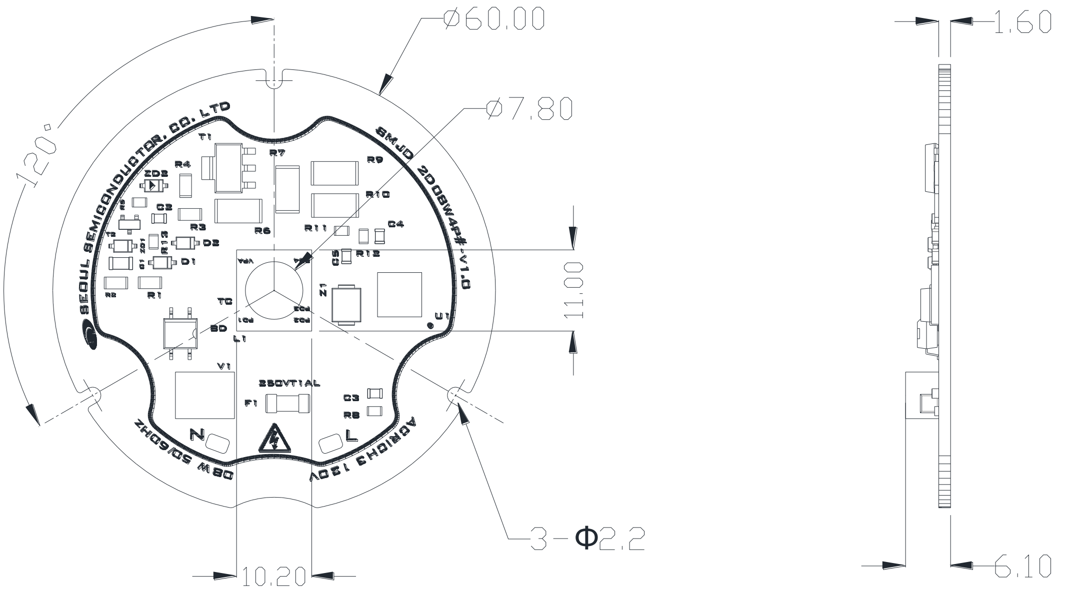
CIE Chromaticity Diagram, T_j=85℃, I_F=20mA



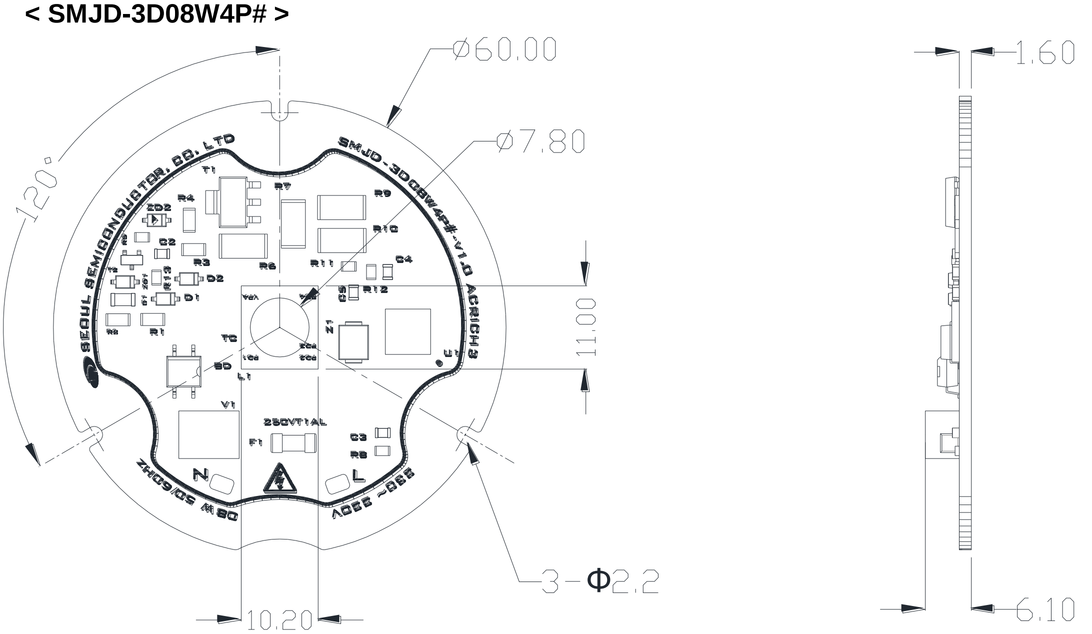
3-STEP						4-STEP					
F10		G10		H10		F11		G11		H11	
CIE x	CIE y	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y	CIE x	CIE y
0.4006	0.3829	0.4267	0.3946	0.4502	0.4020	0.3981	0.3800	0.4243	0.3922	0.4477	0.3998
0.4051	0.3954	0.4328	0.4079	0.4576	0.4158	0.4040	0.3966	0.4324	0.4100	0.4575	0.4182
0.4159	0.4007	0.4422	0.4113	0.4667	0.4180	0.4186	0.4037	0.4451	0.4145	0.4697	0.4211
0.4108	0.3878	0.4355	0.3977	0.4588	0.4041	0.4116	0.3865	0.4361	0.3964	0.4591	0.4025

Mechanical Dimensions

< SMJD-2D08W4P# >



< SMJD-3D08W4P# >

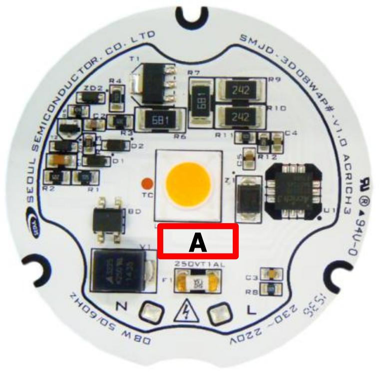


Notes :

(1) All dimensions are in millimeters. (Tolerance : ±0.2)

(2) Scale : None

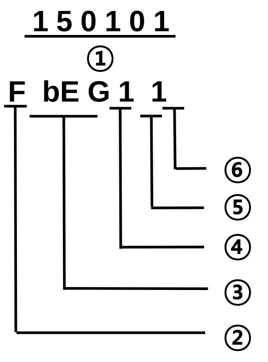
Marking Information



A : Marking

A : ex) 150101 FbeG11

- Description



① SMT Date (YYMMDD, 6 Digits)
② CRI (1 Digits)
③ Module Flux Bin (2 Digits)
④ CCT (1 Digit)
⑤ CCT Combination NO. (1 Digit)
⑥ VF Combination NO. (1 Digit)

② CRI		③ Module Flux Bin				④ CCT		⑥ VF Bin		
Mark	**CRI**	**Type**	**Mark**	**Min.**	**Typ.**	**Mark**	**Bin**	**Mark**	**Min.**	**Max.**
F	**80**	**b**	**bE**	660	740	***0**	*0	**1**	F	F
		c	**cF**	830	870	***1**	*1	**2**	G	G
						***2**	*2			
						***3**	*3			
						***4**	*4			
						***5**	*5			
						***A**	*10			
						***B**	*11			

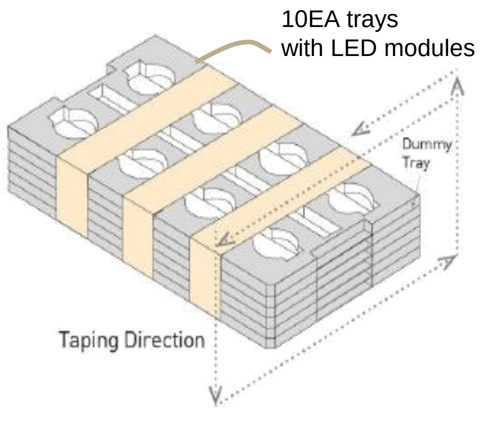
* CCT Mark from *0 to *4 is 3-step

Packing Information

1. Tray information

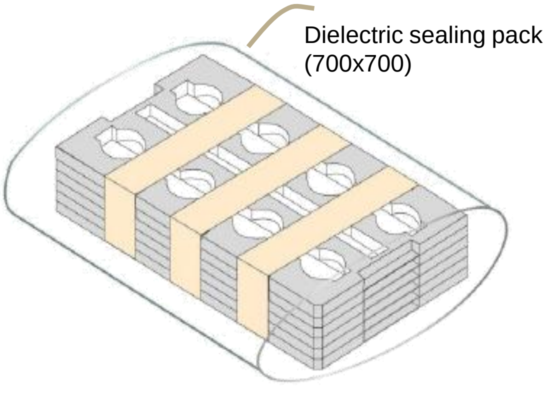
- 24 PCS LED modules packed per tray

2. Tray stack and taping

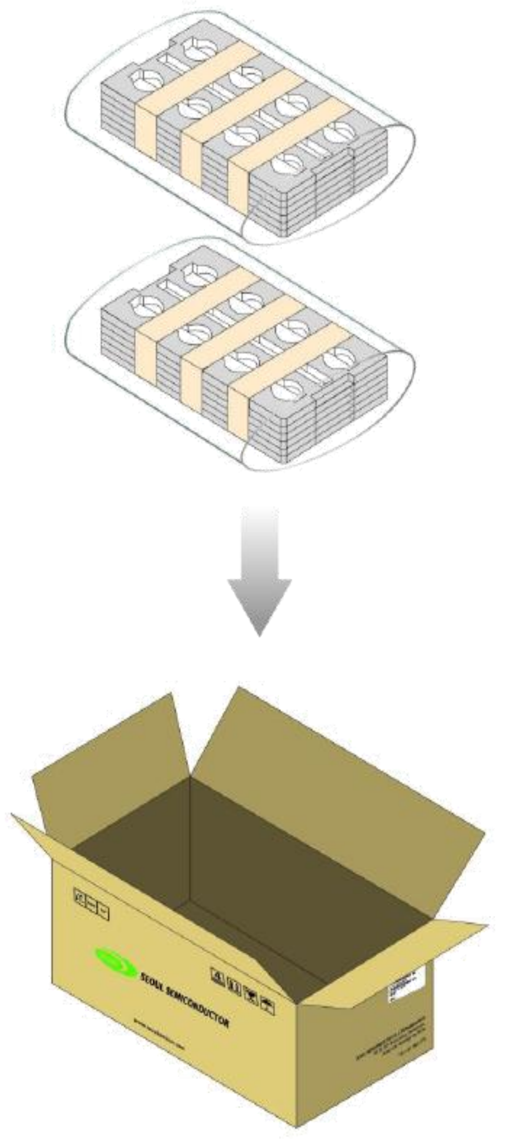


- 10 LED module trays and additional 1 dummy trays each up and down of box
- Add silica gel (1EA) on top of the tray

3. Sealing packing



4. Box information & packing



- 240 PCS modules per BOX 1EA
- 1 Box : 24 PCS per tray x 10 trays = 240 PCS

Label Information

Model No.	SMJD-2D08W4PF (1)
Rank	08bG80A (2)
Type	All (3)
Quantity	XX
Date	YYMDDXXXXX-XXXXXXX
SEOUL	SEOUL SEMICONDUCTOR CO.,LTD.

Notes

(1) The model number designation is explained as follow
SMJD : Seoul Semiconductor internal code
2D : Input voltage (120V = 2D, 220V = 3D)
08W : About Power Consumption
4 : Acrich IC Version 3.0
PF: MJT COB (PF=SAW85F1B)

(2) It represents module optical SPEC’
08b : Luminous flux (08b, 08c)
G : CCT (H,G,E,C,B,A)
80 : CRI (CRI80 = 80, CRI90=90)
A : CIE Area (3step = 3, 4step = 4, A = All)

(3) It represents module CIE SPEC’.
ALL : CIE Area (3step, 4step, All)

(4) It is attached to the top of a sealing pack & the bottom right corner of the box.

TOTAL Quantity XX
SEOUL SEMICONDUCTOR CO.,LTD.

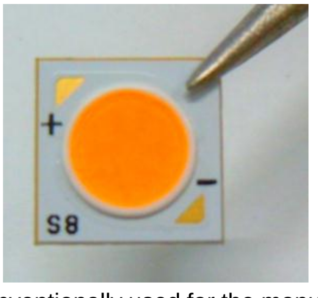
Notes

(1) It is attached to the bottom right corner of the box.

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 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

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Company Information

Seoul Semiconductor (SeoulSemicon.com) manufacturers 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 it's 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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Revision History

Revision	Date	Page	Remarks
0.0	2015-10-30	All	Initial release