

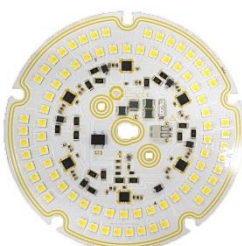
Integrated AC LED Solution

Acrich3 – 95W

SMJQ-XC95W4PX



SMJQ-2C95W4PA



SMJQ-3C95W4P7



Product Brief

Description

- The Acrich3 series of products are designed to be 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

- Connects directly to AC line voltage
- High Power Efficiency & Factor
- Low THD
- Long Life Time
- Simple BOM
- Miniaturization
- Lead Free Product
- RoHS Compliant

Key Applications

- Factory Ceiling Light
- Industrial Light
- High Bay
- Low Bay

Table 1. Product Selection

Part No.	Vin [Vac]	P [W]	CCT [K]	Flux [lm]		CRI
				Min.	Typ.	Min.
SMJQ-2C95W4PA	120	95	3700 - 6000	9,500	10,300	70
SMJQ-3C95W4P7	220					

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Performance Characteristics

Table 2. Electro Optical Characteristics, T_a = 25°C

Parameter	Symbol	Value			Unit	Mark
		Min.	Typ.	Max.		
Luminous Flux ^[1]	Φ_v	10300			lm	B,C,D,E
Correlated Color Temperature ^[2]	CCT	5300	5600	6000	K	B
		4700	5000	5300		C
		4200	4500	4700		D
		3700	4000	4200		E
CRI	Ra	70	-	-	-	
Input Voltage ^[3]	V_{in}	120			Vac	2C
		220				3C
Power Consumption	P	95			W	95W
Operating Frequency	f	50 / 60			Hz	
Power Factor	PF	Over 0.97			-	
Viewing Angle	$2\Theta_{1/2}$	120			deg.	
Tolerance of Surge ^[4]	V_s	500	-	-	V	

Notes :

- (1) Φ_V is the total luminous flux output measured with an integrated sphere.
- (2) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.
- (3) 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 °C.
- (4) Surge withstand in accordance with IEC61000-4-5.(Line to Line)

Performance Characteristics

Table 3. Absolute Maximum Ratings, T_a = 25°C

Parameter	Symbol	Unit	Value
Maximum Input Voltage	V _{in}	VAC	144 (@120VAC)
			264 (@220VAC)
Power Consumption	P	W	114
Operating Temperature	T _{opr}	°C	-30 ~ 85
Storage Temperature	T _{stg}	°C	-40 ~ 100
ESD Sensitivity	-	-	±4,000V HBM

Chracteristics Graph

Fig 1. Relative Spectral Distribution vs. Wavelength Characteristic – B,C

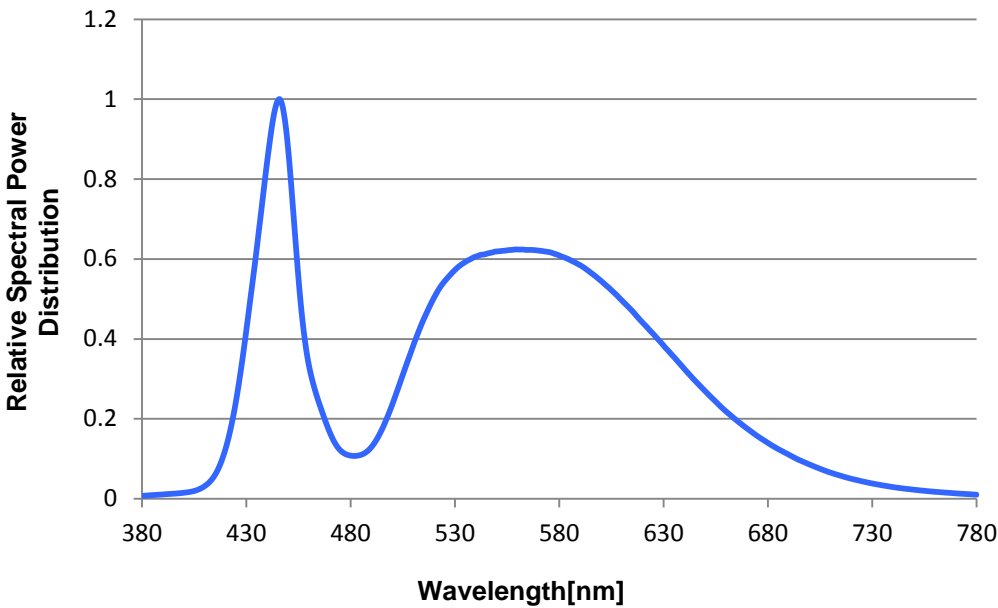
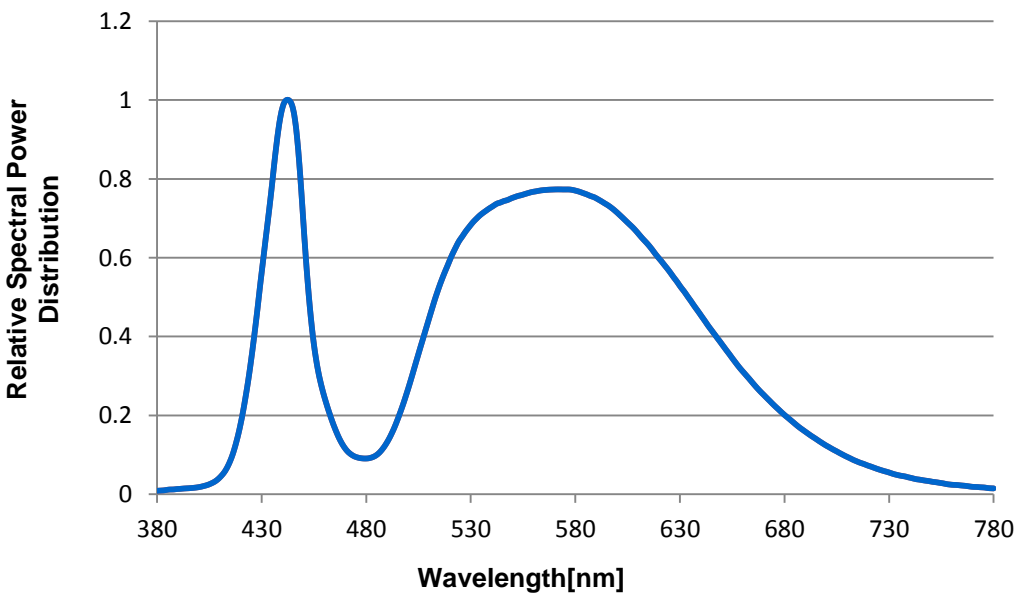


Fig 2. Relative Spectral Distribution vs. Wavelength Characteristic – D,E



Chracteristics Graph

Fig 3. Relative Power Distribution vs. Voltage, $T_a=25^{\circ}\text{C}$, 120V (P.Com Mode)

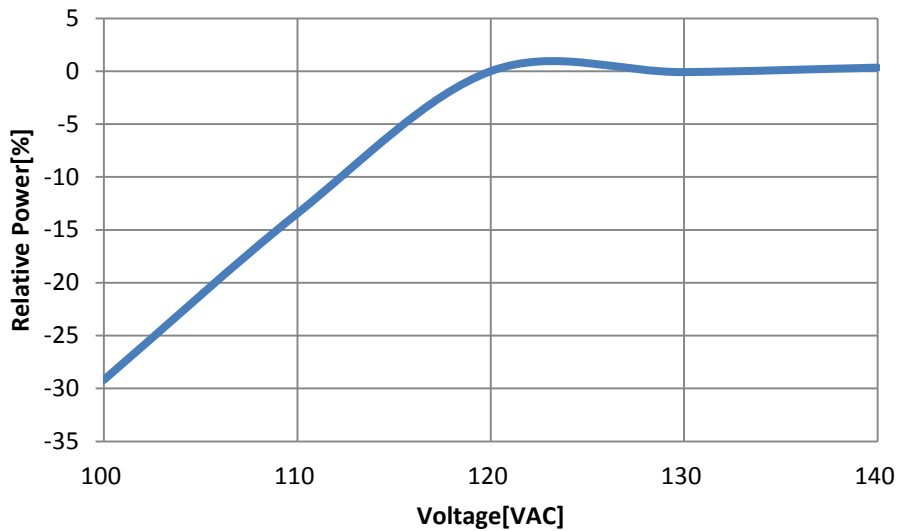
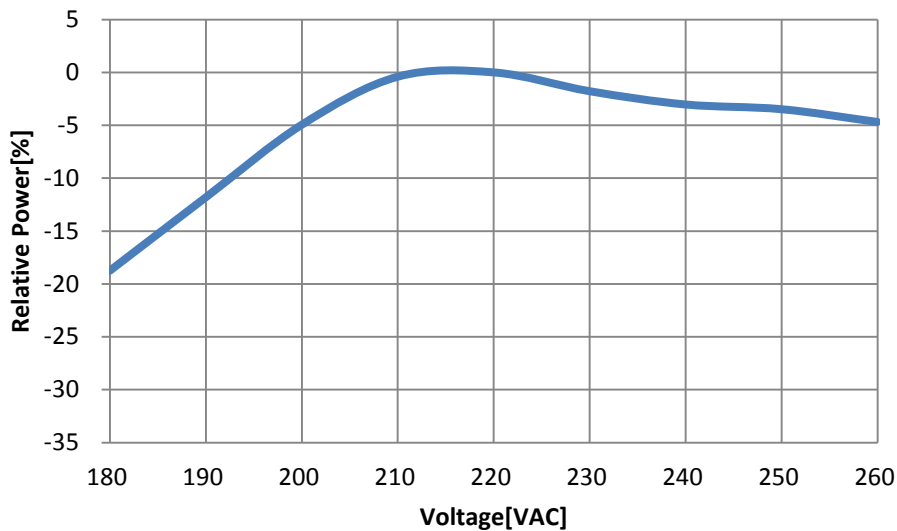


Fig 4. Relative Power Distribution vs. Voltage, $T_a=25^{\circ}\text{C}$, 220V (P.Com Mode)

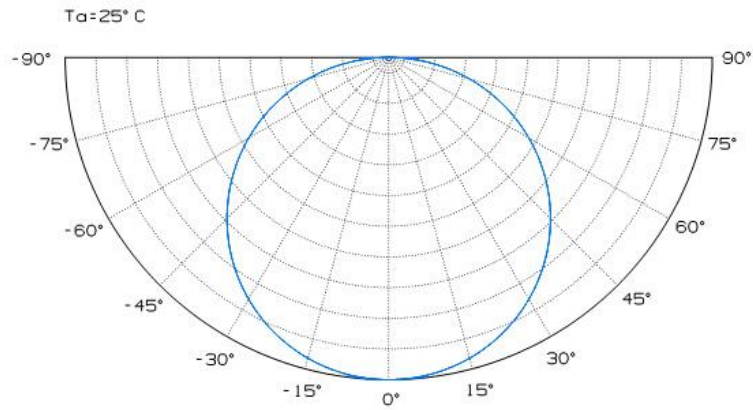


Notes :

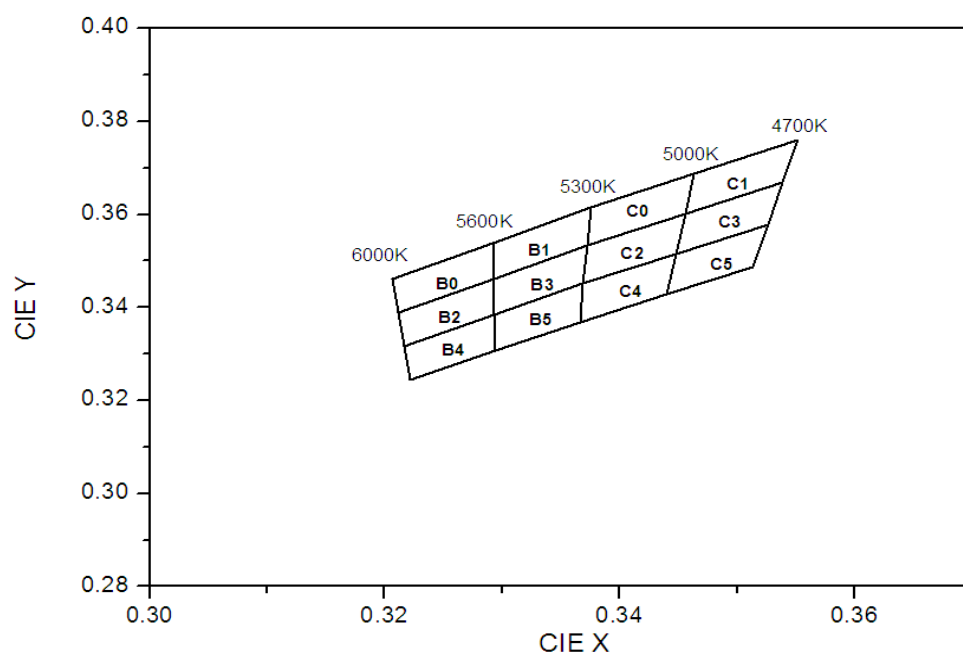
Power Compensation Range : $\pm 5\%$ of Rated Power within Rated Voltage +20%

Chracteristics Graph

Fig 5. Radiant Pattern, $T_a = 25^\circ\text{C}$

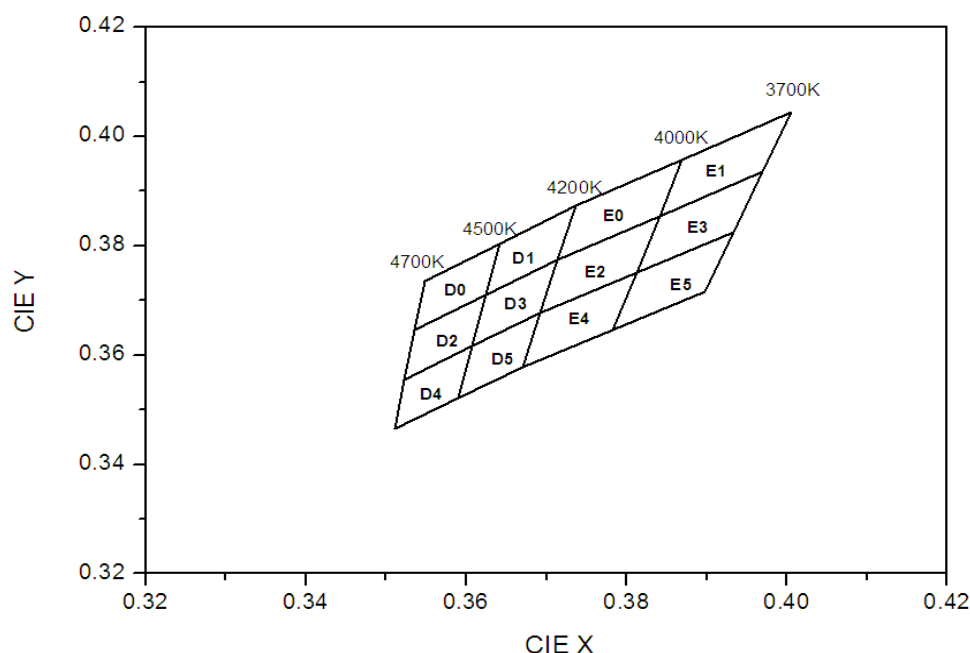


Color Bin Structure

CIE Chromaticity Diagram


B0		B1		B2	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3207	0.3462	0.3292	0.3539	0.3212	0.3389
0.3212	0.3389	0.3293	0.3461	0.3217	0.3316
0.3293	0.3461	0.3373	0.3534	0.3293	0.3384
0.3292	0.3539	0.3376	0.3616	0.3293	0.3461
B3		B4		B5	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3293	0.3461	0.3217	0.3316	0.3293	0.3384
0.3293	0.3384	0.3222	0.3243	0.3294	0.3306
0.3369	0.3451	0.3294	0.3306	0.3366	0.3369
0.3373	0.3534	0.3293	0.3384	0.3369	0.3451
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	0.376	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	0.344	0.3428
0.3526	0.3578	0.344	0.3428	0.3514	0.3487
0.3539	0.3669	0.3448	0.3514	0.3526	0.3578

Color Bin Structure

CIE Chromaticity Diagram


D0		D1		D2	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3548	0.3736	0.3641	0.3804	0.3536	0.3646
0.3536	0.3646	0.3625	0.3711	0.3523	0.3555
0.3625	0.3711	0.3714	0.3775	0.3608	0.3616
0.3641	0.3804	0.3736	0.3874	0.3625	0.3711
D3		D4		D5	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3625	0.3711	0.3523	0.3555	0.3608	0.3616
0.3608	0.3616	0.3511	0.3485	0.3590	0.3521
0.3692	0.3677	0.3590	0.3521	0.3670	0.3578
0.3714	0.3775	0.3608	0.3616	0.3692	0.3677
E0		E1		E2	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3736	0.3874	0.3869	0.3958	0.3714	0.3775
0.3714	0.3775	0.3842	0.3855	0.3692	0.3677
0.3842	0.3855	0.3970	0.3935	0.3813	0.3751
0.3869	0.3958	0.4006	0.4044	0.3842	0.3855
E3		E4		E5	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3842	0.3855	0.3892	0.3677	0.3813	0.3751
0.3813	0.3751	0.3870	0.3578	0.3783	0.3646
0.3934	0.3825	0.3783	0.3646	0.3898	0.3716
0.3970	0.3935	0.3813	0.3751	0.3934	0.3825

Part List

Table 4-1. Part List

No	Part	Reference	Specification	Quantity
1	PCB	-	Al, ø145, T=1.6, 1 layer / Cu 2oz / White PSR	1
2	LED	-	SAW0LA0A @120Vac	96
			SAW0LH0A @220Vac	78
3	IC	U1~U6	DT3007C @120Vac	6
			DT3007B @220Vac	6
4	Fuse	F1	250V, 2A	1
5	Varistor	V1~V4	391Vac	4
6	Bridge Diode	BD1	600V, 1A	1
7	TVS	Z1~Z6	440V, 600W, 5%, Unidirectional	6
8	DIODE	D2	RS1010FL(1000V 1A)	1
9	ZENER DIODE	Z7	MMSZ5258B	1
10	Resistor	R1~R12	R6432, 2Ω, 5%(J)	12
11		R13,R15,R17,R19, R21,R23	R2012, 16KΩ, 1%(F) @120Vac	6
12			R2012, 13KΩ, 1%(F) @220Vac	6
13		R14,R16,R18,R20, R22,R24	R2012, 16KΩ, 1%(F) @120Vac	6
14			R2012, 24KΩ, 1%(F) @220Vac	6
15		R25~R30	R2012, 2MΩ, 5%(J)	6
16		R31~R36	R2012, 68KΩ, 5%(J) @120Vac	6
17			R2012, 39KΩ, 5%(J) @220Vac	6
18		R37	-	-
19		R38,R39	R3216, 160KΩ, 5%(J)	2
20		R10	R3216, 300Ω, 5%(J)	1
21		J1~J5	6432, 0Ω, 5%(J)	5

Notes : The above specification is subject to change without further notice for the improvement of products

Part List

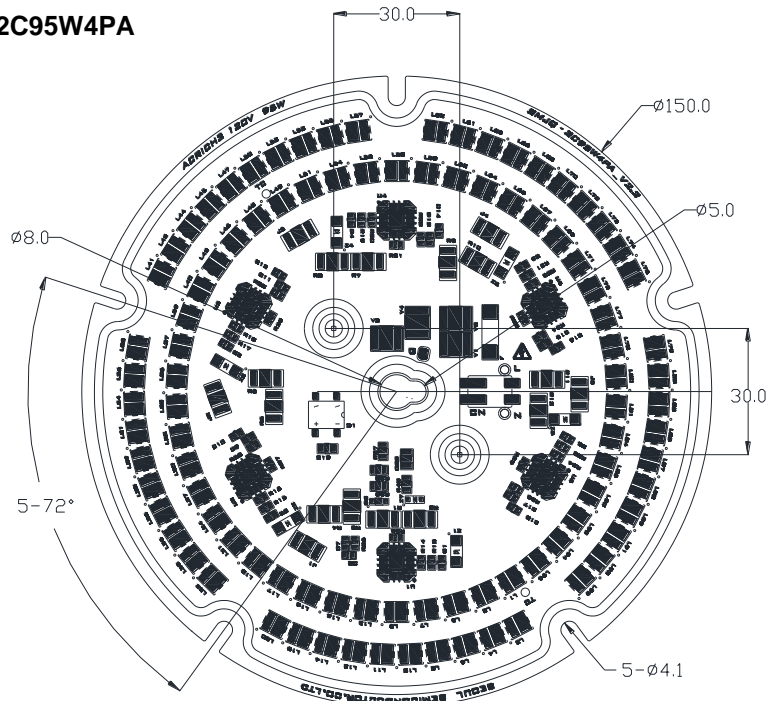
Table 4-2. Part List

No	Part	Reference	Specification	Quantity
22	Capacitor	C1~C6	C2012, 100nF, 25V X7R	6
23		C7~C18	C2012, 10uF, 25V X7R	12
24		C19	-	-
25		C20	C3225 10uF X7R	1
26	Connector	Con1	Wago 2060-402 Molex 1041880210	1

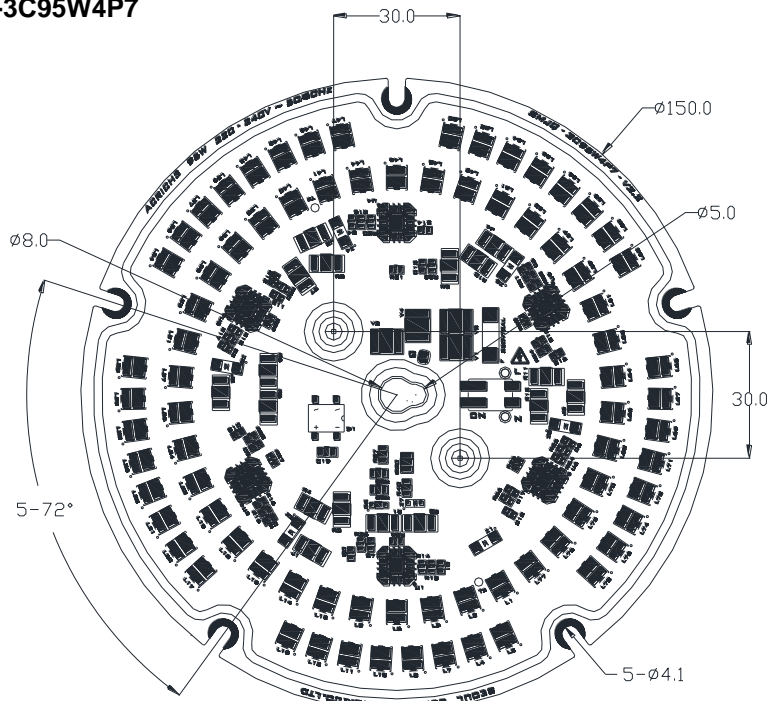
Notes : The above specification is subject to change without further notice for the improvement of products

Mechanical Dimensions

SMJQ-2C95W4PA



SMJQ-3C95W4P7

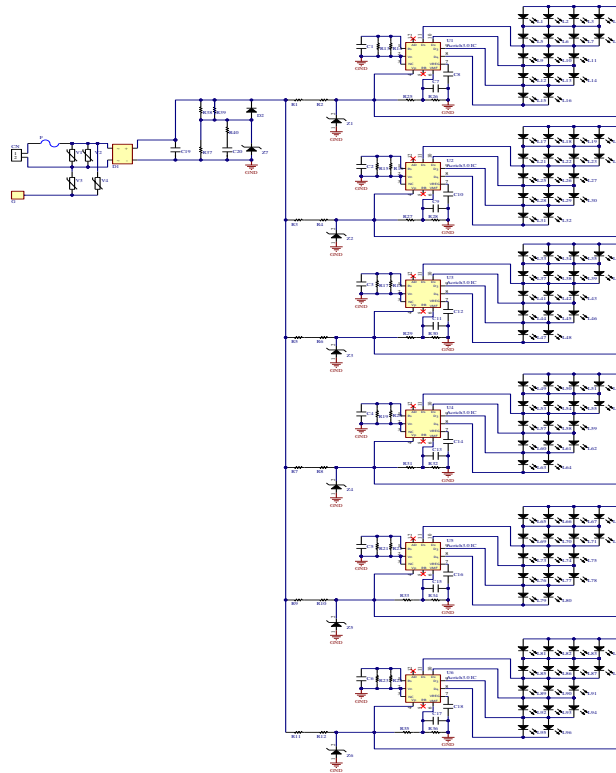


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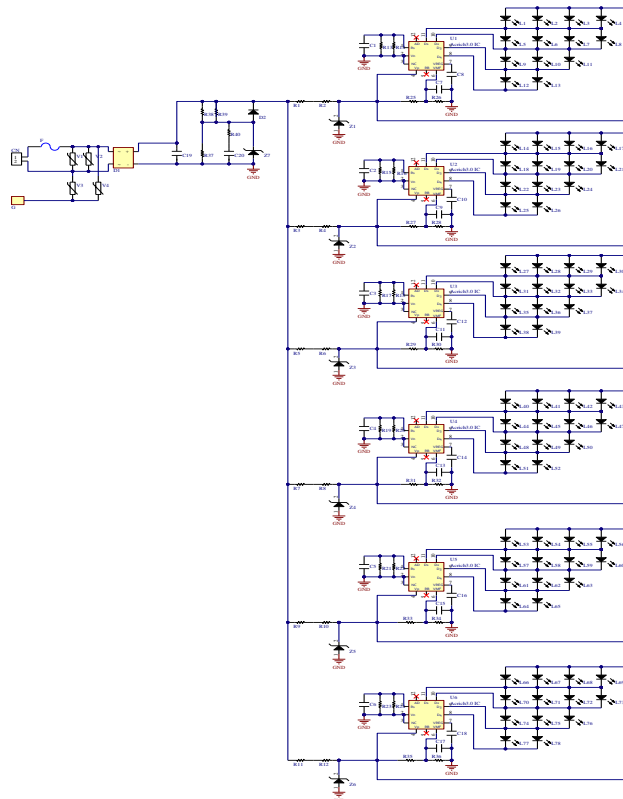
- (1) All dimensions are in millimeters. (Tolerance : ± 0.2)
- (2) Scale : None

Circuit Drawing

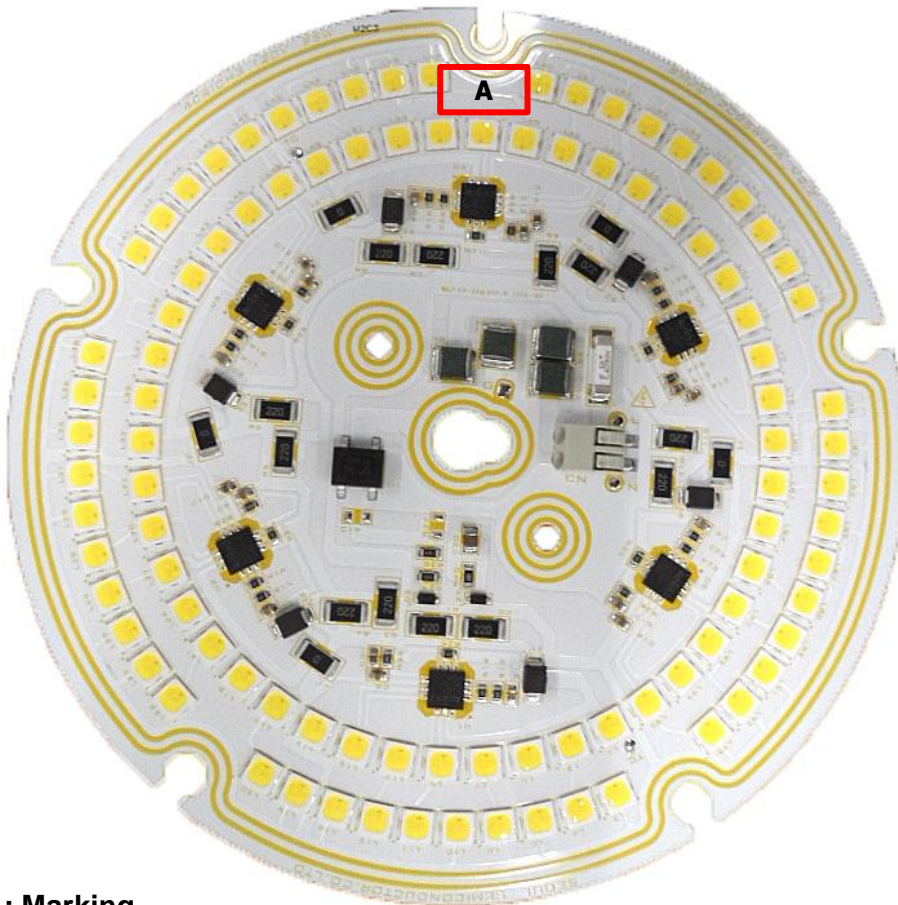
SMJQ-2C95W4PA



SMJQ-3C95W4P7



Marking Information



A : Marking

ex) 150101 W2C2A

W2 C2 A

- Description

<u>1 5 0 1 0 1</u>	①	SMT Date (YYMMDD, 6 Digits)
①	②	LED PKG. Luminous Intensity Bin (2 Digits)
<u>W2 C2 A</u>	③	LED PKG. Color Bin (2 Digits)
② ③ ④	④	Voltage Bin (2 Digits)

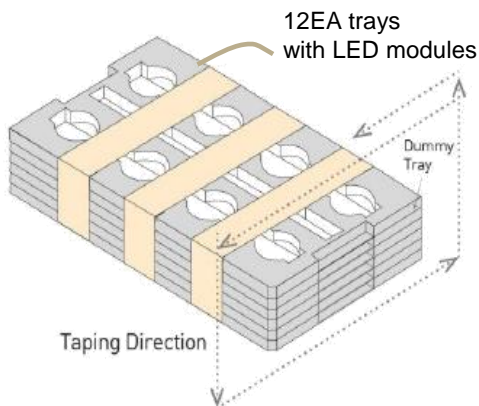
Packing

1. Tray information



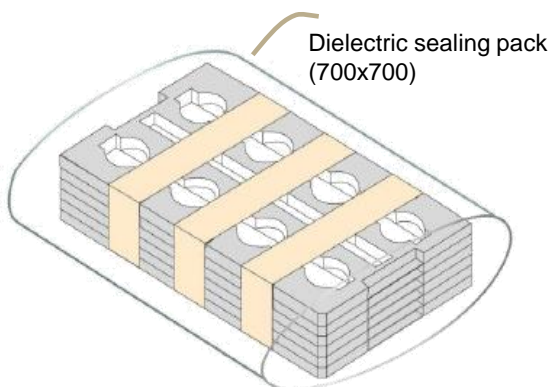
- 6 PCS LED modules packed per tray

2. Tray stack and taping

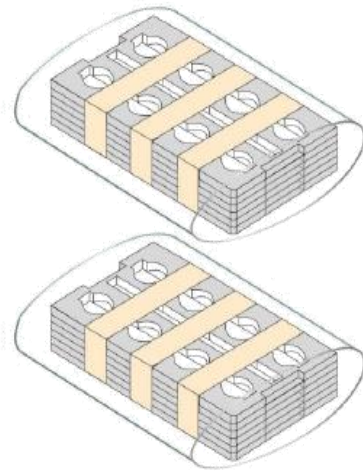


- 12 LED module trays and additional 2 dummy trays up and down of box
- Add silica gel (1EA) on top of the tray

3. Sealing packing



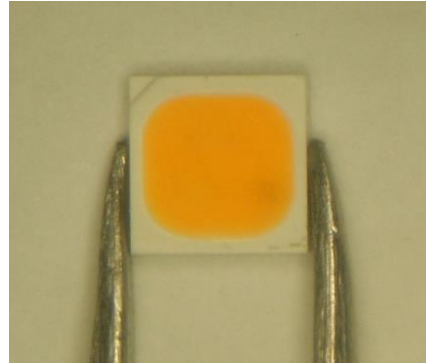
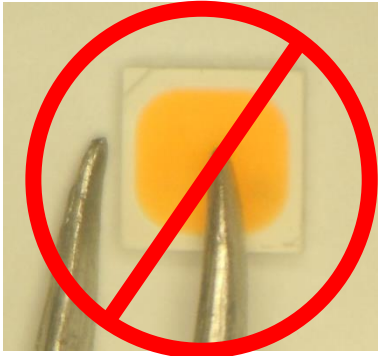
4. Box information & packing



- 60 PCS modules per BOX 1EA

** 1 Box: 6 PCS per tray x 12 trays = 60 PCS

Handling of Silicone Resin for LEDs



- (1) Acrich2 series is encapsulated with silicone resin for high optical efficiency.
- (2) Please do not touch the silicone resin area with sharp objects such as pincette(tweezers).
- (3) Finger prints on silicone resin area may affect the performance.
- (4) Please store LEDs in covered containers to prevent dust accumulation as this may affect performance.
- (5) Excessive force more than 3000gf to the silicone lens can result in fatal or permanent damage with LEDs.
- (6) Please do not cover the silicone resin area with any other resins such as epoxy, urethane, etc.

Precaution for Use

- (1) Please review the Acrich2 Application Note for proper protective circuitry usage.
- (2) Please note, Acrich2 products run off of high voltage, therefore caution should be taken when working near Acrich2 products.
- (3) Make sure proper discharge prior to starting work.
- (4) DO NOT touch any of the circuit board, components or terminals with body or metal while circuit is active.
- (5) Please do not add or change wires while Acrich2 circuit is active.
- (6) Long time exposure to sunlight or UV can cause the lens to discolor.
- (7) Please do not use adhesives to attach the LED that outgas organic vapor.
- (8) Please do not use together with the materials containing Sulfur.
- (9) Please do not assemble in conditions of high moisture and/or oxidizing gas such as Cl, H₂S, NH₃, SO₂, NO_x, etc.
- (10) Please do not make any modification on module.
- (11) Please be cautious when soldering to board so as not to create a short between different trace patterns.
- (12) Do not impact or place pressure on this product because even a small amount of pressure can damage the product. The product should also not be placed in high temperatures, high humidity or direct sunlight since the device is sensitive to these conditions.
- (13) When storing devices for a long period of time before usage, please following these guidelines:
 - * The devices should be stored in the anti-static bag that it was shipped in from Seoul-Semiconductor with opening.
 - * If the anti-static bag has been opened, re-seal preventing air and moisture from being present in the bag.
- (14) LEDs and IC are sensitive to Electro-Static Discharge (ESD) and Electrical Over Stress (EOS). The Acrich2 product should also not be installed in end equipment without ESD protection. 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:

Precaution for Use

- 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)

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) manufactures 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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