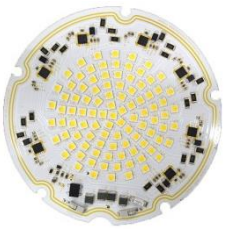
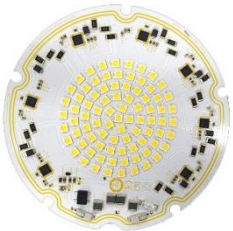
Integrated AC LED Solution

Acrich3 – 105W

SMJQ-XCA5W4PX



SMJQ-2CA5W4PA



SMJQ-3CA5W4P7

RoHS

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-2CA5W4PA	120	105	3700 - 6000	10,500	11,500	70
SMJQ-3CA5W4P7	220					

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Performance Characteristics

Table 2. Electro Optical Characteristics, T_a = 25ºC

Parameter	Symbol	Value			Unit	Mark
		Min.	Typ.	Max.		
Luminous Flux [1]	Φ_V		11500		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		105		W	A5W
Operating Frequency	f		50 / 60		Hz	
Power Factor	PF		Over 0.97		-	
Viewing Angle	$2\Theta_{1/2}$		120		deg.	

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℃.

Performance Characteristics

Table 3. Absolute Maximum Ratings, T_a = 25ºC

Parameter	Symbol	Unit	Value
Maximum Input Voltage	V_{in}	VAC	144 (@120VAC)
			264 (@220VAC)
Power Consumption	P	W	126
Operating Temperature	T_{opr}	ºC	-30 ~ 85
Storage Temperature	T_{stg}	ºC	-40 ~ 100
ESD Sensitivity	-	-	±4,000V HBM

Characteristic Graph

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

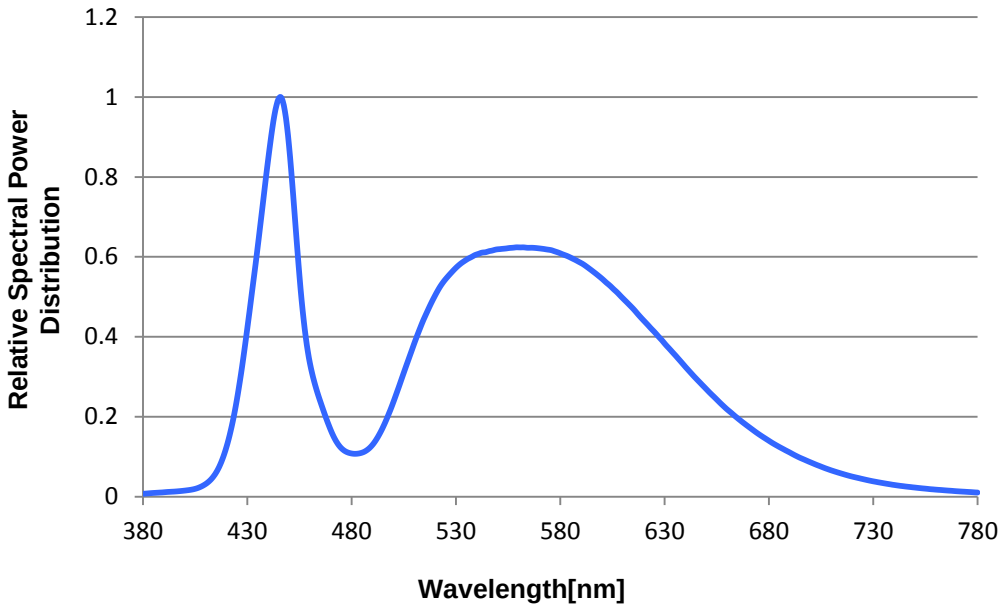
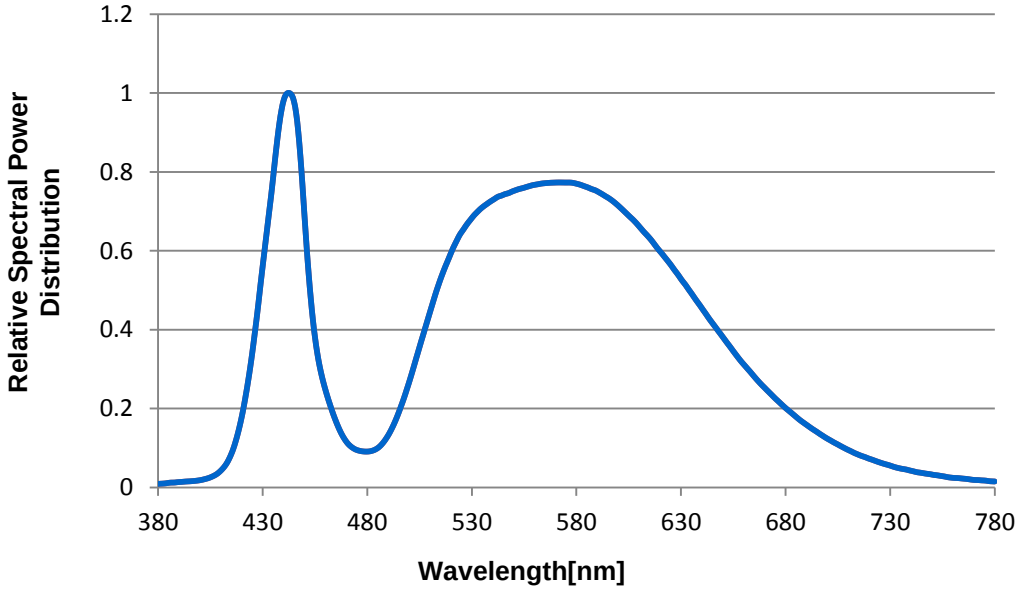


Fig 2. Relative Spectral Distribution vs. Wavelength Characteristic – D,E



Characteristic Graph

Fig 3. Relative Power Distribution vs. Voltage, T_a=25℃, 120V (P.Com Mode)

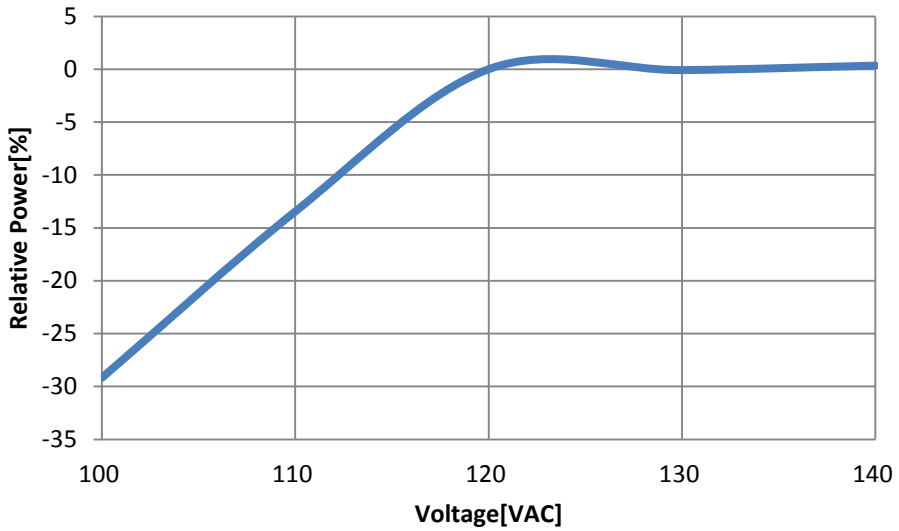
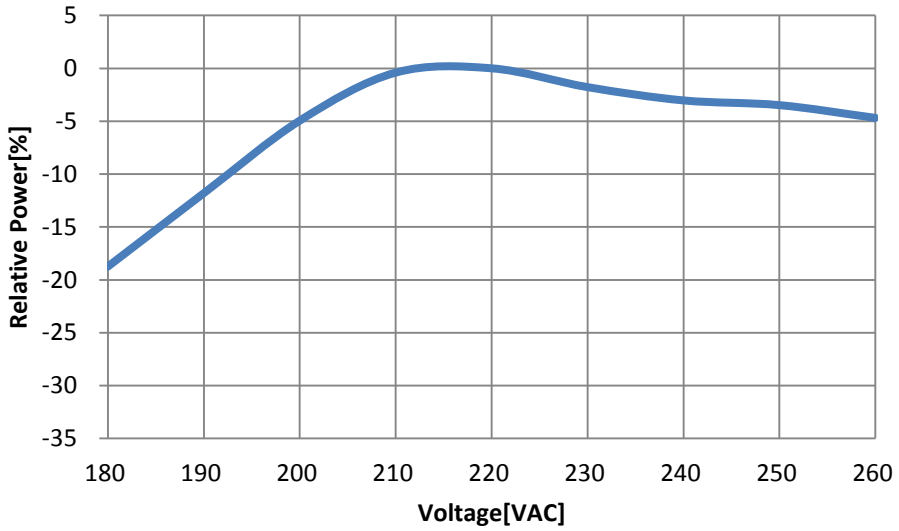


Fig 4. Relative Power Distribution vs. Voltage, T_a=25℃, 220V (P.Com Mode)

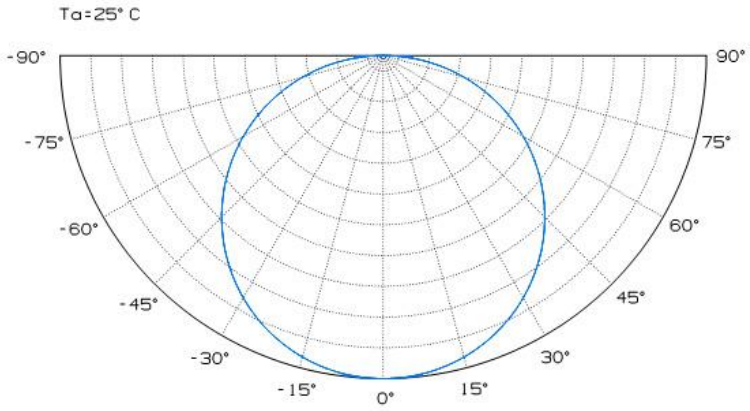


Notes :

Power Compensation Range : ±5% of Rated Power within Rated Voltage +20%

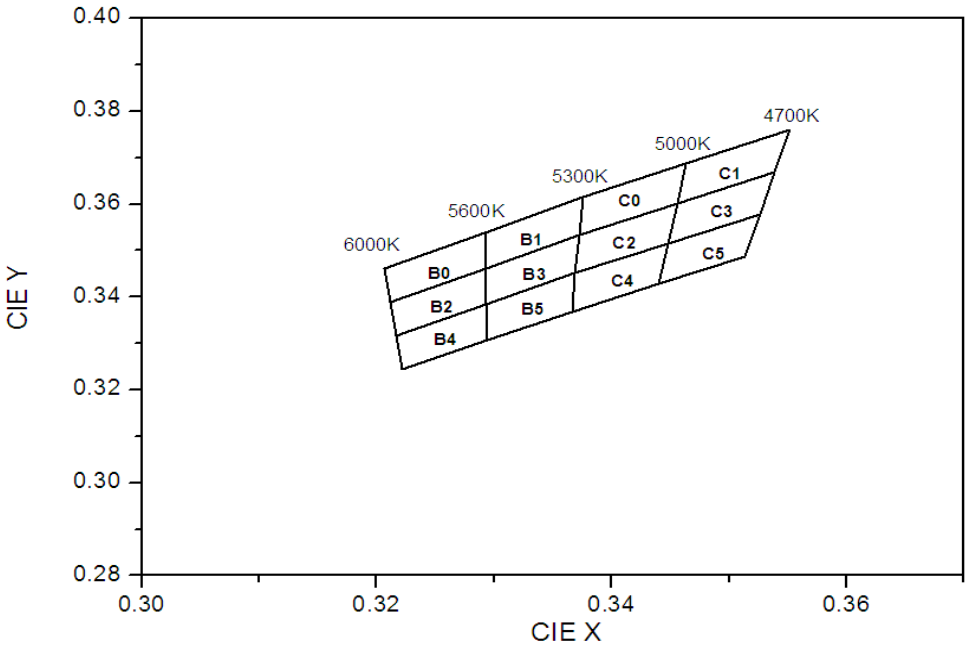
Characteristic Graph

Fig 5. Radiant Pattern, T_a =25℃



Color Bin Structure

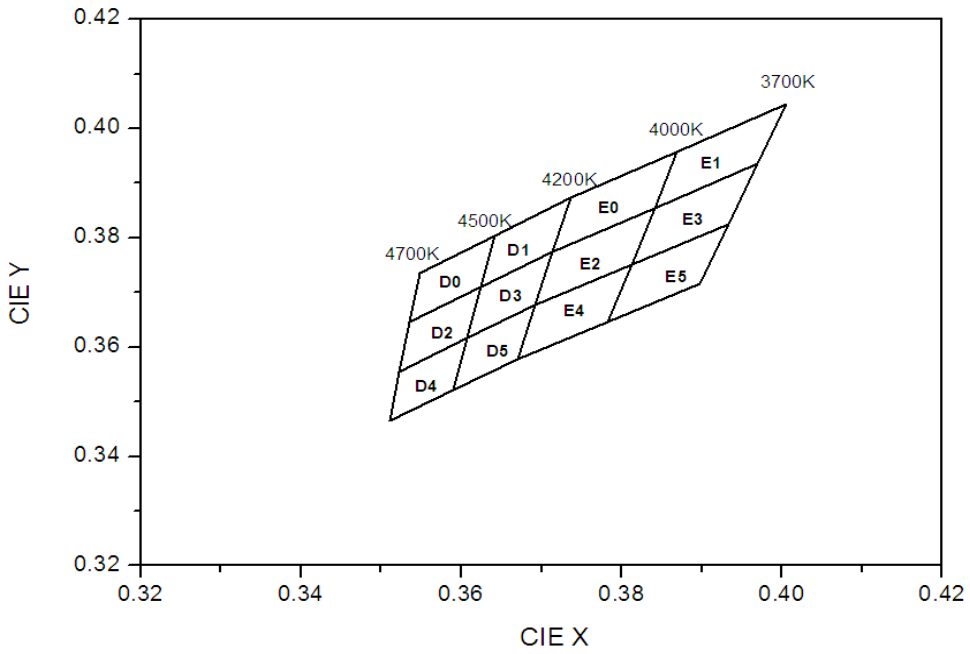
CIE Chromaticity Diagram



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	0.3368	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	0.3368	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	0.3465	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	0.3692	0.3677	0.3813	0.3751
0.3813	0.3751	0.3670	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	98
			SAW0LH0A @220Vac	84
3	IC	U1~U7	DT3007C @120Vac	7
			DT3007B @220Vac	7
4	Fuse	F1	250V, 2A	1
5	Varistor	V1~V4	391Vac	4
6	Bridge Diode	BD1	600V, 1A	1
7	TVS	Z1~Z7	440V, 600W, 5%, Unidirectional	7
8	DIODE	D2	RS1010FL(1000V 1A)	1
9	ZENER DIODE	Z8	MMSZ5258B	1
10	Resistor	R1~R14	R6432, 22Ω, 5%(J)	14
11		R15,R17,R19,R21,R23, R25,R27	R2012, 12KΩ, 1%(F) @120Vac	7
12			R2012, 16KΩ, 1%(F) @220Vac	7
13		R16,R18,R20,R22,R24, R26,R28	R2012, 21KΩ, 1%(F) @120Vac	7
14			R2012, 16KΩ, 1%(F) @220Vac	7
15		R29~R35	R2012, 2MΩ, 5%(J)	7
16		R36~R42	R2012, 68KΩ, 5%(J) @120Vac	7
17			R2012, 39KΩ, 5%(J) @220Vac	7
18		R43	-	-
19		R44,R45	R3216, 160KΩ, 5%(J)	2
20		R46	R3216, 300Ω, 5%(J)	1
21		J1~J6	6432, 0Ω, 5%(J)	6

Part List

Table 4-2. Part List

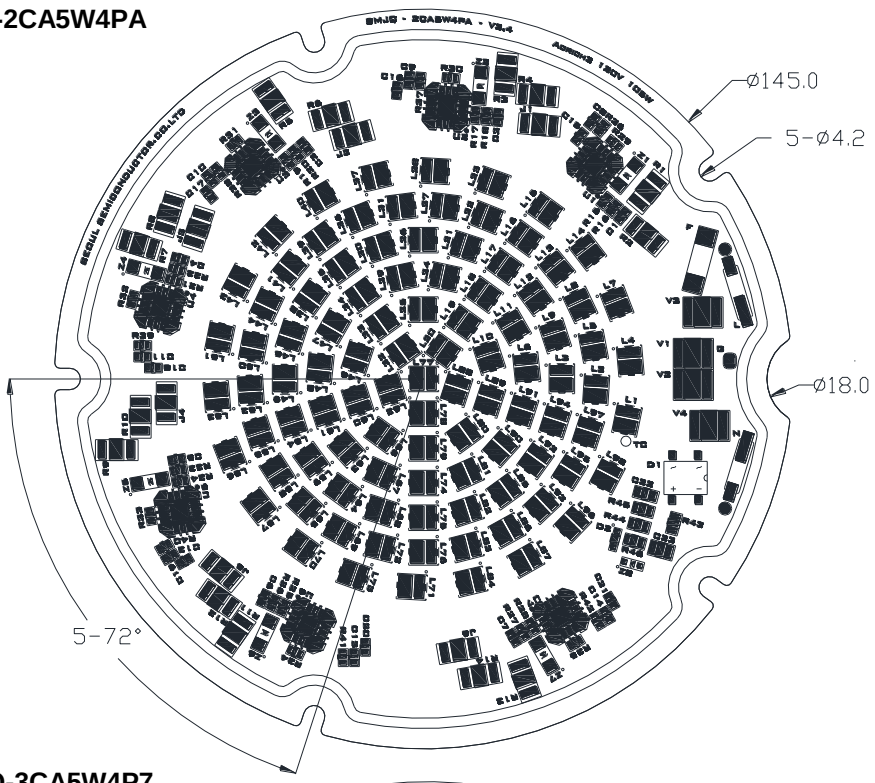
No	Part	Reference	Specification	Quantity
22	Capacitor	C1~C7	C2012, 100nF, 25V X7R	7
23		C8~C21	C2012, 10uF, 25V X7R	14
24		C22	-	-
25		C23	C3225 10uF X7R	1
26	Connector	Con1, Con2	Wago 2060-401 Molex 1041880110	2

Notes :

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

Mechanical Dimensions

SMJQ-2CA5W4PA



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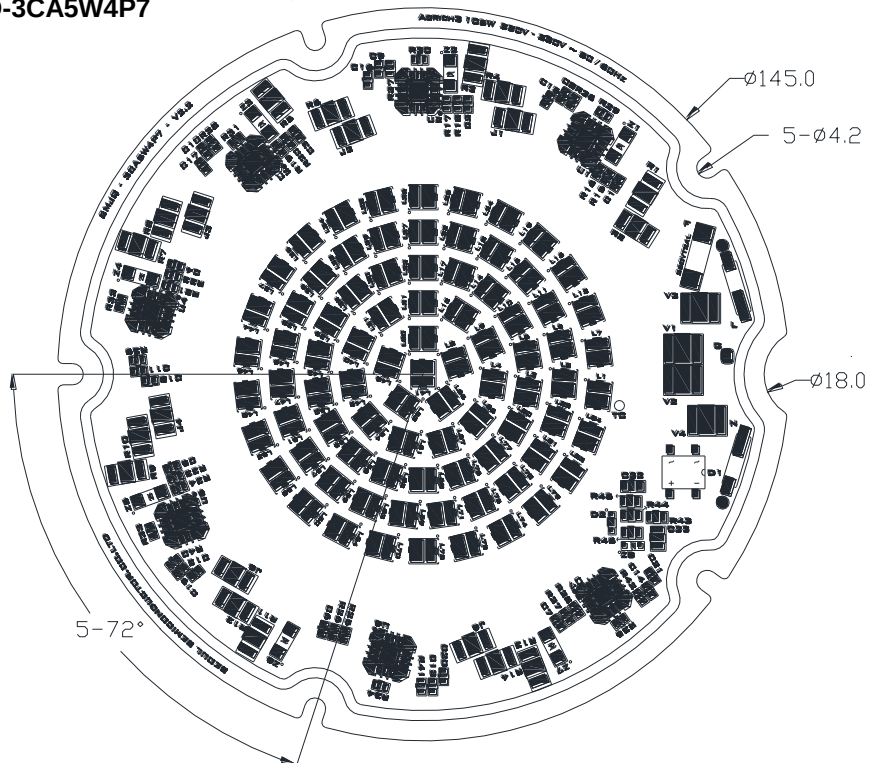
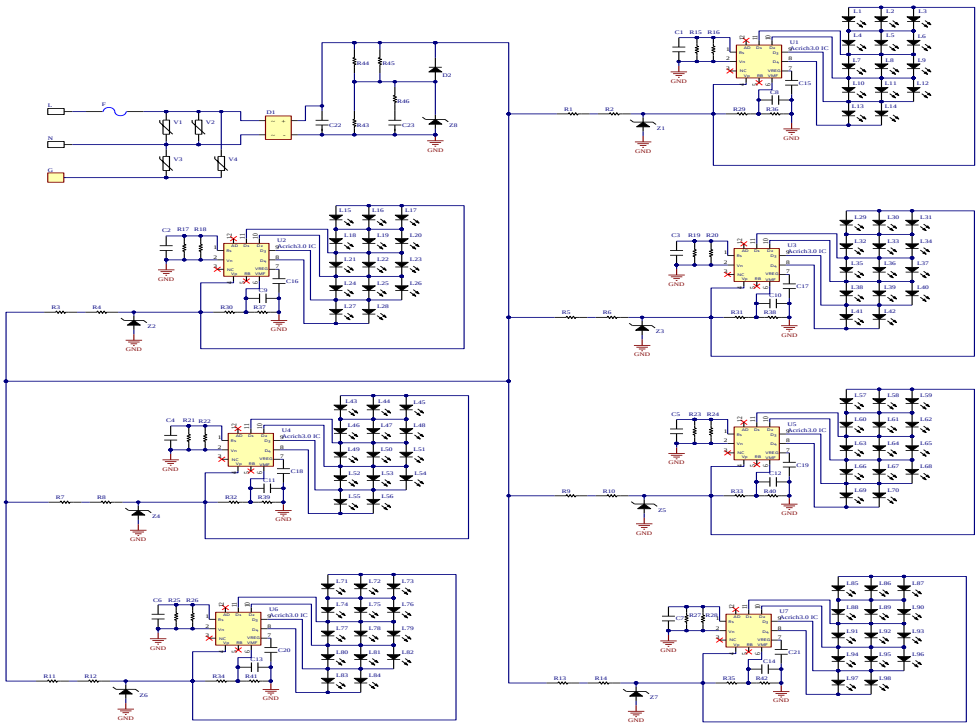


Notes :

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

Circuit Drawing

SMJQ-2CA5W4PA



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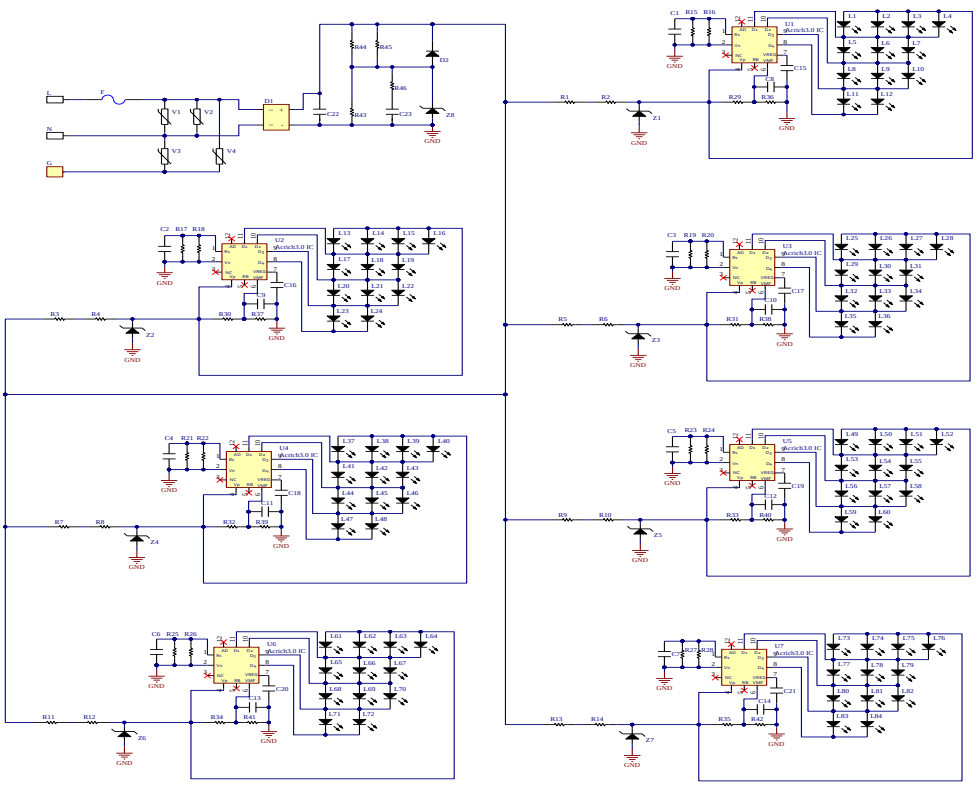
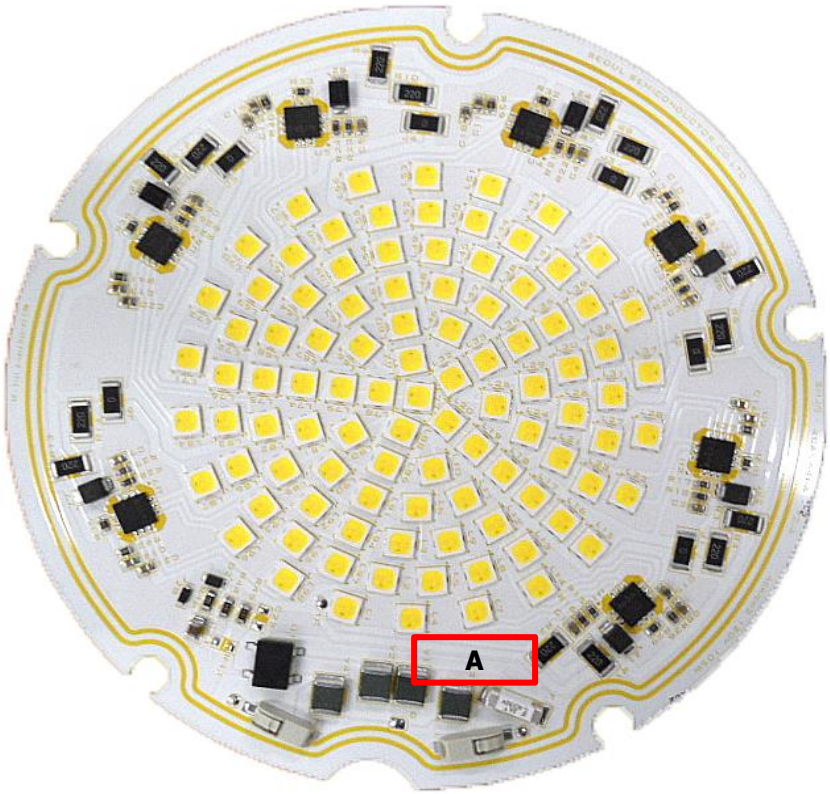


Marking Information



A : Marking

ex) 150101 W2C2A

W2 C2 A

- Description

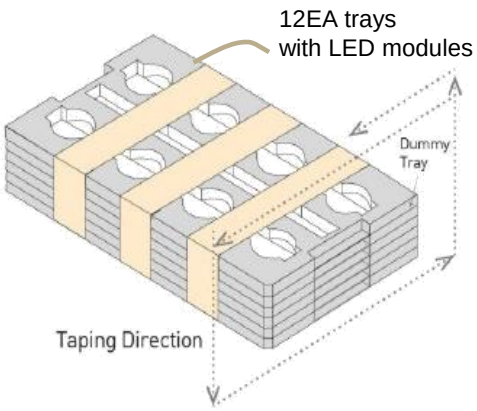
1 5 0 1 0 1 ①	① SMT Date (YYMMDD, 6 Digits)
W2 ②	② LED PKG. Luminous Intensity Bin (2 Digits)
C2 ③	③ LED PKG. Color Bin (2 Digits)
A ③	④ Voltage Bin (2 Digits)

Packing

1. Tray information

• 6 PCS LED modules packed per tray

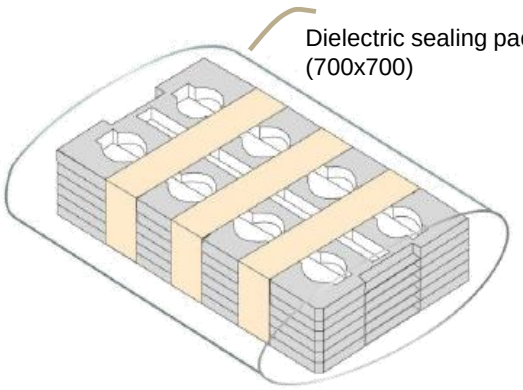
2. Tray stack and taping



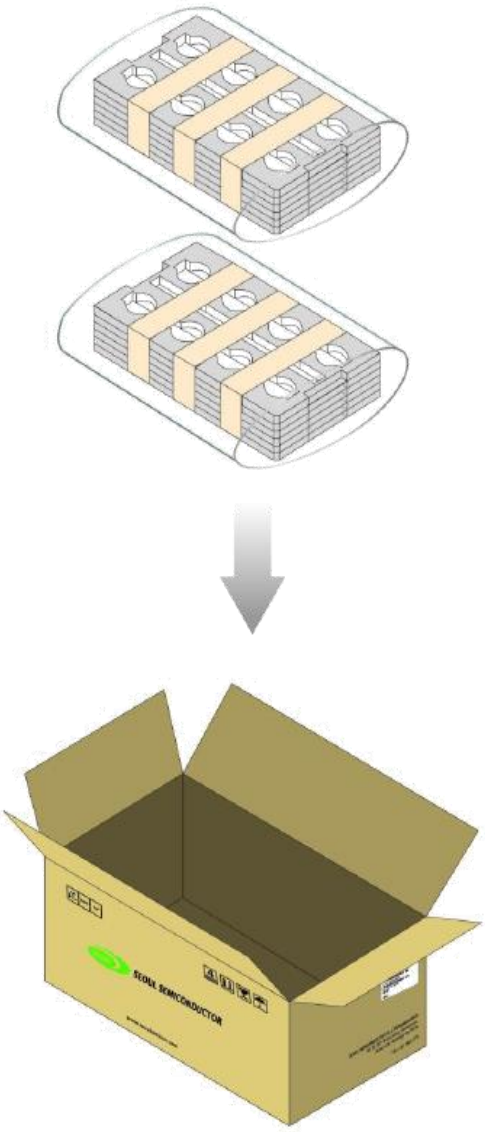
• 12 LED module trays and additional 2 dummy trays up and down of box

• 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

Label Information

Model No.	**SMJQ-XCA5W4PX (1)**
Rank	**W2G06A (2)**
Type	**STD (3)**
Quantity	**60**
Lot No.	**YYMDDXXXXX-XXXXXXX**
SEOUL	**SEOUL SEMICONDUCTOR CO.,LTD.**

Notes

(1) The model number designation is explained as follow
- SMJQ : Seoul Semiconductor internal code
- X : (2=120V, 3=220V)
- C : Power Compensation Mode(Optional)
- A5W : About Power Consumption
- 4 : Acrich3 IC(DT3007B, DT3007C)
- PD: MJT PKG (SAW0LA0A, SAW0LH0A)

(2) It represents the LED module rank.
- W2 : Flux Bin
- G06 : 6 LED Bins of CCT (C = CCT)
- A : Non-Mixing

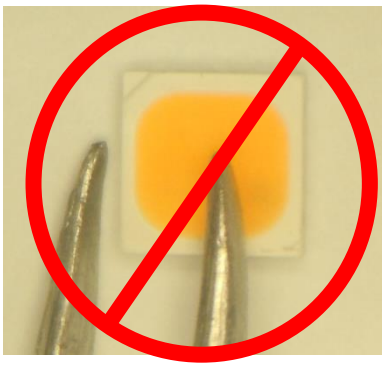
(3) It represents ANSI 7 Step bin(STD).

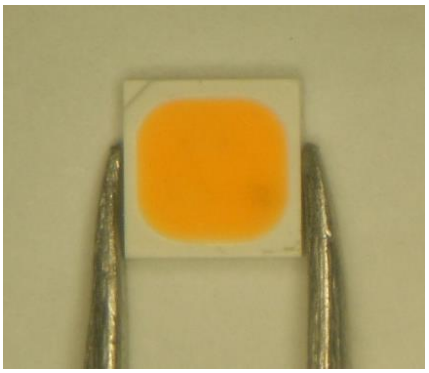
TOTAL Quantity

XXX

SEOUL **SEOUL SEMICONDUCTOR CO.,LTD.**

Handling of Silicone Resin for LEDs





(1) Acrich3 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 Acrich3 Application Note for proper protective circuitry usage.

(2) Please note, Acrich3 products run off of high voltage, therefore caution should be taken when working near Acrich3 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 Acrich3 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, H_2S, NH_3, SO_2, 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 Acrich3 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

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

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