

Integrated AC LED Solution

**Acrich2 – 30W**

SMJQ-13XXFNSX



## Product Brief

### Description

- The Acrich2 series of products are designed to be driven directly off the AC line voltage (with an SPC board) and do not need the typical AC/DC converters essential for conventional lighting products
- The converter or driver found in most general lighting products can limit the overall life of the product, but with the Acrich2 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 through a Surge Protection circuit (SPC2.5)
- High Power Factor and Low THD
- Long Life Time with Simple BOM
- Lead Free Product
- RoHS Compliant
- High Efficacy

### Key Applications

- Street Light
- Road-way

**Table 1. Product Selection Table**

Part No.	Vin [Vac]	P [W]	CCT [K]	Flux [lm]		CRI
				min	max	Min.
SMJQ-132NFNSA <sup>(1)</sup>	120	30	3700~4200	2700	3000	70
SMJQ-132NFNSB <sup>(2)</sup>						
SMJQ-132DFNSA			4700~5300			
SMJQ-132DFNSB						
SMJQ-133NFNSA	220		3700~4200			
SMJQ-133NFNSB						
SMJQ-133DFNSA			4700~5300			
SMJQ-133DFNSB						

**Notes :**

(1), (2) Final character on the part number is "A" or "B". It means that "A" is connector type and "B" is cable type

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## Performance Characteristics

**Table 2. Electro Optical Characteristics, T<sub>a</sub> = 25°C**

Parameter	Symbol	Value			Unit	Mark
		Min.	Typ.	Max.		
Luminous Flux	$\Phi_v$ [2]	2700	3000	-	lm	
Correlated Color Temperature [3]	CCT	3700	4000	4200	K	13XNFNSX
		4700	5000	5300		13XDFNSX
CRI	Ra	70	-	-	-	
Input Voltage [4]	V <sub>in</sub>	120			Vac	132XFNSX
		220				133XFNSX
Power Consumption	P	27	30	33	W	
Operating Frequency	f	50 / 60			Hz	
Power Factor	PF	Over 0.97			-	
Viewing Angle	H	147			deg.	
	V	47				
Transient Surge [5]	Vs	1000			V	
IP grade	-	65				
Weight	g	600 ± 50				

**Notes :**

- (1) Test voltage is 120Vac and 220Vac at T<sub>a</sub> = 25°C.
- (2)  $\Phi_v$  is the total luminous flux output measured with an integrated sphere.
- (3) Correlated Color Temperature is derived from the CIE 1931 Chromaticity diagram.
- (4) 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.
- (5) Transient Surge withstand in accordance with IEC61000-4-5 And Ring Wave Surge at 120Vac. It should be needed SPD(Surge Protect Device) because it's not include a ground wiring in engine. Ring Wave Surge is seven strikes, 100kHz 2.5kV in accordance with ANSI/IEEE C62.41.2-2002 Category A operation.

## Performance Characteristics

**Table 3. Absolute Maximum Ratings,  $T_a = 25^{\circ}\text{C}$ , 220Vac**

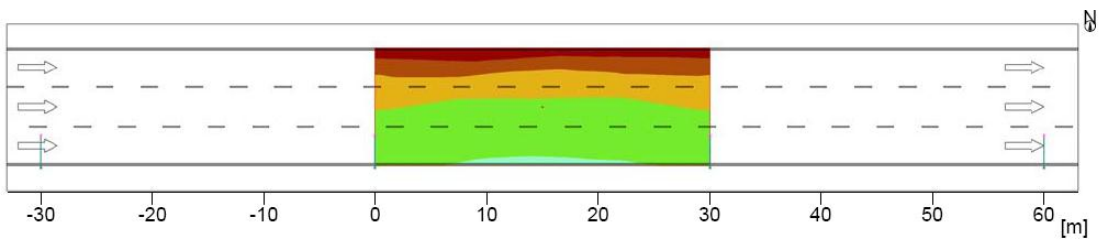
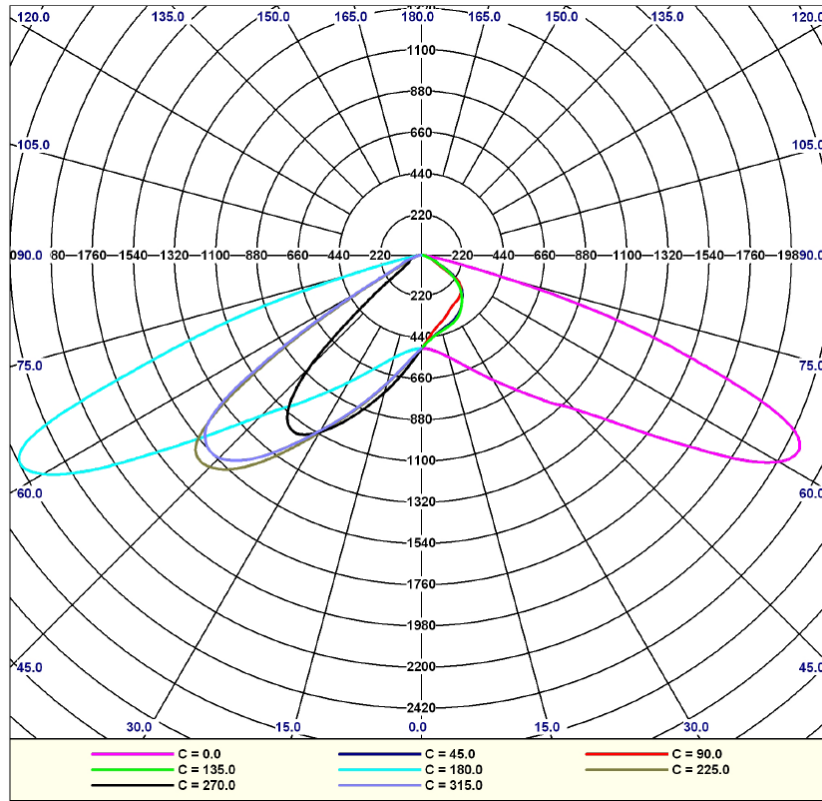
Parameter	Symbol	Unit	Value
Maximum Input Voltage <sup>1)</sup>	$V_{in}$	Vac	264 at 220Vac
			144 at 120Vac
Power Consumption	P	W	37
Operating Temperature	$T_{opr}$	$^{\circ}\text{C}$	- 40 ~ 45
Storage Temperature <sup>2)</sup>	$T_{stg}$	$^{\circ}\text{C}$	- 40 ~ 100
ESD Sensitivity	-	-	$\pm 4,000\text{V HBM}$

**Notes :**

- (1) Maximum Voltage doesn't indicate the operating voltage which customers use but means tolerable voltage according to each country's voltage variation rate.
- (2) Ambient temperature without operation.

# Characteristics Graph

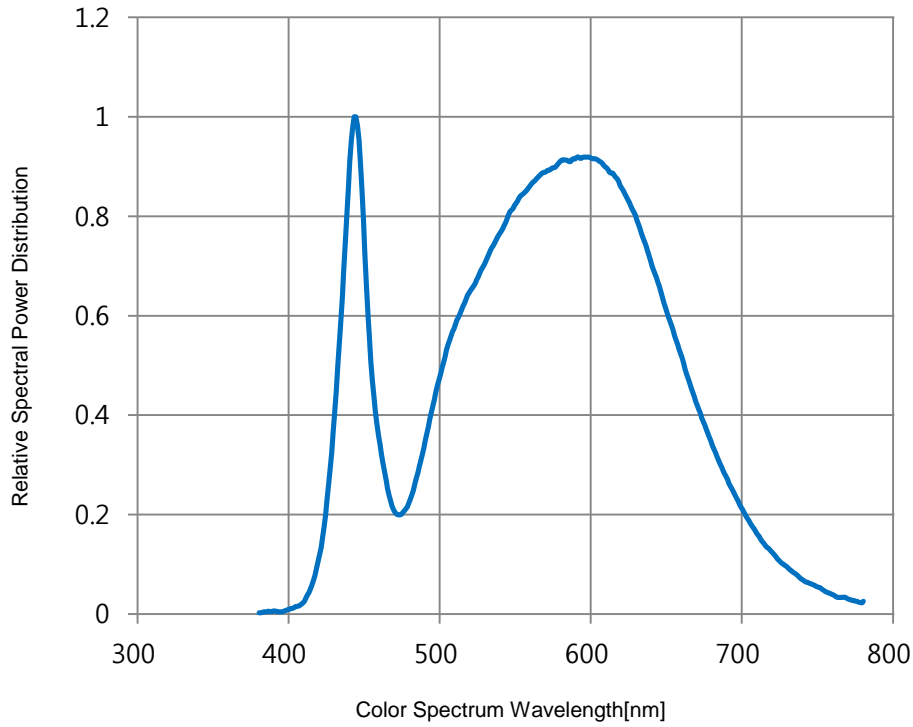
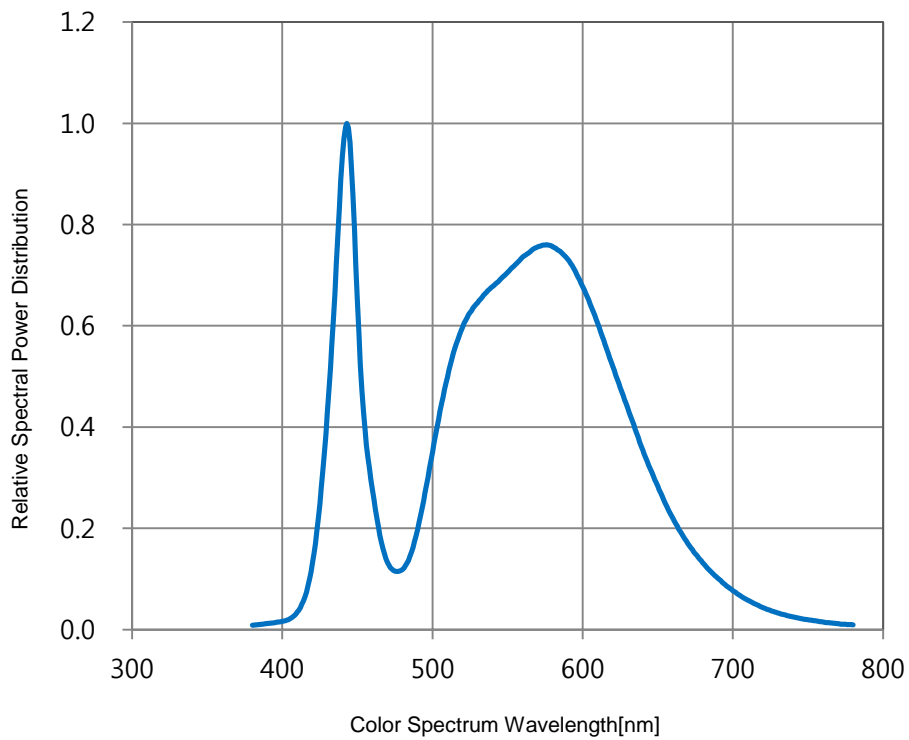
Fig 1. Light Distribution Profile,  $T_a = 25^\circ\text{C}$



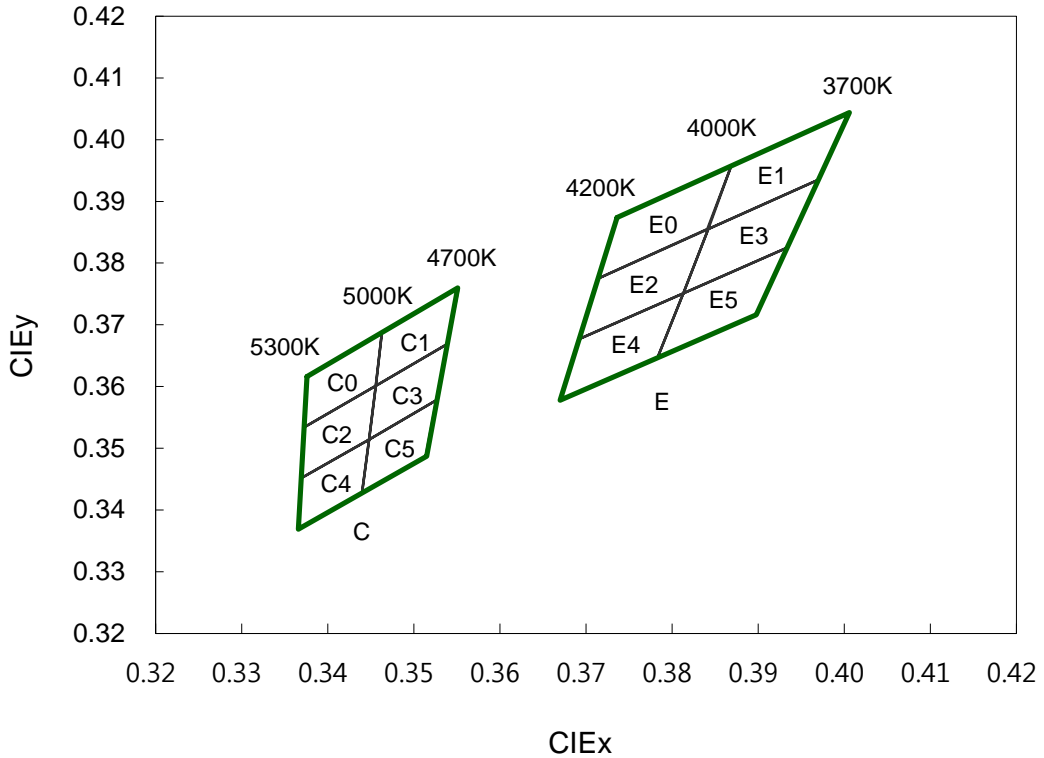
**Notes :**

- (1) It is a TYPE II Light Distribution Profile
- (2) Illuminance Uniformity  $U_0$  ( $E_{min}/E_m$ ) is 0.42 which was calculated at the luminaire height of 12m and the luminaire power is 120W

## Characteristics Graph

**Fig 2. Relative Spectral Distribution vs. Wavelength Characteristic – E**

**Fig 3. Relative Spectral Distribution vs. Wavelength Characteristic – C**


## Color Bin Structure

**CIE Chromaticity Diagram, Ta = 25°C**


C0		C1		E0		E1	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3376	0.3616	0.3463	0.3687	0.3736	0.3874	0.3869	0.3958
0.3373	0.3534	0.3456	0.3601	0.3714	0.3775	0.3842	0.3855
0.3456	0.3601	0.3539	0.3669	0.3841	0.3855	0.3970	0.3935
0.3463	0.3687	0.3552	0.3760	0.3869	0.3958	0.4006	0.4044
C2		C3		E2		E3	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3373	0.3534	0.3456	0.3601	0.3714	0.3775	0.3842	0.3855
0.3369	0.3451	0.3448	0.3514	0.3692	0.3677	0.3813	0.3751
0.3448	0.3514	0.3526	0.3578	0.3813	0.3751	0.3934	0.3825
0.3456	0.3601	0.3539	0.3669	0.3842	0.3855	0.3970	0.3935
C4		C5		E4		E5	
CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y	CIE X	CIE Y
0.3369	0.3451	0.3448	0.3514	0.3692	0.3677	0.3813	0.3751
0.3366	0.3369	0.3440	0.3428	0.3670	0.3578	0.3783	0.3646
0.3440	0.3428	0.3514	0.3487	0.3783	0.3646	0.3898	0.3716
0.3448	0.3514	0.3526	0.3578	0.3813	0.3751	0.3934	0.3825

## Part List

**Table 4. Part List – SMJQ-13XXFNSA**

No	Part	Specification	Quantity
1	Group Lens Cover	<ul style="list-style-type: none"> <li>Material : Polycarbonate</li> <li>Thickness : 2.0mm</li> </ul>	1
2	Lens Screw	<ul style="list-style-type: none"> <li>Material : Stainless Steel</li> <li>Type : M3</li> </ul>	8
3	Sealing Rubber	<ul style="list-style-type: none"> <li>Material : Molded Silicone</li> </ul>	1
4	LED module	<ul style="list-style-type: none"> <li>LED PKG : MJT5050</li> <li>PCB : Aluminum Metal PCB 1.6T</li> <li>On-board Surge Protection Circuit</li> </ul>	1
5	Module Screw	<ul style="list-style-type: none"> <li>Material : Stainless Steel</li> <li>Type : M2</li> </ul>	2
6	Heat sink	<ul style="list-style-type: none"> <li>Material : Die-cast Aluminum</li> <li>Color : Pantone Black</li> <li>Thermal Grease between the PCB and Heat sink</li> </ul>	1
7	PG-7	<ul style="list-style-type: none"> <li>Water Proof Connector : Type PG-7</li> <li>Material : Polycarbonate</li> </ul>	1
8	Wire Harness	<ul style="list-style-type: none"> <li>Water Proof Wire Harness</li> <li>Easy to connect</li> </ul>	1
9	Thermal Grease	<ul style="list-style-type: none"> <li>Color : White</li> </ul>	-

**Notes :**

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



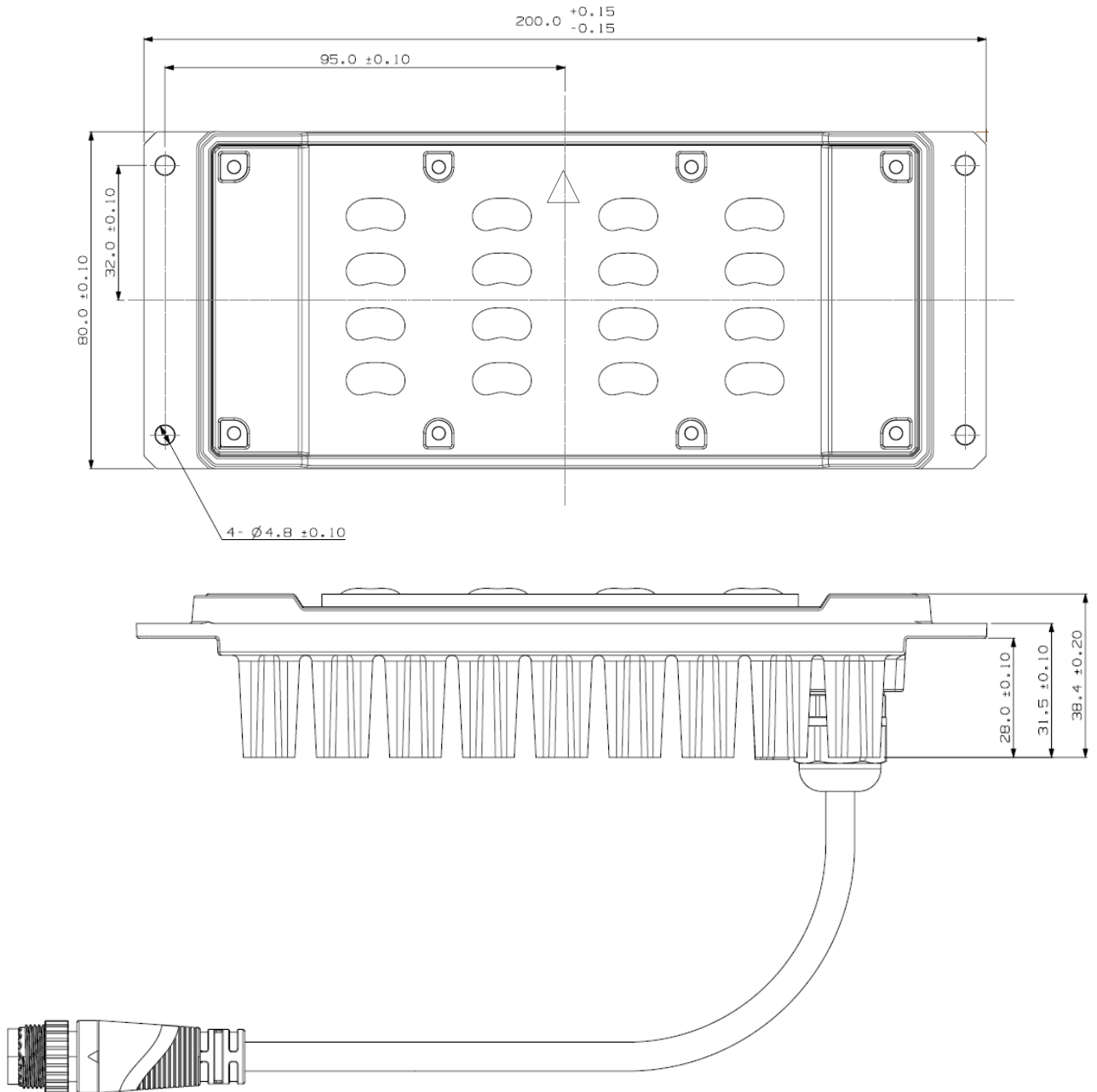
## Part List

**Table 5. Part List – SMJQ-13XXFNSB**

No	Part	Specification	Quantity
1	Group Lens Cover	<ul style="list-style-type: none"> <li>• Material : Polycarbonate</li> <li>• Thickness : 2.0mm</li> </ul>	1
2	Lens Screw	<ul style="list-style-type: none"> <li>• Material : Stainless Steel</li> <li>• Type : M3</li> </ul>	8
3	Sealing Rubber	<ul style="list-style-type: none"> <li>• Material : Molded Silicone</li> </ul>	1
4	LED module	<ul style="list-style-type: none"> <li>• LED PKG : MJT5050</li> <li>• PCB : Aluminum Metal PCB 1.6T</li> <li>• On-board Surge Protection Circuit</li> </ul>	1
5	Module Screw	<ul style="list-style-type: none"> <li>• Material : Stainless Steel</li> <li>• Type : M2</li> </ul>	2
6	Heat sink	<ul style="list-style-type: none"> <li>• Material : Die-cast Aluminum</li> <li>• Color : Pantone Black</li> <li>• Thermal Grease between the PCB and Heat sink</li> </ul>	1
7	PG-7	<ul style="list-style-type: none"> <li>• Water Proof Connector : Type PG-7</li> <li>• Material : Polycarbonate</li> </ul>	1
8	Wire	<ul style="list-style-type: none"> <li>• AWG17 / Rubber 200mm, Stripped 25mm , Tinned 5mm</li> </ul>	1
9	Thermal Grease	<ul style="list-style-type: none"> <li>• Color : White</li> </ul>	-

## Mechanical Dimensions

### SMJQ-13XXFNSA

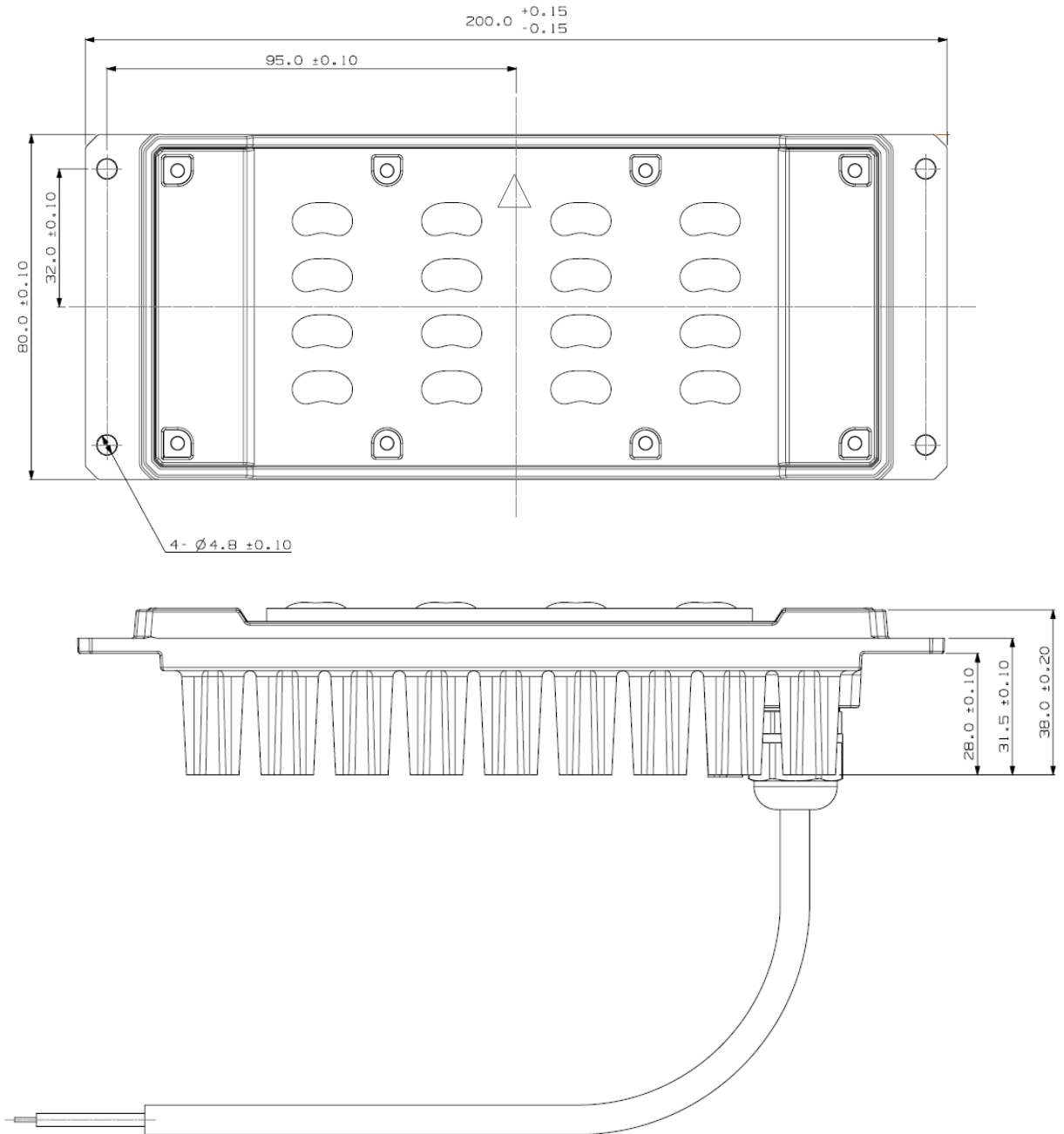


#### Notes :

- (1) All dimensions are in millimeters. (Tolerance unless noted :  $\pm 0.2$ )
- (2) Power cable's length is 155mm. Tolerance is  $\pm 5$ mm
- (3) Scale : None
- (4) Water-proof connector(male) belong to engine and other side connector(female) available to purchase from SSC partner.

## Mechanical Dimensions

### SMJQ-13XXFNSB



#### Notes :

- (1) All dimensions are in millimeters. (Tolerance unless noted :  $\pm 0.2$ )
- (2) Power cable's length is 150mm, stripped 25mm and tinned 5mm. Tolerance is  $\pm 5$ mm
- (3) Scale : None
- (4) Water-proof connector(male) belong to engine and other side connector(female) available to purchase from SSC partner.

## Marking Information



- Label specification
- resolution : 300dpi
- QR code Cell size : > 0.25mm



<b>SMJQ</b>	-----	1
<b>132DFNSA</b>	-----	2
<b>W2C2A</b>	-----	3
<b>140630</b>	-----	4
<b>000777</b>	-----	5

### Marking Points

**Table 6. QR code numbering**

Code	Description	Part Number	Value
X <sub>1</sub> X <sub>2</sub> X <sub>3</sub> X <sub>4</sub>	Product Name	SMJQ	Seoul Lighting Module
X <sub>5</sub> X <sub>6</sub>	Power consumption	13	30W
X <sub>7</sub>	Input Voltage	2 or 3	2 : 120Vac 3 : 220Vac
X <sub>8</sub>	Color Temperature	N or D	N : Neutral White D : Cool White
X <sub>9</sub>	Beam angle	F	140-200°
X <sub>10</sub>	Dimming	N	None
X <sub>11</sub>	Base	S	etc
X <sub>12</sub>	Consecutive Number	B	-
X <sub>13</sub>	Package rank	W2C2A	-
X <sub>14</sub>	Production date	140630	2014-06-30
X <sub>15</sub>	Serial number	000001 ~ 999999	-

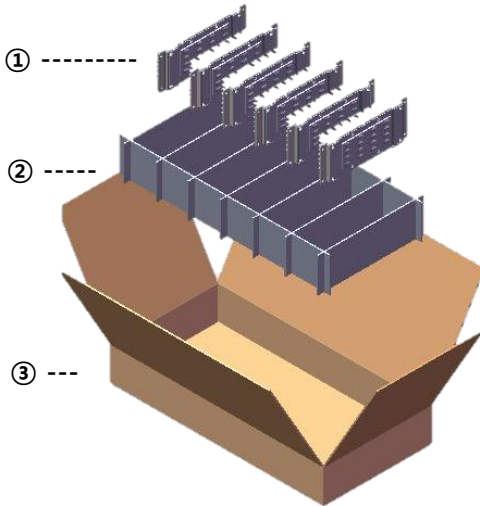
## Packing

### 1. Inner Box packing

#### Step1.



- All Engines are packed with bubble bags
- A Silica gel is included in the bubble bag

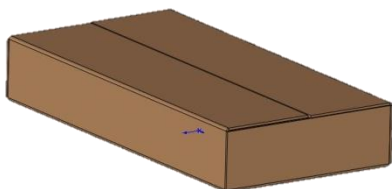


- ① Street lighting engines
- ② Paper assembly guide
- ③ Inner box

#### Step2.

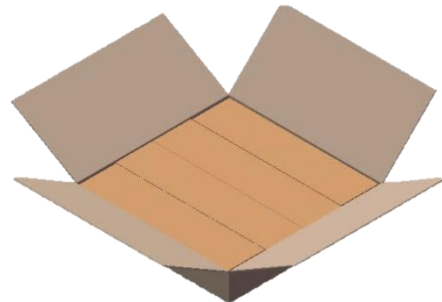
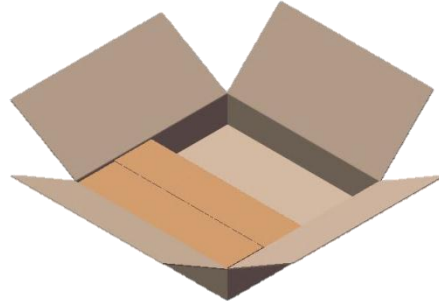


- 6 engines are packed in an inner box



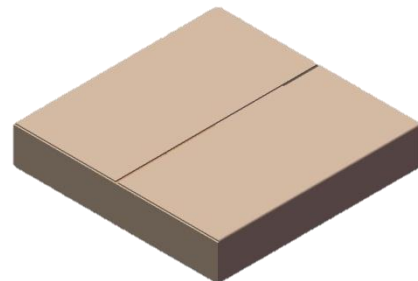
### 2. Outer Box packing

#### Step3.



- 2 inner boxes are packed in a outer box

#### Step4.



- Total 12pcs engines are packed in each outer box

\* Outer box size


450(W) x 520(L) x 120(H)mm

\* Inner box size

225(W) x 445(L) x 90(H)mm



\* Outer Box weight is about 9kg

## Label Information

<b>Model No.</b>	<b>SMJQ-13XXFNSX<sup>(1)</sup></b>
<b>Rank</b>	<b>W2C2A <sup>(2)</sup></b>
<b>Type</b>	
<b>Quantity</b>	<b>XX</b>
<b>Date</b>	<b>YYYY.MM.DD</b>
	<b>SEOUL SEMICONDUCTOR CO.,LTD.</b>

**Notes**

- (1) Product nomenclature is explained on page 12.
- (2) It is indicated the LED module rank that consist of five character.
- (3) It is attached to the top left corner of the box.

<b>TOTAL Quantity</b>  <b>XX</b>
 <b>SEOUL SEMICONDUCTOR CO.,LTD.</b>

**Notes**

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

## 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) DO NOT touch any of the circuit board, components or terminals with body or metal while circuit is active.
- (4) Please do not add or change wires while Acrich2 circuit is active.
- (5) Long time exposure to sunlight or UV can cause the lens to discolor.
- (6) Please do not use adhesives to attach the LED that outgas organic vapor.
- (7) Please do not use together with the materials containing Sulfur.
- (8) Please do not assemble in conditions of high moisture and/or oxidizing gas such as Cl, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>x</sub>, etc.
- (9) Please do not make any modification on module.
- (10) Please be cautious when soldering to board so as not to create a short between different trace patterns.

## Precaution for Use

(11) 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 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)

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



## Handling with regards to static electricity

- (1) The Acrich2 products use an integrated circuit (IC) which can be damaged when exposed to static electricity. Please handle using equipment that prevents static electricity. Do not touch unless ESD protection is used.
- (2) The Acrich2 product should also not be installed in end equipment without ESD protection.

## Storage before use

- (1) 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.
- (2) 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.

## Guidelines for properly working with Acrich2

- (1) Discharge the lighting system a minimum of 2-3 times prior to working with the module.
- (2) Use only properly rated test equipment and tools for the rated voltage and current of the product being tested.
- (3) It is strongly suggested to wear rubber insulated gloves and rubber bottom shoes.
- (4) Do not wear any conductive items (such as jewelry) which could accidentally contact electric circuits.
- (5) Perform several tests with power off and the lighting system unplugged.
- (6) Faults, lightning, or switching transients can cause voltage surges in excess of the normal ratings.
- (7) Internal component failure can cause excessive voltages.
- (8) Stored or residual electricity in long wire could be hazardous.
- (9) Make sure proper discharge prior to starting work.



## Company Information

### Published by

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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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