Integrated AC LED Solution

Acrich2 – 13W

Product Brief

Description

- The Acrich2 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 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
- High Power Efficiency & Factor
- Low THD
- Long Life Time
- Simple BOM
- Miniaturization
- Lead Free product
- RoHS compliant

Key Applications

- Down light
- Factory Ceiling light
- Industrial Light
- Flush mount

Table 1-1. Product Selection (CCT)

Part No.	VF [V]	P [W]	Color	CCT [K]	CRI Min.
SMJD-2V12W2P3	120	13	Cool	4700 – 6000	80
			Neutral	3700 – 4200	
SMJD-3V12W2P3	220		Warm	2600 – 3200	

Table 1-2. Product Selection (Flux)

Part No.	VF [V]	P [W]	Flux	Flux [lm]	
				Min.	Typ.
SMJD-2V12W2P3	120	13	13a	880	1000
			13b	1140	1210
SMJD-3V12W2P3	220		13a	880	1000
			13b	1140	1210

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Performance Characteristics

Table 2. Electro Optical Characteristics, T_a = 25ºC

Parameter	Symbol	Mark	Value			Unit
			Min.	Typ.	Max.	
Luminous Flux	Φ_V [2]	13a	880	1000	1140	lm
		13b	1140	1210	1300	
Correlated Color Temperature [3]	CCT	B	5300	5600	6000	K
		C	4700	5000	5300	
		E	3700	4000	4200	
		G	2900	3000	3200	
		H	2600	2700	2900	
CRI	Ra		80	-	-	-
Operating Voltage [4]	V_{opt}	2V	120			V[RMS]
		3V	220			
Power Dissipation	P_D		12.0	13.0	13.8	W
Operating Frequency	Freq		50 / 60			Hz
Power Factor	PF		Over 0.97			-
View Angle	2Θ 1/2		120			deg.
Tolerance of Surge [5]	V_s		500	-	-	
Transient Protection [6]	V_s		2500	-	-	

Notes :

1. At 120V/220V RMS, T_a=25℃
2. ΦV 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℃.
5. Surge withstand in accordance with IEC61000-4-5
6. At 120V RMS, Seven strikes, 100kHz 2.5KV in accordance with ANSI/IEEE C62.41.2-2002 Category A operation

Absolute Maximum Ratings

Table 3. Absolute Maximum Ratings, T_a = 25ºC

Parameter	Symbol	Raged Voltage	Value	Unit
Max. Voltage	V_{opt}	120V	140	V[RMS]
		220V	264	
Power Dissipation	P_d		17.5	W
Operating Temperature	T_{opr}		-30 ~ 85	ºC
Storage Temperature	T_{stg}		-40 ~ 100	ºC
ESD Sensitivity	-		±4,000V HBM	-

Thermal Resistance

Part	Package Power Dissipation [W]	Maximum Junction Temp. [℃]	Rθ [℃/W]
Acrich2 LED	SAW8KG0B Max 0.58	125	27
Acrich2 IC	Max 1.0	150	11.25

The Acrich2 LED has a thermal resistance of 27℃/W from junction of the LED to the

LED lead.

The maximum junction temperature of the Acrich2 LED package is 125℃, therefore the maximum lead temperature T_{s_max} is

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

= 125℃ - (27℃/W * 0.58W) = 109.34℃

Although this is the maximum lead temperature, it is recommended to keep the lead temperature under 70℃

The Acrich2 IC has a 11.25℃/W thermal resistance from junction to the top surface.

The maximum junction temperature (T_{t_max}) of the IC is 150℃, therefore the maximum temperature of the top of the IC is

$T_{t\_max} = T_{j\_max} - (R\theta_{j\text{-}t} * P_D)$

= 150℃ - (11.25℃/W * 1.0W) = 138.75℃

Relative Spectral Distribution

Fig 1-1. Relative Spectral Distribution vs. Wavelength Characteristic – G, H

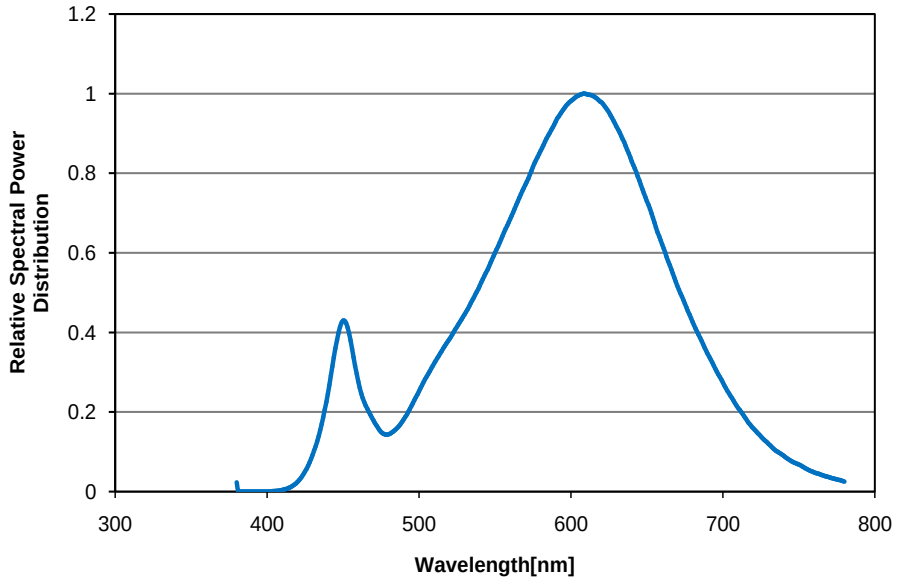
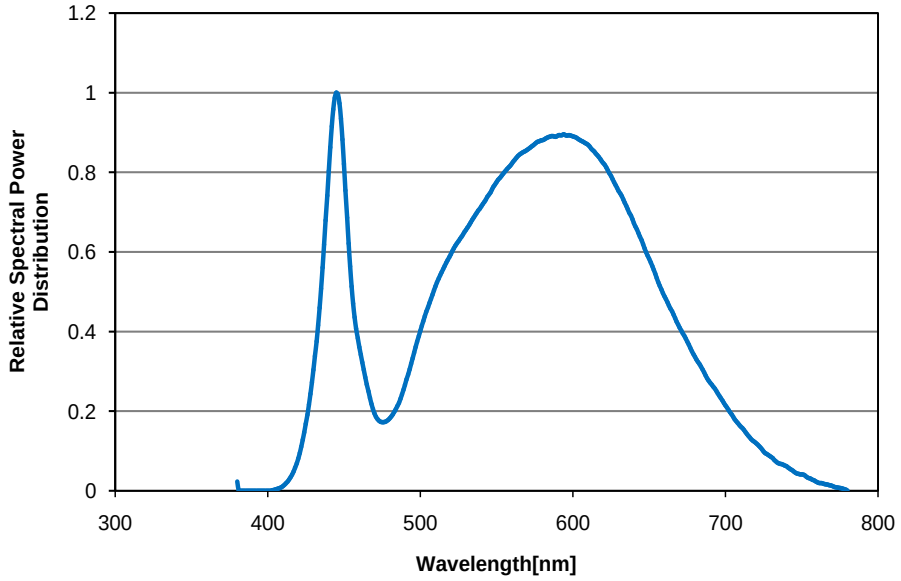
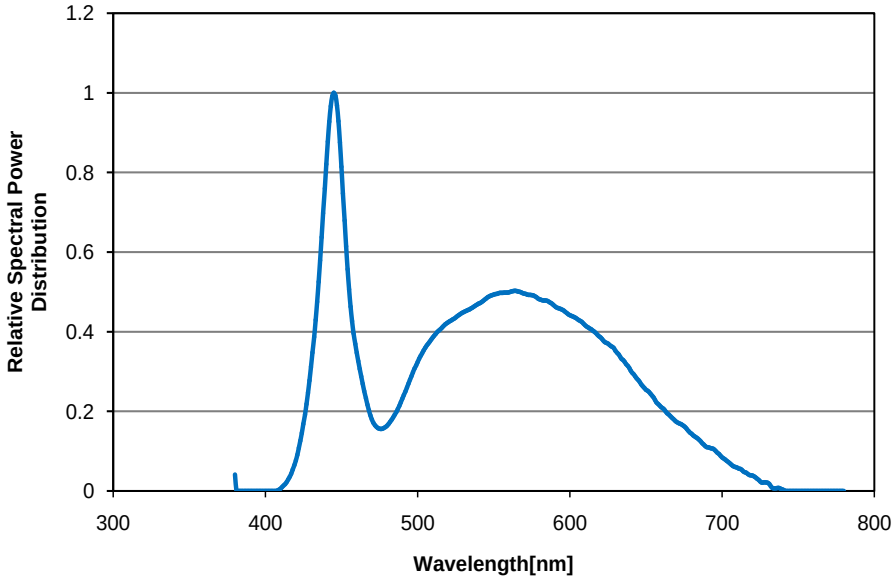


Fig 1-2. Relative Spectral Distribution vs. Wavelength Characteristic – E



Relative Spectral Distribution

Fig 1-3. Relative Spectral Distribution vs. Wavelength Characteristic – B, C



Relative Power Distribution

Fig 2-1. Relative Power Distribution vs. Voltage at T_a=25℃, 120V

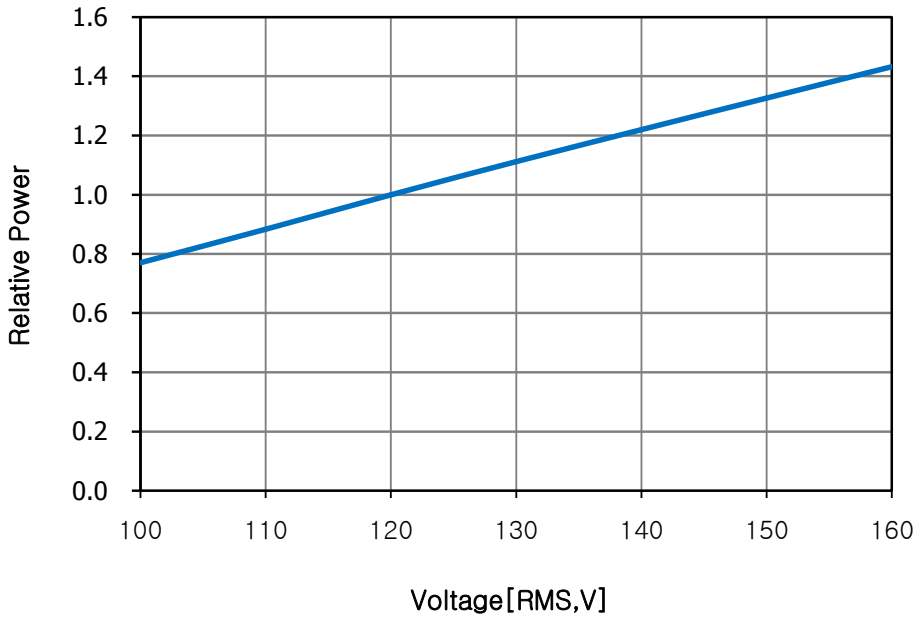
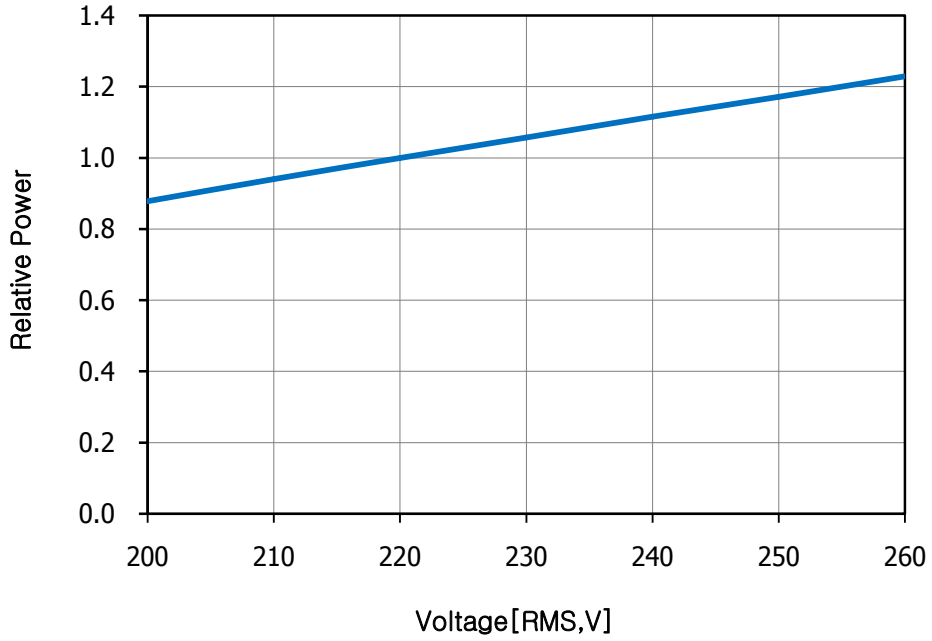


Fig 2-2. Relative Power Distribution vs. Voltage at T_a=25℃, 220V



Relative Luminous Distribution

Fig 3-1. Relative Luminous Flux vs. Voltage at T_a=25℃, 120V

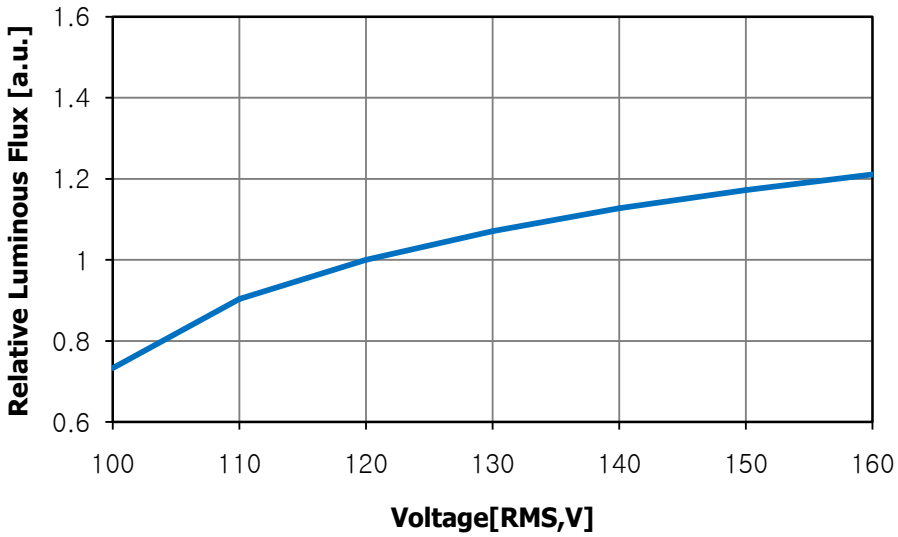
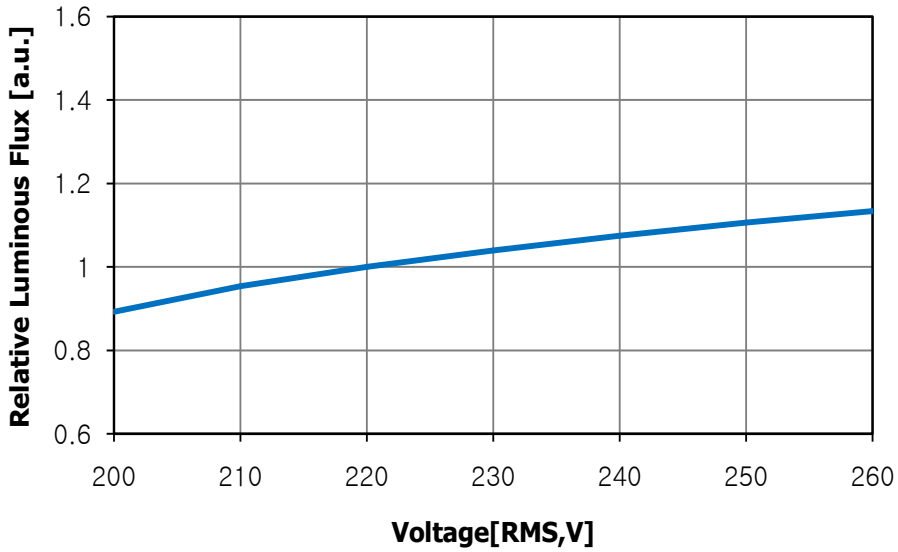
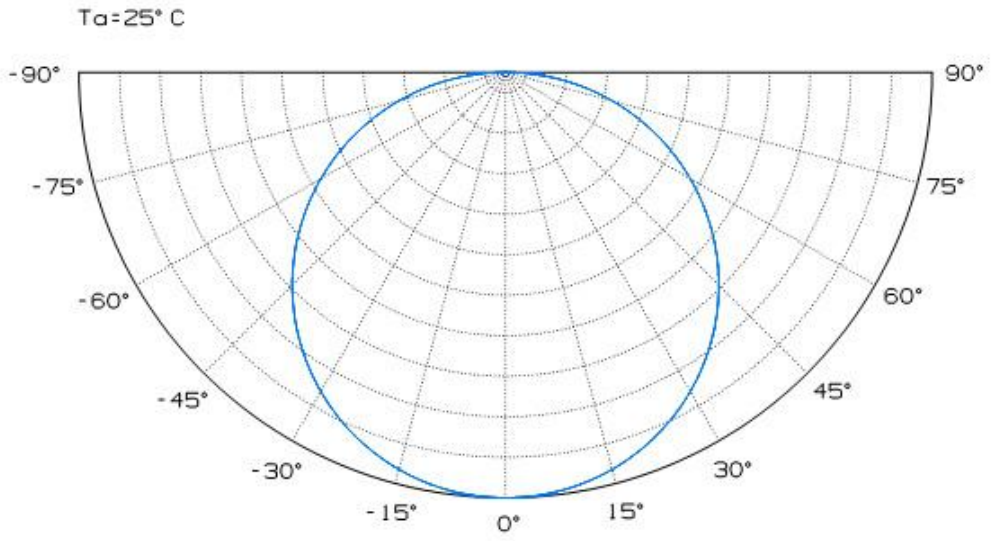


Fig 3-2. Relative Luminous Flux vs. Voltage at T_a=25℃, 220V



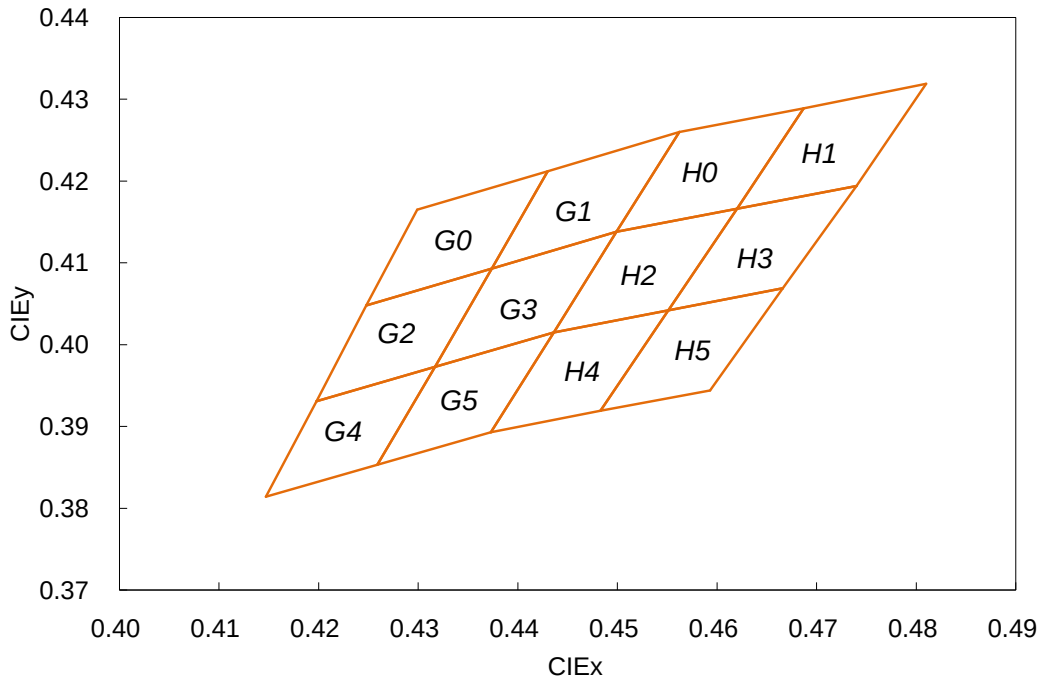
Luminous Flux Characteristics

Fig 4. Radiant Pattern, T_a=25℃



Color Bin Structure

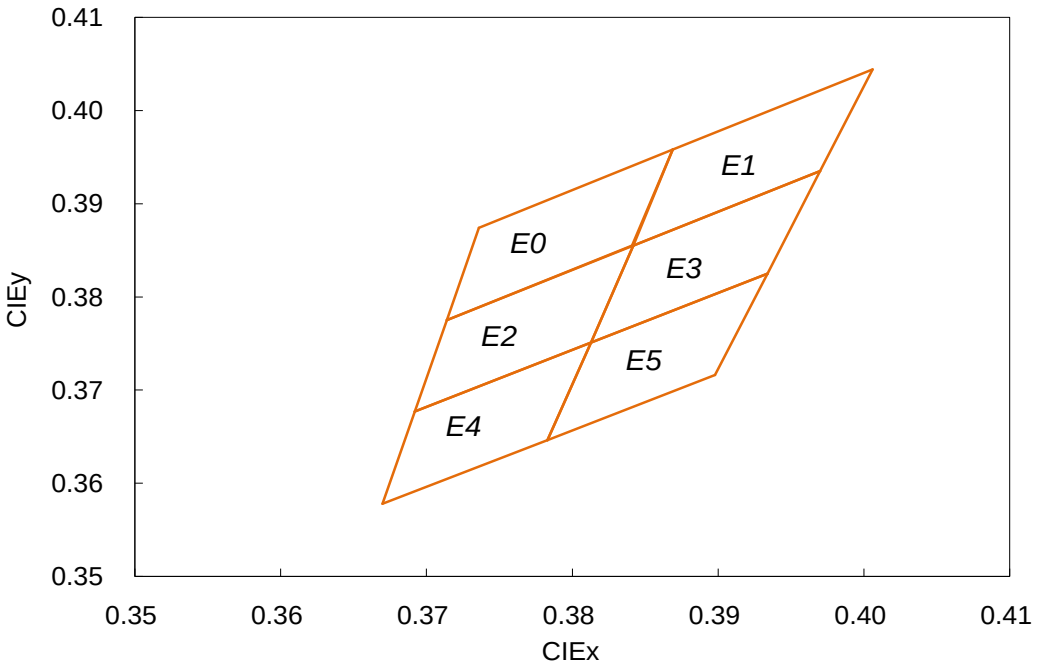
Fig 5-1. CIE Chromaticity Diagram (G, H Rank)



Bin code	X	Y	Bin code	X	Y	Bin code	X	Y
G0	0.4299	0.4165	G1	0.4430	0.4212	G2	0.4248	0.4048
	0.4248	0.4048		0.4374	0.4093		0.4198	0.3931
	0.4374	0.4093		0.4499	0.4138		0.4317	0.3973
	0.4430	0.4212		0.4562	0.4260		0.4374	0.4093
G3	0.4374	0.4093	G4	0.4198	0.3931	G5	0.4317	0.3973
	0.4317	0.3973		0.4147	0.3814		0.4259	0.3853
	0.4436	0.4015		0.4259	0.3853		0.4373	0.3893
	0.4499	0.4138		0.4317	0.3973		0.4436	0.4015
H0	0.4562	0.4260	H1	0.4687	0.4289	H2	0.4499	0.4138
	0.4499	0.4138		0.4620	0.4166		0.4436	0.4015
	0.4620	0.4166		0.4740	0.4194		0.4551	0.4042
	0.4687	0.4289		0.4810	0.4319		0.4620	0.4166
H3	0.4620	0.4166	H4	0.4436	0.4015	H5	0.4551	0.4042
	0.4551	0.4042		0.4373	0.3893		0.4483	0.3919
	0.4666	0.4069		0.4483	0.3919		0.4593	0.3944
	0.4740	0.4194		0.4551	0.4042		0.4666	0.4069

Color Bin Structure

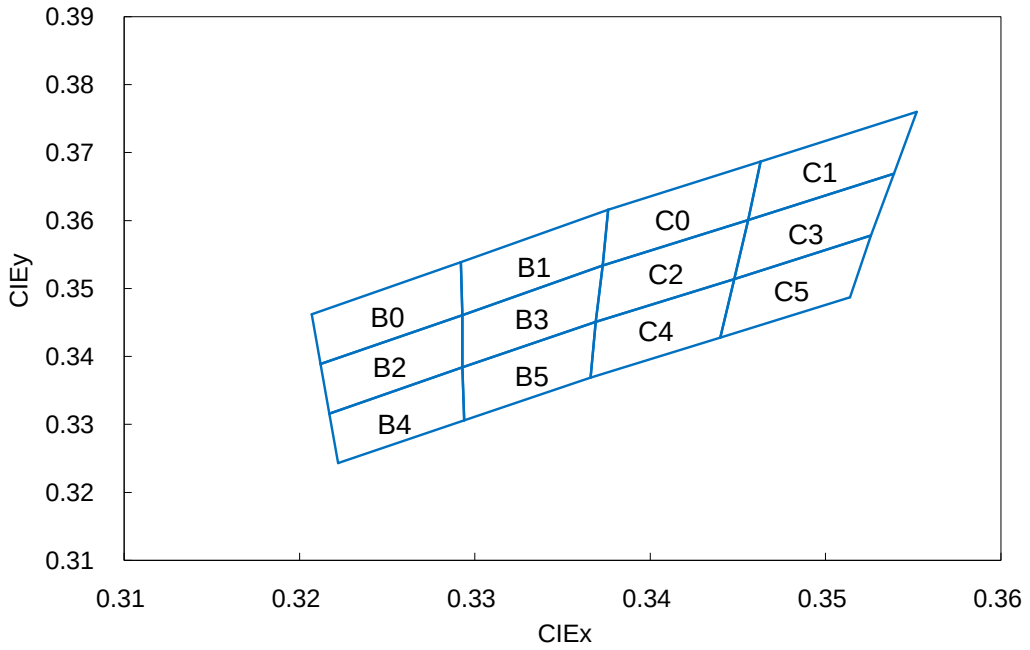
Fig 5-2. CIE Chromaticity Diagram (E Rank)



Bin code	X	Y	Bin code	X	Y	Bin code	X	Y
E0	0.3736	0.3874	E1	0.3869	0.3958	E2	0.3714	0.3775
	0.3714	0.3775		0.3842	0.3855		0.3692	0.3677
	0.3841	0.3855		0.3970	0.3935		0.3813	0.3751
	0.3869	0.3958		0.4006	0.4044		0.3842	0.3855
E3	0.3842	0.3855	E4	0.3692	0.3677	E5	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

Color Bin Structure

Fig 5-3. CIE Chromaticity Diagram (B, C Rank)



Bin code	X	Y	Bin code	X	Y	Bin code	X	Y
B0	0.3207	0.3462	B1	0.3292	0.3539	B2	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	0.3293	0.3461	B4	0.3217	0.3316	B5	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	0.3376	0.3616	C1	0.3463	0.3687	C2	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	0.3456	0.3601	C4	0.3369	0.3451	C5	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

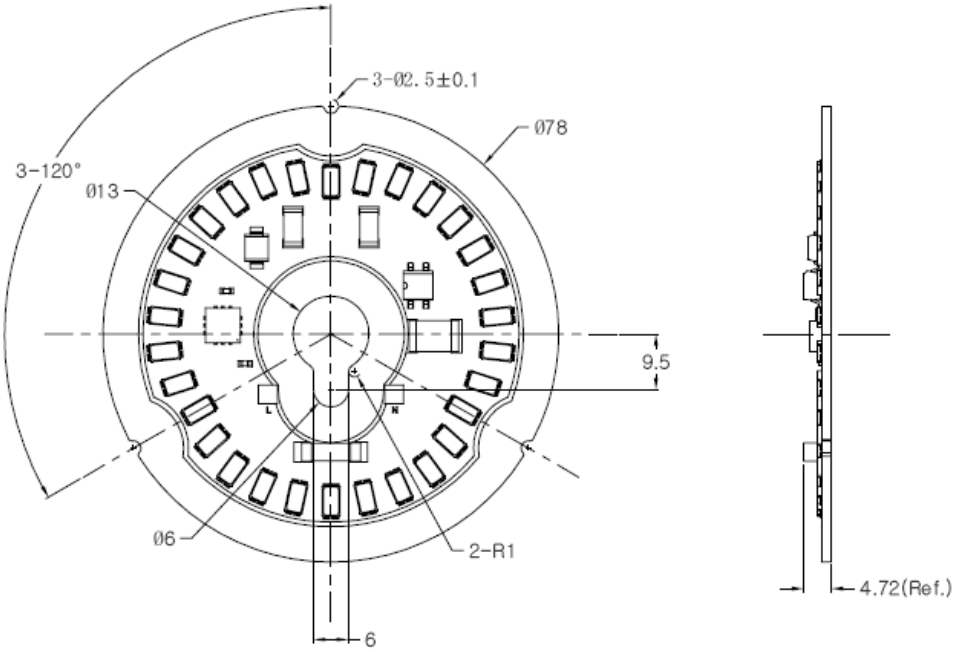
Part List

Table 4. Part List

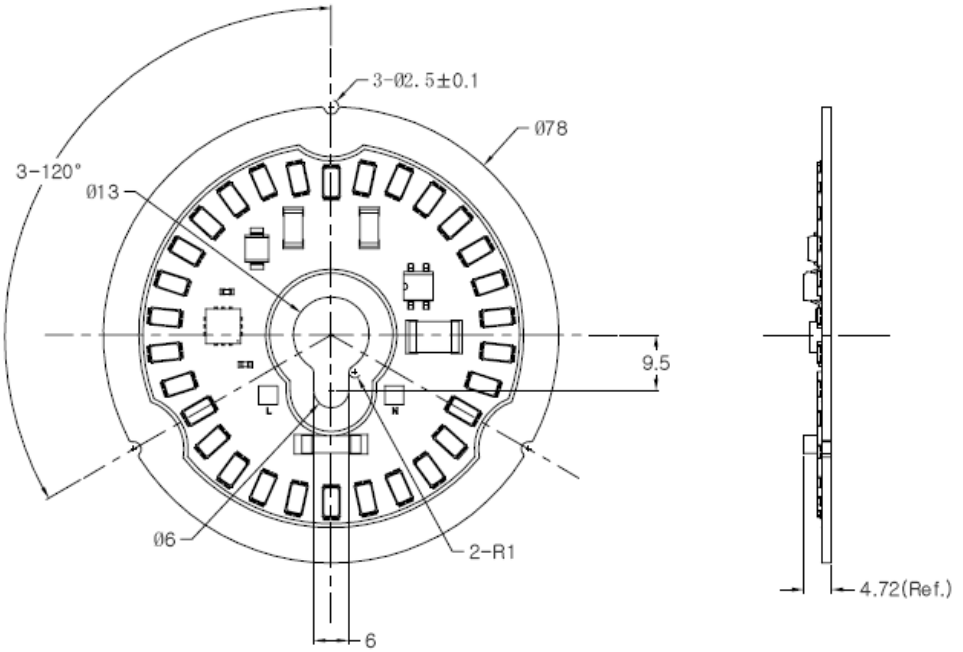
No	Part	Silk	Specification	Q'ty
1	PCB	-	Metal(Al) ø78 1.6t Silk color : Green	1
2	LED	-	SAW8KG0B	30
3	Fuse	F1	250V 1A	1
4	Varistor	V1	275V AC	1
5	Bridge Diode	BD1	MB6S	1
6	Resistor	R1	6432 Size 91Ω 5%	1
7	Resistor	R2		1
8	TVS	Z1	440V 600W UNI 5%	1
9	IC	U1	DT3001B (120V)	1
			DT3001A (220V)	1
10	Resistor	R_{SET}	1608 Size 2.94KΩ 1% (120V)	1
			1608 Size 1.3KΩ 1% (220V)	1
11	Resistor	R_{BLD}	1608 Size 1KΩ 5%	1

Mechanical Dimensions

SMJD-2V12W2P3 (120V)



SMJD-3V12W2P3 (220V)

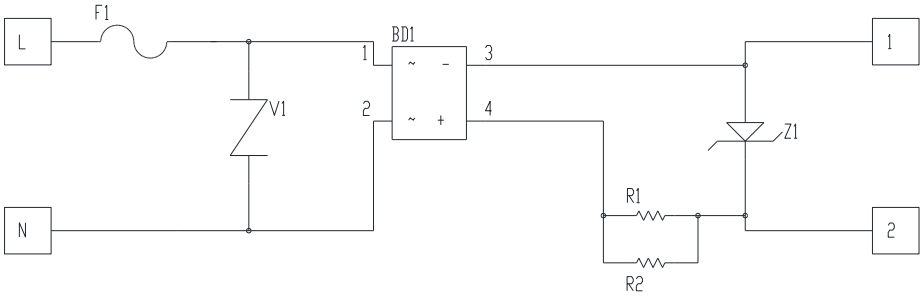


Notes :

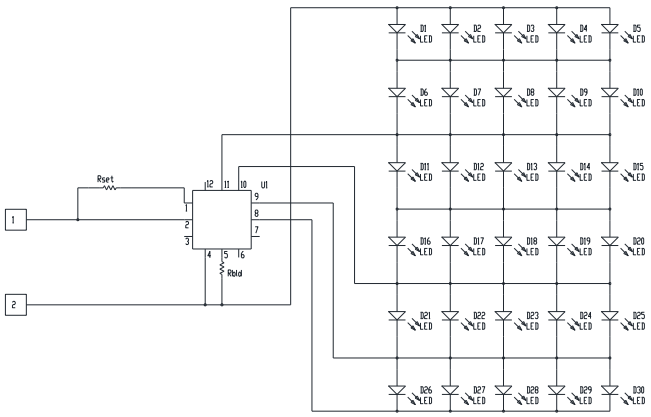
1. All dimensions are in millimeters. (Tolerance : ±0.2)
2. Undefined R0.5
3. Scale : none

Circuit Drawing

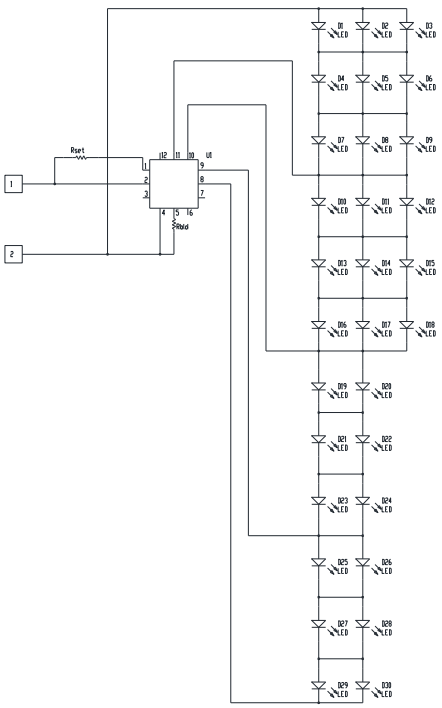
Surge Protection Circuit (SPC)



SMJD-2V12W2P3 (120V)



SMJD-3V12W2P3 (220V)



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, H2S,NH3,SO2,NOX,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.

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.

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
3. 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

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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