AC LEDs: Make Way for a New Generation

The next generation of AC solutions for LED bulbs and luminaires has arrived.
Traditional AC LEDs have been in production for many years and although they simplify design solutions, they have several limitations. Today's Acrich2 solutions from Seoul Semiconductor combine a AC - integrated power IC technology with patented high voltage, multi-junction LEDs that overcome the shortcomings of traditional AC-powered LED solutions.

An AC LED is an LED that operates directly off of AC line voltage. The typical characteristics include dual strings of multiple LEDs (to achieve high voltages) arranged in opposite polarity (or configured with a full-bridge rectifier) to accept the AC waveform and a bias resistor to limit input current. While simple and inexpensive the AC LEDs suffer from many drawbacks including flicker, high total harmonic distortion (and subsequently poor power factor) and low efficacy.

No longer do you have to sacrifice power factor, efficiency, light quality or cost to gain the benefits of using AC technology. The Acrich2 IC solution utilizes a bank switching technology combined with a new type of high voltage LEDs that matches LED forward voltage with the line voltage waveform. Unlike the traditional AC LED solution which suffered from a high forward voltage, this approach increase the forward voltage in steps, allowing for a earlier turn on time, and a better matching of the current to the voltage waveform, thereby improving the power factor and THD. With this new solution, the overall circuit (module) operates on AC power not the LEDs.

The Acrich2 High-Voltage LEDs with Multi-Junction Technology (AcrichMJT) enable a better AC solution. A multi-junction LED, unlike a standard LED that has a single junction and a 3.0V forward voltage drop, has a single semiconductor chip containing multiple light-emitting junctions within it. It allows the creation of LED packages with higher forward voltages and WITHOUT having to mount and wirebond multiple chips.

Part Number	Color Temp	Flux [lm]	VF	If (mA)	Product Image
SAW8KG0B	3700-7000K	42.8	22	20	
	2600-3700	37.8			
SAW8KGOA	3700-7000K	42.8	19	20	
	2600-3700	37.8			
SAW8P42A	3700-7000K	29	12.6	20	
SAW8WA2A	3700-7000K	120	33	40	
	2600-3700	110		40	
SAW09HOA	4200-6000K	165	64	20	

The combination of the AC driver IC and the Acrich Multi-junction LED technology allows the creation of modules that maximize efficiency, reduce part count and design complexity, improve reliability, and reduce cost.

	Traditional AC LED Technology	Acrich2 AC Technology Solution
LED Cost	Large Die, half wasted	Optimized dies size for application
Low Efficiency	Bias resistor consumes power	Switched steps for voltage match
Flicker	Higher Voltage String long off time	Switched forward voltage, short off time
Power Factor/THD	Low/High due to current/voltage mismatch	High/Low due to waveform match
High Reliability	Resistor Power consumption	No Electrolytic capacitors

To facilitate the implementation of luminaire designs using this technology, Seoul Semiconductor has created standard Acrich2 AC LED Modules that come in a wide variety of sizes, shapes and light output levels. These modules are UL recognized components and only require the soldering of two wires to connect to the AC line voltage.

Check out Seoul Acrich2 solutions on our web site at SeoulSemicon.com.

In future articles we will go into more detail on the MJT family of high voltage LEDs and how they enable more efficient and denser light sources.

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Dave has more than 20 years of experience in engineering design and applications support in the semiconductor industry. He has been working in the LEDs and Solid State Lighting industry since 2001.
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