

## Top Ten Myths of LEDs: #6 - "LEDs can't run hot"

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Standard incandescent lamps convert almost all the power they consume into radiation (basically, heat). Unfortunately, only about 5% of this emission is in the visible spectrum, making them very inefficient light sources. On the other hand, since almost all the power is radiated away, there is little need for thermal management. LEDs put 100% of their radiated power into the visible spectrum, but (today) not all the consumed power is radiated, due to losses in the electronics, optics, and LED-related processes. This excess power turns to heat, and must be managed somehow: this is why LED-based lighting products have heatsinks, for example.

Conventional wisdom is that the excess heat is a real problem for LEDs and must be managed at all costs. These notions are reinforced by the emergence of over-engineered LED lighting products that include active cooling systems like fans, heat pipes, or even liquid cooling(!). It would appear that LEDs simply can't run hot...

The truth is there is no fundamental barrier to high-temperature operation for LEDs. While there are practical considerations (LED efficiency does reduce with increased temperature), the limitations on LED operating temperature have to do with the details of the LED chip and package construction. Conventional LEDs based on foreign substrates like sapphire, silicon carbide, or silicon do have limited reliable operating regimes (typically only up to 85°C) because of their high crystal defect densities.

Enter Gallium Nitride on Gallium Nitride (GaN on GaN) technology. The extremely low crystal defect densities, simplified construction, and excellent thermal leveling properties of GaN on GaN LED design enable reliable operation up to 120°C. This allows lighting products, such as Sora's family of retrofit [MR16 lamps](#) [1], to operate at full power in fully enclosed fixtures, a first for the industry. No active cooling is necessary.

And, as GaN on GaN technology evolves and efficiencies increase further, thermal problems become even more a thing of the past, allowing product design teams to focus on the performance, look and feel of the products, and the use of sustainable materials, rather than worrying about wringing out every last ounce of heat.

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*Editor's note (7/2): This blog was edited to include the final two paragraphs.*

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### **Links:**

[1] <http://www.soraa.com/products>