

ENHANCELITE™ SUMMARY OF FEATURES:

- The world's brightest and most efficient LED lamps
- The industry's first A19 lamp to conform to ANSI form factor restrictions
- Smallest & most efficient LED driver
- Unique thermal/heat sink solution
- Recycled Reflectance optics & special color mixing
- The only UL/TUV and FCC certified A19 LED lamps in the industry
- One patent granted with ten patents pending

KEY FEATURES OF AN LED LAMP

When designing an LED lamp there are 5 main factors that need to be addressed. How well you address each of these factors directly determine the quality of the LED lamp:

- LEDs
- Electrical
- Optical Design
- Thermal Management
- Mechanical Design

LEDS:

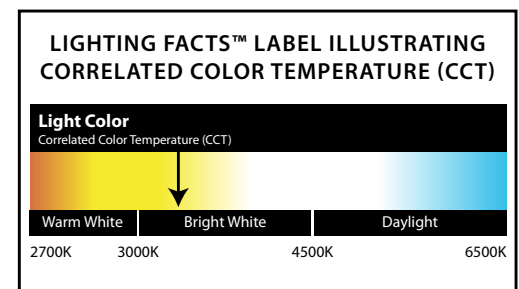
The quality of the LEDs determine the intensity/brightness of the light delivered and the quality of that light. The quality of light is measured by two factors; Color Rendering Index (CRI) and Correlated Color Temperature (CCT).

Color Rendering Index (CRI) indicates how natural a color appears when compared to a source of the same color temperature (CCT). The higher the CRI (based upon a 0-100 scale), the more natural the color appears. The chart to the right shows CRI for each of the three most common lamp types. Most LED lamps have a CRI of 70-80 with a select few companies delivering 85-92 CRI lamps.

LAMP TYPE	CRI
Incandescent	95
Compact Fluorescent (CFL)	65-85
LED	70-92

Correlated Color Temperature (CCT) is measured in degrees Kelvin and indicates the color of light emitted from a light source. Higher color temperatures (5,000 K or more) are cool (blueish white) in color and lower color temperatures (2,700–3,000K) are warm (yellowish white through red) in color. Typical incandescent lamps are 2700K or warm white.

The LEDs used also indirectly affect the luminous intensity of the lamp. Many factors go into luminous intensity but poor quality LEDs will definitely be a limiting factor on how much light can be produced.



THE LEDNOVATION SOLUTION:

Quality Partners:

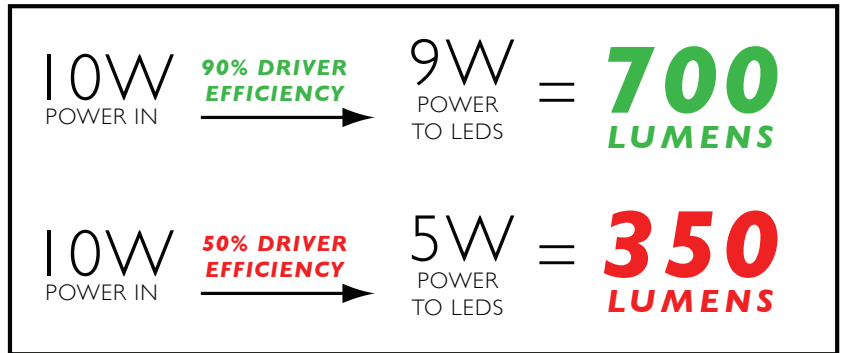
At LEDnovation, quality and performance are our top priorities so we selected an LED chip supplier with over 30 years of LED lighting experience, OSRAM Opto Semiconductors. OSRAM's expertise stems from their extensive experience in the automotive and backlighting industries and they have successfully translated that same level of expertise to solid state lighting for general illumination.

Color Mixing:

EnhanceLite™ LED lamps utilize a patent pending color mixing technique to achieve extremely high light output with high CRI's. This means we do not depend on inefficient phosphor coatings to achieve the desired color temperature, rather we mix it ourselves. This is achieved by mixing a combination of colored high efficiency LEDs with wide beam angle distributions. The wide beam angle allows the colors to mix directly on the LED board resulting in a smooth and uniform light.

ELECTRICAL:

The main item for electrical is the efficiency of the power supply/driver. A low efficiency driver means less lumens out of the lamp (see right).



THE LEDNOVATION SOLUTION:

Most companies buy "off the shelf" drivers with efficiencies of 50-70%. This simply wasn't good enough for us so we designed our own proprietary driver. Our driver is >90% efficient with a power factor >0.9. The significance of power factor lies in the fact that utility companies supply customers with volt-amperes, but bill them for watts. Power factors below 1.0 require a utility to generate more than the minimum volt-amperes necessary to supply the real power (watts). This increases generation and transmission costs. Utilities can charge additional fees to customers who have a power factor below a specified limit, which is typically 0.7. In addition, utilities will likely require high power factors for lamps to qualify for rebates. Low power factors can also be an indicator that an LED lamp has an inefficient driver, for this reason we do not recommend using LED retrofit lamps with power factors below 0.9.

OPTICAL DESIGN

Optics are designed to put light where you want it in the most efficient way possible. It doesn't do you any good if the LEDs put out 1000 lumens but the optics are only 50% efficient meaning only 500 delivered lumens.

THE LEDNOVATION SOLUTION:

The EnhanceLite™ A19 LED lamps have been optimized for general illumination downlight applications. The lamps are designed to project 82% of the light forward and 18% of the light back behind the lamp cap. This means when the lamps are placed in a downlight can, an even light is emitted illuminating the rim of the can and projecting the light uniformly onto the floor.

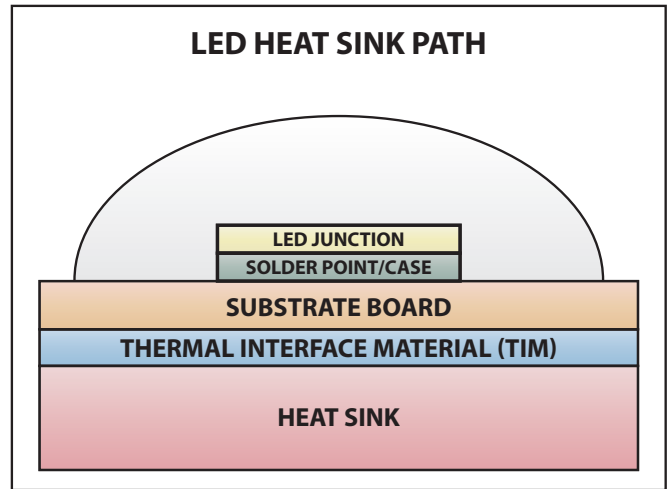
EnhanceLite™ LED lamps feature Recycled Reflectance™, a patented breakthrough in optical control technology. Recycled Reflectance™ allows our lenses to function at a remarkable 91% efficiency while producing a diffuse, even light output. The process of Recycled Reflectance™ consists of a dome and a reflector. The dome is made out of an efficient material that diffuses the light output. The reflector takes any light that is bounced back off of the dome and reflects it back out of the lens, effectively recycling any light loss. Recycled Reflectance™ epitomizes our development teams motto of "every photon of light and every electron is precious."

THERMAL MANAGEMENT

Simply put, LEDs do not like heat. Thermal management systems are designed to draw heat away from the LEDs as efficiently and quickly as possible. Nearly all heat produced from an LED is conducted through the back side of the chip and is generated at the PN junction by electrical energy that was not converted to useful light. The temperature measure here is referred to as the junction temperature and this heat is dissipated through a long and extensive path, from junction to solder point, solder point to board, board to the heat sink and then to the atmosphere.

THE LEDNOVATION SOLUTION:

The EnhanceLite LED lamps utilize aluminum and copper to effectively and efficiently dissipate heat away from the LED junction point to ambient. We have conducted extensive thermal testing on the lamps and other key components (driver, capacitors, etc.) by placing the LED lamps in “worst case scenarios” to ensure the long term reliability you expect. Our testing has determined that it’s not the LEDs themselves that will fail first but the capacitors. Due to this extra care has been taken in sizing and sourcing these components to ensure long term reliability.



MECHANICAL DESIGN

The challenge mechanically is to keep the standard lamp form factor while being able to effectively manage the heat and fit all required components within the lamp body. LED lamps require the power supply/driver to be placed inside the lamp so it is a self contained system. Room for optical control must also be accounted for so LED lamp manufacturers very quickly run out of real estate. Due to this, a large number of LED lamp manufacturers have increased the overall size of their lamps outside the ANSI standard for the incumbent lamp to be replaced. This can lead to lamps hanging out of fixtures or simply not fitting fixtures making it difficult to retrofit effectively.

THE LEDNOVATION SOLUTION:

From the beginning we made it a point to design our lamps within the standard A19 form factor meaning a retrofit lamp must be a true replacement. While this stance definitely wasn’t easy to accomplish, in the end the goal was met and we can proudly say the EnhanceLite LED lamps fit within the ANSI specified A19 standard form factor.