Brainstorm: Medical Electronics

Edited by Jason Lomberg, Technical Editor

How could solid state lighting benefit the medical device sector?

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Medical device displays are lighter, brighter, and slimmer than ever before and while CCFL backlights powered by DC-AC inverters are still in use, those are primarily legacy applications. New designs are based on LED backlights powered by LED driver modules. LED backlit units (BLUs) have provided medical device displays with increased brightness and higher reliability. They also allow for a significant power savings which is especially important in portable, battery-powered applications

LED backlights offer numerous advantages over CCFL BLUs including very low power consumption, increased dimming ratios, significantly reduced electromagnetic interference (EMI), and they don't require warm-up time at cold temperatures. LED- based designs are less fragile and more reliable than their CCFL counterparts. Average LED lifetimes are approaching 70,000 hours. The LED driver's wide-range dimming capability offers a valuable advantage for medical displays as they must be fully legible in both bright daylight and low-light applications. These characteristics are essential for medical devices requiring 24/7 operation such as a bedside patient monitor.

It is important that the LED driver in a high-performance medical diagnostic display is a full-function power supply that maintains constant current, addresses thermal management, provides a wide dimming range, and has a very low EMI footprint. LED driver package configurations that provide footprint-compatibility with existing CCFL inverters – i.e., designed in the same form factor as inverters already in the field – are easing the transition to LED backlights. These drop-in replacements allow for a fast, easy upgrade without re-designing or re-tooling the mounting hardware and ensure the eventual adoption of solid state lighting in the medical device sector.

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The benefits of solid-state lighting are widely recognized. Compared to incandescent or halogen lamps, LED-based systems are environmentally friendly, energy efficient, and reliable. Solid-state lamps produce high-intensity white light with very low power consumption. And, with an expected lifespan of up to 50,000 hours versus just 3,000 for halogen lamps, the cost and disruption for maintenance is significantly reduced.

These benefits make them ideal for use in medical applications characterized by long periods of sustained use, such as surgical lighting, x-ray backlighting and exam lights.

However, making the transition from traditional incandescent or halogen lamps is not just a matter of changing a light bulb. Solid-state lighting requires a system solution that optimizes the LED source, power conversion, control and drive electronics, thermal management and optics.

A key challenge for medical applications is to produce an intense white light with a CRI greater than 85. This requirement adversely affects the luminous efficacy of the LEDs. Manufacturers like TT electronics have developed innovative approaches to color mixing using advanced circuit design, thermal management, and optics to effectively achieve the desired CRI.

The energy efficiency, light quality and reliability will continue to drive an increased demand for solid-state lighting in medical applications. With expertise in optics, thermal management, electrical design, and system test, TT electronics provides an easy route to manufacturers making this transition.

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