

Enlightenment *on* LEDs

Practical, inexpensive HB LEDs (high-brightness light-emitting diodes) are here. Now, what can we do with them, and what will be their impact on electronics and consumers? With their promise of high efficiency, high reliability, and long life, HB LEDs are in the news because of the US government's push toward "greener" approaches to today's energy and economic challenges. Lighting currently accounts for 10 to 20% of all electricity use worldwide. A highly efficient, long-lived, and rugged SSL (solid-state-lighting) device, such as an HB LED, offers a new lighting technology that can reduce our energy usage without any painful habit changes in lighting. Is that the scenario that will occur, though? In the first article in this supplement, you'll read about the research of Jeff Tsao of Sandia National Laboratories. His research shows that lighting, rather than being based on consumers' needs, is a historically constant percentage of the GDP (gross domestic product). What are the implications of this finding, and how will the adoption of new lighting technologies play out worldwide?

HB-LED components do not exist in a vacuum; they require sophisticated current drivers to ensure that the

multiple LEDs they employ have similar currents and thus create uniform light output. In addition, because of HB LEDs' susceptibility to damage from heat, thermal management is important. In another article, Jeff Perry, senior manager at National Semiconductor's Webench group, covers how to choose an HB LED and how to protect that device with temperature sensors that feed back to the current-drive circuitry.

John Betten, a long-time contributor to *EDN*, looks at a common power scenario for LEDs in which the input and output voltages around the HB-LED driver can overlap and are often "dirty" as they come off the ac line, as in automotive applications. He suggests an architecture that drives the LEDs negatively.

And Silvestro Fimiani, product-marketing manager at Power Integrations, suggests that careful attention to power conversion, and especially to PFC (power-factor correction), is possible with careful electronics power conversion for current control of an incandescent-lamp replacement. (The Energy Star draft for SSL will probably mandate this PFC requirement.)

—Margery Conner, Technical Editor

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