Light Matters

Designing illumination systems with high-brightness LEDs

THE ORDINARY LIGHT BULB MAY BE BANNED IN MY HOME STATE. You may have heard that Lloyd Levine, chair of the California Assembly's Utilities and Commerce Committee, introduced legislation last month to outlaw sales of incandescents in the state by 2012. I don't know whether this will happen or not, but maybe that's a side issue. A very public and soundbite-worthy statement was made, and the need for energy-efficient lighting was brought back into the spotlight once again.

We know that the largest single market for high-brightness LEDs (HBLEDs) in the future, the "killer app", will be general purpose illumination. These are the ceiling lights in the room you're now sitting in, the task lamp on your desk, torchieres in the hall and even the streetlights outside your window.

From an electrical standpoint, those devices all have one thing in common: AC mains power. When they eventually incorporate HBLEDs, they'll have two other things in common: highly optimized AC to DC conversion systems designed to meet stringent energy mandates, and power factor correction and/or harmonics reduction circuitry. IEC 1000-3-2 requires power factor correction for lighting systems at power levels greater than 25 W.

Less expensive options like compact fluorescent lamps (CFLs) are available today, but these are lumen-limited and cannot offer the feature set or flexibility of HBLEDs. Besides- after ten minutes working under a compact fluorescent, you begin to feel like an extra in a Fellini film.

The time to become acquainted with the system-level issues of off-line (mains-powered) HBLED illumination is now. Under the Energy Star program, a joint initiative of the US Department of Energy and the Environmental Protection Agency, products that meet certain criteria are eligible to receive an Energy Star designation. There are possible tax credits and other incentives for consumers and businesses using Energy Star products. The program is currently being extended to include HBLED-based illumination applications such as the ones described above. The draft proposal is available now and posted on our web site — very interesting, and very thorough.

On a component level, imagine a high-brightness white LED that can be connected directly to the AC mains… without any power supply, or, for that matter, without any circuitry at all. I saw a demonstration of such a device several months ago at a Seoul Semiconductor R&D center in Korea. Unbelievable. This part, which Seoul calls the "Acriche", was just announced publicly and is now released for production. Initially they are being supplied on small boards with connectors. Two Acriche LEDs produce 150 lumens, four produce 300 lm, etc. Each board has two connectors so they can be daisy-chained.

If you're interested in reading any of the previous LED-focused Light Matters columns, they are all posted to the LightSpeed webpage (www.em.avnet.com/LightSpeed). More information on the Acriche can be found there as well. Your emails with questions or suggestions are always welcome.

Cary Eskow is director of LightSpeed, the solid state lighting and LED business unit of Avnet Electronics Marketing. An ardent advocate of energy efficient LED-based illumination, he has worked closely with LED manufacturers, advanced analog IC and secondary optics vendors since his first patent using LEDs was issued two decades ago. LightSpeed works with customers through their national team of illumination-focused engineers called "Illumineers," experienced in thermal, drive stage and optics design. Prior to LightSpeed, Cary was Avnet's technical director and managed Avnet's North American FAE team.