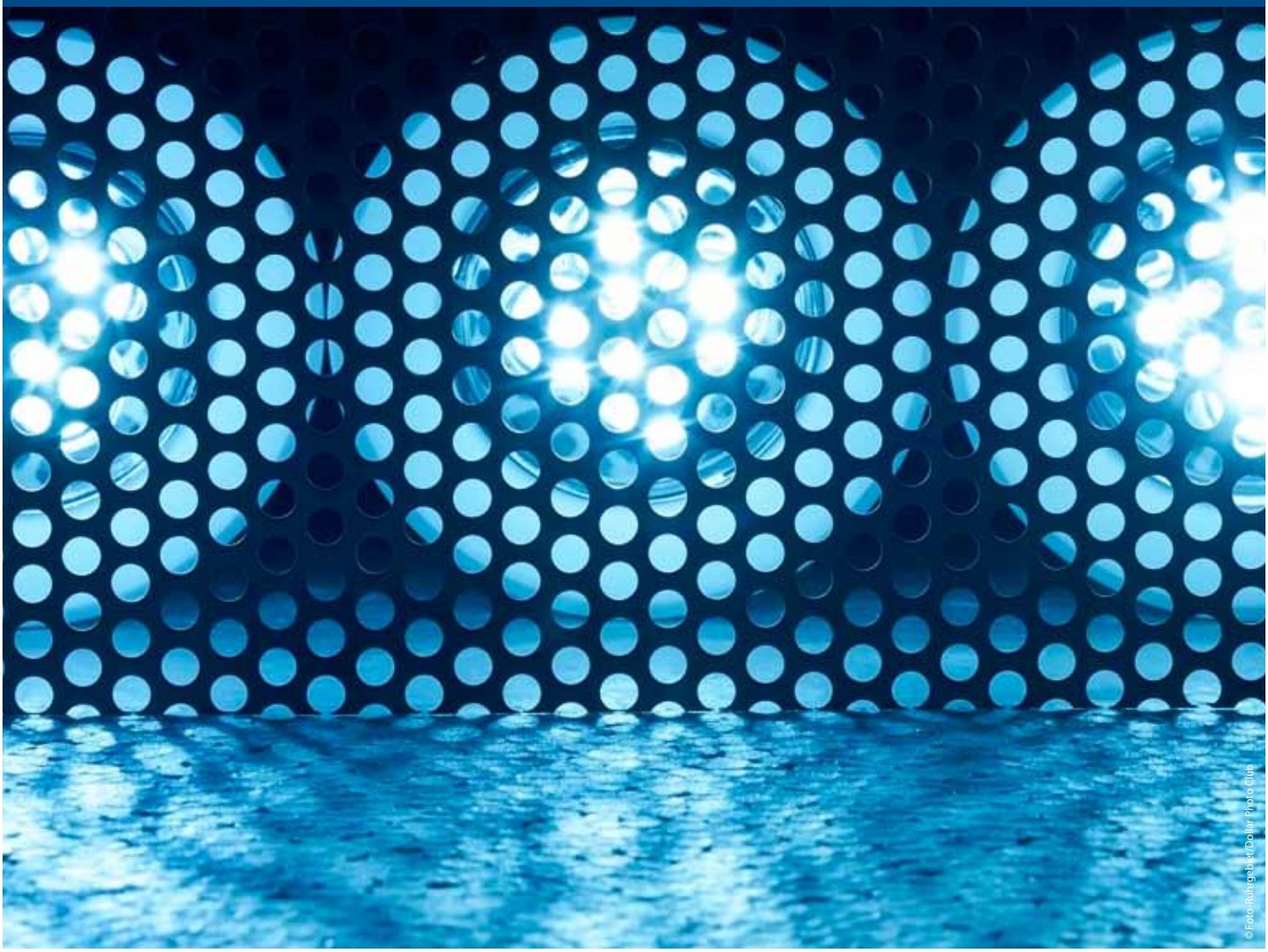
LED Lighting: A Bright Future That Is Now Enlightening the Past



MOUSER ELECTRONICS

LED Lighting: A Bright Future That Is Now Enlightening the Past

By Paul Golata, Mouser Electronics

Over several years now, high-power LEDs have made rapid advances as far as power and raw luminous output are concerned. Much to Edison's discontent, solid-state is now firmly established as the technology of choice for ambitious indoor and outdoor lighting applications-leading to greater engineering light-bulb moments. The conversion includes even the popular location of St. Peter's Square in Rome, which is now lit by over 130 luminaires containing Osram neutral white LEDs. Could this be the ultimate blessing for LED lighting?

Device-Level Advances

Engineers can expect ever more powerful emitters to continue emerging from the laboratories of the leading manufacturers, if for no other reason than to claim kudos as King of the Hill. For some time now, however, the emphasis has been shifting towards optimizing device performance to meet other practical economic and aesthetic considerations.

The continued focus on improvements in efficiency regarding lumens per square millimeter (lm/mm2), as well as lumens per Watt (lm/W). This is important, as lighting manufacturers now look to improve subsequent generations of currently successful products: newer, better devices within the same footprint as their predecessors allow new products to be introduced quickly and cost-effectively without requiring a major redesign. Cree introduced the latest generation of its benchmark high-power XP-L emitter in September,

Figure 1: Osram now provides a unique lighting experience to St. Peter's Square in Rome. (Source: Governatorato S.C.V. - Direzione dei Musei)

raising lumen output and efficacy (lumens per Watt) by 7% and 15% respectively. Reflecting the value placed by industry on area efficiency, the Illuminating Engineering Society of North America Progress Committee praised three LEDs from Osram's Oslon and Durius families for delivering a combination of high output and small footprint.

The latest generations of packaged LEDs, such as Cree's XP-L and Lumileds' Luxeon Core and Compact Chip On Board (COB), a variety of new devices arrived to help designers take their products to the next level quickly while bringing significant advances in the development of package-less LEDs. Seoul Semiconductor has become the first supplier to enter mass production of package-less devices with its WICOP family. These devices promise to save cost and footprint by eliminating package components such as a lead frame and bond wires. With WICOP, Seoul Semiconductor has perfected a way of enhancing the luminous efficacy of package-less emitters: the devices achieve higher lumens per Watt than either conventional packaged high-power LEDs or alternative chip-scale package devices.

Focus on Quality and Color

With growing confidence in the ability to illuminate large areas, either indoors or outdoors, engineers and designers are increasingly directing their attentions towards the quality of illumination. The IES has published the TM30-15 color-quality metric, which helps designers assess the rendering of a wider range of colors more accurately than is possible using the traditional Color Rendering Index (CRI) that expresses average color fidelity in comparison with an ideal light source.

Although CRI can be manipulated to achieve an artificially high score, its strength lies in its simplicity. It is still not clear whether the significantly more complex TM30-15 will be widely used, or even well understood, throughout the industry. However, component producers and lighting designers are coming to terms with the ability to customize light in ways that have not been possible in the past, and this is creating new opportunities.

One of these is horticultural lighting, and in recent months, major LED manufacturers have introduced products aimed directly at this sector, including the Lumileds Luxeon SunPlus and Cree XQ-E and XP-E families. These new LED devices are optimized to produce spectra that are known to maximize photosynthesis which enables growers to combine excellent, LED-optimized lighting with existing indoor-farming expertise, covering aspects such as temperature and atmospheric carbon dioxide to shorten the crop-growing season further while also optimizing flavor and yield. Moreover, of course, there is the added attraction of lower utility bills thanks to the known efficiency advantages of LED lighting. As global food demand continues to increase with rising population, here is one-way technology can help to meet the critical challenges facing future generations.

The success of horticultural LED lighting is one example of how the controllability of LEDs can deliver extra value in specific applications. A tougher challenge, and potentially an even greater opportunity, is to increase understanding of human-centric lighting and provide new products that fully exploit the controllability of LEDs to benefit human health, well-being, and productivity.

Still Waiting for Bluetooth® Mesh

LED light is closely associated with the smart lighting revolution, and for much of the year, the industry has been excited by the promise of the new Bluetooth® mesh profiles. These should enable end-users to control lights throughout a large area, such as an entire house or even an office or factory, directly from their smartphone when in Bluetooth range of any node in the network. The Bluetooth SIG has assigned a working group to look at various proposals; its publication is expected but has not yet been announced. When it arrives, the official Bluetooth mesh standard may not contain many surprises, as it is widely projected to be based on the CSRmesh™ technology currently powering networkable Bluetooth radios such as CEL's MeshConnect™ modules.

New Standard for Efficient Power?

If integration of LED lighting within smart networks is to become easier, integration with the building's power infrastructure could also benefit from some simplification. Implementing circuitry for AC/DC and voltage conversion in each fitting adds expense and wastes energy. Power over Ethernet (PoE) is one option that could help minimize power-conversion losses and save costs, which has the additional benefit of carrying power as well as control signaling over the same network cable.

Distributed Low-Voltage Power (DVLP) has arrived. Like PoE, DLVP comes within the class 2 power limits of 100 Watts and 60V. While PoE is arguably better able to service smart lighting as a part of the IoT, DLVP-provided it becomes an open standard-could help significantly reduce lighting installation costs while maximizing the inherent energy-saving advantages of LED lighting; which, if we can all cast our minds back far enough, was the reason the technology first gained widespread attention.

Paul Golata joined Mouser Electronics in 2011. As a Senior Technical Content Specialist, Mr. Golata is accountable for contributing to the success in driving the strategic leadership, tactical execution, and overall product line and marketing direction for advanced technology-related products. Mr. Golata provides design engineers with the newest and latest information delivered through the creation of unique and valuable technical content that facilitates and enhances Mouser Electronics as the preferred distributor of choice. Before Mouser Electronics, he served in various manufacturing-, marketing-, and sales-related roles for Hughes Aircraft Company, Melles Griot, Piper Jaffray, Balzers Optics, JDSU, and Arrow Electronics. Mr. Golata holds a BSEET from DeVry Institute of Technology - Chicago, IL; an MBA from Pepperdine University - Malibu, CA; an MDiv w/BL from Southwestern Baptist Theological Seminary - Fort Worth, TX; and a PhD from Southwestern Baptist Theological Seminary - Fort Worth, TX. Mr. Golata may be reached at paul.golata@mouser.com