

Case Study

PHILIPS



Case Study: Contemporary Task Lighting

**LUXEON Rebel enables Eye-catching Looks
with Outstanding Performance**

When Trilux of Germany wanted to make a strong design statement in task lighting, they turned to the only light source capable of achieving their vision — the LUXEON Rebel from Philips Lumileds. No other source offered the size and performance to meet Trilux's design objectives for the simple, contemporary lines and thin profile of the Trilux Estilio floor lamp. Today, the Estilio brings a sleek new look to hotel lobbies, offices, and residences.

Based in Arnsberg, Germany, Trilux (www.trilux.de) is a pioneer in advanced lighting, with a reputation for delivering high quality solutions. In 1912 the company's founder, Wilhelm Lenze, saw that replacing traditional gas lamps with new electric lights would improve quality of life in ways that people could barely have dreamed. Almost 100 years later, Trilux is a leader in using the latest power LED technologies to deliver bright, efficient, low-profile lighting while setting new standards for style and performance in the 21st century.

As a leading designer of lamps for industrial, commercial and high-end consumer lighting markets, Trilux is embracing power LEDs to create exciting new products for customers. In the process, Trilux delivers efficient luminaires with longer lifetimes due to the longevity and power saving capabilities of LEDs compared to conventional incandescent or fluorescent lamps.

Trilux has taken advantage of the small size and high performance available from the LUXEON family to create the Estilio free-standing floor lamp, which is a sleek, minimalist design made of straight aluminum profiles only 2cm thick. The ultra-small dimensions and lightness of the component parts not only enable high-tech styling but also make for extreme ease of use. The

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- Stefan Seltsmann
Engineer

Trilux Photometrics Laboratory

LUMILEDS
LIGHT FROM SILICON VALLEY



lamp is balanced and easily adjustable, allowing users to move and tilt the unit to direct the light precisely as required.

Advanced Task-Lighting Solution

As a task-lighting product, Estilio is destined for use in hotels, lobbies and offices, as well as prestige consumer markets. The technical challenge for Trilux was meeting the German standard DIN 5035.7, which specifies the minimum light output for such luminaires: at least 300 lux is required within a central 600mm field. Achieving this high functional performance within the confines of the desired ultra-low-profile design required new thinking about everything from the light source, to optics, to thermal management.

Choosing the Light Source

Having previously used the LUXEON K2 power LED from Philips Lumileds in the Trilux Athenik downlight, design engineer Stefan Seltmann already had experience with the small size and high lumens per Watt available from leading power LEDs. For the ultra-low-profile Estilio lamp, Philips Lumileds worldwide distributor Future Lighting Solutions recommended the new LUXEON Rebel power LED: its outline of 3mm x 4.5mm, and height of 2.1mm, would allow Trilux to achieve its target output using six LEDs to create a much smaller light source than a comparable fluorescent lamp. "The LUXEON Rebel opens the door to exciting new styling directions as well as outstanding performance," confirms Seltmann. "With the current desire for ultra-small size and lightness for chic looks and ease of use, we really needed the most advanced power LEDs available."

For Trilux, achieving a long lifetime was also an important consideration, not only to offer a low cost of ownership but also because the brand is founded on a high perception of quality. "The small package size of the LUXEON Rebel allowed us to use more LEDs, operating well below their maximum current, while still undercutting the dimensions of a fluorescent lamp," Seltmann comments. "We have successfully minimized the stress on each device, resulting in a longer operating lifetime. In practice, we have also found that the lifetime of LUXEON LEDs exceeds the specifications given in the datasheets."

"Since the lifetime of an LED source is closely related to temperature, the small size of LUXEON Rebel also provided valuable extra freedom to design the most effective heatsink within the physical dimensions specified."

Optics for Optimization

As with any LED-based luminaire, careful optical design was also critical to the overall success of the project. The optical flux from individual LEDs must be correctly focused and directed to maximize efficiency. For the Estilio, Trilux

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- Ralf Busch
Trilux Product Management

engineered a 3-part optical system including two lenses and a reflector. The reflector is a high-performance reflective material called UXP-S, which Trilux uses to build reflectors and louvres for all its families of high-quality luminaires. Its reflectivity of 98 percent provides outstanding efficiency, while the hinged design allows the user to direct the light as needed.

For the lens system, Trilux turned to Finnish optical technology specialist Ledil Oy, with which Trilux has a well-established relationship. The two companies have already achieved



outstanding results working on the Trilux Lumena 400 lamp featuring LUXEON K2 power LEDs. With the Estilio, Trilux presented its partner with a tough challenge: manage every available lumen as efficiently as possible by directing all of the light from each LED onto the ultra-efficient UXP-S reflector.

Adrian Fischer of Trilux developed the specification for the optics. Ledil's Tomi Kuntze was responsible for meeting it. "A conventional light source such as a CCFL would normally require a 12 degree lens to meet Adrian's specification," he explains. "These tend to be expensive because they are difficult to produce in large quantities." However, the small chip size and high optical performance of the LUXEON Rebel LEDs contributed directly to a more convenient and cost-effective solution. We were able to create a two-part optic, combining a primary collimator to focus each LED and a high-efficiency focuser to direct the flux to the optimal area of the reflector."

Estilio in Action

Each of the six LUXEON Rebel LEDs in the Estilio lamp fitting is operated at 700 mA, resulting in total optical output of around 400 lux within the specified 600mm central field—far surpassing the DIN 5035.7 requirement for task lighting. The lamp also provides generous illumination throughout its general field, providing a high level of lighting for a multitude of purposes.



LUXEON Rebel with TFFC

LUXEON Rebel high-power LEDs are surface-mount devices incorporating Philips Lumileds' Thin-Film Flip-Chip (TFFC) technology. TFFC eliminates features that have limited the performance of previous generations of power LEDs, such as bond wires that prevent efficient coupling of emitted light into the associated optics.

In addition, TFFC maximizes the effective emitting area of the chip, and enables a uniform, tightly controlled surface. This boosts utilization of the chip and also simplifies the design of secondary optics.

Compared to vertically injected thin-film (VTF) devices or standard flip-chip LEDs, TFFC is a major enabling technology driving power LEDs forward into high-performance lighting applications. These include street lighting and vehicle headlamps, as well as advanced interior lighting solutions such as the Trilux Estilio task lamp.

The total power consumption of the Estilio is only 17 Watts and delivers luminaire efficiency of more than 40 lumens per Watt. This result is significantly better than what could be achieved with a cold cathode fluorescent (CCFL) lamp based solution. As LED performance continues to increase, the power savings potential for LED solutions will become even greater. Because high power LEDs are smaller, more energy efficient, have a much longer life, and contain no hazardous materials such as mercury, they are increasingly recognized as the most environmentally responsible choice in lighting.

Present and Future

Trilux launched Estilio within its high-end lighting portfolio in July 2008. The lamp is already gaining admiration from designers and architectural professionals across





Europe, and has won industry awards including the Innovations award from Architektur und Technik magazine.

"The LUXEON Rebel was the only light source we could possibly use to achieve our performance targets within tiny dimensions and take our markets by surprise," adds Ralf Busch, Product Manager at Trilux. "We have already exceeded the accepted performance standards for this type of lighting, and we expect LUXEON Rebel LEDs to take great strides forward in the future. This technology is only at the beginning of its development, and we are working with Philips Lumileds and Future Lighting Solutions to further increase performance while at the same time increasing efficacy. Looking forward, we anticipate introducing even smaller, more advanced products for customers, with extra power savings and even higher reliability."

LUXEON Rebel Benefits for Trilux Estilio Project

- Smallest power LED—enables never before possible luminaire design
- Outstanding performance and efficacy
- Industry leading reliability and lumen maintenance
- Maximum usable light and lifetime at 700 mA drive current
- Simplified optical design

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