

**PHILIPS**

LED Systems

White paper



**Safer by  
design**



# Increasing LED performance

Like all technology-driven businesses, the general LED lighting industry is constantly looking for new design opportunities. LED modules are used in combination with a growing range of LED drivers in an ever-expanding variety of fixtures, markets, applications and environments. New applications for these LED systems provide suppliers with insight into performance and reliability. Based on this insight, Philips Lighting is constantly improving its LED components to prevent system failure to the highest possible degree. The performance of LED modules can be affected by degradation, moisture and corrosion. This, in turn, can lead to degradation of color and brightness or even complete system failure. Philips LED systems counteract this degradation by for example, avoiding overheating and minimizing the risk of electrostatic charge.



# Avoiding overheating

Integrating a fuse to protect components and maintain safe operation

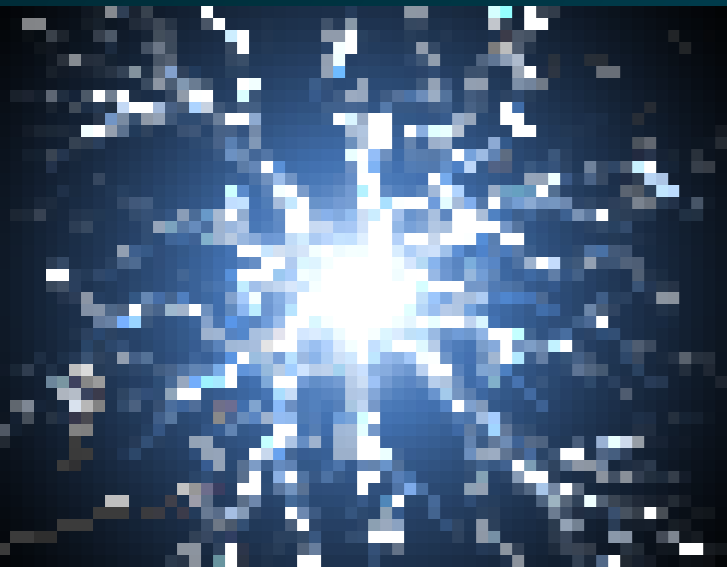


Since Philips LED modules are designed for use in the broadest possible range of general lighting fixtures, markets and applications, fuses are incorporated to ensure operation is as safe as possible. A fuse allows the current to pass through it under normal conditions, but interrupts the current flow when the value specified for the fuse is exceeded. This prevents the excessive current damaging other components.

The output of a LED driver is a constant current, which is set according to the number of LEDs it is driving. In the event of sequential LED failures, the fuse protects individual LEDs or LED strings against excessive high current, thereby avoiding potentially unsafe conditions arising as the result of considerable temperature increase (when an LED conducts too much current, its temperature rises). All Fortimo and CertaFlux linear LED modules are equipped with fuses.

# Minimizing electrostatic discharge

LEDs are sensitive to Electrostatic Discharge, or ESD, commonly referred to as 'static electricity'. If this charge, which can build up on a person or object such as a tool, is discharged into a LED component, it may cause lasting damage and instant or masked LED failure.

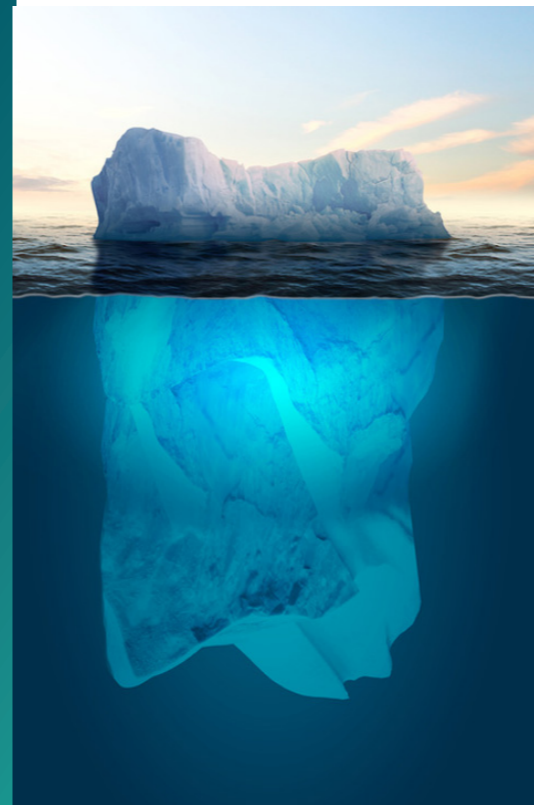


Although many manufacturers take precautions, the lighting industry has no standards in place aimed at controlling ESD. Normal movement around a workbench can generate up to 6 kilovolts, although up to 15 kilovolts has been measured on dry winter days. Low relative humidity further leads to large electrostatic charge build-up.

In order to minimize the risk on failures caused by electrostatic discharge, we implement ESD resilient features. Each individual LED on a Philips linear LED module contains a Zener diode or transient voltage suppressor (TVS) to minimize failures caused by ESD. The contact discharge limit is higher than 8 kilovolts and air discharge limit is higher than 15 kilovolts. What's more, our supplier control plan ensures ESD performance is supported through extensive testing,

# Realistic proven lifespan

Although LED lifetimes exceed those associated with previous lighting technologies and have been proven in countless applications and installations, there are no clearly defined standards governing the qualification of LED systems' lifetimes and reliability. Interpreting technical data from individual components to define the lifetime of an entire system can result in false expectations.



The TM 21 standard based on LM80 test data is commonly used as the source for lifetime predictions. However, the LED performance needs to be judged not only by this element, but also by other factors. Studies show that when it comes to evaluating LED system lifetimes and reliability, lumen maintenance is important, but not the only relevant factor. Critical system failures are the most visible and annoying consequences.

The LED Systems Reliability Consortium (LSRC) has identified the main causes for these occurrences. Most commonly, they include power electronics failure, moisture ingress, corrosion, gasket sealing leaks, and poor thermal management.

Philips Lighting has developed advanced product design and validation methods that realistically assess LED reliability

and performance, ensuring products truly meet lifetime specifications. Very demanding validation procedures, such as accelerated lifetime tests and multiple environmental overstress tests, must be passed before a component can be mass produced. Methods such as failure mode and effects analysis and advance system modeling are used in the design phase. Suppliers are carefully selected and repeatedly audited, and inline testing, process control and ongoing reliability testing are fully integrated in product design and specification. Should a product fail in the field despite all these efforts, customers are offered immediate, hassle-free support. Of course, vast numbers of products in use today, which operate for long periods of time without difficulty, are the best proof of our reliability.

## Fortimo and Xitanium – partners in performance

Luminaire performance is determined by the sum of its component parts. Combining components from the complementary Fortimo LED modules and Xitanium LED driver families enables design-in simplicity, flexibility, compatibility and long life, plus the convenience of dealing with just one supplier of vital luminaire components.

## Philips, a legacy in lighting

With more than 125 years of experience to draw on, Philips delivers peace of mind to lighting fixture manufacturers, specifiers and end users. If you wish to engage in the world of LED lighting together with a company you can trust, choose Philips Lighting. As one of the world's leading lighting and LED pioneers, we have a reputation to uphold, and reliability is an essential element in all our products and the performance claims we make about them.

125  
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