

LEDs for General Purpose Lighting

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Until a few years ago, LEDs were mainly seen as low-power light sources in indicators and advertising. With huge progress being made in terms of device performance, this has profoundly changed.

Especially since the beginning of the 21st century, LED components manufacturers and material suppliers have achieved remarkable progress in their endeavor to increase chip performance, phosphor efficiency and overall device efficiency, resulting in increased luminous efficiency (lm/W), high reliability / lifetime, high color rendering etc., making solid state lighting (SSL) not only feasible for professional lighting such as displays, signage, indicators, architectural, surgical and automotive applications, but bringing it closer to enter the general lighting market with applications such as home, office, and retail lighting.

In indoor applications, fluorescent lamps are still standard, with an efficiency of 80 – 90 lm/W; however, LEDs are catching up quickly. While the efficiency of standard high-power white LEDs on the market is about 40 – 70 lm/W, efficiencies of >100 lm/W have been achieved, and LEDs with an efficiency comparable to fluorescent lamps are to enter mass production.

Besides energy saving, one big advantage of LEDs is their tunability of the color temperature. For instance, for RGB-devices, the color locus can be varied anywhere within the color gamut by independently controlling the current for R, G, and B. Furthermore, it is recognized that color rendering and color temperature have a physiological influence on humans. A combination of a blue LED with green and red phosphors would cover most of the visible spectrum and can achieve color rendering indices (RA8) of well over 90. By combination of warm and cold white devices with the appropriate drivers and sensors, it is possible to automatically adjust the color temperature with daytime and season (cold white in summer/daytime, warm white in winter/evening). Due to the potential of miniaturization, LEDs have a considerable advantage over other light sources for including optics and achieving well-defined emission angles and shapes, which would not be possible with big-sized fluorescent lamps.