

HOT LED!

Light-emitting diodes (LEDs) are becoming more important in everyday lighting installations. Get ahead of the curve with this overview of where LEDs are right now—and how to avoid problems in selecting and installing them.

By Craig DiLouie

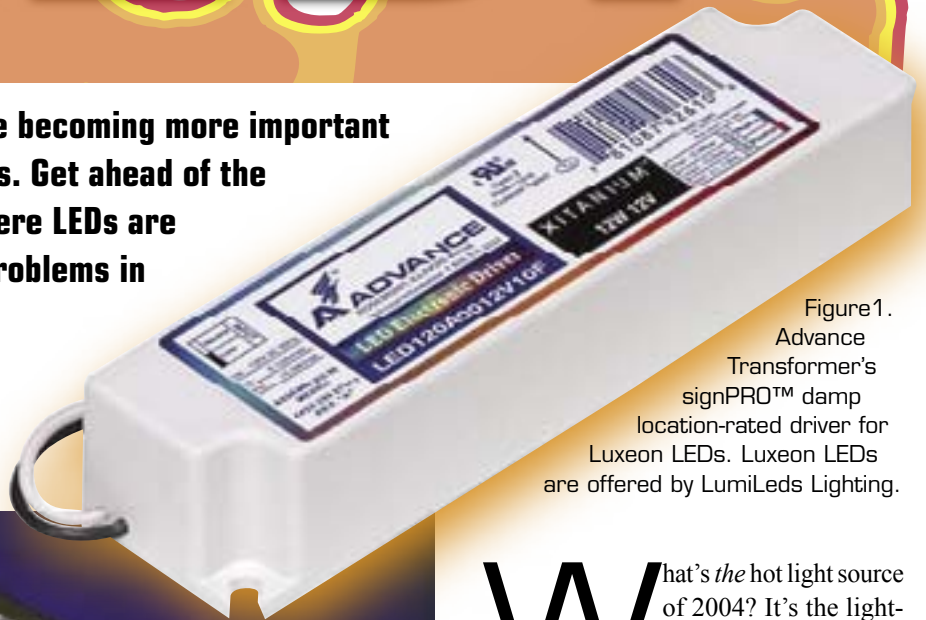


Figure 1. Advance Transformer's signPRO™ damp location-rated driver for Luxeon LEDs. Luxeon LEDs are offered by LumiLeds Lighting.



Figure 2. After an electrical fire destroyed the face of a Carl's Jr. fast-food franchise sign, the neon signage was replaced with new LED signage powered by Advance Transformer's signPRO LED drivers. Input watts dropped from 200W to 38W with the LED system, producing a payback of less than two years.

What's the hot light source of 2004? It's the light-emitting diode (LED).

Just look at the evidence from LightFair. There were 44 exhibitors (companies) with LED products on display at the 2003 event. But this past spring, that number nearly doubled to 80 suppliers. Solid-state lighting products won four out of the six top new product awards, including Best of Show, and about half of the 31 awards given.

Lighting industry trends focus on smaller light sources and fixtures that contain more intelligence—and are more colorful. Unique LED capabilities dovetail with these trends! White LEDs, invented in the late 1990s, have opened new possibilities for competition with traditional light sources.

Colored LEDs already dominate the exit sign market—representing an esti-

LED Installation: Some Tips

With LED standards not yet fully developed, Al Marble of Advance Transformer says, it's important that all components be supplied as a fully integrated system from one supplier.

Similarly, OSRAM SYLVANIA's Sameer Sodhi recommends strictly following manufacturer installation instructions. "One of the areas that doesn't get sufficient attention during installation is the maximum LED load that can be placed on the driver," he adds.

Most driver output ratings are intended for an LED load placed directly on the output for ambient temperatures of 25°C or higher, he says. Remote mounting of the driver results in voltage drops and power losses on the DC wiring that must be properly calculated.

Additionally, LEDs draw higher power at cold ambient temperatures, Sodhi says—precisely the opposite of what happens with fluorescent lamps. This, too, can lead to system malfunction.

Outdoor applications: Where the power supply is mounted remotely, he says, the maximum LED load on the driver should be de-rated by 10% to 20% to avoid system conflicts during cold temperatures.

Installation errors

Contractors may make one of several common mistakes—errors that Sodhi and Marble believe can be prevented.

"One connect too many LED strings in series," says Sodhi. "Putting too many strings in series may result in too low a voltage being available to the last string(s) in the chain." How can this problem be avoided?

1. **Ensure that the maximum recommended string length is not exceeded.**
2. **Alternatively, connect wiring from the driver to the middle of the LED string, ensuring that each half of the string gets the same voltage.**

Pay special attention to the driver's environmental rating, Marble says. Most drivers are "dry location only" and must be installed in a weatherproof electrical enclosure if used outdoors. Damp location drivers should be used in signs or raceways where some moisture is expected, and wet location drivers are typically supplied in a pre-assembled, sealed enclosure for mounting outdoors.

"Contractors are advised to make sure that the driver is rated for use in its environment," he says. "They should also make sure that the driver has been evaluated and rated for use within the particular LED system."

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driver (at 10V or 24V) and convert it into three-channel output—usually red, blue and green—that can be mixed to create a dynamic mix of colors.

"Possibilities are endless," Marble notes, "with the use of fully electronic drivers."

Dimming: With the ability to incorporate dimming, too, the driver can

regulate LED light output over a range from 0% to 100%. Most dimming drivers operate using a method called pulse width modulation (PWM), which enables dimming with minimal color shift in the LED output.

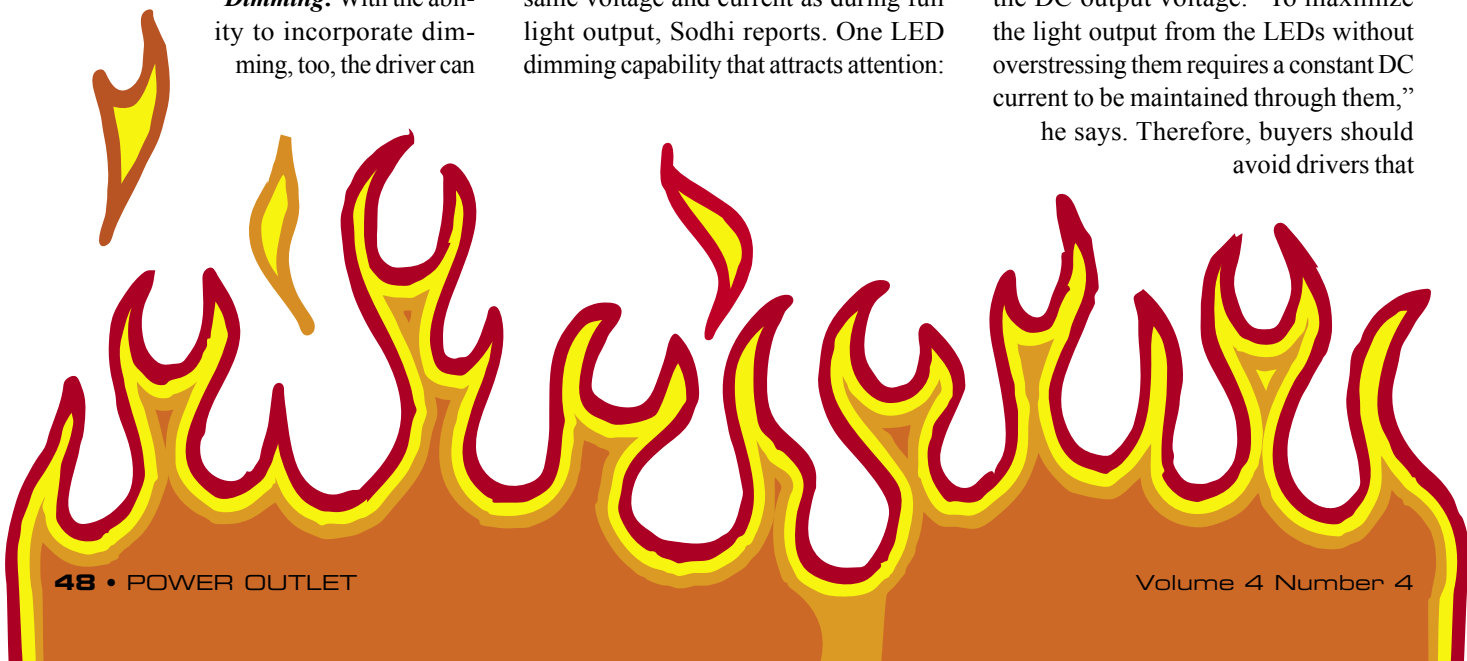
During dimming, LEDs operate at the same voltage and current as during full light output, Sodhi reports. One LED dimming capability that attracts attention:

By dimming different-colored LEDs at the same time, a range of colors can be generated through color mixing.

Practical considerations

A most important factor in choosing LED drivers, Sodhi says, is quality of the DC output voltage. "To maximize the light output from the LEDs without overstressing them requires a constant DC current to be maintained through them,"

he says. Therefore, buyers should avoid drivers that



create significant “ripple” content in the DC output.

UL Class 2 ratings, which are required for LEDs in sign applications, would benefit general lighting applications, Marble claims: “UL Class 2 mandates that the driver has voltage, current, and power below certain levels on the secondary.”

Other selection considerations, Marble says: Choose LED drivers that:

- have short-circuit protection;
- are designed specifically for the given application; and
- that can handle temperature extremes.

“Off-the-shelf DC power supplies are typically designed for room temperature applications such as IT or telecom,” says Marble. “Such power supplies may operate erratically or not at all under the rigors of a lighting application.”

Operating problems

Since LED systems are new, they may be difficult to troubleshoot. “Most common problems include either using the wrong voltage driver or overloading the driver,” says Sodhi. “When a wrong voltage driver is used, the LEDs will either not light up or may operate at higher currents than intended.

“A prudent practice is to check the voltage rating of the LED load being used against the rated output voltage of the driver. For example, using a 12V driver on a 10V LED load could result in significantly shorter life of the module.”

LEDs offer an exciting addition to the world of lighting

Rates for a current range, LED light output is proportional to current. Generally, it will run hotter as current increases, which could shorten the unit’s life. Over-driving LEDs, therefore, can increase light output, but can shorten life due to heat.

How can you detect an overloaded system? To troubleshoot this potential, Sodhi says, measure the voltage available to the last string of LEDs in a long chain. If voltage is at the low end of the acceptable range—or below—“the system is probably overloaded or improperly wired. Increasing the thickness of the wiring used to connect the LEDs to the driver and/or reducing some of the load on the driver are recommended solutions in this instance,” he adds.

Even during normal operation, Marble adds, one should remain aware of heat issues with LEDs. Why? They are “incorrectly believed to generate little or no heat,” he says, pointing out that there can be substantial heat generated in higher-wattage LED fixtures.

“Hopefully, the integrator or fixture manufacturer designed appropriate heat sinks for the system. Still, allowing ample heat dissipation in the installation is good practice, such as mounting to metal or allowing some ventilation if possible.”

The future of LEDs

LEDs are expected to revolutionize the lighting world. Manufacturers will, it is believed, continue to leap whatever technical barriers that remain to broader LED application and adoption. Use of white LEDs is thought to become more attractive in general lighting applications. And increasing specifier interest will drive rapid product development; LEDs are expected to revolutionize the lighting world.

“LEDs offer an exciting addition to the world of lighting,” says Sodhi. “Not only do they offer a substitute for traditional light sources for certain applications, but they also open up a new domain of lighting applications such as decorative architectural lighting. A range of LED drivers, controls, modules, and fixtures are already available to contractors for these applications.”

Adds Marble: “It is becoming clear that LED technology will be key to the progress of lighting in coming years.” ⚡

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