

# LED - TYPES

## Types

The main types of LEDs are miniature, high power devices and custom designs such as alphanumeric or multi-color.

### Miniature LEDs

These are mostly single-die LEDs used as indicators, and they come in various-sizes from 2 mm to 8 mm, through-hole and surface mount packages. They are usually simple in design, not requiring any separate cooling body. Typical current ratings ranges from around 1 mA to above 20 mA. The small scale sets a natural upper boundary on power consumption due to heat caused by the high current density and need for heat sinking.

### High power LEDs

High power LEDs (HPLED) can be driven at currents from hundreds of mA to more than an ampere, compared with the tens of mA for other LEDs. Some can produce over a thousand lumens. Since overheating is destructive, the HPLEDs must be mounted on a heat sink to allow for heat dissipation. If the heat from a

HPLED is not removed, the device will burn out in seconds. A single HPLED can often replace an incandescent bulb in a flashlight, or be set in an array to form a powerful LED lamp.

Some well-known HPLEDs in this category are the Lumileds Rebel Led, Osram Opto Semiconductors Golden Dragon and Cree X-lamp. As of September 2009 some HPLEDs manufactured by Cree Inc. now exceed 105 lm/W (e.g. the XLamp XP-G LED chip emitting Cool White light) and are being sold in lamps intended to replace incandescent, halogen, and even fluorescent style lights as LEDs become more cost competitive.

LEDs have been developed by Seoul Semiconductor that can operate on AC power without the need for a DC converter. For each half cycle part of the LED emits light and part is dark, and this is reversed during the next half cycle. The efficacy of this type of HPLED is typically 40 lm/W. A large number of LED elements in series may be able to operate directly from line voltage. In 2009 Seoul Semiconductor released a high DC voltage capable of being driven from AC power with a simple controlling circuit. The low power dissipation of these LED afford them to be use used more flexibly than the original AC LED.

### **SuperFlux/Piranha LEDs**

Superflux is the trademarked name for a series of medium power through-hole mounted LEDs of a particular shape manufactured by Lumileds. They consist of a square package, with the internal diode mounted to four leads (two cathode leads, two anode leads) for better heat conduction and an integrated dome lens. This package is now often called a Piranha package, since the Superflux name is trademarked. The most common use of these LEDs are light panels, emergency lighting and automotive LED tail-light lighting (though they have recently been superseded by SnapLEDs in many automotive applications). These wide angle LEDs provide large areas of light and a wide viewing angle in a small compact diode. Additionally, due to the larger amount of metal in the LED, they are able to handle higher currents (up to 70mA). The higher current allows for the much higher light output required for tail-lights and emergency lighting.

### **Application-specific variations**

- *Flashing LEDs* are used as attention seeking indicators without requiring external electronics. Flashing LEDs resemble standard LEDs but they contain an integrated multivibrator circuit which causes the LED to flash with a typical period of one second. In diffused lens LEDs this is visible as a small black dot. Most flashing LEDs emit light of a single color, but more sophisticated devices can flash between multiple colors and even fade

through a color sequence using RGB color mixing.

- *Bi-color LEDs* are actually two different LEDs in one case. They consist of two dies connected to the same two leads antiparallel to each other. Current flow in one direction produces one color, and current in the opposite direction produces the other color. Alternating the two colors with sufficient frequency causes the appearance of a blended third color. For example, a red/green LED operated in this fashion will color blend to produce a yellow appearance.
- *Tri-color LEDs* are two LEDs in one case, but the two LEDs are connected to separate leads so that the two LEDs can be controlled independently and lit simultaneously. A three-lead arrangement is typical with one common lead (anode or cathode).
- *RGB LEDs* contain red, green and blue emitters, generally using a four-wire connection with one common lead (anode or cathode). These LEDs can have either common positive or common negative leads. Others however, have only two leads (positive and negative) and have a built in tiny electronic control unit.
- *Alphanumeric LED displays* are available in seven-segment and starburst

format. Seven-segment displays handle all numbers and a limited set of letters. Starburst displays can display all letters. Seven-segment LED displays were in widespread use in the 1970s and 1980s, but increasing use of liquid crystal displays, with their lower power consumption and greater display flexibility, has reduced the popularity of numeric and alphanumeric LED displays.

Source: <http://www.juliantrubin.com/encyclopedia/electronics/led.html>