LED (Light Emitting Diode)

An LED is a semiconductor light source that emits light when current flows through it. Unlike traditional bulbs, LEDs don't have filaments—they rely on electroluminescence.

Working Principle:

When a suitable forward voltage is applied, electrons move through the semiconductor material and recombine with electron holes. This process releases energy in the form of photons (light). Polarity matters: the long leg (anode) connects to the positive, and the short leg (cathode) connects to the negative.

Types:

- Standard LED
- Bi-color / Tri-color LED
- RGB LED
- SMD LED
- High-Power LED

Applications:

- Power indicators
- Digital displays
- Decorative lighting
- Remote controls
- Backlighting in devices

Advantages:

- Energy-efficient
- Long lifespan
- No warm-up time
- Safe (low voltage)
- Available in many colors and sizes

Disadvantages:

- Directional light
- Needs current-limiting resistors
- Sensitive to heat and overvoltage