

Driving an LED

Electrical Engineering

Why an LED is a current device, and how to size the resistor that sets it.

An LED is set by its current, so the series resistor is what actually fixes the brightness.

$$R = (V_{\text{supply}} - V_f) / I_f$$

5 V, red V_f 2.0 V

$3.0 \div 0.02$.

150 Ω for 20 mA

3.3 V, blue V_f 3.0 V

Very tight.

15 Ω for 20 mA

Resistor dissipation

$3.0 \text{ V} \times 20 \text{ mA}$.

60 mW

THE COMMON MISTAKE

- ✗ **Parallel LEDs sharing one resistor**
- ✓ **One resistor each, or a current sink**

Forward voltages differ by tens of millivolts between parts, so the lowest one takes most of the current and fails first.

When the supply barely exceeds V_f the resistor controls almost nothing. Use a constant-current driver instead.