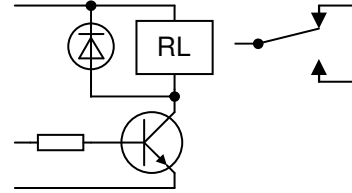
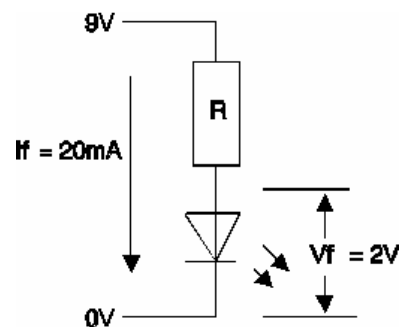


Diodes

Diodes are one-way devices – the current can only flow when the cathode is more negative than the anode. They are used in power supplies and as protection diodes across relays. When a relay switches off the collapsing magnetic field generates a current that wants to go the wrong way through the driving transistor. This current could destroy the transistor so a diode is fitted across the relay to allow this reverse current to flow easily. A protection diode should also be used with a magnetic buzzer as that works as a fast and repeatedly switching electro-magnetic relay.



Light emitting diodes (LEDs) are extremely useful and reliable lights. They are very easy to use and are available in a range of colours and shapes. But in order to use them correctly in a circuit they need a series resistor, to protect them against large currents. Large currents cause them to get hot and 'burn out'.



$$R = (\text{Supply V} - V_f) / I_f$$

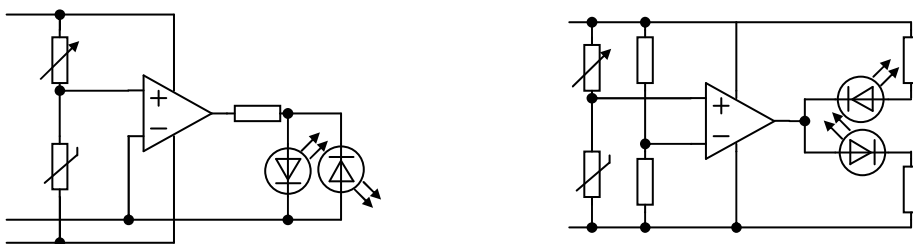
$$R = (9V - 2V) / 20\text{mA}$$

$$R = 7V / 20\text{mA}$$

$$R = 0.35K = 350 \text{ ohms}$$

The value of the resistor used depends on the type of LED used, the current it can safely handle, and the voltage of the power supply. The voltage dropped across the LED is usually around 2 volts and the recommended current is a maximum of 20mA. The value of the resistor is calculated using Ohms Law as shown.

Using a comparator with a dual voltage supply, a bi-colour LED (or two LEDs back to back) can be attached from the output to 0volts. Only one LED will be lit at any particular moment.



With the single power supply version (on the right) the same principle applies except that with a non-perfect OpAmp (such as a 741) there will be a small waste current of about 1mA through the "off" LED. If you are using high efficiency LEDs this small current may be enough to light the LED.

For details of the use of diodes in power supplies, see the power supplies revision pages.