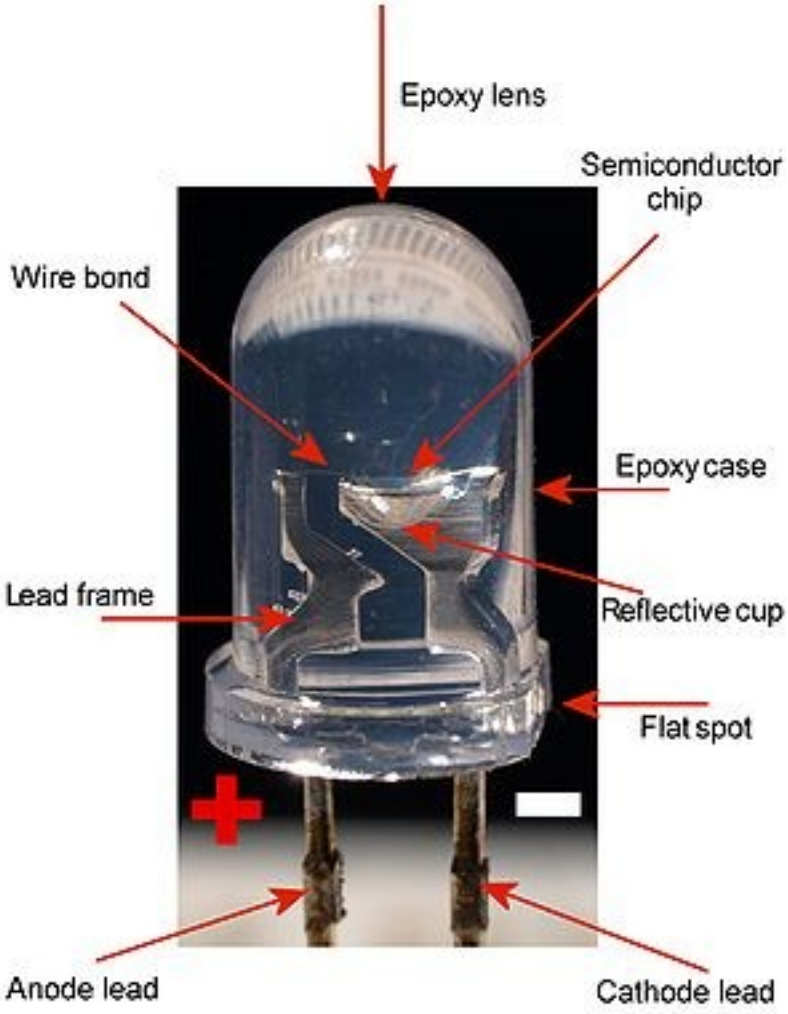
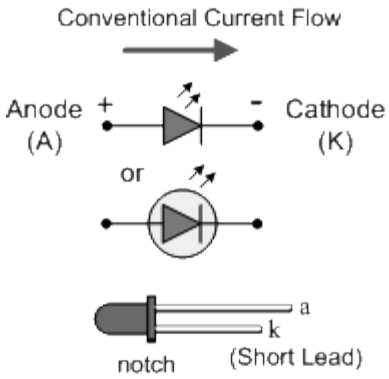
The following is for information purposes only and comes with no warranty.

See http://www.bristolwatch.com/





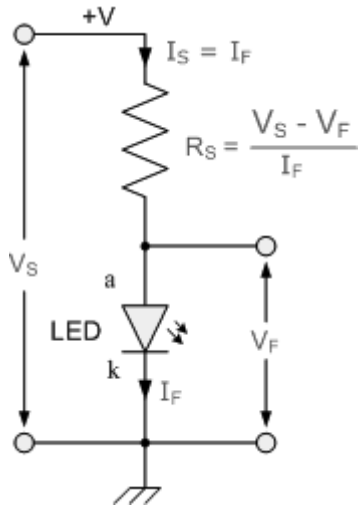
Light Emitting Diodes

Light Emitting Diodes are made from compound type semiconductor materials such as Gallium Arsenide (GaAs), Gallium Phosphide (GaP), Gallium Arsenide Phosphide (GaAsP), Silicon Carbide (SiC) or Gallium Indium Nitride (GaInN). The exact choice of the semiconductor material used will determine the overall wavelength of the photon light emissions and therefore the resulting color of the light emitted, as in the case of the visible light colored LEDs, (RED, AMBER, GREEN etc).

Before a light emitting diode can "emit" any form of light it needs a current to flow through it, as it is a current dependent device. As the LED is to be connected in a forward bias condition across a power supply it should be Current Limited using a series resistor to protect it from excessive current flow. From the table above we can see that each LED has its own forward voltage drop across the PN junction and this parameter which is determined by the semiconductor material used is the forward voltage drop for a given amount of forward conduction current, typically for a forward current of 20mA. In most cases LEDs are operated from a low voltage DC supply, with a series resistor to limit the forward current to a suitable value from say 5mA for a simple LED indicator to 30mA or more where a high brightness light output is needed.

Typical LED Characteristics

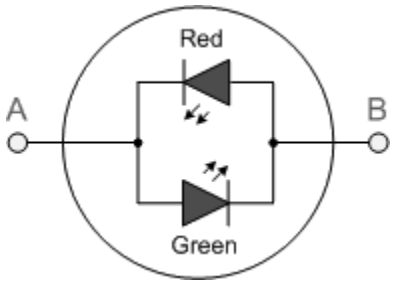
Semiconductor Material	Wavelength	Color	voltage at 20mA
GaAs	850-940nm	Infra-Red	1.2v
GaAsP	630-660nm	Red	1.8v
GaAsP	605-620nm	Amber	2.0v
GaAsP:N	585-595nm	Yellow	2.2v
GaP	550-570nm	Green	3.5v
SiC	430-505nm	Blue	3.6v
GaInN	450nm	White	4.0v



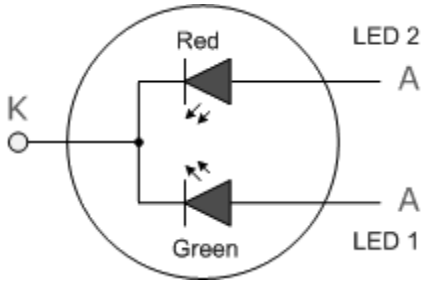
$$R_S = \frac{V_S - V_F}{I_F} = \frac{5v - 2v}{10mA} = \frac{3}{10x10^{-3}} = 300\Omega$$

Multi-LEDs

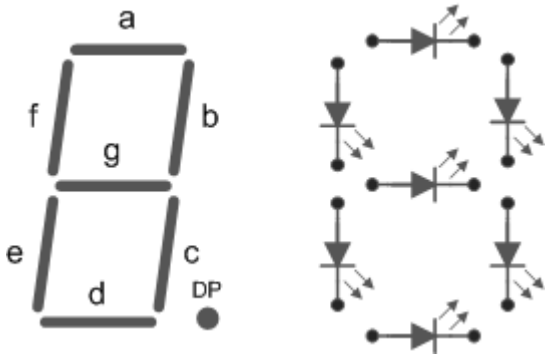
LEDs are available in a wide range of shapes, colors and various sizes with different light output intensities available, with the most common (and cheapest to produce) being the standard 5mm Red LED. LED's are also available in various "packages" arranged to produce both letters and numbers with the most common being that of a "Seven-Segment Display" arrangement.



Connect A to positive and B to negative the green LED will light up.
Connect A to negative and B to positive the red LED will light.



In this case we have three connections with the cathodes (K) connected in common. Either LED or both can be cut on together or alone.



In this case we could have eight LEDs connected with a common cathodes or common anodes arranged to produce a numeric display for a calculator.

Ref. www.electronics-tutorials.ws