

## How to calculate the value of LED resistor?

A typical LED can pass 30 –40 mA current without destroying the device. Normal current that gives sufficient brightness to a standard Red LED is 20 mA. But this may be 40 mA for Blue and White LEDs. A current limiting resistor is necessary to protect LED from excess current that is flowing through it. The value of this series resistor should be carefully selected to prevent damage to LED and also to get sufficient brightness at 20 mA current. The current limiting resistor can be selected using the formula

$$R = V / I$$

Where R is the value of resistor in ohms, V is the supply voltage and I is the allowable current in Amps. For a typical Red LED, the voltage drop is 1.8 volts. So if the supply voltage is 12 V ( $V_s$ ), voltage drop across the LED is 1.8 V ( $V_f$ ) and the allowable current is 20 mA ( $I_f$ ) then the value of the series resistor will be

$$V_s - V_f / I_f = 12 - 1.8 / 20 \text{ mA} = 10.2 / 0.02 \text{ A} = 510 \text{ Ohms.}$$

A suitable available value of resistor is 470 Ohms. But it is advisable to use 1 K resistor to increase the life of the LED even though there will be a slight reduction in the brightness. Since the LED takes 1.8 volts, the output voltage will be 2 volts less than the value of Zener. So if the circuit requires 12 volts, it is necessary to increase the value of Zener to 15 volts. Table given below is a ready reckoner for selecting limiting resistor for various versions of LEDs at different voltages.