Electronics Tutorial about Resistors

Resistors Tutorial and Summary

The job of a **Resistor** is to limit the current flowing through an electrical circuit.

Resistance is measured in **Ohm's** and is given the symbol Ω

Carbon, Film and Wirewound are all types of resistors.

Resistor colour codes are used to identify the resistance and tolerance rating of small resistors.

The BS1852 Standard uses letters and is used to identify large size resistors.

Tolerance is the percentage measure of the accuracy of a resistor from its preferred value with the E6 (20%), E12 (10%), E24 (5%) and E96 (1%) series of tolerance values available.

Series Resistor Tutorial

Resistors that are daisy chained together in a single line are said to be connected in **SERIES**.

Series connected resistors have a common **Current** flowing through them.

- $I_{total} = I1 = I2 = I3$ .... etc

The total circuit resistance of series resistors is equal to:

- $R_{total} = R_1 + R_2 + R_3 + ... R_n$ etc.

Total circuit voltage is equal to the sum of all the individual voltage drops.

- $V_{total} = V1 + V2 + V3$ .... etc

The total resistance of a series connected circuit will always be greater than the highest value resistor.

Parallel Resistor Tutorial

Resistors that have both of their respective terminals connected to each terminal of another resistor or resistors are said to be connected in **PARALLEL**.

Parallel resistors have a common **Voltage** across them.

- $V_S = V1 = V2 = V3$ .... etc

Total resistance of a parallel circuit is equal to:

- $$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots\ldots + \frac{1}{R_n} \text{ etc}$$

Total circuit current flow is equal to the sum of all the individual branch currents added together.

- $I_{total} = I1 + I2 + I3 \ldots$. etc

The total resistance of a parallel circuit will always be less than the value of the smallest resistor.

Resistor Power Rating

The larger the power rating, the greater the physical size of the resistor.

All resistors have a maximum power rating and if exceeded will result in the resistor overheating and becoming damaged.

Standard resistor power rating sizes are 1/8 W, 1/4 W, 1/2 W, 1 W, and 2 W.

Low ohmic value power resistors are generally used for current sensing or power supply applications.

The power rating of resistors can be calculated using the formula:

- $$\text{Power (P)} = V \times I = I^2R = \frac{V^2}{R}$$

In AC Circuits the voltage and current flowing in a pure resistor are always "*in-phase*" producing 0^o phase shift..

When used in AC Circuits the AC impedance of a resistor is equal to its DC Resistance.

The AC circuit impedance for resistors is given the symbol Z.