Electric Circuits

Ohms Law

The amount of electric current through a metal conductor, at a constant temperature, in a circuit is proportional to the voltage across the conductor and can be described by:

$$I = V/R$$

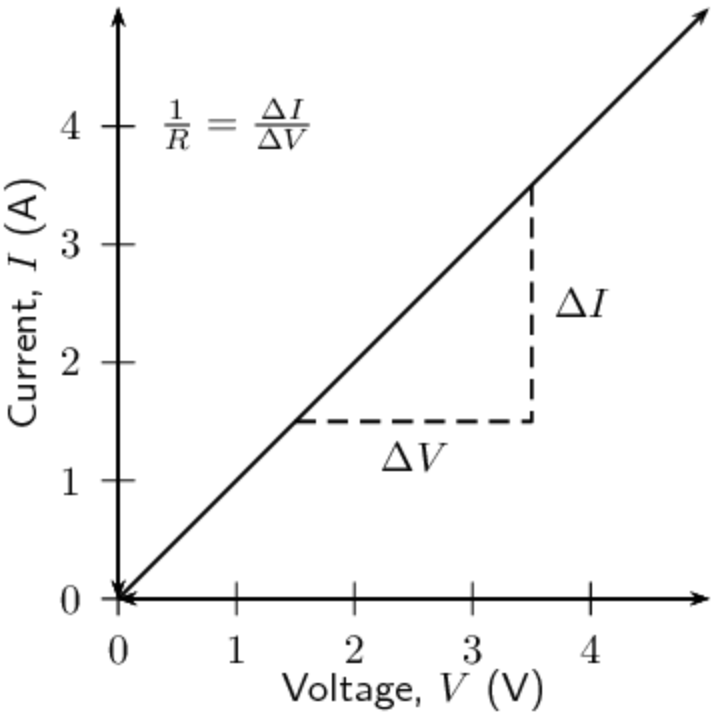
where:

- I = current through the conductor
- V = voltage across the conductor
- R = resistance of the conductor.

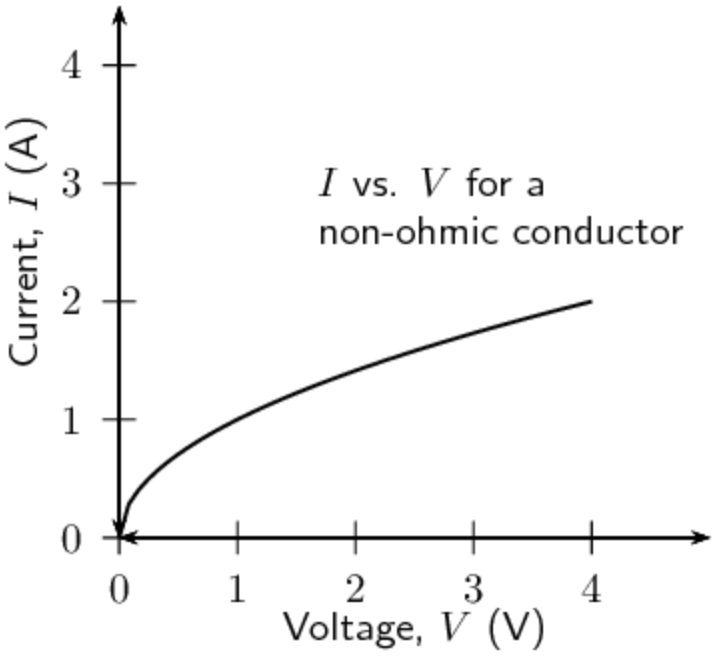
> The resistance of the conductor is constant, independent of the voltage applied across it or current passed through it.

Ohmic vs non-ohmic conductors

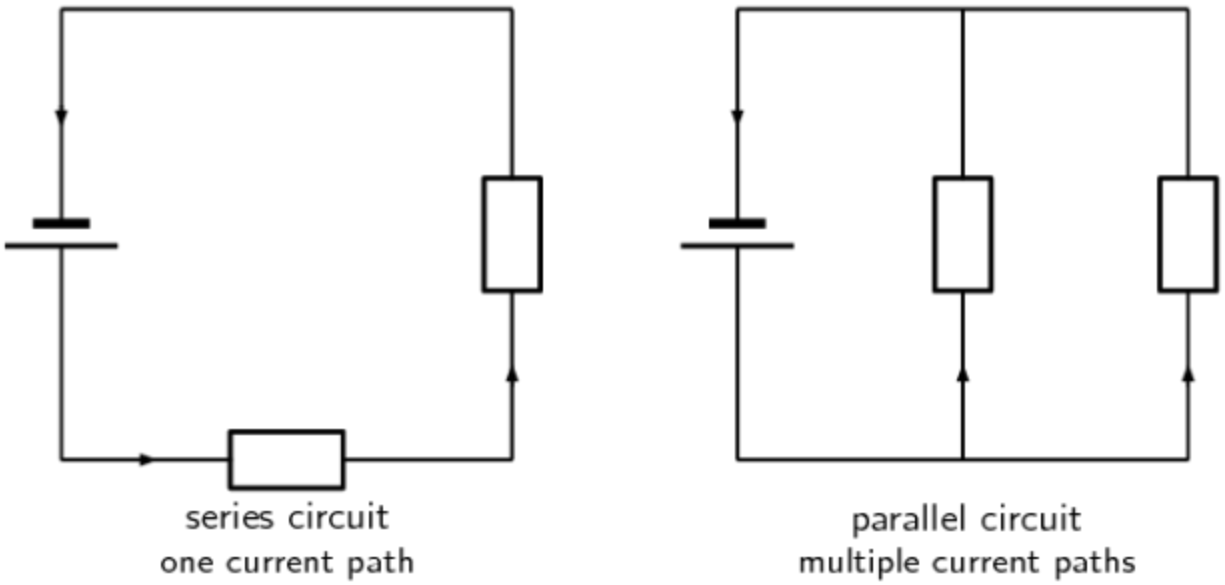
- Ohmic conductors obey ohms law: the graph of voltage against current is linear



- Non-Ohmic conductors do not obey ohms law therefore the graph of voltage against resistance is non-linear
- Mainly changes due to temperature changes



Resistors in series and in parrallel



Series circuit

$$R\,s\ = R\,1\ + R\,2\ + R\,3\ + \ldots + R\,n$$

$$I\ \ = I\,1\ = I\,2\ = I\,3$$

$$V\ total\ = V\ 1\ + V\ 2\ + V\ 3$$

Parrallel circuits

$$1/R\,p\ = 1/R\,1\ + 1/R\,2\ + 1/R\,3\ + \ldots + 1/R\,n$$

$$I\ total\ = I\ 1\ + I\ 2\ + I\ 3$$

$$V = V\ 1\ = V\ 2\ = V\ 3$$

Power and energy

Electrical Power

Electrical power is the rate at which electrical energy is converted in an electric circuit. Described by:

$$P = I * V$$

Where:

- P = Power in watts (W)
- I = Current in Ampres (A)
- V = Voltage in volts (V)

Electrical Power

Electrical energy is simply power times time described by:

$$E = P * t$$

Where:

- E = Energy in joules (J)
- P = Power in watts (W)
- t = Time in seconds (s)

Physical Quantities	Unit name	Unit symbol
Current (I)	Amperes	A

Physical Quantities	Unit name	Unit symbol
Electrical energy (E)	Joules	J
Power (P)	Watts	W
Resistance (R)	Ohms	Ω
Voltage (V)	Volts	V