

Ohm's law | Resistance, Ohmic Devices, and Non-Ohmic Devices

Ohm's law states that the [electric current](#) flowing through a conductor is directly proportional to the potential difference across its ends provided the physical state such as temperature etc of the conductor remains constant.

Ohm's Law Formula



Edu input

$I \propto V$
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$$V = IR$$

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Where $1/R$ is the constant of proportionality. "R" is called the Resistance of the conductor.

What is Resistance?

"The opposition offered by the atoms of the conductor to the flow of electric current is called Resistance."

What is the Unit of Resistance?

The SI unit of resistance is “Ohm”

Symbol:

It is denoted by the symbol “ Ω ”

Definition of Ohm:

The resistance of the conductor is said to be 1 ohm if a potential difference of 1 volt produces a current, of 1 ampere in it.

Mathematically,

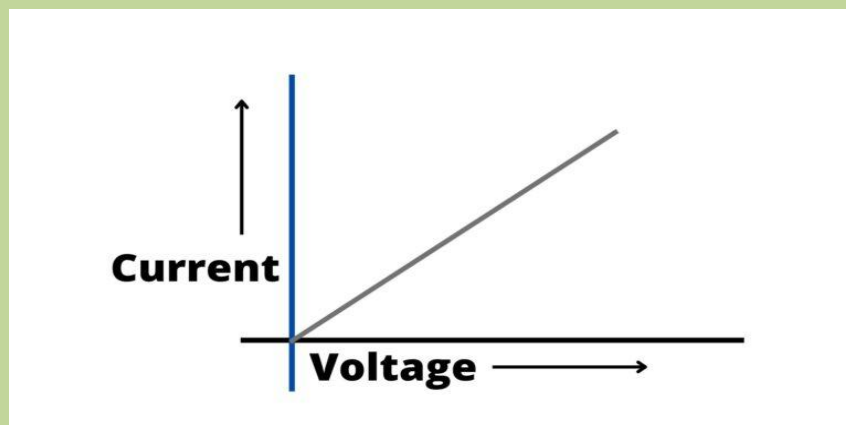
$$1\text{ohm}=1\text{volt}/1\text{ampere}$$

The resistance of the conductor depends on the nature, dimensions, and physical state (like temperature) of the conductor

What are Ohmic devices?

“The devices for which Ohm’s law holds good and the graph between V and I is a straight line are called Ohmic devices.”

The graph between V and I is a straight line for ohmic devices.



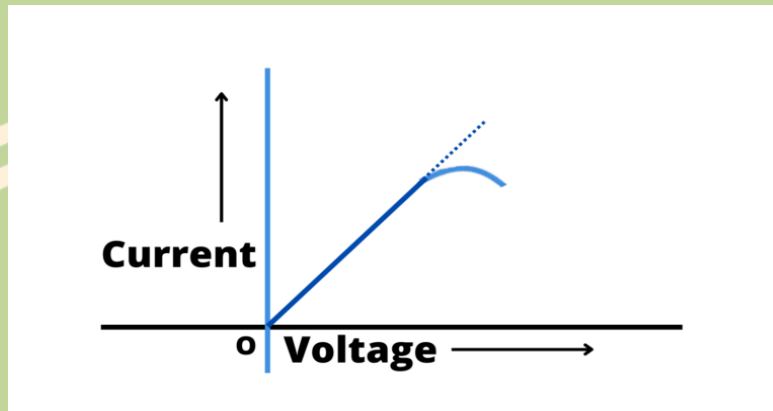
What are Non-Ohmic devices?

“The devices which do not obey Ohm’s law are called Non-Ohmic devices. The graph between V and I is not a straight line”

Examples:

- The filament of a bulb
- Semi-conductor diode

Why Filament lamp is Non-Ohmic?



Apply a certain potential difference ‘ V ’ across the terminals of a filament lamp and measure the resulting current I passing through it and plot a graph for different values of V and I .

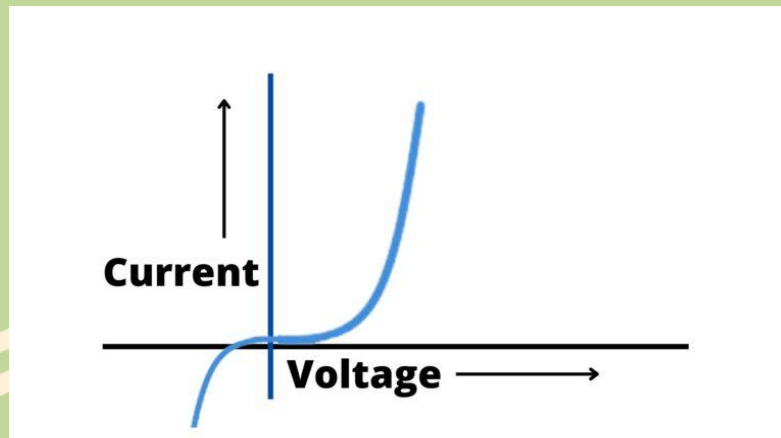
The graph will not be a straight line due to the reason that the resistance of filament increases with the increase in temperature.

So, with the increase in resistance of the filament, Ohm’s law does not hold good.

A Semiconductor Diode is a Non-Ohmic device why?

Another Example of a non-ohmic device is a semi-conductor diode.

The current-voltage graph of such a diode is not a straight line. So semiconductor diode is a non-ohmic device.



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