CIRCUIT FUNDAMENTALS

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- Zero reference level
- Chassis ground
- Ohm's law
- Formula variations of Ohm's law
- Graphical representation of Ohm's law
- Linear resistor
- Non-linear resistor.

Zero Reference Level

- The Zero reference level or the common point is considered to be of zero potential.
- All other circuit voltages weather positive or negative , are measured with respect to this Common or ZRL.
- To avoid errors in measurements of various voltages in electronics circuit it is necessary to select some common point at zero potential.
- Any point, not necessarily at zero volts.

Chassis Ground

- Chassis is a conducting metal sheet.
- A chassis ground is a ground-collection point that connects to the metal enclosure of an electrical device.
- All circuit voltages are measured with respect to chassis ground which is supposed to be at zero potential.
- A chassis ground may be used for shielding and grounding to prevent electrical shock.
- Any malfunctions to the equipment that short into the chassis will cause a current to flow through the chassis to ground instead of a person who contacts it.

Ohm's law

- At constant temperature, potential difference across an element is directly proportional to the current flowing across the element.
- $V \alpha I$
- $V = IR$
- R= constant of proportionality and is called resistance of the conductor.
- Ohm's law is applied only when physical conditions (temperature, dimensional of the material are constant.
- Ohm's law is only applicable to conductors (not to the insulators and semiconductors).

Formula variations of Ohm's law

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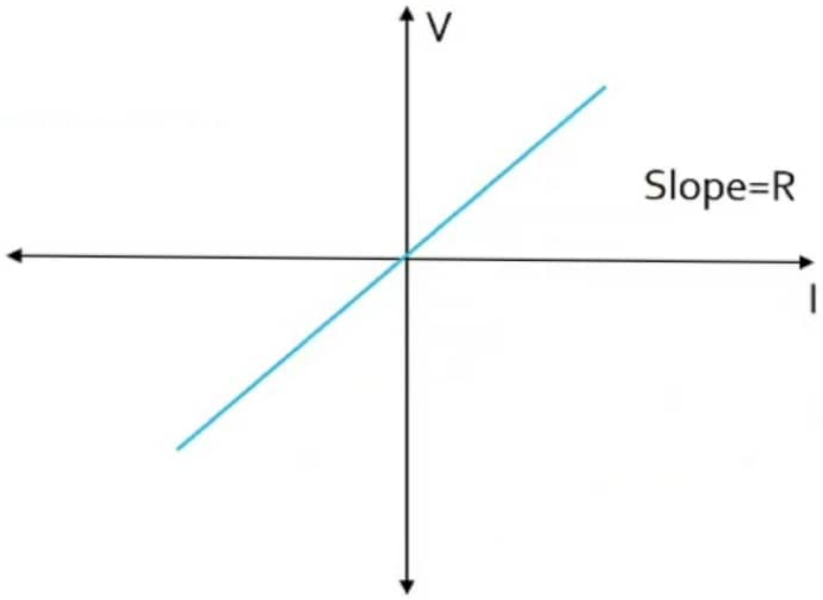
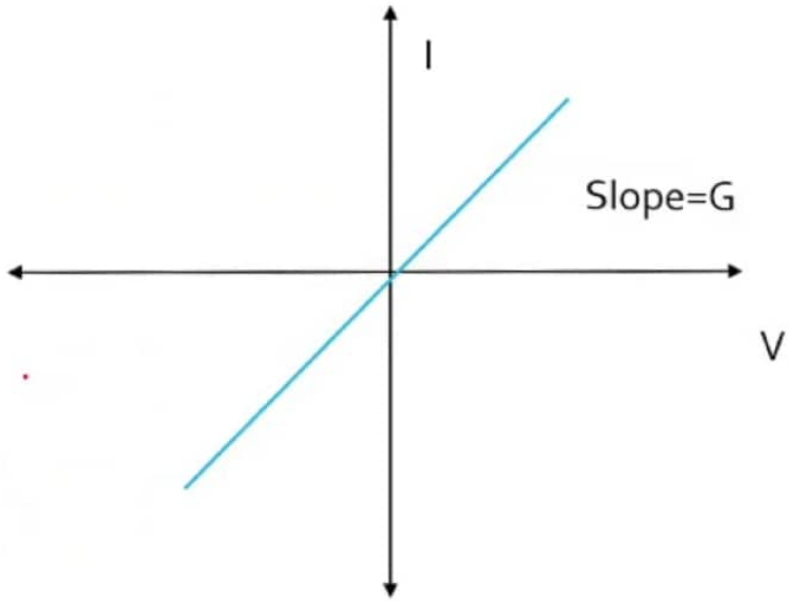
- I=V/R -for finding current
- R= V/I - for finding resistance
- V=IR - for finding voltage
- In field theory, Ohm's law states that at constant temperature, current density is directly proportional to electric field intensity.
- $J \alpha E$
- $J=\sigma E$

Graphical representation of Ohm's law

- Graph between applied potential difference (V) and current (I) flowing through the conductor will be a straight line passing through origin.



VI Characteristics



IV Characteristics

Graphical representation of Ohm's law

- Both the IV and VI graph shows the relation between potential V, and current I.

VI Characteristics:

- In VI graph, we take potential at y-axis and current at x-axis.
- The slope of VI graph give us the resistance.

IV Characteristics:

- In IV graph, Current is at y-axis and potential is at x-axis.
- The reciprocal of the slope of IV graph shows the resistance.

Use of Power and energy formula

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Power

- $P=VI$
- $P=I^2 R$
- $P=V^2/R$

Energy

- $E=W=P\times t$
- $E=VIt$
- $E =V^2t/R$
- $E=I^2Rt$

Linear and Non-linear resistor

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Linear resistor:

- A linear resistor is one whose value remains constant i.e. It does not depend on applied voltage.
- Its resistance doesn't vary with the flow of current through it.
- The current through it, will always be proportional to the voltage applied across it. It obeys Ohm's law.
- It has linear VI characteristics (straight line) .

Non-linear resistor

- Non-linear resistors are the resistors whose voltage and current characteristics vary non-linearly.
- The voltage and current values depend upon other factors like temperature and light, but they may not be linear.
- It does not obey Ohm's law.
- It has non-linear VI characteristics.