Outline

- Circuit theory is foundational course
- Electric circuit elements
- Voltage and current sources
- Ohm's law

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Foundational course

The electric circuit theory course is the most important course for an electrical and related engineering student

Communication

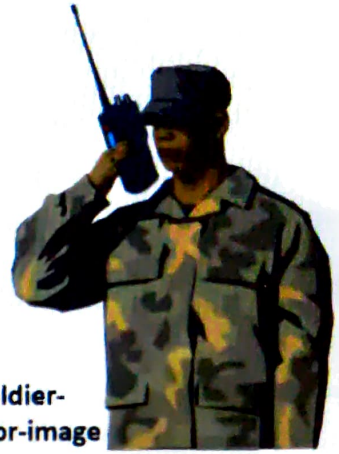
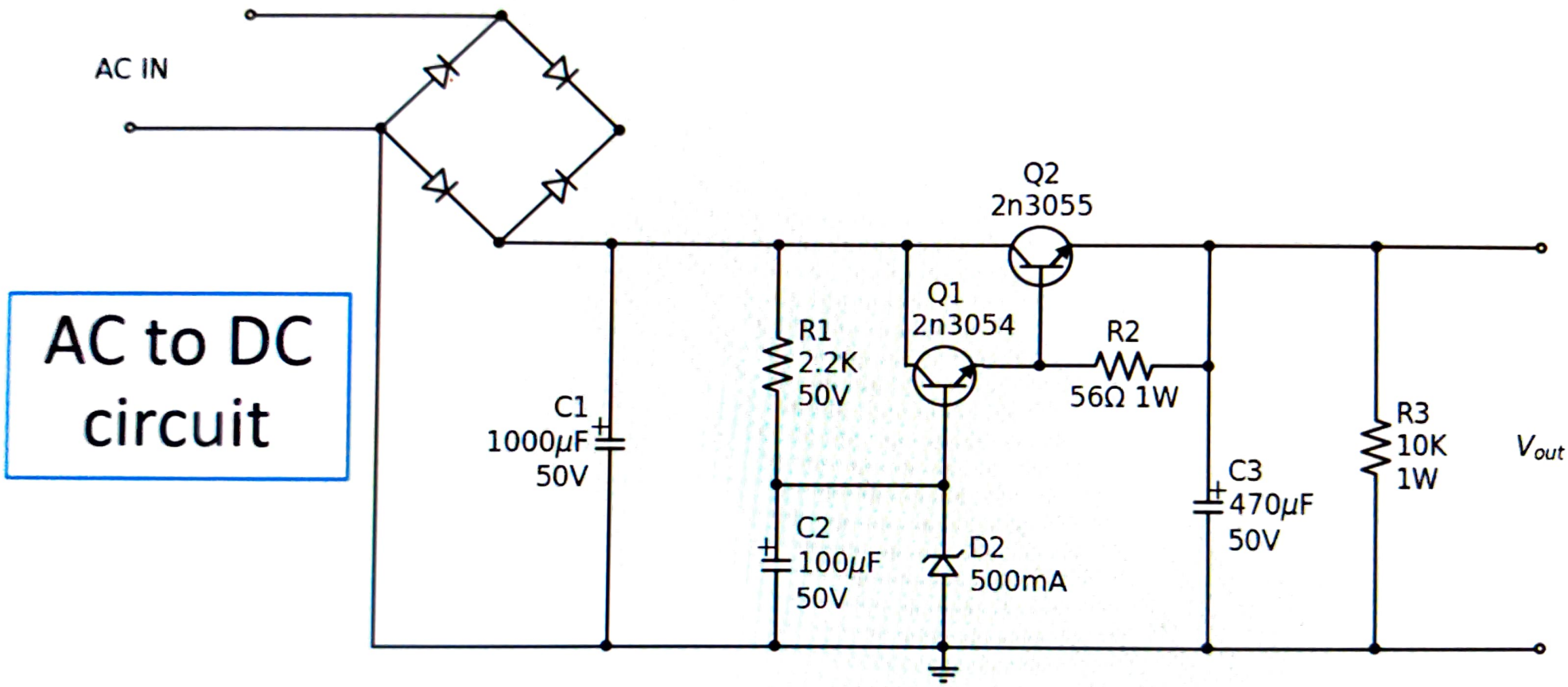


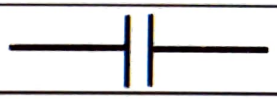
Photo: https://freesvg.org/soldier-with-walkie-talkie-radio-vector-image

Complex electric circuit: DC Power Supply



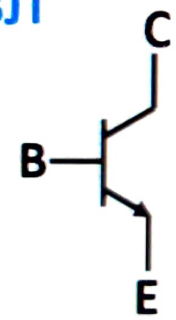
Electric circuit elements

Passive elements

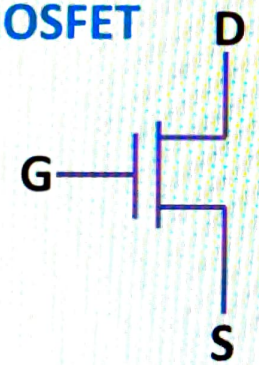
Element	Notation	Circuit symbol
Resistor	R	
Inductor	L	
Capacitor	C	

Active elements

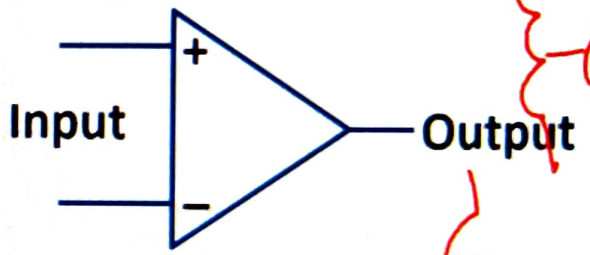
BJT



MOSFET



OpAmp



Electric circuit elements

Passive elements Either dissipate power or store energy

- Resistor
  - Two terminal passive component that opposes the flow of electrons
  - Dissipates energy in the form of heat
- Inductor (coil, choke, reactor)
  - Stores energy in the magnetic field when current flows through it
- Capacitor
  - Device that stores energy in the electric field

Active elements Amplifies power

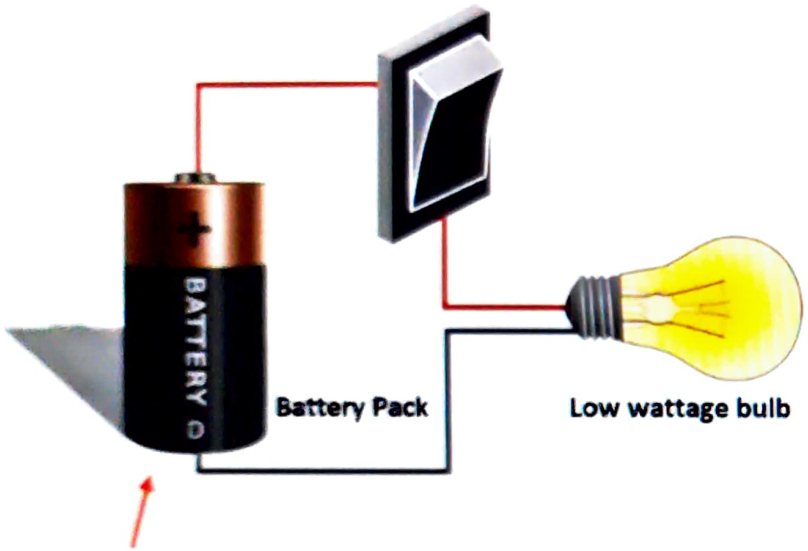
- BJT, MOSFET, OpAmp amplify power

Voltage and current sources

- **Independent sources**
  - Whose magnitude doesn't depend on any other quantity in the circuit
  - Provide constant magnitude of voltage or current
  - Examples
    - ***Independent voltage source:*** Generator, Battery etc.
    - ***Independent current source:*** Common base, Common gate transistor circuits
- **Dependent sources**
  - Whose magnitude depend on any other quantity in the circuit
    - Dependent voltage source
    - Dependent current source
- **Ideal sources**
  - Which will provide constant terminal voltage or current irrespective of load
- **Practical sources**
  - Has source resistance drop, whose terminal voltage or current decreases with load

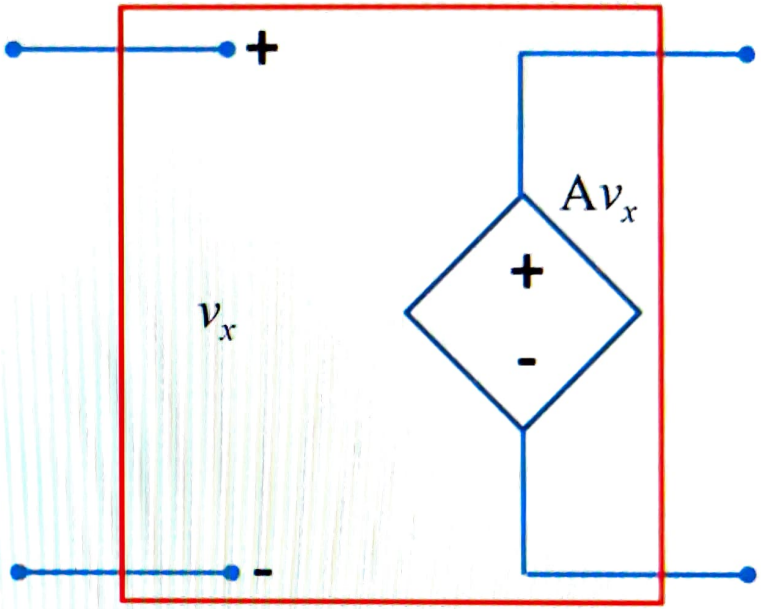
Examples of **Independent** and **Dependent** voltage sources

Battery bulb circuit



Independent voltage source

Transistor equivalent circuit model



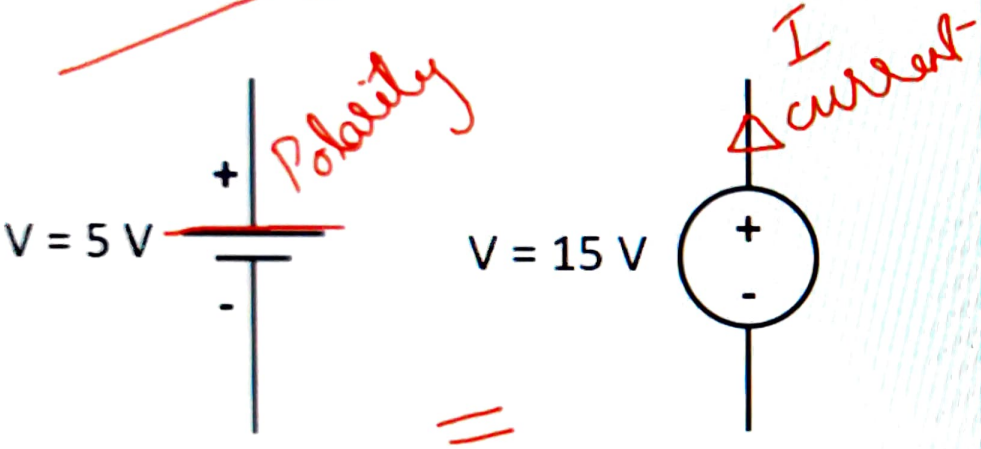
Magnitude of the voltage is dependent on the open circuit voltage source

Photos: https://freesvg.org

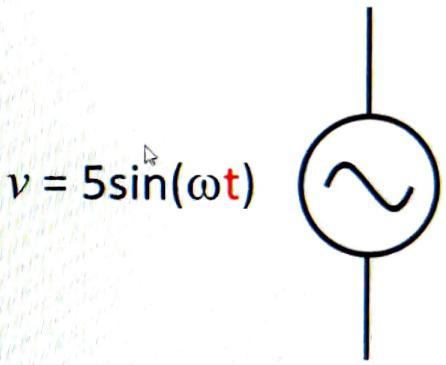
Circuit symbols

Independent **voltage** source

DC voltage source

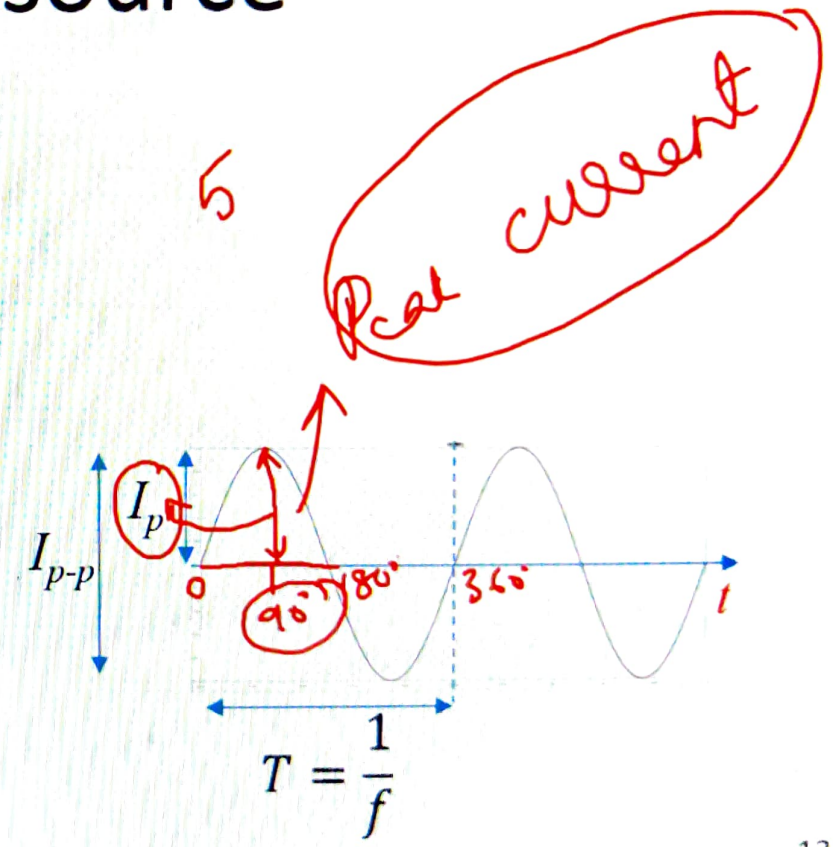


AC voltage source



Circuit symbols

Independent **current** source

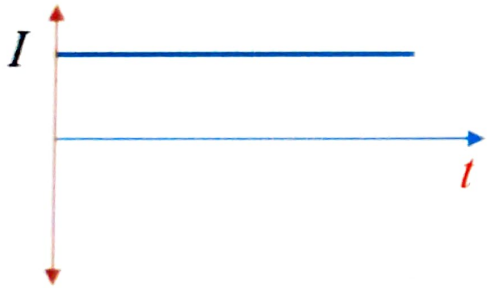


Circuit symbols

Independent **current** source

DC current source

$I = 5$ A



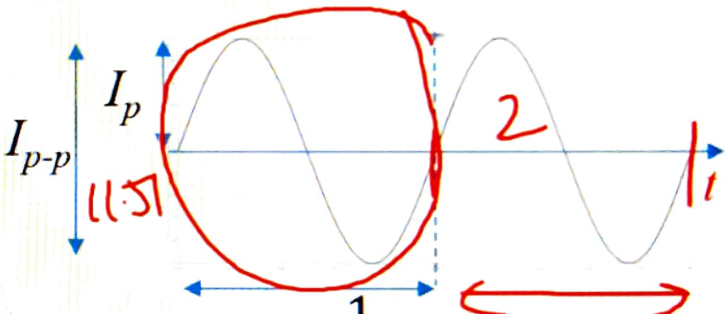
AC current source

where $\omega = 2\pi f$

Example:

$i = 5\sin(2\pi 50t)$

$i = 5\sin(\omega t)$



$$T = \frac{1}{f}$$