

Outline

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

electronics
electrical
Instew
cans

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Raise hand



Turn on captions



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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>

Transferring energy from one location to another



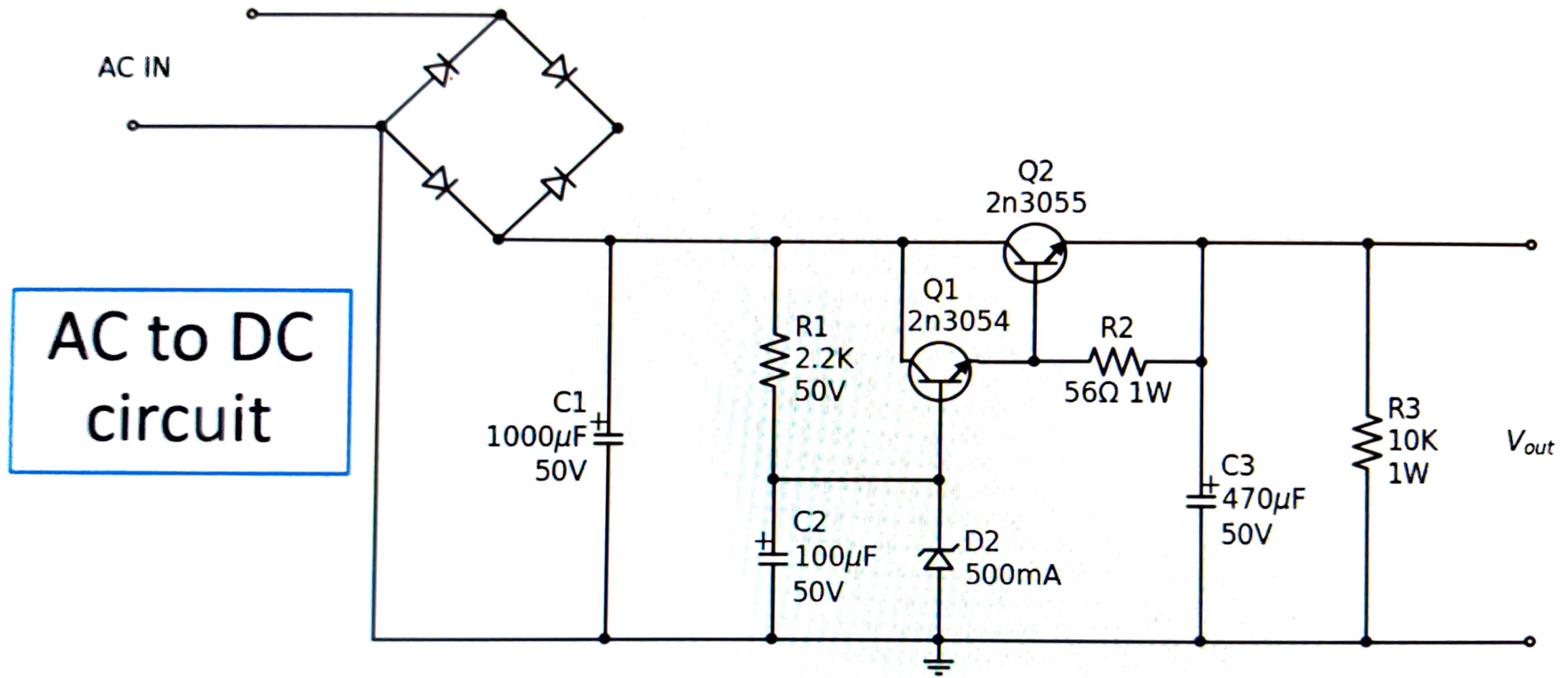
Photo: <https://electricalacademia.com/electric-power/electric-power-transmission-distribution-system/>

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Complex electric circuit: DC Power Supply





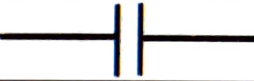
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Electric circuit elements

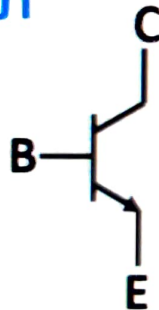
Passive elements

Element	Notation	Circuit symbol
Resistor	R	
Inductor	L	
Capacitor	C	



Active elements

BJT

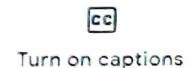
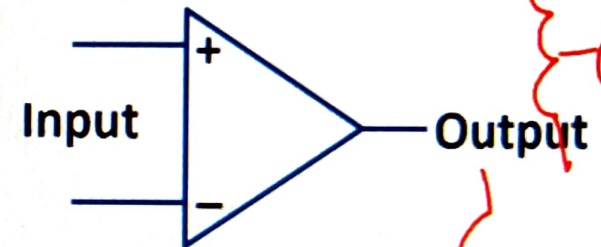


MOSFET



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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



electrical
Heat

Pain



Spark

electrical connections



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

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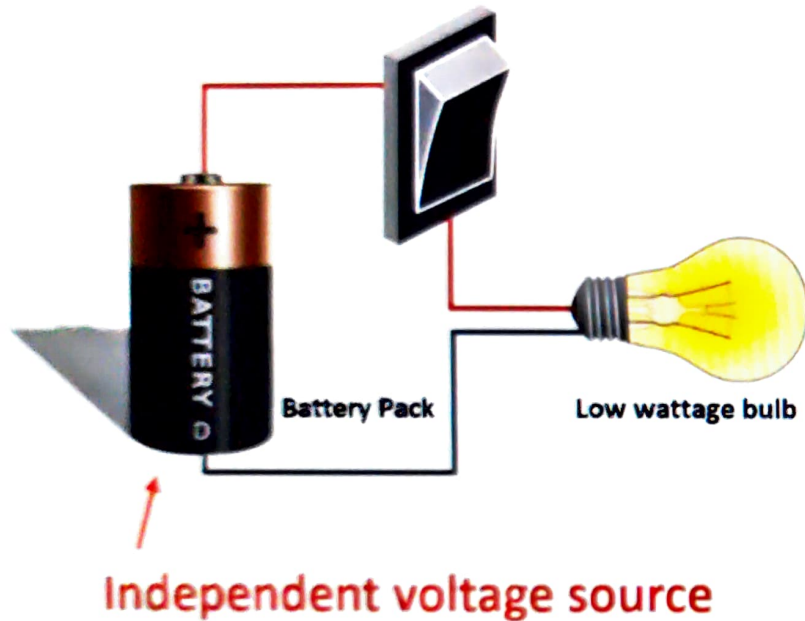
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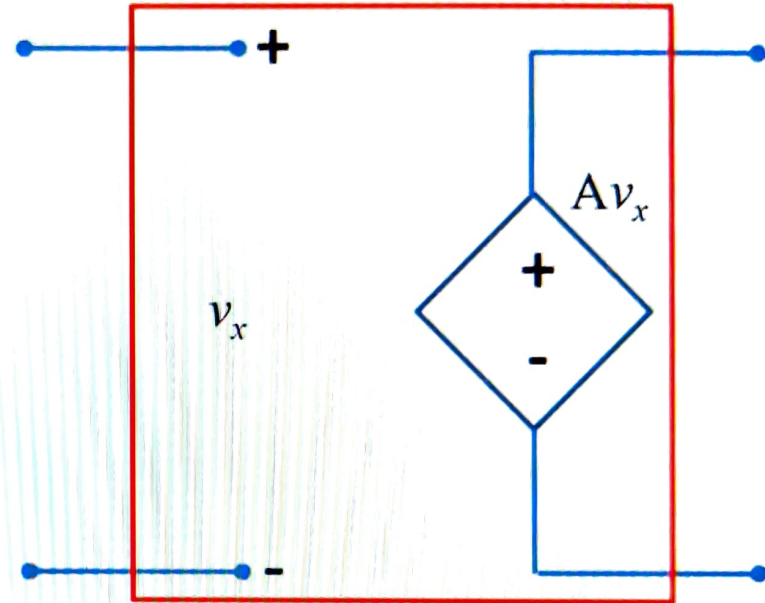
Examples of **Independent** and **Dependent** voltage sources

Battery bulb circuit



Photos: <https://freesvg.org>

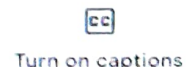
Transistor equivalent circuit model



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

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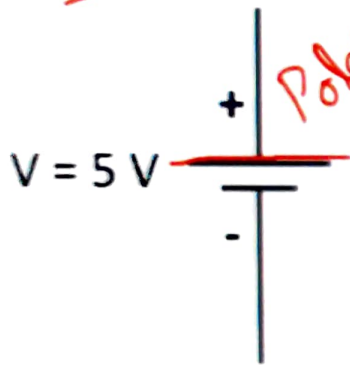


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Circuit symbols

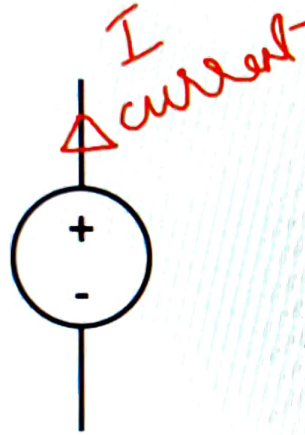
Independent **voltage** source

DC voltage source



$V = 15\text{ V}$

$=$



AC voltage source

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



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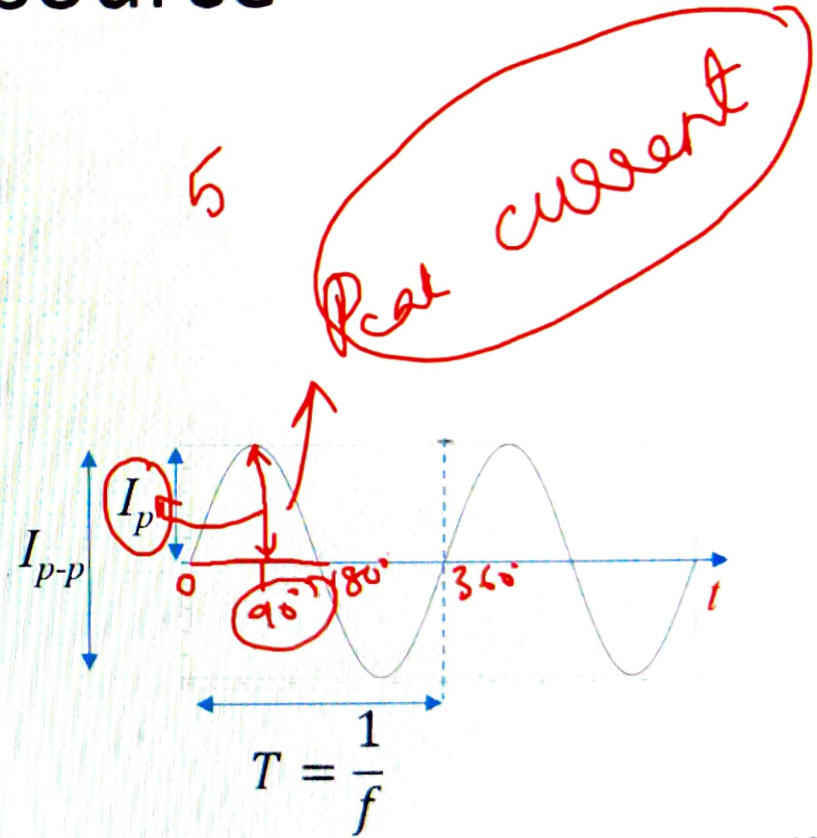
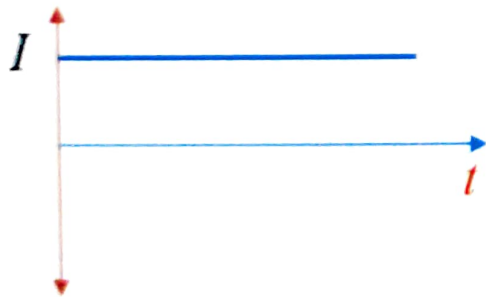
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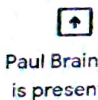
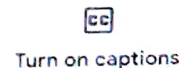
Circuit symbols

Independent **current** source



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Circuit symbols

Independent **current** source

DC current source

$$I = 5 \text{ A}$$



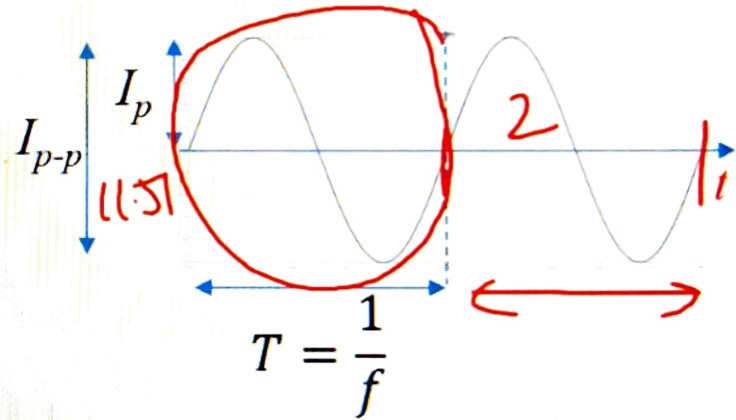
AC current source

where $\omega = 2\pi f$

Example:

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

$\frac{1}{8 \times 10^{-6}} = 0.02$
 $H3$



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