

# Foundations of Electrical and Computer Engineering

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## Analog Circuit Fundamentals

1. Current  $\equiv$  the flow of charge around a closed path in a circuit.  
Symbol  $\equiv i(t)$  or  $i$   
Unit  $\equiv$  Amperes, Amps or (A)  
Current is a vector of Amperes and direction. It may be defined at any one point along a circuit with either positive or negative values. A negative value current is equivalent to a positive value but opposite direction current.
2. Voltage  $\equiv$  the measure of potential difference between two points in a circuit.  
Symbol  $\equiv v(t)$  or  $v$   
Unit  $\equiv$  Volts or (V)  
Voltage is a vector of voltage and polarity. The point with positive polarity is the point where the potential difference is greatest. Voltage may also be either positive or negative, and a negative voltage is equivalent to a positive voltage with reversed polarity.
3. Power  $\equiv$  a measure of useful output of a circuit.  
Symbol  $\equiv p(t)$  or  $p$   
Unit  $\equiv$  Watts or (W)  
Relationship  $\equiv p(t) = v(t) * i(t)$  or  $p = vi$   
Conservation of Power  $\equiv$  in a valid circuit, the total power supplied is equivalent to the total power absorbed. Power can be absorbed or supplied by a given element. Circuit validity, as used in the of Conservation of Power is true as a consequence of the law. That is to say, a circuit that does not satisfy the Conservation of Power is not a valid circuit.

To determine if an element absorbs or supplies power:

1. Take measurements of current and voltage before and after the element, in terms of positive values.

2. If current flows into the positive side  $\rightarrow$  the element absorbs power.  
If current flows into the negative side  $\rightarrow$  the element supplies power.