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Help

The R-value of insulation put in the walls and ceiling of a house is usually given in units per square area, e.g., $\text{m}^2 \cdot ^\circ\text{C}/\text{W}$. The amount of heat flow across a wall is:

$$\text{Flow} = \text{Area} * (T1 - T2) / \text{R-value}$$

Another important parameter occurring when current flows through a resistor is **power**. The power (P in watts) dissipated in a resistor can be calculated from voltage (V in volts), current (I in amps), and resistance (R in ohms). Interestingly, although voltage has a polarity (+ and -) and current has a direction, power has neither a polarity nor a direction.

$$P = V * I \quad \text{Power} = \text{Voltage} * \text{Current}$$

$$P = V^2 / R \quad \text{Power} = \text{Voltage}^2 / \text{Resistance}$$

$$P = I^2 * R \quad \text{Power} = \text{Current}^2 * \text{Resistance}$$

CHECKPOINT 3.6

There is 1 V across a resistor, and 5 mA is flowing. How much power is being dissipated?

Hide Answer

Power is $V * I = 1\text{V} * 0.005\text{A} = 5 \text{ mW}$.

CHECKPOINT 3.7

There is 2 V across a 100Ω resistor. How much power is being dissipated?

Hide Answer

Power is $V^2 / R = 2\text{V} * 2\text{V} / 100\Omega = 40 \text{ mW}$.

The **energy** (E in joules) stored in a battery can be calculated from voltage (V in volts), current (I in amps), and time (t in seconds). In a manner similar to power, energy has neither a polarity nor a direction.

$$E = V * I * t \quad \text{Energy} = \text{Voltage} * \text{Current} * \text{time}$$

$$1 \text{ of } 2 \quad E = P * t \quad \text{Energy} = \text{Power} * \text{time}$$



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