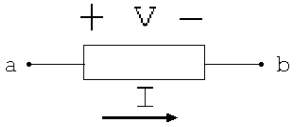
Lecture 21, February 23, 2022

- Average absorbed power
  - If v and i are time-varying, then the instantaneous power is

$$p(t) = v(t)i(t)$$



  - For periodic signals with period **T**, the *average absorbed power* is

$$P = \frac{1}{T}\int_T p(t)dt = \frac{1}{T}\int_T v(t)i(t)dt$$

  - For cosinusoidals $v(t) = Re\{Ve^{j\omega t}\}$ and $i(t) = Re\{Ie^{j\omega t}\}$

$$P = \frac{1}{2}Re\{VI^*\} = \frac{1}{2}Re\{V^*I\}$$

  - Resistor

$$P = \frac{1}{2}Re\{VI^*\} = \frac{1}{2}Re\left\{V\left(\frac{V}{R}\right)^*\right\} = \frac{|V|^2}{2R} = \frac{R|I|^2}{2}$$

    Important: take the magnitude before squaring, and remember dividing by 2.

  - Inductor

$$P = \frac{1}{2}Re\{VI^*\} = \frac{1}{2}Re\left\{(j\omega LI)I^*\right\} = 0 \text{ W}$$

  - Capacitor

$$P = \frac{1}{2}Re\{VI^*\} = \frac{1}{2}Re\left\{\left(\frac{I}{j\omega C}\right)I^*\right\} = 0 \text{ W}$$