Georgia Institute of Technology

Linear Circuits

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An introduction to linear electric circuit elements and a study of circuits containing such devices.

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Power Factor and Power Triangles Part 1

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Gain an understanding of the way that sinusoidal power is analyzed.

Previous Lesson

- Calculated RMS values
- Sinusoid and triangular function examples

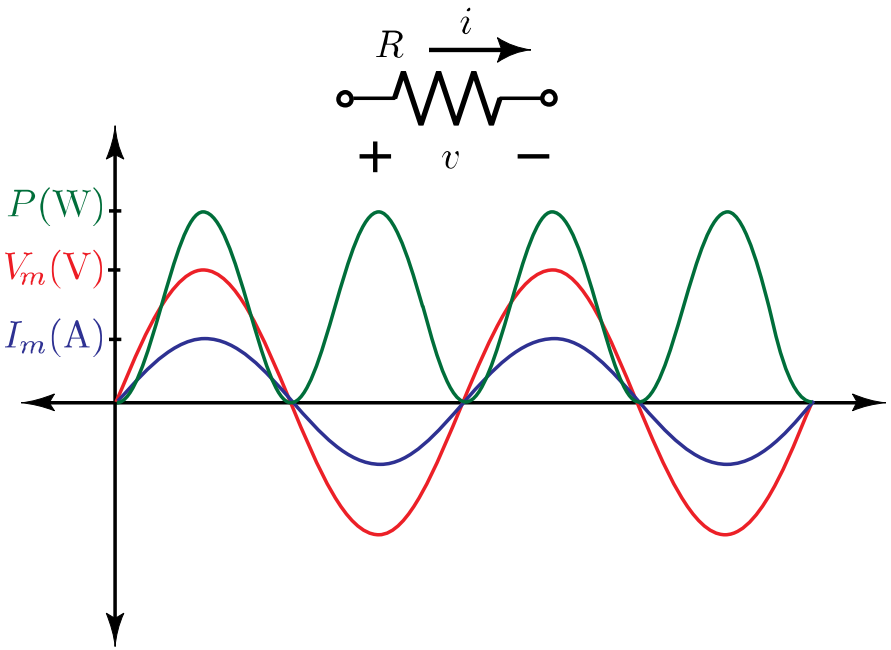
Module 5: Power

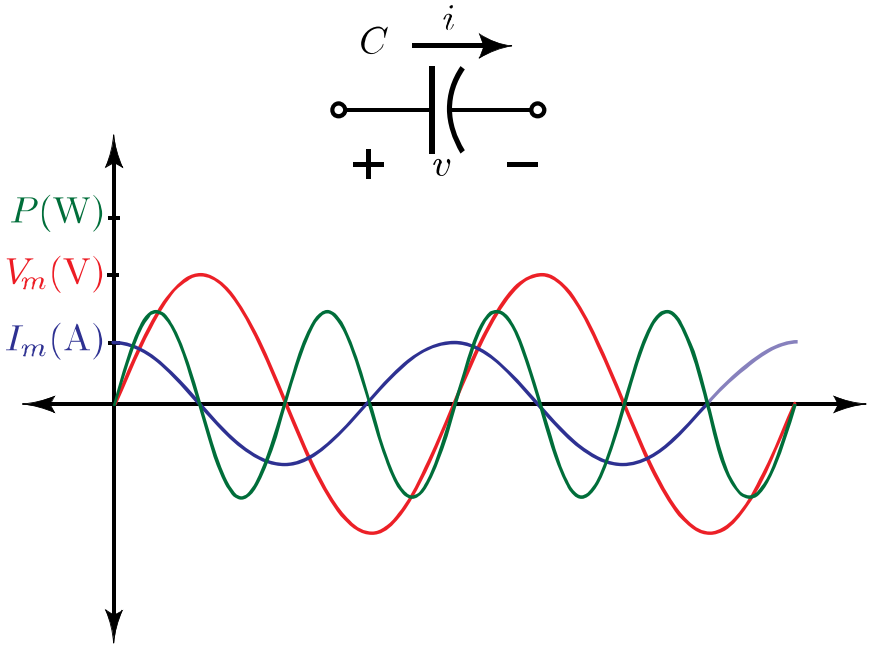
- Root-Mean Square
- Power Factor and Power Triangles
- Maximum Power Transfer
- Transformers

Lesson Objectives

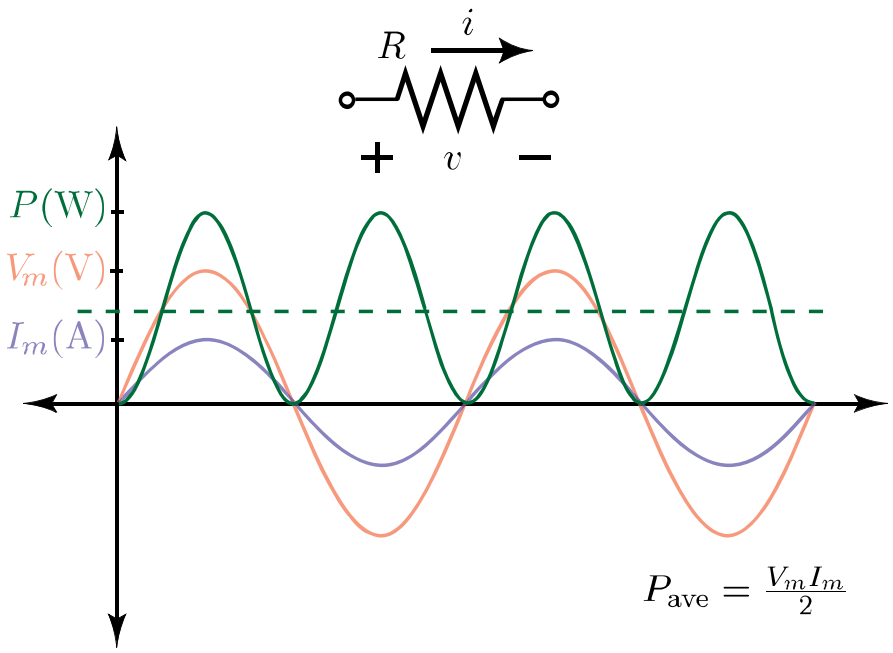
- Identify average power in resistive and reactive devices
- Calculate complex power

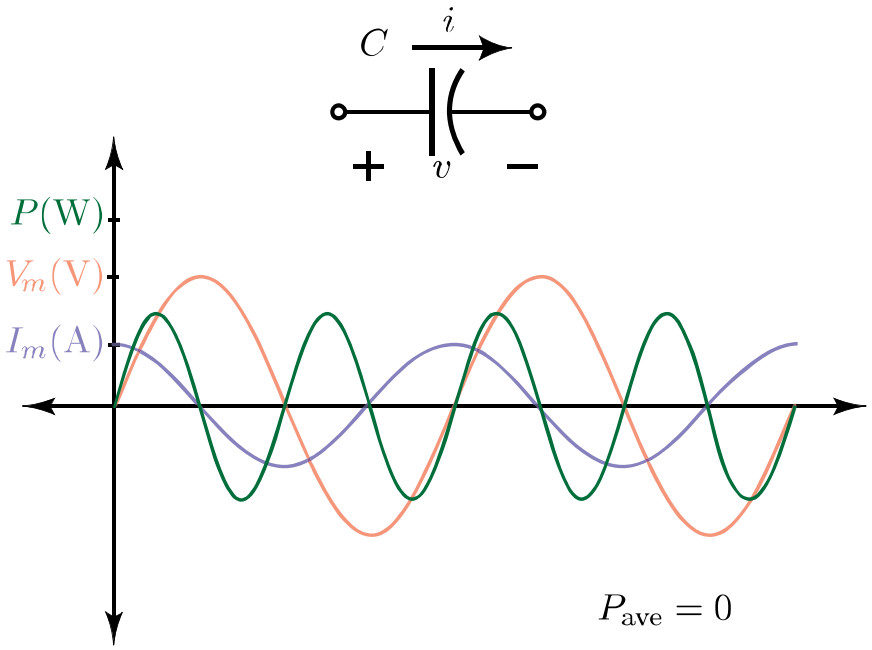
Instantaneous Power





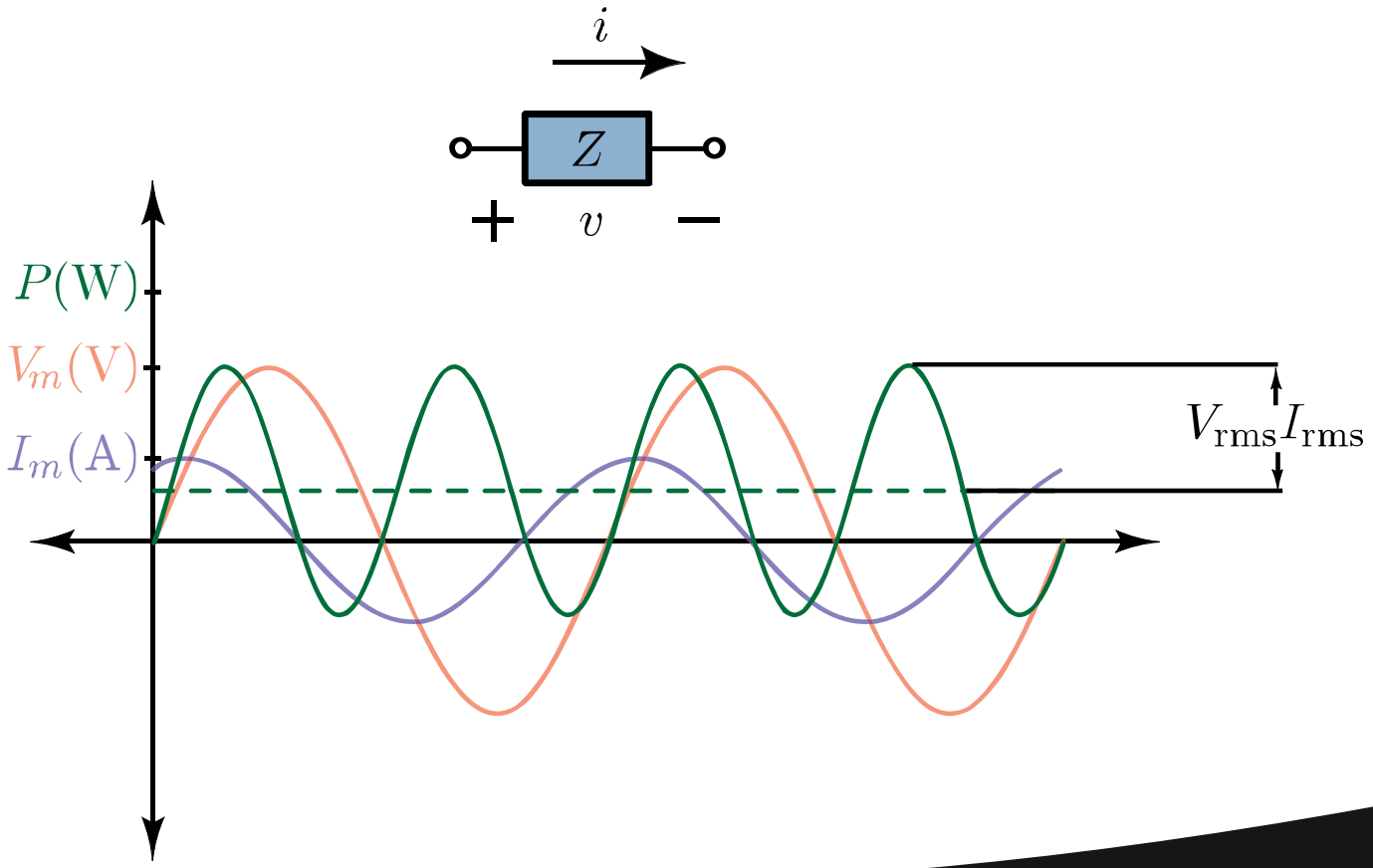
Average Power





$$P_{\text{ave}} = \frac{V_m I_m}{2} = V_{\text{rms}} I_{\text{rms}}$$

Average Power



Complex Power

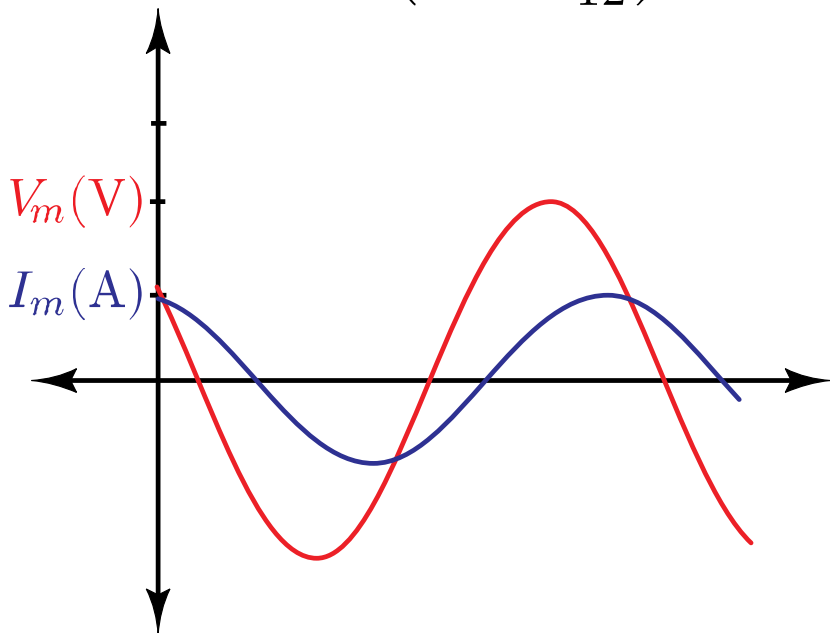
$$v = 5\cos\left(\omega t + \tfrac{\pi}{3}\right)$$

$$i = 2.5\cos\left(\omega t + \tfrac{\pi}{12}\right)$$

$$\boxed{S = \tfrac{1}{2}\mathbb{V}\mathbb{I}^*}$$

$$\mathbb{V} = V_m \angle\theta_v$$

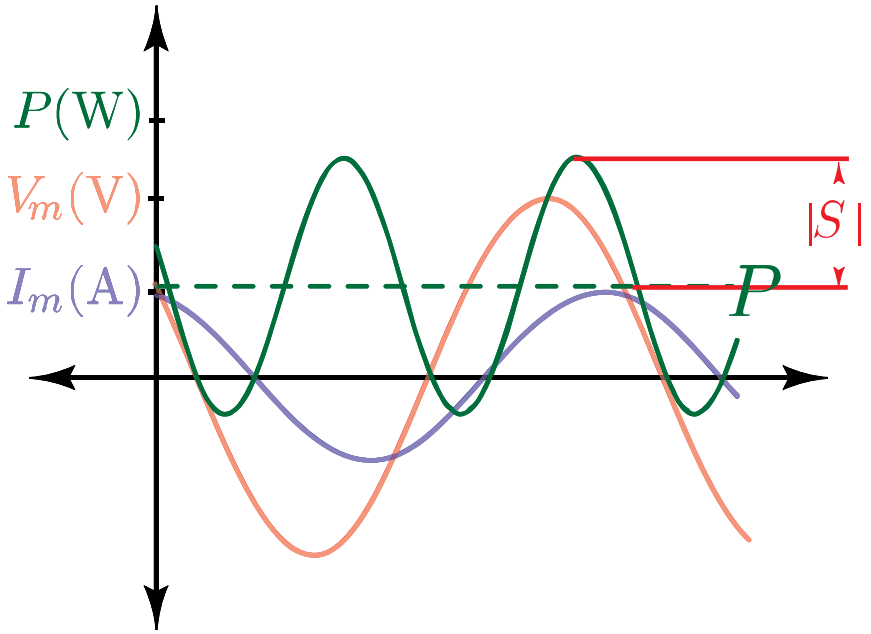
$$\mathbb{I} = I_m \angle\theta_i$$

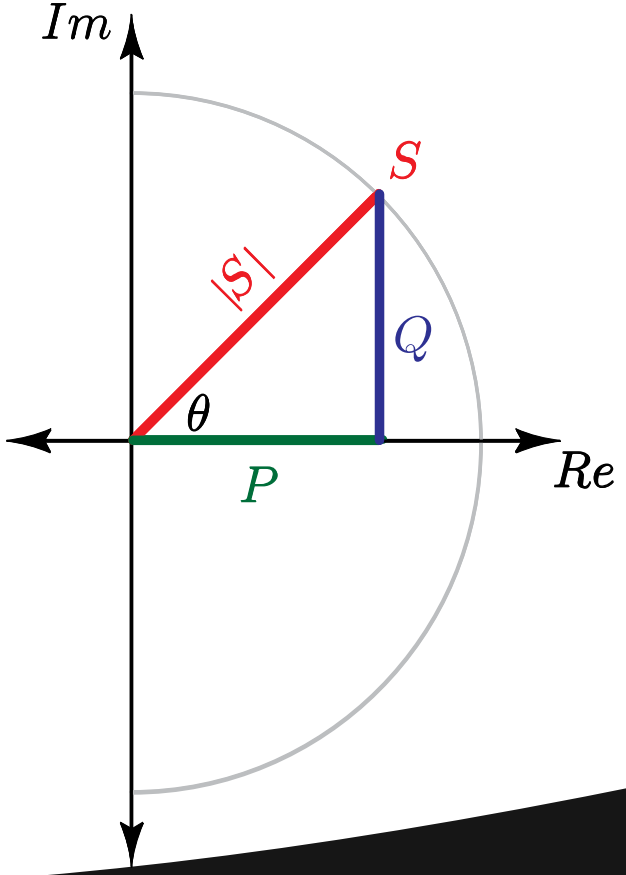


$$S = \frac{V_m I_m}{2}\angle\theta_v - \theta_i = 6.25\angle\frac{\pi}{4}$$

What Complex Power Represents

$$S = \frac{V_m I_m}{2} \angle \theta_v - \theta_i$$





Summary

- Calculated complex power
- Identified the meaning behind complex power

Next Lesson

- Power triangles
- Define important quantities for power analysis