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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Ideal Transformers

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Use the ideal transformer model for transformer analysis.

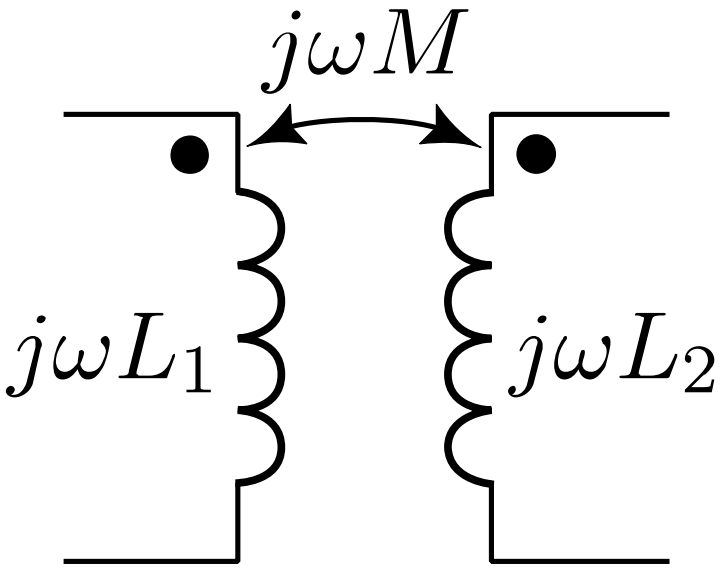
Previous Lesson

- Presented the linear model for analyzing transformers

Lesson Objectives

- Identify the assumptions used for the ideal transformer model
- Use the ideal transformer model for doing simple circuit analysis
- Describe the importance of transformers in power transmission

k : Coefficient of Coupling



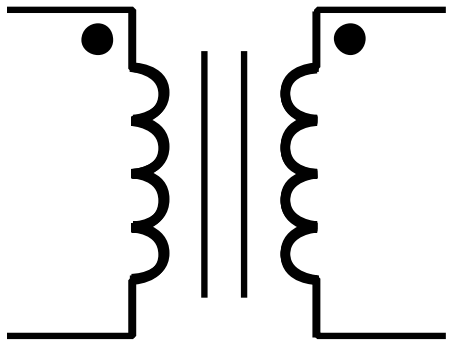
$$0 \leq k \leq 1$$

$$L_1 = 4\text{mH} \qquad L_2 = 9\text{mH} \qquad M = 2\text{mH}$$

$$M = k\sqrt{L_1 L_2}$$

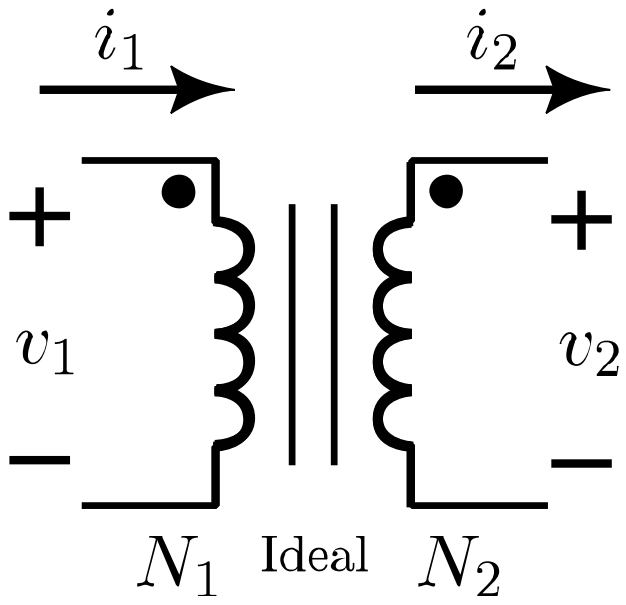
The Ideal Transformer

- Coupling coefficient k=1
- $L_1 = L_2 = \infty$
- Losses from coil resistances are negligible



Ideal

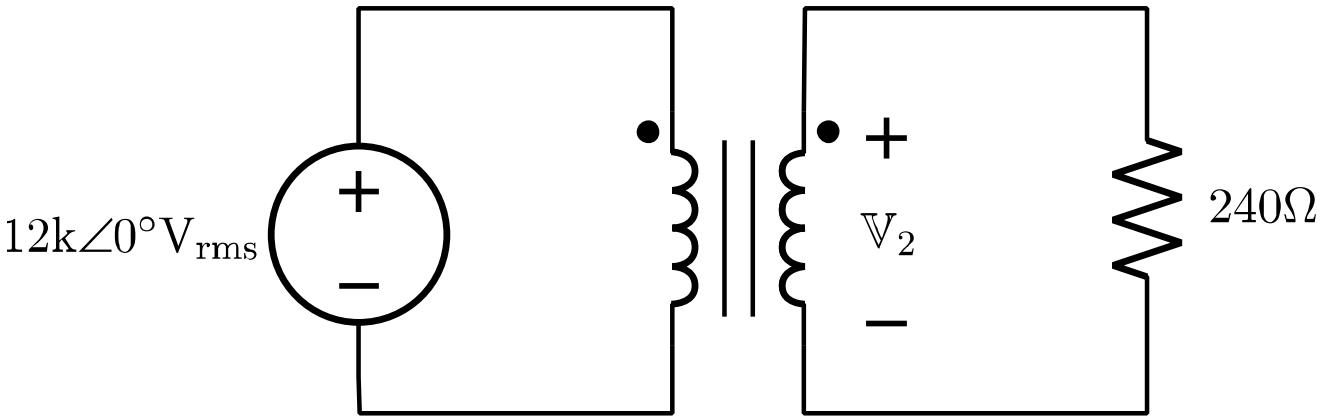
Properties of the Ideal Transformer



$$\boxed{\frac{v_1}{N_1} = \frac{v_2}{N_2}}$$

$$\boxed{N_1 i_1 = N_2 i_2}$$

Example



$$\mathbb{V}_2 = 120\angle 0°\text{V}_{\text{rms}}$$

Implications

- Transformers allow a change from one voltage to another voltage
- High-voltage low-current power transmission allows long-distance power distribution systems

Summary

- Showed the ideal transformer model
- Used the model to solve an example system
- Identified the usefulness of transformers for power transmission

Next Lesson

- Sensor: linear-variable differential transformers (LVDT)