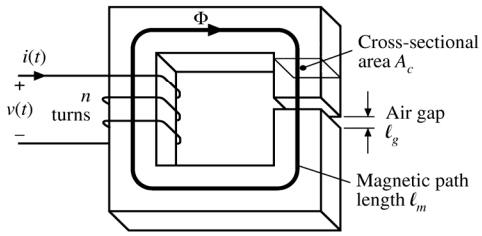
Magnetic Circuits

Inductor Magnetic Circuit Model

Saturation Limits

Example: Gapped Inductor



Gapped Inductor Magnetic Circuit

Effect of Air Gap

$$ni = \Phi\left(\mathcal{R}_c + \mathcal{R}_g\right)$$

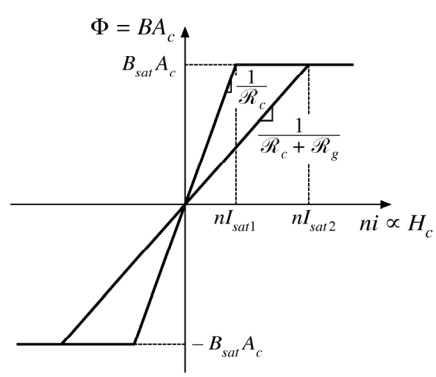
$$L = \frac{n^2}{\mathcal{R}_c + \mathcal{R}_g}$$

$$\Phi_{sat} = B_{sat}A_c$$

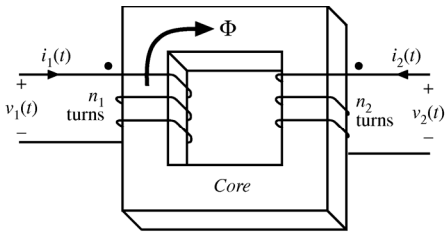
$$I_{sat} = \frac{B_{sat}A_c}{n}\left(\mathcal{R}_c + \mathcal{R}_g\right)$$

Effect of air gap:

- decrease inductance
- increase saturation current
- inductance is less dependent on core permeability



Transformer Example



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