ECE 203

Circuits I

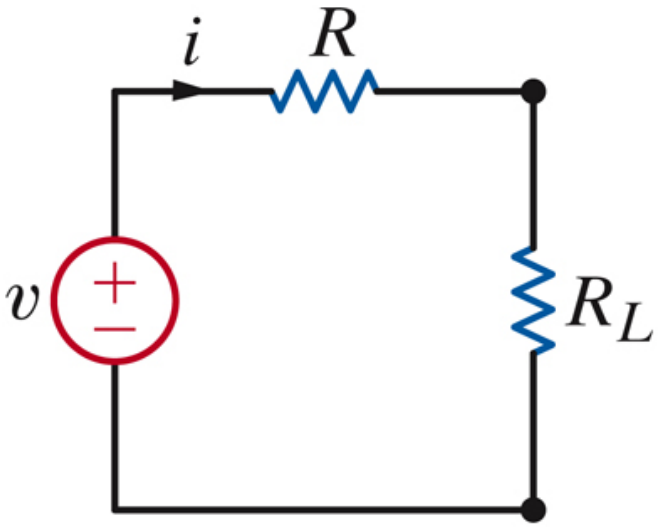
Maximum Power Transfer

Lecture 8-3

Maximum Power Transfer

Question: For what condition will the power transferred to the load be maximized?

Note: R and v can be the equivalent Thévenin circuit of any linear circuit!



$$P_{\text{load}} = i^2 R_L = \left(\frac{v}{R + R_L} \right)^2 R_L$$

Maximum Power Transfer

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$$\frac{dP_{\text{load}}}{dR_L} = \frac{(R + R_L)^2 v^2 - 2v^2 R_L (R + R_L)}{(R + R_L)^4} = 0$$

$$R_L = R$$

In other words, maximum power transfer takes place when the load resistance $R_L = R$

Example: Go to Example 8-3.1

Max power and Thévenin equivalent

This demonstrates an important application of the Thévenin equivalent circuit: You get maximum power transfer to a load when $R_L = R_{Th}$

So, once you calculate R_{Th} of a circuit, you can either adjust the load to equal R_{Th}, or redesign the circuit so that R_{Th} is the same as the load your would like to drive.

Max power example

Go to Example 8-3.2