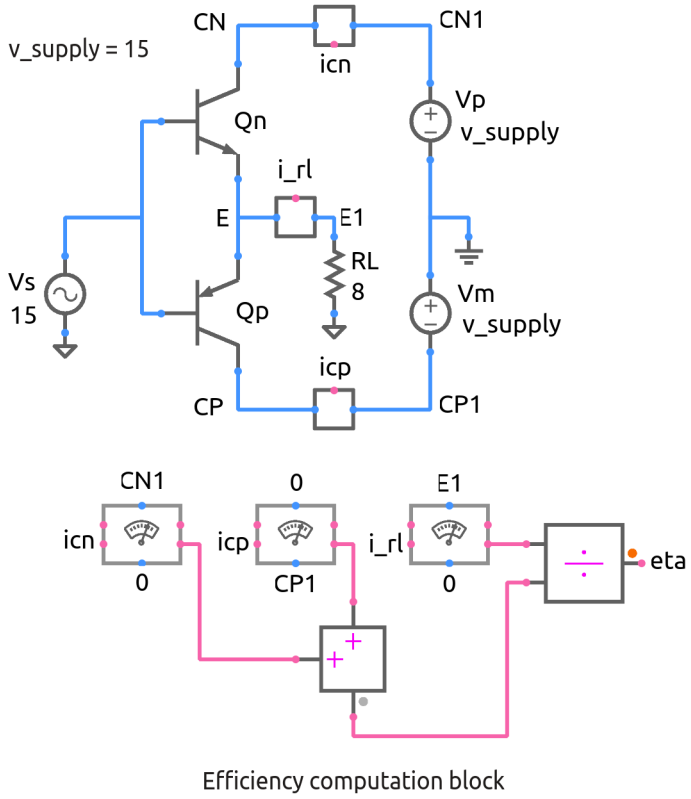
bjt_class_b.sqproj



Efficiency computation block

Shown in the figure is a Class B amplfier. We are interested in the efficiency of the amplifier given by $\eta = \dfrac{P_{RL}}{P_{RL} + P_+ + P_-}$, where P_{RL} is the average power delivered to the load, and P_+, P_- are the average powers supplied by the positive and negative supply, respectively. For convenience, the above computation is incorporated in the project file, as shown in the figure. Let the input voltage be denoted by $V_i(t) = V_m \sin \omega t$.

Exercise Set

1. For $V_m = 5\,\text{V}$, what waveform would you expect for $V_o(t)$?

2. Run the simulation, and plot V_i and V_o together (on the same plot). Observe the cross-over distortion which is expected from a Class B amplifier.

3. Plot the collector current versus time for each transistor. Verify with simulation.

4. For $V_m = 5\,\text{V}$, $10\,\text{V}$ and $15\,\text{V}$, run the simulation, and plot the efficiency (denoted by the variable `eta` in the figure) versus time. Note that, since the efficiency involves *average*

powers, it is constant with respect to time. Explain qualitatively why η is expected to improve when V_m is increased. Ignoring the base-emitter voltage drops, calculate the theoretically expected values of η for the above three values of V_m, and compare with the simulation results.

References

1. J. Millman and A. Grabel, *Microelectronics,* McGraw-Hill, 1988.

2. A. S. Sedra, K. C. Smith, and A. .N. Chandorkar, *Microelectronic Circuits*, Oxford University Press, 2004.