

UNIVERSITY OF UTAH
ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT

ECE 3110

SPICE ASSIGNMENT #1

COMMON-EMITTER AMPLIFIER CHARACTERISTICS

Assignment

The purpose of this assignment is to learn SPICE simulation techniques, but more importantly to prepare you for Lab 2. The values from this assignment will be compared to the measurements in Lab 2. You should complete the simulations before attempting the lab measurements. This will help you know what to look for and expect in Lab 2. Hopefully this will make your time in lab more efficient and allow you to learn more.

Create a PSPICE schematic for the following circuit. The model for the 2N3904 transistor is available in PSPICE.

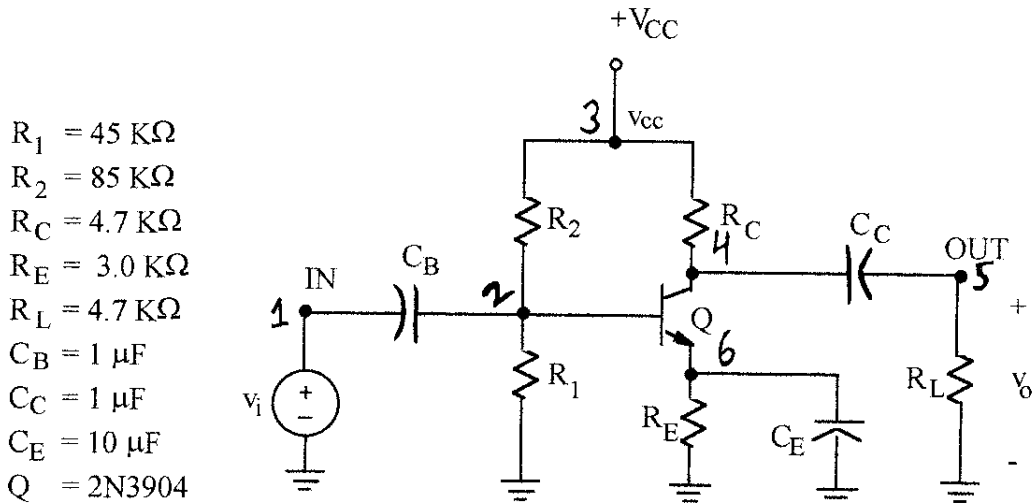


Fig. 1. Single stage common-emitter bipolar voltage amplifier.

1. Set $V_{CC} = +10$ Volts and simulate the DC operating point. Report the node voltages of the base, collector, and emitter.
2. Apply a transient sinusoidal source at 10kHz to the input. Run a transient simulation and find the highest input voltage that doesn't give visible distortion on the output. This should be really small, probably around 15mV or so. This number doesn't need to be reported, just keep it in mind for Lab 2. Using the

same simulation, report the gain at this frequency. **When running transient simulations, it is good practice to set the “maximum time step” to about 1000 times shorter than the total simulation time so that you have good time resolution in your plots.**

3. Next, apply a 1 Volt AC source to the circuit and run an AC simulation to observe the frequency response (transfer function). Use the DB() and P() functions to plot the gain in dB and the phase in degrees.

Plot the gain and phase transfer functions, and show these in your lab report. Find and report the high and low 3-dB corner frequencies in Hz.

What to turn in

1. A plot of your SPICE schematic.
2. Report the DC voltage of the base, collector, and emitter.
3. Report the gain from the transient simulation.
4. Your transfer function Bode plot, with appropriate labels and units. Report your midband gain, and both 3-dB corner frequencies.