

In this lab you will build and characterize a differential amplifier. The learning goals are listed below:

- Implement a class A, B and AB amplifiers, which requires considering their biasing.
- Observe differences in distortion, power output and efficiency between the amplifiers.

**IMPORTANT NOTE:** The class AB circuit you build here is the output stage of your operational amplifier. Please keep it on your breadboard for use in future labs.

## 1 Compare Class A and Class B amplifiers

In this section you will build and compare class A, class B, and class AB power amplifiers.

Please measure the following for each amplifier:

1. Measure the output impedance.
2. Save a trace containing the input and output waveforms overlaid.
3. Use your output voltage measurements to calculate the power driven into the load.
4. Take measurements which allow you to calculate the power pulled from the supply. A sense resistor in series with the supply is an easy way to measure current.
5. Compare your output waveform to major sources of non-linearity in theory. Explain any significant distortion.
6. Comment on the sound the amplifier makes when driving into a speaker.

Some design details of the amplifiers appear below:

1. All amplifiers may have capacitively coupled inputs.
2. All amplifiers must have capacitively coupled outputs. Don't overdo it on your output coupling cap because large capacitors at the output of an emitter follower can make the stage unstable.
3. All amplifier measurements (except output impedance, which you can measure in whatever way feels comfortable) should be carried out with a speaker load attached while a 3V<sub>pp</sub>, 1kHz sine wave is driven into the input.
4. These amplifiers may require practical biasing circuits that were not pictured in lecture. These circuits will probably just be resistor dividers, but feel free to build current mirrors if you want to give it a shot.
5. The class A amplifier should be an emitter follower which is resistively biased with 10mA of current. It should operate on a 10V supply.
6. The class B amplifier should be a push-pull operating off of a 10V supply.
7. The class AB amplifier should be built to the design in Figure 1.
8. Be careful of the power ratings of your resistors (usually 0.1W) and transistors (about 0.3W w/o heat sink)

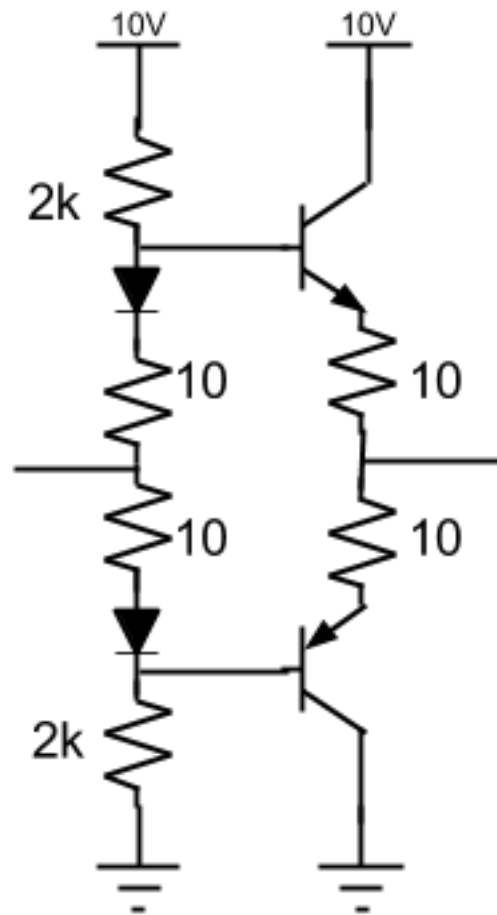


Figure 1: Schematic of a Class AB push-pull amplifier.