**Lab – The Common-Emitter Amplifier**

**Objectives:**

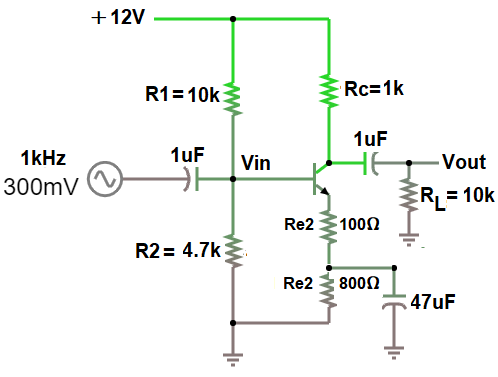
After performing this experiment, you will be able to:

-Build a common emitter amplifier circuit and describe what the circuit does.

-Measure the input and output signals and record the differences

-Determine the gain of the amplifier

In a common-emitter (CE) amplifier, the input signal is applied between the base and emitter and an output signal is developed between the collector and emitter. The transistor's *emitter* is common to both the input and output circuits, *hence,* the *term common emitter.*



*Figure 1- Common Emitter Amplifier[[1]](#endnote-1)*

Diagram

Description automatically generated

*Figure 2- Pin Diagram for 2N3904 transistor*

**Equipment and Materials Needed:**

Equipment: Powered Breadboard, Function Generator, 2-Channel Oscilloscope, DMM

Resistors: one 100 , one 330  one 800 two 1.0 k, one 4.7 k two10 k

Capacitors: two 1.0 F, one 47 F

One 2N3904 *npn* transistor (or equivalent)

One 10 k potentiometer

P**rocedure:**

1. Measure and record the resistance of the resistors listed in Table 8-1.

**Table 8-1**

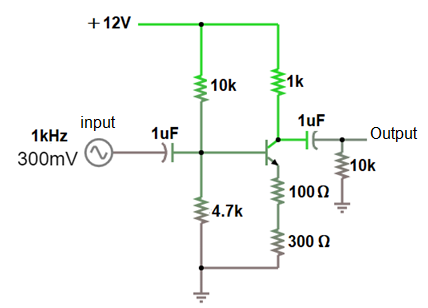
|  |  |  |
| --- | --- | --- |
| Resistor | Listed Value | Measured Value |
| R1 | 10 k |  |
| R2 | 4.7 k |  |
| RE1 | 100  |  |
| RE2 | 330  |  |
| RC | 1.0 k |  |
| RL | 10 k |  |

**Activity 1 Measuring the Gain of an Amplifier**

1.Wire up the circuit below and connect the output of the function generator to the input of the circuit. Use the pin diagram in figure 1 to connect the 2N3904 transistor correctly

2. Connect Ch1 of your oscilloscope to the input of the circuit and Ch2 to the output. **Note:** Make sure that the black probe is connected to ground.

3.Turn on the function generator and set the frequency of the signal to 1kHz and turn the output dial until the amplitude of the signal is 300 mV (i.e.-Vp= 300mV)



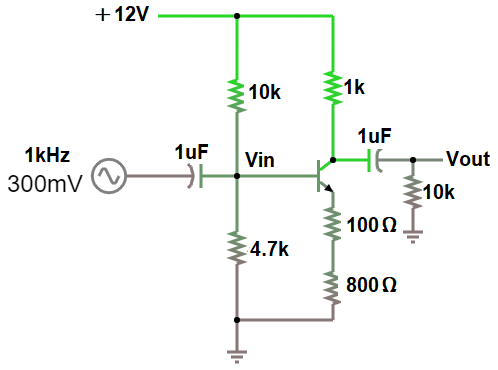
*Figure 3- Common Emitter Amplifier*

4.Sketch (or photograph) the input and output signal in your notebook and record the amplitude of each signal. Be sure to record the maximum and minimum voltage values of the input and output signals.

5.Calculate the gain of the amplifier circuit. Recall that the gain is given by

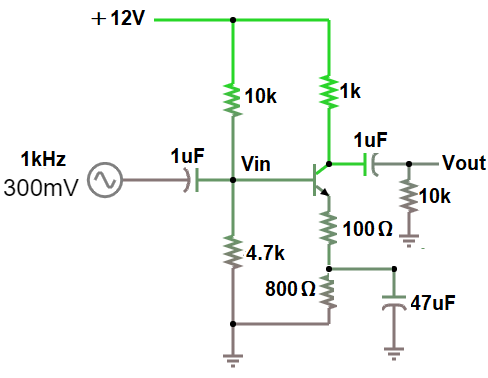
6.Slowly increase the amplitude knob on the function generator until the positive and negative peaks of the output are clipped. Carefully sketch or photograph the signal on the oscilloscope and make a note of what is happening in your notebook.

**Question:** What is the voltage level at which the output signal is clipped?

7. Now reduce the input signal amplitude back to 300 mV. Turn off the function generator and prototyping board and replace the 300-W resistor with an 800-W resistor as shown below. Repeat steps 4-5 above.

*Figure 4- Common Emitter Amplifier*

8. Turn off any power to the circuit and add a capacitor to the circuit as shown below. This capacitor is called a **bypass capacitor**.

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*Figure 5 – CE Amplifier with bypass capacitor*

**Data and Observations:** In your report, discuss the differences in the output signals for the circuits of Figures 3-5. Be sure to mention the effect that changing the emitter resistor from 300 W to 800 W had on the output signal as well as the effect of adding a capacitor (47mF) to the circuit.

1. All schematic diagrams were created with Falstad circuit simulator (https://falstad.com/circuit/) [↑](#endnote-ref-1)