ELEC-313
Lab 8: Bipolar Junction Transistor Characterization

November 16, 2013

Date Performed:	November 13, 2013
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1 Objective

The objective is to plot the output characteristic of a common-emmitter transistor circuit, and use it to determine the current gain and output conductance.

2 Equipment

Transistor: 2N7000	Power supply: HP E3631A
Function generator: HP 33120	Multimeter: HP 34401A
Oscilloscope: Agilent 54622D	Capacitors: 0.1 µF
Resistors: 100 Ω, 300 Ω, 470 Ω, 1 kΩ (x2) 33 kΩ, 100 kΩ (x2)	

3 Schematics

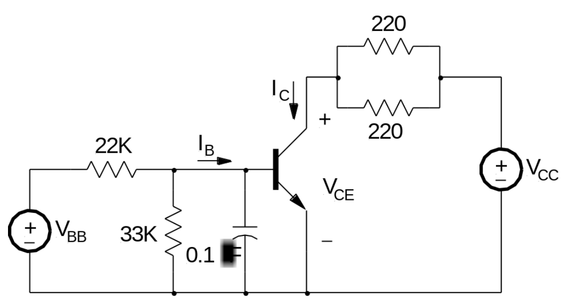

Figure 1: Common-emitter transistor circuit

4 Procedure

1. Construct the circuit of Figure 1. Use the +6 V power supply for V_{BB} and the +25 V supply for V_{CC}. Be sure to keep the connection distance between the capacitor and the transistor short. Use the HP multimeter to measure the base current (I_B) on the source side of the capacitor and Fluke multimeters to measure the collector voltage and current (V_{CE} and I_C).

2. Adjust V_{BB} so that base current (I_B) is 20 µA.

3. Adjust V_{CC} from 0.5 − 1.5 V in 0.25 V steps, then from 2 − 20 V in 2 V steps.

4. At each step measure the collector current, I_C, and the collector-to-emitter voltage, V_{CE}. If I_B has drifted, readjust V_{BB} before recording the values of I_C and V_{CE}.

5. Adjust V_{BB} for a base current of 50 µA, 80 µA, and 100 µA. Repeat steps 3 and 4 at each I_B value.

5 Results

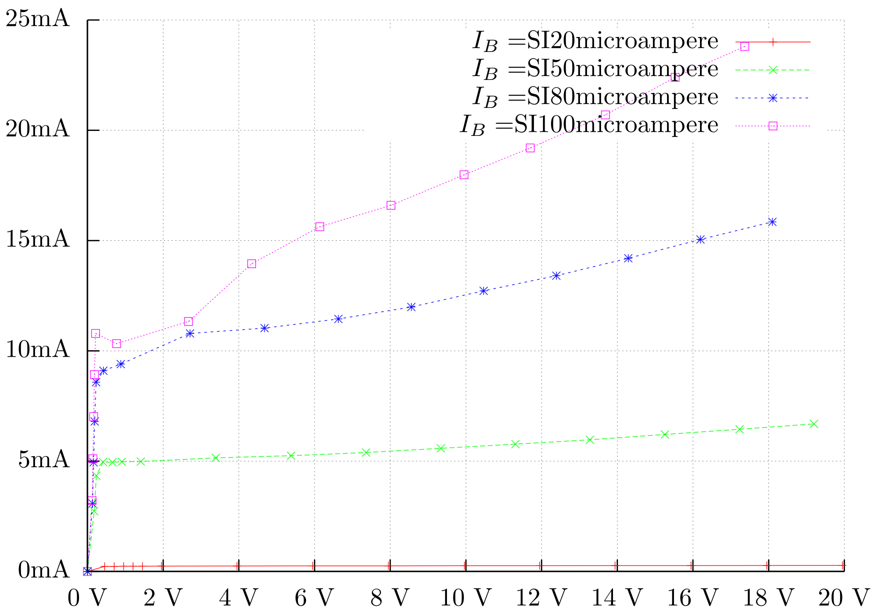

Figure 2: V_{CE} vs. I_C

6 Conclusion

7 Equations

$$h_{oe} \approx \frac{1}{r_o} = \frac{\Delta I_C}{\Delta V_{CE}} \tag{1}$$

$$\beta = \frac{I_C}{I_E} \tag{2}$$