

ELEC-313  
Lab 8: Bipolar Junction Transistor  
Characterization

November 16, 2013

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## 1 Objective

The objective is to plot the output characteristic of a common-emitter 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  $\mu\text{F}$   
Resistors: 100  $\Omega$ , 300  $\Omega$ , 470  $\Omega$ , 1 k $\Omega$  (x2) 33 k $\Omega$ , 100 k $\Omega$  (x2)

## 3 Schematics

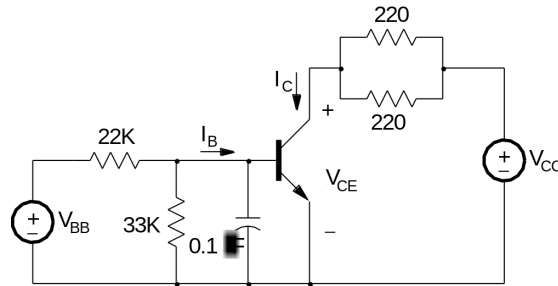


Figure 1: Common-emitter transistor circuit

## 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  $\mu\text{A}$ .
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  $50\mu\text{A}$ ,  $80\mu\text{A}$ , and  $100\mu\text{A}$ . Repeat steps 3 and 4 at each  $I_B$  value.

## 5 Results

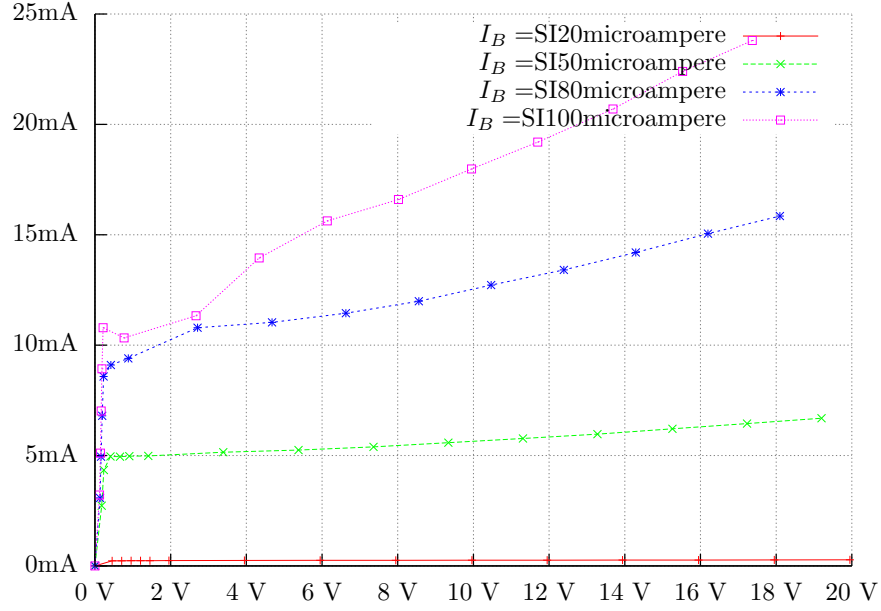


Figure 2:  $V_{CE}$  vs.  $I_C$

## 6 Conclusion

## 7 Equations

$$h_{oe} \approx \frac{1}{r_o} = \frac{\Delta i_C}{\Delta v_{CE}} \quad (1)$$