Chapter 4 Assignment

4.5 A certain npn silicon transistor has $\beta = 100$ and $i_B = 0.1 mA$. Sketch i_c against v_{CE} for v_{CE} ranging from 0 to 5 V. Repeat for $\beta = 300$. Ignore second-order effect.

4.8 An npn transistor is operating with the base-emitter junction forward biased and the base-collector junction reverse biased. If $i_c = 9mA$ for $i_B = 0.3mA$, find i_E, α, and β.

4.9 A transistor has $\beta = 50$. What is the value of α ?

4.10 Consider an npn transistor at room temperature that has $I_{ES} = 10^{-13}A$, $\beta = 100$, $v_{CE} = 10V$, and $i_E = 10mA$. Find v_{BE}, v_{BC}, i_B, i_c, and α. (Assume that $V_T = 26mV$ at room temp.)

4.15   An npn transistor has $V_{BE} = 0.7V$ for $I_E = 10mA$. Find V_{BE} if $I_E = 1mA$. Repeat for $I_E = 1\mu A$. Assume a temperature of 300 K.

4.24   A certain pnp silicon transistor has $\beta = 100$ and $i_B = 0.1mA$. Sketch i_c against v_{CE} for v_{CE} ranging from 0 to $-5V$. Repeat for $\beta = 300$. Ignore second-order effects.

4.25   At temperature of $30°C$, a particular pnp transistor has $V_{BE} = -0.7V$ for $I_E = 2mA$. Estimate V_{BE} for $I_E = 0.1mA$ at a temperature of $180°C$