ECE 320 - Homework #2

Semiconductors, PN Junction, Diode VI Characteristics. Due Wednesday, September 6th, 2017

Semiconductors

- 1) What is the difference between n-type, p-type, and intrinsic silicon?
- 2) An 0805 resistor is made out of silicon with dimensions
 - Width & height: 1.25mm x 1.25mm
 - Length: 2mm

What does the doping level need to be to make this a 1k resistor using Boron (p-type semiconductor)?

PN Junction

- 3) If Vin = +3V, will current flow in the following circuit? Why?
- 4) If Vin = -3V, will current flow in the following circuit? Why?

Diode VI Characteristics

Assume the VI characteristics for a diode are:

$$V_d = 0.052 \cdot \ln(10^8 I_d + 1) \qquad I_d = 10^{-8} \left(\exp\left(\frac{V_d}{0.052}\right) - 1 \right)$$

- 5) Write the voltage node equations for the following circuit
- 6) Solve for V1, V2, and V3 (hint: use Matlab and fminsearch())
- 7) Check your answers in PartSim (or similar program)

Lab:

8) Build the diode circuit below and check your calculations

