

EE112 Lab Experiments

**Experiment 2: Diodes, Bipolar Junction Transistors  
and MOS Characterization**

**4. Lab**

**4.1. Diode Parameter Characteristic**

Plot  $\log(I_d)$  vs.  $V_d$  curve. Fit the ideality factor of the diode: \_\_\_\_\_.

Fit the saturation current  $I_s$ : \_\_\_\_\_, series resistance  $R_s$ : \_\_\_\_\_.

Plot  $C_D$  vs.  $V_R$  curve and  $1/C_D^2$  vs.  $V_R$ .

Extract the zero bias capacitance  $C_{j0}$ : \_\_\_\_\_, built-in voltage  $V_j$ : \_\_\_\_\_.

**4.2. Bipolar Junction Transistor Characterization**

Plot  $I_c$  vs.  $V_{CE}$  curves with different  $I_B$ .

What is the averaged early voltage  $V_A$ : \_\_\_\_\_.

Plot  $\beta_F$  vs.  $I_C$ .

Plot  $C_{BC}$  vs.  $V$  curve and  $1/C_{BC}^2$  vs.  $V$ .

Extract the zero bias capacitance  $C_{j0}$ : \_\_\_\_\_, built-in voltage  $V_j$ : \_\_\_\_\_.

**4.3. MOSFET Characterization**

Plot  $I_D$  vs.  $V_{DS}$  curves with different  $V_{GS}$ . Label the cutoff, triode and saturation regions on the plot. What is the channel length modulation  $\lambda$ : \_\_\_\_\_.

What is the transconductance  $G_m$  with a bias of  $V_{GS} = 2.1$  V and  $V_{DS} = 1.5$  V: \_\_\_\_\_.

What is the transconductance  $G_m$  with a bias of  $V_{GS} = 2.1$  V and  $V_{DS} = 0.06$  V: \_\_\_\_\_.

Plot  $I_D^{0.5}$  vs.  $V_G$ , extract  $V_{TH}$ : \_\_\_\_\_ and  $K_n$ : \_\_\_\_\_.