H.W. #2 EE 420/ECG 620 Spring 2019

Show your work for credit and put a box around each of your answers (follow the hw guidelines!) Unless otherwise indicated use the book's long-channel (1 um) process.

1. Explain, in your own words, why a MOSFET with a positive (non-zero) drain current (i.e., the MOSFET has a V_{GS} or V_{SG} greater than the threshold voltage) is operating in saturation when it is diode connected, that is, when its gate and drain are shorted together. (1 points)

2. Show, using simulations, that a diode-connected NMOS (body connected to ground) or PMOS (body connected to *VDD*) device behaves like a diode. Knowing that there is a parasitic diode between the drain/source and the MOSFET's body, see below PMOS for example, comment on the maximum and minimum voltages that one could use with a diode-connected MOSFET to keep this diode from turning on. (4 points)

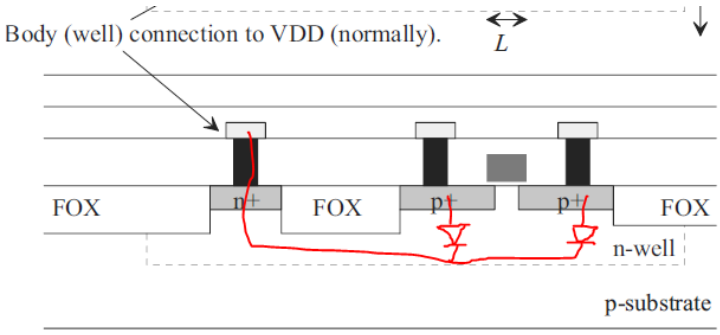

Figure 4.13 Layout and cross-sectional views of an PMOS device.

3. Explain, in your own words that you verify with simulations, what happens to the drain voltages below if a current is injected or stolen as indicated. Verify your understanding using simulations. Note that these circuits are from HW #1 so the DC hand calculations done for this HW can be used to determine reasonable injected/stolen current values. (2 points)