2.7 Exercises

2.1 A process has a nominal K_p of $10\mu AV^{-2}$ and a thin-oxide thickness (t_{ox}) of 1000 $A°$. A batch of circuits have a t_{ox} of 800 $A°$. What would the nominal K_p be? What effect would this have on the drain current of n- and also p-transistors?

2.2 A transistor has a drawn W of 20μ and a drawn L of 5μ. During processing, the polysilicon is overetched by 1μ on all sides. The source and drain diffusions bloat by $.5\mu$. If $K_p = 15\mu AV^{-2}$, what is the β of the final transistor?

2.3 Calculate the $g_{m(sat)}$ of a transistor with $\beta = 40\ \mu AV^{-2}$, $\lambda = .03\ V^{-1}$, $V_t = 1.0\ V$, and $V_{gs} = 5\ V$, taking into account channel length modulation.

2.4 Calculate the input switching voltage for a 2-input NOR gate constructed of identical sized n- and p-transistors with one input held high and both inputs held high. How do the noise margins vary? What ramifications does this have for multiple input gates?