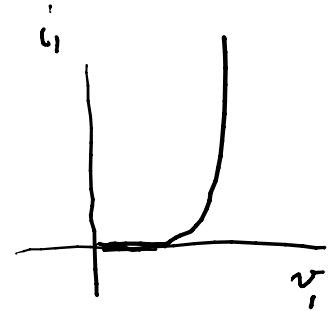
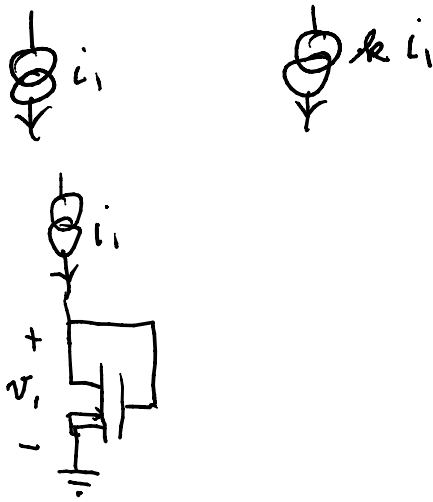


current mirrors

$$i_1 = \frac{K_P}{2} \frac{W}{L} (V_{GS} - V_{TO})^2$$

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02/07/07



$$\Rightarrow v_1 = V_{TO} + \sqrt{\frac{i_1}{\frac{K_P}{2} \frac{W}{L}}}$$

circle out

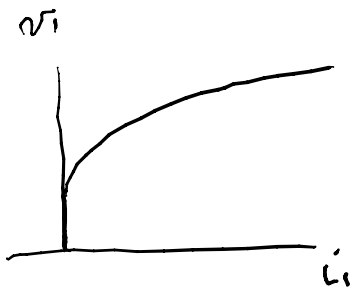
law for saturation NMOS

$$V_{DS} \geq V_{GS} - V_{TO}$$

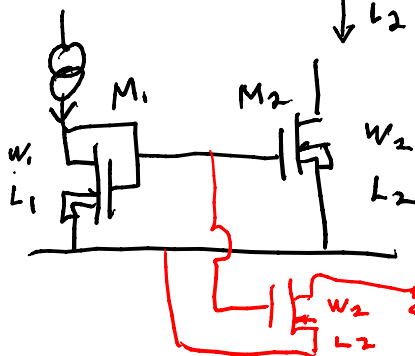
here $V_{DS} = V_{GS} \Rightarrow$ always $V_{GS} \geq V_{GS} - V_{TO}$

if $V_{TO} > 0$

so this diode is in saturation



\therefore look at



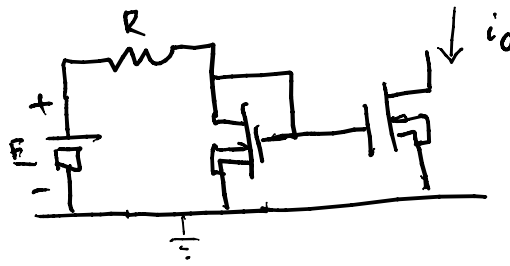
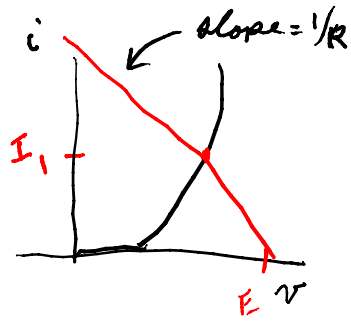
if M_2 is in saturation

$$i_2 = \left(\frac{w_2}{L_2}\right) (V_{GS_2} - V_{TO})^2 \cdot \frac{K_P}{2}$$

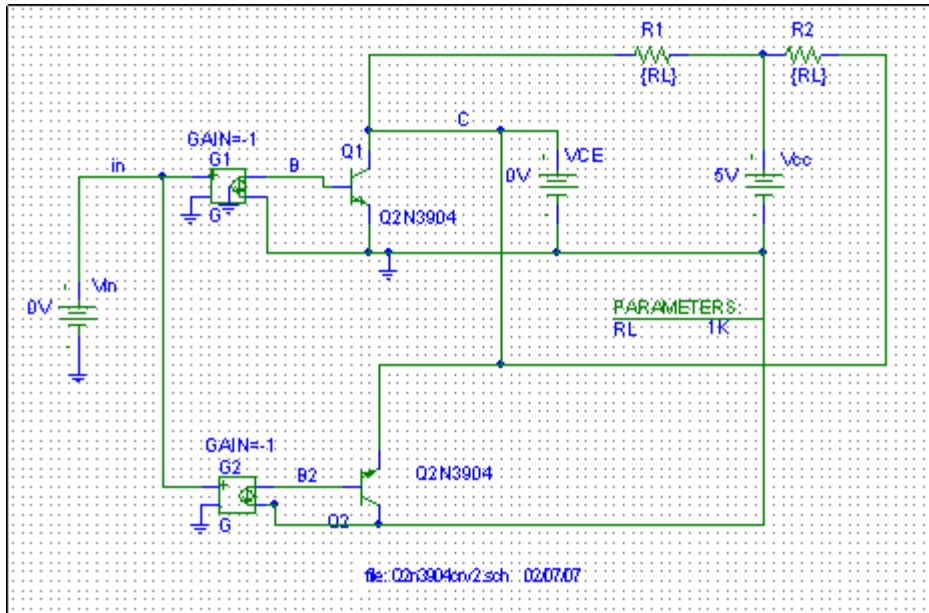
$$i_1 = \left(\frac{w_1}{L_1}\right) (V_{GS_1} - V_{TO})^2 \cdot \frac{K_P}{2}$$

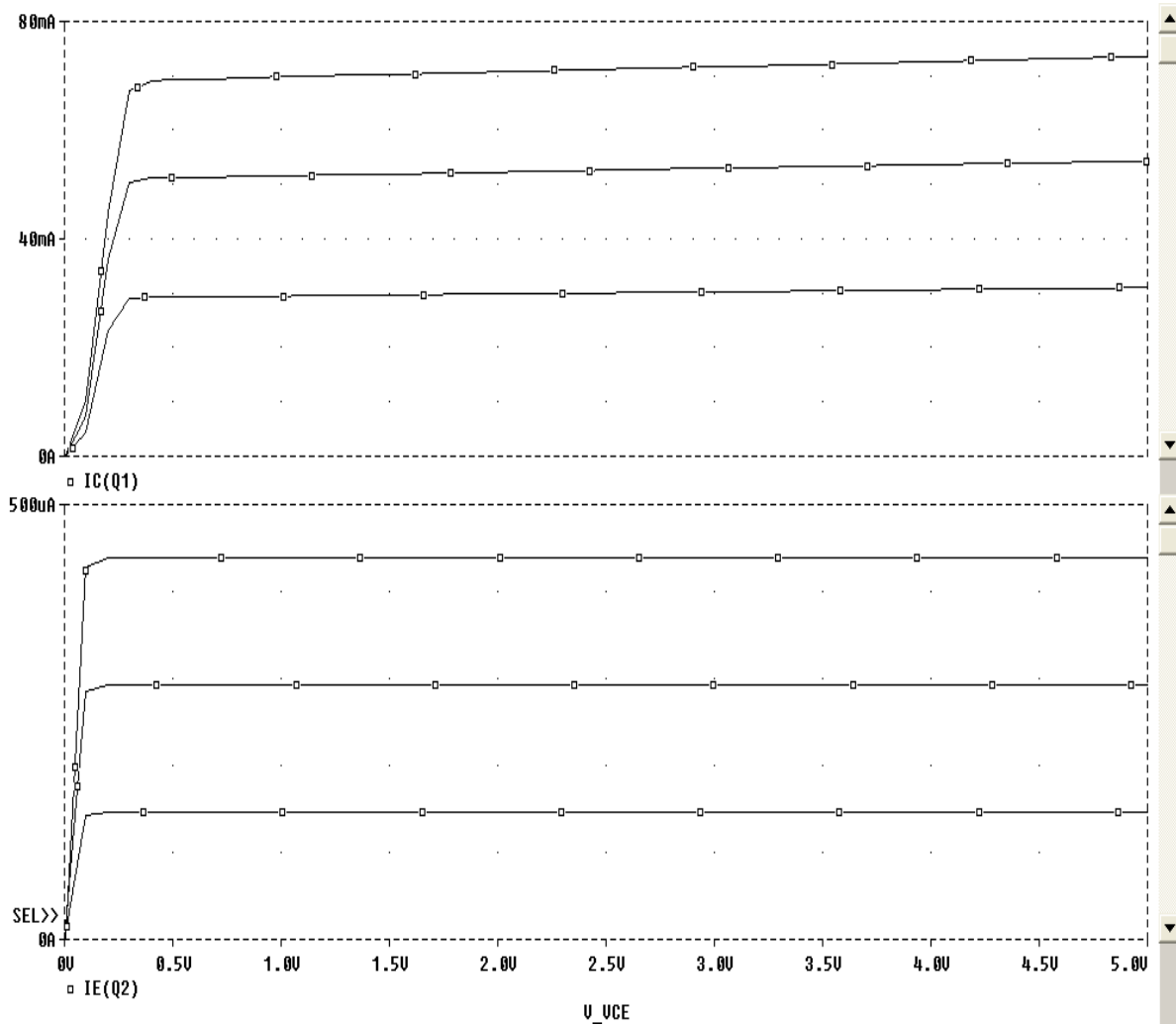
as $V_{GS_1} = V_{GS_2}$ then

$$\frac{i_2}{i_1} = \frac{(w_2/L_2)}{(w_1/L_1)}$$



To see difference between a BJT and it "turned over"
 (so the emitter acts as a collector & vice versa)





Note KP of Spice MOS model is k'_n or k'_p of test
 λ & γ of test are LAMBDA & GAMMA of spice
 V_{TO} of test is V_{TO} of Spice (if the source S is tied to bulk B)
 if $S \neq B$ have body effect, Eq. (4.33) of p. 258 of test