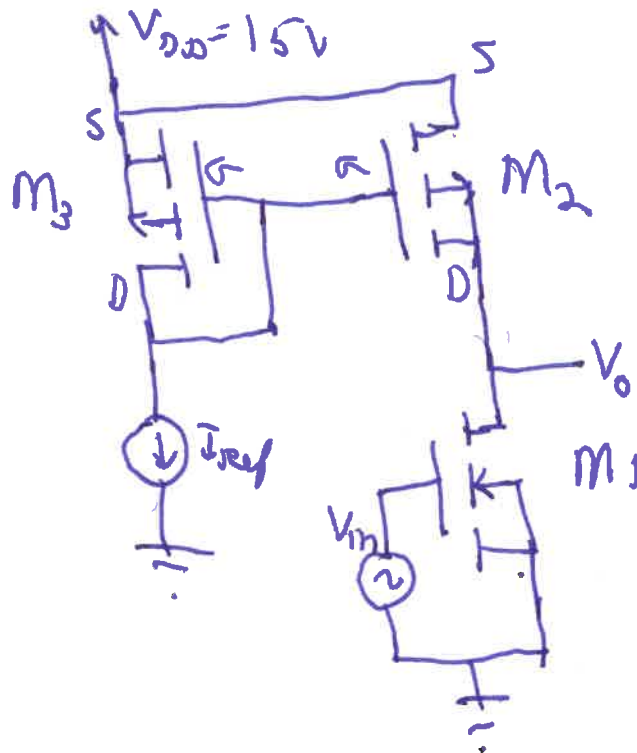


Mon 28 Nov 2016

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current mirror

common Source Amp



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

① current in M_1 is I_{ref}

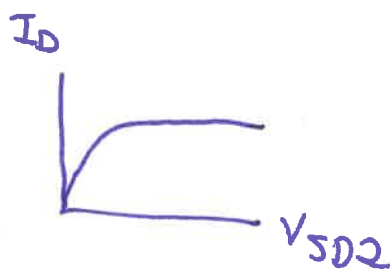
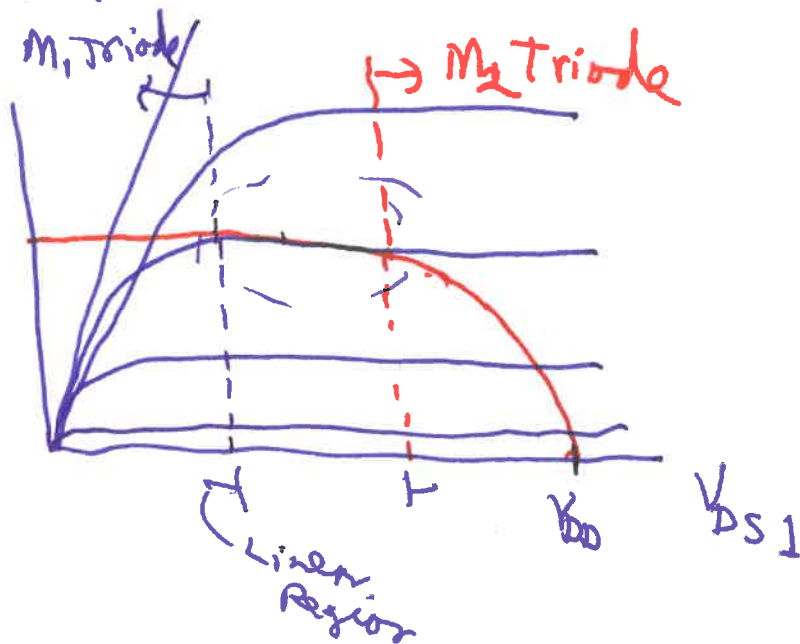
option Change $\frac{W}{L}$ in M_2 to
Change the current.

$$I_{D1} = K_P \frac{W}{L} (V_{GS1} - V_{th1})^2 \left(1 + \frac{V_{DS1}}{V_A}\right)$$

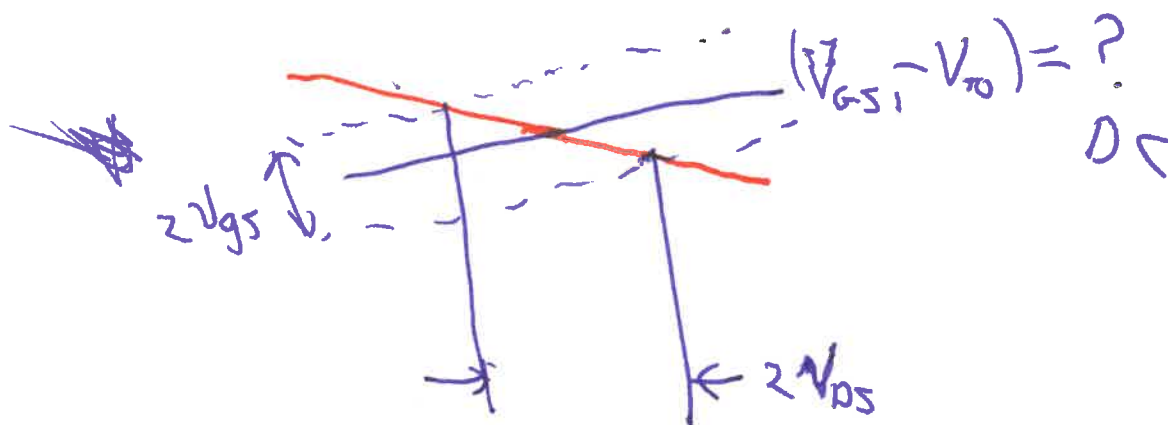
$$I_{D1} = I_{D2}$$

$$V_{DS1} + V_{DS2} = V_{DD}$$

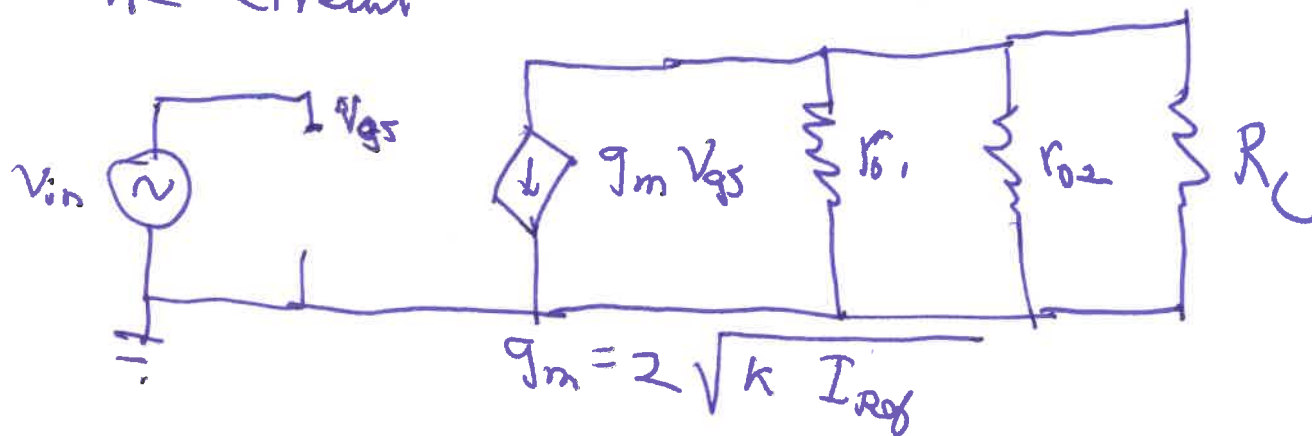
Graphical Analysis



$$V_{DS1} = V_{DD} - V_{SD2}$$



AC Circuit



if $R_L \rightarrow \infty$

open circuit

$$A_v = -g_m (r_{o1} \parallel r_{o2}) \quad \text{pretty good.}$$

$$R_{out} = (r_{o1} \parallel r_{o2}) \quad \text{Not so nice!}$$

$$R_{in} \rightarrow \infty \quad \text{Nice!}$$

No "real" resistors; Nice!

Logic Goals

Complete: Implement all logic fns.

Simple: as few different devices as possible

Fan out:

Noise tolerance

Low Power Consumption

Small & Fast

Function

	AB	"A and B"		NAND	Not (A and B)
	A+B	"A or B"		NOR	Not (A or B)
	$\bar{A}$	"not A"			

XOR A or B but not Both

Equivalence $A = B$