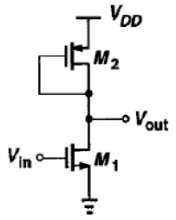
Design a single ended amplifier shown in the fig to achieve the following specs

Spec.	
DC Gain	6 dB
BW	≥ 10 GHz
Power Consumption	≤ 1.5 mW
Cap Load	50 fF



$$P_{cons} = V_{DD}\, I_D \leq 1.5\ mW \rightarrow I_D \leq 1.25\ mA$$

$$GBW = \frac{g_{m1}}{2\pi C_{out}} \geq 2 * 10\ GHz \rightarrow g_{m1} \geq 6.28\ mS$$

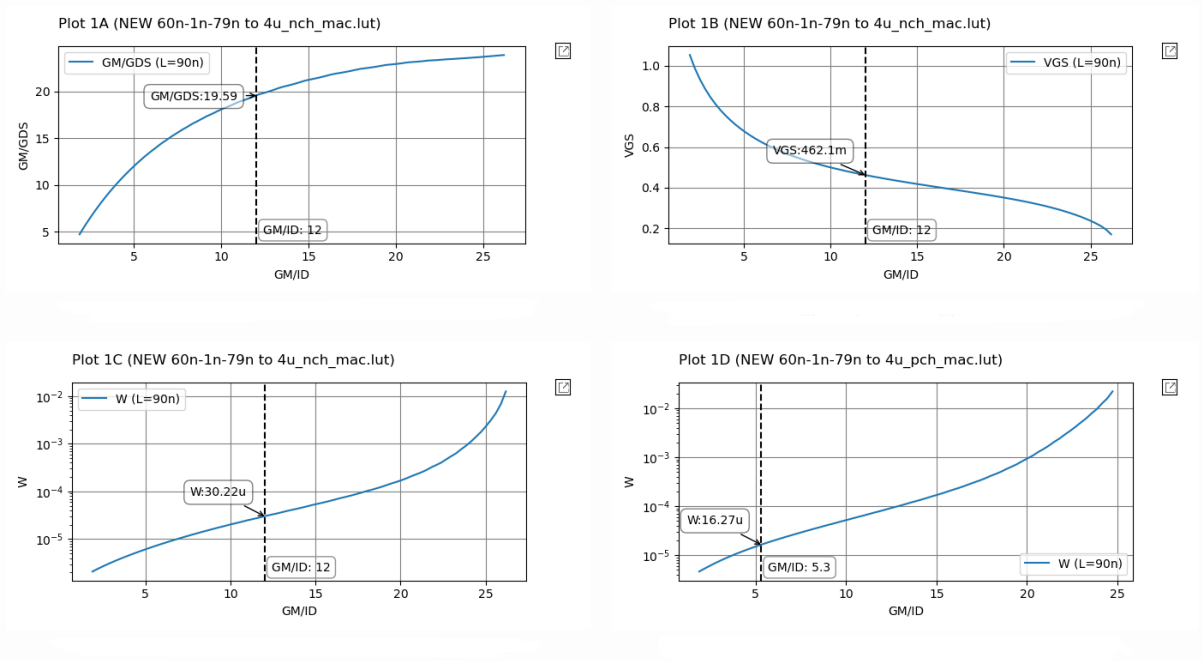
$$g_{m1} = 15\ mS \rightarrow \left(\frac{g_m}{I_D}\right)_1 = 12$$

$$A_v = g_{m1} R_{out} = 2 \rightarrow R_{out} = 134\ \Omega$$

$$\frac{1}{g_{m2}} = 150\ \Omega \rightarrow g_{m2} = 6.7\ mS \rightarrow \left(\frac{g_m}{I_D}\right)_2 = 5.3$$

$$R_{out} = \frac{R_{D1}.r_{o1}}{R_{D1} + r_{o1}} = 134 \rightarrow r_{o1} \geq 1257\ \Omega \rightarrow \left(\frac{g_m}{g_{ds}}\right)_1 \geq 19$$

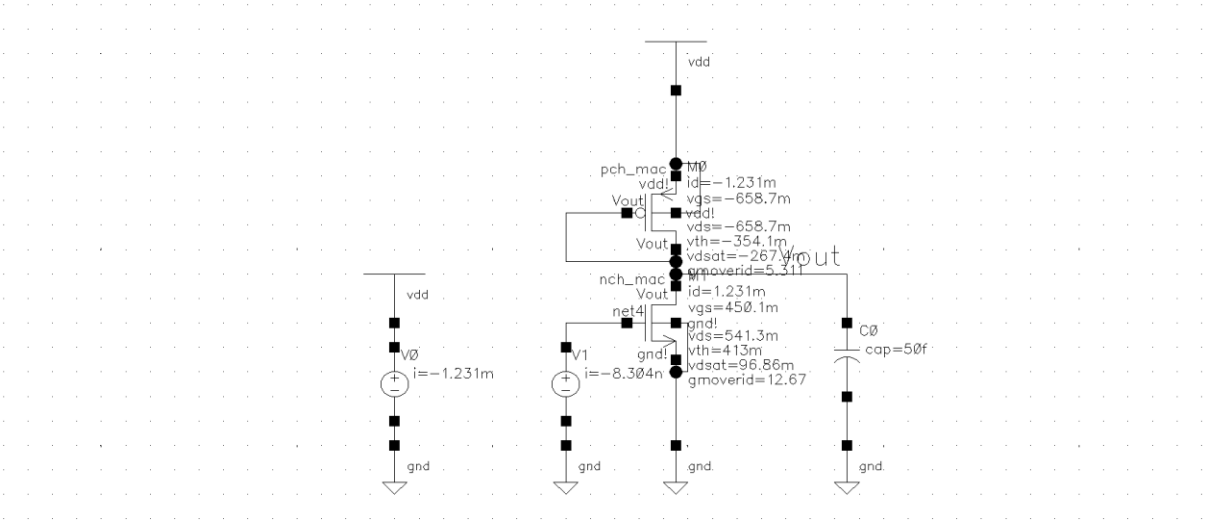
$$\text{Assume } V_{out} = 600\ mV \text{ and } L_1 = L_2$$



$$L = 90\ nm, V_{GS1} = 462.1\ mV, W_1 = 30.22\ um, W_2 = 16.27\ um$$

Apply Results to Cadence

DC - OP



AC Analysis