Design a single ended amplifier (choose common source with resistive load) to achieve the following specs

Spec.	
DC Gain	$20\ dB$
BW	$\geq 1\ GHz$
Power Consumption	$\leq 0.5\ mW$
Cap Load	$50\ fF$

1. Design (Using gmoverid charts)

$$P_{cons} = V_{DD}\ I_D \leq 0.5\ mW \rightarrow I_D \leq 400\ uA$$

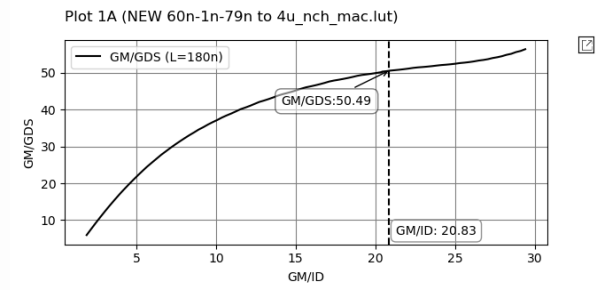
$$GBW = \frac{g_m}{2\pi C_{out}} \geq 10 * 1\ GHz \rightarrow g_m \geq 3.14\ mS$$

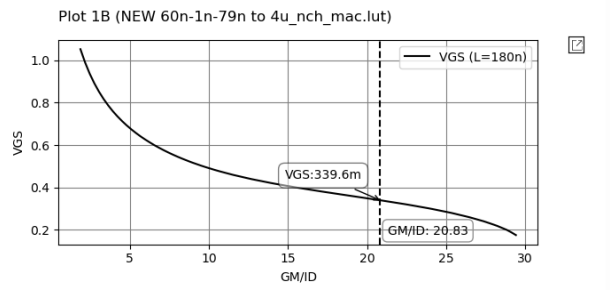
$$Assume\ V_{out} = 0.6 \rightarrow maximum\ output\ swing \rightarrow R_D = \frac{1.2 - 0.6}{400\ u} = 1500\ \Omega$$

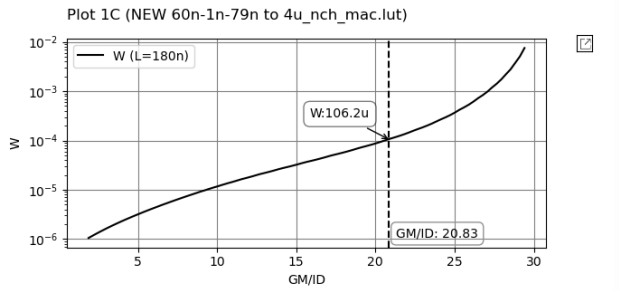
$$Assume\ R_{out} = 1200\ \Omega \rightarrow\ R_{out} = \frac{R_D . r_o}{R_D + r_o} = 1200 \rightarrow r_o \geq 6000\ \Omega$$

$$A_v = g_m R_{out} = 10 \rightarrow g_m = 8.33\ mS \rightarrow \frac{g_m}{I_D} = 20.83$$

$$\frac{g_m}{g_{ds}} \geq 50$$

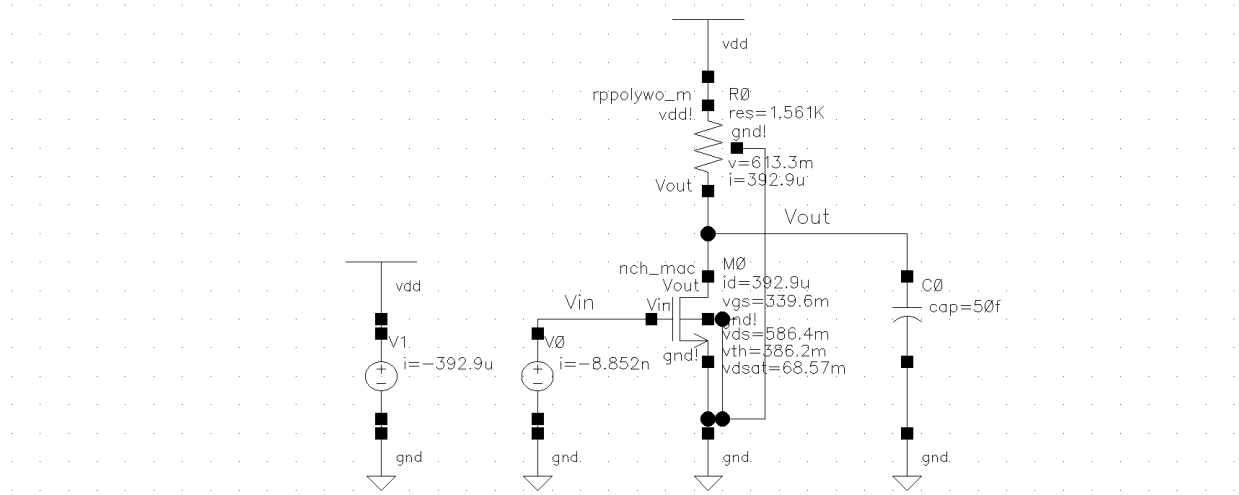






2. *Simulations*

- *DC OP*



- *AC Analysis*