Required: Design a Common Source Amplifier that meets the following specs.

Spec.	
DC Gain	12 dB
BW	≥ 3 GHz
Power Consumption	≤ 2 mW
Cap Load	50 fF

$$P_{cons} = V_{DD}\, I_D \leq 2\ \text{mW} \rightarrow I_D \leq 1.6\ \text{mA}$$

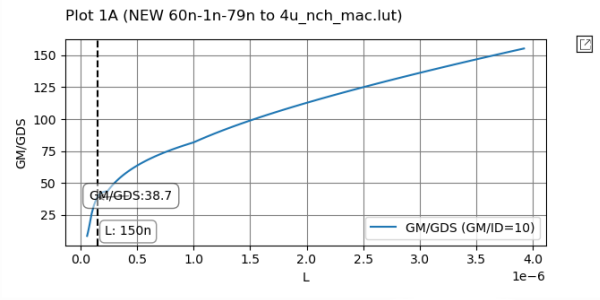
$$\text{GBW} = \frac{g_m}{2\pi C_{out}} \geq 4 * 3\ \text{GHz} \rightarrow g_m \geq 3.8\ \text{mS} \rightarrow \frac{g_m}{I_D} \geq 2.375$$

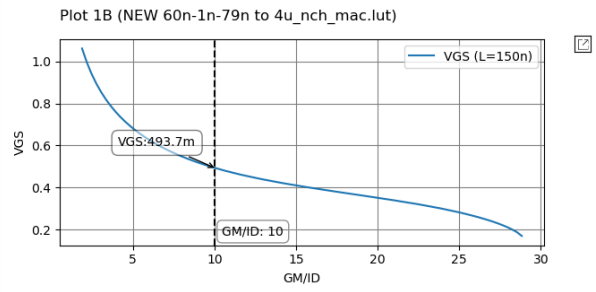
$$\frac{g_m}{I_D} = 10 \rightarrow g_m = 16\ \text{mS}$$

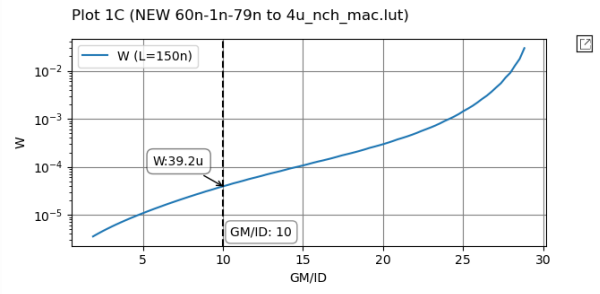
$$A_v = g_m R_{out} = 4 \rightarrow R_{out} = 250\ \Omega \rightarrow R_D = 1.2R_{out} = 300\ \Omega \rightarrow r_o = 1500\ \Omega$$

$$\frac{g_m}{g_{ds}} \geq 24$$

$$L = 150\ \text{nm} \rightarrow V_{GS} = 493.7\ \text{mV} \rightarrow W = 39.2\ \text{um}$$

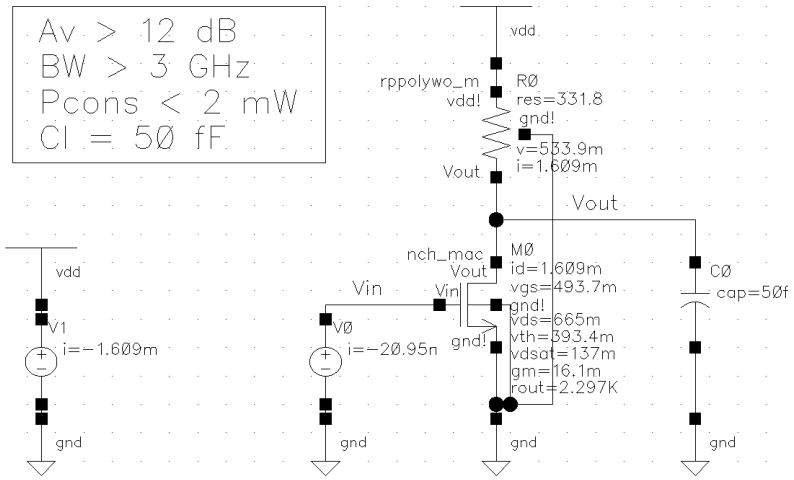






Simulations

1. DC Operation Points



2. AC Analysis