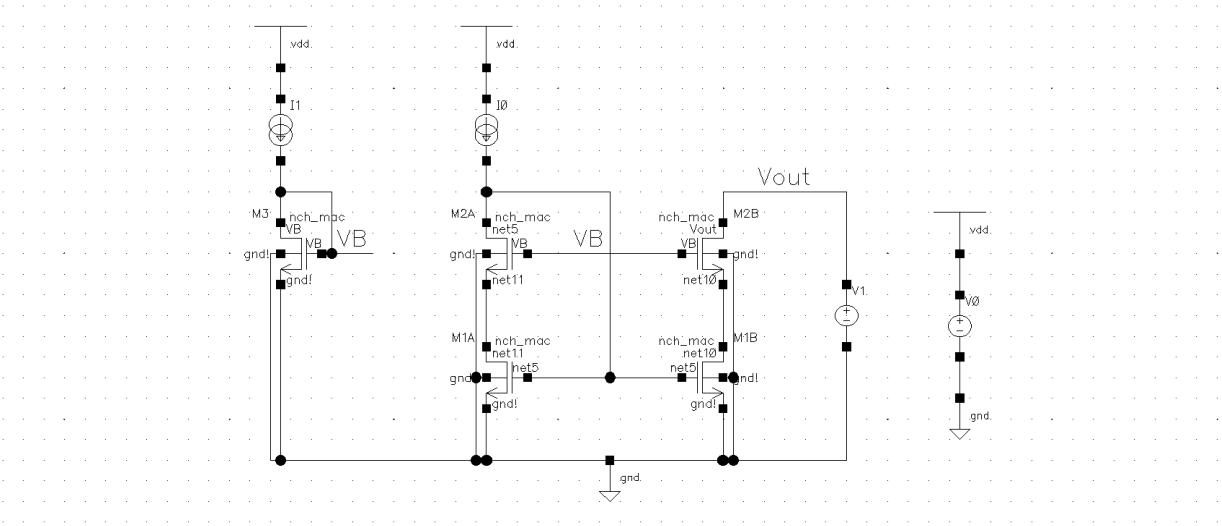
Design a low-voltage cascode current mirror with a 1:2.5 input current to output current ratio. The low frequency output impedance should be greater than 200 kΩ. Assume a 25 μA input current and Vout is 400 mV.



1. *Design (Using gmoverid charts)*

$$\textit{As large Rout is required} \rightarrow \textit{ Assume } L_1 = 180\ nm \textit{ and bias it in SI } \left(\frac{g_m}{I_D} = 10\right)$$

$$W_1 = 2.142\ um \rightarrow r_{o1} = 19.08\ k\Omega$$

$$R_{out} = g_{m2} r_{o2} r_{o1} = 200\ k\Omega$$

$$g_{m2} r_{o2} = \frac{200\ k\Omega}{19.08\ k\Omega} = 10.5$$

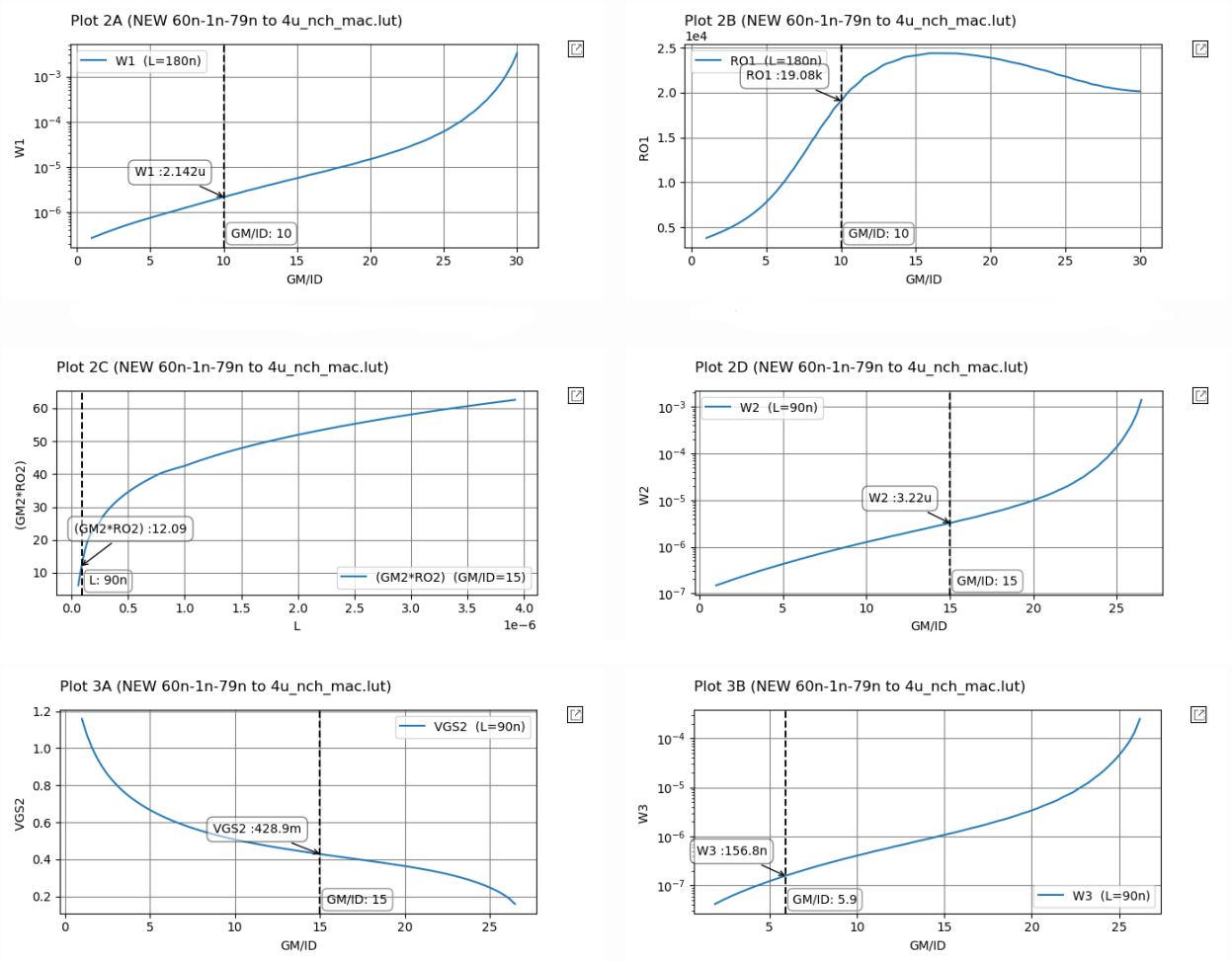
$$\textit{For cascode transistor bias it in MI } \left(\frac{g_m}{I_D} = 15\right)$$

$$L_2 \geq 90\ nm \rightarrow W_2 = 3.22\ um$$

$$\textit{For the VB device } M3 : V_{GS3} \geq V_{GS2} + V_1^*$$

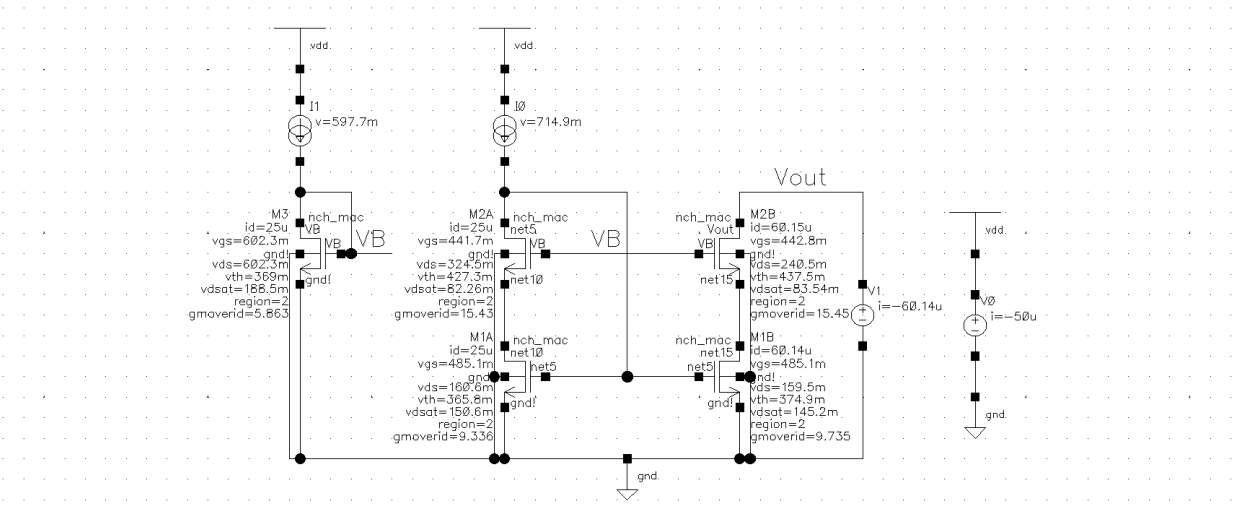
$$V_{GS3} \geq 628.9\ mV \rightarrow \left(\frac{g_m}{I_D}\right)_3 = 5.9$$

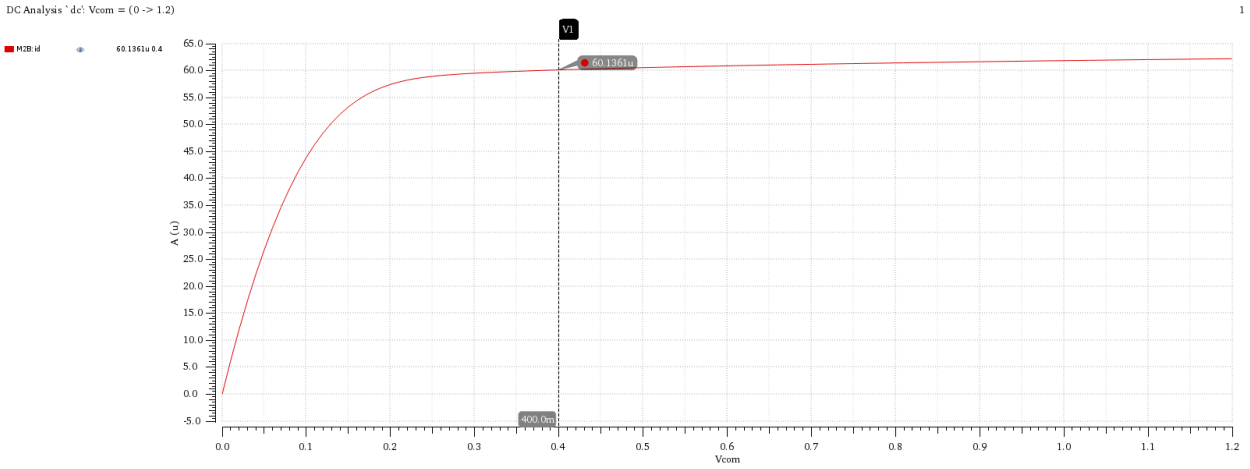
$$L_3 = L_2 \rightarrow W_3 = 156\ nm$$



2. *Simulations*

- *DC OP*





- *AC Output Impedance*