SMALL SIGNAL RESISTANCE OF DIODE CONNECTED MOSFET

\[ V_{DD} \text{ IN SMALL SIG } = 0V \]

REPLACE WITH SMALL SIGNAL MODEL

"IMPEDANCE AT A NODE" PROCEDURE

1. APPLY \( V_x \)
2. CALCULATE \( i_x \)
3. \( r_x = \frac{V_x}{i_x} \)

2. KCL AT GATE
\[ i_x = g_m V_{gs} + \frac{V_x}{r_0} \]

KVL AROUND GATE; \( V_{gs} = V_x \)

3. \( r_x = \frac{V_x}{i_x} \)
\[ \frac{V_x}{i_x} = \frac{1}{g_m + \frac{1}{r_0}} = \frac{1}{g_m} || r_0 \]

USUALLY \( r_0 \gg \frac{1}{g_m} \)

\[ r_x \approx \frac{1}{g_m} \]

SMALL SIGNAL MODEL FOR DIODE CONNECTED MOSFET (NMOS OR PMOS) IS \( \frac{1}{g_m} \):

\[ \text{small signal model} \quad \frac{1}{g_m} \]