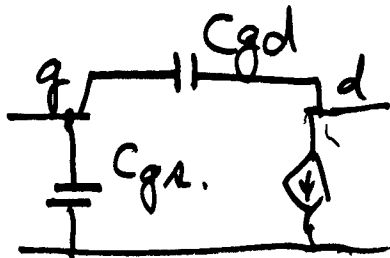
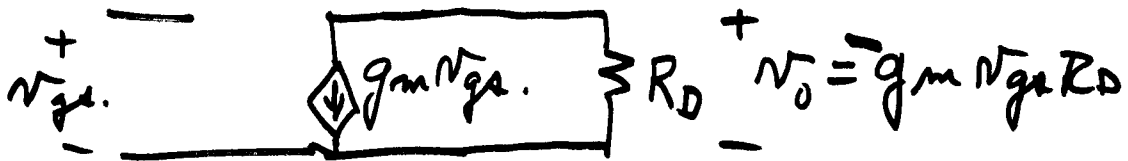


FREQUENCY RESPONSE

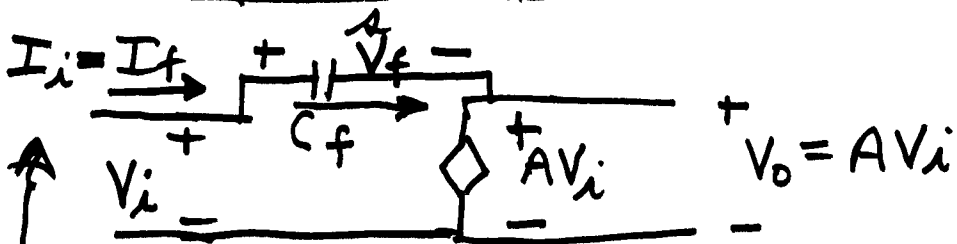
THE MILLER EFFECT

GBW

MOSFET MODEL

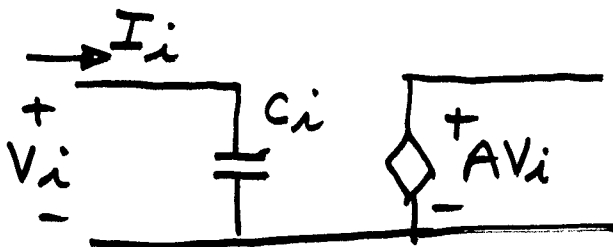


$$Z_c = \frac{1}{j\omega C}$$



$$V_f = V_i - V_o = V_i - AV_i = V_i(1-A)$$

$$I_f = \frac{V_f}{Z_f} = \frac{V_i(1-A)}{Z_f}$$



$$I_i = I_f$$

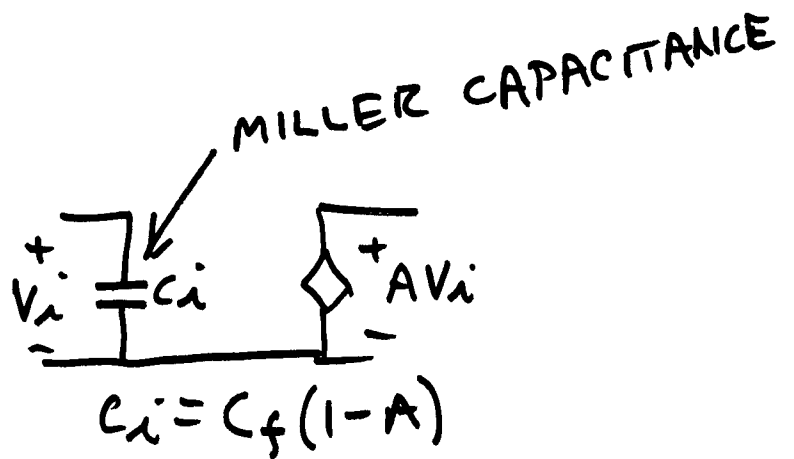
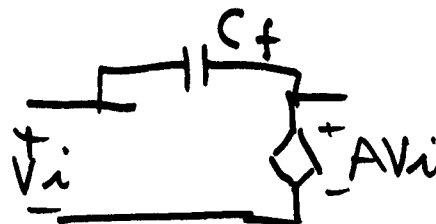
$$\frac{V_i}{Z_i} = \frac{V_i(1-A)}{Z_f}$$

$$Z_i = \frac{Z_f}{1-A}$$

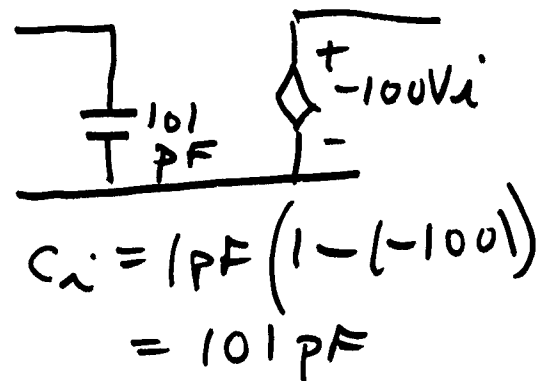
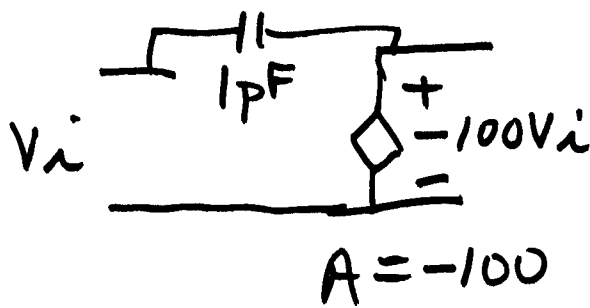
$$\frac{1}{j\omega C_i} = \frac{\frac{1}{j\omega C_f}}{1-A}$$

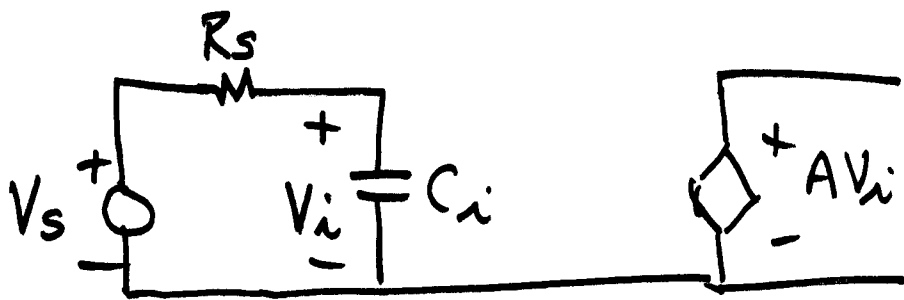
$$\frac{1}{C_i} = \frac{1}{C_f(1-A)}$$

$$C_i = C_f(1-A)$$

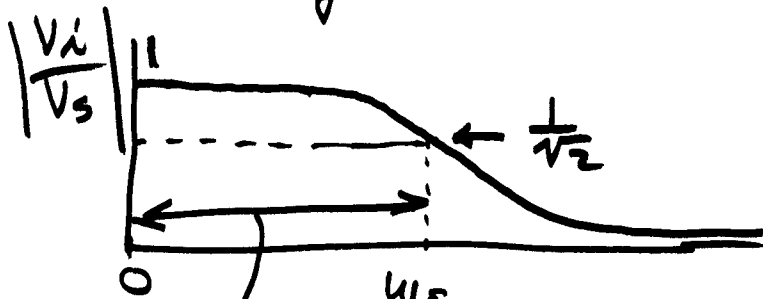


EXAMPLE



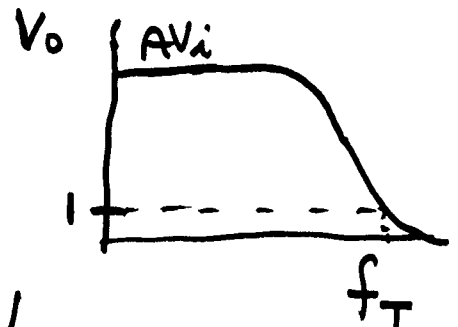


$$V_i = V_s \left[\frac{\frac{1}{j\omega C_i}}{\frac{1}{j\omega C_i} + R_s} \right] = V_s \left[\frac{1}{1 + j\omega R_s C_i} \right]$$



$$\omega_c = \frac{1}{R_s C_i} = BW$$

BW



UNITY-GAIN BANDWIDTH

$$\text{gain} = 1 \\ = 0 \text{ dB}$$

$$V_o = AV_i$$

$$BW = \frac{1}{R_s C_f (1-A)}$$

$$(1-A) \cdot BW = \frac{1}{R_s C_f}$$

$$|A| \gg 1$$

$$|A| \cdot BW = \frac{1}{R_s C_f}$$

gain - bandwidth product

GBW

