

Miller Effect

The miller effect is the effective multiplication of a impedance across a negative gain device.

Consider circuit 1 below with gain $-G$ and Capacitance C . The capacitor can be transformed to an equivalent shunt input capacitance as shown in figure 2 .

Figure 1

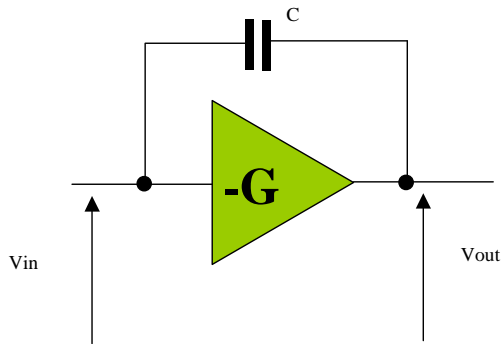
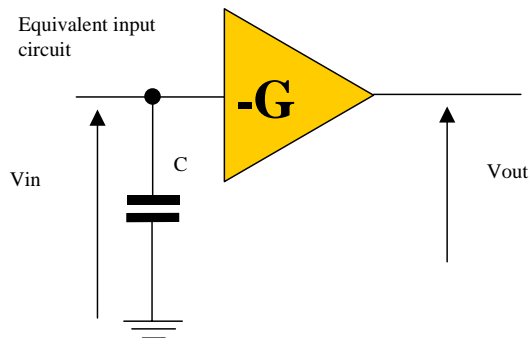


Figure 2



$$V_C = V_{IN} - V_{OUT} \quad \text{Sub in for } V_{OUT} \quad -G \cdot V_{IN}$$

$$V_C = V_{IN} - (-G \cdot V_{IN}) = V_{IN}(G+1)$$

$$I_C = V_C \cdot j\omega C$$

$$C_{SHUNT} = \frac{I_C}{V_{IN}} = \frac{V_C \cdot j\omega C}{V_C} = \frac{V_C \cdot j\omega C \cdot (G+1)}{V_C} = C(G+1)$$

On the output there will be another shunt capacitor of value $C \cdot \left(\frac{1}{G} + 1 \right)$.