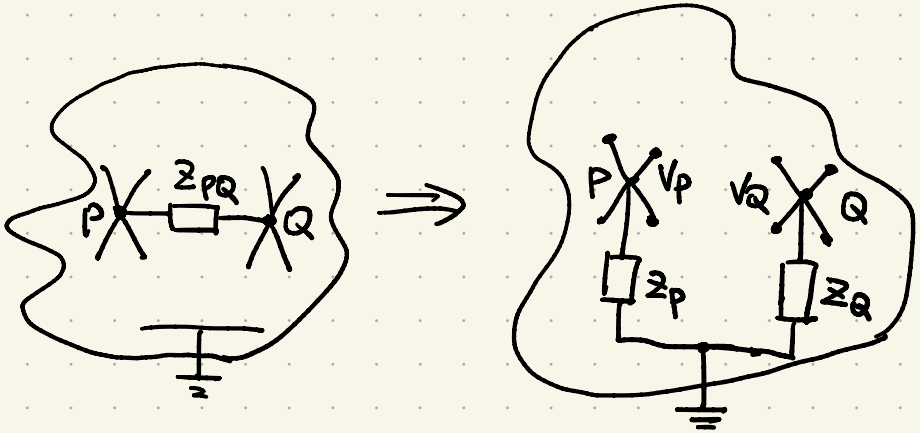
Lec 19

- The Miller Effect
- High-freq. Model of Bipolar Transistor

- Miller's Theorem

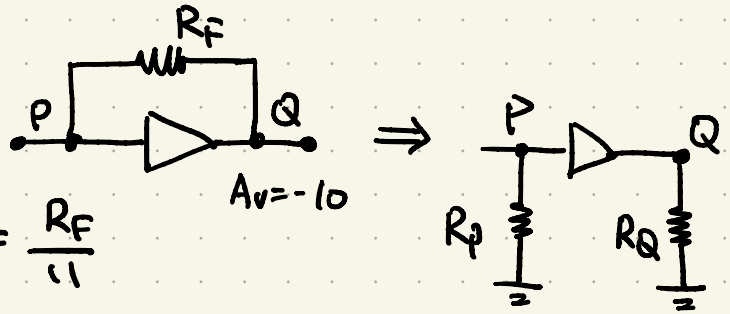


Current drawn from P: $\frac{V_P - V_Q}{Z_{PQ}} = \frac{V_P}{Z_P}$

$$Z_P = \frac{Z_{PQ}}{1 - \frac{V_Q}{V_P}}$$

$$Z_Q = \frac{Z_{PQ}}{1 - \frac{V_P}{V_Q}}$$

Example



$$R_P = \frac{R_F}{1 - A_V} = \frac{R_F}{11}$$

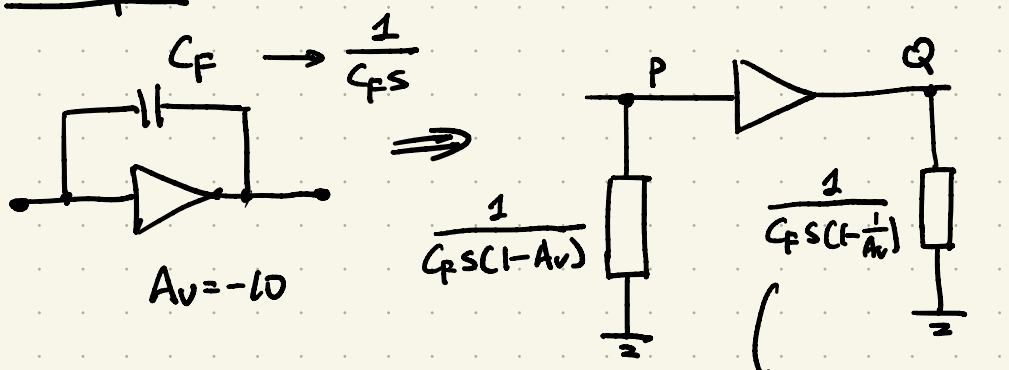
$$R_Q = \frac{R_F}{1 - \frac{1}{V_Q/V_P}} = \frac{R_F}{1.1}$$

The Miller Effect: Z_{PQ} is divided by $1 - A_V$ as it appears at the input.

Q: what if $A_V = +10$ V

$$R_P = \frac{R_F}{-9}$$

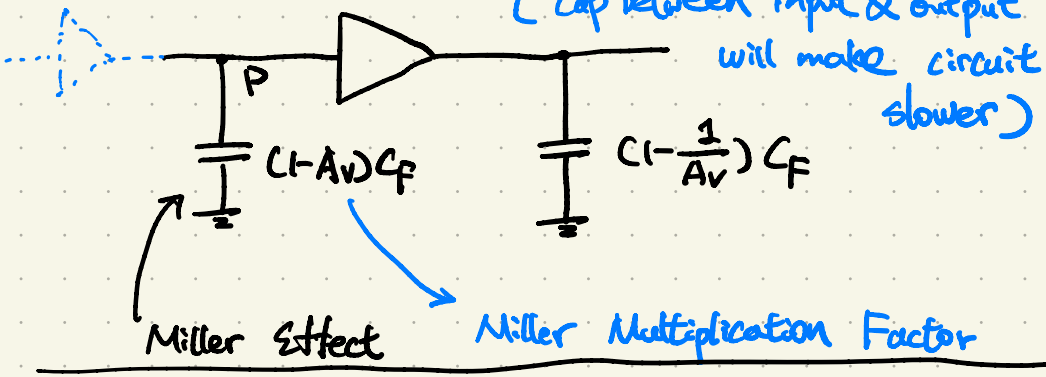
Example



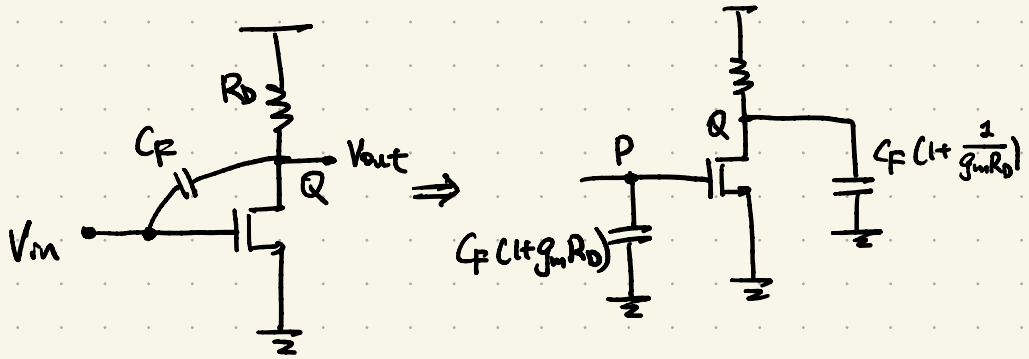
equivalent cap = $C_F(1-A_V)$

$C_F(1-\frac{1}{A_V}) = 1.1\,C_F$

(cap between input & output will make circuit slower)



Example



Caution: ① Miller's approximation has introduced new pole !
(because we assume the A_V to be low-freq. gain)

② Miller's approximation has eliminate the zero

High-Freq. Model of Bipolar Transistors