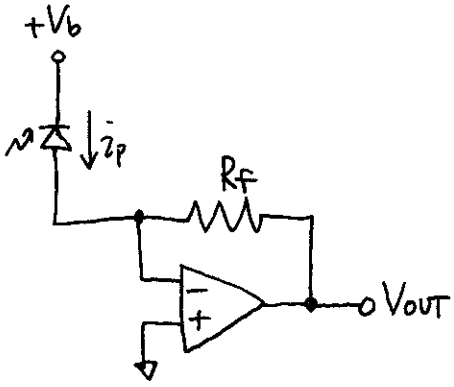

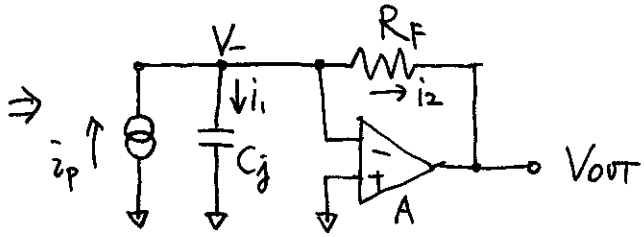

$$\begin{cases} V_{OUT} = -A V_- \\ \dot{i}_p = \dot{i}_1 + \dot{i}_2 \\ \dot{i}_1 = V_- \cdot i\omega C_j \\ \dot{i}_2 = -V_{OUT}/R_f \end{cases}$$

$$\Rightarrow V_{OUT} = -A\frac{\dot{i}_1}{i\omega C_j} = \frac{-A}{i\omega C_j}(\dot{i}_p - \dot{i}_2)$$

$$= \frac{-A}{i\omega C_j}(\dot{i}_p + V_{OUT}/R_F)$$

$$\left(1 + \frac{A}{i\omega C_j R_F}\right) V_{OUT} = \frac{-A}{i\omega C_j}\dot{i}_p$$

$$R_{TRANS} \equiv \frac{-V_{OUT}}{\dot{i}_p} = R_f \frac{1}{1 + i\omega C_j R_f/A}$$

$$= R_F \frac{1}{1 + if/f_c} \qquad f_c = \frac{A}{2\pi C_j R_F}$$

1) As far as $A \gg f/f_1$ $R_{TRANS} = R_F$ $\left(= R_F \frac{1}{1+if/(Af_1)}\right)$ $\equiv Af_1$

2) if $A \ll f/f_1$ $R_{TRANS} = R_F \times \frac{Af_1}{if}$

3) at $A = f/f_1$ oscillation

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assume $A = A_0 \frac{1}{1+if/f_A}$, $R_{TRANS} = \frac{R_F}{1 + i\frac{f}{f_1 A_0} - \frac{f^2}{f_1 f_A A_0}}$

$f_{cut} = \sqrt{f_1 f_A A_0}$ $\left(= \sqrt{f_1 \times GBW}\right)$

$Q = \sqrt{f_1 A_0 / f_A}$