

6) Output noise current due to induced gate noise current

(2)

$$\bar{i}_{on} |_{Total}$$

$$= \frac{1}{2R_s} \frac{\omega_T}{j\omega} (\bar{V}_s + \bar{V}_g) + \frac{1}{2} \bar{i}_d + \frac{1}{2R_s} \frac{\omega_T}{j\omega} (R_s + j\omega L_g + j\omega L_s) \bar{i}_g$$

$$= \frac{1}{2R_s} \frac{\omega_T}{j\omega} (\bar{V}_s + \bar{V}_g + (R_s + j\omega L_g + j\omega L_s) \bar{i}_g) + \frac{1}{2} \bar{i}_d$$

overall noise factor

$$\Rightarrow F = \frac{\bar{i}_{on} \cdot \bar{i}_{on}^*}{\left( \frac{1}{2R_s} \frac{\omega_T}{j\omega} \bar{V}_s \right) \left( \frac{1}{2R_s} \frac{\omega_T}{j\omega} \bar{V}_s \right)^*}$$

$$= \frac{\frac{1}{4R_s^2} \left( \frac{\omega_T}{\omega} \right)^2 \left\{ \bar{V}_s^2 + \bar{V}_g^2 + (R_s^2 + \omega^2 (L_g + L_s)^2) \bar{i}_g^2 \right\} + \frac{1}{4} \bar{i}_d^2}{\frac{1}{4R_s^2} \left( \frac{\omega_T}{\omega} \right)^2 \bar{V}_s^2}$$

$$+ \frac{1}{4} \frac{1}{R_s} \frac{\omega_T}{j\omega} (R_s + j\omega L_g + j\omega L_s) \bar{i}_g \cdot \bar{i}_d^* - \frac{1}{4} \frac{1}{R_s} \frac{\omega_T}{j\omega} (R_s - j\omega L_g - j\omega L_s) \bar{i}_g^* \cdot \bar{i}_d$$

$$\frac{\frac{1}{4R_s^2} \left( \frac{\omega_T}{\omega} \right)^2 \bar{V}_s^2}{\frac{1}{4R_s^2} \left( \frac{\omega_T}{\omega} \right)^2 \bar{V}_s^2}$$