$$Q = \frac{\omega(L_g + L_s)}{2R_s} = \frac{\frac{1}{2R_s}}{\frac{1}{\omega C_{gs}}}$$

Numerator

Denominator

$$= \frac{1}{4R_s^2}\left(\frac{\omega_T}{\omega}\right)^2 \left\{ \overline{v_s}^2 + \overline{v_g}^2 + R_s^2(1+4Q^2)\overline{i_g}^2 \right\} + \frac{1}{4}\overline{i_d}^2 + \frac{1}{4R_s}\left(\frac{\omega_T}{j\omega}\right) R_s(1+j2Q)\overline{i_g \cdot i_d}^* - \frac{1}{4R_s}\left(\frac{\omega_T}{j\omega}\right) R_s(1-j2Q)\overline{i_g}^* \cdot \overline{i_d}$$

$$\overline{i_g \cdot i_d}^* = C\sqrt{\overline{i_g}^2 \cdot \overline{i_d}^2}$$

$$\overline{i_g}^* \overline{i_d} = C^* \sqrt{\overline{i_g}^2 \cdot \overline{i_d}^2}$$

$C = j0.395$

apply

$$= \frac{1}{4R_s^2}\left(\frac{\omega_T}{\omega}\right)^2 \left\{ \overline{v_s}^2 + \overline{v_g}^2 + R_s^2(1+4Q^2)\overline{i_g}^2 \right\} + \frac{1}{4}\overline{i_d}^2 + \frac{1}{4}\left(\frac{\omega_T}{j\omega}\right)\sqrt{\overline{i_g}^2 \cdot \overline{i_d}^2}\left\{ C(1+j2Q) - C^*(1-j2Q) \right\}$$

$$= \frac{1}{4R_s^2}\left(\frac{\omega_T}{\omega}\right)^2 \left\{ \overline{v_s}^2 + \overline{v_g}^2 + R_s^2(1+4Q^2)\overline{i_g}^2 \right\} + \frac{1}{4}\overline{i_d}^2 + \left(\frac{\omega_T}{j\omega}\right)\sqrt{\overline{i_g}^2 \cdot \overline{i_d}^2} \times \frac{C}{2}$$

uncorrelated noise

correlated noise