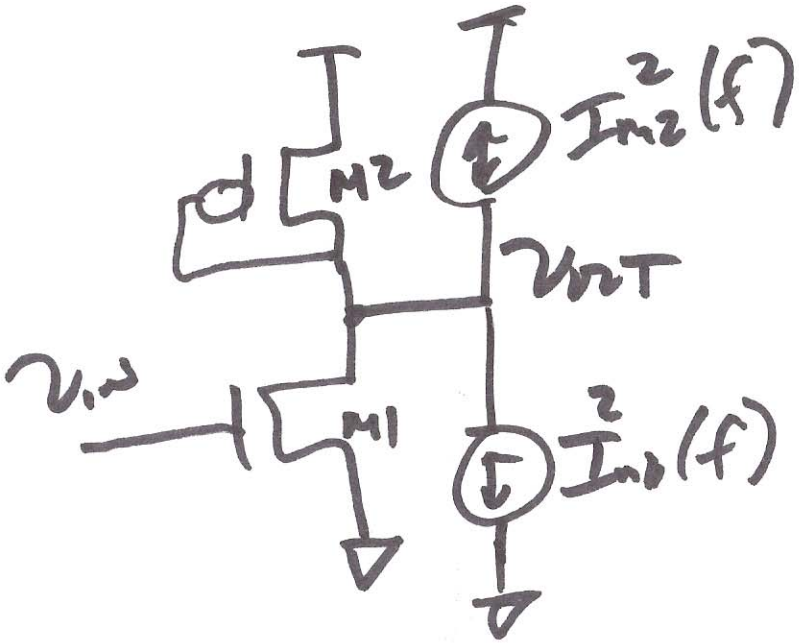
$$I_{D1}^2(f) = \underbrace{\frac{KF \cdot I_D^{AF}}{f \cdot C_{ox}' \cdot L \cdot W}}_{\text{flicker noise}} + \underbrace{\frac{8kT}{3} \cdot g_m}_{\text{Thermal noise}}, \frac{A^2}{Hz}$$

Fig. 21.14 CS with gate-drain connected load



$$V_{o,noise}^2(f) = \left(\frac{1}{g_{m2}}\right)^2 \cdot \left(I_{n1}^2(f) + I_{n2}^2(f)\right)$$

$$\text{Gain} = \frac{1/g_{m2}}{1/g_{m1}} = \frac{g_{m1}}{g_{m2}}$$

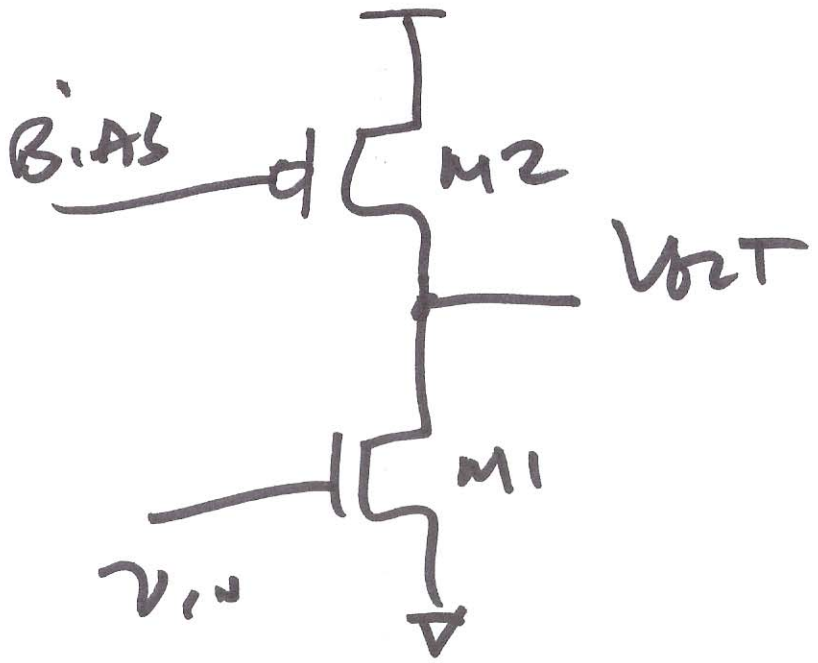
Input referred Noise

$$V_{iNOISE}^2(f) = \frac{\left(I_{n1}^2(f) + I_{n2}(f)^2\right)\left(\frac{1}{g_{m2}}\right)^2}{\left(\frac{g_{m1}}{g_{m2}}\right)^2}$$

Low Noise g_{m2} ↓ (↑) ↓

g_{m1} ↑ I_{n2} ↓

Fig. 21.17



Eq. 21.74

$$V_{oNoise}^2(f) = \left(I_{n1}^2 + I_{n2}^2\right)\left(r_{o1} \| r_{o2}\right)^2$$

$$A^2 = g_{m1}^2 \cdot \left(r_{o1} \| r_{o2}\right)^2$$

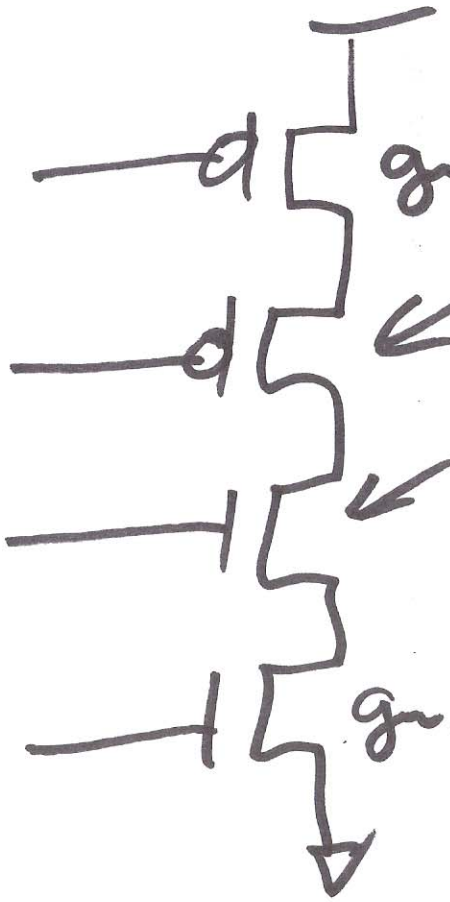
$$V_{iNoise}^2(f) = \frac{I_{n1}^2 + I_{n2}^2}{g_{m1}^2}$$

$g_{m2} \downarrow \quad I_{n2} \downarrow \quad V_{iNoise} \downarrow$

$g_{m1} \uparrow \quad V_{iNoise} \downarrow$

1.34V
$g_{m2} \downarrow$ 0.84V
$g_{m1} \uparrow$ 0.83V

3)



g_m ↘ NOISE ↘

CASCODE don't contribute much to OUTPUT NOISE

g_m ↗ NOISE ↘

SAME NOISE PERFORMANCE AS CS WITH CURRENT MIRROR LOAD

Fig. 21.35

464V

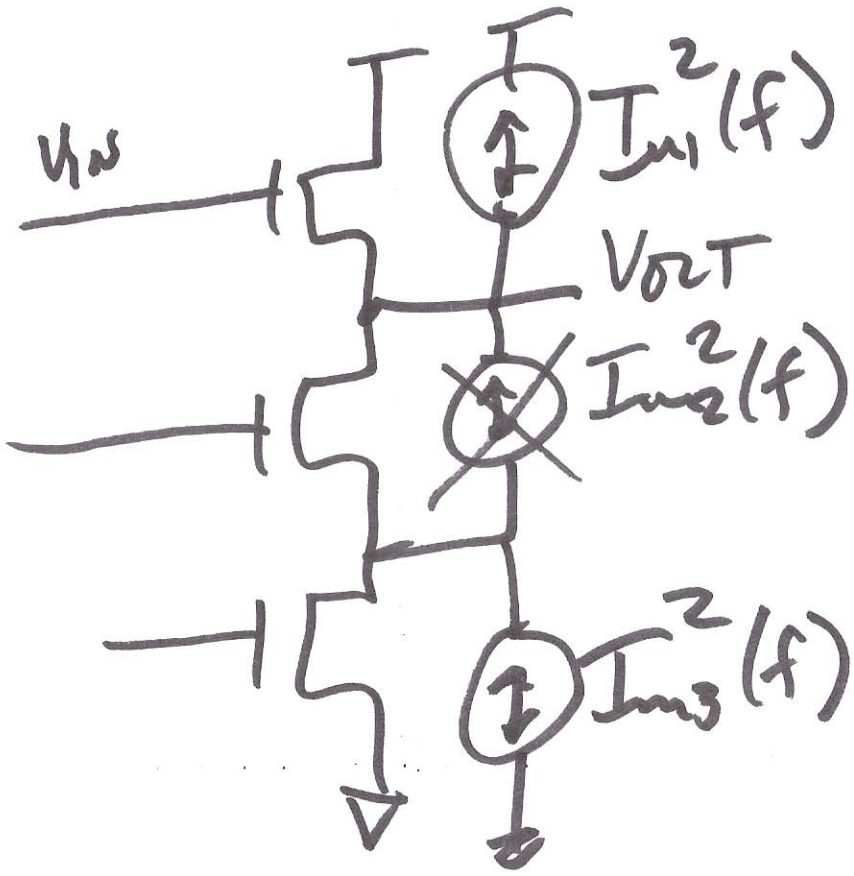
g_{m2} ↘ 40.4V

G_{m1} ↗ 36.4V

↑ load

4)

Fig 21.44



$$V_{OUT,\,noise}^2(f) = \left(I_{n1}^2(f) + I_{n2}^2(f)\right) \cdot \left(\frac{1}{g_{m1}} \,||\, R_{OUTS}\right)^2$$

Use large g_{m1} to reduce output noise