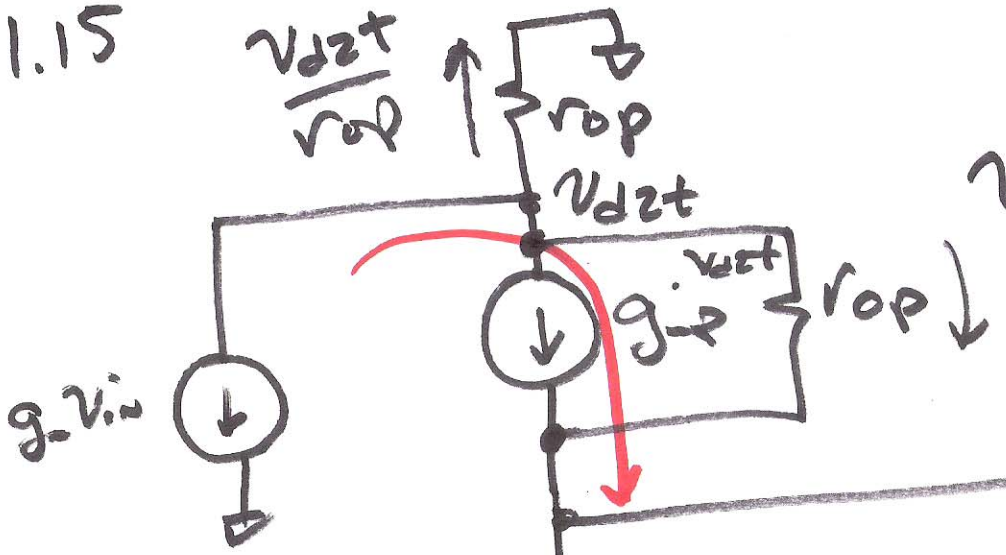
Ch 21 Sec. 21.3

Push-Pull amplifier

A21.15



$$\frac{v_{out}}{R_{OCMSN}} = g_{mp}v_{dzt} + \frac{v_{dzt} - v_{out}}{r_{op}}$$

$$g_m v_{in} + \frac{v_{dzt}}{r_{op}} + g_{mp}v_{dzt} + \frac{v_{dzt} - v_{out}}{r_{op}} = 0$$

$$g_m v_{in} + \frac{v_{dzt}}{r_{op}} + \frac{v_{out}}{R_{OCMSN}} = 0$$

$$\frac{v_{dzt} - v_{out}}{r_{op}} \quad \frac{v_{out}}{g_m v_{in}} = R_{OCMSN}$$

$$\frac{v_{out}}{v_{in}} = -g_m R_{OCMSN}$$

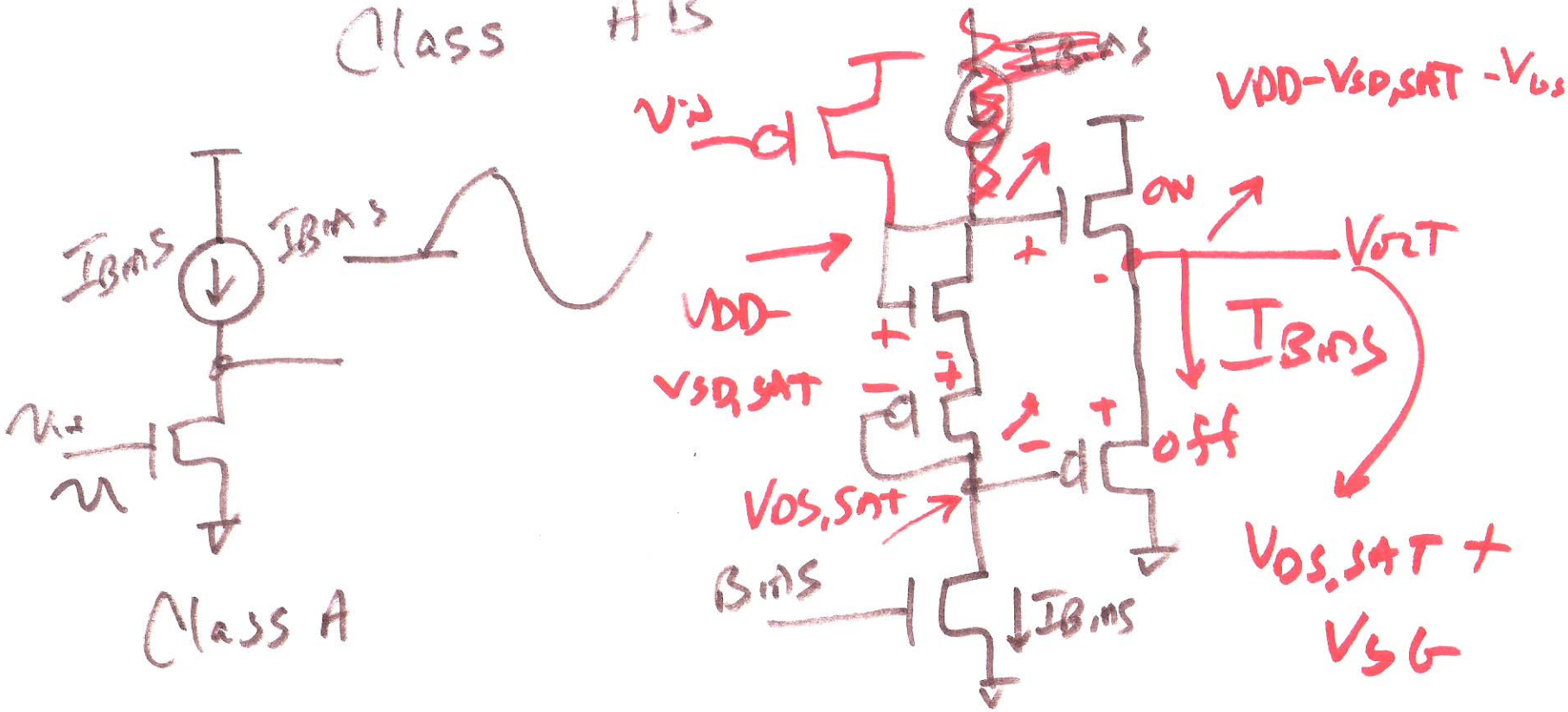
$$= 1504 \cdot 375G$$

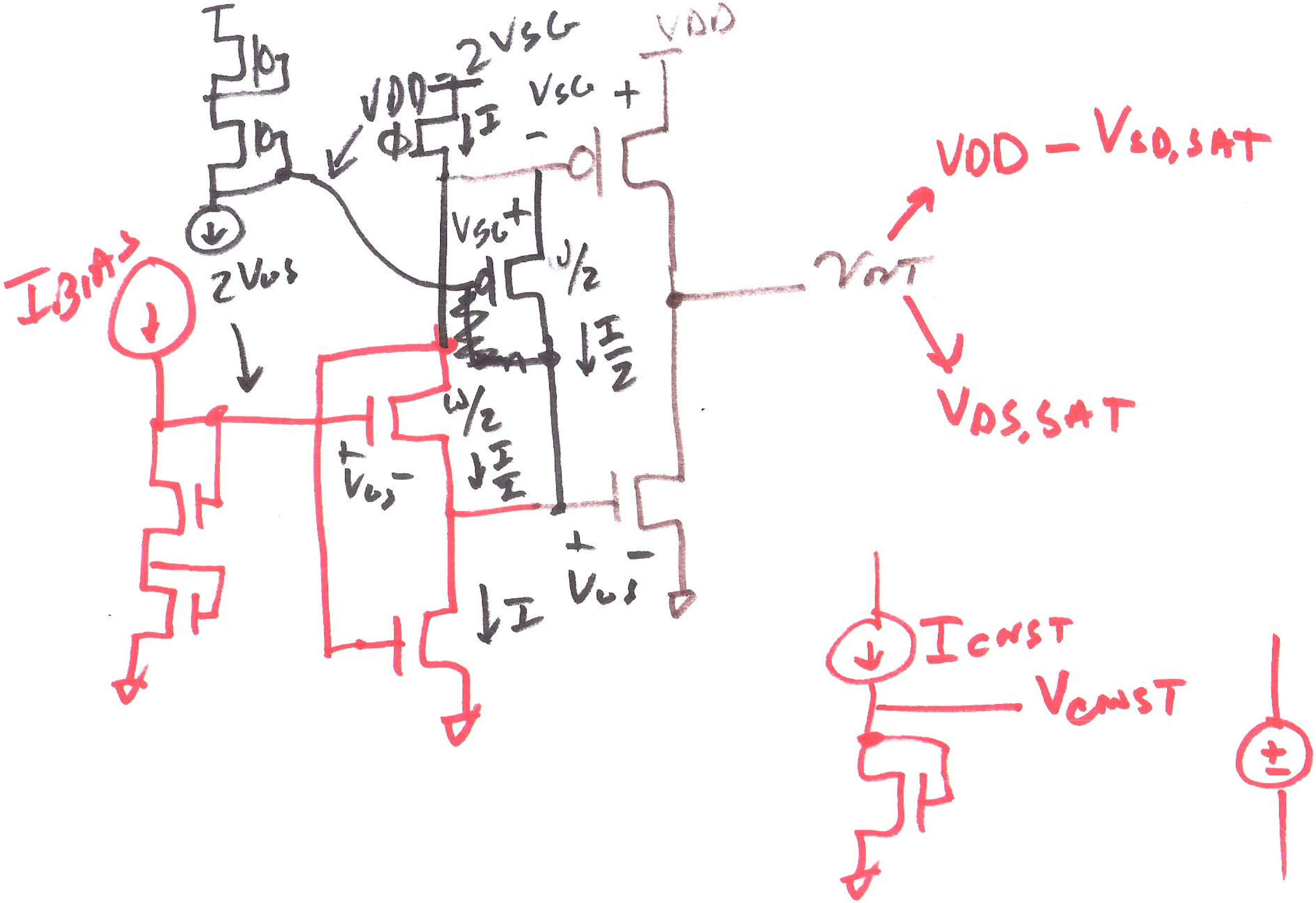
$$= 3.75G$$

$$v_{out} \simeq -g_m v_{in} R_{OCMSN}$$

Push-pull Amplifiers

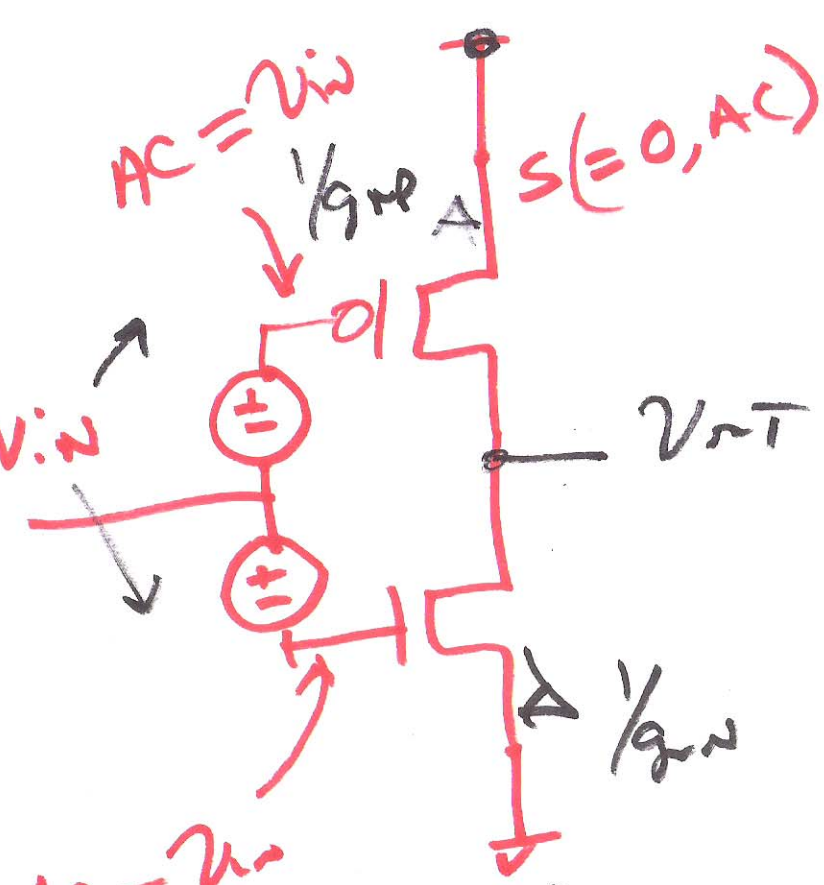
Class AB

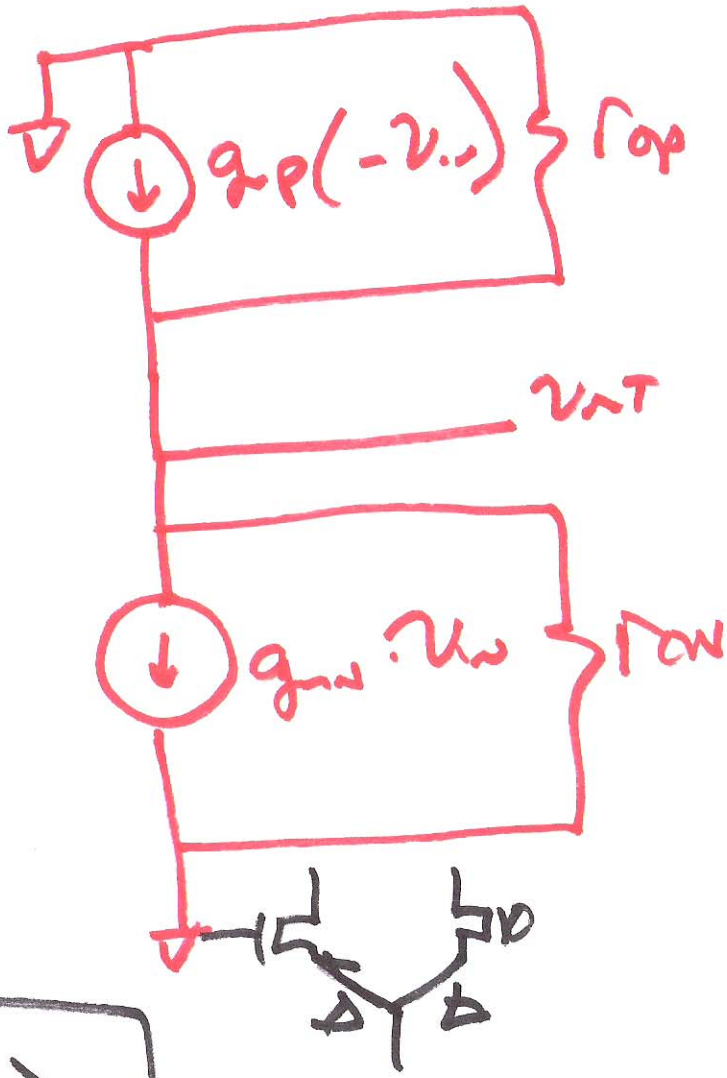




$$\frac{\frac{1}{g_{mN}} \parallel \frac{1}{g_{mP}}}{\frac{1}{g_{mN}} + \frac{1}{g_{mP}}}$$

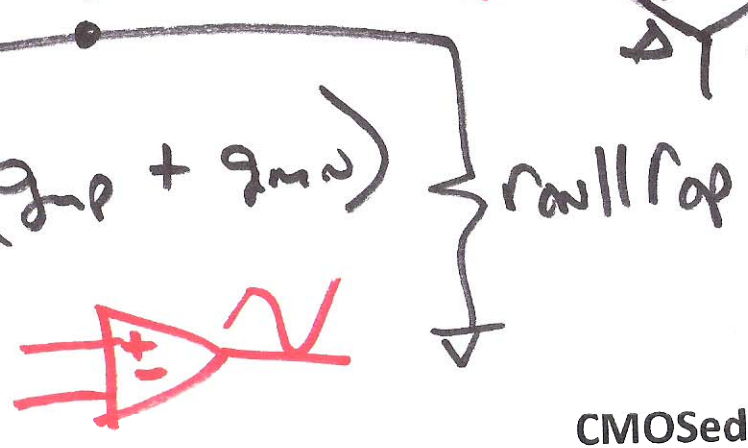
$$\frac{1}{g_{mN} + g_{mP}}$$





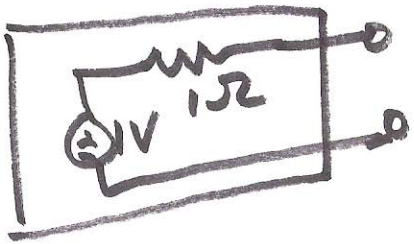
$$v_{out} = -v_{in}(g_{mP} + g_{mN})\, r_{oN} \parallel r_{oP}$$

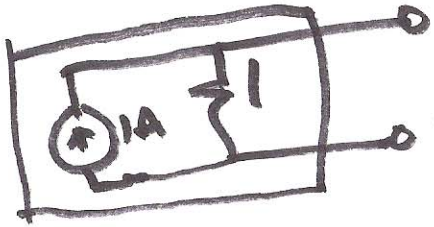
$$\frac{v_{out}}{v_{in}} = -\frac{r_{oN} \parallel r_{oP}}{\frac{1}{g_{mP} + g_{mN}}}$$



$$\frac{v_{out}}{v_{in}} = -(g_p + g_n)(r_{on} \| r_{op})$$

$$= -\left(\sqrt{\beta_p \cdot 2(I_D + i_d)} + \sqrt{\beta_n \cdot 2(I_D + i_d)}\right) \cdot \left(\frac{1}{\lambda_N (I_D + i_d)} \| \frac{1}{\lambda_p (I_D + i_d)}\right)$$





Normally we assume

$i_d \ll I_D$

$i_d + I_D \simeq I_D$

$$R_{ms} = \frac{V_{DD}/2}{\sqrt{2}}$$