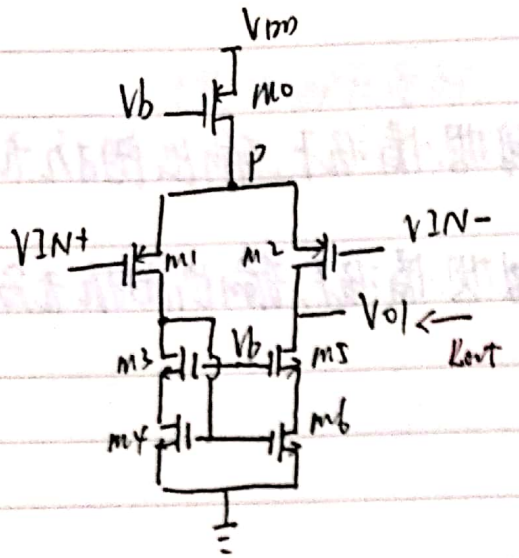
增益计算



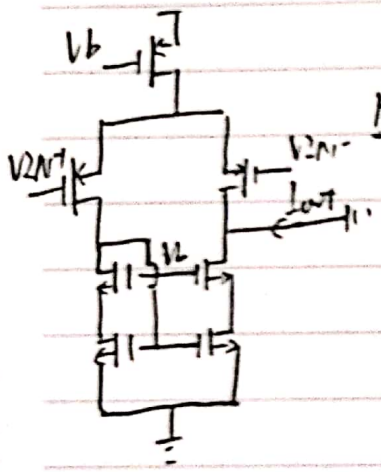
可以把 Vp 看成接地.

那么 M2 和 M5.M6 是并联关系

M5.M6 可以简单看成 cascode

M5.M6 输入阻抗约为

$(1+g_{m5}r_{o5})r_{o6}+r_{o5}$



$I_{D1}=|I_{D3}|=|I_{D4}|=|I_{D5}|=|I_{D6}|=I_{D2}$

且 $I_{D1}=-g_{m1,2}\frac{V_{in}}{2}$

从图 $I_{out}=-g_{m1,2}V_{in}$

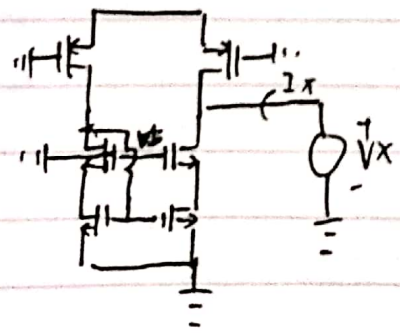
故 $|G_m|=g_{m,2}$

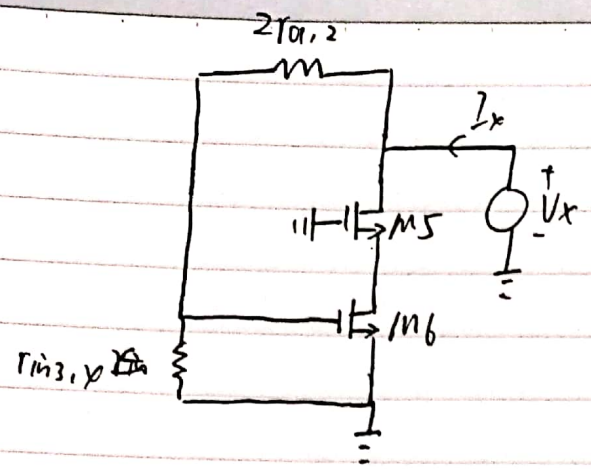
$|A_v|=G_mR_{out}$

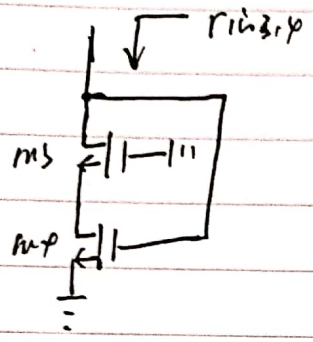
$=g_{m1,2}\cdot\{r_{o2}\,//\,[(1+g_{m5}r_{o5})r_{o6}+r_{o5}]\}$

如果按两种画些.(按书上的(第二版)137页计算)

$|G_m|=g_{m1,2}$



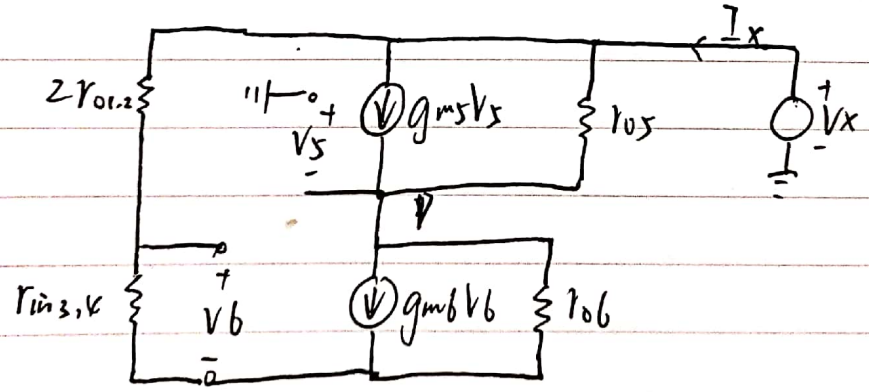




画等效电阻图可算得

$$r_{in3,4} = \frac{r_{o3} + r_{o4} + g_m r_{o3} r_{o4}}{1 + (g_m r_{o3} + 1) g_m r_{o4}}$$

则 $$V_{as6} = \frac{r_{in3,4}}{r_{in3,4} + 2r_{o1,2}} \cdot V_x$$



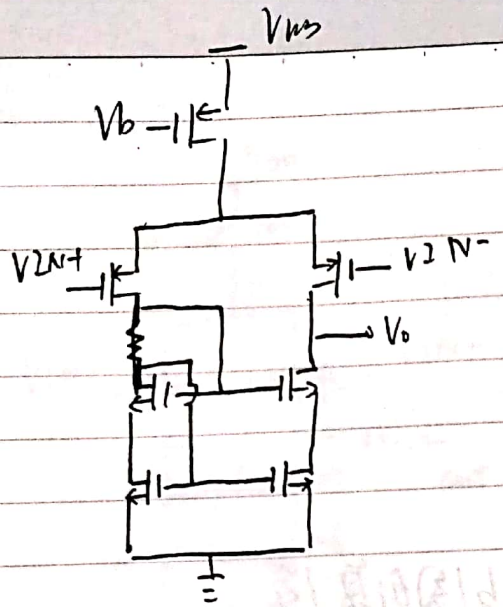
$$V_6 = \frac{r_{in3,4}}{r_{o1,2} + r_{in3,4}} \cdot V_x$$

$$I_x = g_m V_6 + \frac{V_p}{r_{o6}} \Rightarrow V_p = (I_x - g_{m6} V_6) r_{o6}$$

$$= g_{m5}(-V_p) + \frac{V_x - V_p}{r_{o5}}$$

$$V_p = -V_5$$

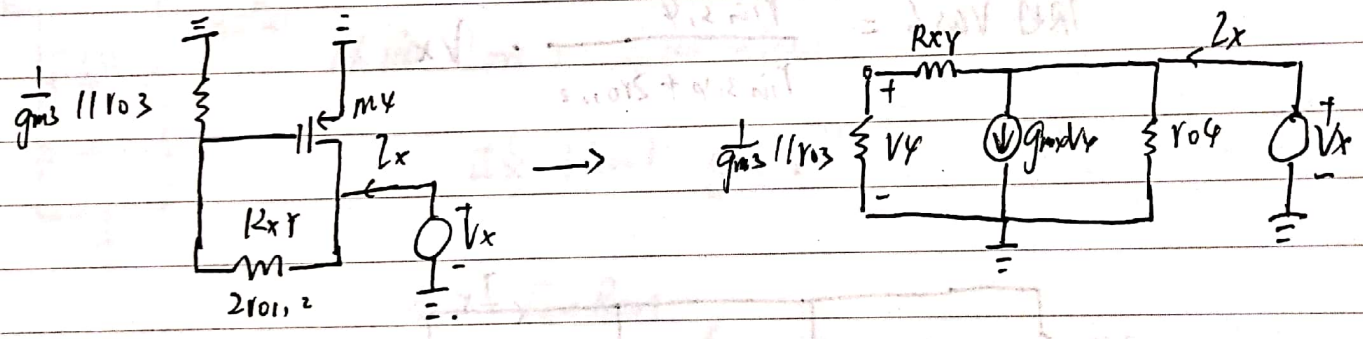
…… 可算出，~~Rout~~ $R_{out} = \frac{V_x}{I_x} = \cdots$ （略）



这个结构叫前面类似

关于拉扎维(第二版) P139 五管放大 Av 计算

$|G_m| = g_{m1,2}$



$$V_y = \frac{\frac{1}{g_{m3}} \parallel r_{o3}}{R_{xy} + \frac{1}{g_{m3}} \parallel r_{o3}} \cdot V_x$$

$$\cancel{I_x = g_m V_y}$$

$$I_x = \frac{V_x}{R_{xy} + \frac{1}{g_{m3}} \parallel r_{o3}} + g_m V_y + \frac{V_x}{r_{oy}}$$

$$= \frac{V_x}{2r_{o1,2} + \frac{1}{g_{m3}} \parallel r_{o3}} \left[1 + \left(\frac{1}{g_{m3}} \parallel r_{o3}\right) g_{mx}\right] + \frac{V_x}{r_{oy}}$$