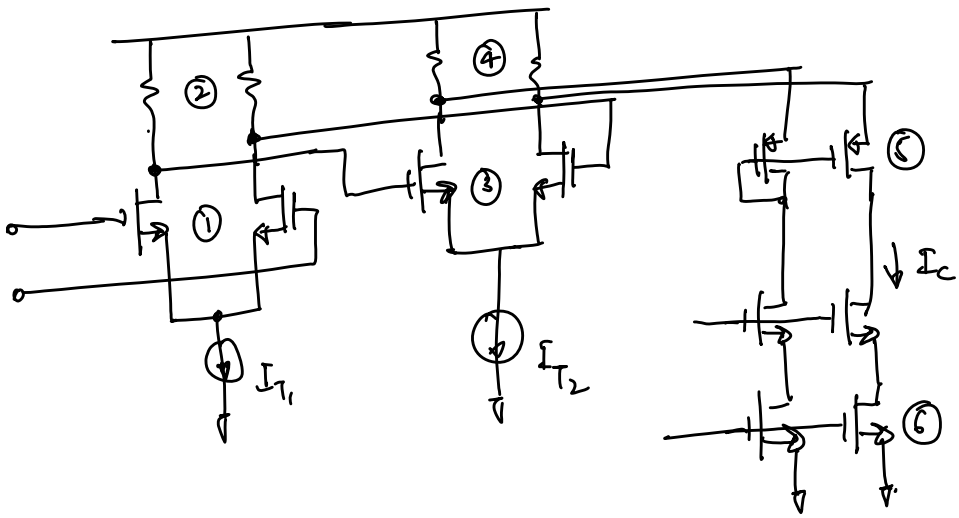
HS COMP OFFSET ANALYSIS



$$V_{OS_1} = \Delta V_{TH_1}$$

$V_{OS_2} =$

$$\Delta V_{OUT} = \left| \frac{I_{T_1}}{2}\left(R_2 - \frac{\Delta R_2}{2}\right) - \frac{I_{T_1}}{2}\left(R_2 + \frac{\Delta R_2}{2}\right) \right|$$

$$= \frac{I_{T_1}}{2}\Delta R_2 = g_{m_1} R_2 V_{OS_2}$$

$$\therefore \; V_{OS_2} = \frac{I_{T_1}}{2}\frac{\Delta R_2}{g_{m_1} R_2}$$

$$V_{OS_3} = \frac{\Delta V_{TH_3}}{g_{m_1} R_2}$$

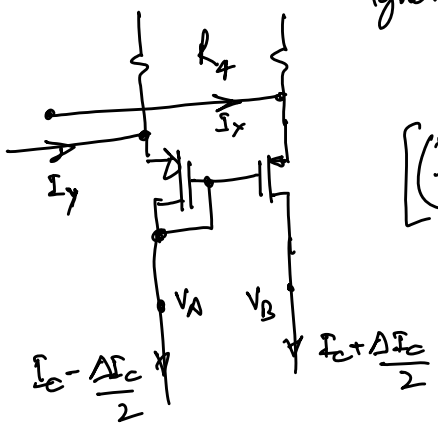
$$g_{m_1} R_2 \, g_{m_3} R_4 \, V_{OS_4} = \left| \left(I_c + \frac{I_{T_2}}{2}\right)\left(R_4 - \frac{\Delta R_4}{2}\right) - \left(I_c + \frac{I_{T_2}}{2}\right)\left(R_4 + \frac{\Delta R_4}{2}\right) \right|$$

$$= \left(I_c + \frac{I_{T_2}}{2}\right)\Delta R_4$$

$$\text{or} \quad V_{OS4} = \left(I_c + \frac{I_{T_2}}{2}\right)\frac{\Delta R_4}{g_{m_1} R_2 \, g_{m_3} R_4}$$

$$V_{OS5} = \frac{\Delta V_{TH3}}{g_{m3} R_4 g_{m1} R_2}$$

V_{OS6}:



Ignoring Body Effect due to mismatched currents

$V_A = V_B \therefore$

$$\left[\left(\cancel{I_c} - \frac{\Delta I_c}{2}\right) - I_y\right] R_4 + \cancel{V_{gs5}} - \frac{\Delta V_{gs5}}{2}$$

$$= \left[\left(\cancel{I_c} + \frac{\Delta I_c}{2}\right) - I_x\right] R_4 + \cancel{V_{gs5}} + \frac{\Delta V_{gs5}}{2}$$

$$(I_x - I_y) R_4 = \Delta I_c R_4 + \Delta V_{gs5}$$

$$\Delta V_{gs5} = \frac{\Delta I_c}{g_{m5}}$$

$$\therefore I_x - I_y = \Delta I_c + \frac{\Delta I_c}{g_{m5} R_4}$$

$$V_{OS6} = \Delta I_c \left(1 + \frac{1}{g_{m5} R_4}\right) \cdot \frac{1}{g_{m3}} \cdot \frac{1}{g_{m1} R_2}$$