15/10/14

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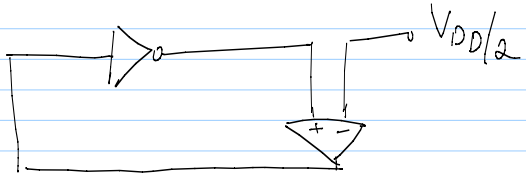
If $V_{Tn} = V_{Tp}$

$$\frac{(W/L)_p}{(W/L)_n} = \frac{\mu_n}{\mu_p}$$

$$\Rightarrow V_B = \frac{V_{DD}}{2}$$



V_X

$$V_{D_p} - V_{G_p} = V_{T_p}$$

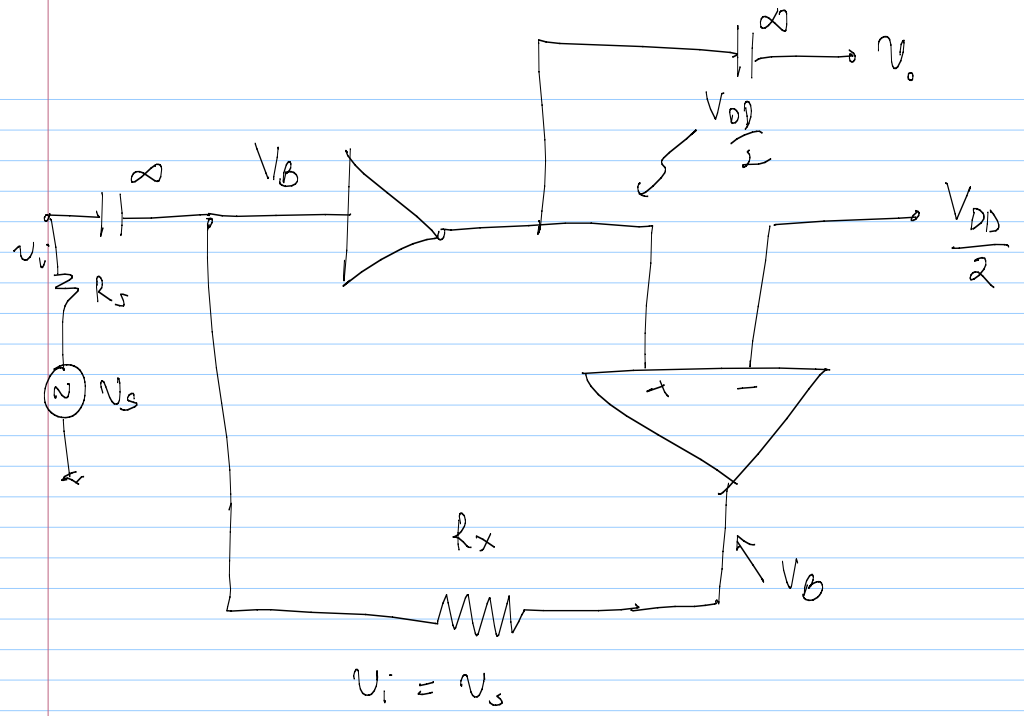
$$V_X - V_B = V_{T_p}$$

$$V_X = V_B + V_{T_p}$$

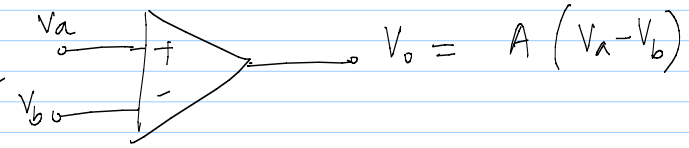
V_Y

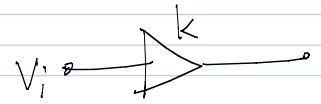
$$V_{D_n} = V_{G_n} - V_{T_n}$$

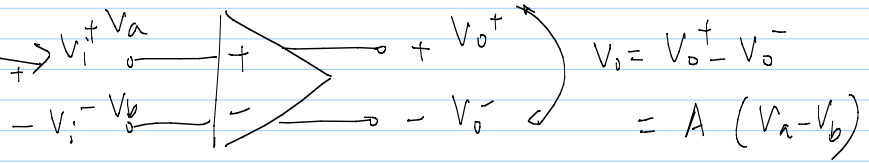
$$V_Y = V_B - V_{T_n}$$

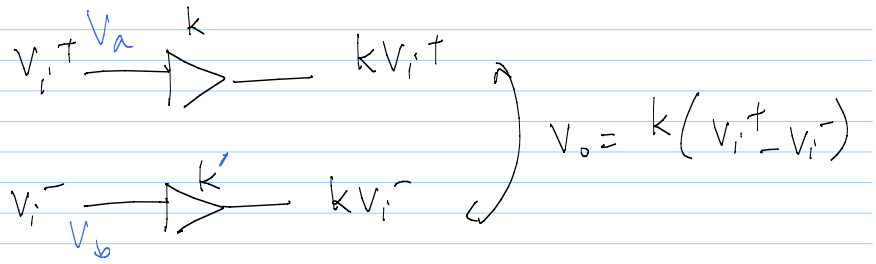


Differential Amplifiers



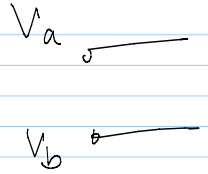






$$V_o = kV_a - k'V_b$$

$$= k(V_a - V_b) + (k - k')V_b$$



$$V_a = \frac{V_a - V_b}{2} + \frac{(V_a + V_b)}{2}$$

$$V_b = -\left[\frac{V_a - V_b}{2}\right] + \frac{(V_a + V_b)}{2}$$

$\frac{V_a - V_b}{2} = V_{dm}$ differential mode voltage

$\frac{V_a + V_b}{2} = V_{cm}$ common-mode voltage

$$V_a = V_{cm} + V_{dm}$$

$$V_b = V_{cm} - V_{dm}$$