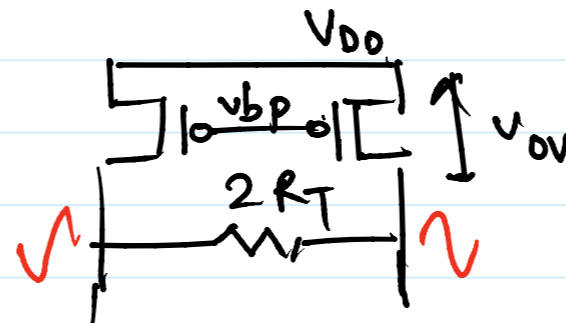
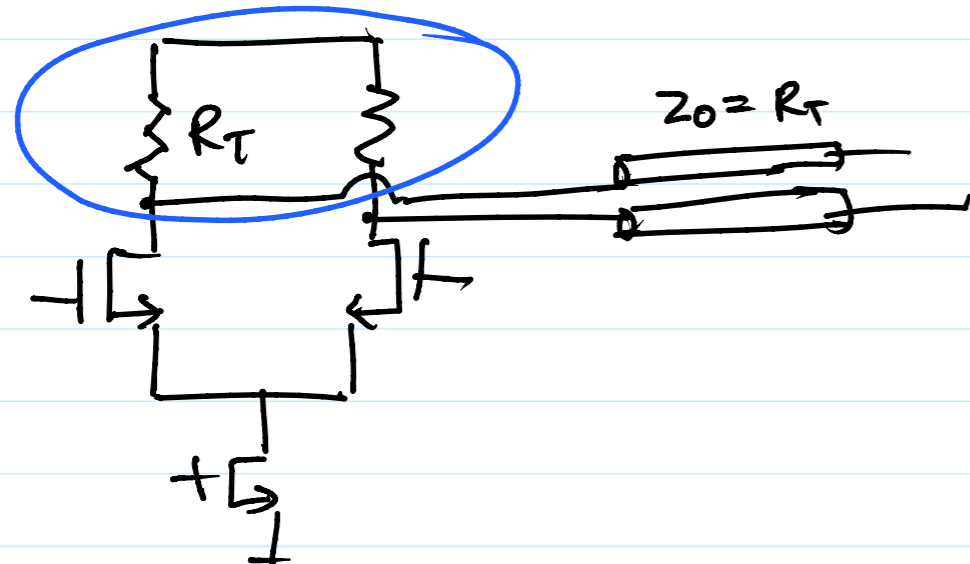
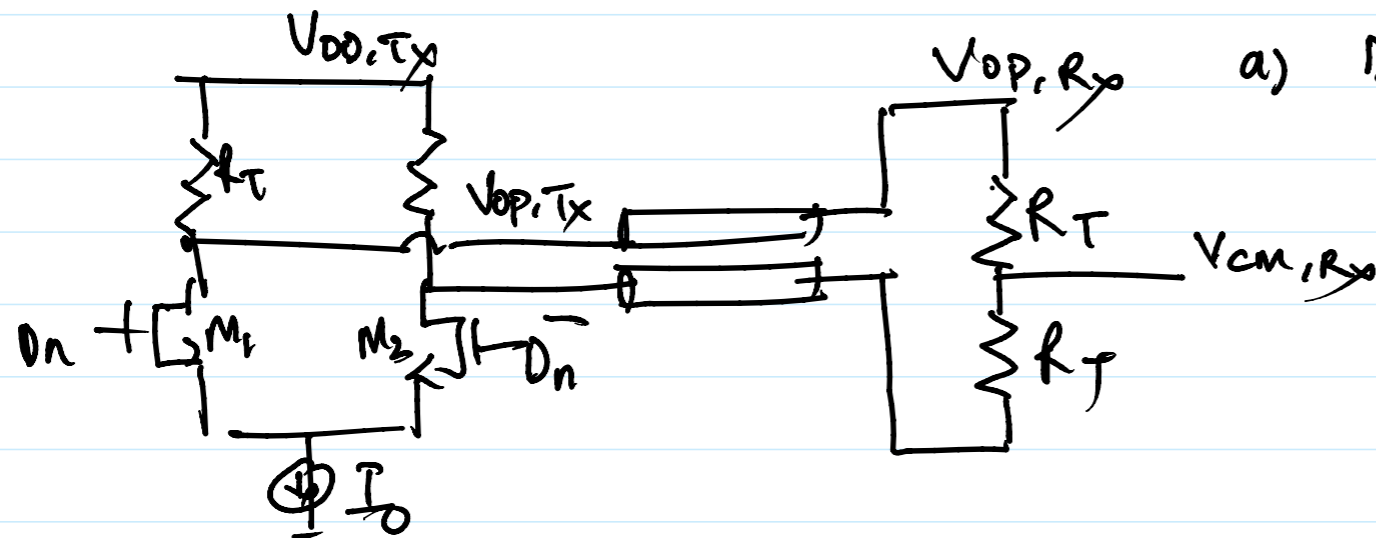
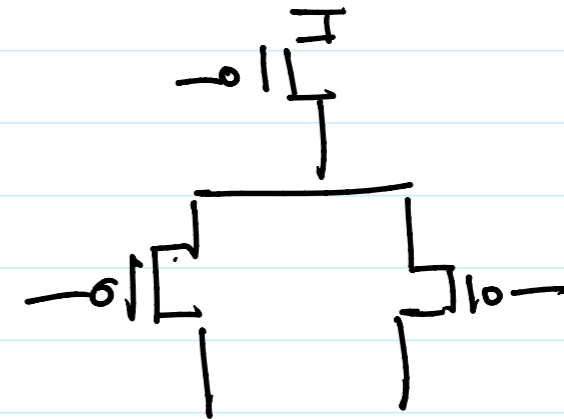


Lecture 35

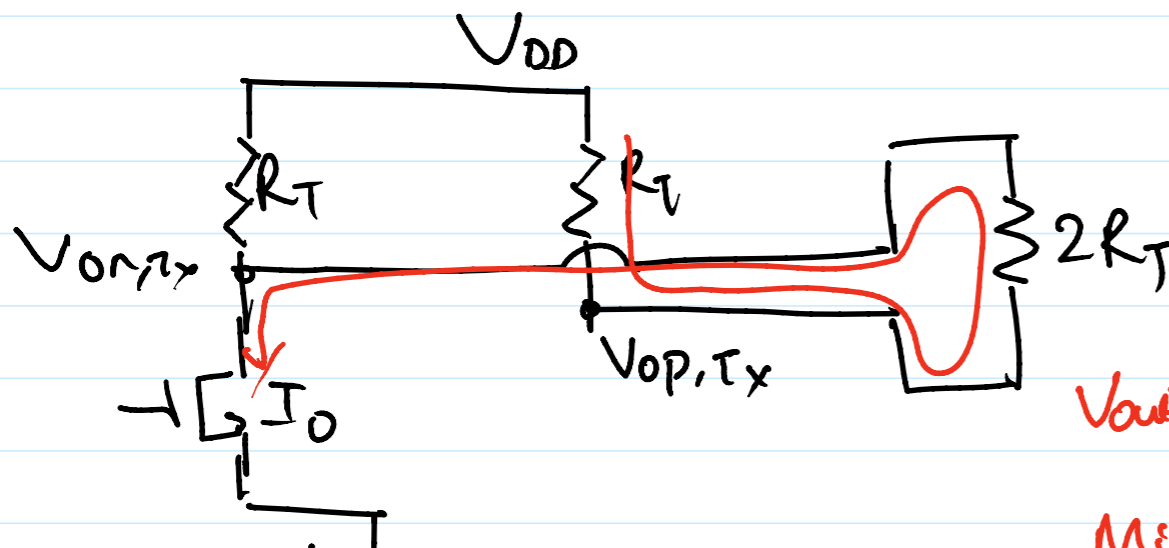
CML o/p driver



LVDS



a) Differential termination



$$V_{on, Tx} = V_{DD} - \frac{3}{4} I_0 R_T$$

$$V_{op, Tx} = V_{DD} - \frac{I_0}{4} R_T$$

$$V_{out} = V_{op, Tx} - V_{on, Tx} = \frac{I_0}{2} R_T$$

Minimum current - I_0

Common mode term.

$$V_{on, Tx} = V_{DD, Tx} - \frac{I_0}{2} R_T$$

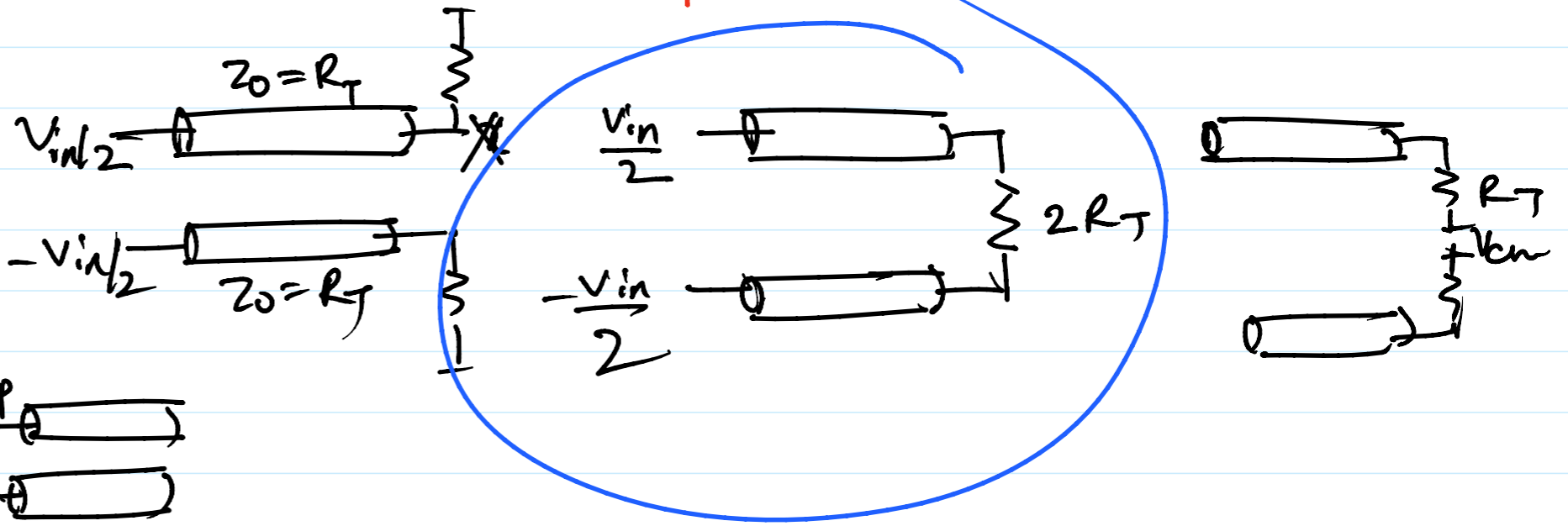
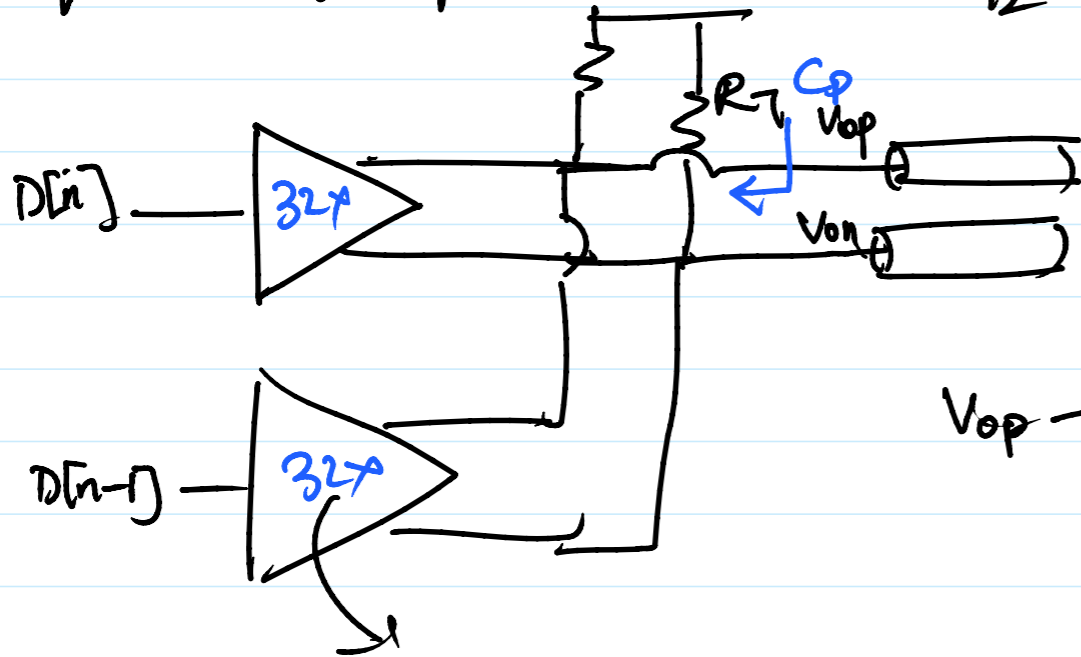
$$V_{op, Tx} = V_{DD}$$



Minimum current = $\frac{I_0}{4}$

CML Eq.

$$h_{eq}(z) = d_0 + \alpha_1 z^{-1}$$



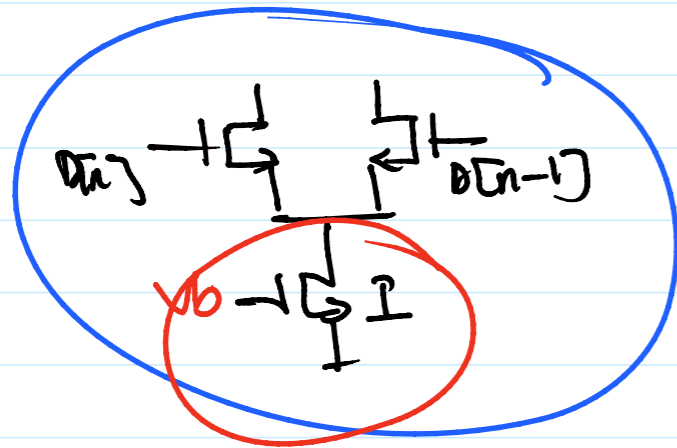
$$V_{op} - V_{on} = (I_{main} D_n - I_{post} D_{n-1}) \frac{R_T}{2}$$

$$= \underbrace{(I_{ma} + I_{po})}_{I_0} \frac{R_T}{2} \left(\frac{I_{ma}}{I_0} D_n - \frac{I_{po}}{I_0} D_{n-1} \right)$$

$$= \frac{I_0 R_T}{2} (d_0 D_n - \alpha_1 D_{n-1})$$

$$0 \leq I_{ma} \leq I_0, \quad 0 \leq I_{po} \leq I_0$$

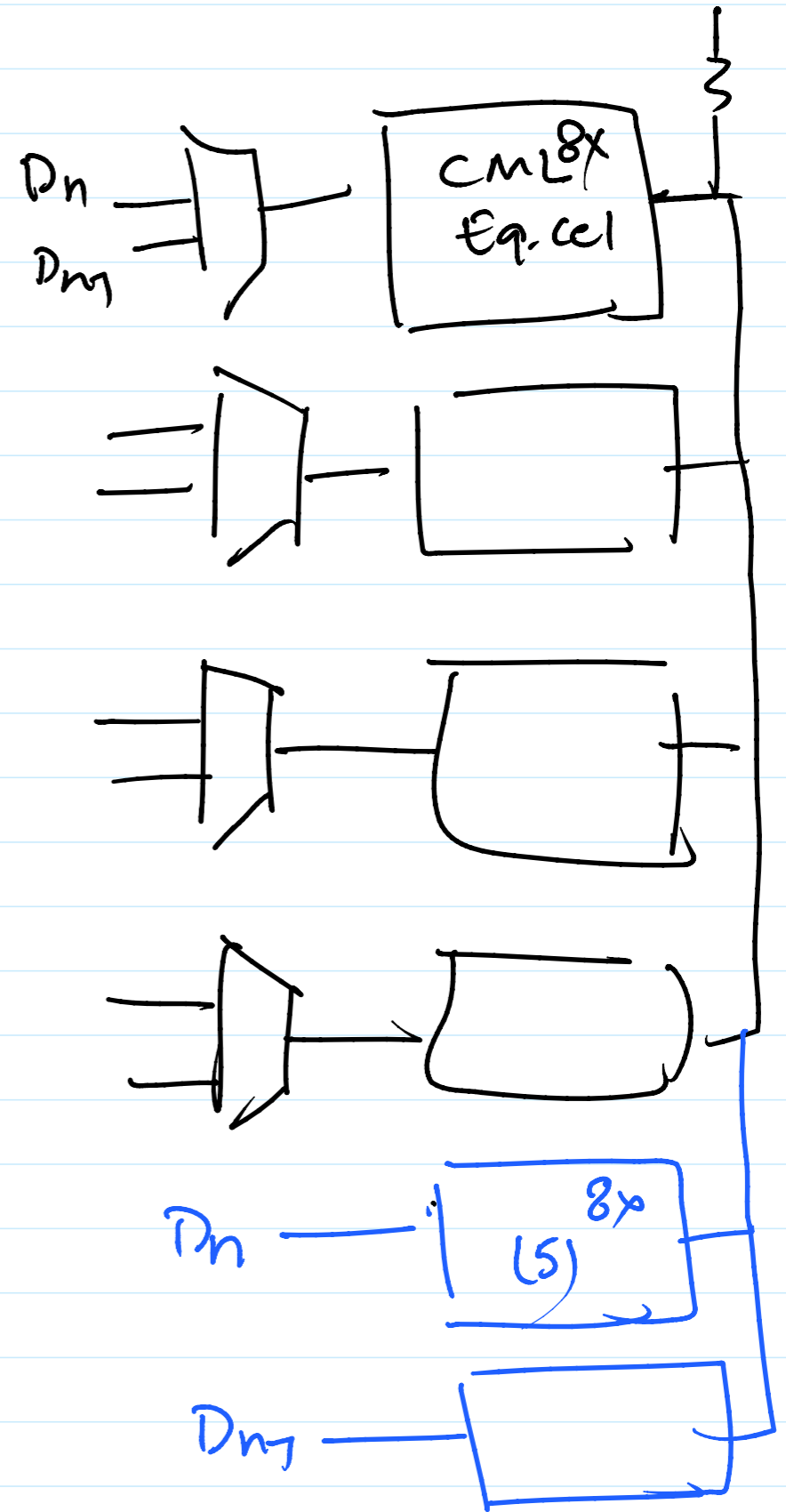
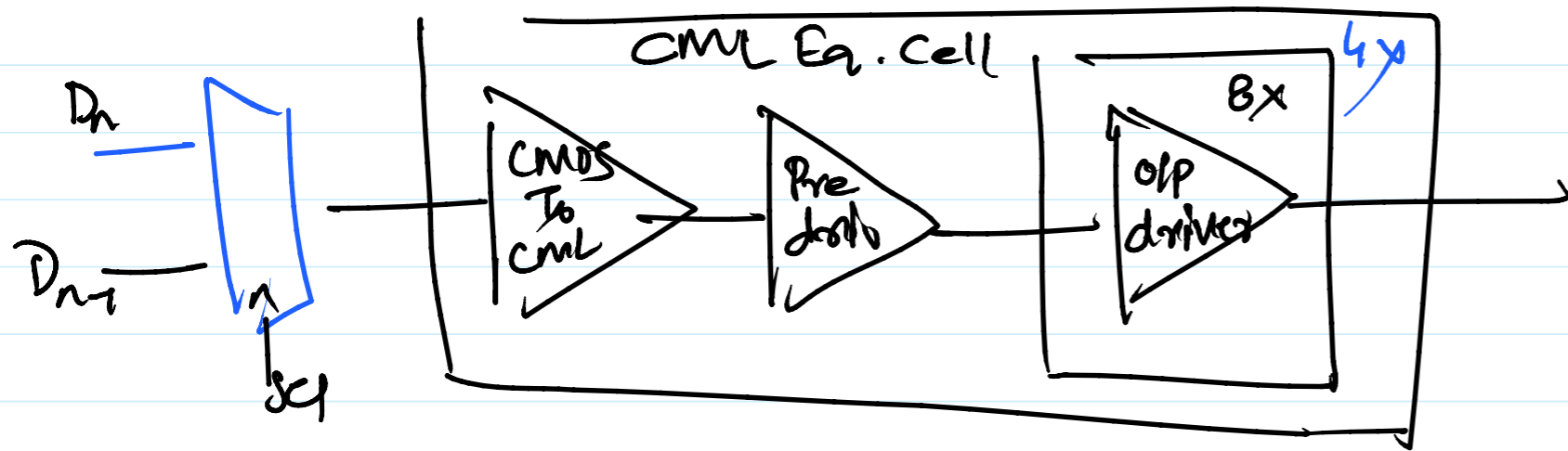
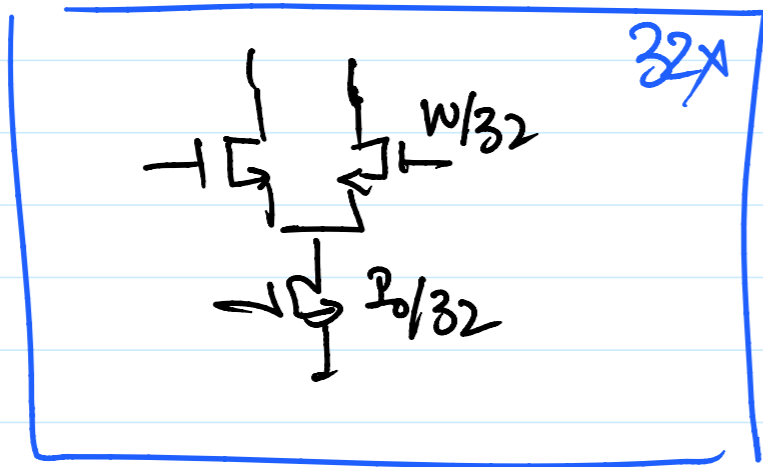
$$I_{ma} = \frac{3}{4} I_0, \quad I_{po} = \frac{I_0}{4}$$



Resolution = $\frac{I_0}{32}$



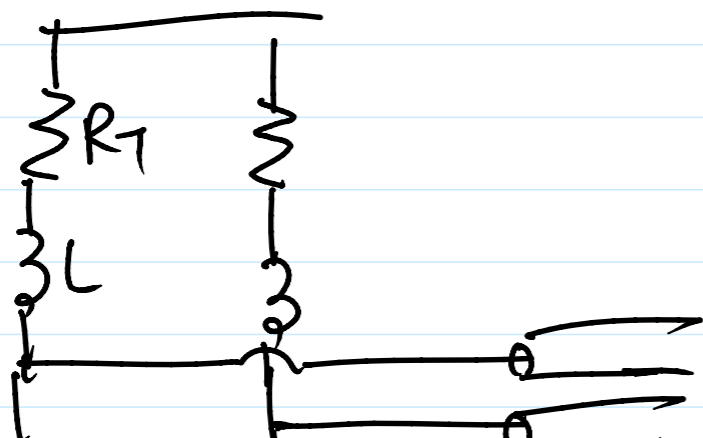
32



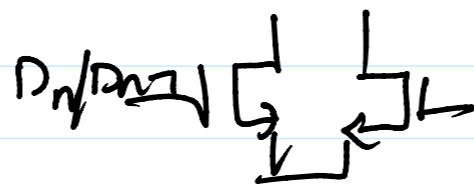
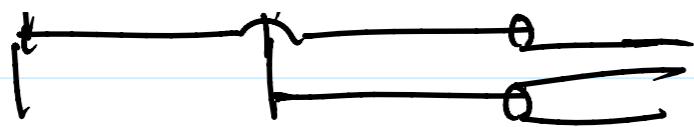
$I_{\text{post cursor}} = 3 \text{ cells}$

$I_{\text{main cursor}} = 24 \text{ cells}$

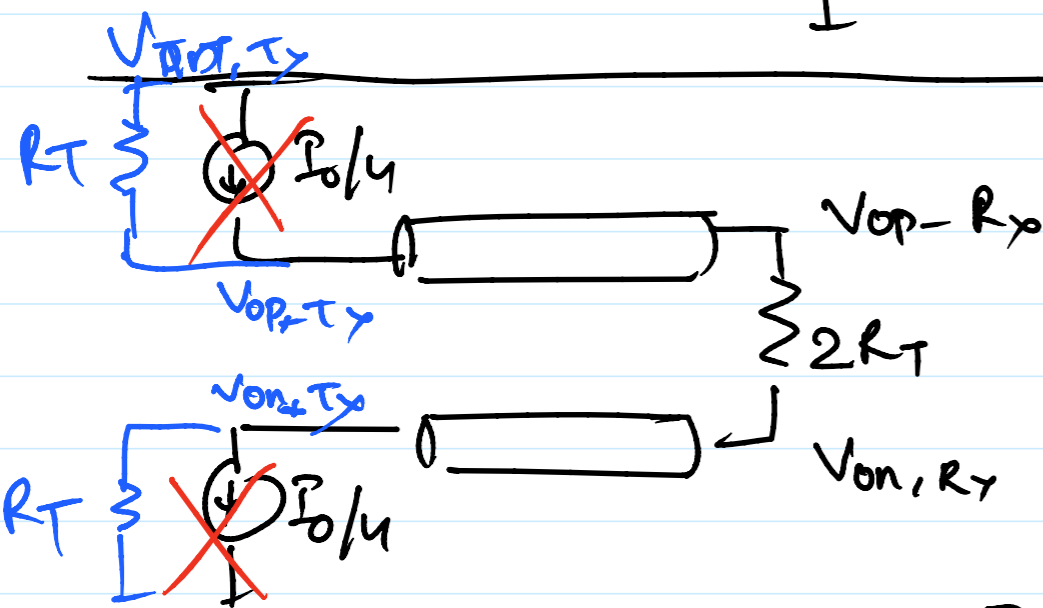
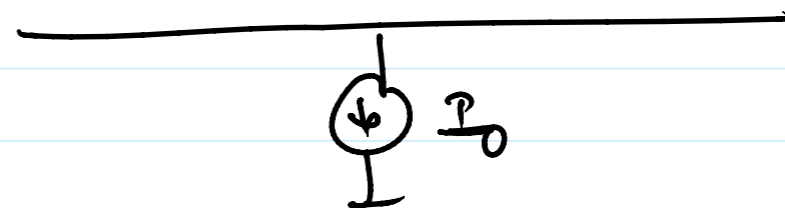
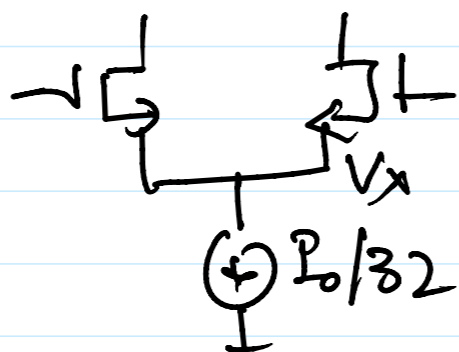
$$\frac{I_{\text{post}}}{I_{\text{main}}} = \frac{3}{32}$$



$D_n/D_m \rightarrow L_1$



32 cells



$$V_{op-Rx} - V_{on-Rx} = V_{out} = \frac{I_0}{4} (2R_T) = \frac{P_0 R_T}{2}$$

$$\frac{I_0}{4} = \frac{V_{DD,Tx}}{4R_T}$$

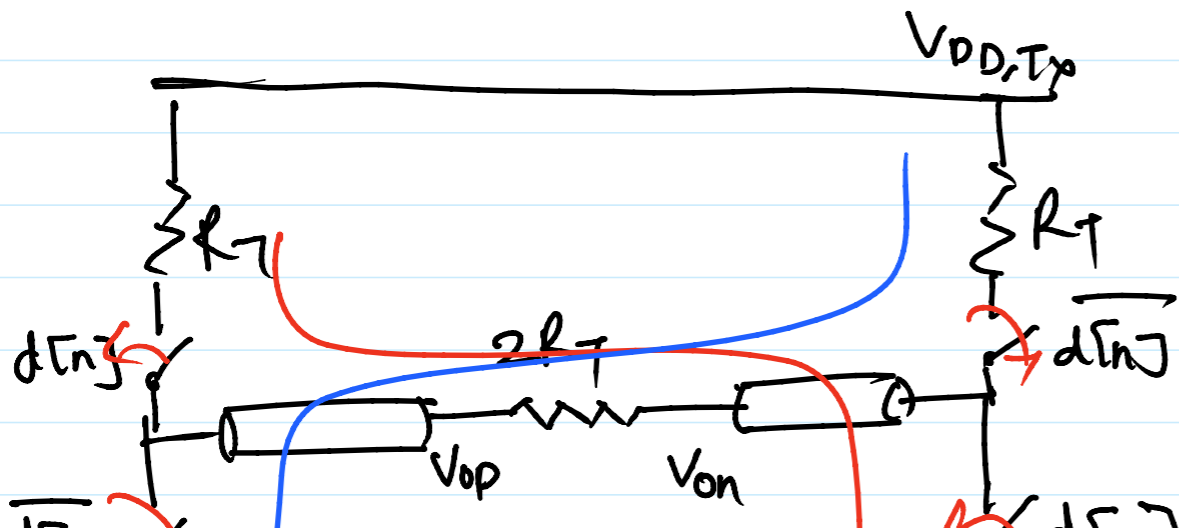
VM o/p driver

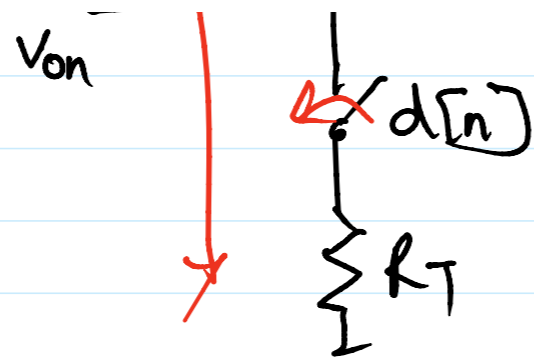
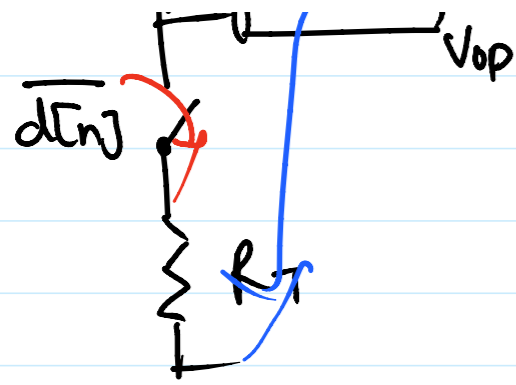
For CML o/p driver, $V_{out} = \frac{P_0 R_T}{2} \Rightarrow I_0 = 2 \frac{V_{out}}{R_T}$

For VM o/p driver, $I = \frac{V_{DD,Tx}}{4R_T} = \frac{V_{out}}{2R_T}$

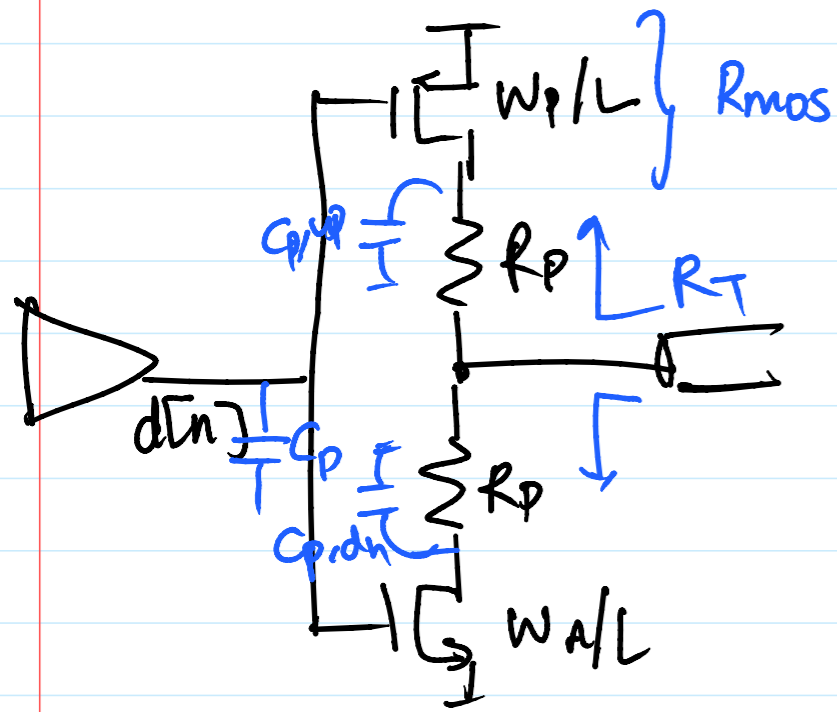
$$I_{VM,drv} = \frac{P_{CML,drv}}{4}$$

$$V_{op} - V_{on} = D_n \left(\frac{V_{DD,Tx}}{2} \right)$$





High-swing o/p driver



$$R_T = R_p + R_{pmos} = R_p + R_{nmos}$$

if $R_T = 50 \Omega$,

- 1) $R_p = 45 \Omega$, $R_{nmos} = 5 \mu$
- 2) $R_p = 5 \mu$, $R_{nmos} = 45 \Omega$

R_{nmos} low
Parasitic cap \uparrow

