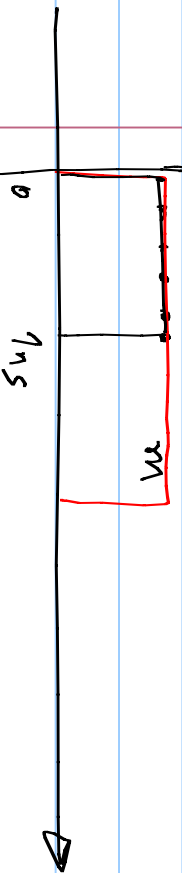
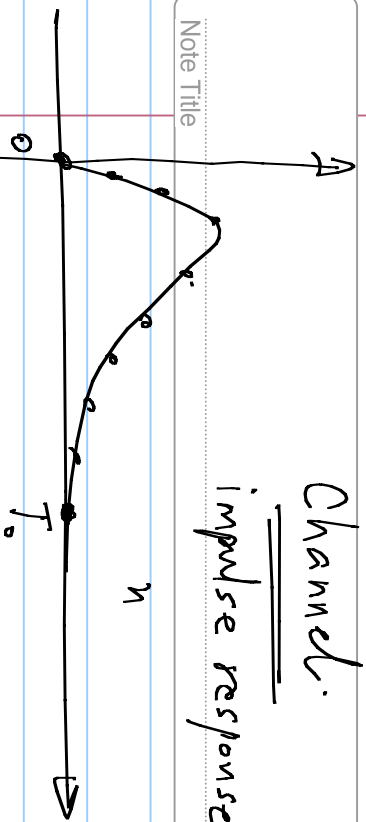


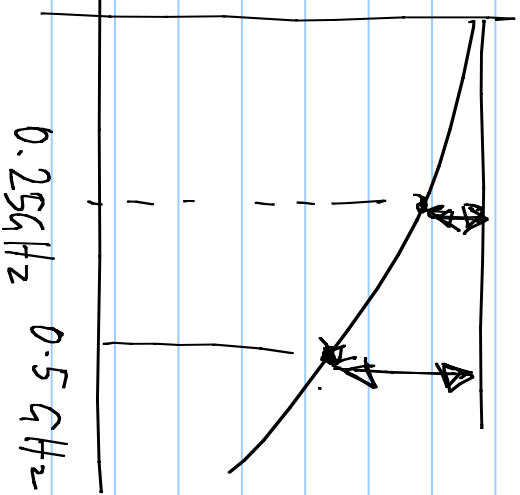
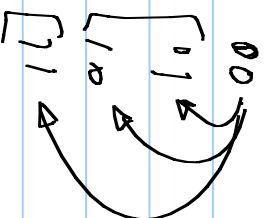
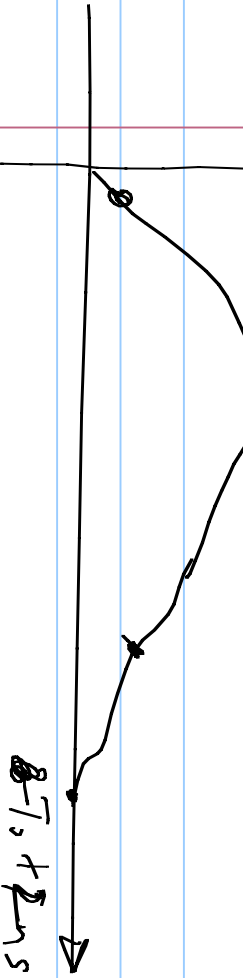
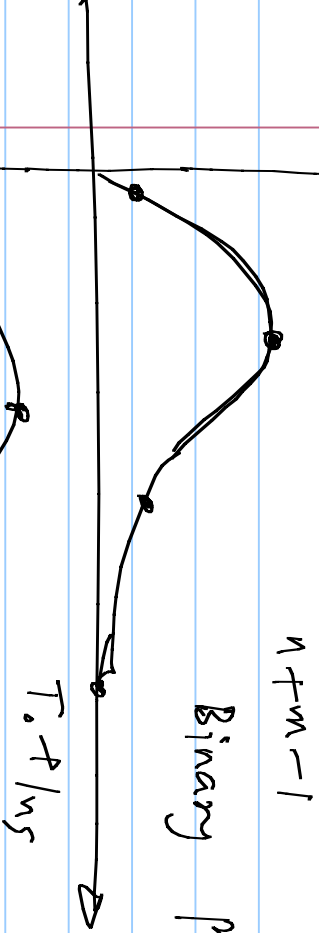
Channel:
impulse response

Binary: 1 kb/s

PAM4: 0.5 ks/s, each symbol = 2 bits.

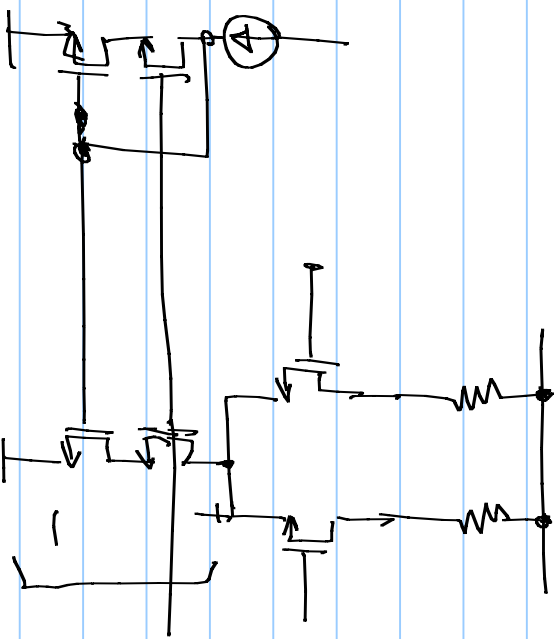
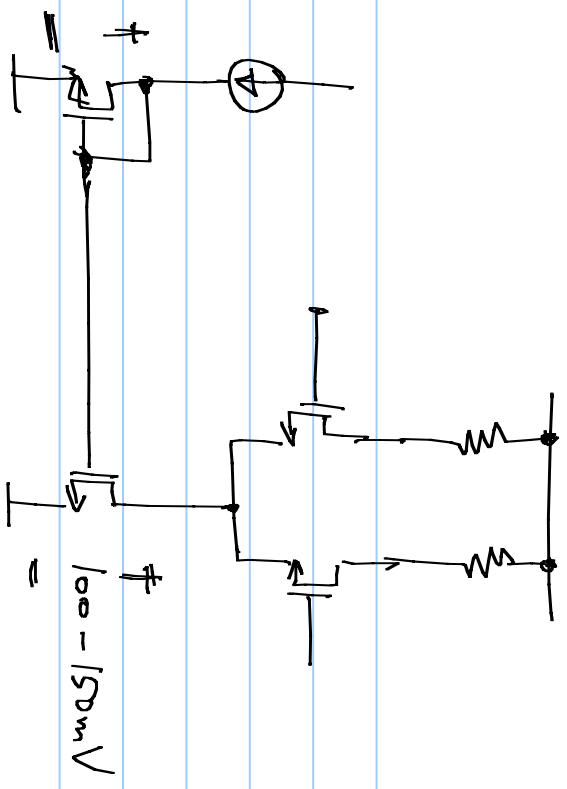


Binary pulse response



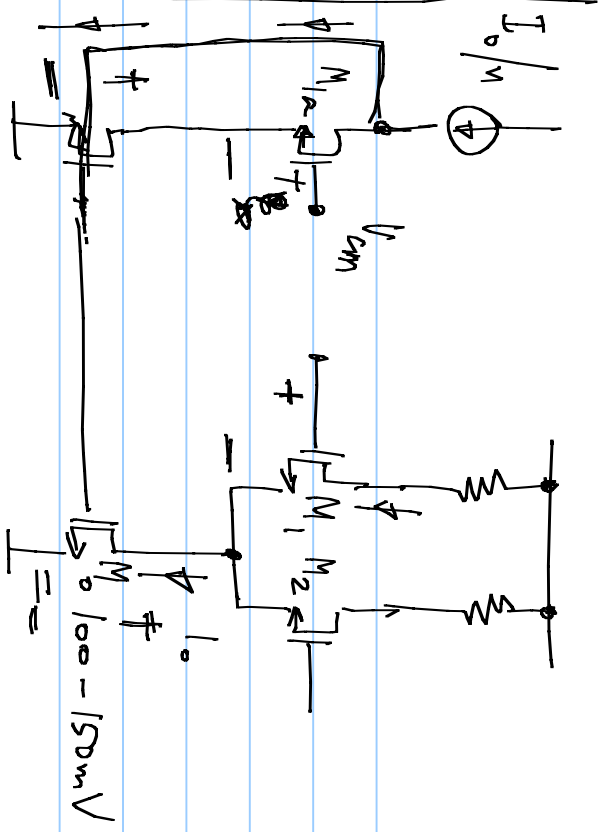
Transmitter;

- 1) Diff pairs in parallel
- 2) Tail currents are tuned
- 3) Ref. branch current varied
(to minimize tail node capacitance)
- 4) Bias current $\propto \frac{V_{ref}}{R}$ to make swing independent of resistor variations.
- 5) Bias accuracy.
→ Cascode: Better accuracy, needs more headroom



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 - Replica biasing:



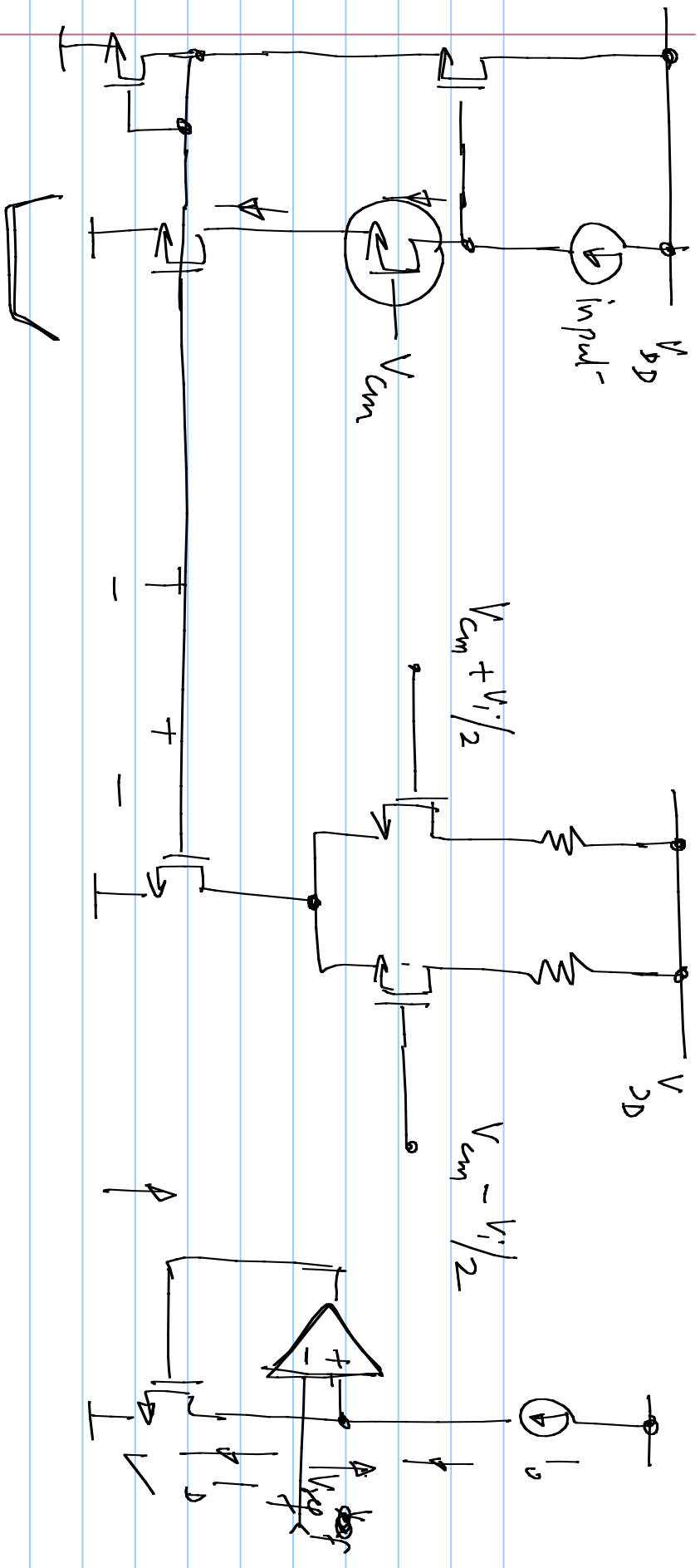
$$M_{oa} = \frac{I_{oa}}{W}$$

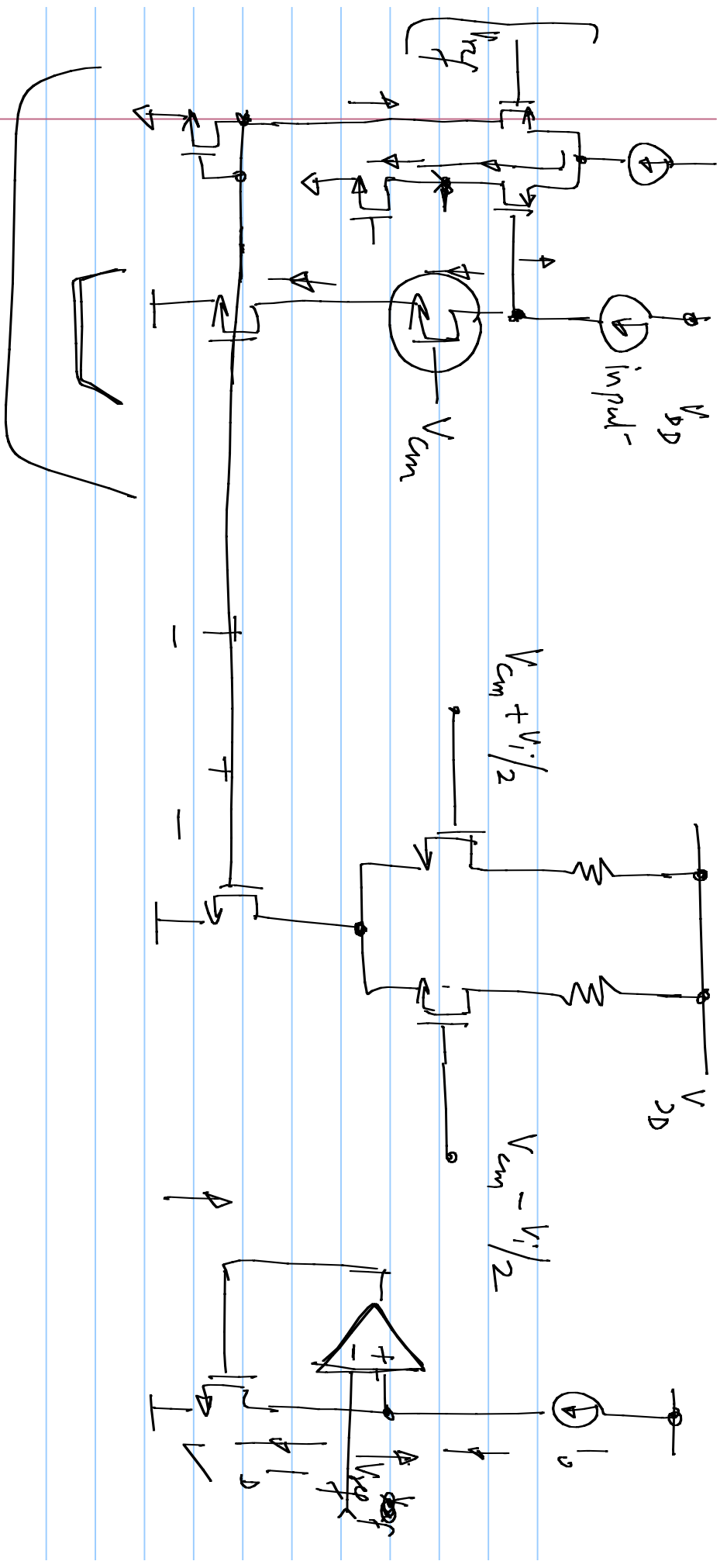
$$M_{oa}: \frac{W}{L} \quad M_o: n \cdot \frac{W}{L}$$

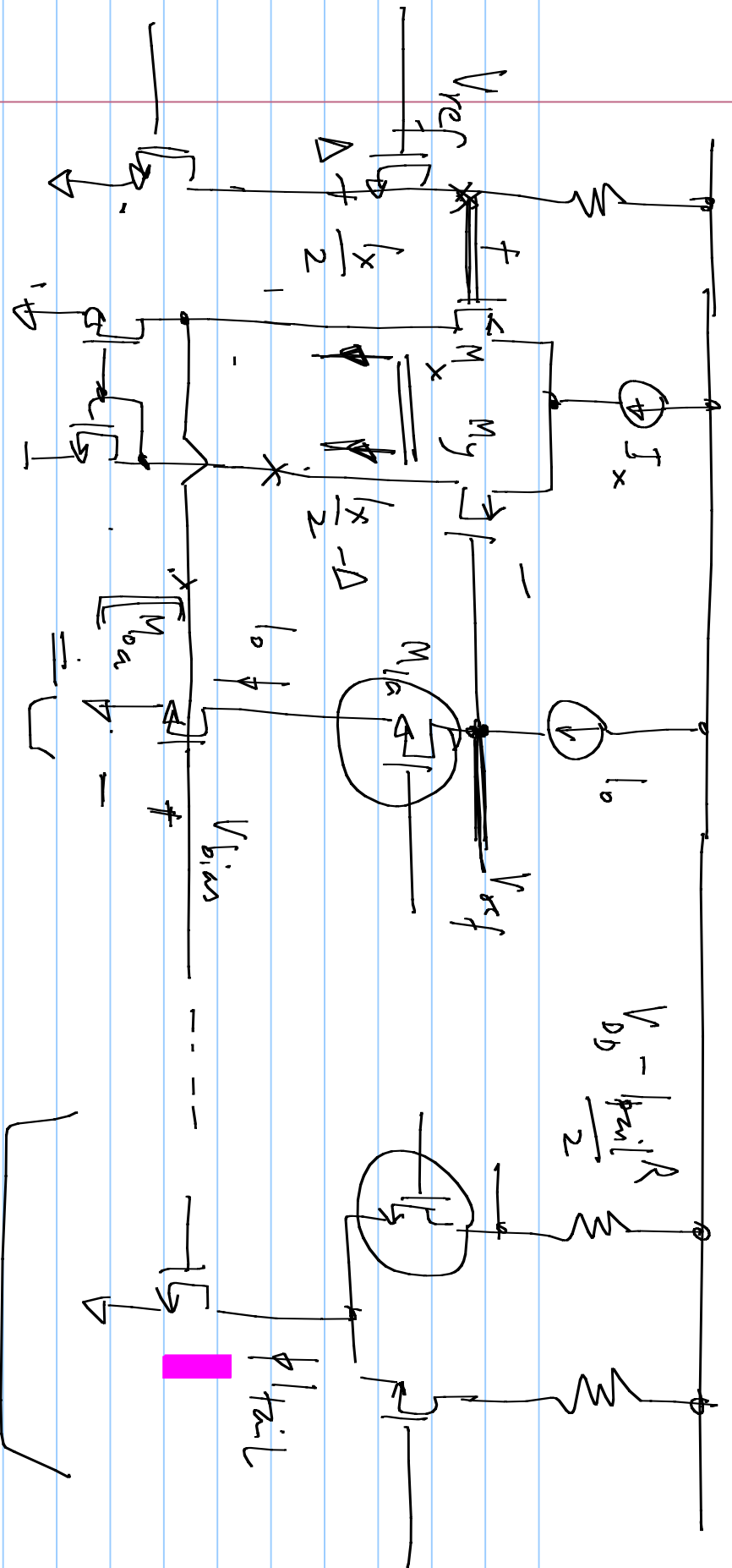
$$M_{1a}: 2 \cdot \frac{W}{L}, \quad M_1: n \cdot \frac{W}{L}$$

$$M_{oa}, M_o: \text{same } I/W$$

$$M_{1a}, M_1, M_2: \text{same } I/W$$







High speed

