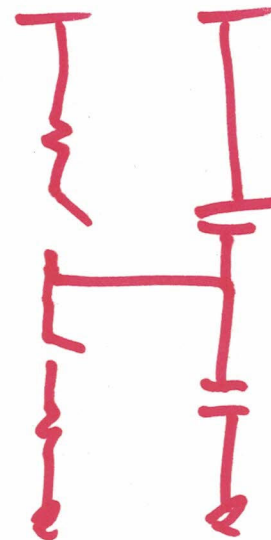
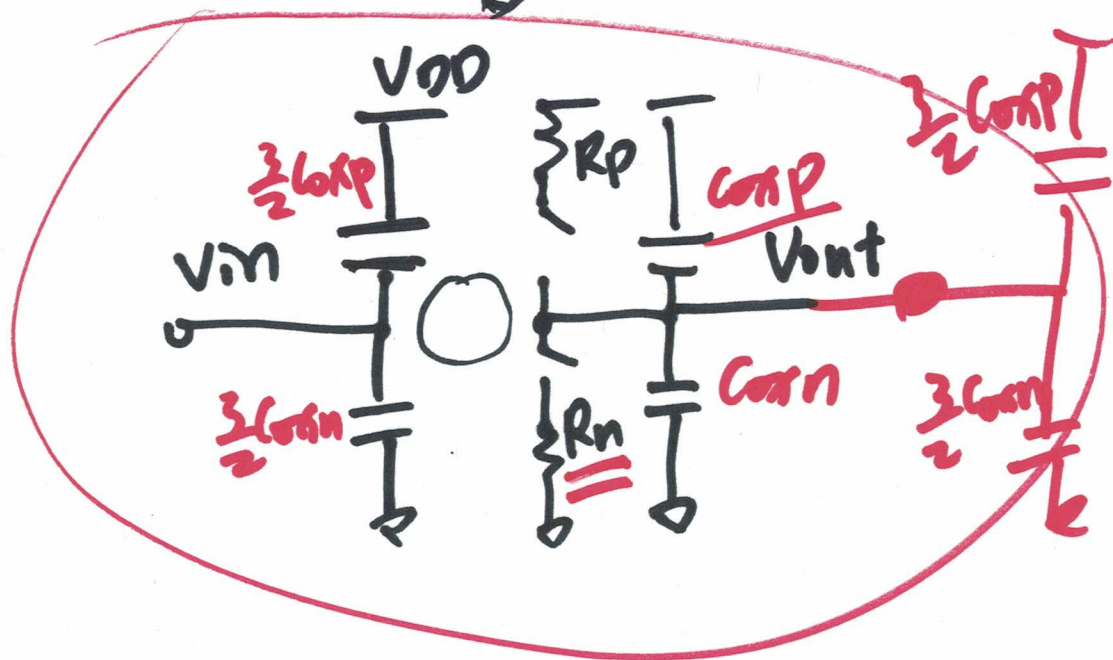
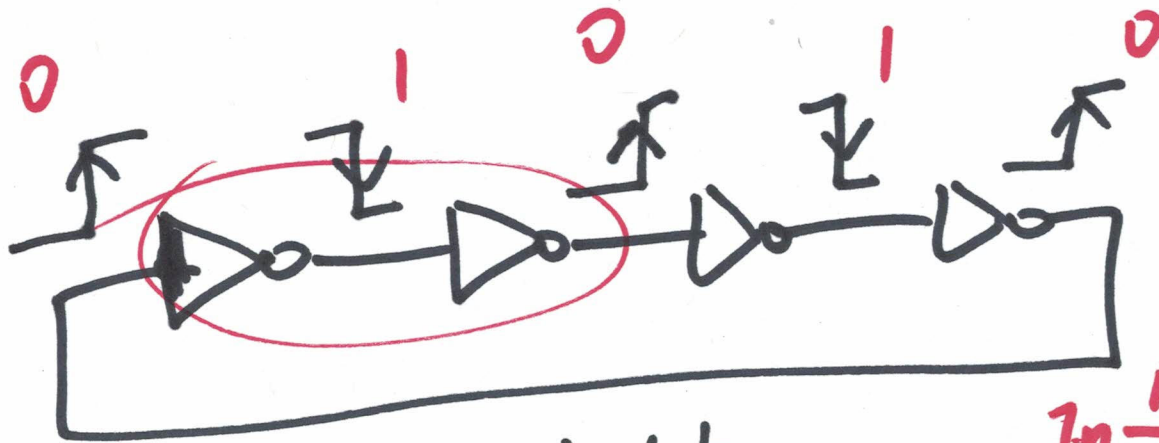


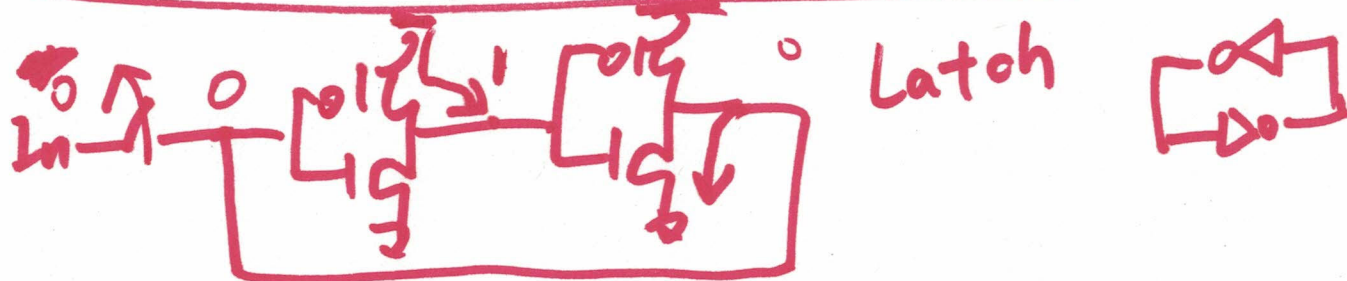
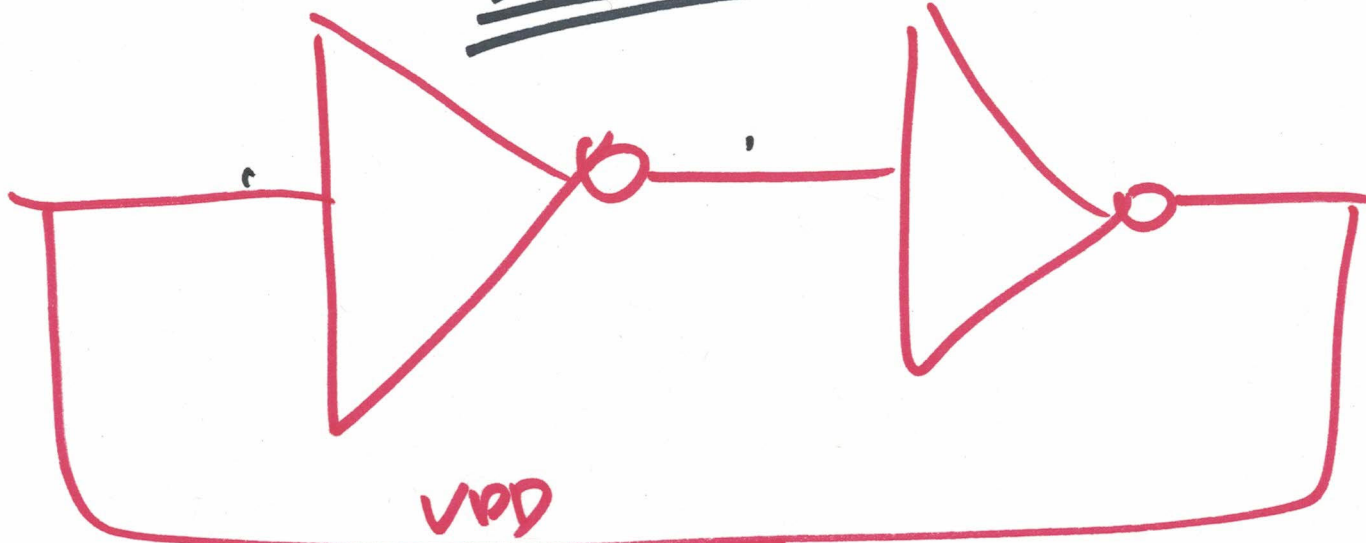
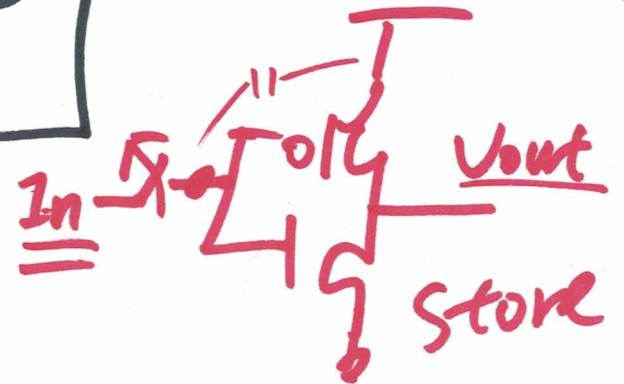
$\frac{1}{2}C_{ox}$

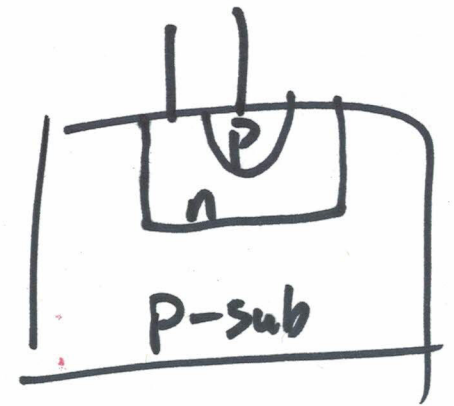
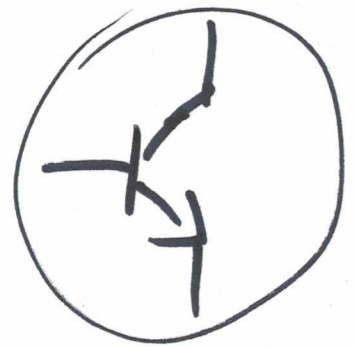
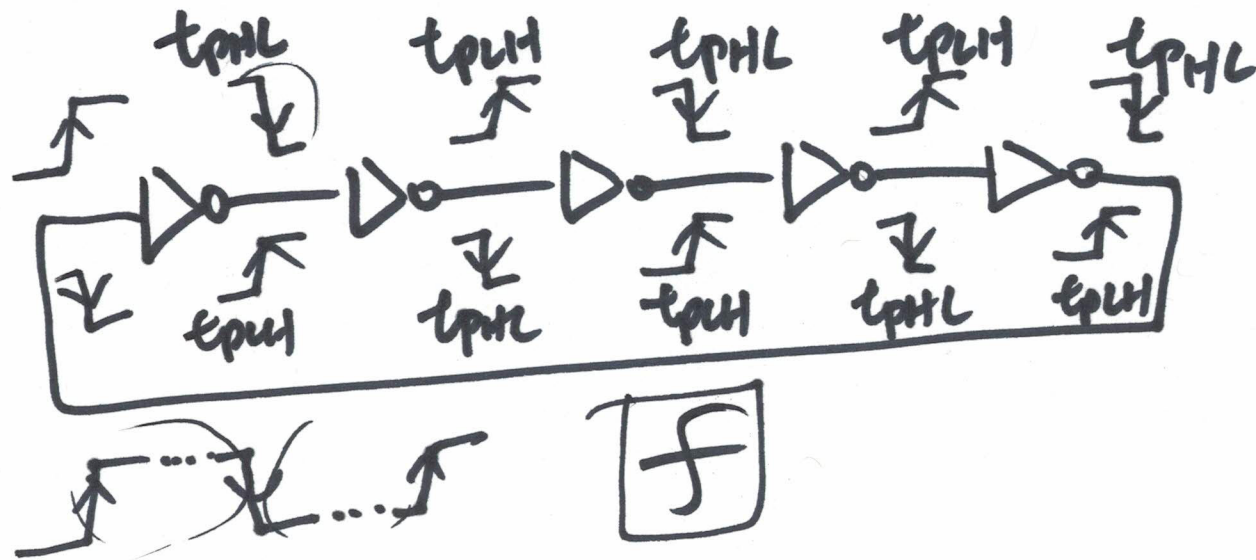


Ring oscillator



D-Latch





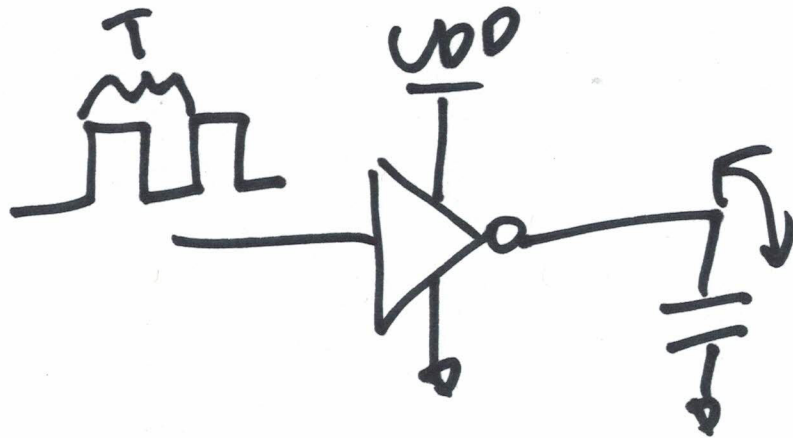
$$T = 5(t_{pHL} + t_{pLH}) = N(t_{pHL} + t_{pLH})$$

$$f = \frac{1}{T}$$

$$t_{pHL} = 0.7 R_n \cdot \frac{C}{2} (C_{xp} + C_{on})$$

$$t_{pLH} = 0.7 R_p \cdot \frac{C}{2} (C_{xp} + C_{on})$$

Dynamic Power Dissipation



$$I_{avg} = \frac{Q_{tot}}{T} = \frac{V_{DD} \cdot C_{tot}}{T}$$

$$P_{avg} = V_{DD} \cdot I_{avg} = \underbrace{V_{DD}^2} \cdot \underbrace{C_{tot}} \cdot \underbrace{f}_{\uparrow}$$

Clocked D Latch

