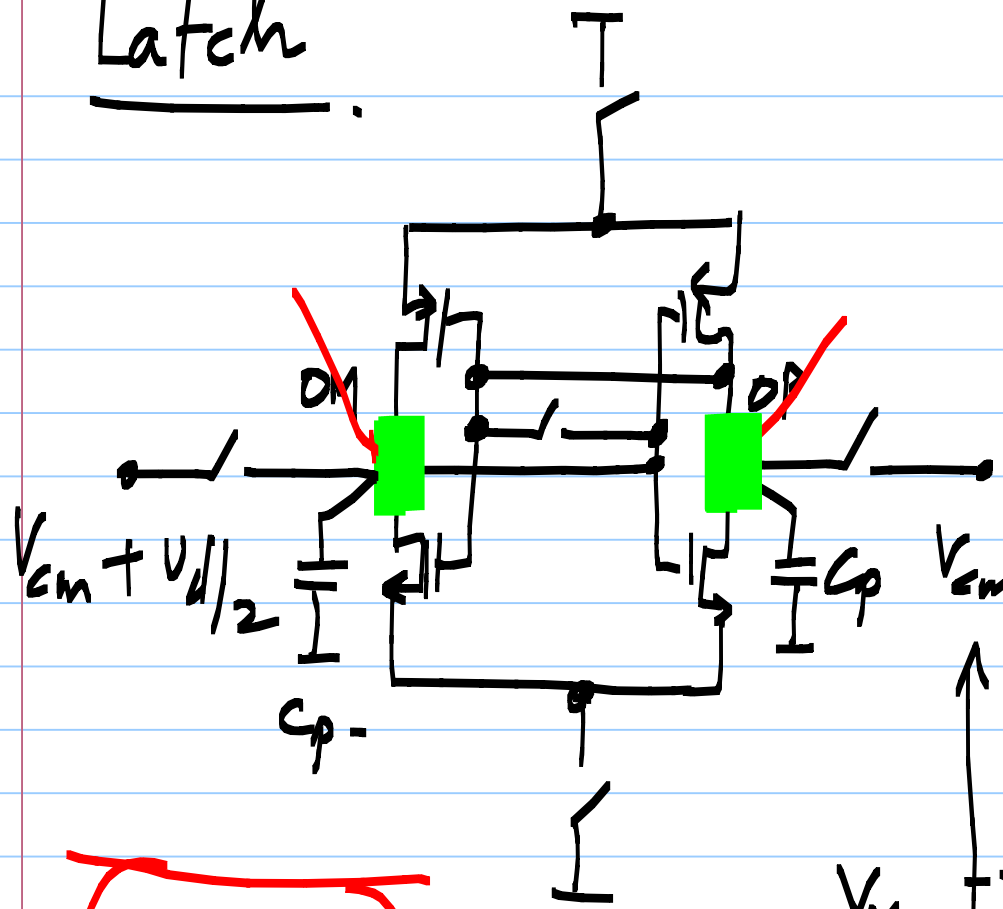
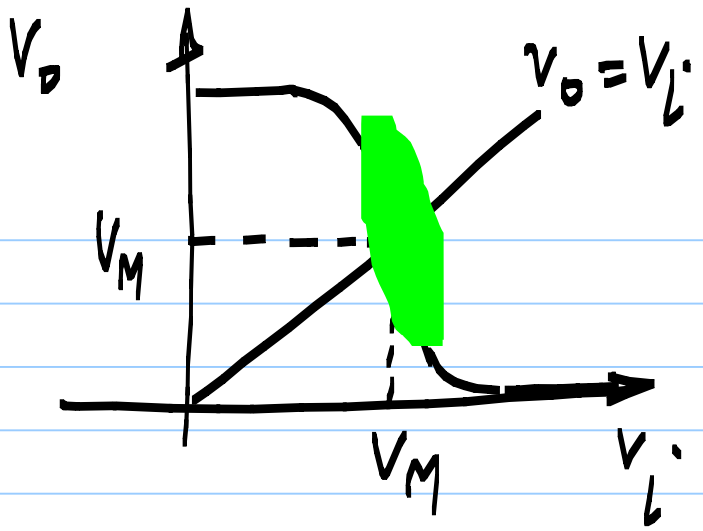
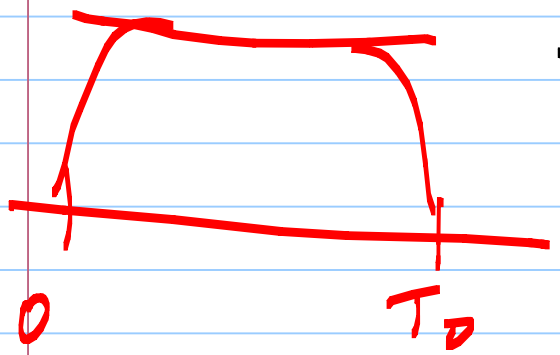
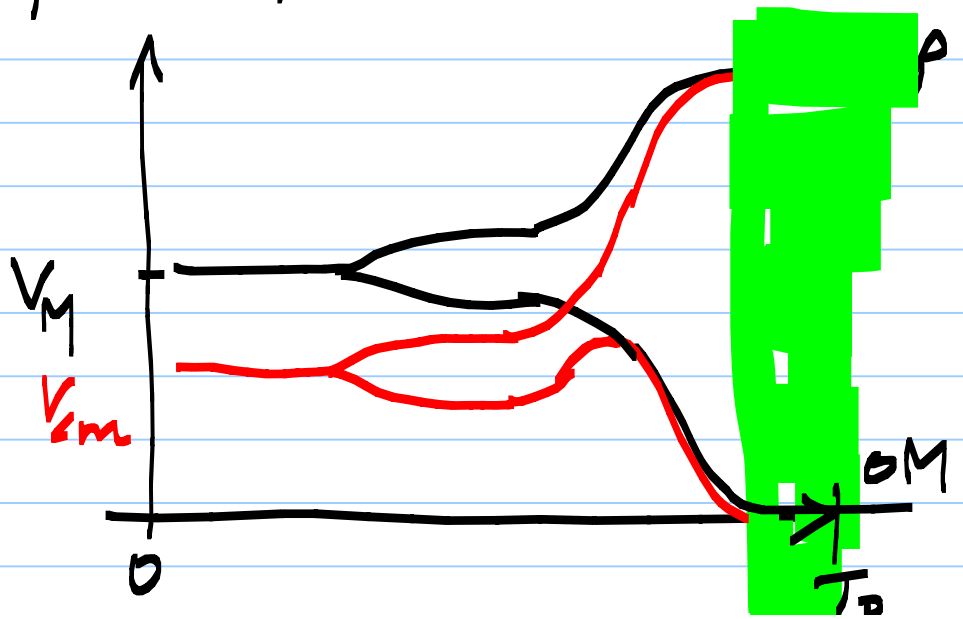
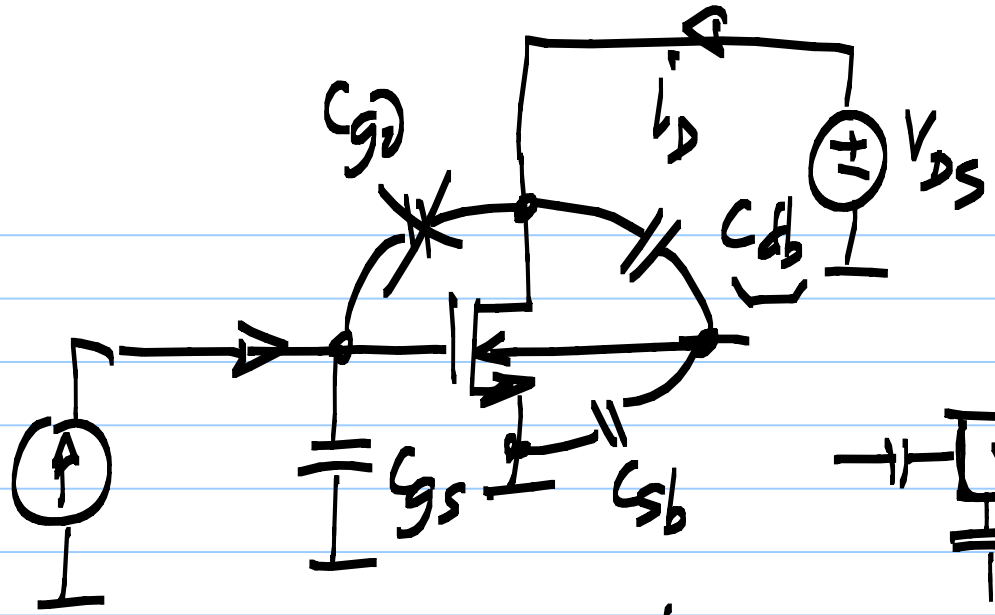
Latch

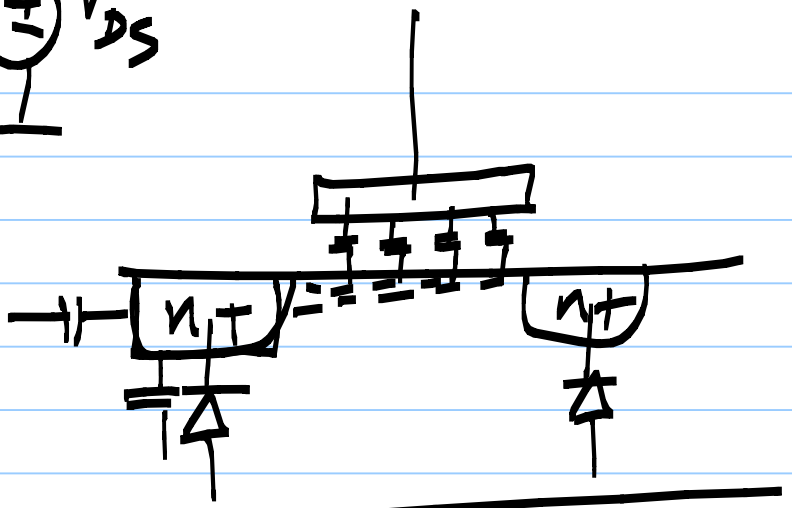

T
ϕ_M
ϕ_P
$V_{cm} + v_d/2$
C_p
C_p
$V_{cm} - v_d/2$


V_o
$v_o = v_i$
V_M
V_M
v_i


0
T_D

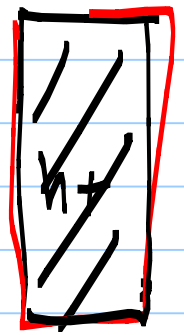

V_M
V_{cm}
0
ϕ_M
T_D

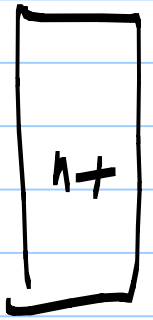




+ Interconnect parasitics

$$\frac{g_m}{sC_{gs}} \qquad \omega_T = \frac{g_m}{C_{gs}}$$

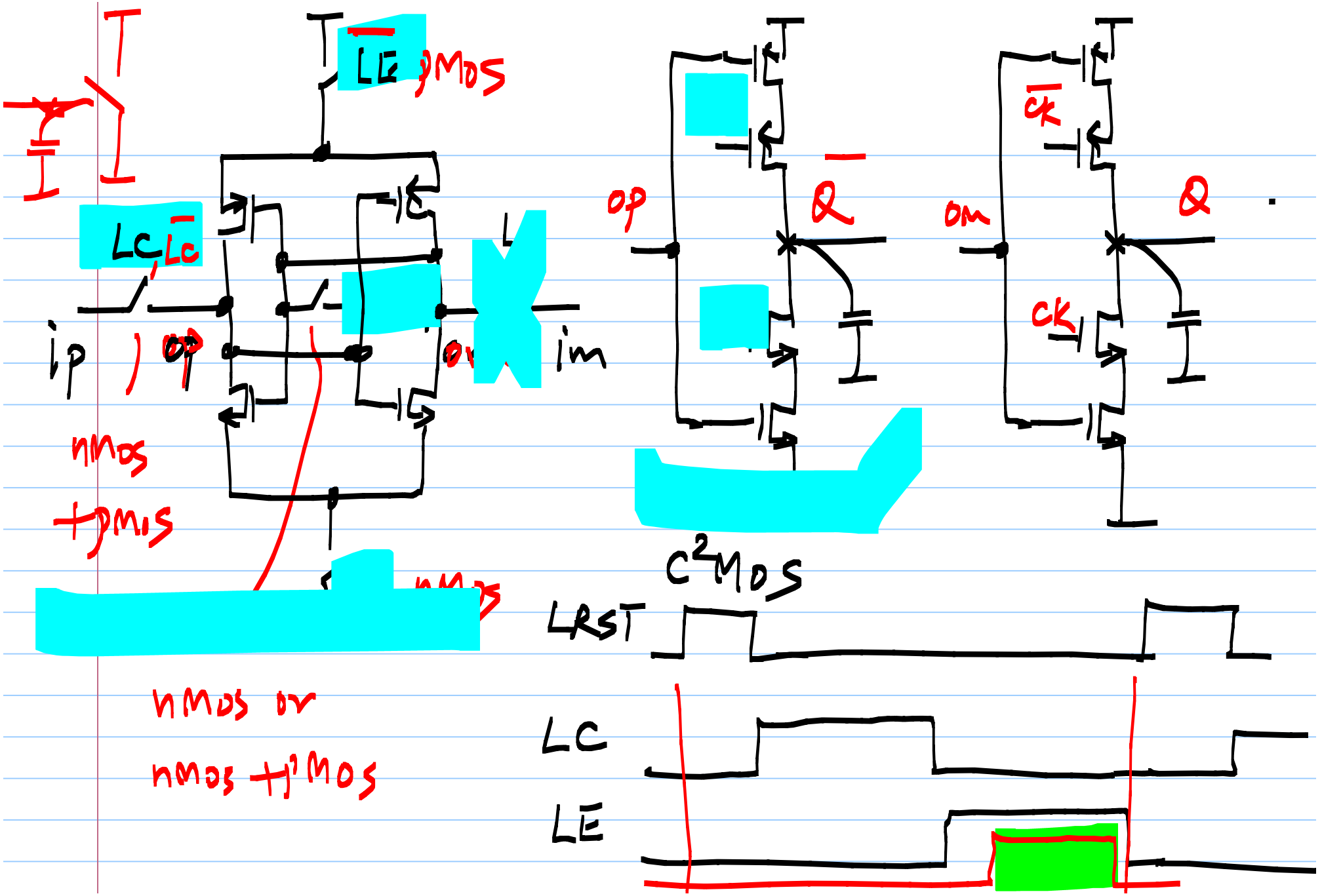


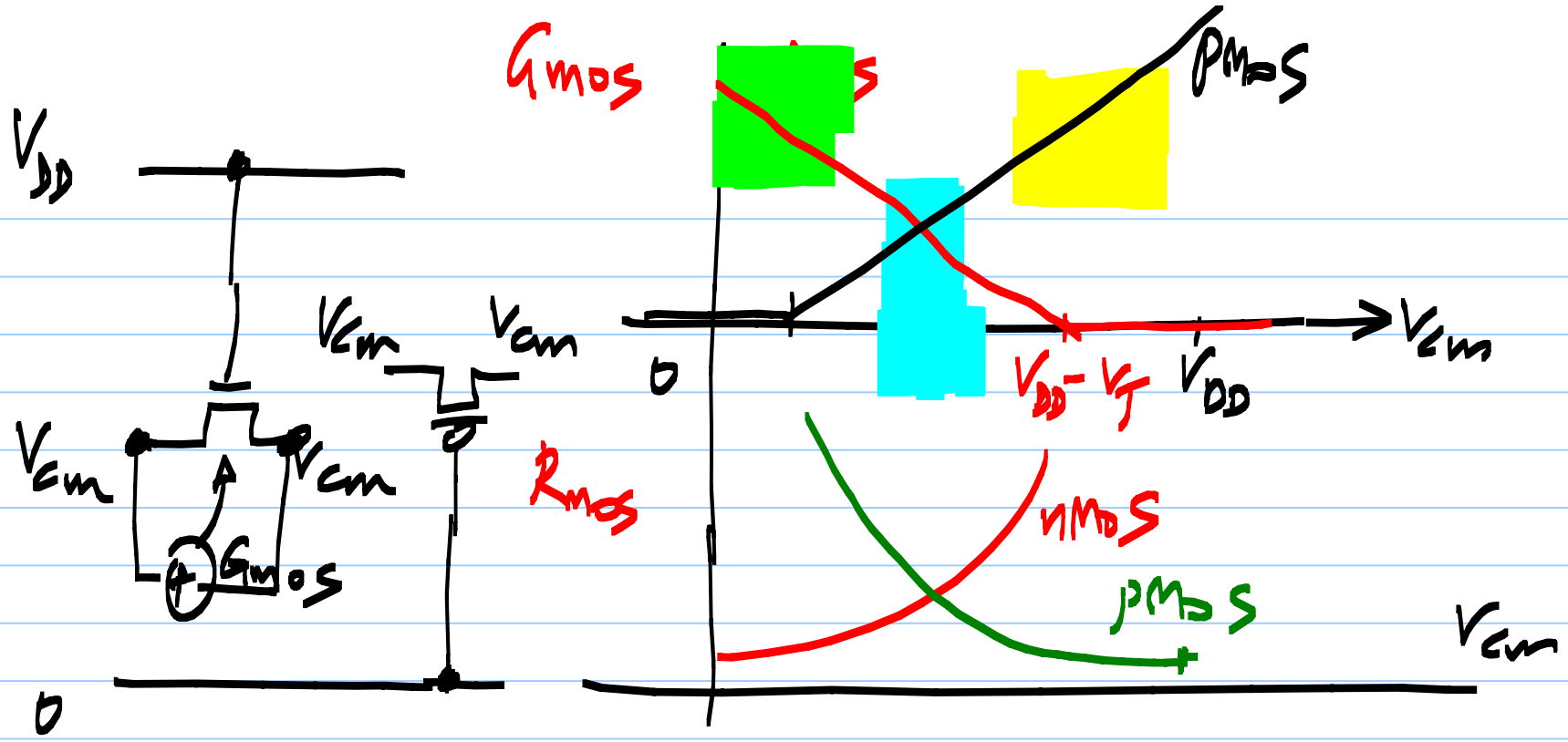


$C_j \cdot$ Area + $C_{jsw} \cdot$ Perimeter

$$\omega_T = \frac{g_m}{C_{gs}} = \frac{\mu C_{ox} \frac{W}{L} (V_{GS} - V_T)}{\frac{2}{3} WL C_{ox}}$$

$$= \frac{3}{2} \mu \cdot \frac{(V_{GS} - V_T)}{L^2}$$


T
LE
pMOS
LC
LC
ip
op
im
nMOS
+pMOS
nMOS or
nMOS + pMOS
op
Q
om
Q
CK
CK
C²MOS
LRST
LC
LE



$$G_{nmos} = \mu_n C_{ox} \frac{W}{L} \left(V_{DD} - V_{cm} - V_{Tn} \right) \qquad V_{cm} < V_{DD} - V_T$$

$$V_{cm} \geq V_{DD} - V_T$$

0

$$G_{pmos} = \mu_p C_{ox} \frac{W}{L} \left(V_{cm} - V_{Tp} \right) \qquad V_{cm} > V_{Tp}$$

strongArm latch