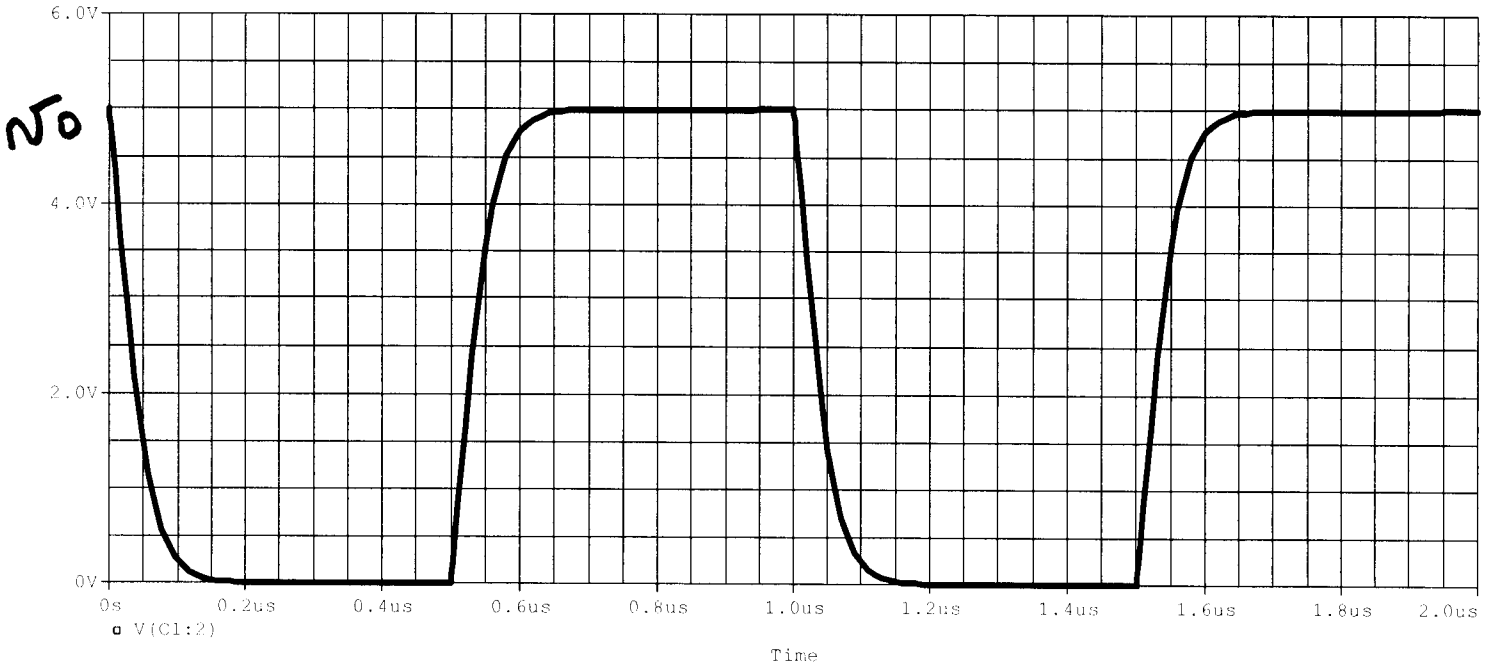
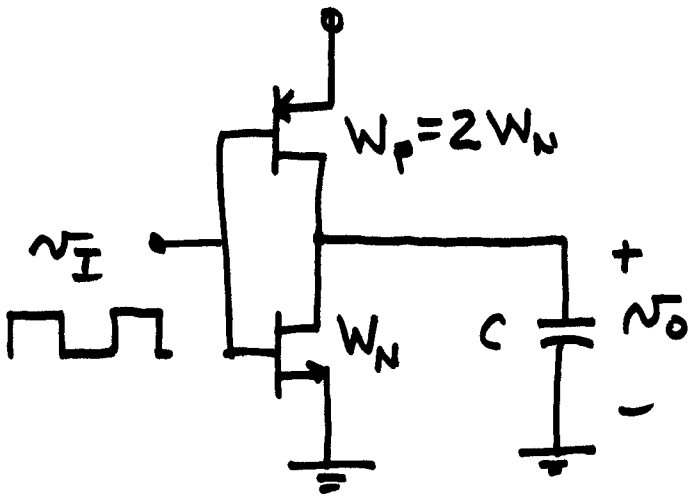
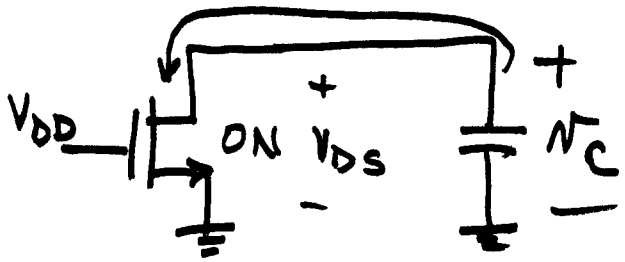

6.0V
4.0V
2.0V
0V
V_O
0s
0.2us
0.4us
0.6us
0.8us
1.0us
1.2us
1.4us
1.6us
1.8us
2.0us
V(C1:2)
Time


$W_P = 2W_N$
V_I
W_N
C
+
V_O
−

DISCHARGE



$v_C(0) = V_{DD}$

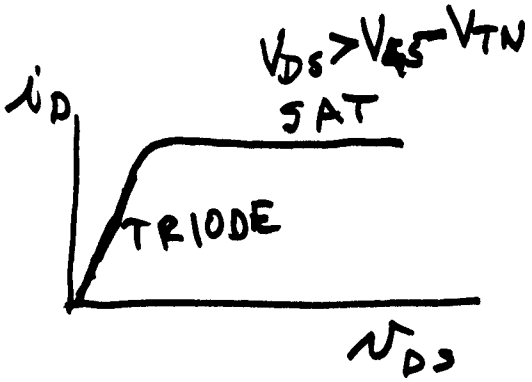
at $t = 0^+$

$V_{DS} = V_{DD}$

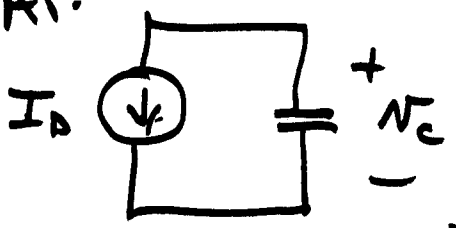
$I_D = K(V_{GS} - V_{TN})^2$

$= K(V_{GS}^{V_{DD}} - V_{TN})^2$

CONSTANT

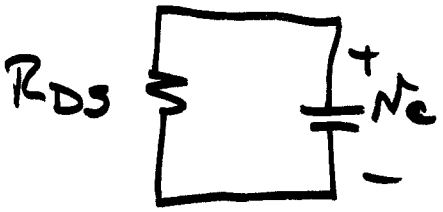


SAT.

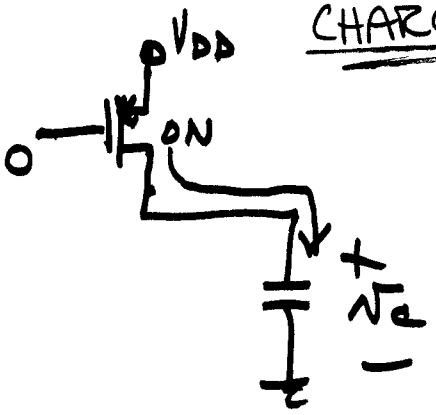


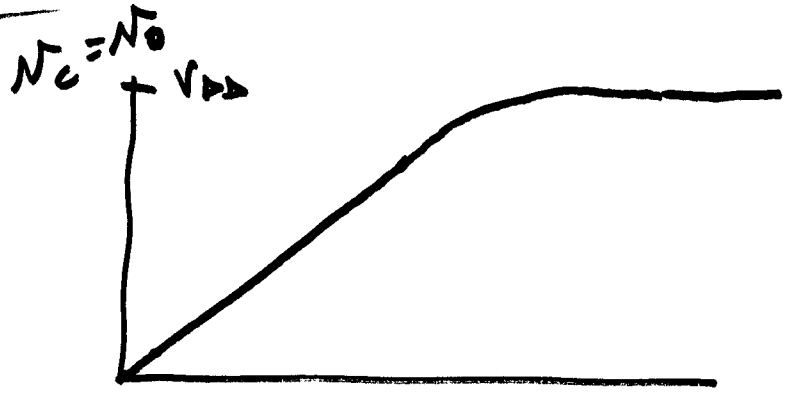
$v_c = \frac{Q}{C}$

TRIODE

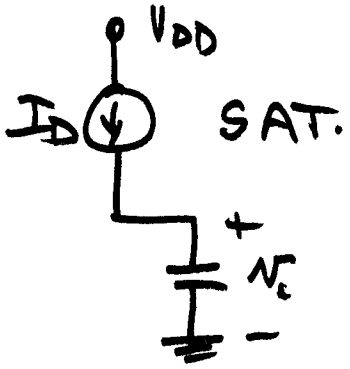


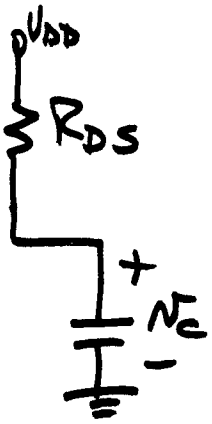
CHARGING

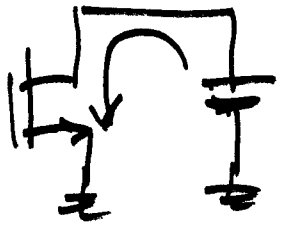




$$I_D = K_p\left(V_{SG} - |V_{TP}|\right)^2$$







$v_c(0) = V_{DD}$

energy $= W = \frac{1}{2} C V^2$

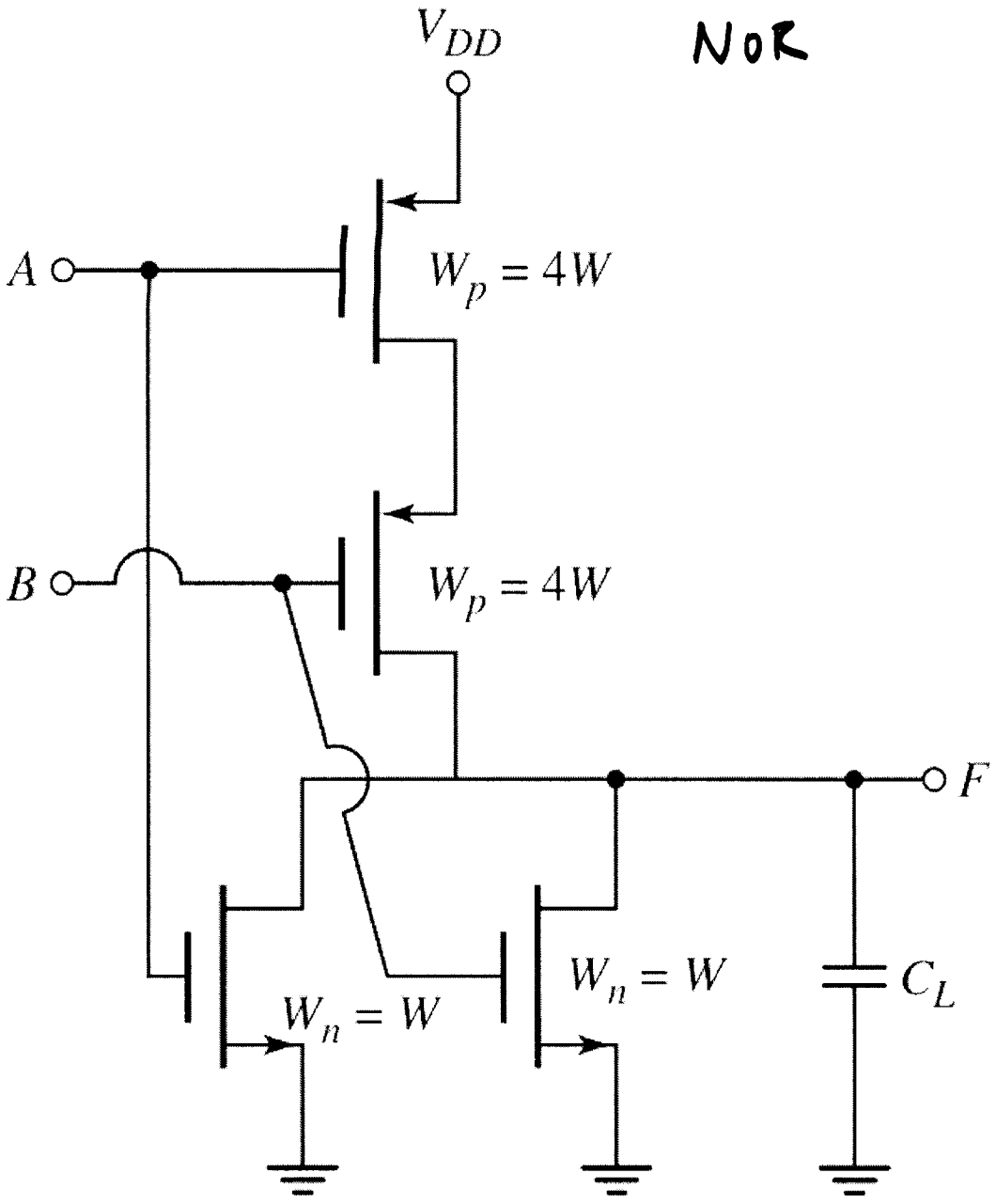
Discharge

also for charging $W = \frac{1}{2} C V^2$

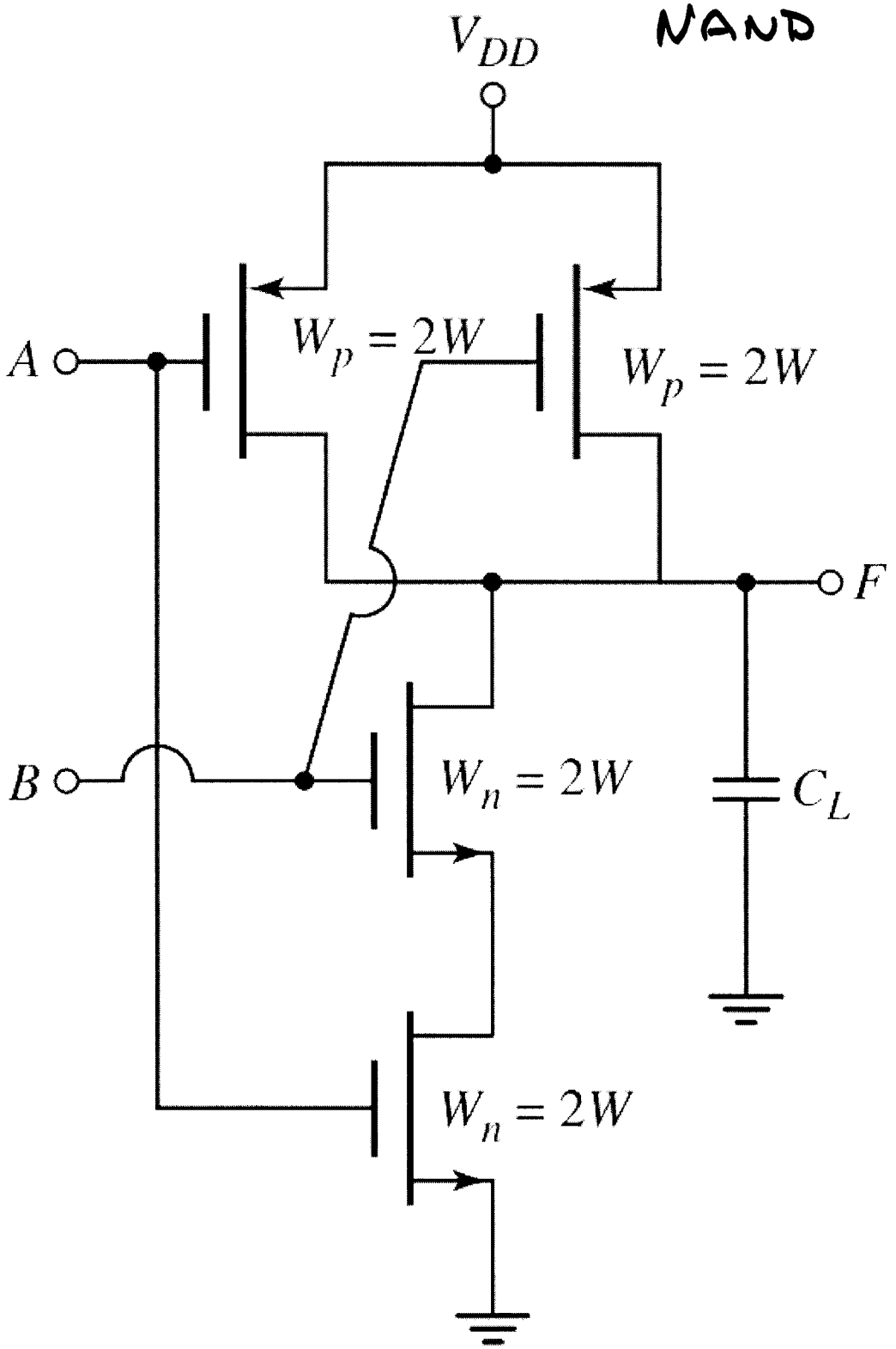
Per switching cycle:

$$W = \frac{1}{2} C V^2 + \frac{1}{2} C V^2 = C V^2$$

$$P = \frac{W}{T} = \frac{C V^2}{T} = f C V^2$$



(b)


NAND
V_{DD}
$W_p = 2W$
$W_p = 2W$
A
B
F
$W_n = 2W$
$W_n = 2W$
C_L