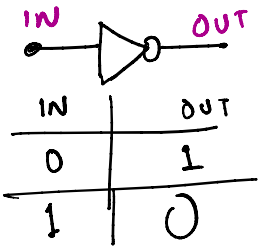
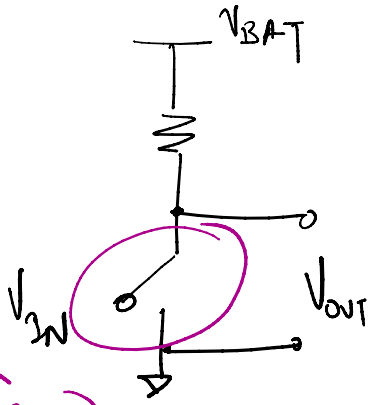
Lecture 11

19 August 2024 00:07

NOT Gate / Inverter



IN	OUT
0	1
1	0

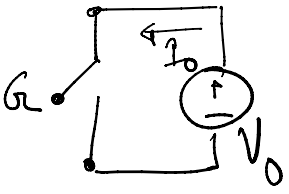


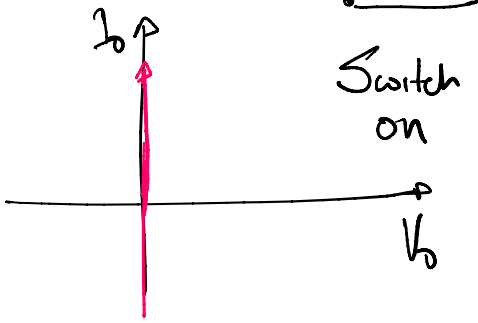
(V_{IN} → High
Switch → Closed)

Ideal Switch

$R_{on} = 0$

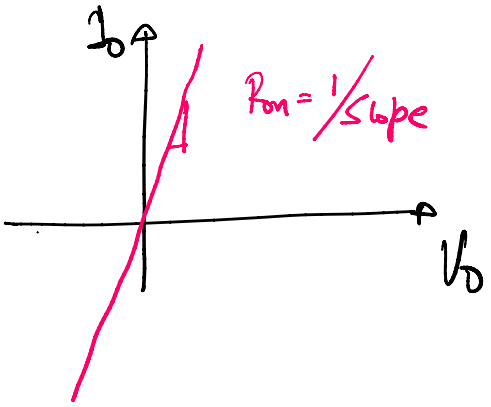
$R_{off} = \infty$



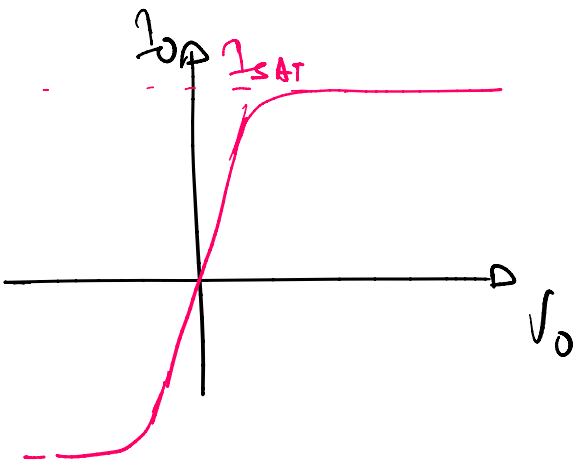


Switch on

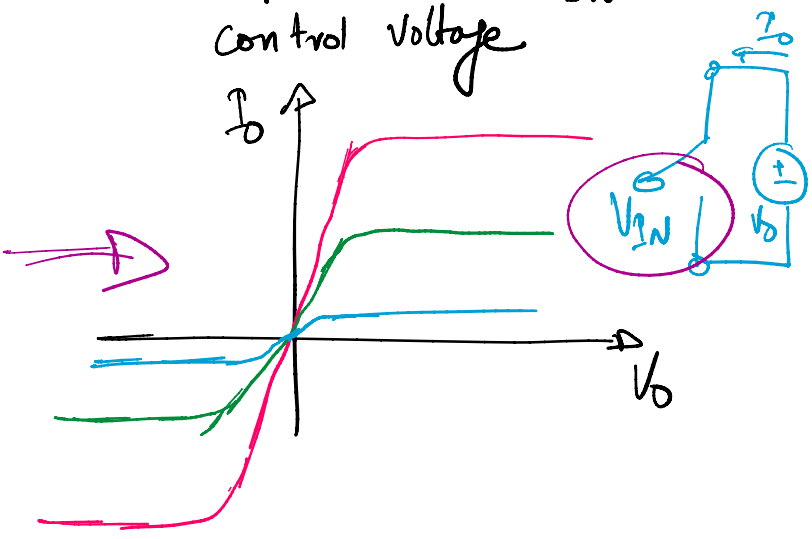
Real Switch with $R_{on} \neq 0$

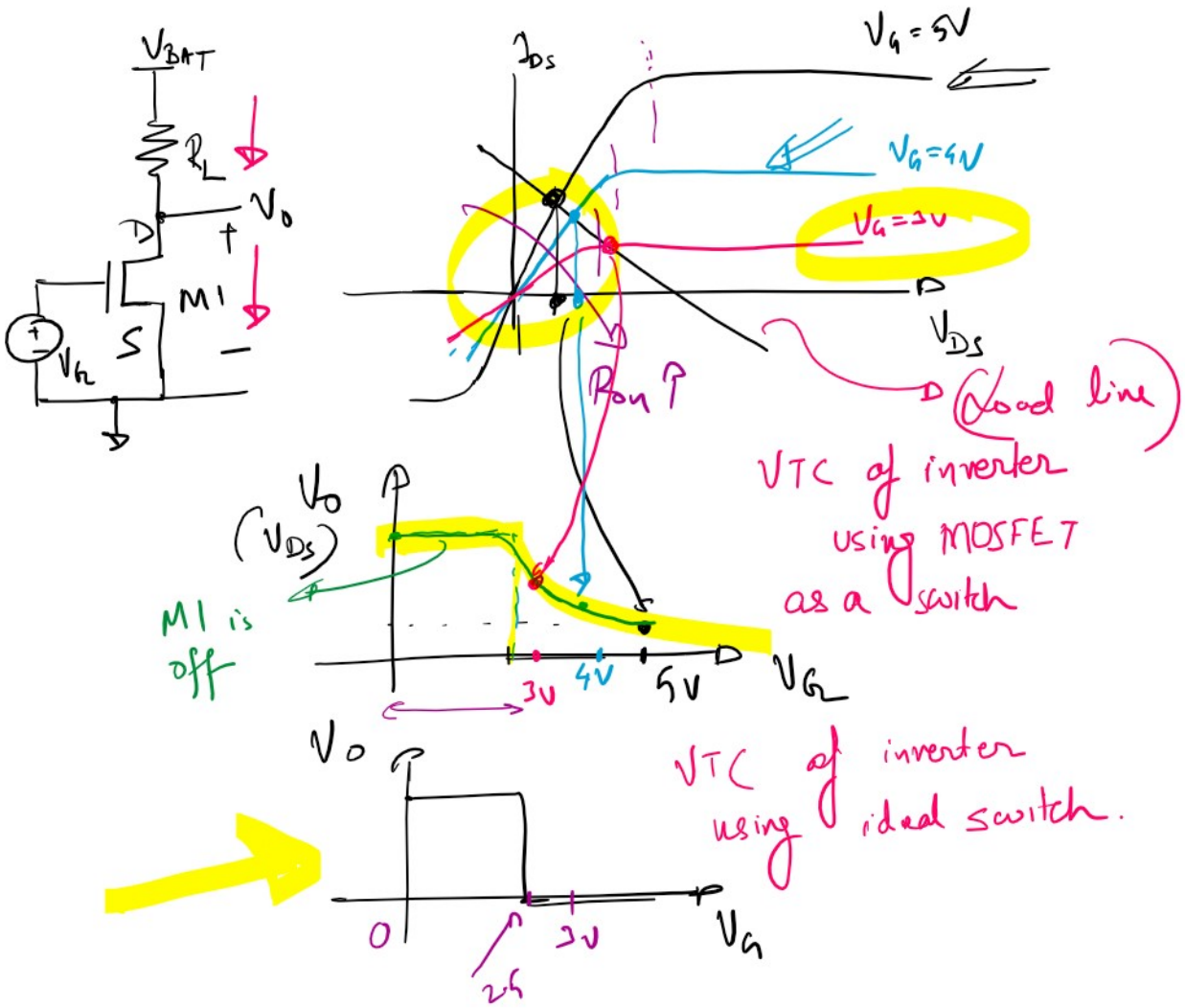


Real Switch with non-zero R_{on} and current saturation:

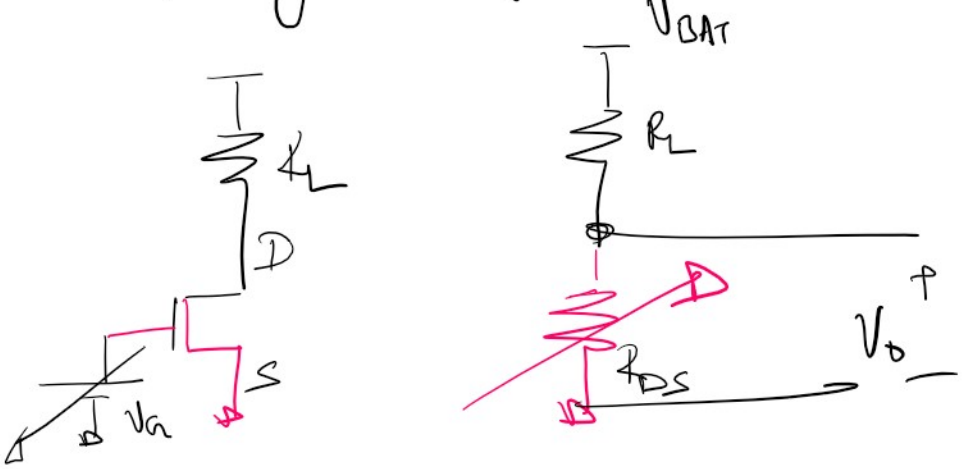


Real Switch with R_{on} and I_{SAT} dependent on V_{IN} or control voltage



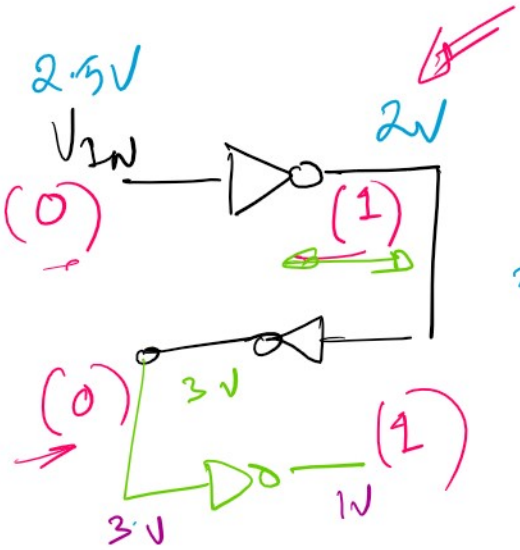


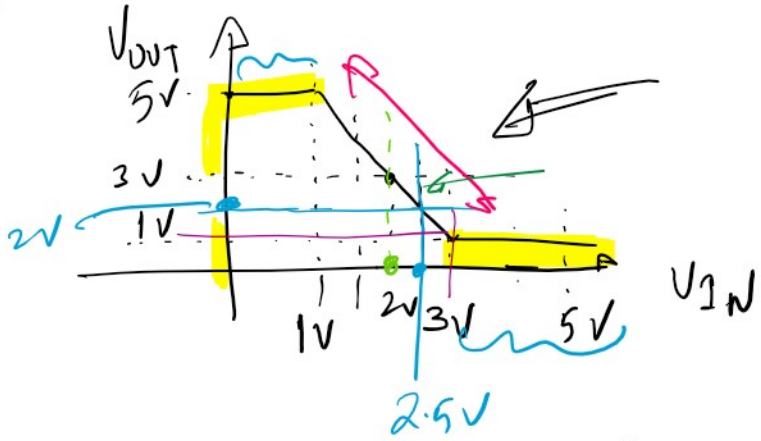
A MOSFET can be thought of as a Resistor whose resistance is controlled by the gate voltage



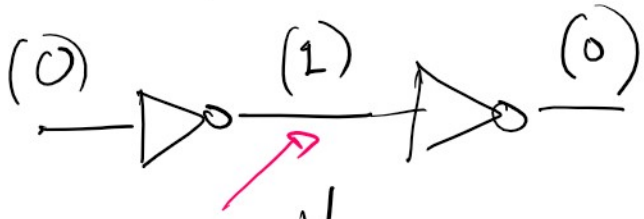
$$\frac{V_{BAT}\, R_{DS}(V_G)}{R_L + R_{DS}(V_G)}$$

NOISE MARGIN





Say: logic 0 $\Rightarrow$ Voltage $<$ V_{IL} → Input → low
i/p



V_{IL}
1V

V_O
3.5V

Not going to get recognised as valid logical i/p.

Input logic 0
valid if $V_{IN} < 2V$

Input logic 1
valid if $V_{IN} > 4V$

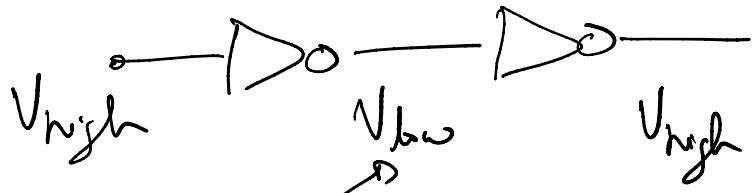
For accurate logic propagation the

V_{OH} (o/p high voltage) must be

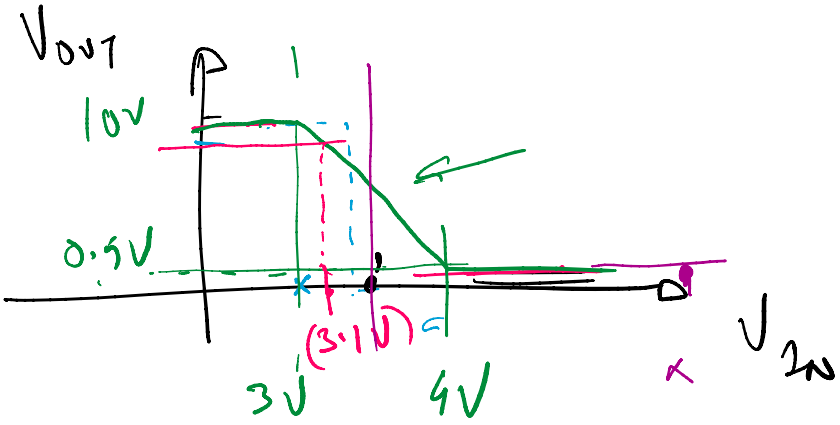
$>$ or $<$??

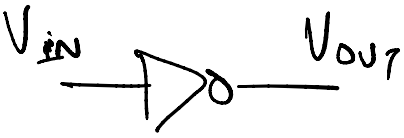
V_{IH} (i/p high voltage level) of the next gate.

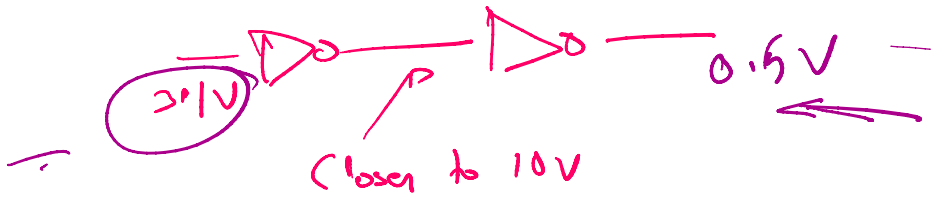
V_{IH} (i/p high voltage level) of the next gate



V_{OL} has to be lower than V_{IL}





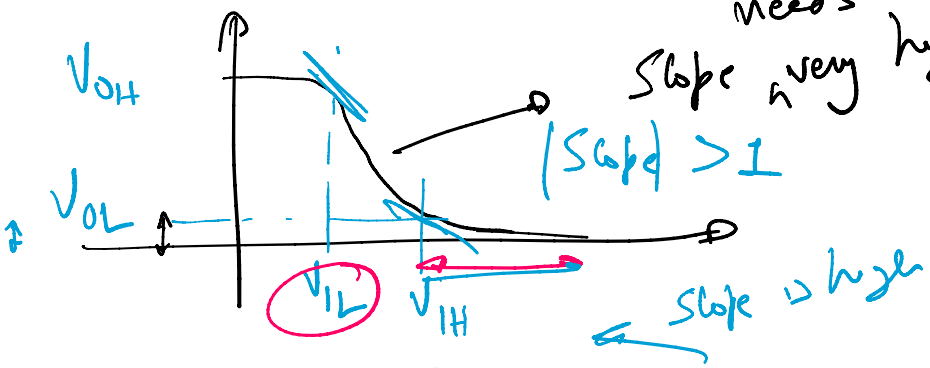


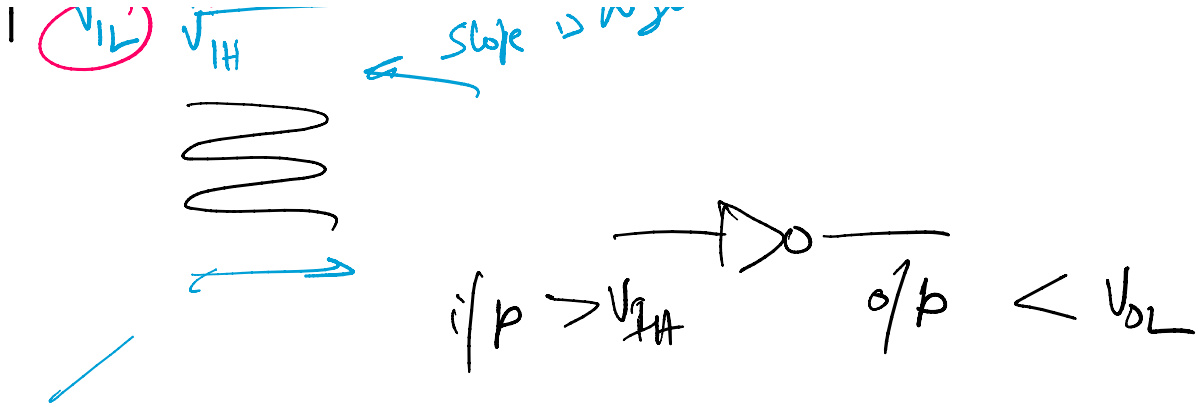
V_{IL} V_{OH} > V_{IH}

$$V_{OH} - V_{IH} = NM_H$$

V_{IH} V_{OL} < V_{IL}

$$V_{IL} - V_{OL} = NM_L$$




V_{IL}
V_{IH}
slope is very
i/p > V_{TH}
o/p < V_{OL}