

Digital Circuits 1: ECE 2200

Lecture 2

Bit = 1 bit

ibble = 4 bits

byte = 8 bits

Switch Logic

TTL

CMOS, 3.3V Logic
most circuits now

Dynamic Memory

on chip mem

Volatile Mem

Binary 0 Binary 1

Circuit open

Circuit closed

0 - 0.8V

2.0 - 5.0V

0 - 0.8V

2.0 - 3.3V

Capacitor
discharged

Capacitor
charged

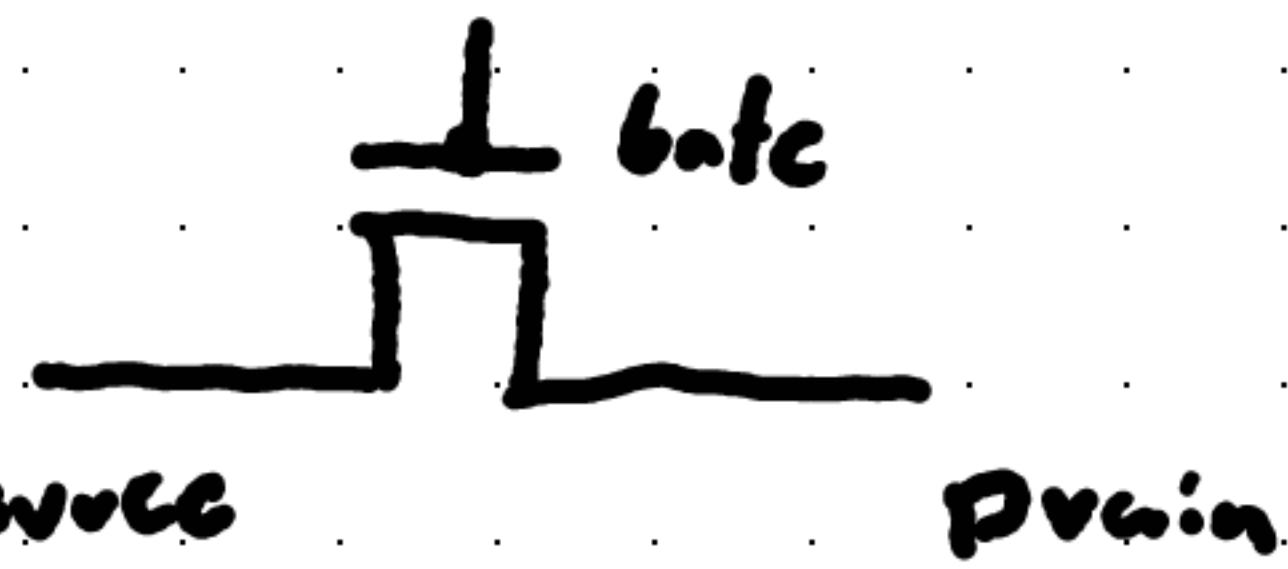
Not
Blown

Blown

Ideal Switches - Mos Transistors

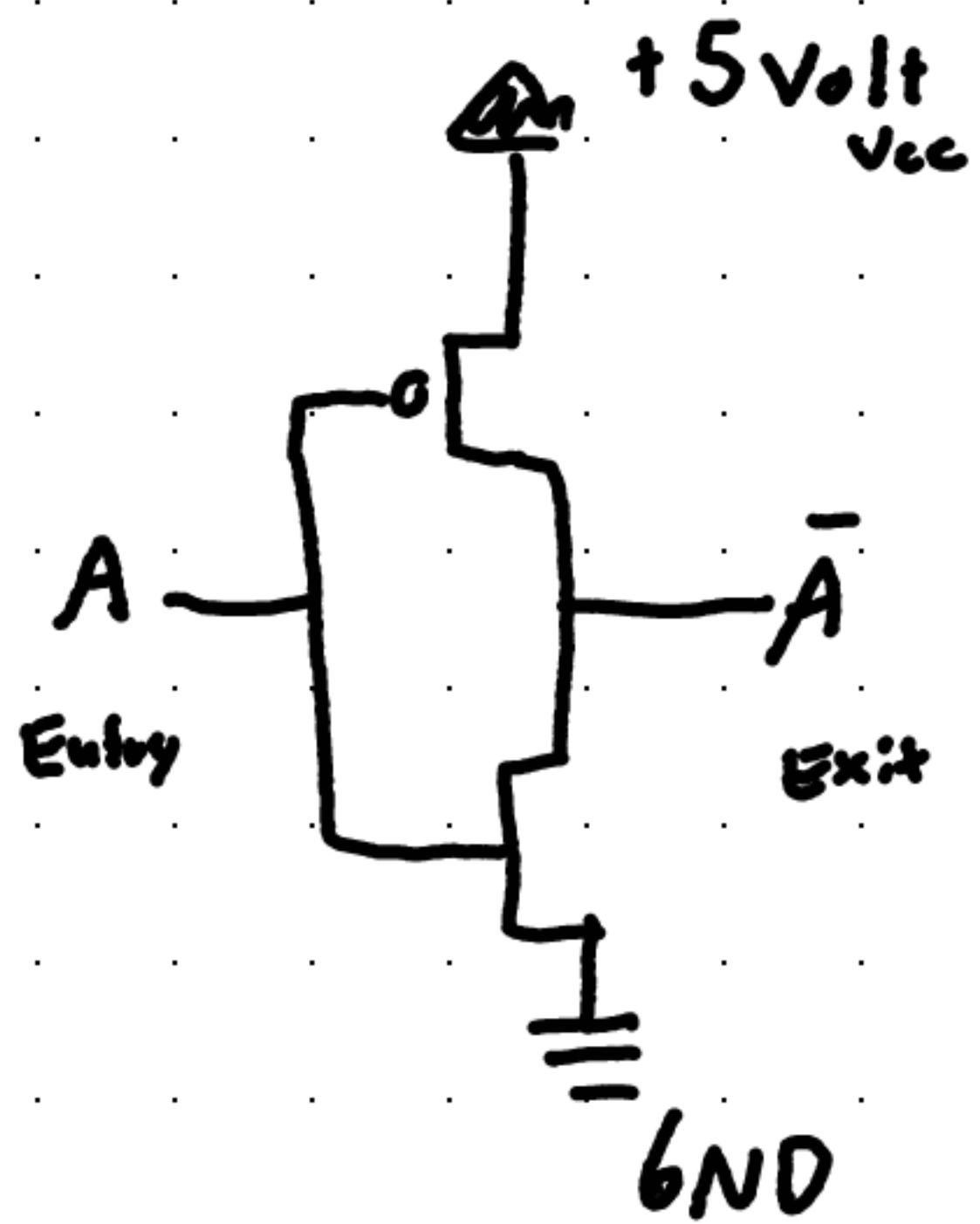
Nmos - Requires positive "High gate" voltage to close

Pmos - Requires negative "low gate" voltage to close



Nmos and pmos Transistors can be put on the same chip. They can be complementary to each other this way! one turns another off!

Pmes Inverter Diagram



O ← This little
bubble represents
negative

Logic Gates



NOT gate



AND



OR



NAND



NOR



XOR



XNOR

"Odd number of
Inputs High, output
Should be High"

"Even Number of
Inputs High,
Output is High"

Fundamental
Gates!

Truth Tables - For Gates

NOT

A	\bar{A}
0	1
1	0

AND

B	A	AB
0	0	0
0	1	0
1	0	0
1	1	1

NAND

B	A	\overline{AB}
0	0	1
0	1	1
1	0	1
1	1	0

OR

B	A	$A+B$
0	0	0
0	1	1
1	0	1
1	1	1

NOR

B	A	$\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

XOR

B	A	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

XNOR

B	A	$\overline{A \oplus B}$
0	0	1
0	1	0
1	0	0
1	1	1

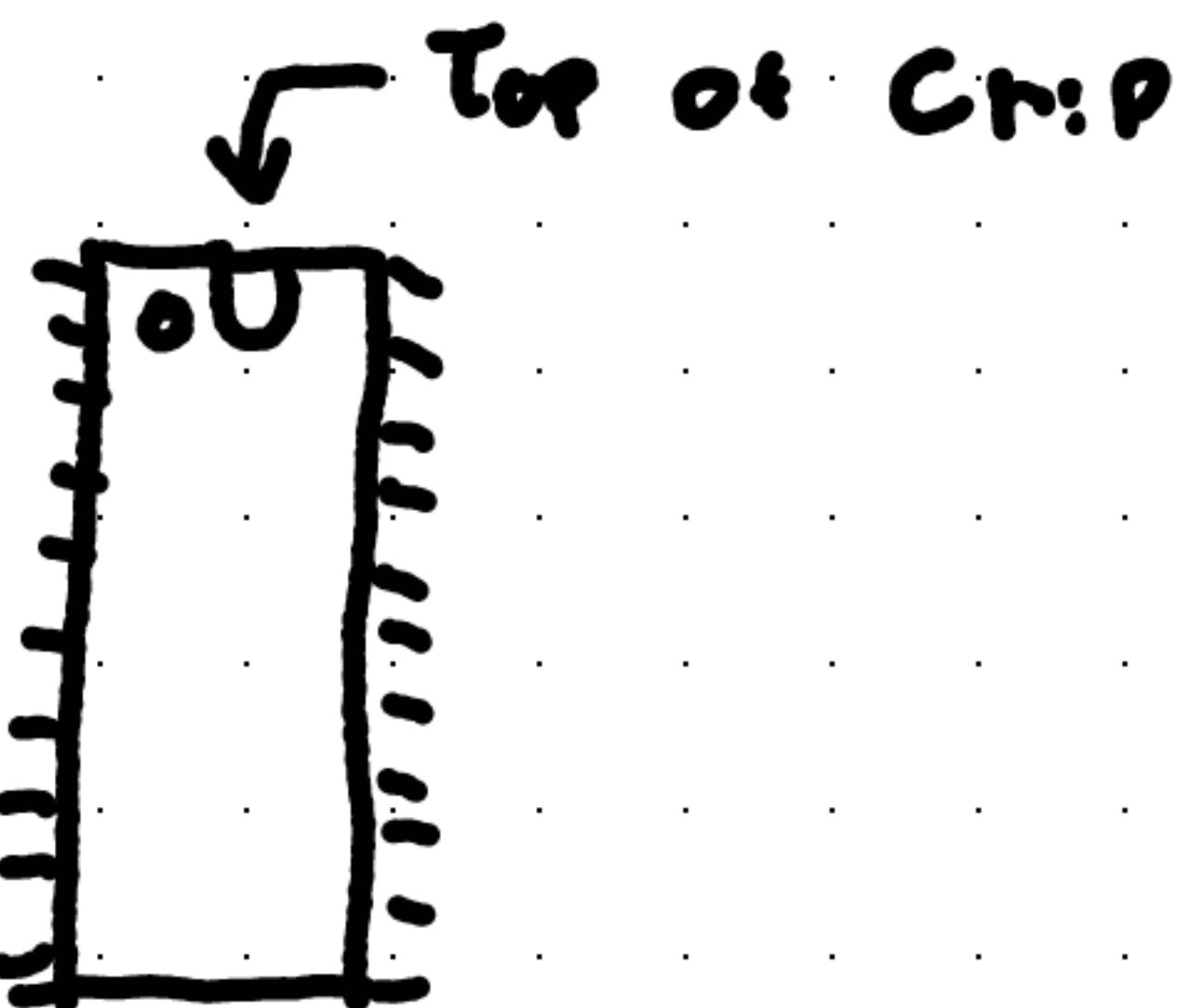
Boolean Addition

$$0 + 0 = 0$$

$$0 + 1 = 1$$

$$1 + 1 = 1$$

Significance of Model Numbers



Prefix

74: Commercial Temperature Range

54: Military Temperature Range

<u>Number</u>	<u>Significance</u>
7400	NAND gate
7408	AND gate
7402	NOR gate
7486	XOR gate
7432	OR gate
7409	INV gate

