

# Digital Circuits 1: EEED 2200

## Lecture 2

Bit = 1 bit

nibble = 4 bits

byte = 8 bits

Switch Logic

TTL

CMOS, 3.3V Logic  
most circuits now

Dynamic Memory

on chip non  
volatile memory

Binary 0

Circuit open

0-0.8V

0-0.8V

Capacitor  
discharged

Not  
Blown

Binary 1

Circuit  
closed

2.0-5.0V

2.0-3.3V

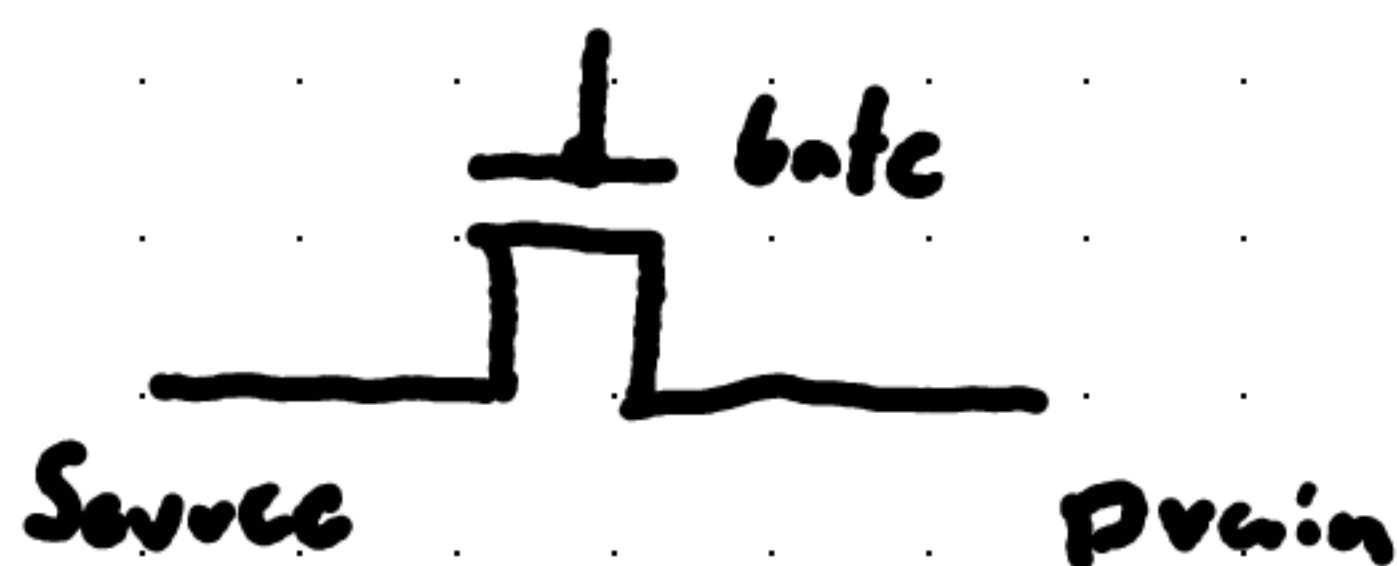
Capacitor  
charged

Blown

# Ideal Switches - Mos Transistors

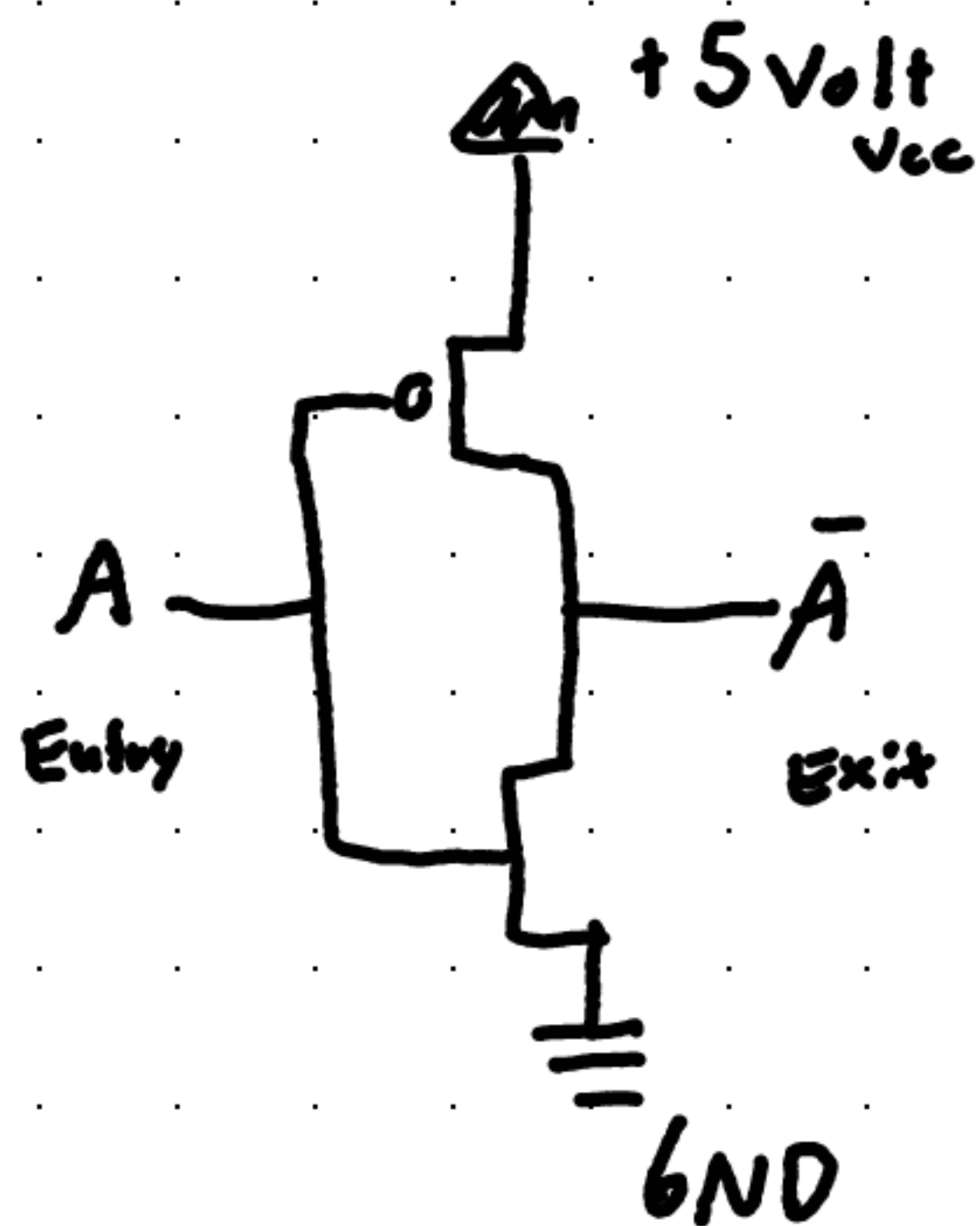
Nmos - Requires positive "High gate" voltage to close

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!

# PNP Inverter Diagram



◦ ← This little bubble represents negation

# Logic Gates



NOT gate



AND

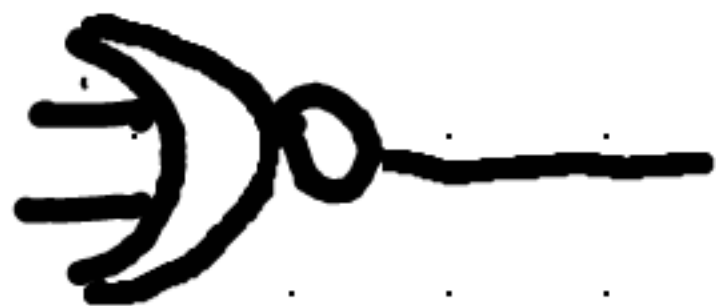


OR

Fundamental  
gates!



NAND



NOR



XOR



XNOR

"Odd number of  
Inputs High, output  
should be high"

"Even number of  
Inputs high,  
output is high"

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

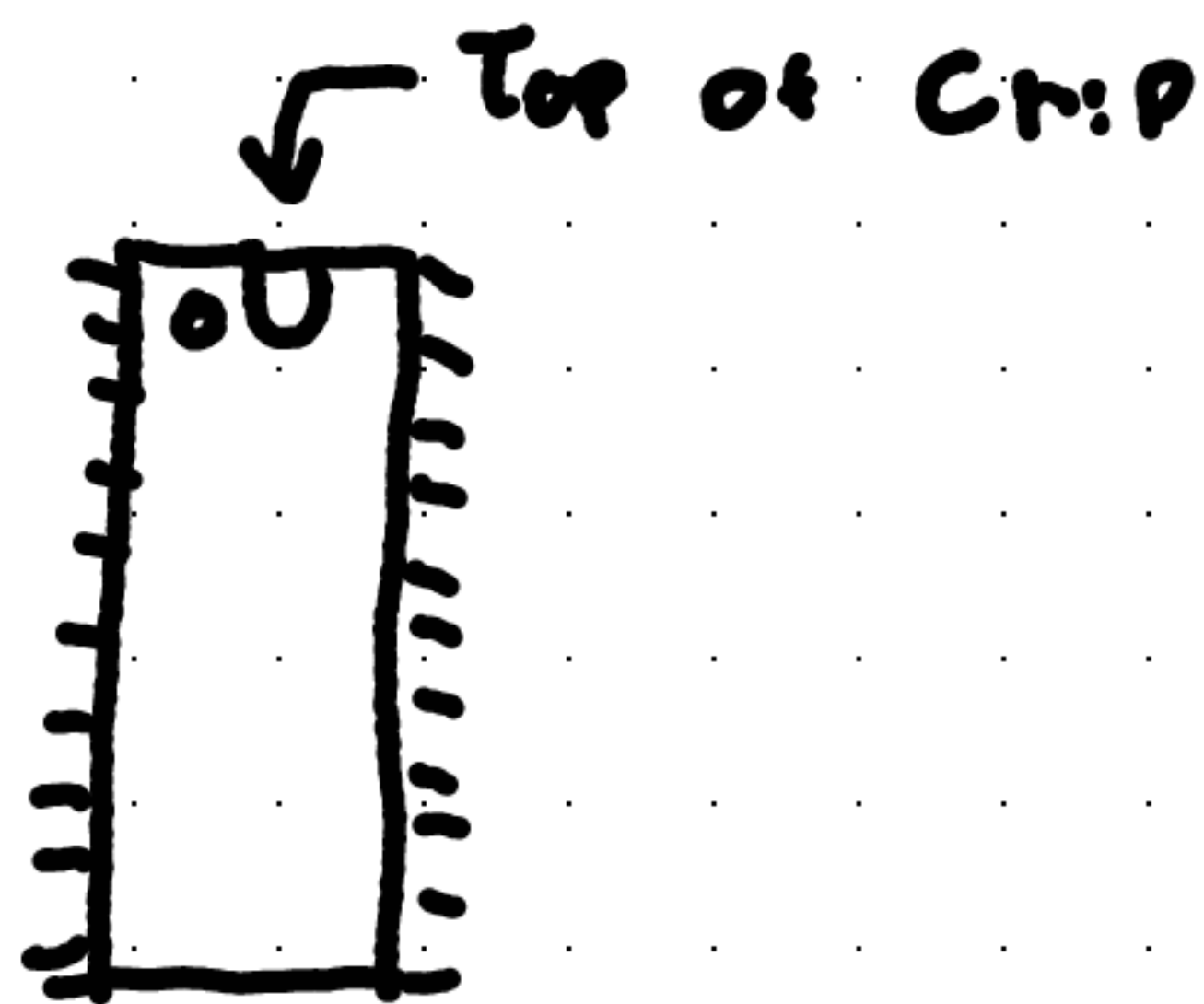
## Boolean Addition

$$0 + 0 = 0$$

$$0 + 1 = 1$$

$$1 + 1 = 1$$

# Significance of Model Numbers



## Prefix

74: Commercial Temperature Range

54: Military Temperature Range

### Number

### Significance

7400	→	NAND gate
7408	→	AND gate
7402	→	NOR gate
7486	→	XOR gate
7432	→	OR gate
7404	→	INV gate

