IEEE's Hands on Practical Electronics (HOPE)

Week 9: CMOS, Digital Logic

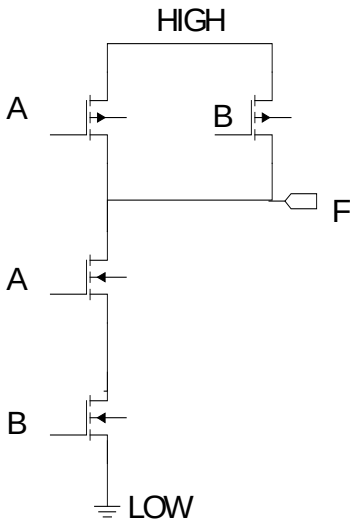
Definitions:

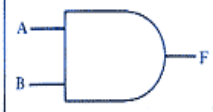
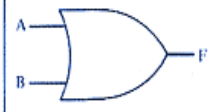
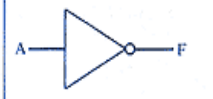
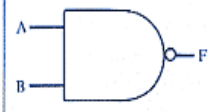
CMOS: Complementary MOS. Uses both PMOS and NMOS in the same circuit.
Boolean Algebra: Developed by George Boole (1815-1864)
Logic: The study of the principles and criteria of valid inference
Gates: Examples: AND, OR, NOT, NAND, NOR
NAND: equivalent to an AND followed by a NOT
NOR: equivalent to an OR followed by a NOT

Conventions:

Yes or true are defined to be 1 or HIGH
No or false are defined to be 0 or LOW

Actual implementation of a NAND with transistors:



Name	Graphic Symbol	Algebraic Function	Truth Table
AND		F = A · B or F = AB	A B | F 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1
OR		F = A + B	A B | F 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 1
NOT		$F = \overline{A}$ or F = A′	A | F 0 | 1 1 | 0
NAND		$F = (\overline{AB})$	A B | F 0 0 | 1 0 1 | 1 1 0 | 1 1 1 | 0
NOR		$F = (\overline{A + B})$	A B | F 0 0 | 1 0 1 | 0 1 0 | 0 1 1 | 0

The top two transistors in parallel are PMOS, and the bottom two are NMOS.