

# Digital Logic

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These slides introduce digital logic concepts

# Digital Logic

- Digital Logic
  - Defining an expression(operand) as **True** or **False**
  - In the digital world we indicate **T** with a **logical value 1**
  - In the digital world we indicate **F** with the **logical value 0**
  - **1** is defined as the positive voltage supply value
  - **0** is defined as 0V or Gnd

# Digital Logic

- Digital Logic
  - Logic Expression
    - Operation Operand  $\rightarrow$  T(1) or F(0)
    - Operand Operation Operand  $\rightarrow$  T(1) or F(0)
  - Operations
    - NOT – flips the evaluation of the operand
      - T  $\rightarrow$  F or F  $\rightarrow$  T
    - OR – evaluates as True if **either** operand is true
    - AND – evaluates as True if **both** operands are true

# Digital Logic

- **NOT** – flips the evaluation of the operand
  - **1** → **0** or **0** → **1**
  - **not operand**
  - **~ operand**
  - operand

A = T = 1

B = F = 0

not A → 0

~ B → 1

not (not A) → 1

~ A → 1

NOT	
A	Not A
0	1
1	0

# Digital Logic

- **OR** – evaluates as 1(T) if either operand is 1 (T)
  - op1 or op2
  - op1 | op1
  - op1 + op2

A = 1

B = 0

C = 1

A or B → 1

A | C → 1

B + C → 1

(not A) | B → 0

OR		
A	B	A or B
0	0	0
0	1	1
1	0	1
1	1	1

# Digital Logic

- **AND** – evaluates as 1(T) if both operands are 1(T)
  - op1 and op2
  - op1 & op2
  - (op1)(op2)

A = 1

B = 0

C = 1

A and B → 0

A & C → 1

BC → 0

A & (not B) → 1

AND		
A	B	A and B
0	0	0
0	1	0
1	0	0
1	1	1

# Digital Logic

- Additional Operations
  - **NAND** – evaluates as **NOT (AND)**
  - **NOR** – evaluates as **NOT (OR)**
  - **XOR** – evaluates as 1(T) if only one operand is 1(T)
  - **XNOR** – evaluates as **NOT (XOR)**