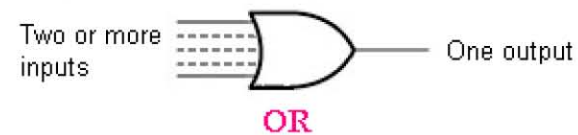# Week 3

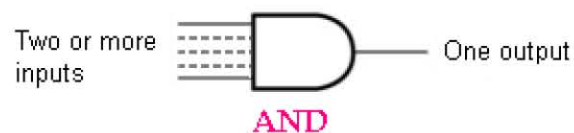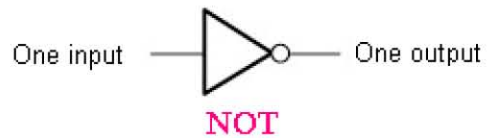## Basic Logic Operations

# Overview of Basic Logic Functions

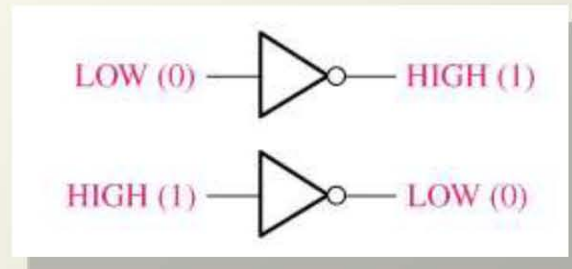# Basic Logic Operations

**There are only three basic logic operations:**



One input ——▷o—— One output

**NOT**



Two or more inputs ----▷—— One output

**AND**



Two or more inputs ----▷—— One output

**OR**

# Basic Logic Operations
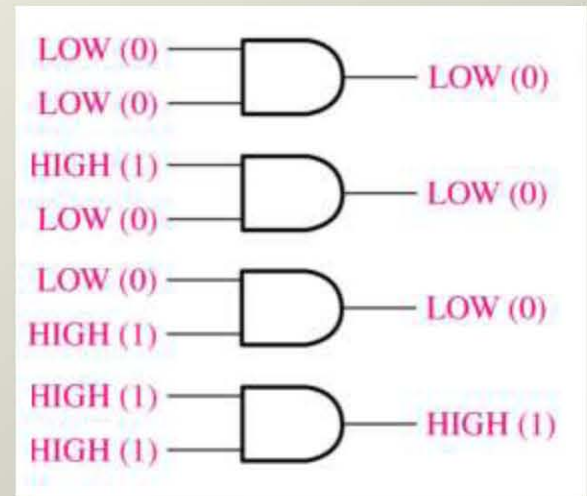
## The NOT operation



- When the input is LOW, the output is HIGH
- When the input is HIGH, the output is LOW

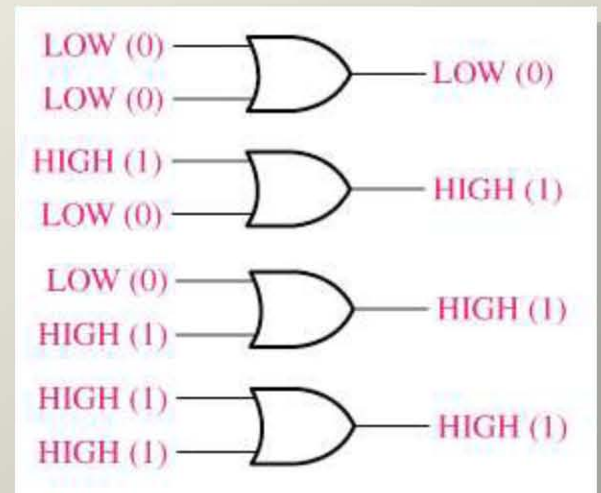**The output logic level is always opposite the input logic level.**

# Basic Logic Operations

- ## The AND operation
  - When any input is LOW, the output is LOW
  - When both inputs are HIGH, the output is HIGH

# Basic Logic Operations

- ## The OR operation

  - ### When any input is HIGH, the output is HIGH

  - ### When both inputs are LOW, the output is LOW

# Overview of Basic Logic Functions

# Overview of Basic Logic Functions

- Comparison function
- Arithmetic functions
- Code conversion function
- Encoding function
- Decoding function
- Data selection function
- Data storage function
- Counting function

## Comparison function

- Compares two binary values and determines whether or not they are equal

## Arithmetic functions

- Perform the basic arithmetic operations on two binary values:
  - Addition
  - Subtraction of two values
  - Multiplication
  - Division

Code conversion function

- Converts, or translates, information from one code format to another

## Overview of Basic Logic Functions

Encoding function

- Converts non-binary information into a binary code

Decoding function

- Converts binary-coded information into a non-binary form

# Data selection function

- ## Multiplexer (mux)
  - Switches digital data from any number of input sources to a single output line

- ## Demultiplexer (demux)
  - switches digital data from a single input to any number of output lines

# Data storage function

- Retains binary data for a period of time
  - Flip-flops (bistable multvibrators)
  - Registers
  - Semiconductor memories
  - Magnetic-media memories
  - Optical-media memories

# Counting function

- Generates sequences of digital pulse that represent numbers

# Course Outline

- Number system, Arithmetic operations, digital codes
- Logic gates
- Boolean Algebra and logic simplifications
- Basic Logic Functions
  - Comparison function
  - Arithmetic functions
  - Code conversion function
  - Encoding and decoding functions
  - Data selection function
  - Data storage function (memory)
  - Counting function
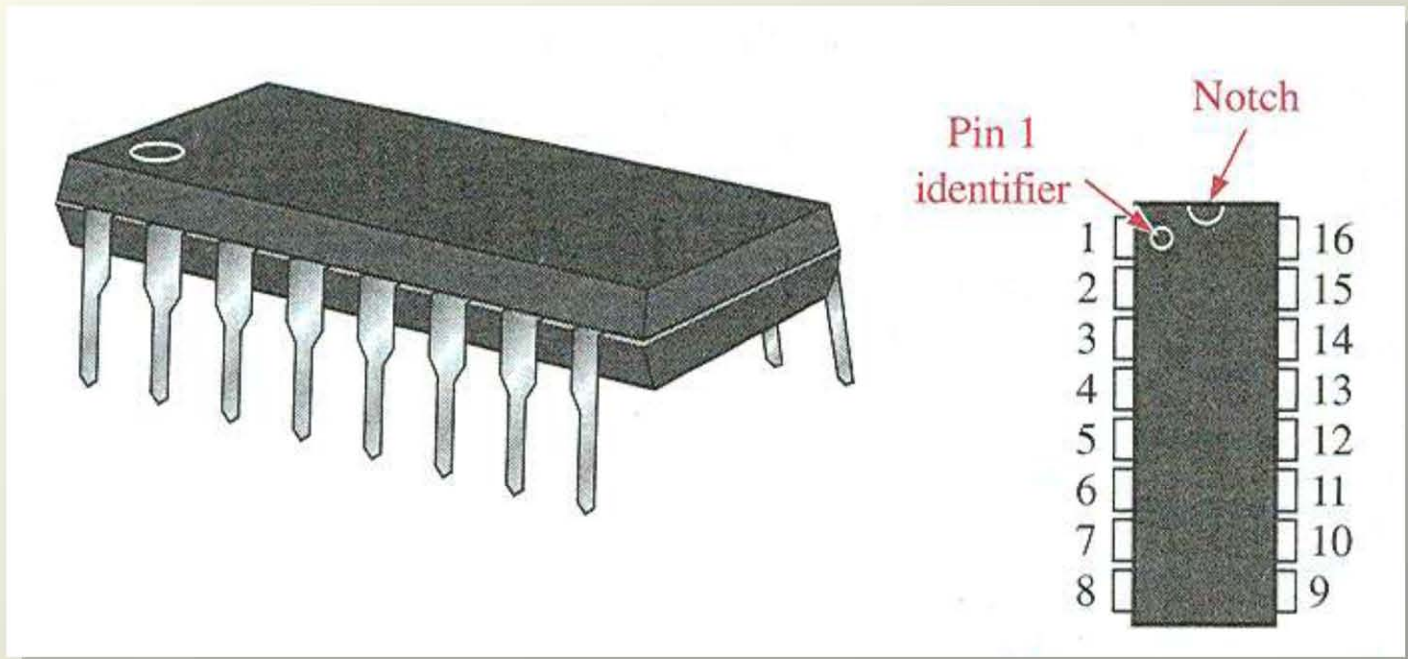- Memory and Storage ( brief)
- Laboratory

# Fixed-Function Integrated Circuits

IC package styles

- Dual in-line package (DIP)

- Small-outline IC (SOIC)

- Flat pack (FP)

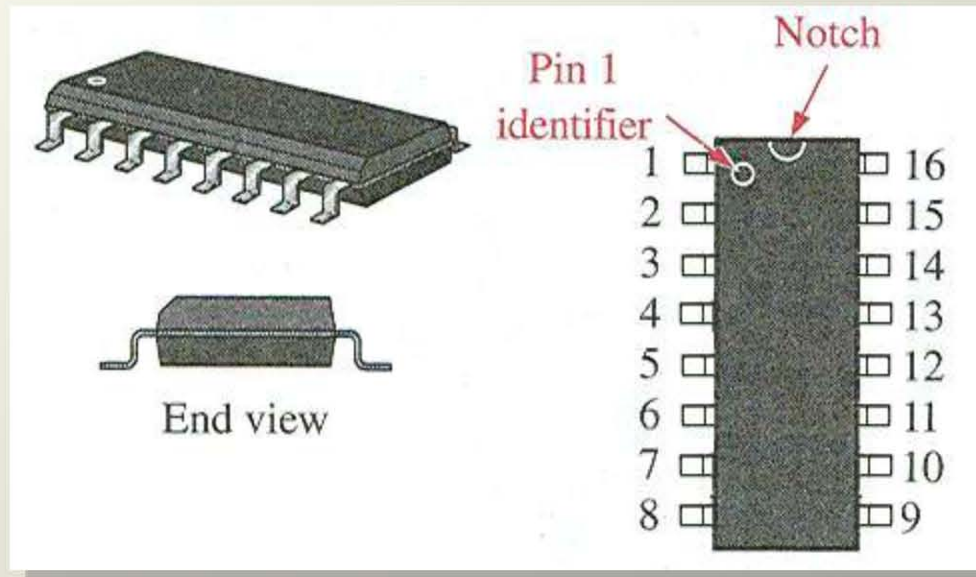- Plastic-leaded chip carrier (PLCC)

- Leadless-ceramic chip carrier (LCCC)

# Fixed-Function Integrated Circuits
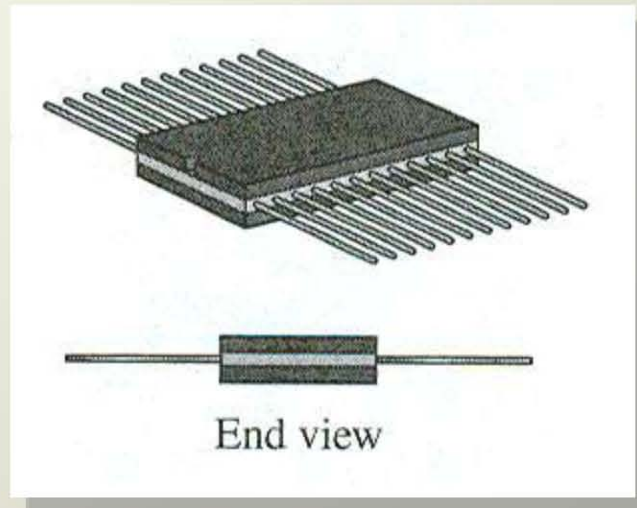
- Dual in-line package (DIP)

# Fixed-Function Integrated Circuits
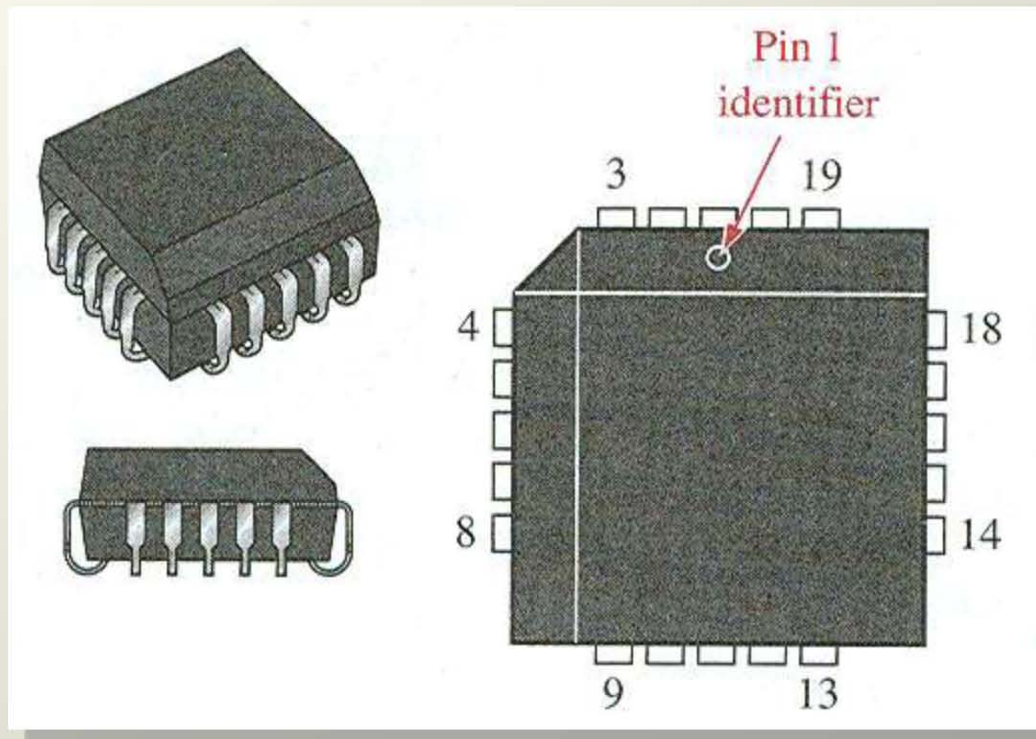
- ## Small-outline IC (SOIC)

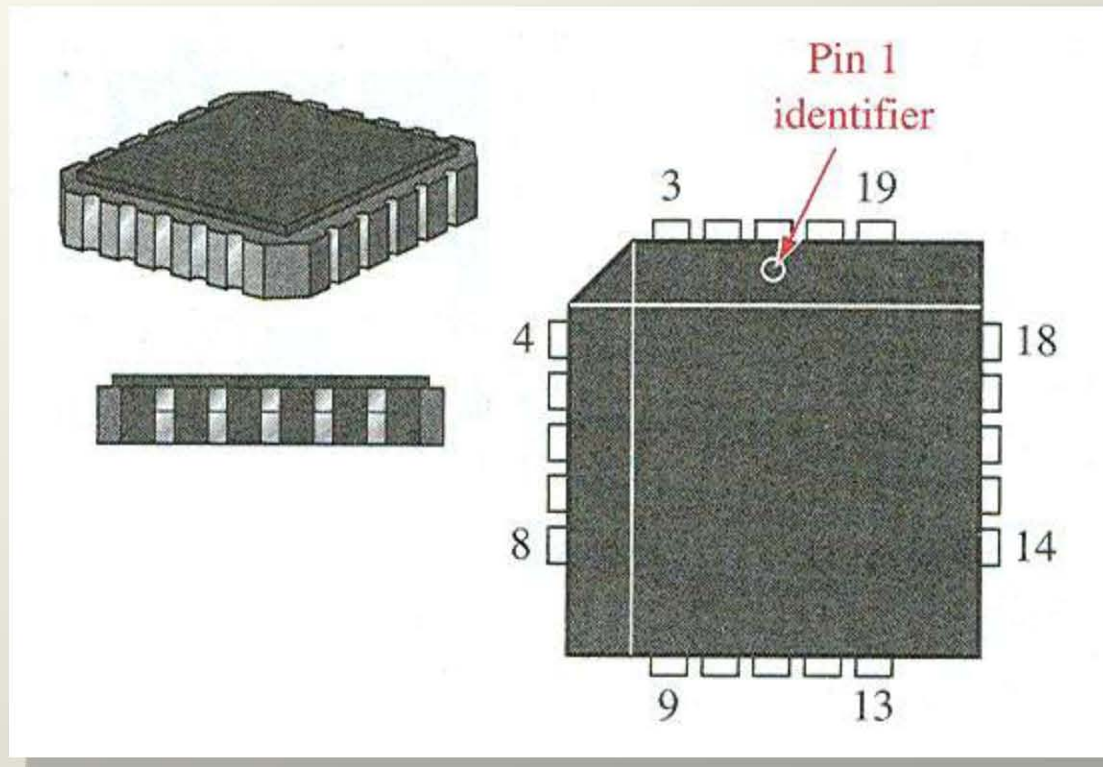# Fixed-Function Integrated Circuits

- Flat pack (FP)

End view

# Fixed-Function Integrated Circuits

- ## Plastic-leaded chip carrier (PLCC)

# Fixed-Function Integrated Circuits

- ## Leadless-ceramic chip carrier (LCCC)

# Test and Measurement Instruments

# Test and Measurement Instruments

- Analog Oscilloscope
- Digital Oscilloscope
- Logic Analyzer
- Logic Probe, Pulser, and Current Probe
- DC Power Supply
- Function Generator
- Digital Multimeter

# Key Terms

- Analog
- Digital
- Binary
- Bit
- Pulse
- Clock
- Timing diagram
- Serial
- Parallel
- Logic
- Input
- Output

- Gate
- NOT
- Inverter
- AND
- OR
- Integrated Circuits ICs

**Text book**
**Digital Fundamentals by Thomas Floyd, 3rd edition**
**Pearson Prentice Hall**