Transistors (Silicon sandwich)

- Type
  - BIT: Cmos
    - Junction Bipolar
  - Field-Effect MOS FET

- Function movement of electrons:

Integrated circuits

- Small-scale SSI
- Medium-scale MSI
- Large-scale LSIs
- Very large-scale VLSI
- Ultra-large-scale USL

- [ combinational logic ]
  - Logic Gates circuits
  - Time-independent Logic

- [ sequential logic ]
  - latches (or flip-flops) circuits
  - (one-bit memory)

CPU memory

Devices → MPU

micro controller units

Small computer on a single chip

AND

NAND

XOR

A

B

A

B

C

A

B

C

W

D

Q

Latch

Latch

Latch

Latch

* complementary symmetry metal-oxide-semiconductor
[1] A field-programmable gate array
[2] Application specific integrated circuit
Micro processors

- Components
  - Memory
  - Bus
  - CPU
    - I/O
      - Data
      - Control
    - Add

Characteristics

- CPU
  - Gen. Purpose
    - Programmable
- Binary Data
  - Function
    - Fetch
      - Decode
        - Binary
          - Halo
    - Execute
Understanding the binary data

Number System

Binary: base 2 (0-1)

Hexadecimal: base 16 (0-9, A-F)

Conversion:

1. \[ 101_2 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 4 + 1 = 5 \]

2. \[ 1010_2 = 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 = 10 \]

Negative numbers

2. \[ \begin{align*}
10/2 & \rightarrow 5 \quad & \text{LSB} \\
5/2 & \rightarrow 2 \quad & 1 \\
2/2 & \rightarrow 1 \quad & 0 \\
1/2 & \rightarrow 0 \quad & 1 \quad & \text{MSB}
\end{align*} \]

3. \[ \begin{array}{c|c|c}
10111000 & 2 & 8 \\
1 & 2 & 8 \\
1 & 2 & A \\
1 & 2 & B \\
10 & 12 & C \\
\end{array} \]