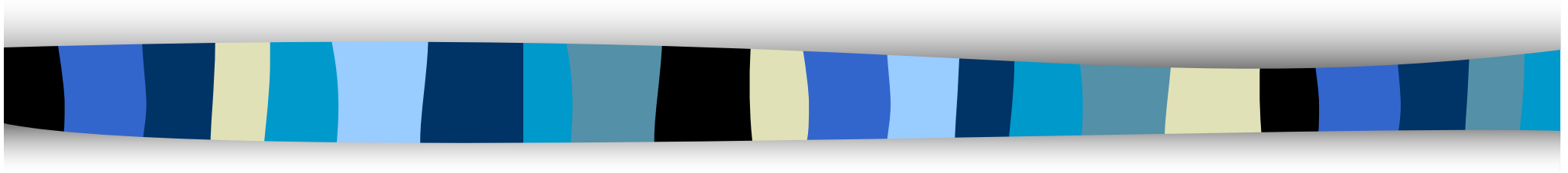
Micro . Computer System Lab.

Introduction



Outline

- From Diode to Micro Computer System
  - Technologies briefing
- Micro Computer System Basics

From Diode to Micro Computer System

- Diode switch

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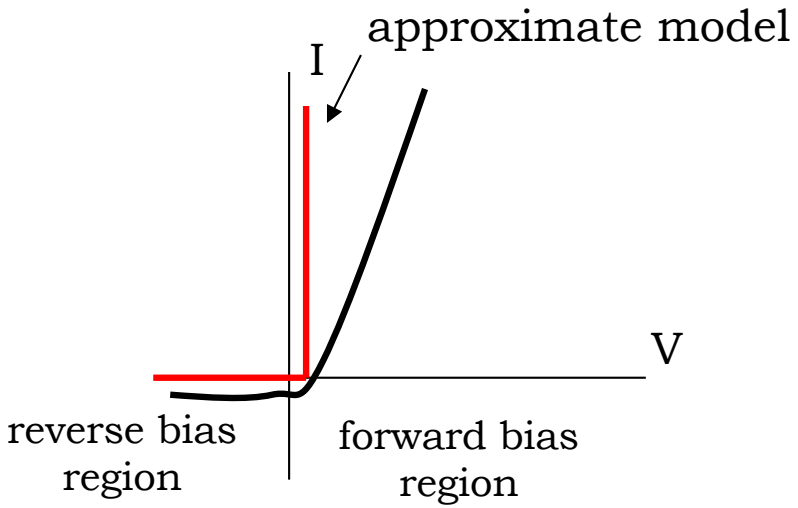
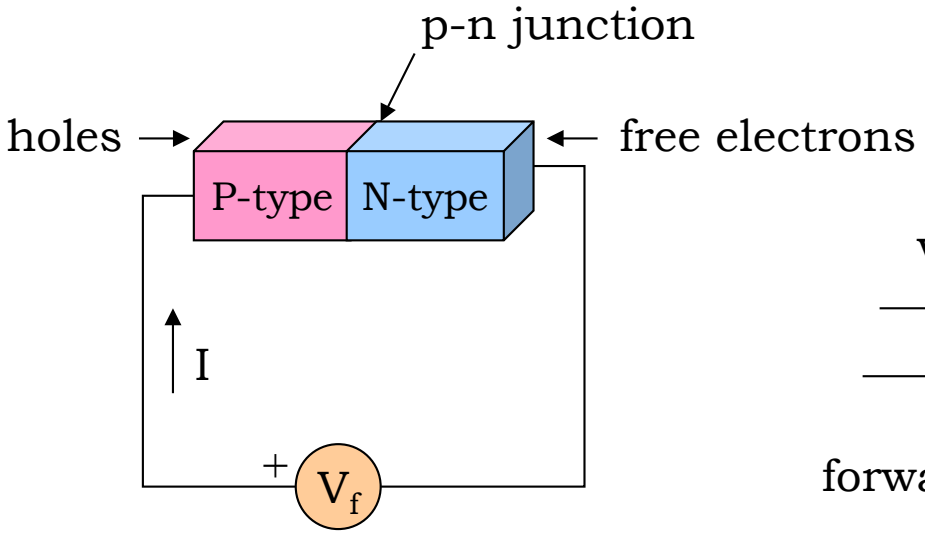
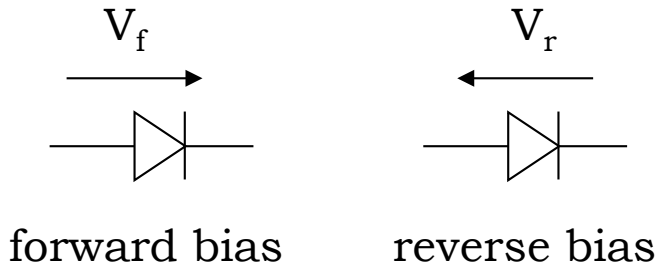
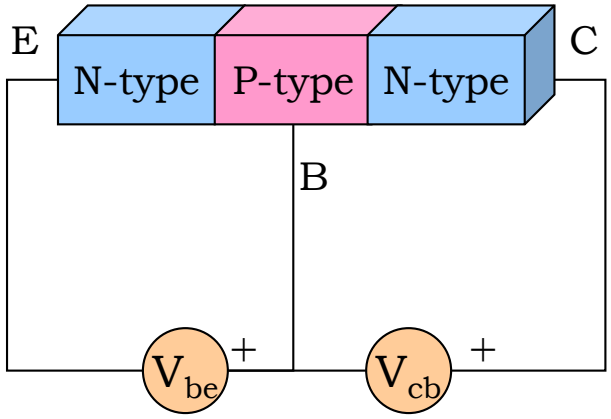


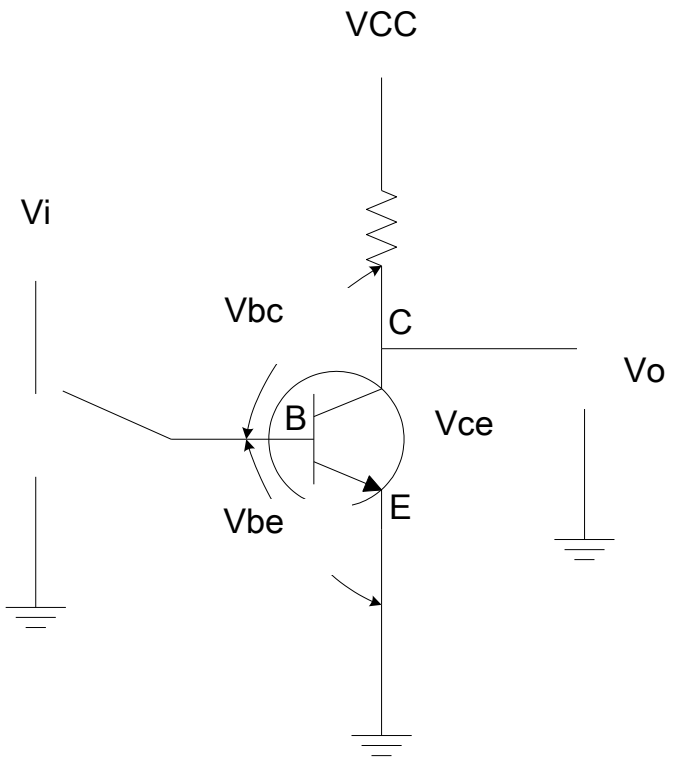




From Diode to Micro Computer System (Cont.)

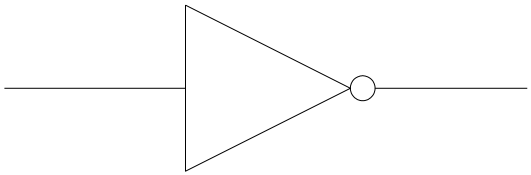
- Transistor switch
  - npn BJT



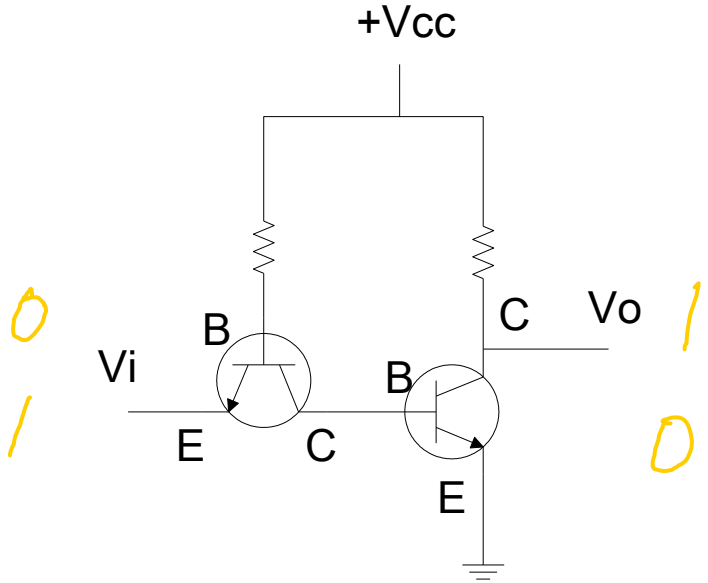


From Diode to Micro Computer System (Cont.)

- Transistor switch (Cont.)
  - Inverter

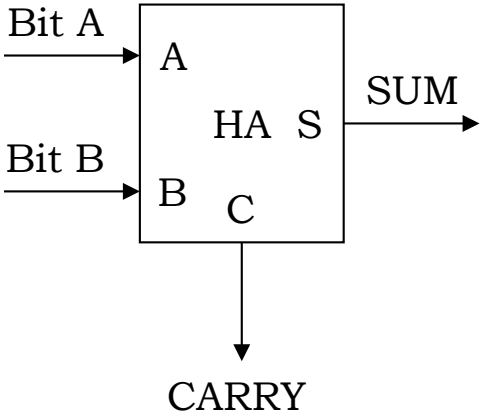


Xi	Xo
0	1(+V)
1(+V)	0



From Diode to Micro Computer System (Cont.)

- Combinational logic design
  - Half adder



A	B	C	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

AB	0	1
0	0	1
1	1	0

S

AB	0	1
0	0	0
1	0	1

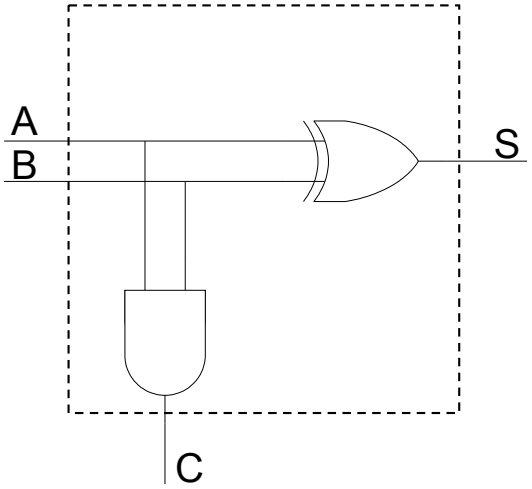
C

S=A⊕B

C=A•B

From Diode to Micro Computer System (Cont.)

- Combinational logic design
  - Half adder (Cont.)



From Diode to Micro Computer System (Cont.)

- Combinational logic design
  - Arithmetic and logic units (ALUs)

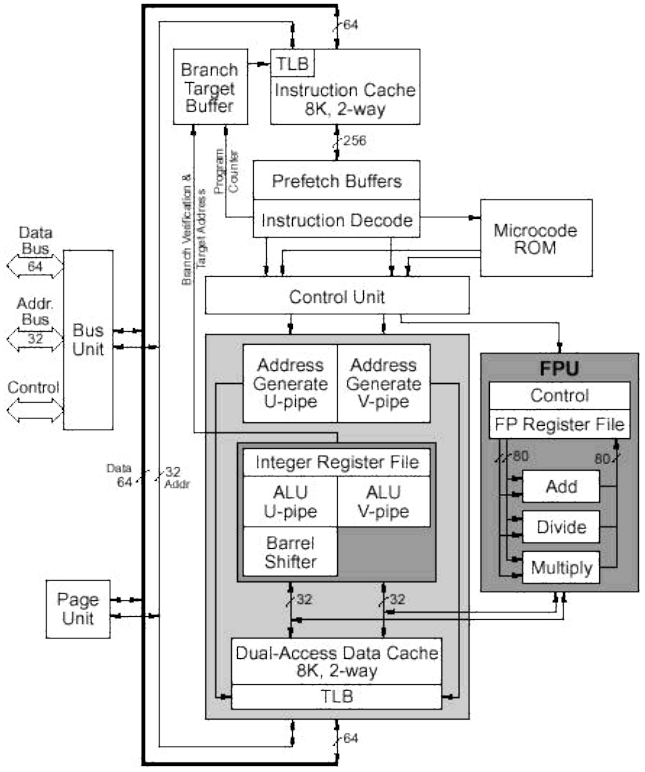
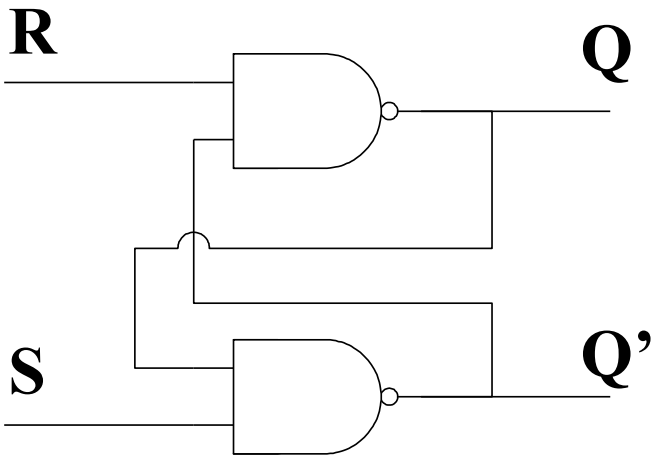


Figure 1. Pentium block diagram.

From Diode to Micro Computer System (Cont.)

- Combinational logic design
  - Flip-flop



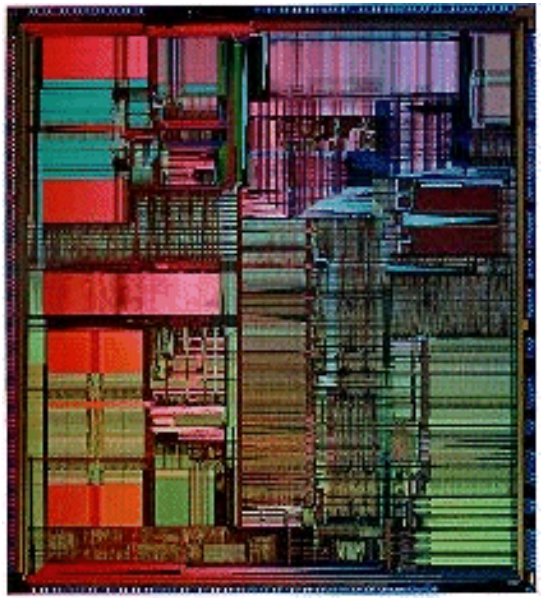
R	S	Q_{n+1}
0	0	Q_n
0	1	1
1	0	0
1	1	X

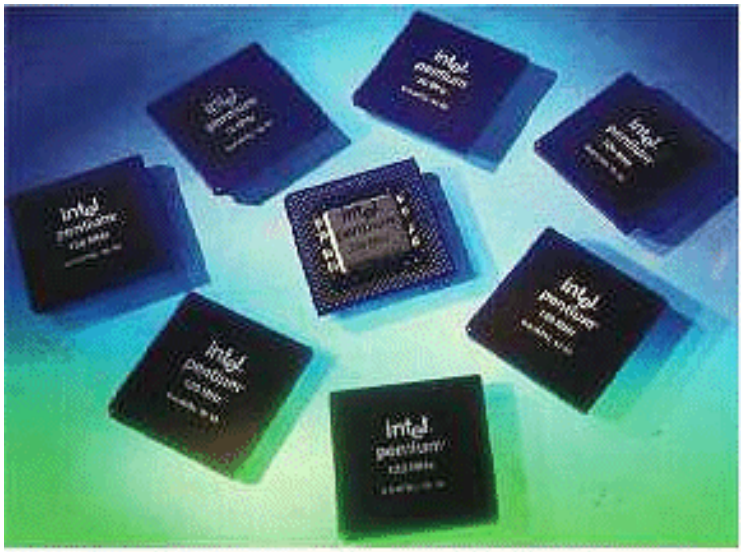
From Diode to Micro Computer System (Cont.)

- Combinational logic design
  - Memory
    - Register, cache, RAM, …

From Diode to Micro Computer System (Cont.)

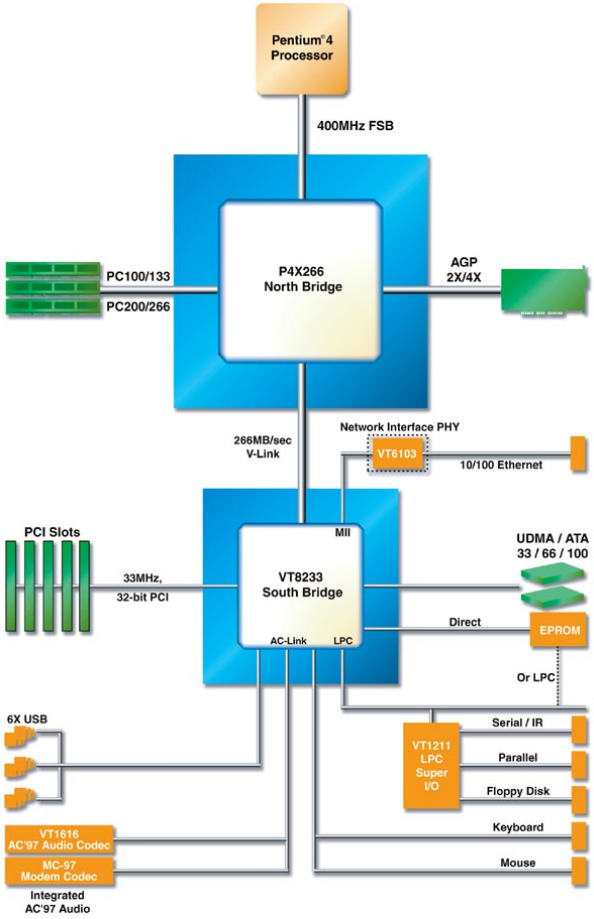
- Processor
  - CPU, Microprocessor





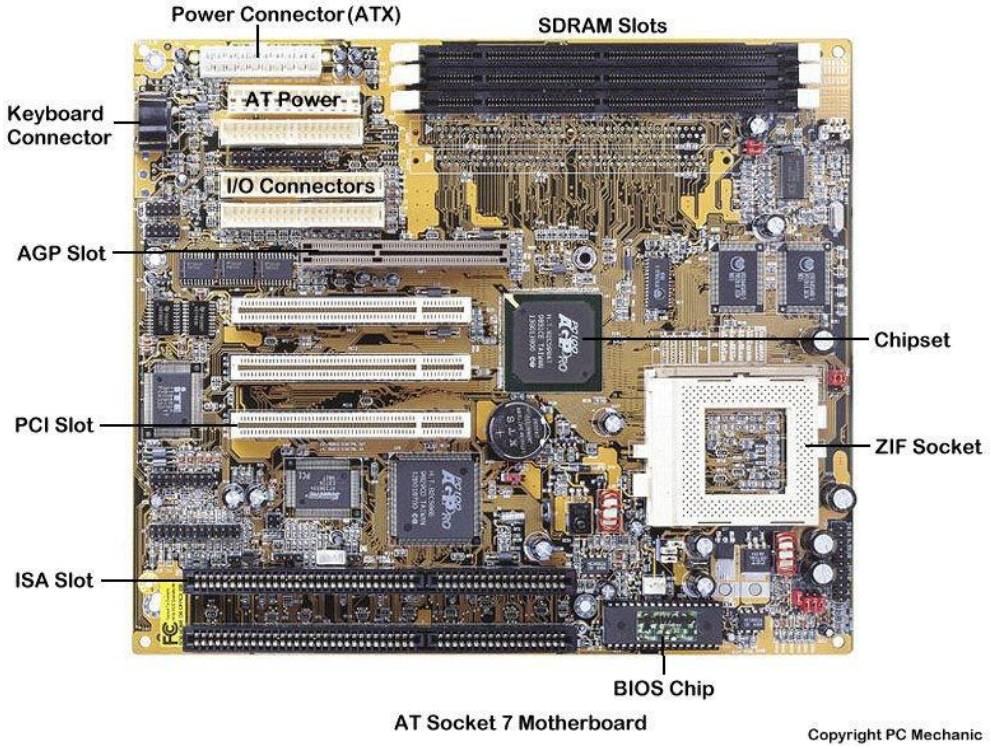
From Diode to Micro Computer System (Cont.)

- Micro processor ⇨ Micro computer system



From Diode to Micro Computer System (Cont.)

- Micro processor ⇨ Micro computer system (Cont.)

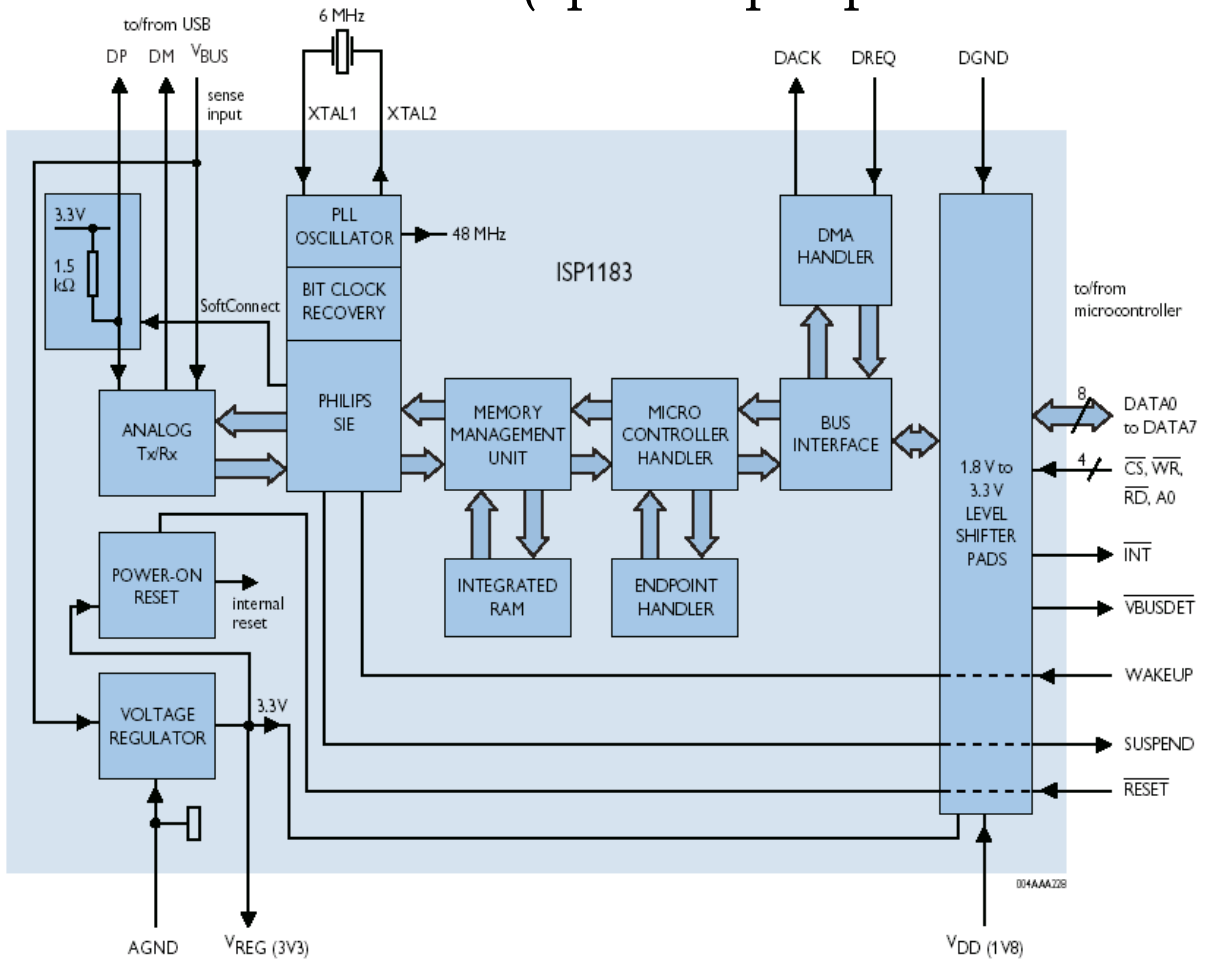


From Diode to Micro Computer System (Cont.)

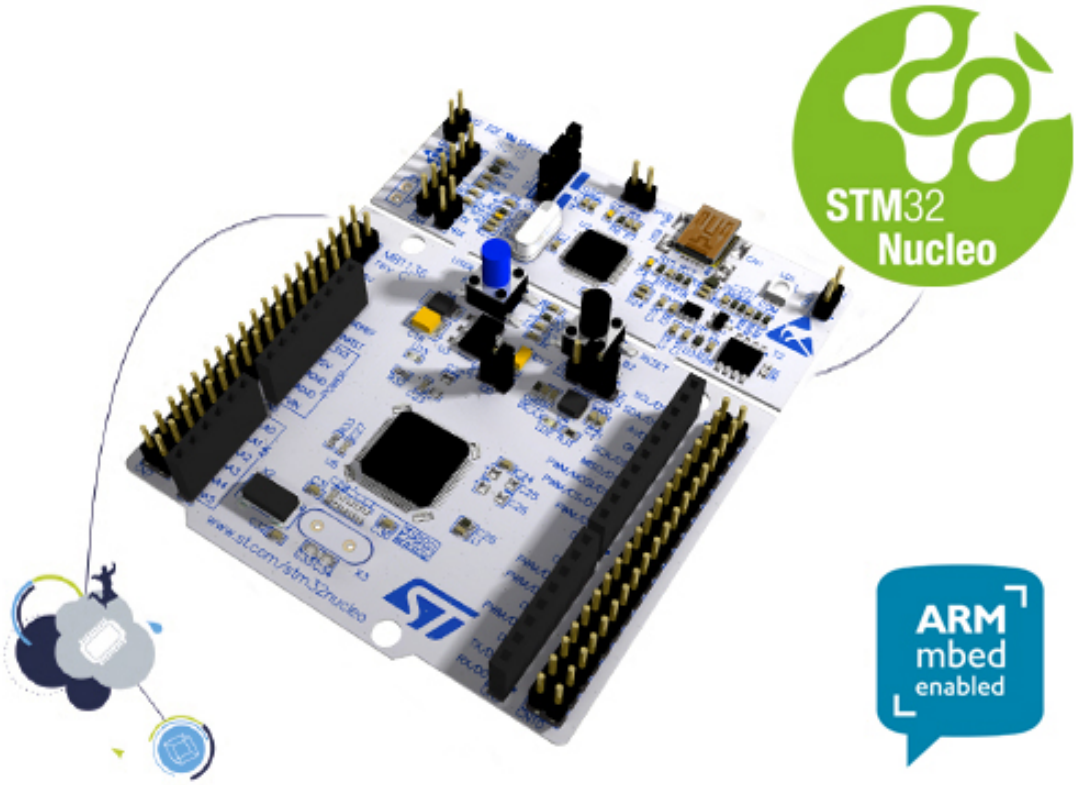
- Processor vs. computer
  - Micro computer, mini computer, mainframe, super computer, …
- Computer vs. controller
  - integrated circuit semiconductor chip that performs the bulk of the processing and controls the parts of a system; "a **microprocessor** functions as the central processing unit of a microcomputer"; "a disk drive contains a microprocessor to handle the internal functions of the drive"
  - A microprocessor on a single integrated circuit intended to operate as an embedded system. As well as a CPU, a **microcontroller** typically includes small amounts of RAM and PROM and timers and I/O ports (single chip computer)

From Diode to Micro Computer System (Cont.)

- USB controller (special purpose micro controller)

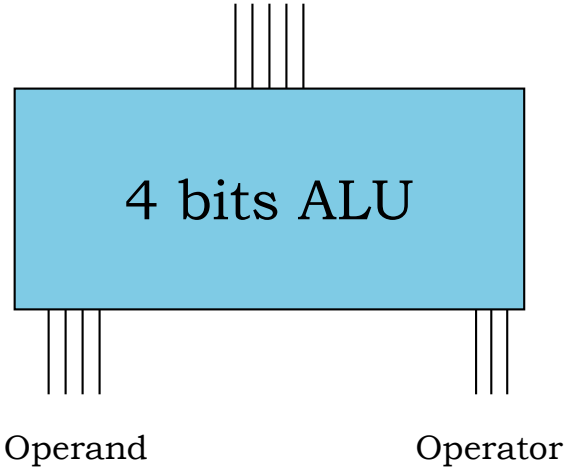


Micro Computer System Basics (Cont.)



Microcontroller introduction

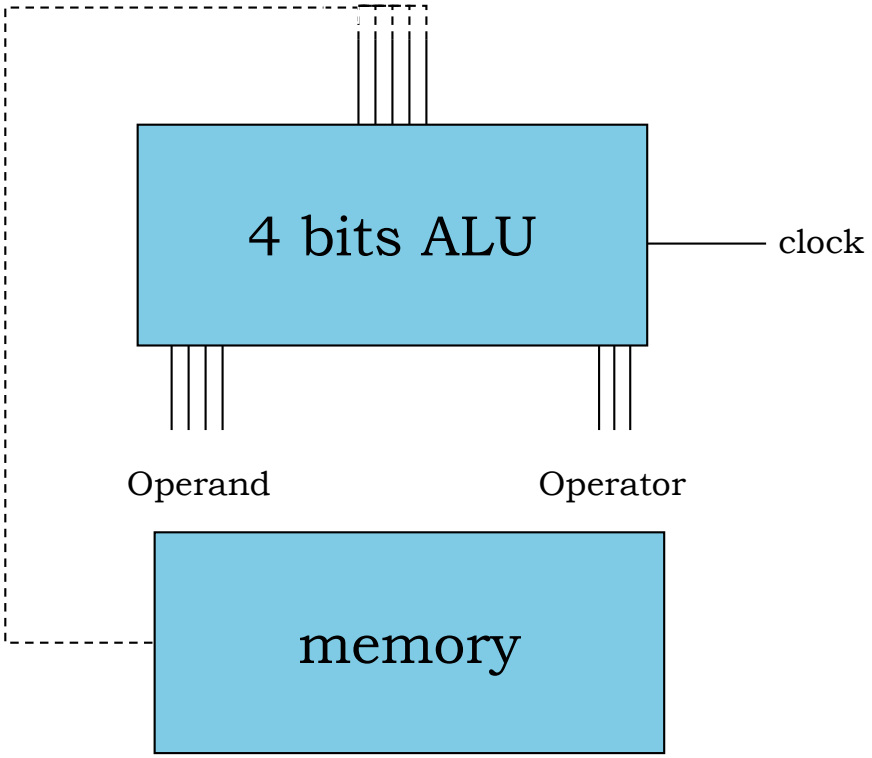
- Let's review computer architecture first
  - 4 bits ALU



OP code	
000	+
001	-
010	X
011	/
100	MOV A, [4 bits]

Microcontroller introduction (Cont.)

- With memory



Microcontroller introduction (Cont.)

- Clock rate
  - The fundamental rate in cycles per second at which a computer performs its most basic operations such as adding two numbers or transferring a value from one register to another
- Machine cycle
  - The four steps which the CPU carries out for each machine language instruction: fetch, decode, execute, and store. These steps are performed by the control unit, and may be fixed in the logic of the CPU or may be programmed as microcode which is itself usually fixed (in ROM) but may be (partially) modifiable (stored in RAM)

Microcontroller introduction (Cont.)

- A=5+2-3; (C language)

MOV A 5
ADD A 2
SUB A 3

0101 100
0010 000
0011 001 (machine code)