The 8051 Microcontroller and Embedded Systems

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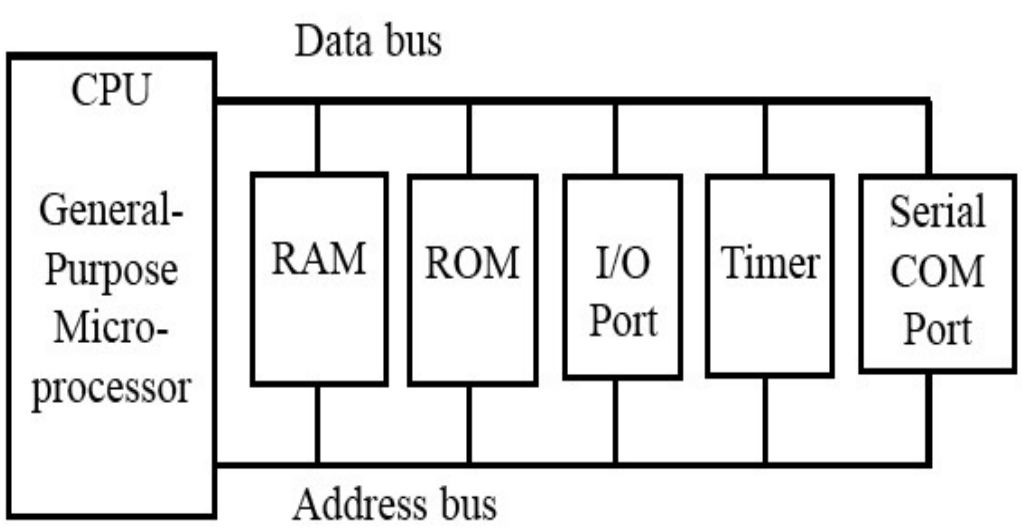
OBJECTIVES

- Comparison of microprocessors and microcontrollers
- Advantages of microcontrollers for some applications
- Concept of Embedded Systems
- Criteria for choosing a microcontroller
- Various members of the 8051 family
- 8051 microcontrollers offered by various manufacturers

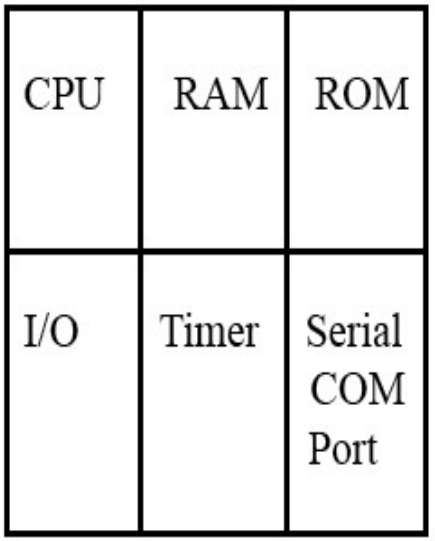
MICROPROCESSORS Vs MICROCONTROLLERS

- General-purpose microprocessor

Microcontroller



(a) General-Purpose Microprocessor System



(b) Microcontroller

MICROPROCESSORS

1. Functional blocks are

   ALU, Reg.,T&C unit

2. There is a rapid movement of data

   /Coad Bw ext.M to µP.

3. Many opcodes involves for data movement

4. Used in the form of Byte/data & have one /two types of bit handling instructions.

5. Costly--- digital computers.

MICROCONTROLLERS

1. Includes the fun. Of µP & in addition to Timer, Parallel & Serial ports, int. RAM & EPROM / EEPROM
2. Rapid movement Of DATA & COAD with in the chip.
3. Few instruction used for this purpose
4. Large no. of bit manipulation
5. Cheap – Designing app for specific dedicate sysm.

EMBEDDED SYSTEM AND THEIR PRODUCTS

Embedded System

The application and processor are combined into a single system

Embedded products

Processor inside the micro controller performs only one task.

Eg: Printer- Getting data from i/p device through the processor and printing it.

MICROCONTROLLERS AND THEIR EMBEDDED PRODUCTS

Home

Appliances
Intercom
Telephones
Security systems
Garage door openers
Answering machines
Fax machines
Home computers
TVs
Cable TV tuner
VCR
Camcorder
Remote controls
Video games
Cellular phones
Musical instruments
Sewing machines
Lighting control
Paging
Camera
Pinball machines
Toys
Exercise equipment

Office

Telephones
Computers
Security systems
Fax machine
Microwave
Copier
Laser printer
Color printer
Paging

Auto

Trip computer
Engine control
Air bag
ABS
Instrumentation
Security system
Transmission control
Entertainment
Climate control
Cellular phone
Keyless entry

TYPES OF 8-BIT MICROCONTROLLER

- Free scale 6811
- Intel's 8051
- Zilog's Z8
- PIC 16X

Each one has unique instruction set &

Register set

CRITEIR'S TO CHOOSE A MICROCONTROLLER FOR DESIGNING

1. Task at hand efficient & cost effective
   Speed, Bit size, Packaging, Power consumption, no. of I/O ports &Timers and Cost.

2. Availability of software tools
   Assembler
   Compiler
   Debugger

3. Availability & Resources of microcontroller

RELIABLE SOURCES OF MICROCONTROLLER

- **Choosing a microcontroller**

Company	Web Site
Intel	www.intel.com/design/mcs51
Atmel	www.atmel.com
Philips/Signetics	www.semiconductors.philips.com
Infineon	www.infineon.com
Dallas Semi/Maxim	www.maxim-ic.com

8051 MICROCONTROLLER AND THEIR FEATURES

Feature	Quantity
ROM	4K bytes
RAM	128 bytes
Timer	2
I/O pins	32
Serial port	1
Interrupt sources	6

Note: ROM amount indicates on-chip program space.

OVERVIEW OF THE 8051 FAMILY

Feature	8051	8052	8031
ROM (on-chip program space in bytes)	4K	8K	0K
RAM (bytes)	128	256	128
Timers	2	3	2
I/O pins	32	32	32
Serial port	1	1	1
Interrupt sources	6	8	6

MICROCONTROLLER 8031

- Is a ROM less 8051 microcontroller
- It does not have internal ROM

  If we add external ROM (as large as 64 KB) to this 8031 MC (for programming code) use 2 I/O ports out of 4 I/O ports

- To avoid this we use PPI 8255

  (I/O port chip, 40 pin IC, 3 ports(A,B,C): 8-bit width)

MICROCONTROLLERS AND EMBEDDED PROCESSORS

Part Number	ROM	RAM	I/O pins	Timers	Interrupts	V_{CC}
DS89C420/30	16K (Flash)	256	32	3	6	5V
DS89C440	32K (Flash)	256	32	3	6	5V
DS89C450	64K (Flash)	256	32	3	6	5V
DS5000	8K (NVRAM)	128	32	2	6	5V
DS80C320	0 K	256	32	3	6	5V
DS87520	16K (UVROM)	256	32	3	6	5V

Source: www.maxim-ic.com/products/microcontrollers/8051_drop_in.cfm

Table :
Versions of 8051/52 Microcontroller From Dallas Semiconductor (Maxim)

Various 8051 Microcontrollers

1. UV-EPROM version ---- µC 8751
2. Flash ROM version----Atmel (AT89C51)
   ----Dallas semiconductor
   (DS 89C4x0)
3. NV-ROM version----- Dallas semiconductor
4. OTP version -----one time programmable version

µC 8751

- It has only 4KB of On-chip UV EPROM-eraser (20 mint.).

Flash type ROM version

In Atmel corp. version of 8051 µC ---A89C51

- 4Kb flash ROM & 128 bytes of RAM
- Requires a ROM burner & need not as eraser

(UV-EPROM)

Dallas semiconductor version of µc

DS 89C4x0

DS 89C420/30 ---- 16 kb of ROM & 440 ---- 32 kb

NV-RAM:

the ability to change the ROM contents one byte at a time

OTP version of µC 8051

-Flash & NV-RAM versions are used

Philips corp. version of 8051 µC

A-D / D-A converters, extended I/O ports &

Both OTP And Flash versions

A brief history of the 8051

- In 1981, Intel Corporation
  Microcontroller 8051 (8-bit processor).
- This microcontroller had
  128 bytes of RAM,
  4K bytes of on-chip ROM,
  two timers,
  one serial port, and
  four ports (each 8-bits wide)
  Six interrupt sources

all on a *single chip.*---- *SYSTEM ON A CHIP*

BLOCK DIAGRAM OF THE 8051 MICROCONTROLLER

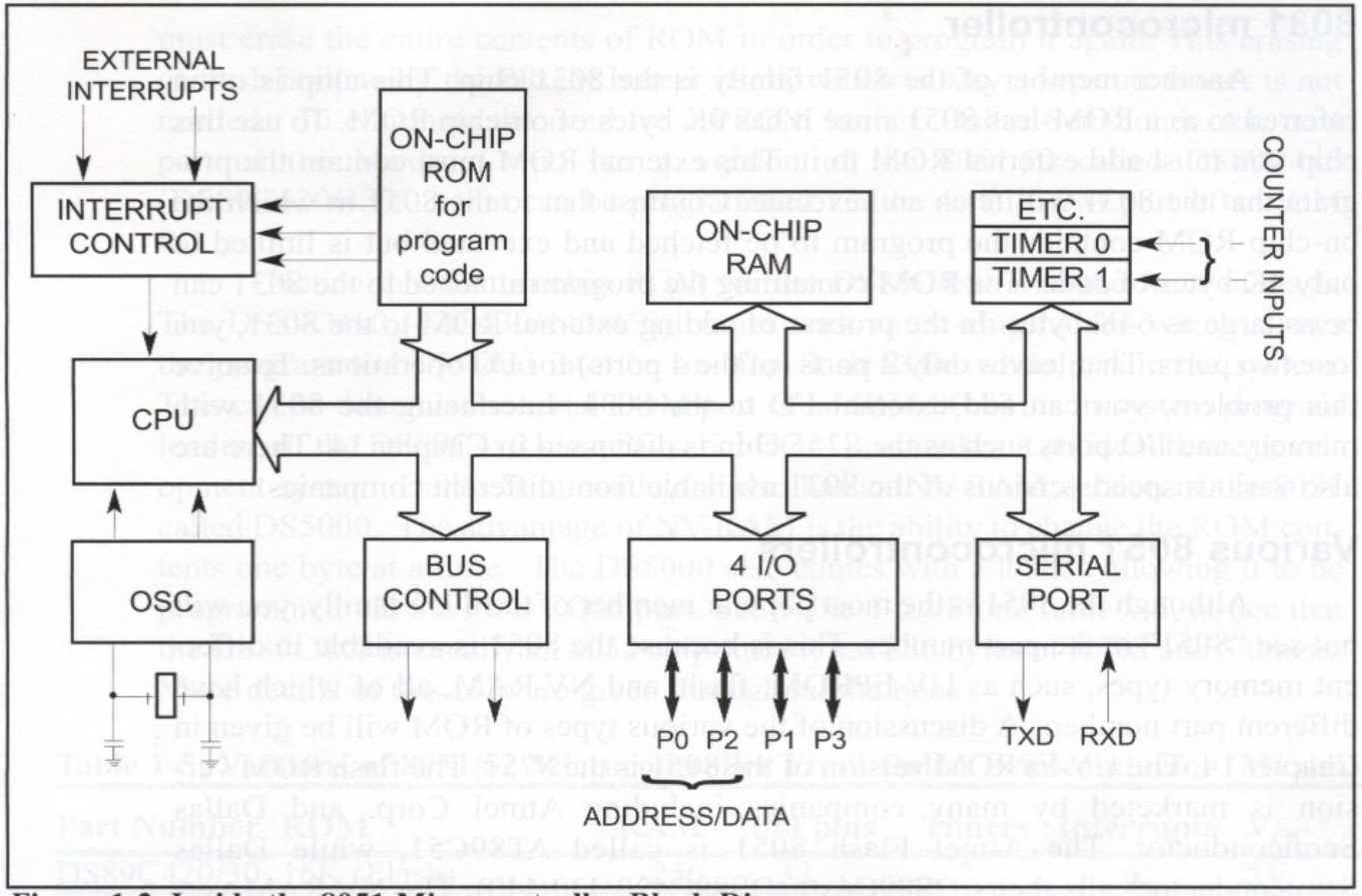


Figure 1-2. Inside the 8051 Microcontroller Block Diagram

Thank you