Introduction of Microcontroller 8051

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The 8051 Microcontroller

Embedded System
(8051 Application)

❑ What is Embedded System?

   ❖ An embedded system is closely integrated with the main system

   ❖ It may not interact directly with the environment

   ❖ For example – A microcomputer in a car ignition control

   ❖ An embedded product uses a microprocessor or microcontroller to do one task only

   ❖ There is only one application software that is typically burned into ROM
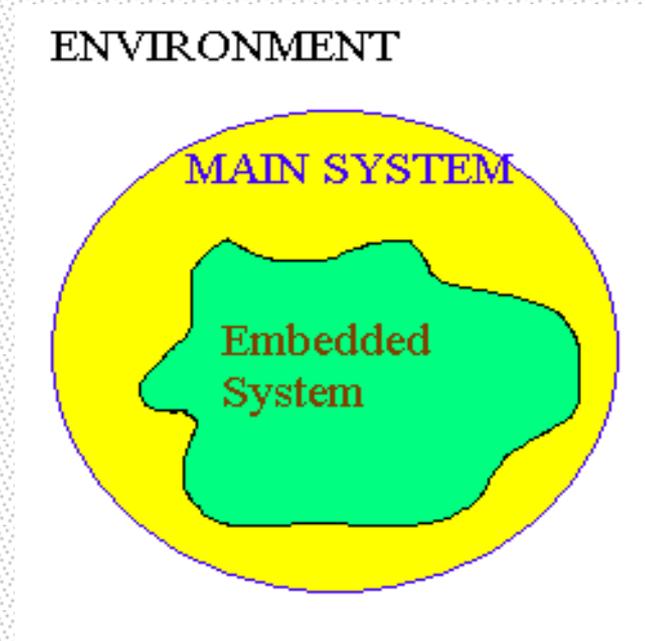
Examples of Embedded Systems

❑ Keyboard
❑ Printer
❑ video game player
❑ MP3 music players
❑ Embedded memories to keep configuration information
❑ Mobile phone units
❑ Domestic (home) appliances
❑ Data switches
❑ Automotive controls
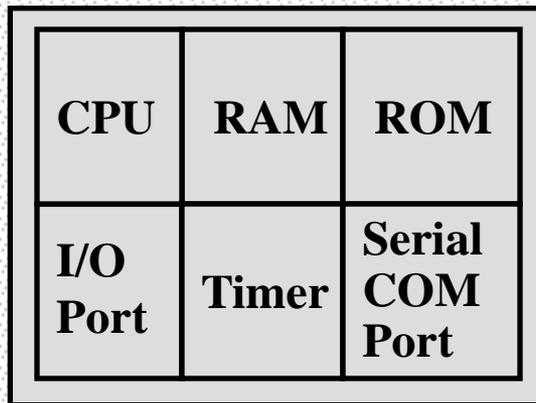
Comparison between Microprocessor and Microcon[...]

SrNo	Microprocessor	Microcontroller
1.	A device that integrates a number of useful functions into a single IC package.	A device which integrates a number of components.
2.	Dependent on other chips for many functions so hardware size increases.	Single chip computer which has everything in-built.
3.	CPU is stand alone, RAM, ROM, I/O, TIMER are separate.	CPU is stand alone, RAM, ROM, I/O, TIMER are all on a single chip.
4.	Designer can decide on the amount of RAM, ROM and I/O ports.	Fix amount of on-chip ROM, RAM, I/O ports.
5.	Program memory and data memory are same.	Uses different Program memory and data memory
6.	Suited for processing information in computer systems.	Suited for control of I/O devices requiring minimum component count.
7.	Powerful addressing mode.	Extremely compact instructions.
8.	Data bus: 8, 16, 32, 64, 128 bits wide	Data bus: 8, 16, 32 bits wide
9.	Clock rate > 1 GHz	10 to 20 MHz
10.	General purpose	Single purpose
11.	System cost is more	System cost is less

Difference between Microprocessor and Microcontroller

- CISC versus RISC
  - RISC stands for "Reduced Instruction Set Computers". Instructions are as bare a minimum as possible to allow users to design their own operations.
  - CISC stands for "Complex Instruction Set Computers". Large number of instructions, each carrying out a different permutation of the same operation.
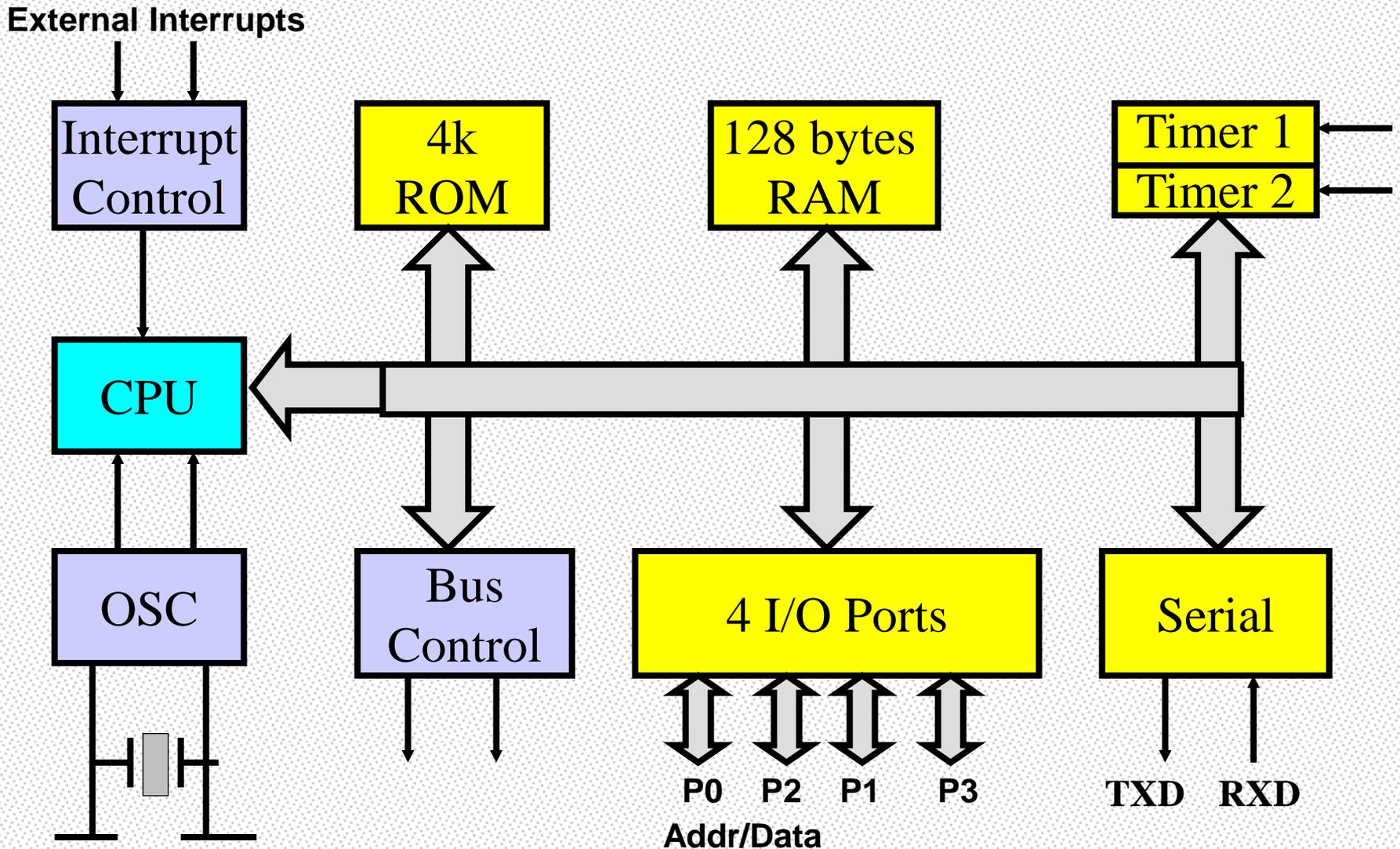
8051 Basic Component

- ❏ 4K bytes internal ROM
- ❏ 128 bytes internal RAM
- ❏ Four 8-bit I/O ports (P0 - P3).
- ❏ Two 16-bit timers/counters
- ❏ One serial interface

CPU	RAM	ROM
I/O Port	Timer	Serial COM Port

← A single chip Microcontroller

Block Diagram

External Interrupts

Interrupt Control

4k ROM

128 bytes RAM

Timer 1

Timer 2

CPU

OSC

Bus Control

4 I/O Ports

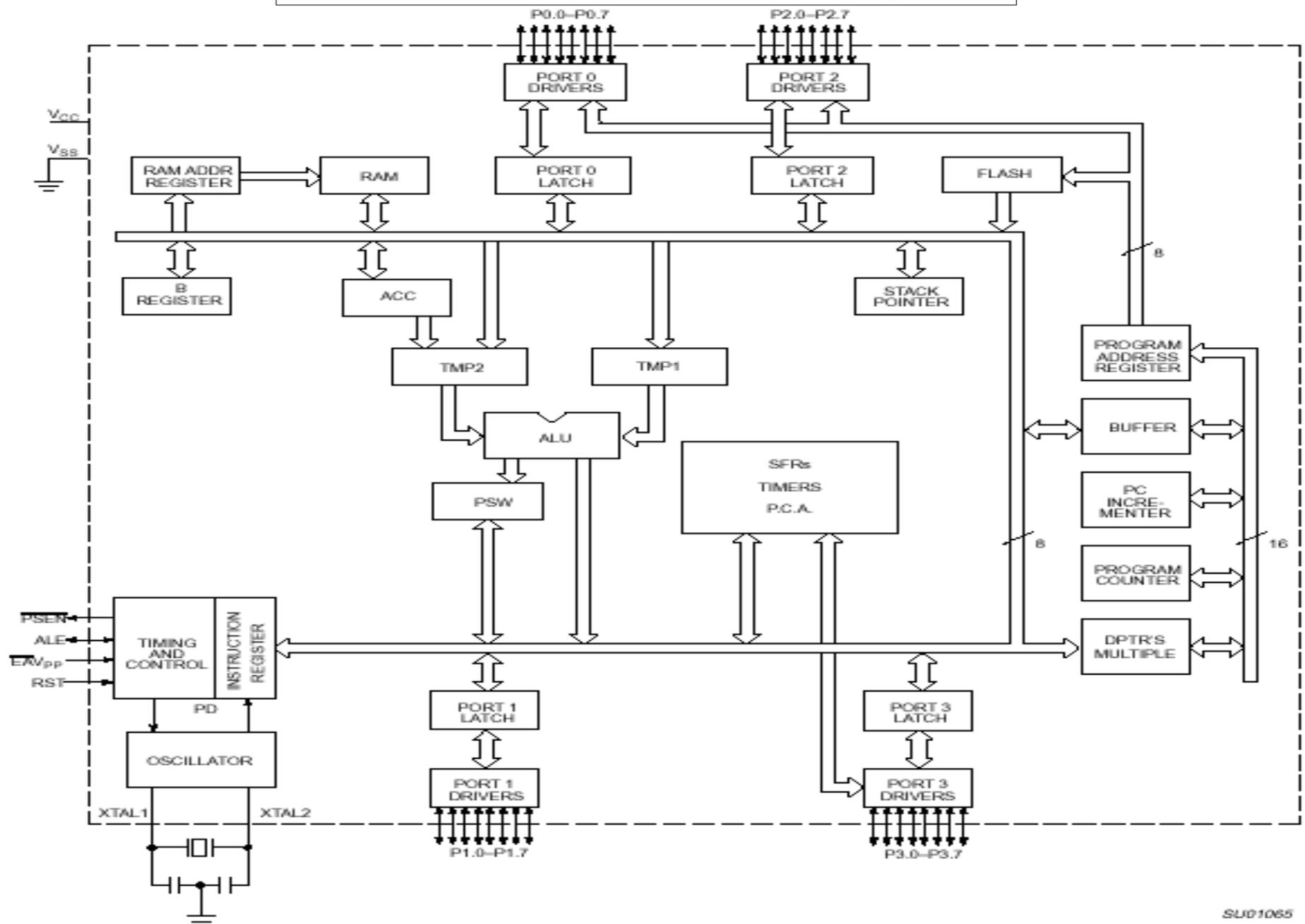Serial

P0   P2   P1   P3

Addr/Data

TXD   RXD

Other 8051 featurs

❑ only 1 On chip oscillator (external crystal)

❑ 6 interrupt sources (2 external , 3 internal, Reset)

❑ 64K external code (program) memory(only read)PSEN

❑ 64K external data memory(can be read and write) by RD,WR

❑ Code memory is selectable by EA (internal or external)

❑ We may have External memory as data and code

Three criteria in Choosing a Microcontroller

❑ meeting the computing needs of the task efficiently and cost effectively
  ❖ speed, the amount of ROM and RAM, the number of I/O ports and timers, size, packaging, power consumption
  ❖ easy to upgrade
  ❖ cost per unit
❑ availability of software development tools
  ❖ assemblers, debuggers, C compilers, emulator, simulator, technical support
❑ wide availability and reliable sources of the microcontrollers

8051 Internal Block Diagram
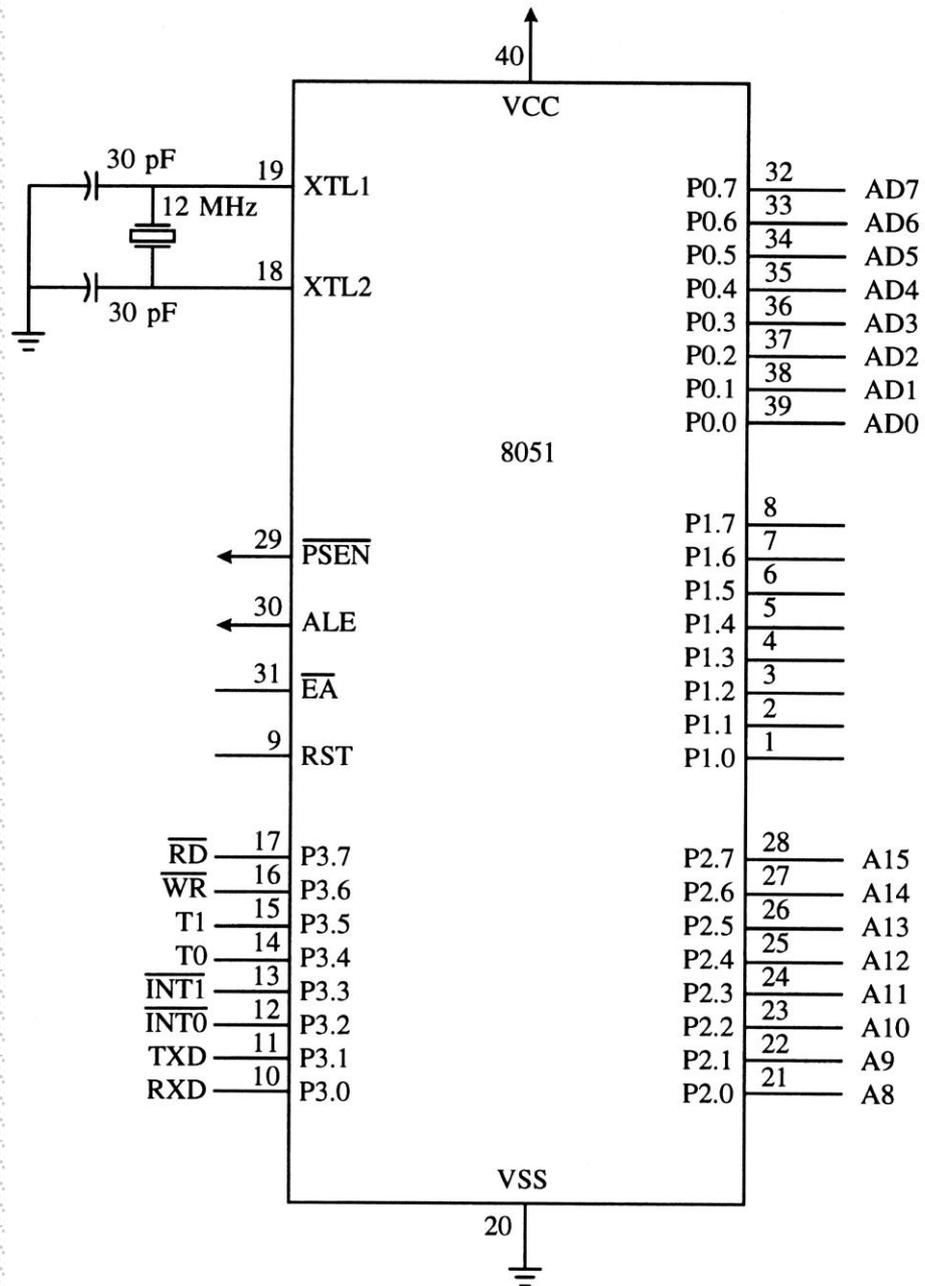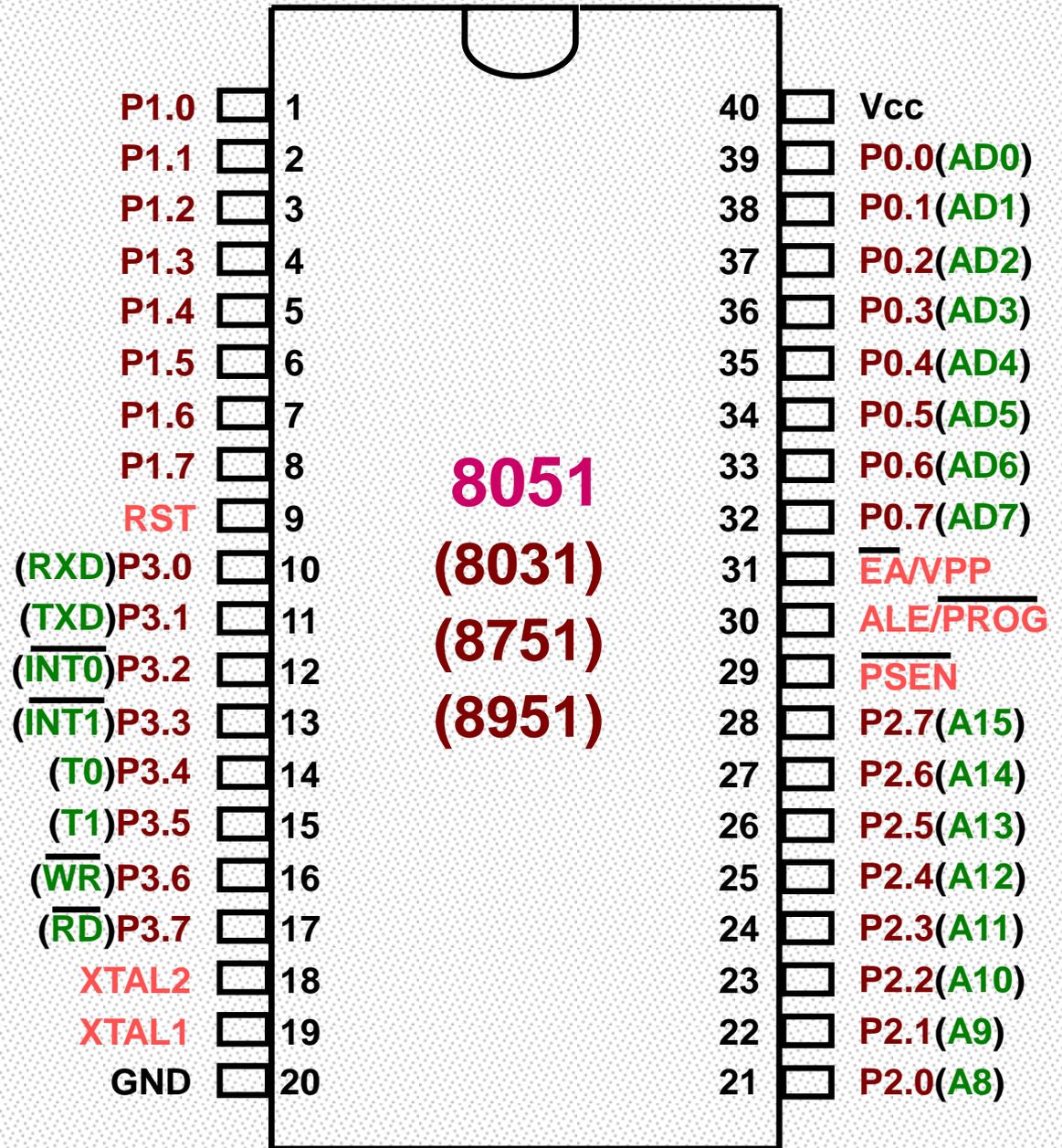

SU01065

8051 Schematic Pin out

FIGURE 2–2
8051 pinouts

8051
Foot Print

8051

(8031)

(8751)

(8951)

Left pins	Pin #		Pin #	Right pins
P1.0	1		40	Vcc
P1.1	2		39	P0.0(AD0)
P1.2	3		38	P0.1(AD1)
P1.3	4		37	P0.2(AD2)
P1.4	5		36	P0.3(AD3)
P1.5	6		35	P0.4(AD4)
P1.6	7		34	P0.5(AD5)
P1.7	8		33	P0.6(AD6)
RST	9		32	P0.7(AD7)
(RXD)P3.0	10		31	EA/VPP
(TXD)P3.1	11		30	ALE/PROG
(INT0)P3.2	12		29	PSEN
(INT1)P3.3	13		28	P2.7(A15)
(T0)P3.4	14		27	P2.6(A14)
(T1)P3.5	15		26	P2.5(A13)
(WR)P3.6	16		25	P2.4(A12)
(RD)P3.7	17		24	P2.3(A11)
XTAL2	18		23	P2.2(A10)
XTAL1	19		22	P2.1(A9)
GND	20		21	P2.0(A8)

Thanks