NMK322 - Microcontroller

Lecture 01 - Overview

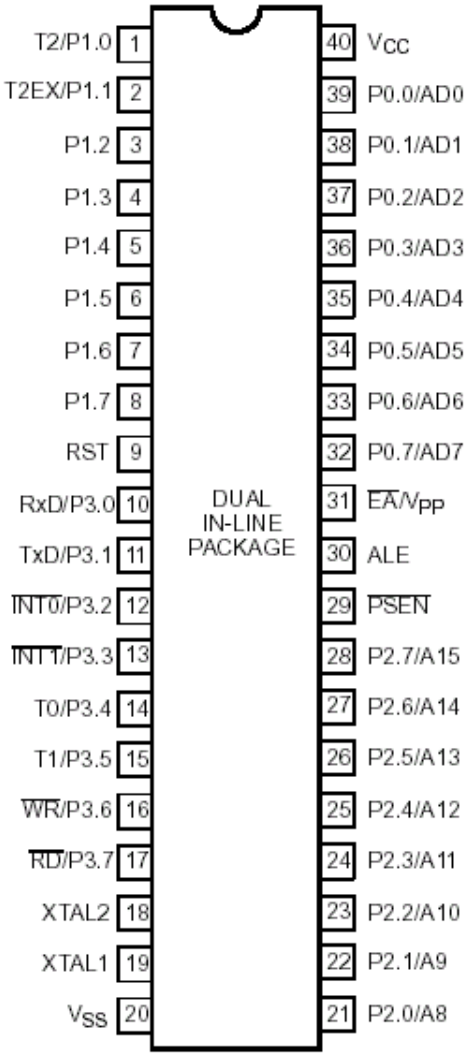
MCS-51
Microcontroller Family

Intel 8051

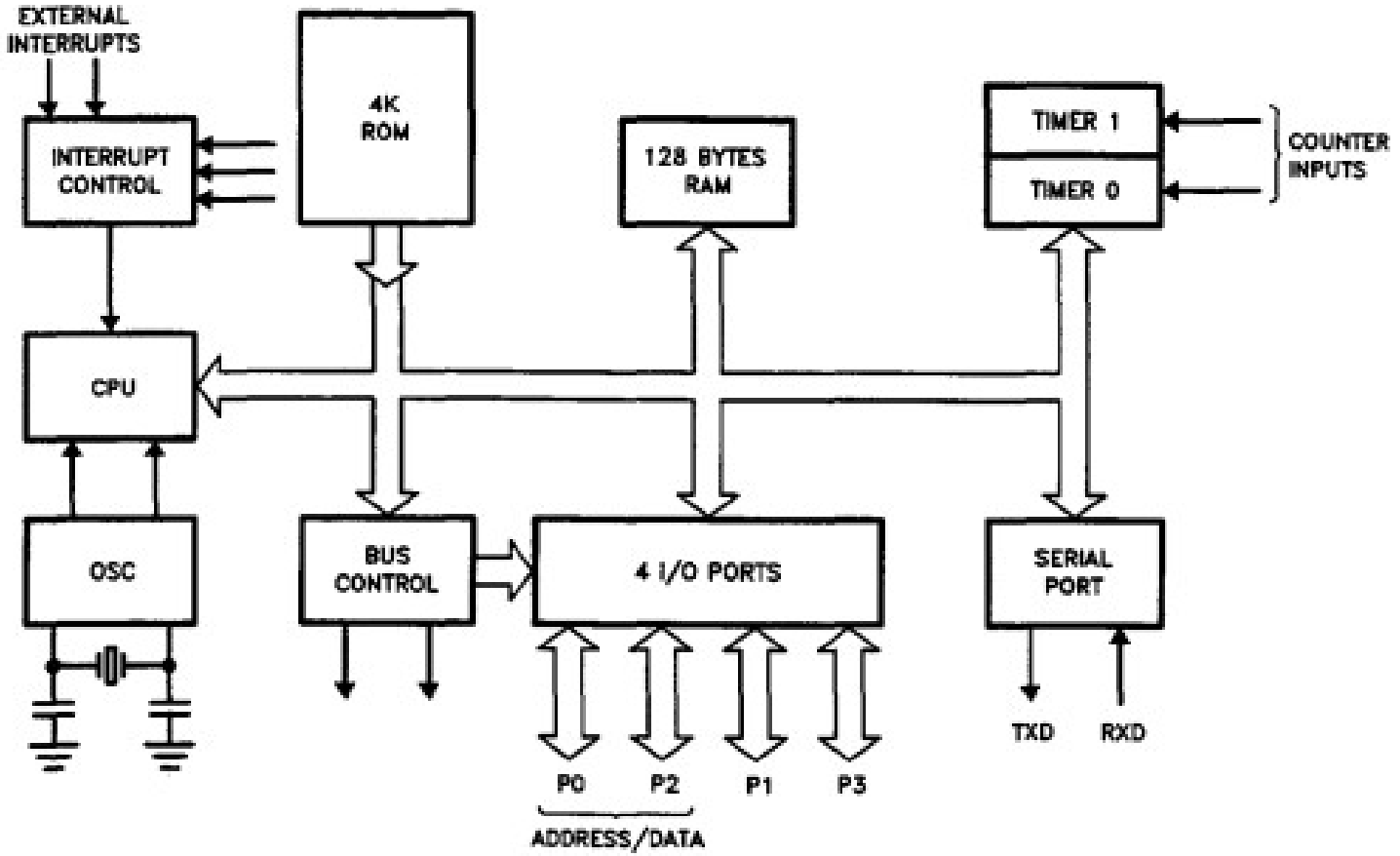
- Original member of MCS-51 Family
- 8-bit processor (optimized for control)
- 64K code memory address space
  - 4KB on-chip PROM
- 64K data memory address space
  - 128B on-chip RAM
- 32 GPIO lines (4 x 8-bit ports)
- Full duplex UART
- 2 x 16-bit timer/counter
- 6-source/5-vector interrupt (2 priority levels)

8051 DIP Pin Diagram

- 40 pin package
  - 32 GPIO pins
  - VCC / VSS
  - ALE (Address Latch Enable)
  - EA / VPP
    - External Address
    - Program Voltage for EPROM based versions of the 8051.
  - XTAL1 and XTAL2
  - Connections for clock crystal.
  - PSEN (Program Store Enable)
    - Read signal for external program memory
  - RST (Reset)



8051 Core



***Note**: Diagram copied from Intel's MCS-51 User's Manual*

MCS-51 Variants

Feature	8051	8052	8751	8752	8031	8032
			EPROM			
On-Chip ROM	4K	8K	4k	8k	0K	0K
RAM (Bytes)	128	256	128	256	128	256
Timers	2	3	2	3	2	3
I/O Ports	4	4	4	4	2	2
Serial Port	1	1	1	1	1	1
Interrupt Sources	6	8	6	8	6	8

***Note**: 8031/32 requires external code memory (loses 2+ ports). Can optionally use 8255 instead.*

Things to Cover

- 8051 Architecture
  - Registers, memory organization
- STC12C5A60S2 Architecture
  - Registers, memory organization
- 8051 Features
  - GPIO, timers, interrupts
- STC12C5A60S2 Features
  - GPIO, timers, interrupts

Special Preview

Serial Monitor

Serial Monitor / Console

- Special interface for (usually) development / debugging purpose
  - minimal interface lines
  - cheap and simple protocol
- Most embedded systems provide similar interfacing option
  - usually RS232 UART
  - covered this in NMK201!

UART Serial Communication

- Universal Asynchronous Receiver-Transmitter
  - computer hardware device for serial transmission
  - basically, parallel ↔ serial logic conversion
  - configurable clock generator (not transmitted)
- Data frame
  - Idle [1](logic high), Start [1](logic low), Data [5-9], Parity [0-1], Stop [1-2] (logic high)
- Signal levels & timing handled externally
  - e.g. RS232, RS485, raw TTL

RS232 Protocol

- standards for serial communication signals
- between DCE (comm.) ↔ DTE (term.)
- specifies (among others):
  - electrical signal characteristics (logic level, timing, etc.)
  - mechanical characteristics (connectors, pin id, etc.)
- common:
  - 3-wires (TX, RX, GND), crossed
  - 5V / TTL level (USB powered)

End of Lecture01