HISTORY OF MICROPROCESSORS

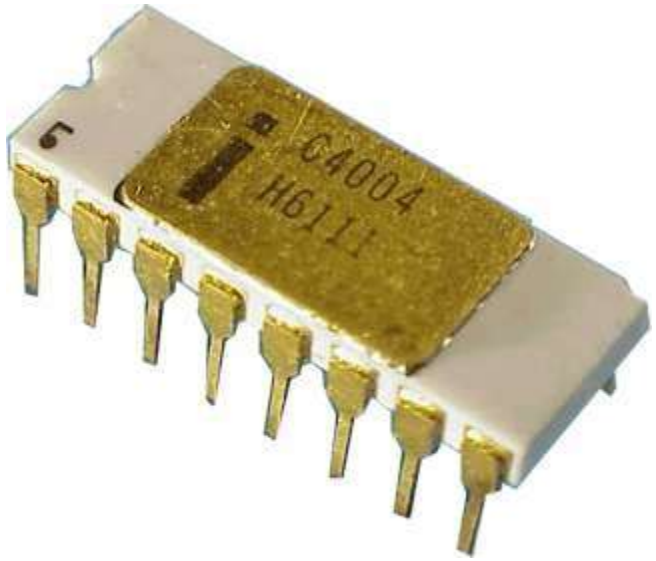
Contents

Introduction

- Fairchild Semiconductors (founded in 1957) invented the first IC in 1959.
- In 1968, **Robert Noyce, Gordan Moore, Andrew Grove** resigned from Fairchild Semiconductors.
- They founded their own company **Intel** (Integrated Electronics).
- Intel grown from 3 man start-up in 1968

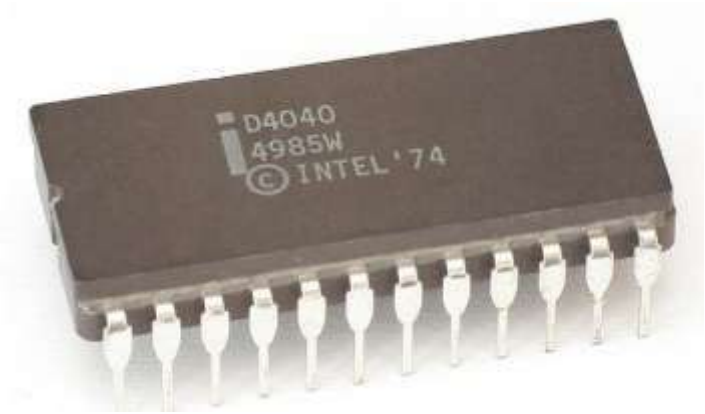
4-bit Microprocessors

INTEL 4004



- Introduced in 1971.
- It was the first microprocessor by Intel.
- It was a 4-bit µP.
- Its clock speed was 740KHz.
- It had 2,300 transistors.
- It could execute around 60,000 instructions per second.

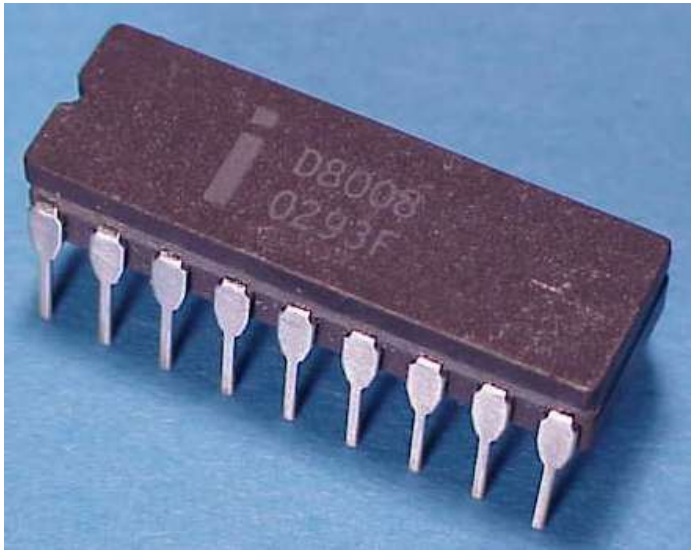
INTEL 4040



- Introduced in 1974.
- It was also 4-bit µP.

8-bit Microprocessors

INTEL 8008



- Introduced in 1972.
- It was first 8-bit µP.
- Its clock speed was 500 KHz.
- Could execute 50,000 instructions per second.

INTEL 8080

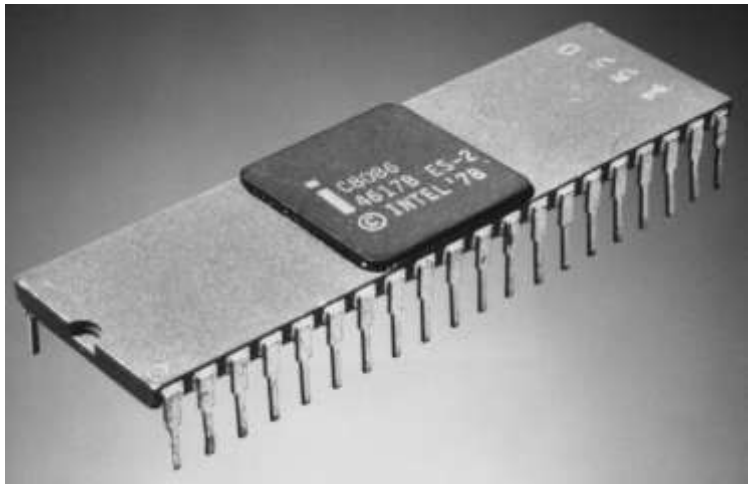
- Introduced in 1974.
- It was also 8-bit µP.
- Its clock speed was 2 MHz.
- It had 6,000 transistors.
- Was 10 times faster than 8008.
- Could execute 5,00,000 instructions per second.

INTEL 8085

- Introduced in 1976.
- It was also 8-bit µP.
- Its clock speed was 3 MHz.
- Its data bus is 8-bit and address bus is 16-bit.
- It had 6,500 transistors.
- Could execute 7,69,230 instructions per second.
- It could access 64 KB of memory.
- It had 246 instructions.

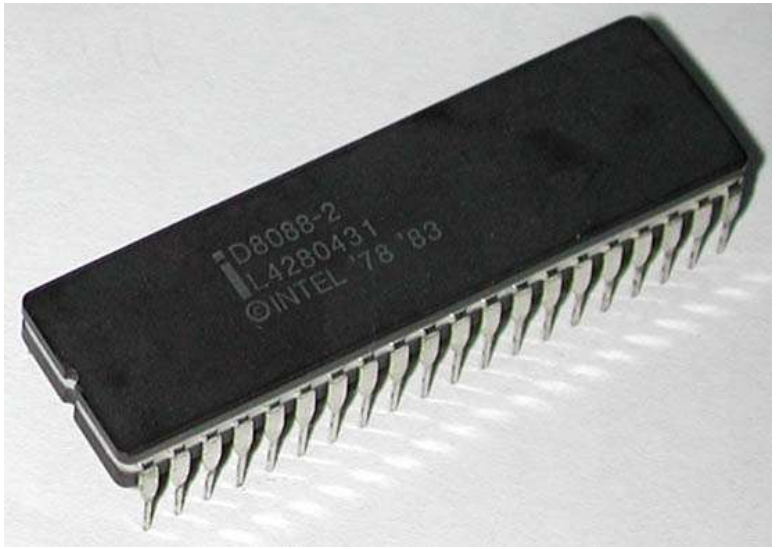
16-BIT MICROPROCESSORS

INTEL 8086



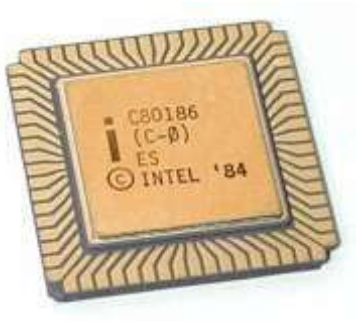
- Introduced in 1978.
- It was first 16-bit µP.
- Its clock speed is 4.77 MHz, 8 MHz and 10 MHz, depending on the version.
- Its data bus is 16-bit and address bus is 20-bit.
- It had 29,000 transistors.
- Could execute 2.5 million instructions per second.
- It could access 1 MB of memory.
- It had 22,000 instructions.
- It had ***Multiply*** and ***Divide*** instructions.

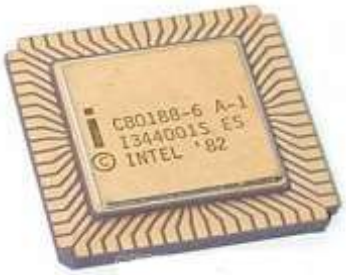
INTEL 8088



- Introduced in 1979.
- It was also 16-bit µP.
- It was created as a cheaper version of Intel's 8086.
- It was a 16-bit processor with an 8-bit external bus.

INTEL 80186 & 80188





- Introduced in 1982.
- They were 16-bit µPs.
- Clock speed was 6 MHz.

INTEL 80286

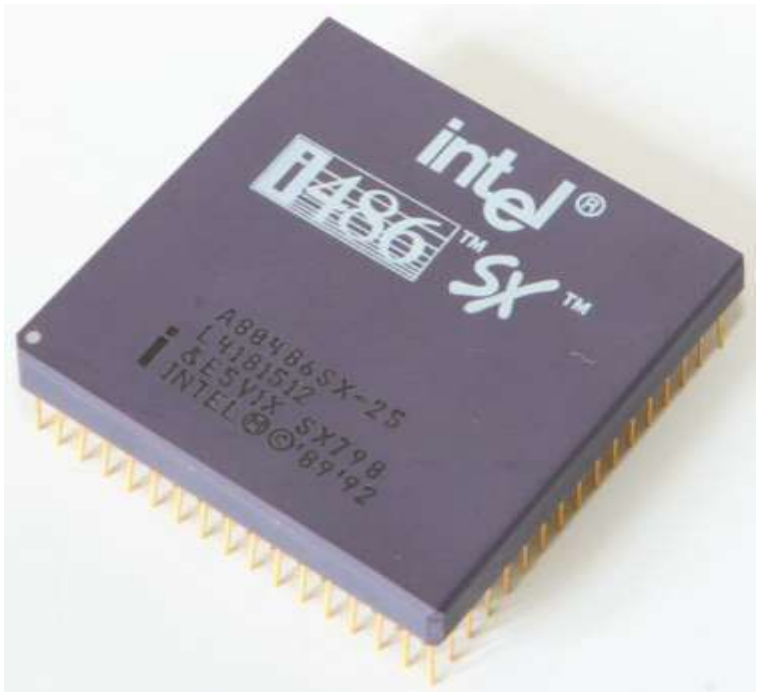
- Introduced in 1982.
- It was 16-bit µP.
- Its clock speed was 8 MHz.

32-bit Microprocessors

INTEL 80386

- Introduced in 1986.
- It was first 32-bit µP.
- Its data bus is 32-bit and address bus is 32-bit.
- It could address 4 GB of memory.

INTEL 80486



- Introduced in 1989.
- It was also 32-bit µP.
- It had 1.2 million transistors.
- Its clock speed varied from 16 MHz to 100 MHz depending upon the various versions.

Intel Pentium

- Introduced in 1993.
- It was also 32-bit µP.
- It was originally named 80586.
- Its clock speed was 66 MHz.

Intel Pentium Pro

- Introduced in 1995.
- It was also 32-bit µP.

Intel Pentium II

- Introduced in 1997.
- It was also 32-bit µP.

Intel Pentium II Xeon

- Introduced in 1998.
- It was also 32-bit µP.

Intel Pentium III

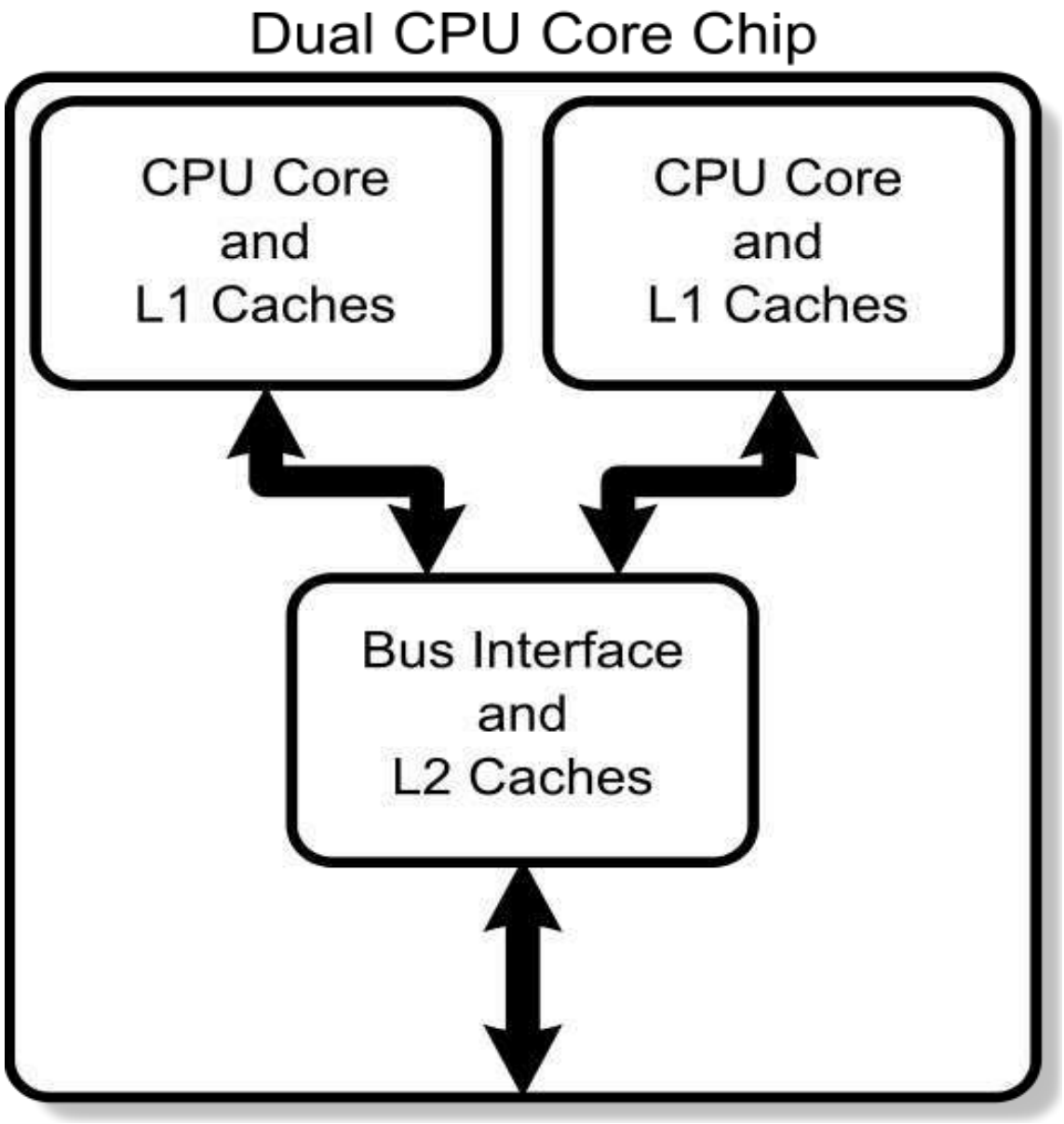
- Introduced in 1999.
- It was also 32-bit µP.

Intel Pentium IV

- Introduced in 2000.
- It was also 32-bit µP.

Intel Dual Core

- Introduced in 2006.
- It is 32-bit or 64-bit µP.
- It has two cores.
- Both the cores have there own internal bus and L1 cache, but share the external bus and L2 cache


Dual CPU Core Chip
CPU Core
and
L1 Caches
CPU Core
and
L1 Caches
Bus Interface
and
L2 Caches

64-bit Microprocessors

Intel Core 2

- Introduced in 2006.
- It is a 64-bit µP.

Intel Core i7

- Introduced in 2008.
- It is a 64-bit µP.

Intel Core i5

- Introduced in 2009.
- It is a 64-bit µP.

Intel Core i3

- Introduced in 2010.
- It is a 64-bit µP.

The salient features of 8085 microprocessor.

8085 Microprocessor

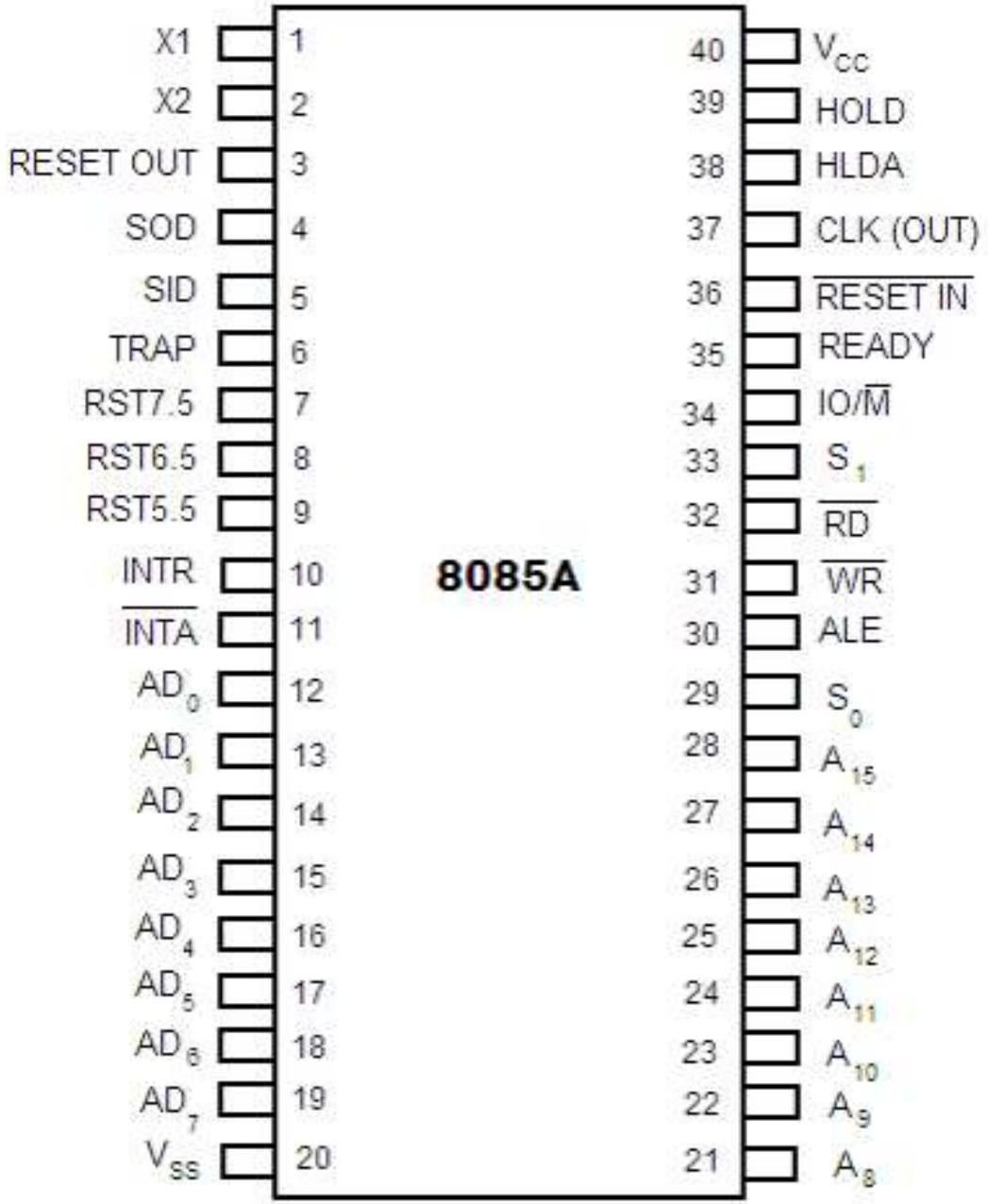
The salient features of 8085 µp are :

1. It is a 8 bit microprocessor.
2. It has 16 bit address bus and hence can address up to 2^{16} = 65536 bytes (64KB) memory locations through A0-A15.
3. The first 8 lines of address bus and 8 lines of data bus are multiplexed AD0 – AD7.
4. Data bus is a group of 8 lines D0 – D7.
5. It supports 5 hardware interrupt and 8 software interrupt.

8085 Microprocessor

6. A 16 bit program counter (PC)
7. A 16 bit stack pointer (SP)
8. Six 8-bit general purpose register arranged in pairs: BC,DE, HL.
9. It requires a signal +5V power supply
10. Maximum Clock Frequency is 3MHz and Minimum Clock Frequency is 500kHz

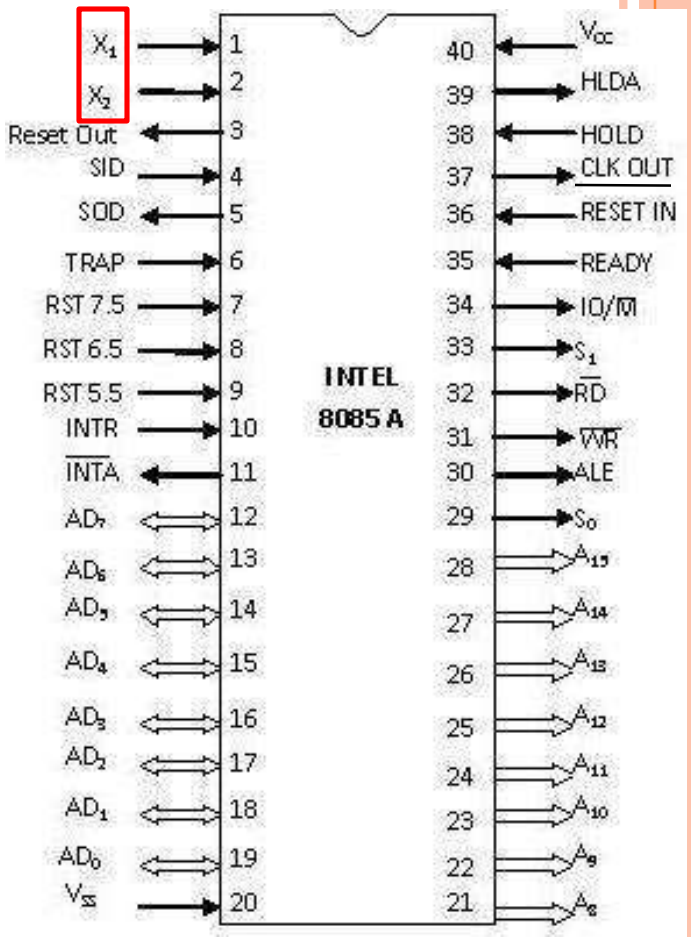
Pin Diagram of 8085



X_1 & X_2

Pin 1 and Pin 2 (Input)

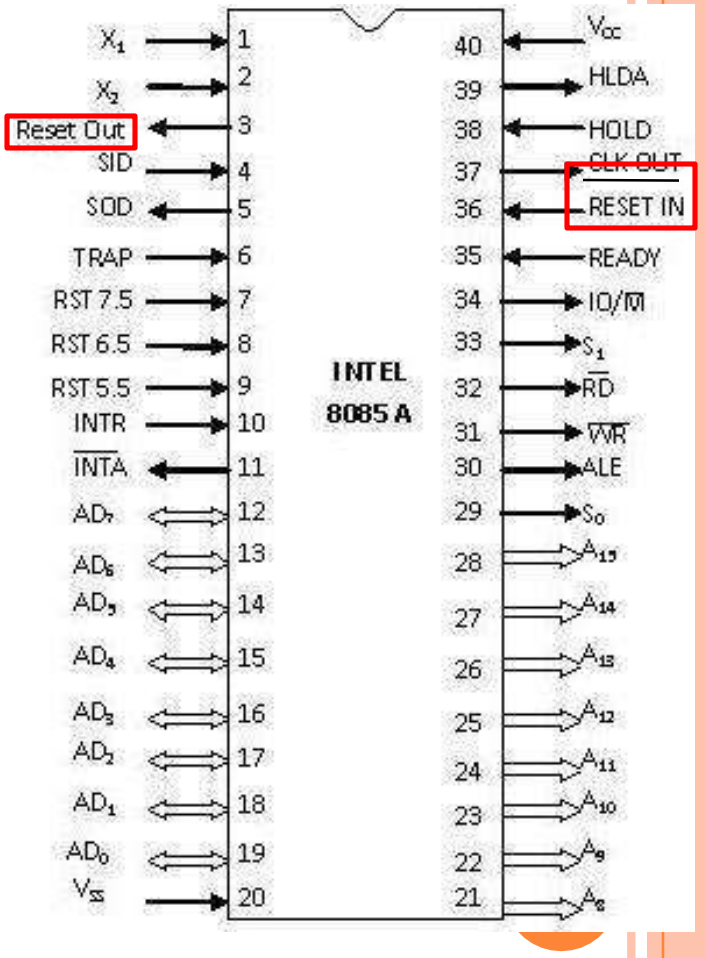
- These are also called Crystal Input Pins.
- 8085 can generate clock signals internally.
- To generate clock signals internally, 8085 requires external inputs from X_1 and X_2.



RESET IN and RESET OUT

Pin 36 (Input) and Pin 3 (Output)

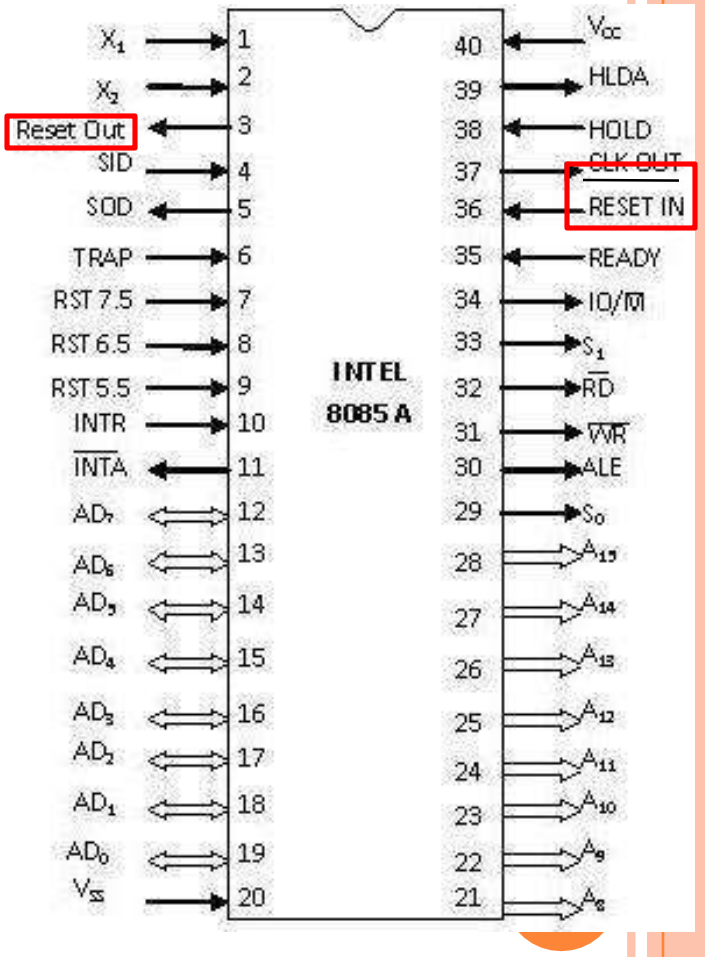
- **RESET IN**:
  - It is used to reset the microprocessor.
  - It is active low signal.
  - When the signal on this pin is low for at least 3 clocking cycles, it forces the microprocessor to reset itself.



RESET IN and RESET OUT

Pin 36 (Input) and Pin 3 (Output)

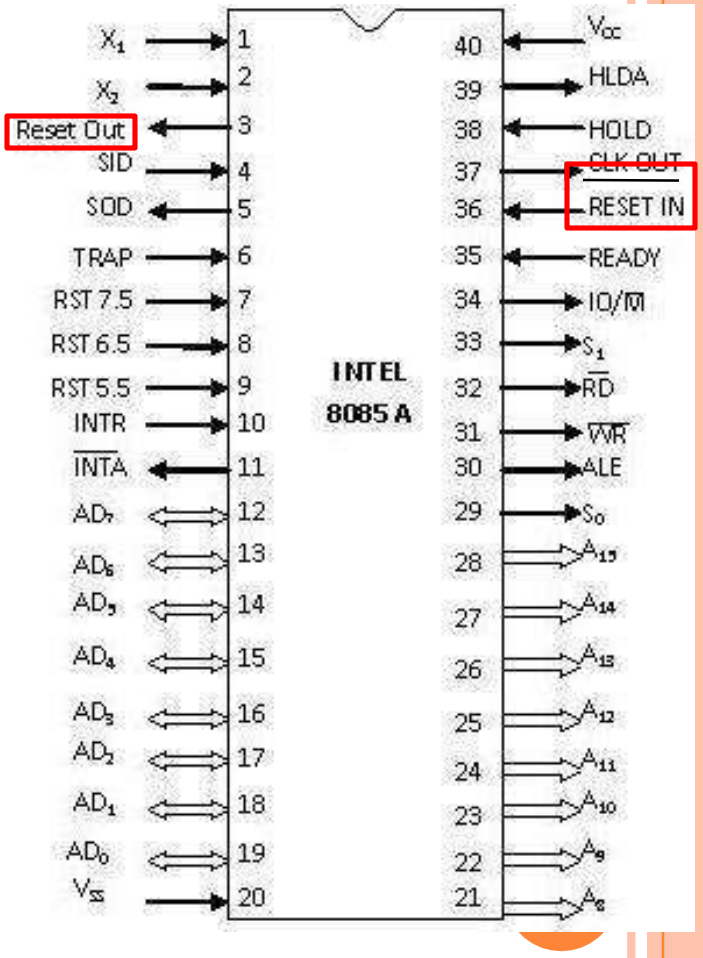
- Resetting the microprocessor means:
  - Clearing the PC and IR.
  - Disabling all interrupts (except TRAP).
  - Disabling the SOD pin.
  - All the buses (data, address, control) are ***tri-stated***.
  - Gives HIGH output to RESET OUT pin.



RESET IN and RESET OUT

Pin 36 (Input) and Pin 3 (Output)

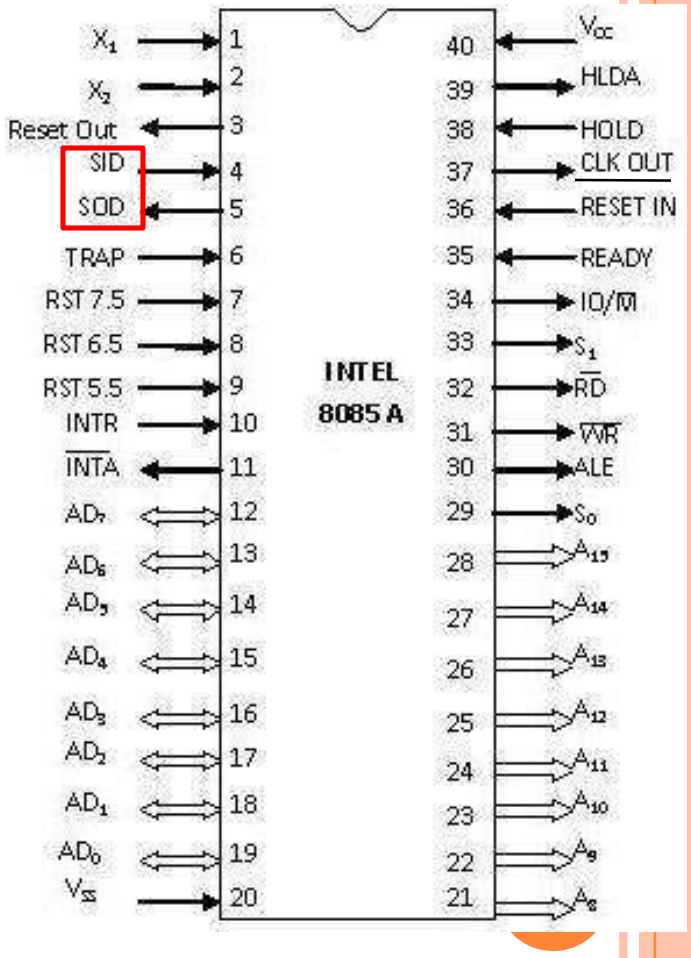
- **RESET OUT:**
  - It is used to reset the peripheral devices and other ICs on the circuit.
  - It is an output signal.
  - It is an active high signal.
  - The output on this pin goes high whenever RESET IN is given low signal.
  - The output remains high as long as RESET IN is kept low.



SID and SOD

Pin 4 (Input) and Pin 5 (Output)

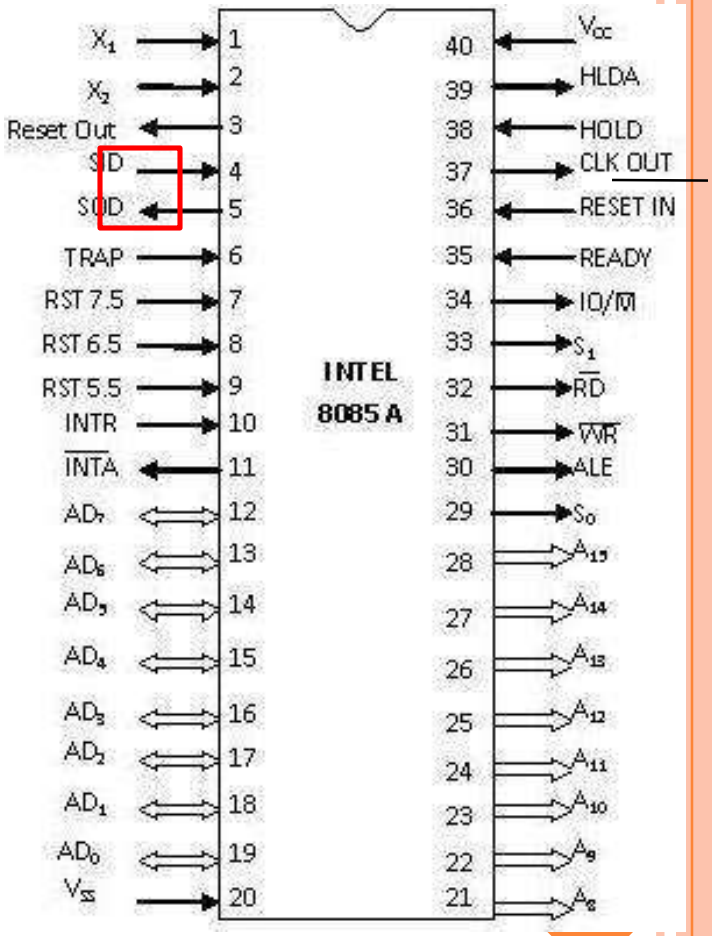
- **SID (Serial Input Data):**
  - It takes 1 bit input from serial port of 8085.
  - Stores the bit at the 8th position (MSB) of the Accumulator.
  - RIM (Read Interrupt Mask) instruction is used to transfer the bit.



SID and SOD

Pin 4 (Input) and Pin 5 (Output)

- **SOD (Serial Output Data):**
  - It takes 1 bit from Accumulator to serial port of 8085.
  - Takes the bit from the 8th position (MSB) of the Accumulator.
  - SIM (Set Interrupt Mask) instruction is used to transfer the bit.



Interrupt Pins

Interrupt Pins

- **Interrupt:**
  - It means *interrupting* the normal execution of the microprocessor.
  - When microprocessor receives interrupt signal, it discontinues whatever it was executing.
  - It starts executing new program indicated by the interrupt signal.
  - Interrupt signals are generated by external peripheral devices.
  - After execution of the new program, microprocessor goes back to the previous program.

Sequence of Steps Whenever There is an Interrupt

- Microprocessor completes execution of current instruction of the program.
- PC contents are stored in stack.
- PC is loaded with address of the new program.
- After executing the new program, the microprocessor returns back to the previous program.
- It goes to the previous program by reading the top value of stack.

Five Hardware Interrupts in 8085

- TRAP
- RST 7.5
- RST 6.5
- RST 5.5