

8051 ARCHITECTURE

Introduction

* 8051 microcontroller is designed by Intel in 1981. It is an 8-bit microcontroller which is built with 40 pins Dual Inline Package (DIP), 4K byte of on-chip ROM storage, 128 bytes of RAM storage, two 16-bit timers, one serial port, and four ports all on a single chip.

* It consists of four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having a crystal frequency of 12 MHz.

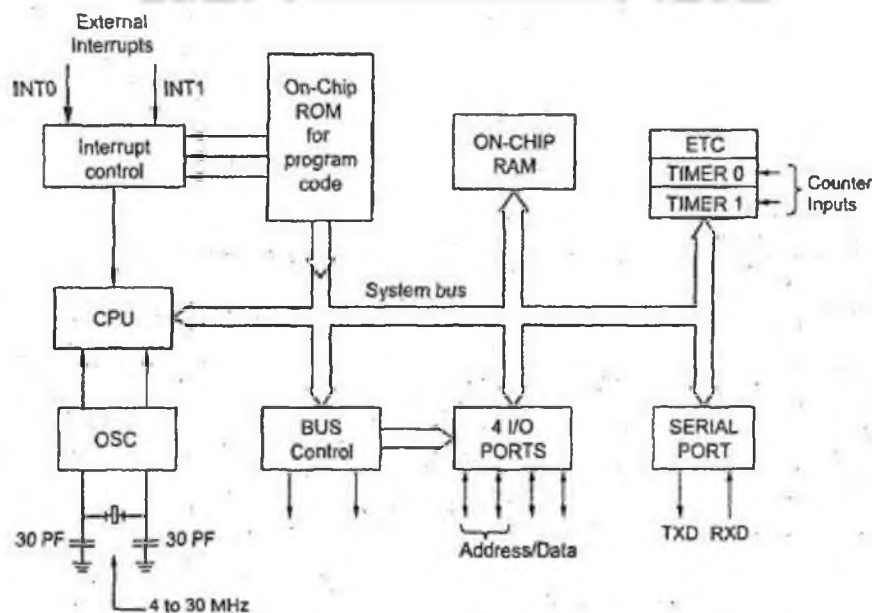


Figure: Architecture (or) Functional block diagram of 8051Microcontroller

All the supporting devices are connected to the CPU by using system bus which consists of an 8-bit data bus, a 16-bit address bus and a bus control signals.

All other devices like program memory, ports, data memory, serial interface, interrupt control, timers, and the CPU are all interfaced together through the system bus.

Functional Blocks

* The basic functional blocks (or) components present internally inside 8051 microcontroller architecture are as follows:

(i) CPU (Central Processing Unit):

* CPU acts as a mind of any processing machine. It synchronizes and manages all processes that are carried out in microcontroller. User has no power to control the functioning of CPU.

* It interprets the program stored in ROM and carries out from storage and then performs it as a projected duty. CPU manages the different types of registers available in 8051 microcontroller.

(ii) Interrupts:

Interrupts is a sub-routine call that is given by the microcontroller when some other program with high priority is requesting for acquiring the system buses, then interrupts occur in current running program.

Interrupts provide a method to postpone or delay the current process, to performs a sub-routine task and then restart the standard program.

Types of interrupt in 8051 Microcontroller:

- The five sources of interrupts in 8051 Microcontroller are,
- Timer 0 overflow interrupt - TFO
- Timer 1 overflow interrupt-TF1
- External hardware interrupt - INTO
- External hardware interrupt - INTI
- Serial communication interrupt - RXD/TXD

* The timer and serial interrupts are internally produced by the microcontroller, whereas the external interrupts are produced by additional interfacing devices or switches that are externally connected with the microcontroller. These external interrupts can be level triggered or edge triggered.

(iii) Memory:

* For the operation of microcontroller, it requires a program which guides the microcontroller to perform the specific tasks. For that, it uses a chip memory for the storage of the program.

* Microcontroller also required memory for storage of data and operands for the short duration. It uses code, or program memory of 4 KB that is, it has 4 KB ROM and it also comprises of data memory (RAM) of 128 bytes.

(iv) Bus:

* Bus is a group of wires which uses as a communication channel to data transfer. The different bus configuration includes 8, 16 or more cables. Therefore, a bus can bear 8 bits, 16 bits all together.

Two types of buses are used in 8051 microcontroller:

(a) Address Bus:

It consists of 16 bit address bus which is generally be used for transferring the data from CPU to memory.

(b) Data Bus:

It consists of 8 bits data bus which is generally be used for transferring the data from one peripherals to other peripherals.

(V) Oscillator:

* Microcontroller is a digital circuit therefore it needs a timer for their operation. To perform timer operation inside microcontroller it required externally connected (or) on-chip oscillator.

* Microcontroller is used inside an embedded system for managing the function of devices. Therefore, 8051 uses the two 16bit counters and timers. For the operation of this timers and counters, the oscillator is used inside microcontroller.