



- **Pins 1 to 8** – These pins are known as Port 1. This port doesn't serve any other functions. It is internally pulled up, bi-directional I/O port.
- **Pin 9** – It is a RESET pin, which is used to reset the microcontroller to its initial values.
- **Pins 10 to 17** – These pins are known as Port 3. This port serves some functions like interrupts, timer input, control signals, serial communication signals RxD and TxD, etc.
- **Pins 18 & 19** – These pins are used for interfacing an external crystal to get the system clock.
- **Pin 20** – This pin provides the power supply to the circuit.
- **Pins 21 to 28** – These pins are known as Port 2. It serves as I/O port. Higher order address bus signals are also multiplexed using this port.
- **Pin 29** – This is PSEN pin which stands for Program Store Enable. It is used to read a signal from the external program memory.
- **Pin 30** – This is EA pin which stands for External Access input. It is used to enable/disable the external memory interfacing.
- **Pin 31** – This is ALE pin which stands for Address Latch Enable. It is used to demultiplex the address-data signal of port.
- **Pins 32 to 39** – These pins are known as Port 0. It serves as I/O port. Lower order address and data bus signals are multiplexed using this port.
- **Pin 40** – This pin is used to provide power supply to the circuit.

Instruction Format

- An **instruction** is a command to the microprocessor to perform a given task on a specified data. Each instruction has two parts: one is task to be performed, called the **operation code** (opcode), and the second is the data to be operated on, called the **operand**. The operand (or data) can be

specified in various ways. It may include 8-bit (or 16-bit) data, an internal register, a memory location, or 8-bit (or 16-bit) address. In some instructions, the operand is implicit.

Instruction word size

- The 8051 instruction set is classified into the following three groups according to word size:
- ü One-word or 1-byte instructions
- ü Two-word or 2-byte instructions
- ü Three-word or 3-byte instructions

1 One-Byte Instructions

- A 1-byte instruction includes the opcode and operand in the same byte. Operand(s) are internal register and are coded into the instruction.
- These instructions are 1-byte instructions performing three different tasks. In the first instruction, both operand registers are specified. In the second instruction, the operand B is specified and the accumulator is assumed. Similarly, in the third instruction, the accumulator is assumed to be the implicit operand. These instructions are stored in 8-bit binary format in memory; each requires one memory location.

2 Two-Byte Instructions

- In a two-byte instruction, the first byte specifies the operation code and the second byte specifies the operand. Source operand is a data byte immediately following the opcode.

3 Three-Byte Instructions

- In a three-byte instruction, the first byte specifies the opcode, and the following two bytes specify the 16-bit address. Note that the second byte is the low-order address and the third byte is the high-order address.

ADDRESSING MODES OF THE 8051 MICROCONTROLLERS

Different addressing modes of the 8051 microcontrollers. In 8051 there are 1-byte, 2-byte instructions and very few 3-byte instructions are present. The opcodes are 8-bit long. As the opcodes are 8-bit data, there are 256 possibilities. Among 256, 255 opcodes are implemented.

The clock frequency is 12MHz, so 64 instruction types are executed in just 1 μ s, and rest are just 2 μ s. The Multiplication and Division operations take 4 μ s to execute.

In 8051 There are six types of addressing modes.

- Immediate Addressing Mode
- Register Addressing Mode
- Direct Addressing Mode
- Register Indirect Addressing Mode
- Indexed Addressing Mode
- Implied Addressing Mode

Immediate addressing mode