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PROJECT REPORT

ON

MICROPROCESSOR

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Under the supervision of Prof. Narendra S. Bhattad

For Subject : “Computer Hardware and Peripherals”

(Subject Code : 22013)

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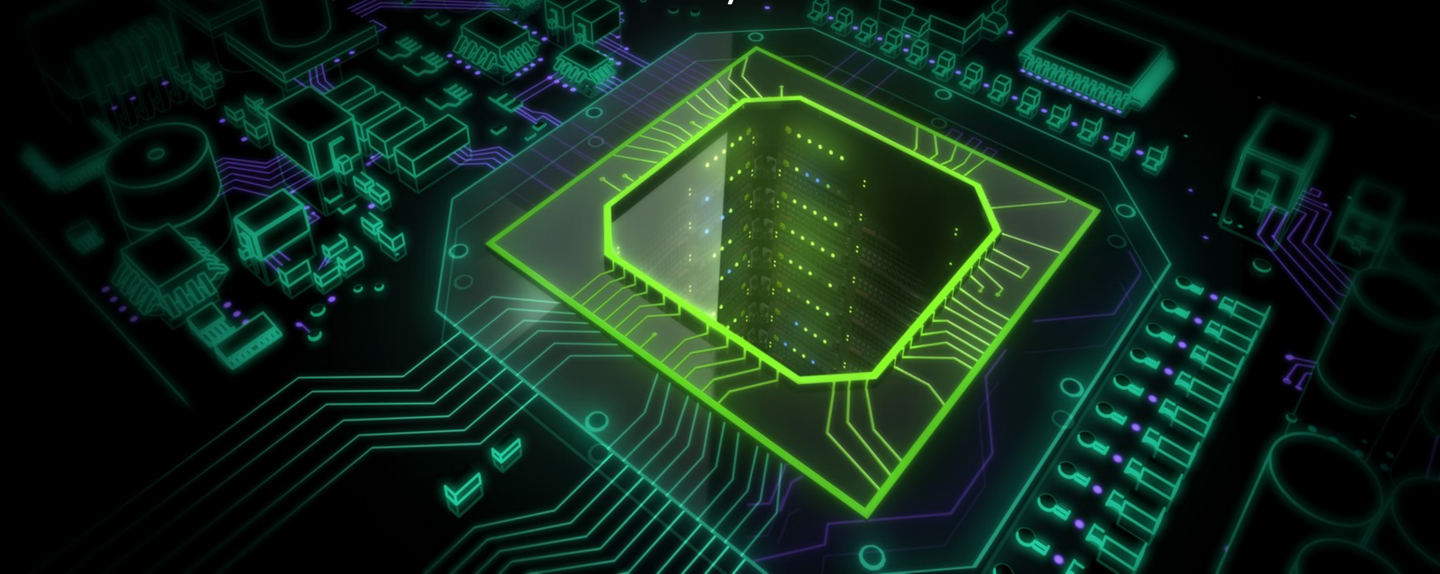

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Dharampeth Polytechnic, Nagpur
Institute Code : 1188

CERTIFICATE

This is to certify that Mr. Yash Dattatraya Desai Roll No. 04 , During Second Semester of Diploma in Computer Technology [C.M.] Submitted the result of work , it is thereby recommended and forwarded for submission.

Signature of Faculty
(Prof. Narendra S. Bhattad)

Department of
Computer Technology [CM]

WHAT IS A MICROPROCESSOR ?

A microprocessor is one of the most exciting technological innovations in electronics since the appearance of the transistor in 1948. This wonder device has not only set in the process of revolutionizing the field of digital electronics, but it is also getting entry into almost every sphere of human life. Applications of microprocessors range from the very sophisticated process controllers and supervisory control equipment to simple game machines and even toys.

It is, therefore, imperative for every engineer, specially electronics engineer, to know about microprocessors. Every designer of electronic products needs to learn how to use microprocessors. Even if he has no immediate plans to use a microprocessor, he should have knowledge of the subject so that he can intelligently plan his future projects and can make sound engineering judgements when the time comes.

The subject of microprocessors is overviewed here with the objective that a beginner gets to know what a microprocessor is, what it can do, how it fits in a system and gets an overall idea of the various components of such a system. Once he has understood signam of each component and its place in the system, he can go deeper into the working details and design of individual components without difficulty.

WHAT IS A MICROPROCESSOR ?

A computer, large or small, can be represented functionally (in a simplified form) by the block diagram in Figure. 1.1. As shown, it comprises of three basic parts or sub-systems:

a) C.P.U.

Central Processing Unit performs the necessary arithmetic and logic operations and controls the timing and general operation of the complete system.

b) Input/Output(1/0)

Devices Input devices are used for feeding data into the CPU, examples of these devices are toggle switches, analog – to digital converters, paper tape readers, card readers, keyboards, disk etc.

The output devices are used for delivering the results of computations to the outside world; examples are light emitting diodes, cathode ray tube (CRT) displays, digital-to-analog converters, card and paper-tape punches, character printers, plotters, communication lines etc. The input--output subsystem thus allows the computer to usefully communicate with the outside world.

c) Memory

It stores both the instructions to be executed (i.e., the program) and the data involved. It usually consists of both RAMs (random-access memories) and ROMS (read-only memories).

WHAT IS A MICROPROCESSOR ?

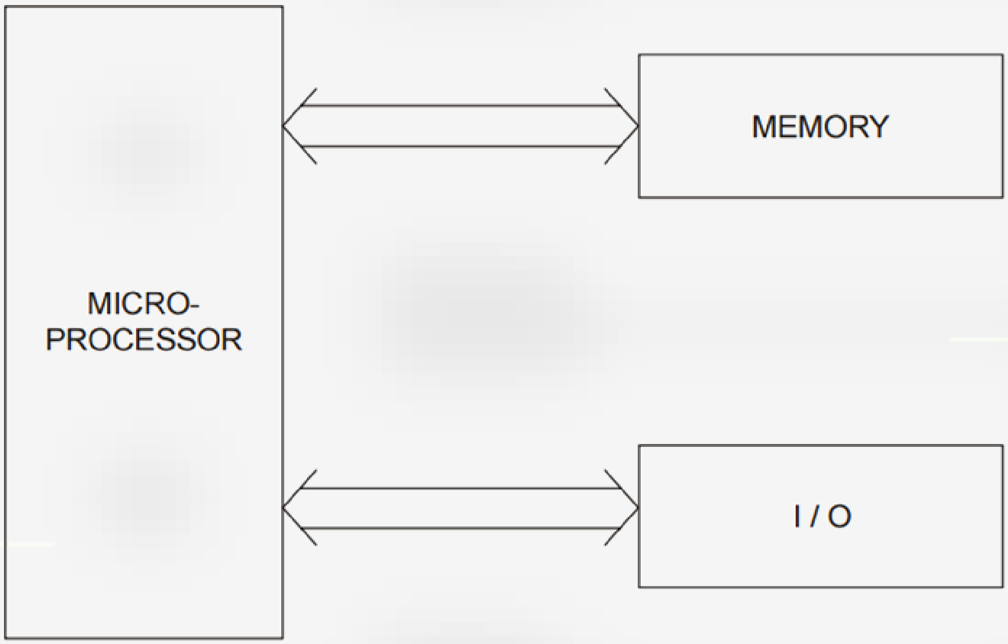
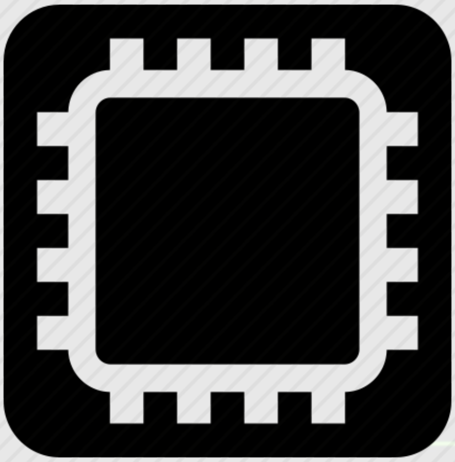


Figure Showing Block Diagram of Microcomputer

WHAT IS A MICROCOMPUTER?

To an engineer who is familiar with mainframe and mini computers, a microcomputer is simply a less powerful mini computer. Microcomputers have smaller instruction sets and are slower than mini computers, but then they are far less expensive and smaller too.

To an engineer with a hardware background and no computer experience, a microcomputer will look like a sequential state machine that can functionally replace thousands of random logic chips, but occupies a much lesser space, costs much lesser and the number of device interconnections being fewer in it, is much more reliable.



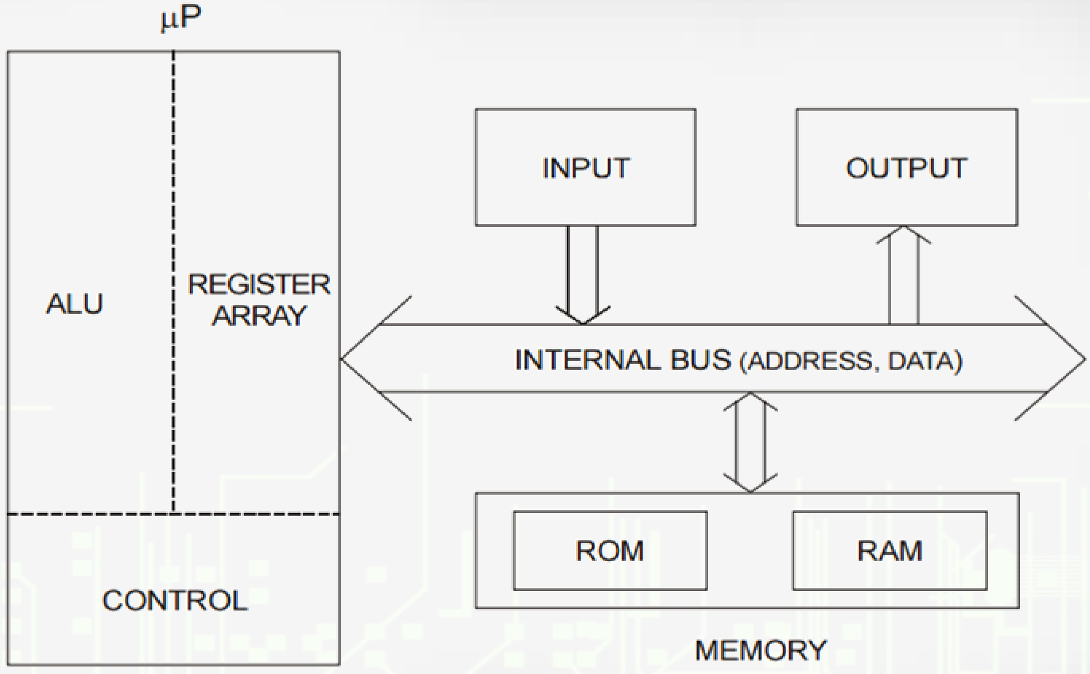
A microcomputer is primarily suited, because of its very low cost and very small size, to dedicated applications. On the same grounds, the mainframe computer is as a rule suitable as a general purpose computer. Mini computer finds applications in both areas.

WHAT IS INSIDE A MICROPROCESSOR ?

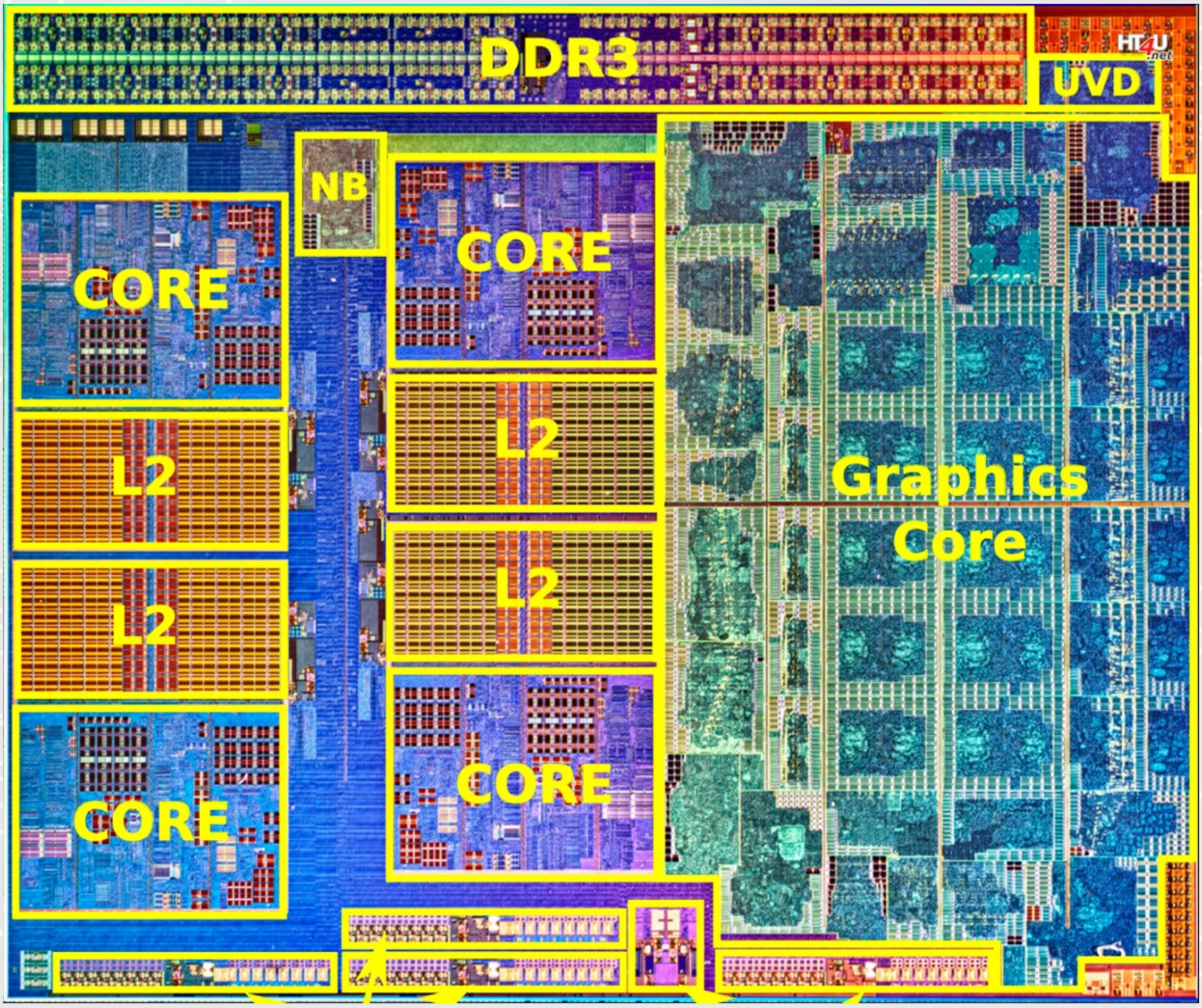
The microprocessor or CPU reads each instruction from the memory, decodes it and executes it. It processes the data as required in the instructions. The processing is in the form of arithmetic and logical operations. The data is retrieved from memory or taken from an input device and the result of processing is stored in the memory or delivered to an appropriate output device, all as per the instructions.

To perform all these functions, the μP (microprocessor) incorporates various functional units in an appropriate manner. Such an internal structure or organizational structure ofμP, which determines how it operates, is known as its architecture.

A typical microprocessor architecture is shown below. The various functional units are as follows:

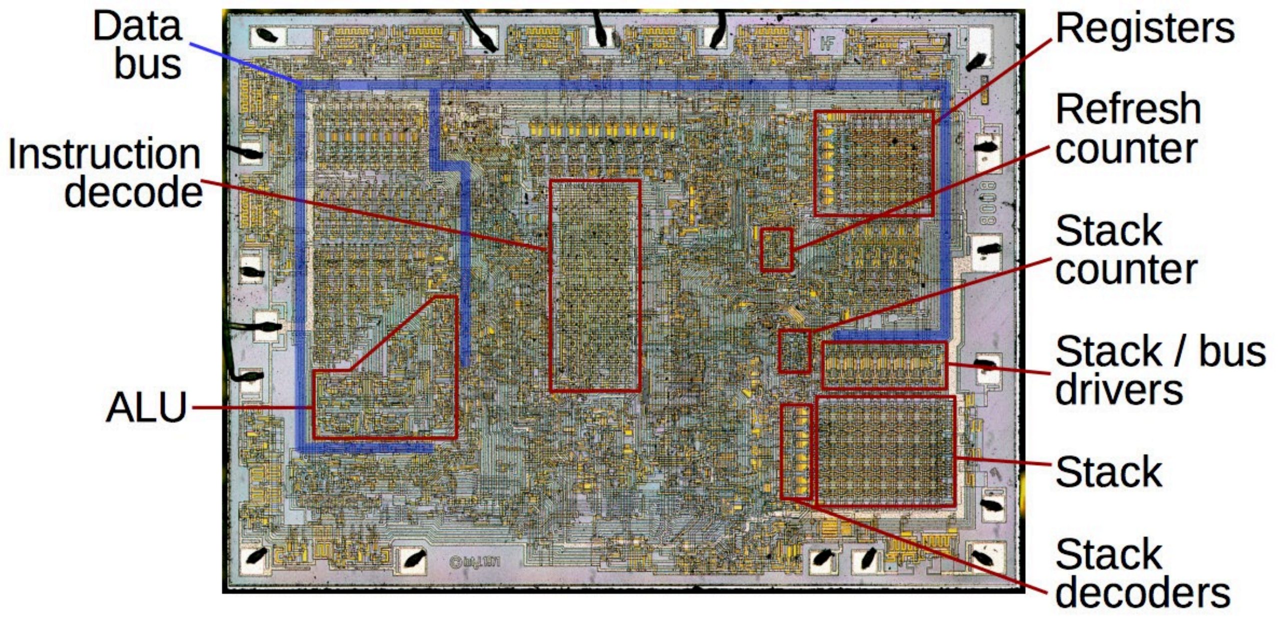


WHAT IS INSIDE A MICROPROCESSOR ?



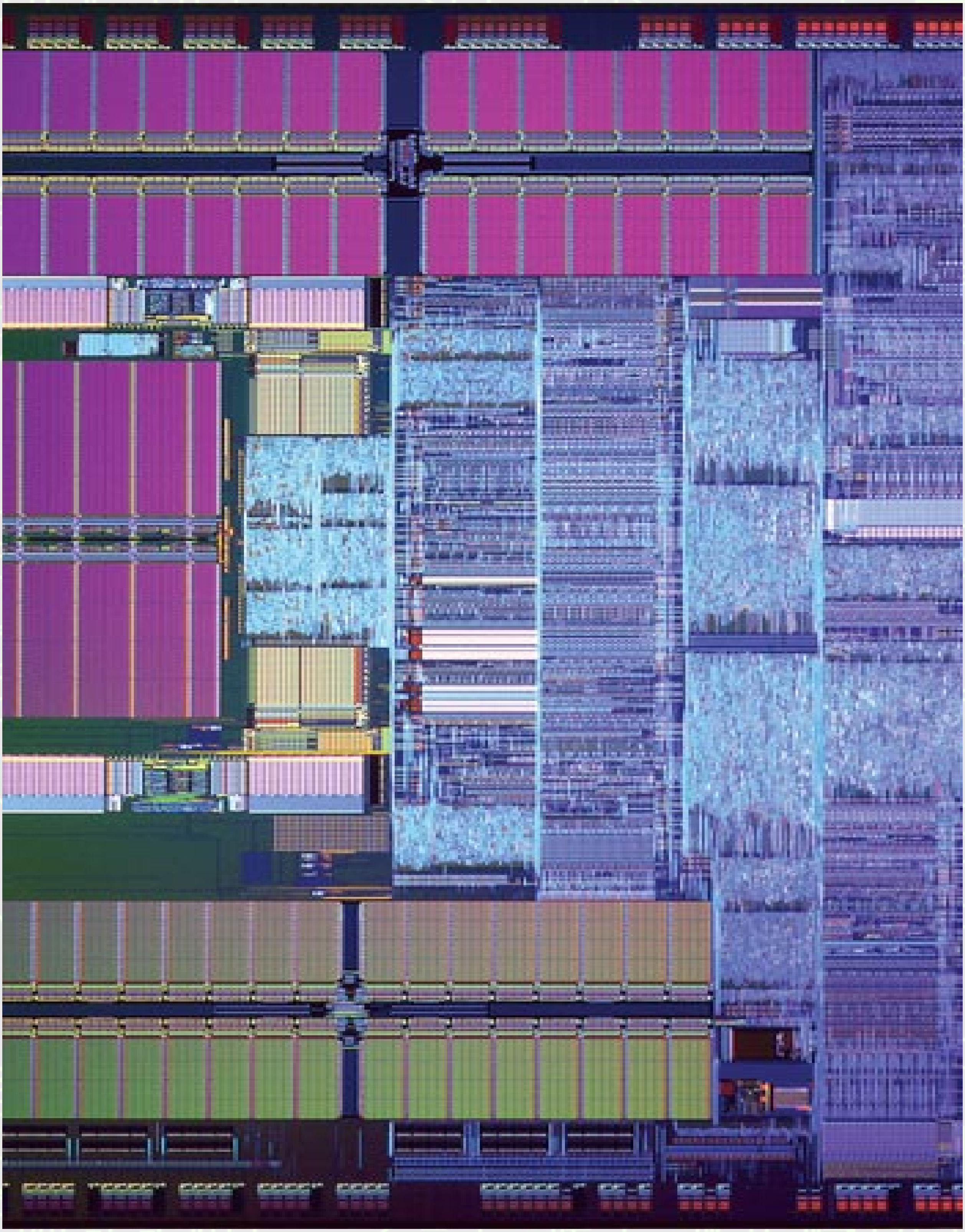
Architecture of Microprocessor

WHAT IS INSIDE A MICROPROCESSOR ?



Architecture of Microprocessor

WHAT IS INSIDE A MICROPROCESSOR ?



Architecture of Microprocessor

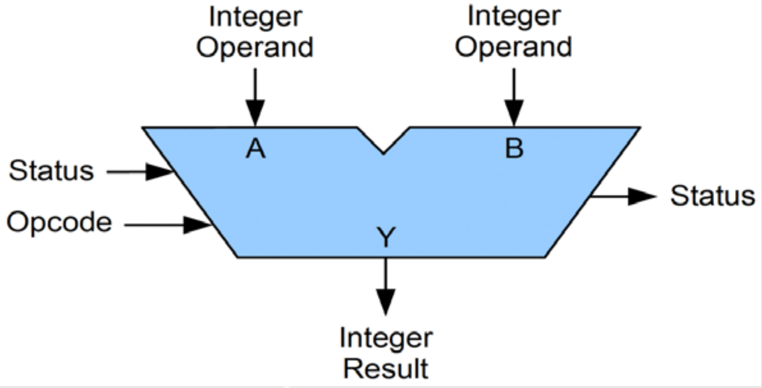
BUSSES

µC (microcomputer), like all computers, manipulates binary information. The binary information is represented by binary digits, called bits. µC operates on a group of bits which are referred to as a word. The number of bits making-µP a word varies with the µP. Common word sizes are 4, 8, 12 and 16 bits (µPs with 32 bit-word have also of late entered the market). Another binary terms that will be of interest in subsequent discussions are the byte and the nibble, which represent a set of 8 bits and 4 bits, respectively. Figure shows busses interconnecting various blocks. These busses allow exchange of words between the blocks. A bus has a wire or line for each bit and thus allows exchange of all bits of a word in parallel. The processing of bits in the µP is also in parallel. The busses can thus be viewed as data highways. The width of a bus is the number of signal lines that constitute the bus. The figure shows for simplicity three busses for distinct functions. Over the address bus, the µP transmits the address of that I/O device or memory locations which it desires to access. This address is received by all the devices connected to the processor, but only the device which has been addressed responds. The data bus is used by the µP to send and receive data to and from different devices (I/O and memory) including instructions stored in memory. Obviously the address bus is unidirectional and the data bus is bi-directional. The control bus is used for transmitting and receiving control signals between the µP and various devices in the system.

Arithmetic-Logic Unit (ALU)

An arithmetic logic unit (ALU) is a combinational digital electronic circuit that performs arithmetic and bitwise operations on integer binary numbers. This is in contrast to a floating-point unit (FPU), which operates on floating point numbers. An ALU is a fundamental building block of many types of computing circuits, including the central processing unit (CPU) of computers, FPUs, and graphics processing units (GPUs). A single CPU, FPU or GPU may contain multiple ALUs.

The inputs to an ALU are the data to be operated on, called operands, and a code indicating the operation to be performed; the ALU's output is the result of the performed operation. In many designs, the ALU also has status inputs or outputs, or both, which convey information about a previous operation or the current operation, respectively, between the ALU and external status registers.



A symbolic representation of an ALU and its input and output signals, indicated by arrows pointing into or out of the ALU, respectively. Each arrow represents one or more signals. Control signals enter from the left and status signals exit on the right; data flows from top to bottom.

INTERNAL REGISTER

A number of registers are normally included in the microprocessor. These are used for temporary storage of data, instructions and addresses during execution of a program. Those in the Intel 8085 microprocessor are typical and are described below:

(i) Accumulator (Ace) or Result Register

This is an 8-bit register used in various arithmetic and logical operations. Out of the two operands to be operated upon, one comes from accumulator (Ace), whilst the other one may be in another internal register or may be brought in by the data bus from the main memory. Upon completion of the arithmetic/logical operation, the result is placed in the accumulator (replacing the earlier operand). Because of the later function, this register is also called as result register.

(**ii) General Purpose Registers or Scratch Pad Memory**

There are six general purpose 8-bit registers that can be used by the programmer for a variety of purposes. These registers, labelled as B, C, D, E, H and L, can be used individually (e.g., when operation on 8-bit data is desired) or in pairs (e.g., when a 16-bit address is to be stored). Only B-C, D-E and H-L pairs are allowed.

(**iii)Instruction Register (IR)**

This 8-bit register stores the next instruction to be executed. At the proper time this stored word (instruction) is fed to an instruction decoder which decodes it and supplied appropriate signals to the control unit. When the execution has been accomplished the new word in the instruction register is processed.

INTERNAL REGISTER

(iv)Program Counter (PC)
This is a 16-bit register which holds the address of the next instruction that has to be fetched from the main memory and loaded into the instruction register. The program controlling the operation is stored in the main memory and instructions are retrieved from this memory normally in order. Therefore, normally the address contained in the PC is incremented after each instruction is fetched. However, certain classes of instruction can modify the PC so that the programmer can provide for branching away from the normal program flow. Examples are instructions in the "jump" and 'call subroutine' groups.

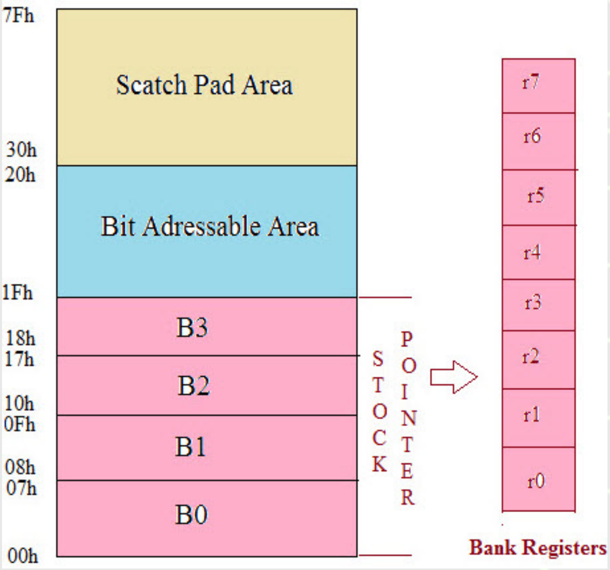
(v) Stack Pointer(SP)
This is also a 16-bit register and is used by the programmer to maintain a stack in the memory while using subroutines.

(vi) Status Register or Condition Flags
A status register consisting of a few flip-flops, called as condition flags (in 8085 the number of flags is five) is used to provide indication of certain conditions that arise during arithmetic and logical operations. These are:

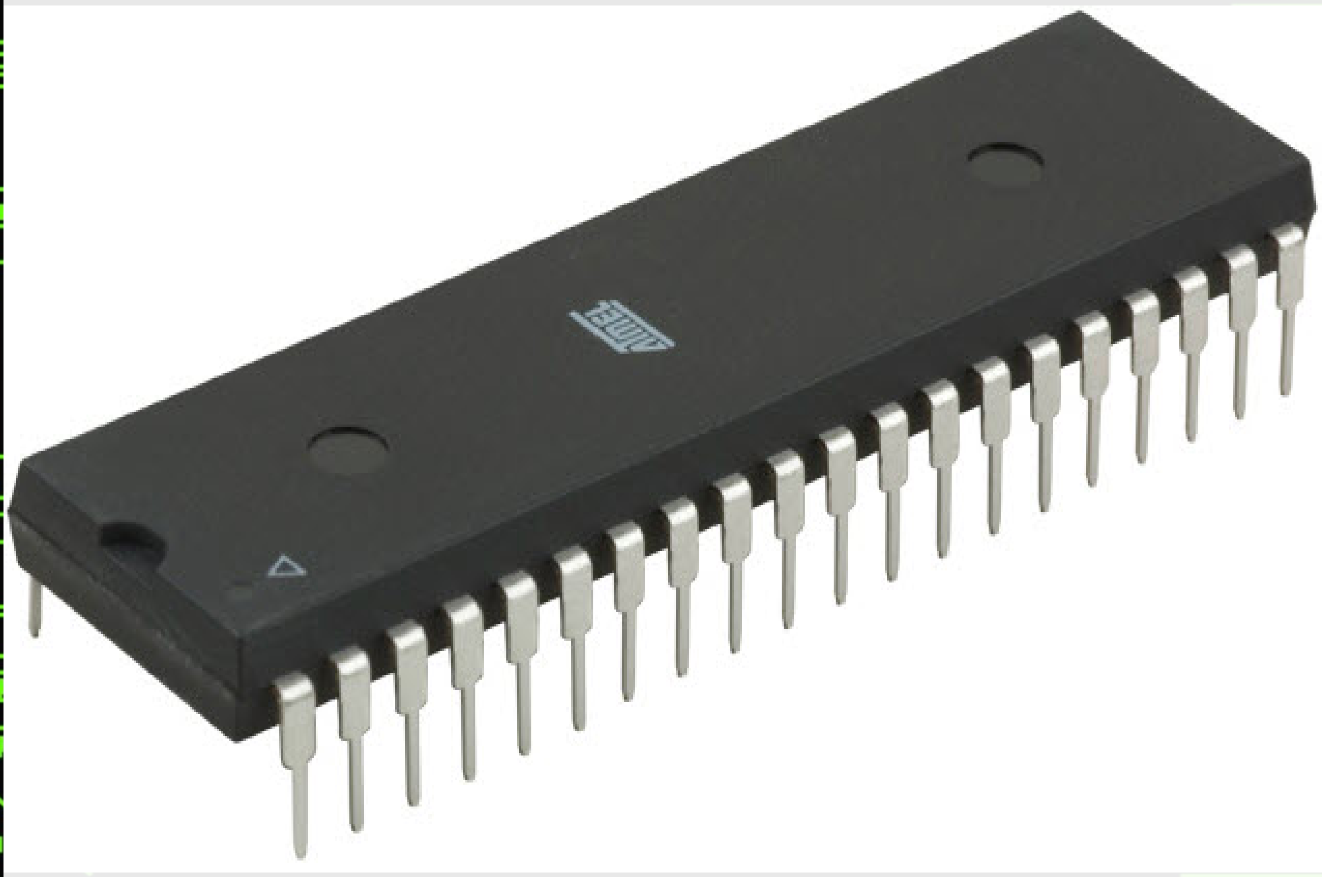
'zero'	Flag is set if result of instruction is 0.
'sign'	Set if MSB of result is 1.
'parity'	Set if result has even parity.
'carry'	Set if carry or borrow resulted.
'auxiliary carry'	Set if instruction caused a carry out of bit 3 and into bit 4 of the resulting value.

INTERNAL REGISTER

(vii)Dedicated Registers
Several other registers are incorporated in the μP for its internal operation. They cannot be accessed by the programmer and hence do not concern much a μP user.

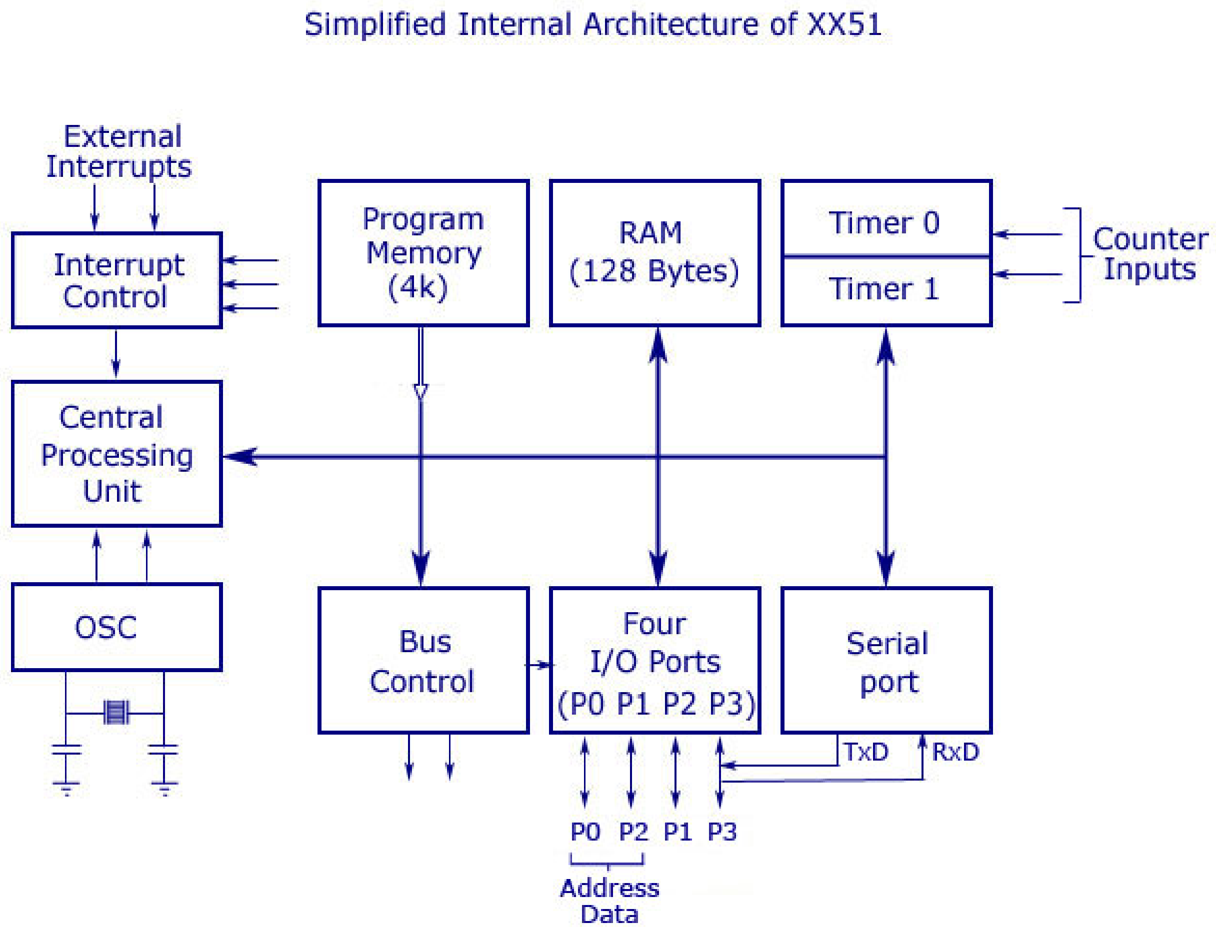


INTERNAL REGISTER



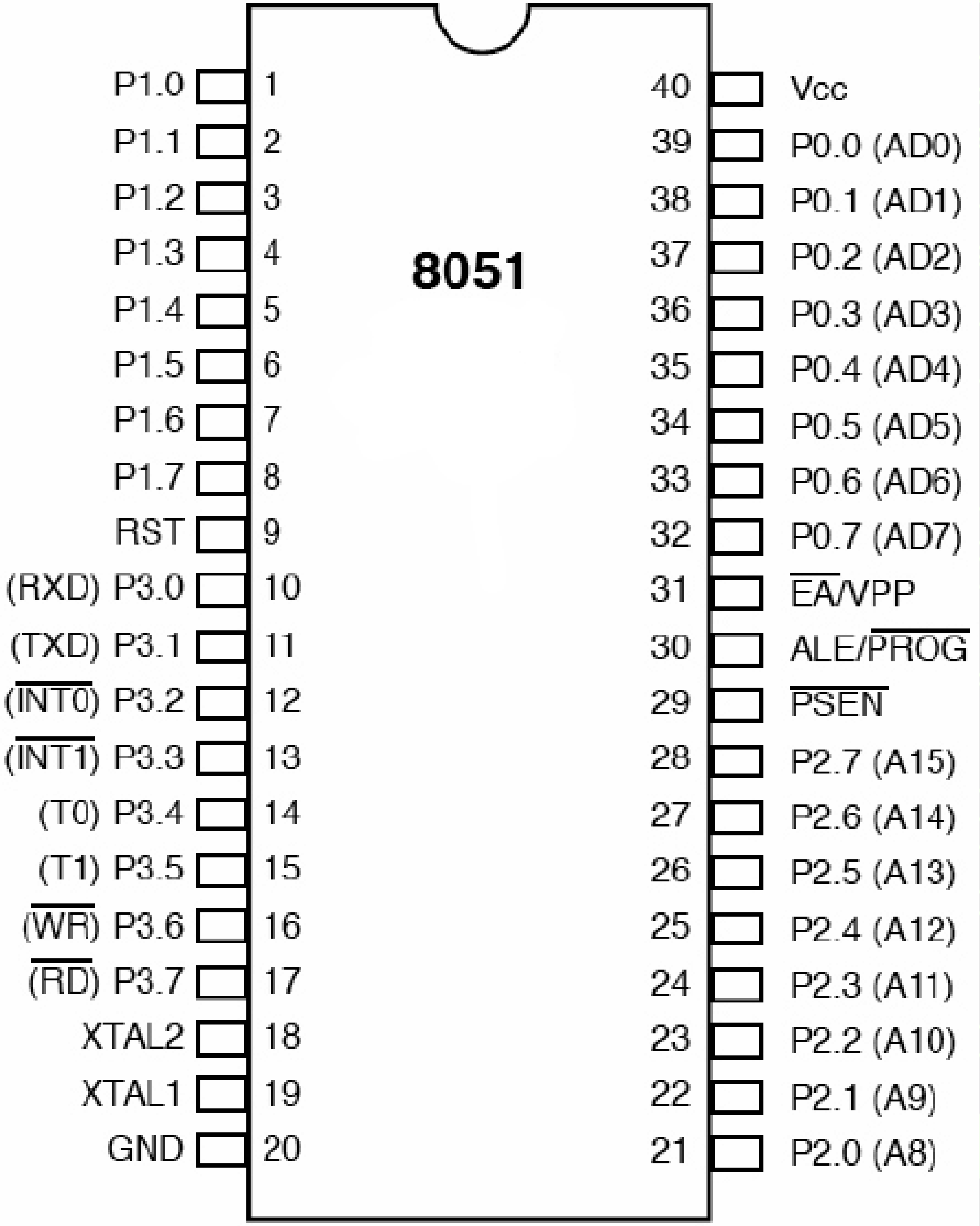
8051 Microcontroller

INTERNAL REGISTER



8051 Microcontroller Architecture

INTERNAL REGISTER



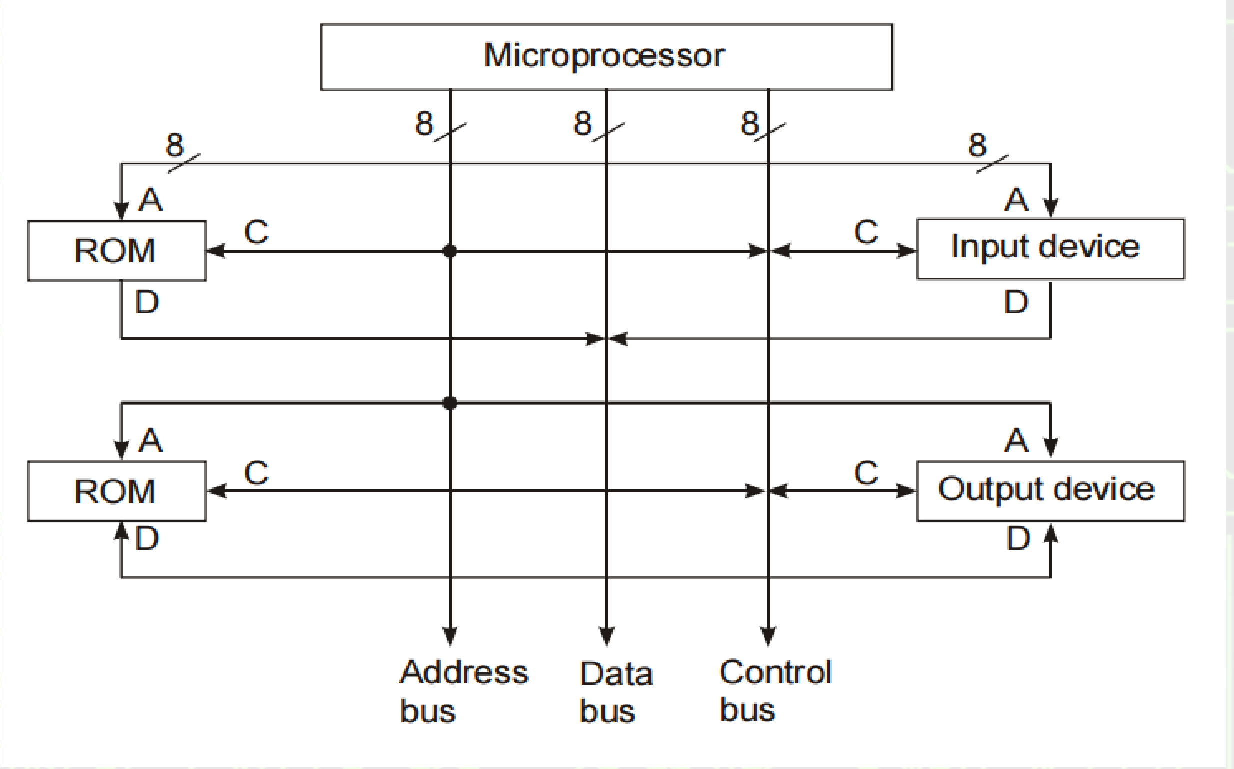
Pins of 8051 Microcontroller

SEMICONDUCTOR MEMORIES

As mentioned earlier, semiconductor memories are required in a microcomputer for storing information which may comprise of

(a) the data to be used for computation,
(b) instructions and
(c) computational results.

A program starts as a set of instructions on a paper, then this is transferred to a set of cards with the instructions punched in code on them. These instructions also can be transferred to magnetic tape, paper tape or directly into semiconductor memory which is the eventual storage space for a program. The semiconductor memory chips are connected to the µP through the address bus, data bus and control bus. (This is also the way that I/0 devices are connected to the µP).



Connection of I/O Devices and Memory

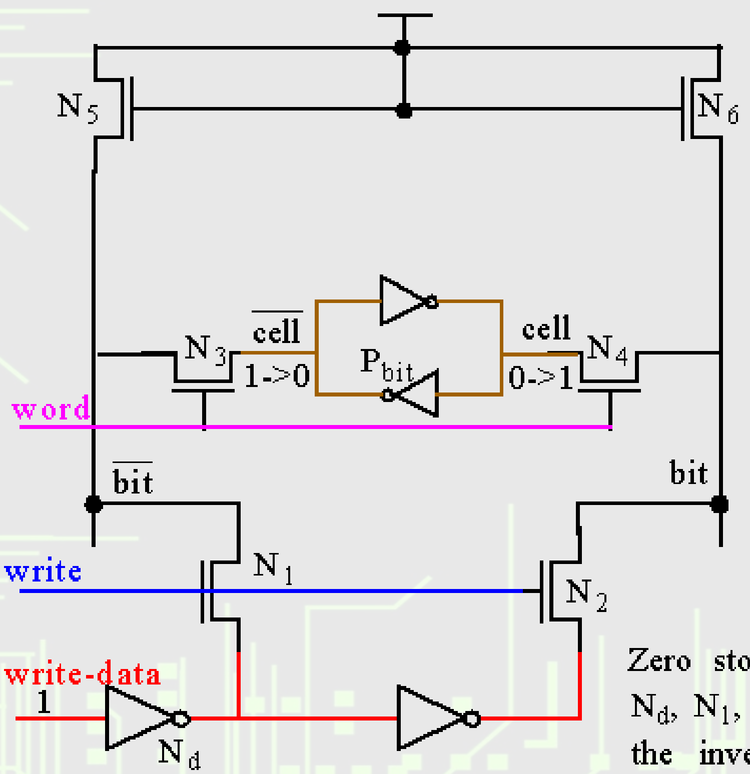
MEMORY CLASSES

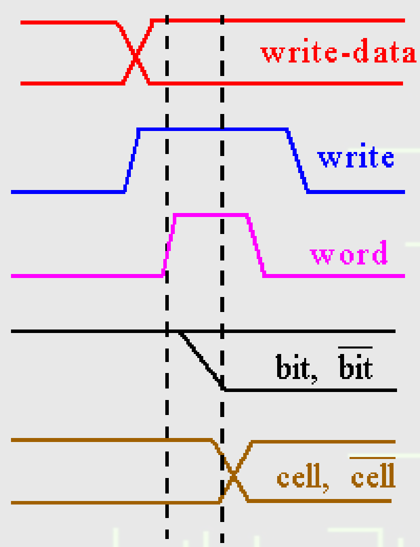
Memories may be broadly divided into two classes:

(a) Random Access Memory (RAM) or Read/Write Memory (RWM)

There is provision in RAMs (RWMs) for writing information into the memory and reading it when the microcomputer is in operation. It is, therefore, used to store information which changes or may change during the operation of the system, viz. data for calculations and results of calculations. It is also used to store the programs which are to be changed frequently. Semiconductor RAM is a volatile memory.

A RAM can be of static or dynamic type. Dynamic RAMs have higher packing densities, are faster and consume less power in the quiescent state. However, because of external refreshing circuitry requirement, the dynamic RAMs are profitable only in large sizes.





Zero stored in cell originally.
N_d, N_1, and N_3 have to pull P_{bit} below the inverter threshold.

MEMORY CLASSES

(b) Read-Only Memory (ROM)
The ROM functions as a memory array whose contents once programmed, are permanently fixed and can not be altered by the µP while the system is operating. It is non-volatile. ROMs exist in many forms.

(i) Mask ROM : It is custom programmed or mask programmed when manufactured and can not be altered thereafter. The cost of a custom built mask for programming is so high that thousands of ROMs storing the same information must be produced to pay for the mask.

(ii) Programmable ROM (PROM) : This type is programmable by the user (typically by electrically overheating fusible links in selected manner). Once programmed, the contents can not be altered. The memory may be programmed one at a time by the user and is thus suitable for the cases where small quantities of a ROM are needed.

(iii)Electrically Alterable ROM (EAROM) : In this type of memory, the contents can be electrically erased (by applying a large negative voltage to control gates of memory cells) and the memory can be then reprogrammed (by applying a large positive voltage to control gates). This type is convenient when the user is not sure of the program and may wish to modify it. This is a typical requirement in prototype development.

(iv) Erasable Programmable ROM (EPROM) : Like EAROM, this type of memory can also be erased and reprogrammed. However, erasing is by exposing the memory chips to high intensity ultravoilet light of a wavelength close to 2537 Å. It has the same application filed as the EAROM.

Bipolar v/s MOS Memories

Basically there are two semiconductor technologies, namely, bipolar and MOS unipolar. Mask ROMs and PROMs are available in both types whereas EAROMs and EPROMs are made with MOS technology only.

In general, bipolar devices (including memories) are faster and have higher drive capabilities. On the other hand, MOS devices consume less space and power and are cheaper. Therefore, MOS memories are preferred where speed is not a critical factor.

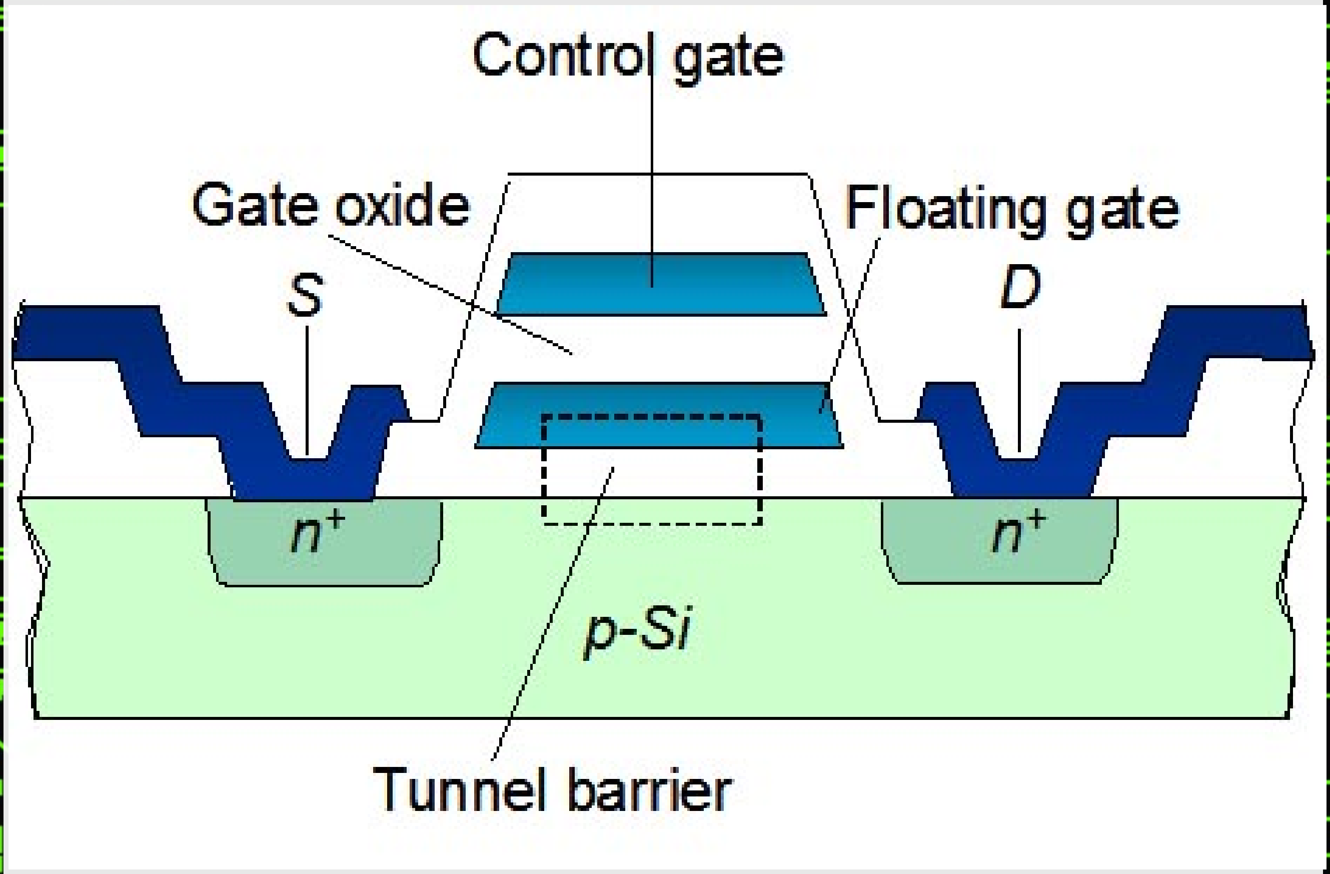
MOS RAM is preferred because:

1. MOS have less leakage current than BJT. So power consumption is less.

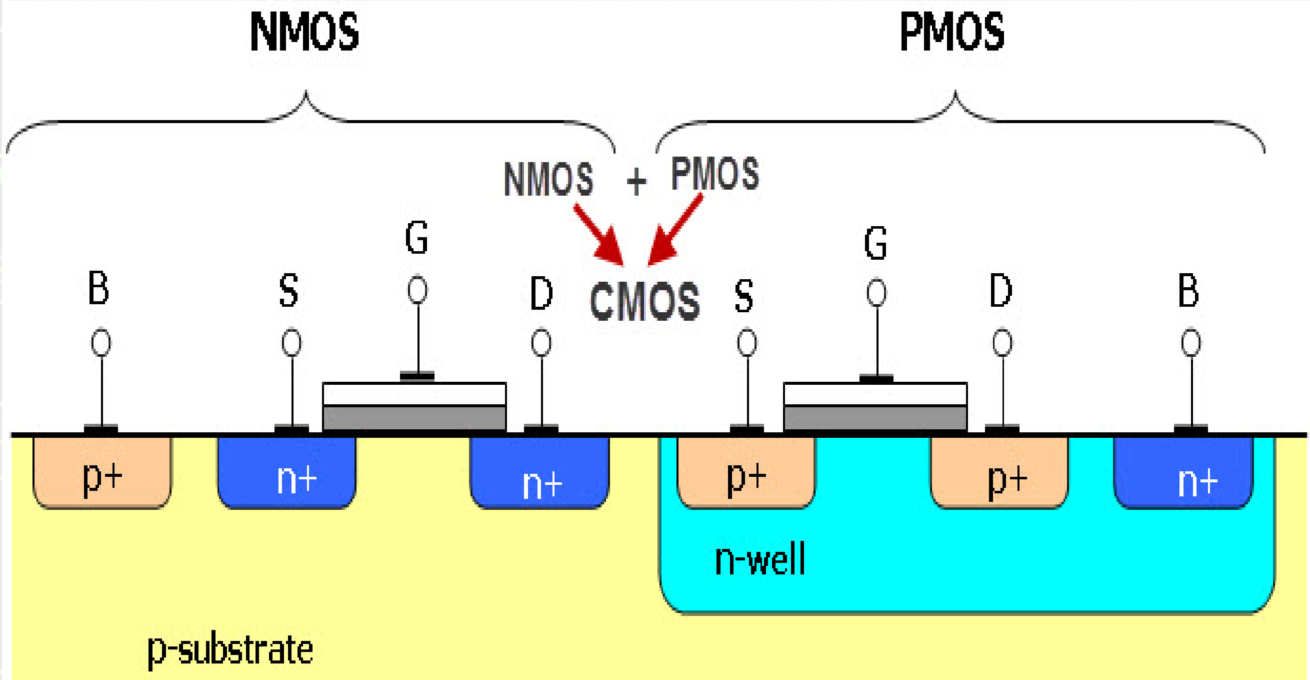
2.MOS transistor has smaller size than BJT. So it gives high packing density.

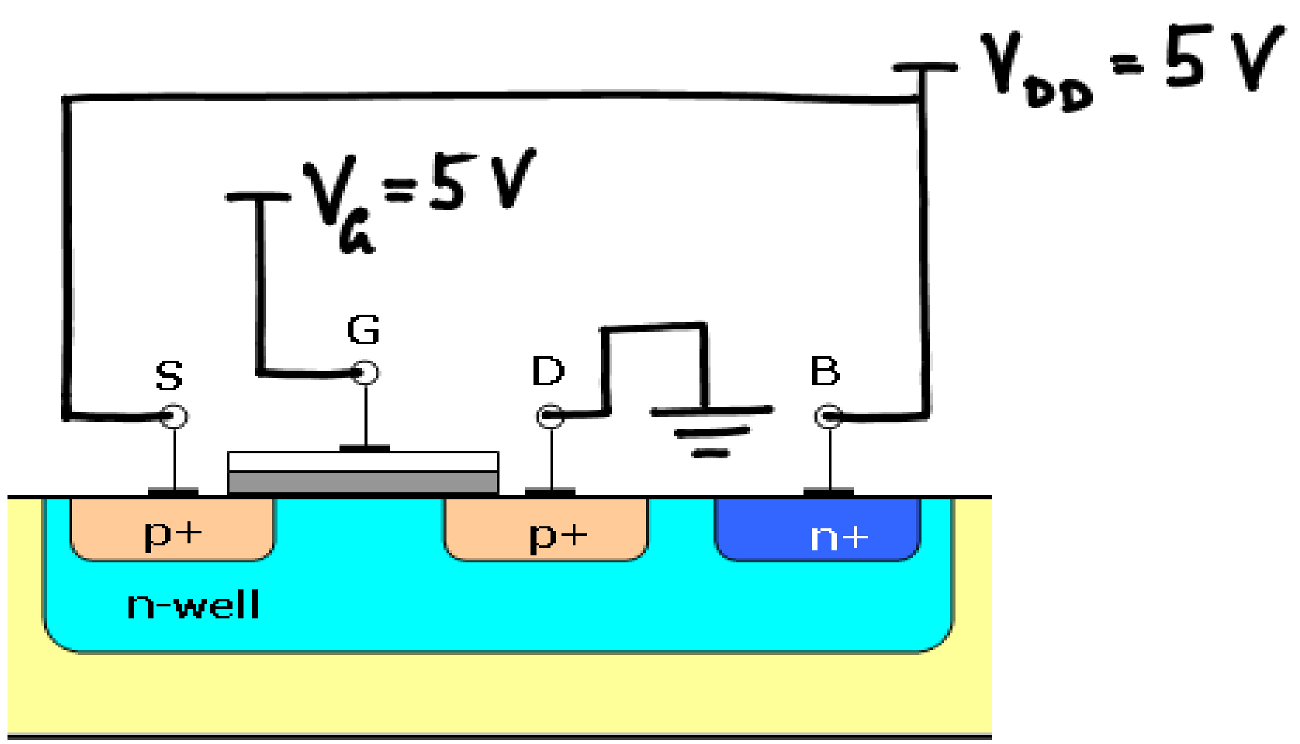
3. MOS fabrication have less number of fabrication step than BJT. Also fabrication of MOS much simpler than BJT.

Bipolar Memories



MOS Memories





PERIPHERAL INTERFACING

FUNCTIONS

When one or more I/O devices (peripherals) are to be connected to a μP, an interface network for each device, called peripheral interface, is required.

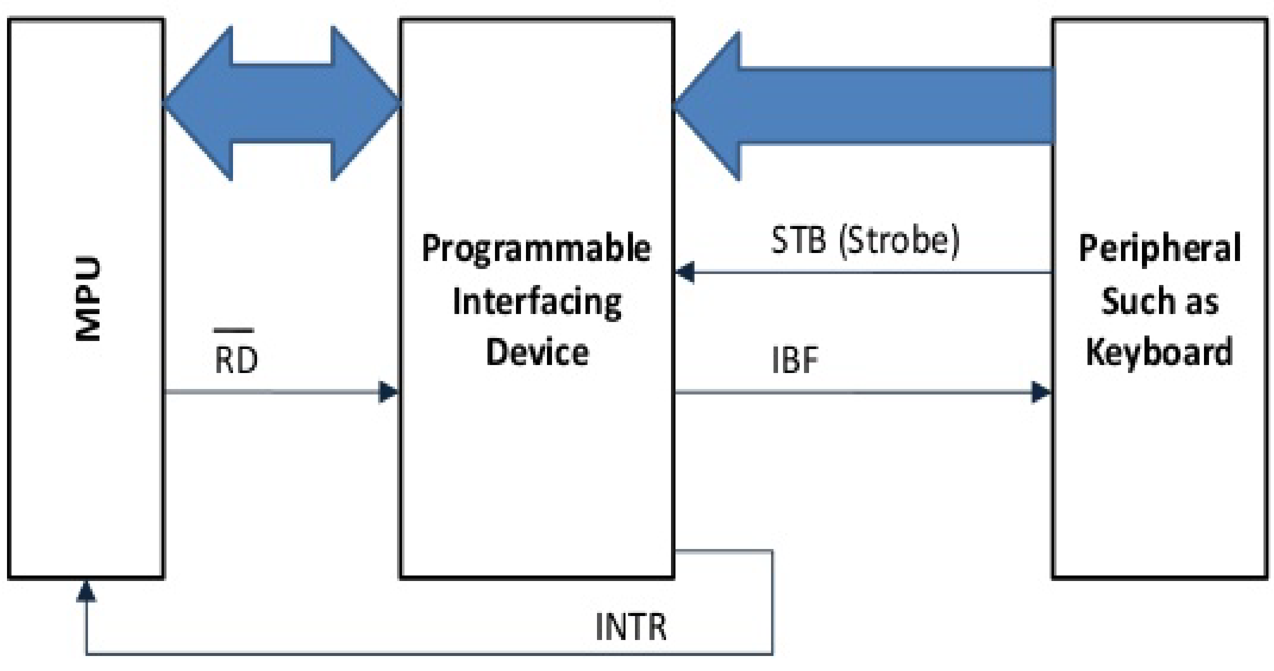
The interface incorporate commonly the following four functions:

(a) Buffering:
Which is necessary to take care of incompatibility between the μP and the peripheral.

(b) Address Decoding:
Which is required to select one of the several peripherals connected in the system.

(c) Command Decoding :
Which is required for peripherals that perform actions other than data transfers.

(d) Timing and Control :
All the above functions require timing and control.



EVOLUTION OF MICROPROCESSOR

The microprocessor has become more essential part of many gadgets. The evolution of microprocessors was divided into five generations such as first, second, third, fourth and fifth generation and the characteristics of these generations are discussed below.

NAME	YEAR	TRANSISTORS	DATA WIDTH	CLOCK SPEED
8080	1974	6,000	8 bits	2 MHz
8085	1976	6,500	8 bits	5 MHz
8086	1978	29,000	16 bits	5 MHz
8088	1979	29,000	8 bits	5 MHz
80286	1982	134,000	16 bits	6 MHz
80386	1985	275,000	32 bits	16 MHz
80486	1989	1,200,000	32 bits	25 MHz
PENTIUM	1993	3,100,000	32/64 bits	60 MHz
PENTIUM II	1997	7,500,000	64 bits	233 MHz
PENTIUM III	1999	9,500,000	64 bits	450 MHz
PENTIUM IV	2000	42,000,000	64 bits	1.5 GHz

EVOLUTION OF MICROPROCESSOR

First Generation Microprocessors

The first generation microprocessors were introduced in the year 1971-1972. The instructions of these microprocessors were processed serially, they fetched the instruction, decoded and then executed it. When an instruction of the microprocessor was finished, then the microprocessor updates the instruction pointer & fetched the following instruction, performing this consecutive operation for each instruction in turn.

Second Generation Microprocessors

In the year 1970, small amount of transistors were available on the integrated circuit in the second generation microprocessors. Examples of the second generation microprocessors are 16-bit arithmetic 7 pipelined instruction processing, MC68000 Motorola microprocessor. These processors are introduced in the year 1979, and Intel 8080 processor is another example of the microprocessor. The second generation of the microprocessor is defined by overlapped fetch, decode and execute the steps. When the first generation is processed in the execution unit, then the second instruction is decoded and the third instruction is fetched.
The difference between the first generation microprocessor and second generation microprocessors was mainly the use of new semiconductor technologies to manufacture the chips. The result of this technology resulted in a fivefold increase in instruction, speed, execution and higher chip densities.

EVOLUTION OF MICROPROCESSOR

Third Generation Microprocessors

The third generation microprocessors were introduced in the year 1978, as denoted by Intel’s 8086 and the Zilog Z8000. These were 16-bit processors with a performance like mini computers. These types of microprocessors were different from the previous generations of microprocessors in that all main workstation industrialists began evolving their own ISC based microprocessor architectures.

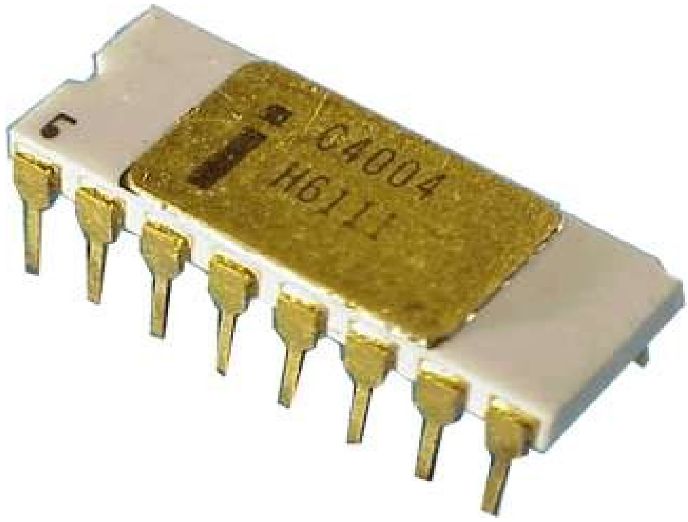
Fourth Generation Microprocessors

As many industries converted from commercial microprocessors to in house designs, the fourth generation microprocessors are entered with outstanding design with a million transistors. Leading edge microprocessors like Motorola’s 88100 and Intel’s 80960CA could issue & retire more than one instruction per clock cycle.

Fifth Generation Microprocessors

Fifth generation microprocessors employed decoupled super scalar processing, and their design soon exceeded 10 million transistors. In fifth generation, PCs are a low-margin, high volume business conquered by a single microprocessor.

INTEL 4004

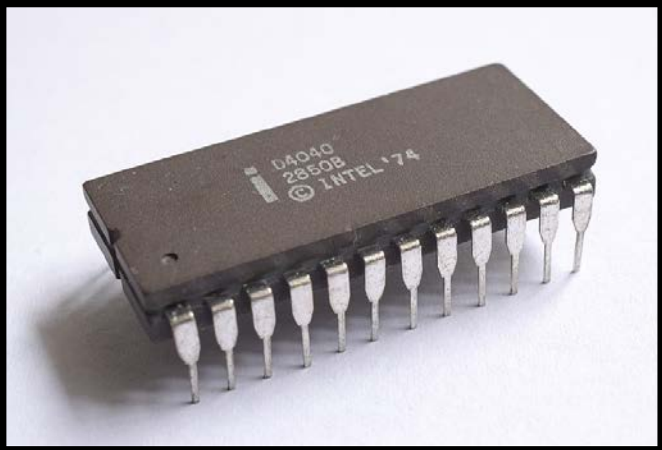


The **Intel 4004** is a 4-bit central processing unit (CPU) released by Intel Corporation in 1971. It was the first commercially available microprocessor by Intel. The chip design started in April 1970, when Federico Faggin joined Intel, and it was completed under his leadership in January 1971. The first commercial sale of the fully operational 4004 occurred in March 1971 to Busicom Corp. of Japan for which it was originally designed and built as a custom chip. In mid-November of the same year, with the prophetic ad "*Announcing a new era in integrated electronics*", the 4004 was made commercially available to the general market. The 4004 was the first commercially available monolithic CPU, fully integrated in one small chip.[*citation needed*] Such a feat of integration was made possible by the use of the then-new silicon gate technology for integrated circuits, originally developed by Faggin (with Tom Klein) at Fairchild Semiconductor in 1968, which allowed twice the number of random-logic transistors and an increase in speed by a factor of five compared to the incumbent MOS aluminum gate technology. Faggin also invented the bootstrap load with silicon gate and the “buried contact”, improving speed and circuit density compared with aluminum gate.

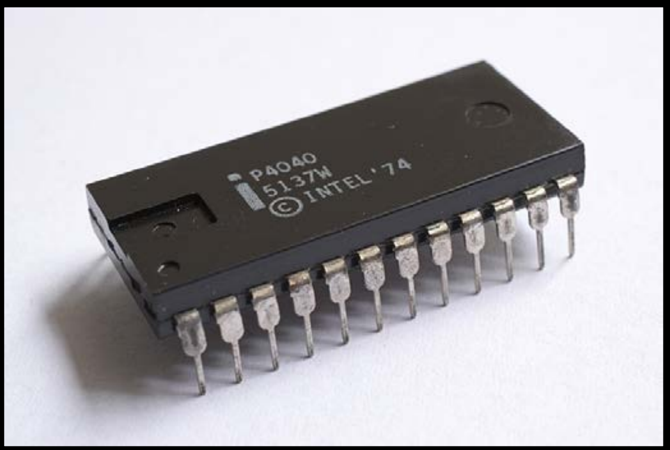
4-BIT MICROPROCESSORS

INTEL 4040

The Intel 4040 microprocessor was the successor to the Intel 4004. It was introduced in 1974. The 4040 employed a 10 µm silicon gate enhancement load PMOS technology, was made up of 3,000 transistors and could execute approximately 60,000 instructions per second.

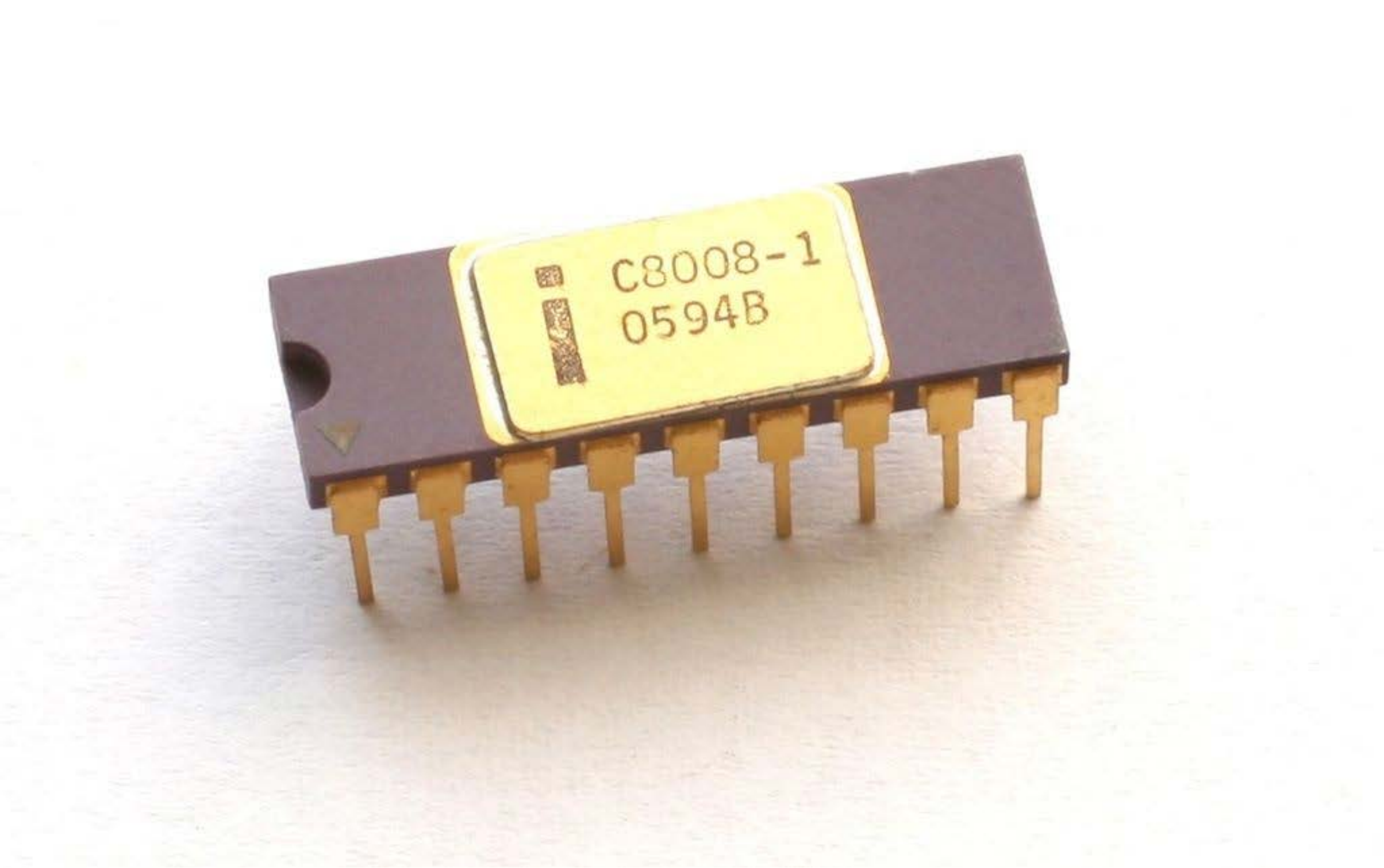


The ceramic D4040 variant.



The plastic P4040 variant.

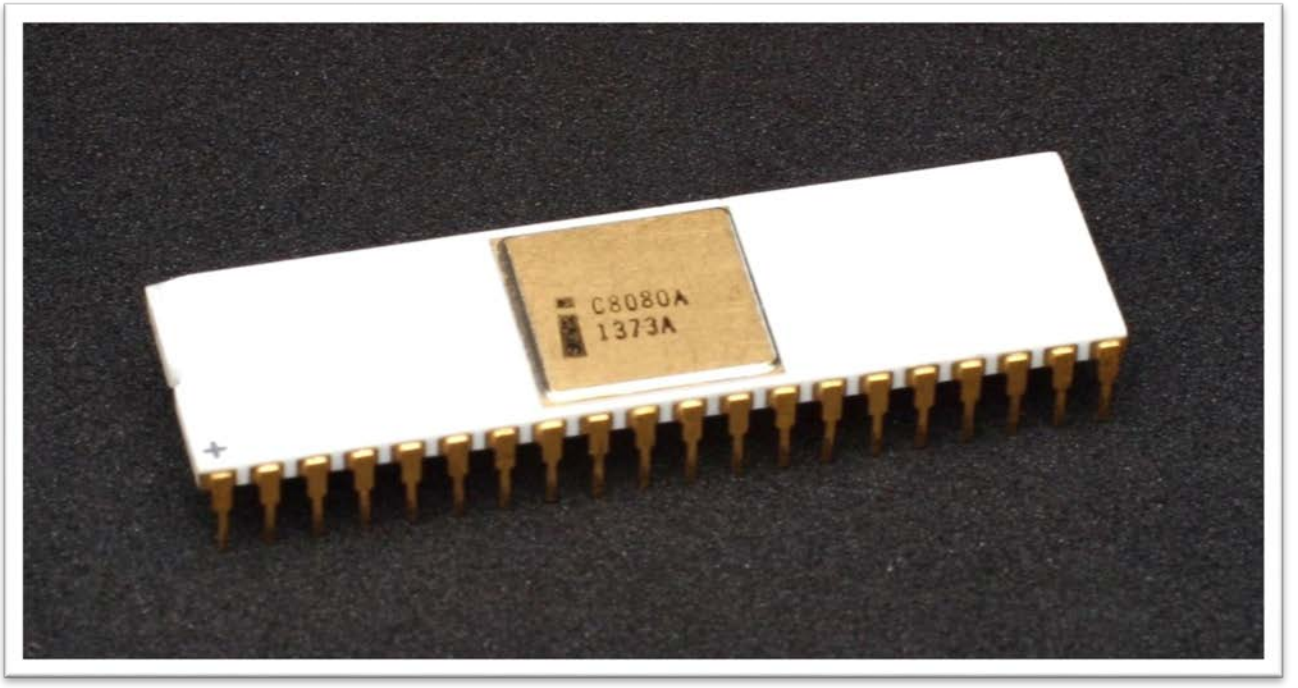
INTEL 8008



The **Intel 8008** ("*eight-thousand-eight*" or "*eighty-oh-eight*") is an early byte-oriented microprocessor designed and manufactured by Intel and introduced in April 1972. It is an 8-bit CPU with an external 14-bit address bus that could address 16 KB of memory. Originally known as the **1201**, the chip was commissioned by Computer Terminal Corporation (CTC) to implement an instruction set of their design for their Data point 2200 programmable terminal. As the chip was delayed and did not meet CTC's performance goals, the 2200 ended up using CTC's own TTL-based CPU instead. An agreement permitted Intel to market the chip to other customers after Seiko expressed an interest in using it for a calculator.

8-BIT MICROPROCESSORS

INTEL 8080

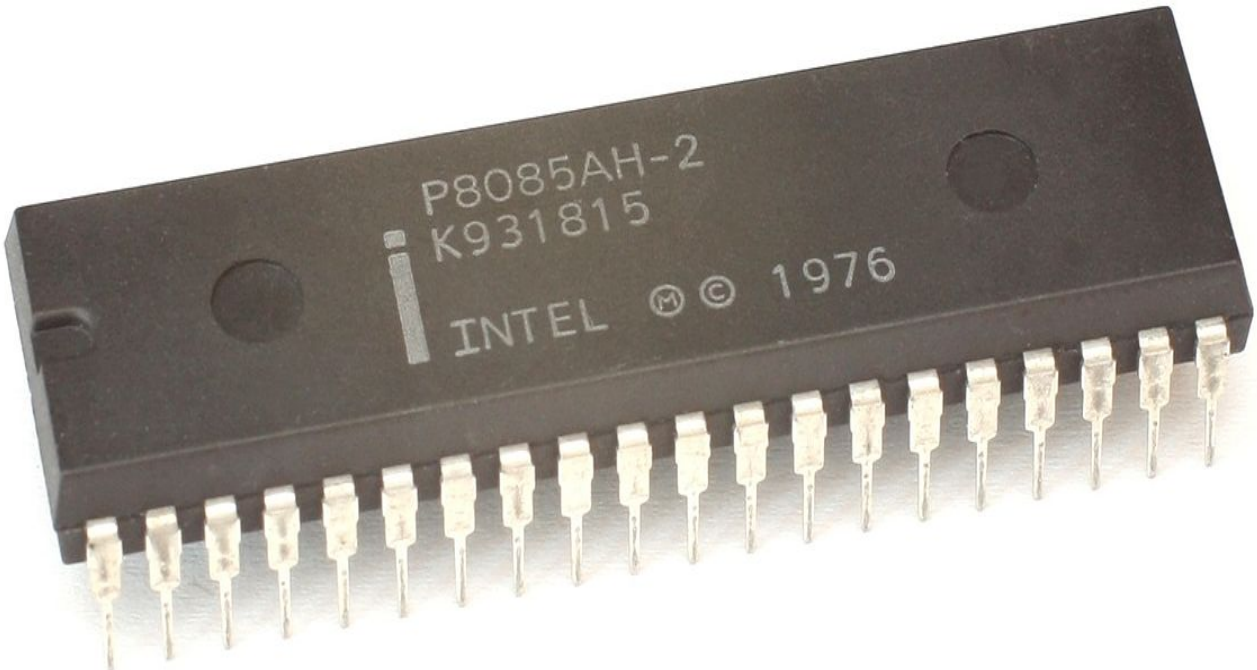


The **Intel 8080** (*"eighty-eighty"*) was the second 8-bit microprocessor designed and manufactured by Intel and was released in April 1974. It is an extended and enhanced variant of the earlier 8008 design, although without binary compatibility. The initial specified clock frequency limit was 2 MHz, and with common instructions using 4, 5, 7, 10, or 11 cycles this meant that it operated at a typical speed of a few hundred thousand instructions per second. A faster variant 8080A-1 became available later with clock frequency limit up to 3.125 MHz

The 8080 requires two support chips to function in most applications, the i8224 clock generator/driver and the i8228 bus controller, and it is implemented in NMOS using non-saturated enhancement mode transistors as loads (alternatively called as *pull-up registers*), therefore demanding a +12 V and a −5 V voltage in addition to the main TTL-compatible +5 V.

8-BIT MICROPROCESSORS

INTEL 8085

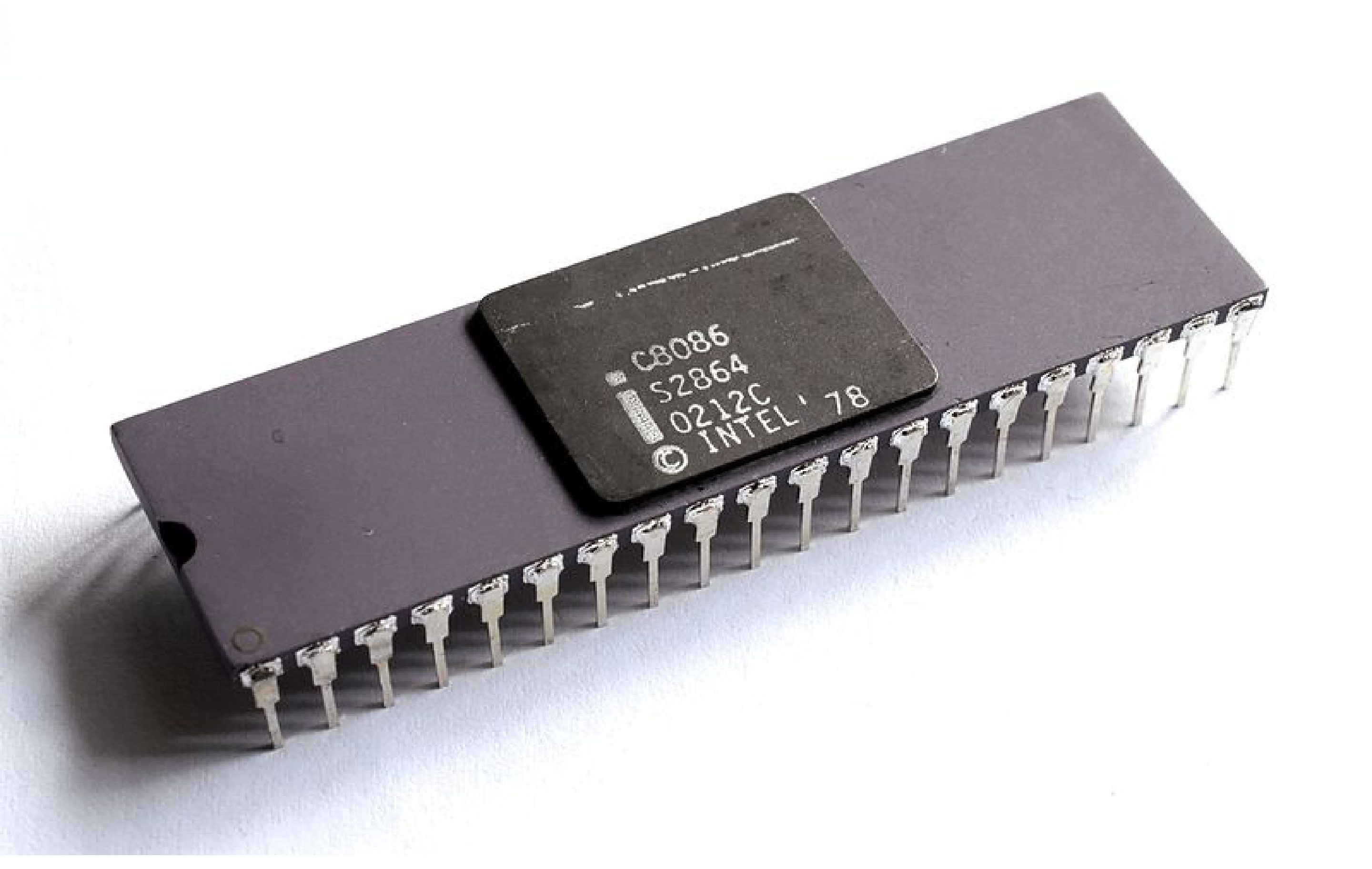


The **Intel 8085** is an 8-bit microprocessor produced by Intel and introduced in 1976. It is a software-binary compatible with the more-famous Intel 8080 with only two minor instructions added to support its added interrupt and serial input/output features. However, it requires less support circuitry, allowing simpler and less expensive microcomputer systems to be built. The "5" in the part number highlighted the fact that the 8085 uses a single +5-volt (V) power supply by using depletion-mode transistors, rather than requiring the +5 V, −5 V and +12 V supplies needed by the 8080. This capability matched that of the competing Z80, a popular 8080-derived CPU introduced the year before. These processors could be used in computers running the CP/M operating system.

The 8085 is supplied in a 40-pin DIP package. To maximize the functions on the available pins, the 8085 uses a multiplexed address/data bus. However, an 8085 circuit requires an 8-bit address latch, so Intel manufactured several support chips with an address latch built in.

16-BIT MICROPROCESSORS

INTEL 8086

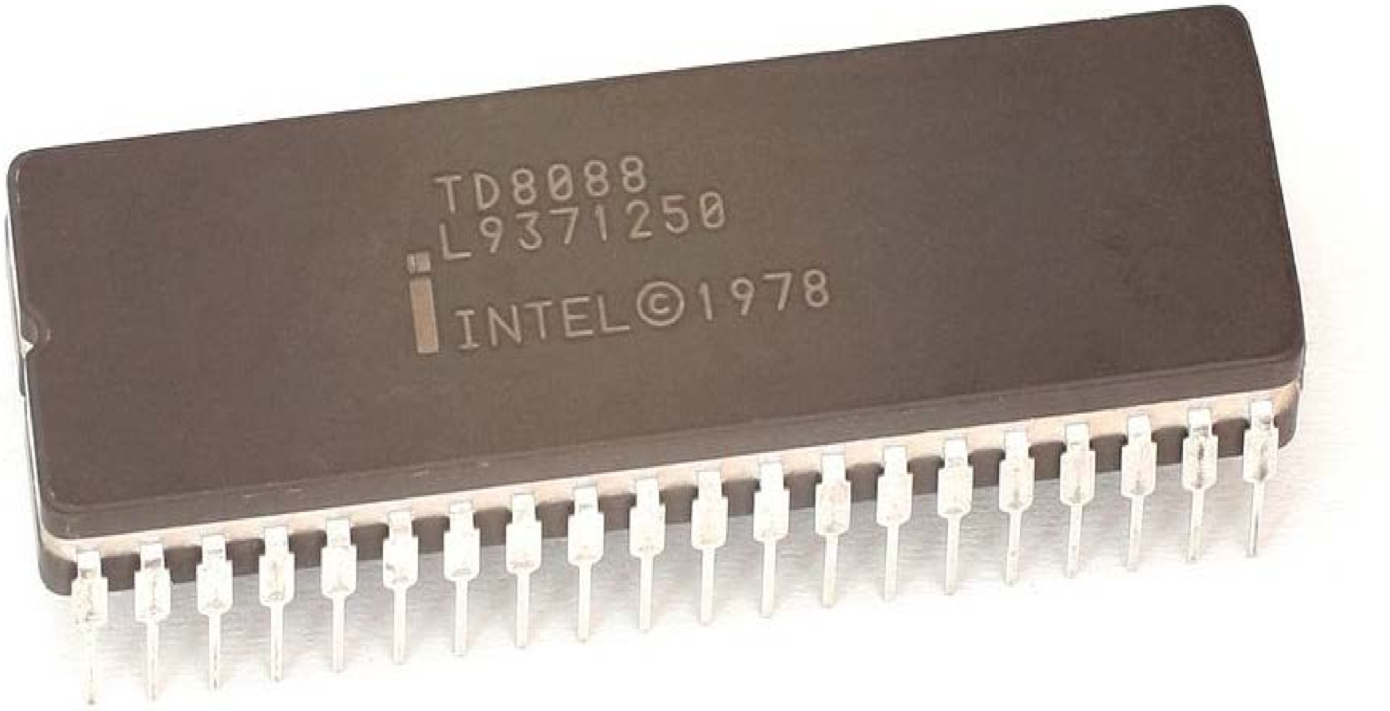


The **8086** (also called **iAPX 86**) is a 16-bit microprocessor chip designed by Intel between early 1976 and mid-1978, when it was released. The Intel 8088, released in 1979, is a slightly modified chip with an external 8-bit data bus (allowing the use of cheaper and fewer supporting ICs), and is notable as the processor used in the original IBM PC design, including the widespread version called IBM PC XT.

The 8086 gave rise to the x86 architecture, which eventually became Intel's most successful line of processors.

16-BIT MICROPROCESSORS

INTEL 8088



The **Intel 8088** (also called **iAPX 88**) microprocessor is a variant of the Intel 8086. Introduced on July 1, 1979, the 8088 had an eight-bit external data bus instead of the 16-bit bus of the 8086. The 16-bit registers and the one megabyte address range were unchanged, however. In fact, according to the Intel documentation, the 8086 and 8088 have the same execution unit (EU)—only the bus interface unit (BIU) is different. The original IBM PC was based on the 8088.

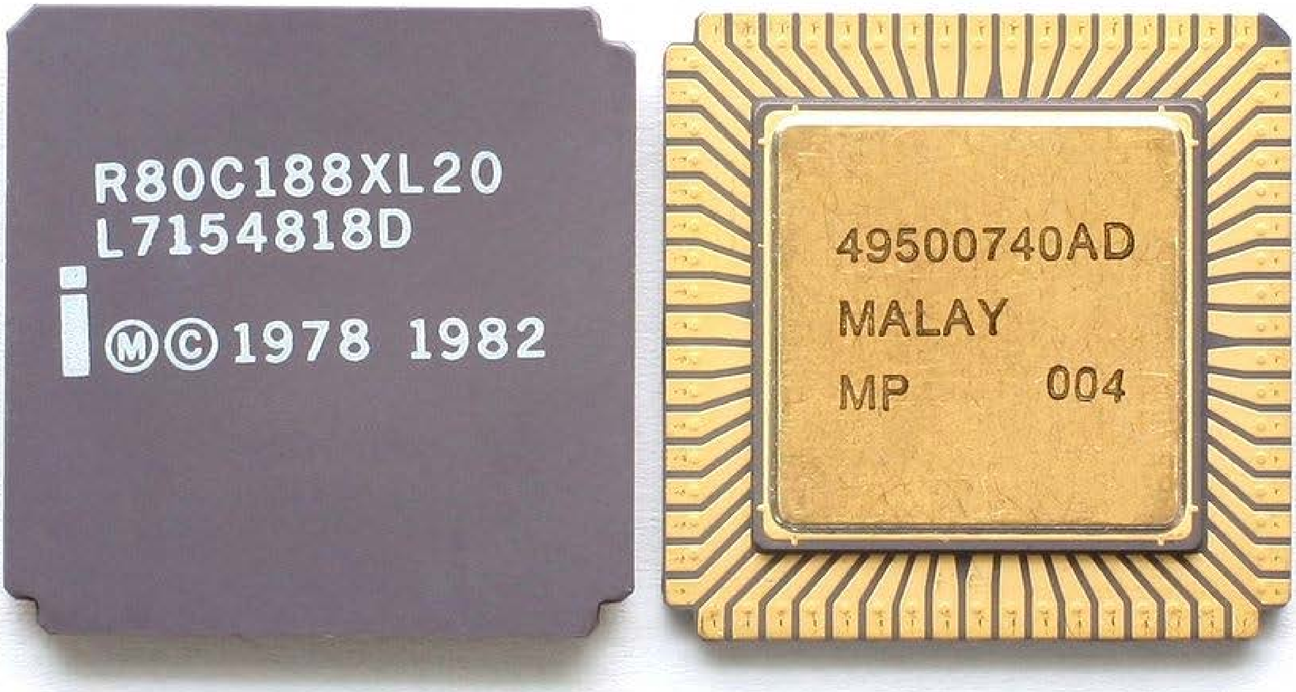
16-BIT MICROPROCESSORS

INTEL 80186

The Intel **80186**, also known as the **iAPX 186**, or just **186**, is a microprocessor and microcontroller introduced in 1982. It was based on the Intel 8086 and, like it, had a 16-bit external data bus multiplexed with a 20-bit address bus. It was also available as the 80188, with an 8-bit external data bus.

16-BIT MICROPROCESSORS

INTEL 80188



The **Intel 80188** microprocessor was a variant of the Intel 80186. The 80188 had an 8-bit external data bus instead of the 16-bit bus of the 80186; this made it less expensive to connect to peripherals. The 16-bit registers and the one megabyte address range were unchanged, however. It had a throughput of 1 million instructions per second.

16-BIT MICROPROCESSORS

INTEL 80286

The Intel **80286** (also marketed as the **iAPX 286** and often called **Intel 286**) is a 16-bit microprocessor that was introduced on 1 February 1982. It was the first 8086 based CPU with separate, non-multiplexed address and data buses and also the first with memory management and wide protection abilities. The 80286 used approximately 134,000 transistors in its original nMOS (HMOS) incarnation and, just like the contemporary 80186, it could correctly execute most software written for the earlier Intel 8086 and 8088 processors.

The 80286 was employed for the IBM PC/AT, introduced in 1984, and then widely used in most PC/AT compatible computers until the early 1990s.

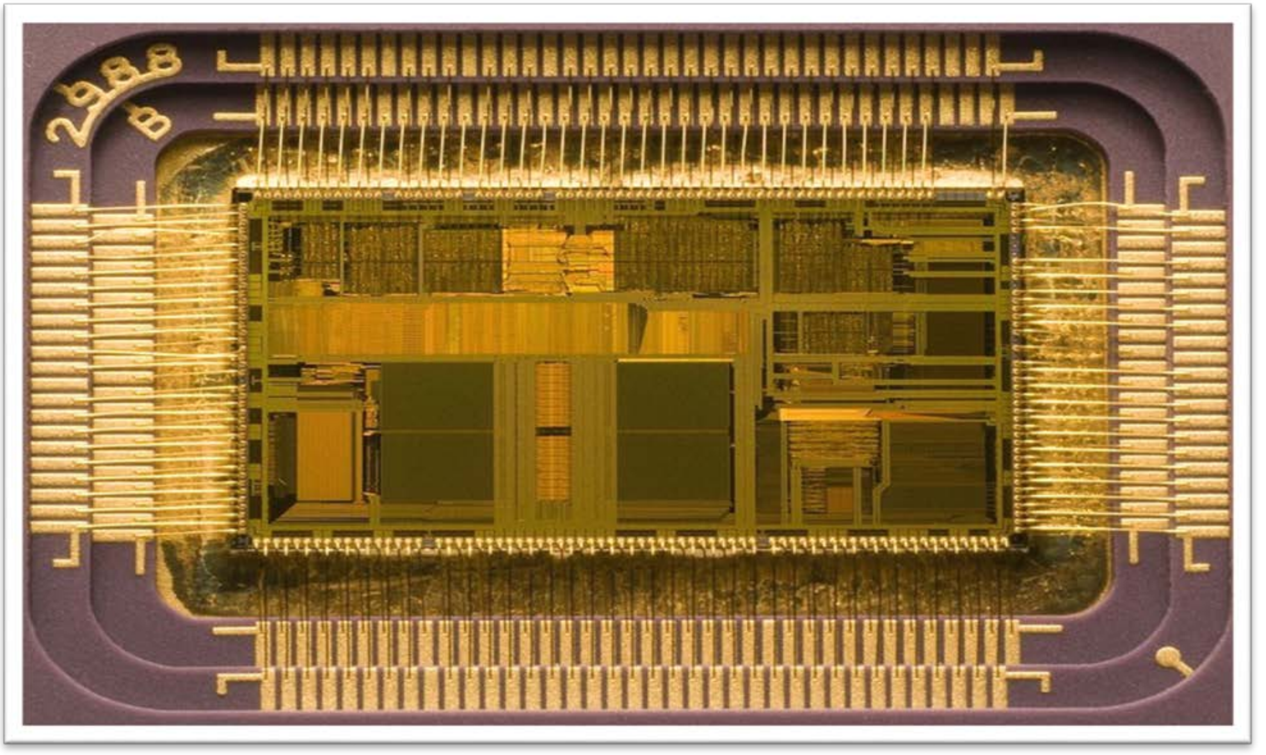
32-BIT MICROPROCESSORS

INTEL 80386

The Intel **80386**, also known as **i386** or just **386**, is a 32-bit microprocessor introduced in 1985. The first versions had 275,000 transistors and were the CPU of many workstations and high-end personal computers of the time. As the original implementation of the 32-bit extension of the 80286 architecture, the 80386 instruction set, programming model, and binary encodings are still the common denominator for all 32-bit x86 processors, which is termed the *i386-architecture*, *x86*, or *IA-32*, depending on context.

The 32-bit 80386 can correctly execute most code intended for the earlier 16-bit processors such as 8086 and 80286 that were ubiquitous in early PCs. (Following the same tradition, modern 64-bit x86 processors are able to run most programs written for older x86 CPUs, all the way back to the original 16-bit 8086 of 1978.)

INTEL 80486



The Intel **80486**, also known as the **i486** or **486** ("*four-eighty-six*"), is a higher performance follow-up to the Intel 80386 microprocessor. The 80486 was introduced in 1989 and was the first tightly pipelined x86 design as well as the first x86 chip to use more than a million transistors, due to a large on-chip cache and an integrated floating-point unit. It represents a fourth generation of binary compatible CPUs since the original 8086 of 1978.

A 50 MHz 80486 executes around 40 million instructions per second on average and is able to reach 50 MIPS peak performance.

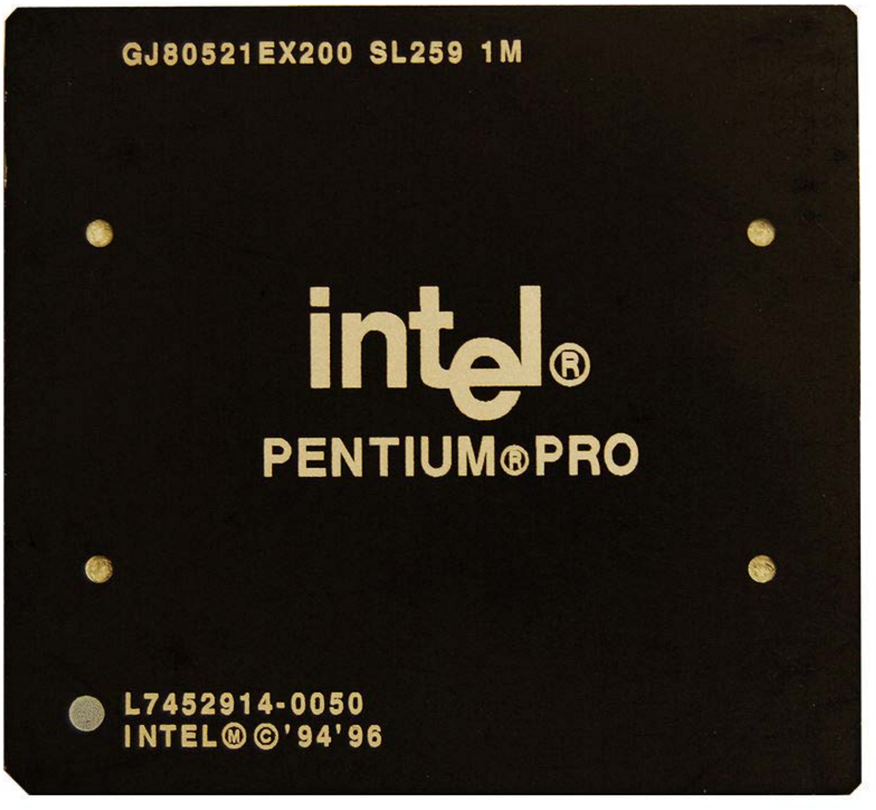
The i486 does not have the usual 80-prefix because of a court ruling that prohibits trademarking numbers (such as 80486). Later, with the introduction of the Pentium brand, Intel began branding its chips with words rather than numbers.

32-BIT MICROPROCESSORS

INTEL PENTIUM

Pentium is a brand used for a series of x86 architecture-compatible microprocessors produced by Intel since 1993. In their form as of November 2011, Pentium processors are considered entry-level products that Intel rates as "two stars", meaning that they are above the low-end Atom and Celeron series, but below the faster Core i3, i5, i7, i9, and high-end Xeon series. As of 2017, Pentium processors have little more than their name in common with earlier Pentiums, which were Intel's flagship processor for over a decade until the introduction of the Intel Core line in 2006. They are based on both the architecture used in Atom and that of Core processors. In the case of Atom architectures, Pentiums are the highest performance implementations of the architecture. Pentium processors with Core architectures prior to 2017 were distinguished from the faster, higher-end i-series processors by lower clock rates and disabling some features, such as hyper-threading, virtualization and sometimes L3 cache.

INTEL PENTIUM PRO



The **Pentium Pro** is a sixth generation x86 microprocessor developed and manufactured by Intel introduced in November 1, 1995. It introduced the P6 microarchitecture (sometimes referred to as i686) and was originally intended to replace the original Pentium in a full range of applications. While the Pentium and Pentium MMX had 3.1 and 4.5 million transistors, respectively, the Pentium Pro contained 5.5 million transistors. Later, it was reduced to a more narrow role as a server and high-end desktop processor and was used in supercomputers like ASCI Red, the first computer to reach the teraFLOPS performance mark. The Pentium Pro was capable of both dual- and quad-processor configurations. It only came in one form factor, the relatively large rectangular Socket 8. The Pentium Pro was succeeded by the Pentium II Xeon in 1998.

INTEL PENTIUM II

The **Pentium II** brand refers to Intel's sixth-generation microarchitecture ("P6") and x86-compatible microprocessors introduced on May 7, 1997. Containing 7.5 million transistors (27.4 million in the case of the mobile Dixon with 256 KB L2 cache), the Pentium II featured an improved version of the first *P6*-generation core of the Pentium Pro, which contained 5.5 million transistors. However, its L2 cache subsystem was a downgrade when compared to Pentium Pros. In early 1999, the Pentium II was superseded by the almost identical Pentium III, which basically only added SSE instructions to the CPU.

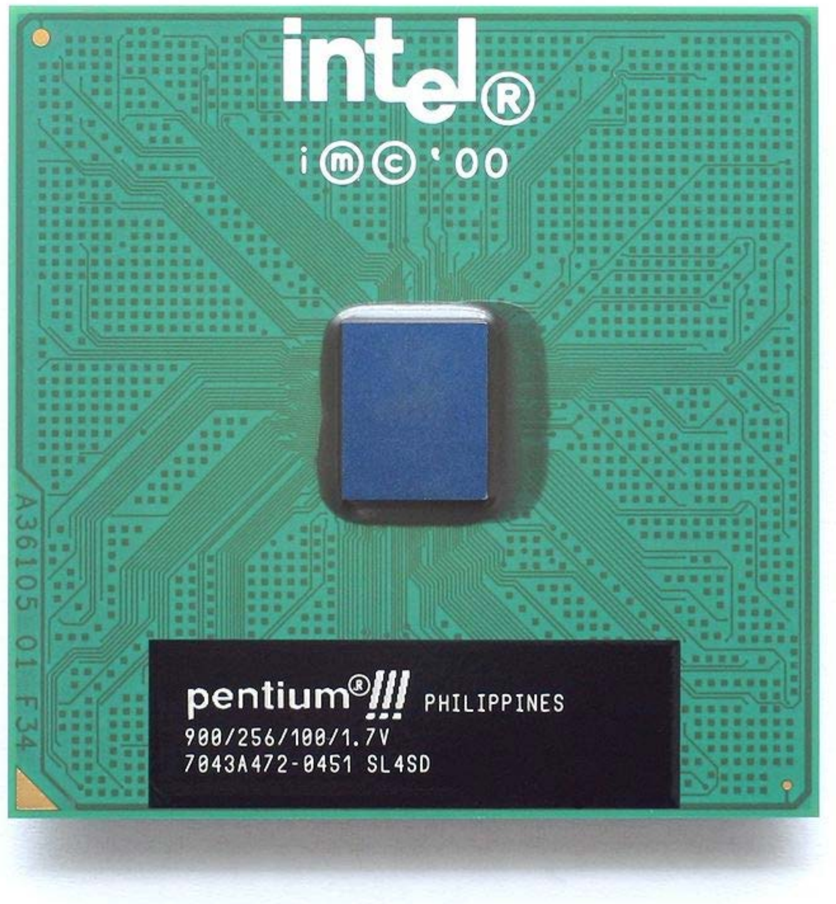
In 1998, Intel stratified the Pentium II family by releasing the Pentium II-based Celeron line of processors for low-end workstations and the Pentium II Xeon line for servers and high-end workstations. The Celeron was characterized by a reduced or omitted (in some cases present but disabled) on-die full-speed L2 cache and a 66 MT/s FSB. The Xeon was characterized by a range of full-speed L2 cache (from 512 KB to 2048 KB), a 100 MT/s FSB, a different physical interface (Slot 2), and support for symmetric multiprocessing.

Intel Pentium II XEON

The first Xeon-branded processor was the Pentium II Xeon (code-named "**Drake**"). It was released in 1998, replacing the Pentium Pro in Intel's server lineup. The Pentium II Xeon was a "*Deschutes*" Pentium II (and shared the same product code: 80523) with a full-speed 512 kB, 1 MB, or 2 MB L2 cache. The L2 cache was implemented with custom 512 kB SRAMs developed by Intel. The number of SRAMs depended on the amount of cache. A 512 kB configuration required one SRAM, a 1 MB configuration: two SRAMs, and a 2 MB configuration: four SRAMs on both sides of the PCB. Each SRAM was a 12.90 mm by 17.23 mm (222.21 mm²) die fabricated in a 0.35 µm four-layer metal CMOS process and packaged in a cavity-down wire-bonded land grid array (LGA). The additional cache required a larger module and thus the Pentium II Xeon used a larger slot, Slot 2. It was supported by the 440GX dual-processor workstation chipset and the 450NX quad- or octo-processor chipset.

32-BIT MICROPROCESSORS

INTEL PENTIUM III



The **Pentium III** (marketed as **Intel Pentium III Processor**, informally **PIII**) brand refers to Intel's 32-bit x86 desktop and mobile microprocessors based on the sixth-generation P6 microarchitecture introduced on February 26, 1999. The brand's initial processors were very similar to the earlier Pentium II-branded microprocessors. The most notable differences were the addition of the SSEinstruction set (to accelerate floating point and parallel calculations), and the introduction of a controversial serial number embedded in the chip during the manufacturing process.

INTEL PENTIUM IV

Pentium 4 is a brand by Intel for an entire series of single-core CPUs for desktops, laptops and entry-level servers. The processors were shipped from November 20, 2000, until August 8, 2008.

All Pentium 4 CPUs are based on the NetBurst architecture. The Pentium 4 *Willamette* (180 nm) introduced SSE2, while the *Prescott* (90 nm) introduced SSE3. Later versions of Prescott introduced Hyper-Threading Technology (HTT).

The first Pentium 4-branded processor to implement 64-bit was the *Prescott* (90 nm) (February 2004), but this feature was not enabled. Intel subsequently began selling 64-bit Pentium 4s using the *"E0" revision* of the Prescotts, being sold on the OEM market as the Pentium 4, model F. The E0 revision also adds eXecute Disable (XD) (Intel's name for the NX bit) to Intel 64. Intel's official launch of Intel 64 (under the name EM64T at that time) in mainstream desktop processors was the N0 stepping Prescott-2M.

INTEL DUAL CORE

The **Pentium Dual-Core** brand was used for mainstream x86-architecture microprocessors from Intel from 2006 to 2009 when it was renamed to Pentium. The processors are based on either the 32-bit *Yonah* or (with quite different microarchitectures) 64-bit *Merom-2M*, *Allendale*, and *Wolfdale-3M* core, targeted at mobile or desktop computers.

In terms of features, price and performance at a given clock frequency, Pentium Dual-Core processors were positioned above Celeron but below Core and Core 2 microprocessors in Intel's product range. The Pentium Dual-Core was also a very popular choice for overclocking, as it can deliver high performance (when overclocked) at a low price.

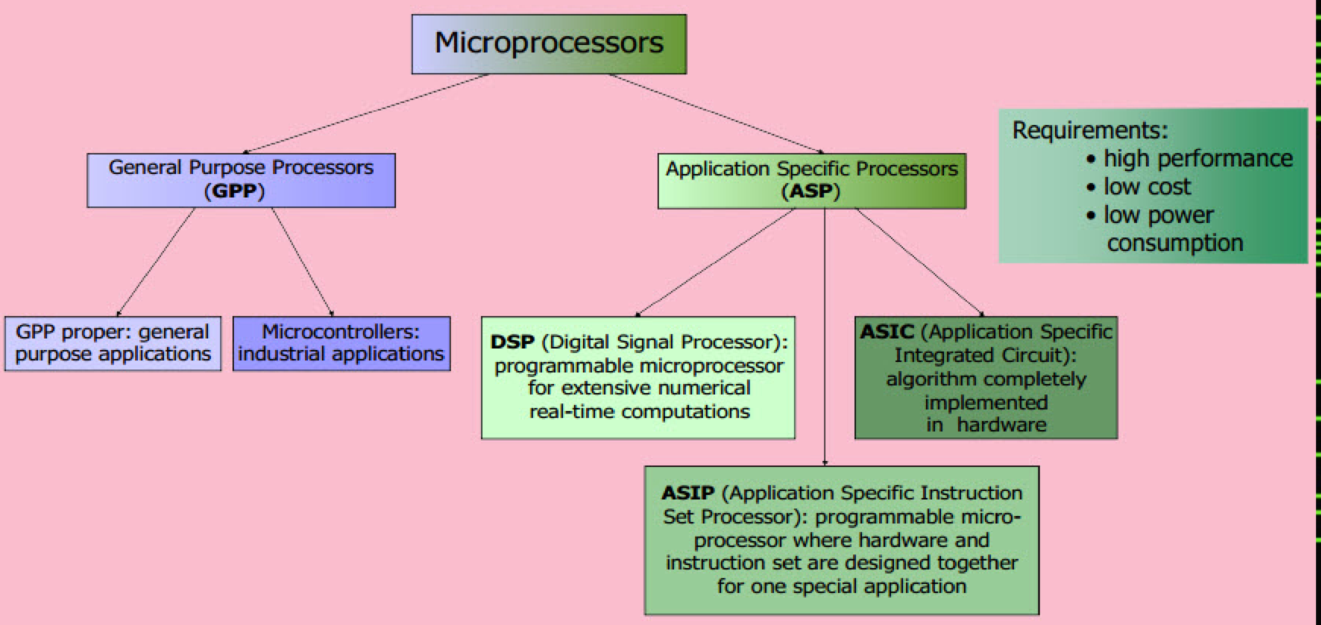
INTEL CORE 2

Core 2 is a brand encompassing a range of Intel's consumer 64-bit x86-64 single-, dual-, and quad-core microprocessors based on the Core microarchitecture. The single- and dual-core models are single-die, whereas the quad-core models comprise two dies, each containing two cores, packaged in a multi-chip module. The introduction of Core 2 relegated the Pentium brand to the mid-range market, and reunified laptop and desktop CPU lines for marketing purposes under the same product name, which previously had been divided into the Pentium 4, Pentium D, and Pentium M brands.

The *Core 2* brand was introduced on 27 July 2006, comprising the **Solo** (single-core), **Duo** (dual-core), **Quad** (quad-core), and in 2007, the **Extreme** (dual- or quad-core CPUs for enthusiasts) subbrands. Intel Core 2 processors with vPro technology (designed for businesses) include the dual-core and quad-core branches.

TYPES OF MICROPROCESSOR

Microprocessors are classified into five types, namely: CISC-Complex Instruction Set Microprocessors, RISC-Reduced Instruction Set Microprocessor, ASIC-Application Specific Integrated Circuit, Superscalar Processors, DSP's-Digital Signal Microprocessors.



TYPES OF MICROPROCESSOR

Complex Instruction Set Microprocessors

The short term of Complex Instruction Set Microprocessors is CISM and they classify a microprocessor in which orders can be performed together along with other low level activities. These types of processors performs the different tasks like downloading, uploading, recalling data into the memory card and recalling data from the memory card. Apart from these tasks, it also does complex mathematical calculations in a single command.

Reduced Instruction Set Microprocessor

The short term of Reduced Instruction Set Microprocessor is RISC. These types of processors are made according to the function in which the microprocessor can carry out small things in specific command. In this way these processors completes more commands at a faster rate.

Superscalar Microprocessors

Superscalar processor facsimiles the hardware on the processor to perform various tasks at a time. These processors can be used for ALUs or multipliers. They have different operational units and these processors can carry out more than a one command by continuously transmitting several instructions to the extra operational units inside the processor. The Application Specific Integrated Circuit The short term of Application Specific Integrated Circuit processor is an ASIC. These processors are used for particular purposes that includes of automotive emissions control or personal digital assistant's computer. This type of processor is made with proper specification, but apart from these it can also be made with off the shelf gears.

TYPES OF MICROPROCESSOR

Digital Signal Multiprocessors

Digital signal processors are also called as DSP’s, these processors are used to encode and decode the videos or to convert the D/A (digital to analog) &A/D (analog to digital). They need a microprocessor that is excellent in mathematical calculations. The chips of this processor are employed in RADAR, home theaters, SONAR, audio gears, TV set top boxes and Mobile phones

There are many companies like Intel, Motorola, DEC (Digital Equipment Corporation), TI (Texas Instruments) associated with many microprocessors such as 8085 microprocessors, ASIC, CISM, RISC, DSPs and 8086 microprocessors like Intel

ADVANTAGES AND DISADVANTAGES OF MICROPROCESSORS

The advantages of microprocessors are

1. The processing speed is high
2. Intelligence has been brought to systems
3. Flexible.
4. Compact size.
5. Easy maintenance
6. Complex mathematics

Some of the disadvantages of microprocessor are it might get overheated and the limitation of the microprocessor imposes on size of data.