MODULE-1
OVERVIEW OF MICROPROCESSORS

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MODULE-1

Overview of Microprocessors

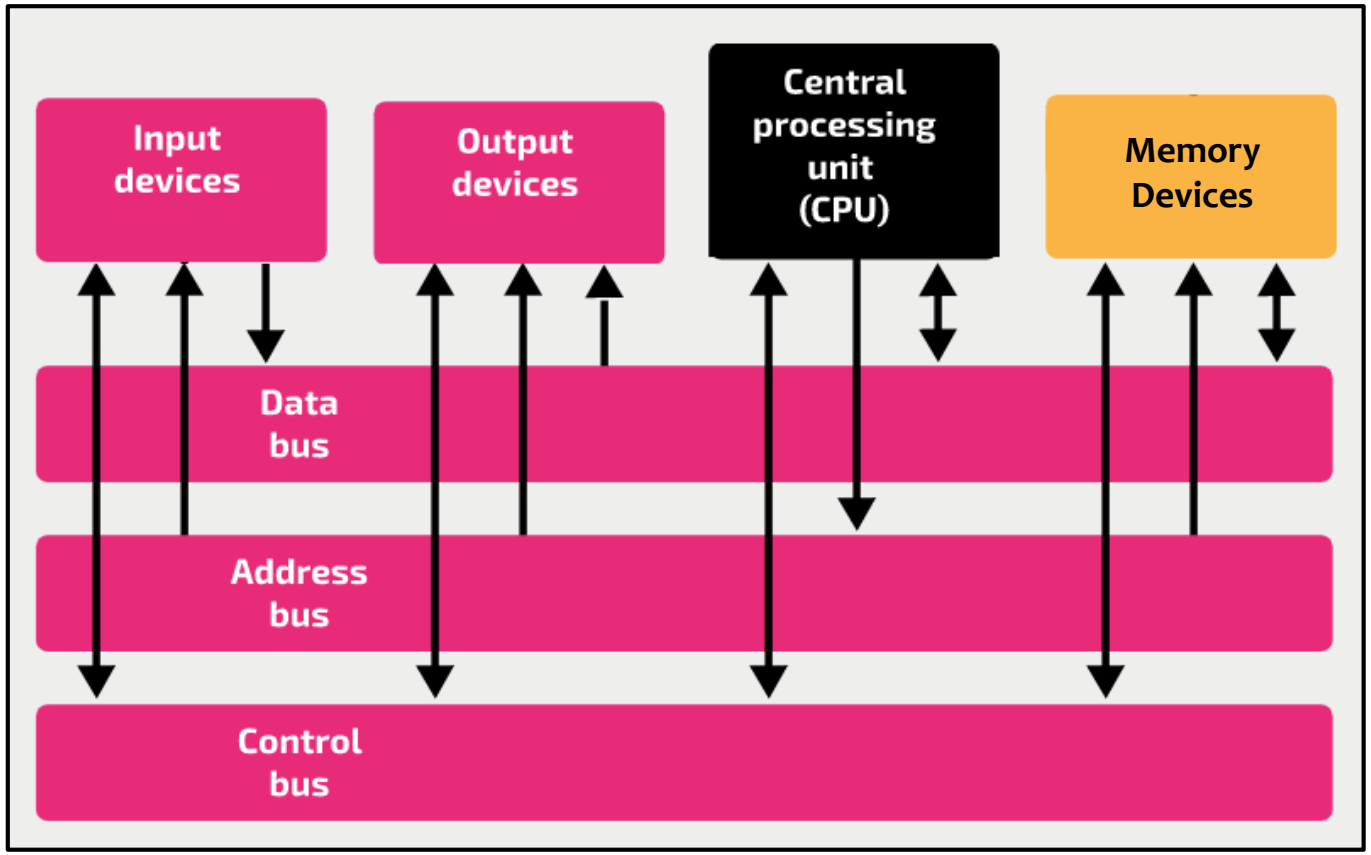
- Introduction to Microprocessors
- 8-bit /16-bit Microprocessor
- Overview of Intel Pentium, I (i3, i5, i7) Series Processor.

INTRODUCTION TO MICROPROCESSOR

INTRODUCTION TO MICROPROCESSOR

COMPUTING SYSTEM

- Basic computing system consist of a Central processing unit (CPU)/ Microprocessor (μP), memory (RAM, ROM), input/output (I/O) unit and System Buses(data, address, control)



MICROPROCESSOR BASED COMPUTING SYSTEM

INTRODUCTION TO MICROPROCESSOR

MICROPROCESSOR

- Microprocessor is a Programmable, Clock driven, Register based, Electronic device that that communicating with the other devices using system bus to reads instruction from a storage device, takes the data from input unit and process the data according to the instructions and provides the result to the output unit.
  - Programmable- Perform Different set operation on the digital data depending on the sequence of instructions supplied by the programmer.
  - Clock Driven – Whole task is divided into basic operations, are divided into precise system clock periods.
  - Register Based – Uses temporary storage element while processing instructions
  - Electronic Device – fabricated on a single chip

INTRODUCTION TO MICROPROCESSOR

How does a Microprocessor Work?

- The microprocessor follows a sequence: Fetch, Decode, and then Execute.
- Initially, the instructions are stored in the memory in a sequential order.
- The microprocessor fetches those instructions from the memory, then decodes it and executes those instructions till STOP instruction is reached.
- Later, it sends the result in binary to the output port. Between these processes, the register stores the temporarily data and ALU performs the computing functions.
- CPU must equipped with necessary resource. Important resources of CPU:
  - Registers – to store the information temporarily
  - ALU – to carryout Arithmetic and Logical operation
  - Program Counter – to point the next instruction to be executed
  - Instruction decoder – to interpret the instruction fetched into the CPU

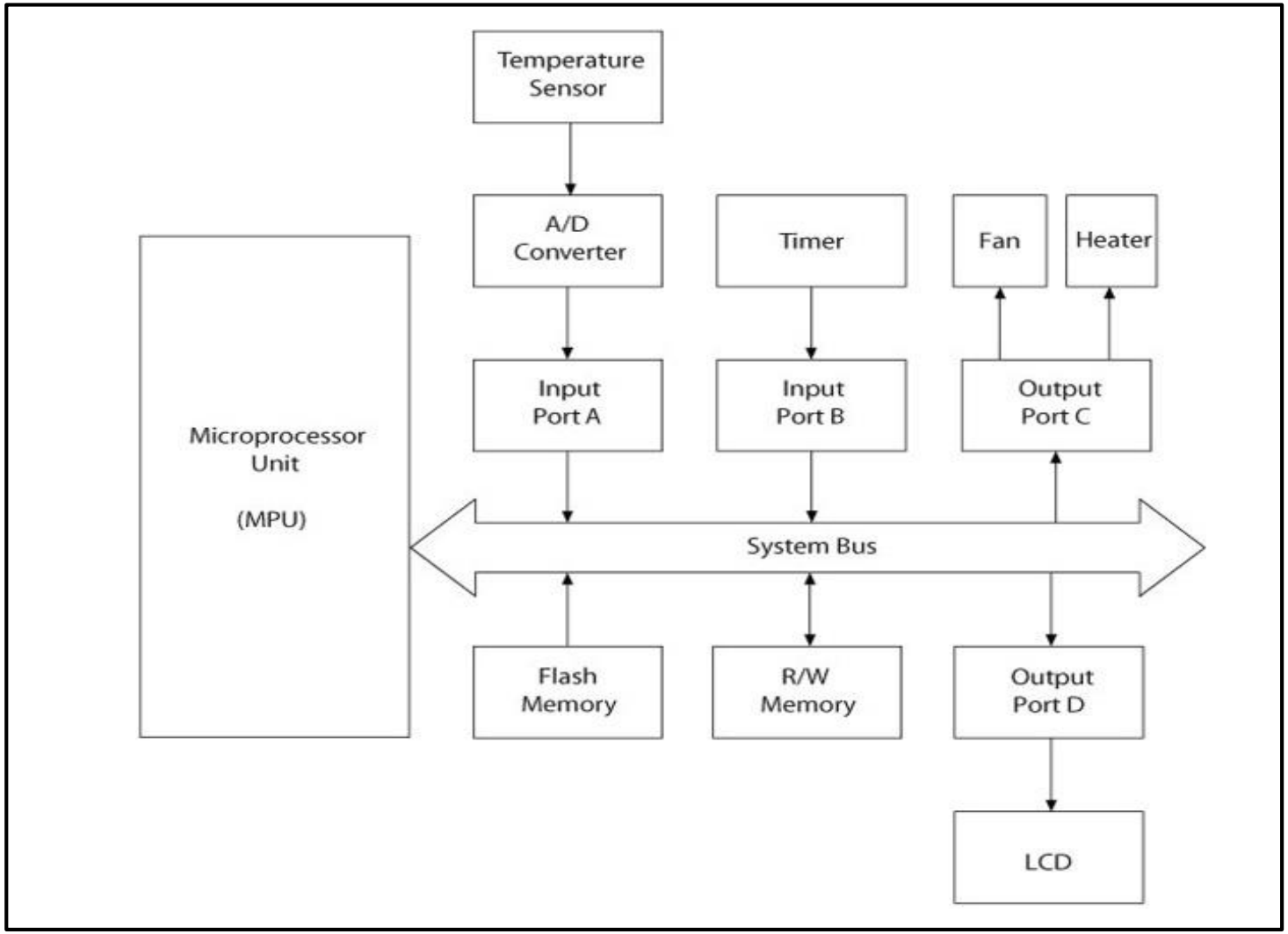
INTRODUCTION TO MICROPROCESSOR

MICROPROCESSOR – IMPORTANT TERMS

- Instruction Set – It is the set of instructions that the microprocessor can understand.
- Bandwidth/Data size – It is the number of bits processed in a single instruction.
- Clock Speed – It determines the number of operations per second the processor can perform. It is expressed in megahertz (MHz) or gigahertz (GHz).It is also known as Clock Rate.
- Word Length – It depends upon the width of internal data bus, registers, ALU, etc. An 8-bit microprocessor can process 8-bit data at a time. The word length ranges from 4 bits to 64 bits depending upon the type of the microcomputer.
- Data Types – The microprocessor has multiple data type formats like binary, BCD, ASCII, signed and unsigned numbers.

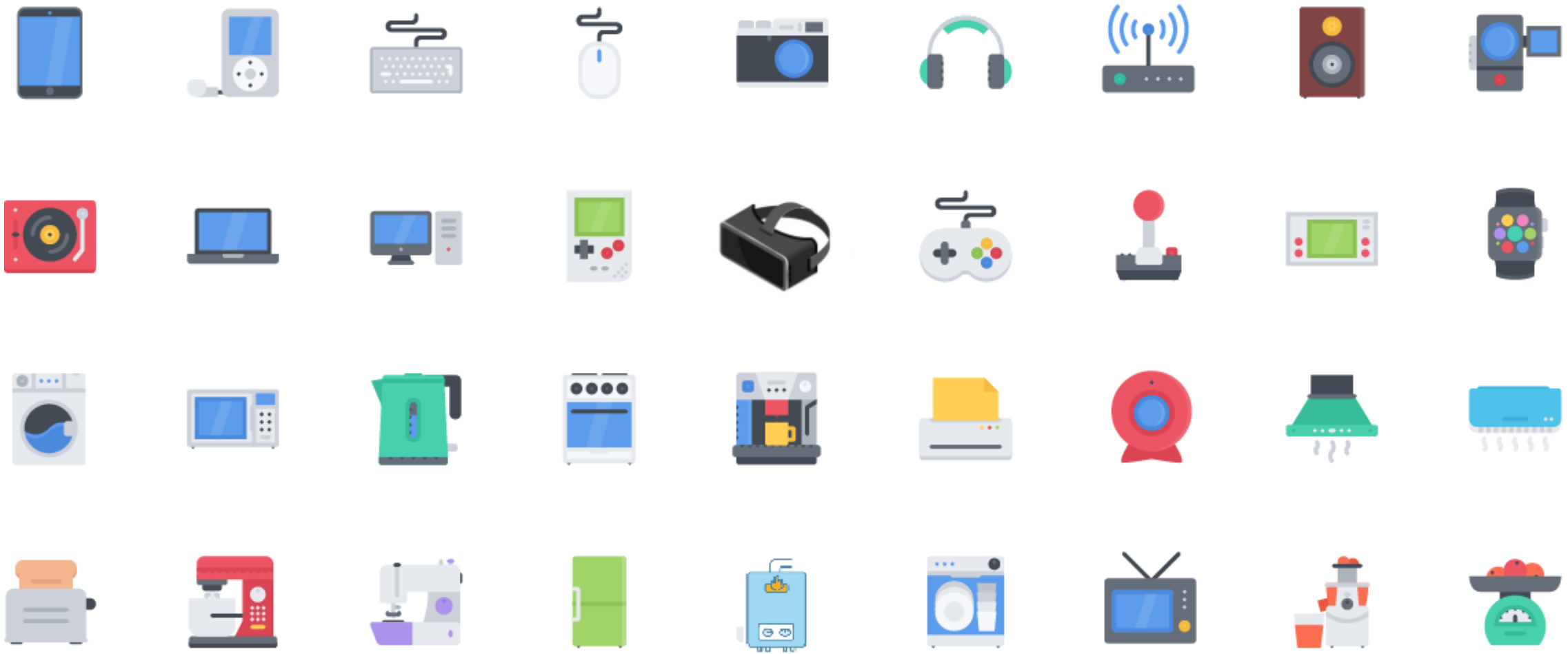
INTRODUCTION TO MICROPROCESSOR

MICROPROCESSOR BASED TEMPERATURE MONITORING SYSTEM



INTRODUCTION TO MICROPROCESSOR

APPLICATIONS OF MICROPROCESSOR



EVOLUTION OF MICROPROCESSORS

EVOLUTION OF MICROPROCESSORS

WORLD'S FIRST MICROPROCESSOR - INTEL 4004

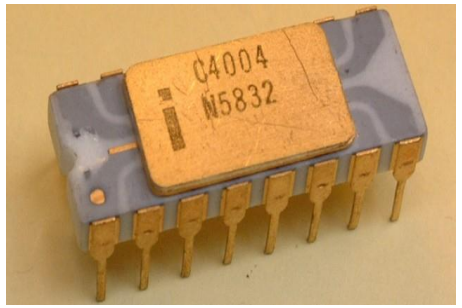
- 1969 - The assignment: Nippon Calculating Machine Corporation approached Intel to design 12 custom chips for its new Busicom 141-PF* printing calculator.

- The Intel solution: Intel designed a set of four chips known as the MCS-4.
  - ROM(4001) - To support the custom applications programs
  - RAM(4002) - For processing data
  - Shift registers(4003) - For the input/output (I/O) port
  - CPU(4004) - Central Processing Unit

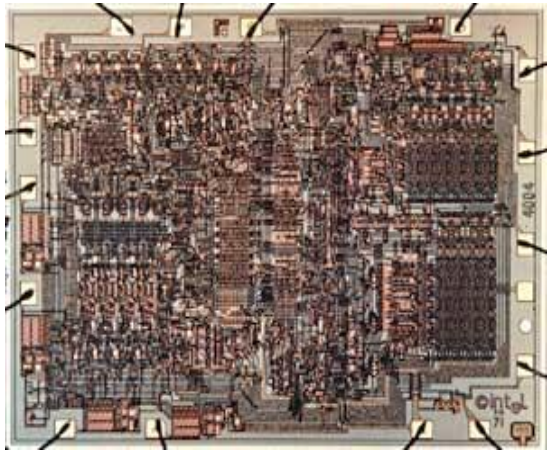
- 1971- Era of integrated electronics: Intel purchased the rights from Nippon Calculating Machine Corporation and launched the Intel 4004 processor and its chipset in the November 15, 1971.

EVOLUTION OF MICROPROCESSORS

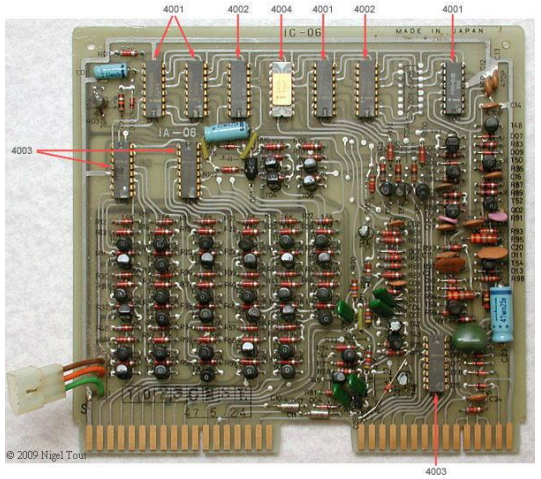
WORLD'S FIRST MICROPROCESSOR - INTEL 4004



INTEL 4004 IC



DIE VIEW OF INTEL 4004 IC



INTERAL VIEW OF BUSICOM 141-PF

BUSICOM 141-PF PRINTING CALCULATOR

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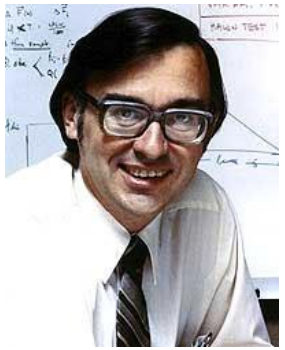

MARCIAN "TED" HOFF

STANLEY MAZOR

MASATOSHI SHIMA

INVENTERS OF INTEL 4004 MICROPROCESSOR

EVOLUTION OF MICROPROCESSORS

WORLD'S FIRST MICROPROCESSOR - INTEL 4004

- We can categorize the microprocessor according to the generations or according to the size of the microprocessor:

- First Generation (4 - bit Microprocessors):
  - The first generation microprocessors were introduced in the year 1971-1972 by Intel Corporation. It was named Intel 4004 since it was a 4-bit processor.
  - It was a processor on a single chip. It could perform simple arithmetic and logical operations such as addition, subtraction, Boolean OR and Boolean AND.

- Second Generation (8 - bit Microprocessor):
  - The second generation microprocessors were introduced in 1973 again by Intel.
  - It was a first 8 - bit microprocessor which could perform arithmetic and logic operations on 8-bit words. It was Intel 8008, and another improved version was Intel 8088.

EVOLUTION OF MICROPROCESSORS

WORLD'S FIRST MICROPROCESSOR - INTEL 4004

- Third Generation (16 - bit Microprocessor):
  - The third generation microprocessors, introduced in 1978 were represented by Intel's 8086, Zilog Z800 and 80286, which were 16 - bit processors with a performance like minicomputers.

- Fourth Generation (32 - bit Microprocessors):
  - Several different companies introduced the 32-bit microprocessors, but the most popular one is the Intel 80386.

- Fifth Generation (64 - bit Microprocessors):
  - After 80856, Intel came out with a new processor namely Pentium processor followed by Pentium Pro CPU, which allows multiple CPUs in a single system to achieve multiprocessing.

  - Other improved 64-bit processors are Celeron, Dual, Quad, Octa Core processors.

EVOLUTION OF MICROPROCESSORS

EVOLUTION OF INTEL PROCESSORS (1)

Processor	Year of release	Clock Rate	Fabrication Technology
4004	Nov. 15,1971	108 kHz	10-micron
8008	April 1972	200 kHz	10-micron
8080	April 1974	2 MHz	6-micron
8085	March 1976	2 MHz	3-micron
8086	June 8, 1978	10 MHz, 8 MHz	3-micron
8088	June 1979	8 MHz, 4.77 MHz	3-micron
80286	Feb. 1982	12 MHz, 10 MHz	1.5-micron
i80386	1985 - 1990	33 MHz, 16 MHz	1 - 1.5-micron
i80486	1989 - 1992	25 MHz - 100 MHz	1 - 0.6-micron
Intel Pentium I	1993 - 1999	65 MHz - 250 MHz	800 nm - 350 nm
Intel Pentium MMX	1996 - 1999	120 MHz - 300 MHz	350 nm - 250 nm
Intel Atom	2008–present	800 MHz - 2.13 GHz	32 nm, 45 nm
Intel Celeron	1998–present	266 MHz - 3.6 GHz	14 nm to 250 nm
Intel Pentium Pro	1995 - 1998	150 MHz - 200 MHz	350 nm, 500 nm
Intel Pentium II	1997 - 1999	233 MHz - 450 MHz	250 nm, 350 nm

EVOLUTION OF MICROPROCESSORS

EVOLUTION OF INTEL PROCESSORS (2)

Processor	Year of release	Clock Rate	Fabrication Technology
Intel Pentium III	1999 - 2003	450 MHz - 1.4 GHz	130 nm, 180 nm, 250 nm
Intel Xeon	1998–present	400 MHz - 4.4 GHz	45 nm to 250 nm
Pentium 4	2000 - 2008	1.3 GHz - 3.8 GHz	65 nm, 90 nm, 130 nm, 180 nm
Pentium 4	2000 - 2008	3.2 GHz - 3.73 GHz	90 nm, 130 nm
Pentium M	2003 - 2008	800 MHz - 2.266 GHz	90 nm, 130 nm
Pentium D/EE	2005 - 2008	2.66 GHz - 3.73 GHz	65 nm, 90 nm
Intel Pentium Dual-Core	2006 - 2009	1.6 GHz - 2.93 GHz	45 nm, 65 nm
Intel Pentium (2009)	2009–present	1.2 GHz - 3.33 GHz	14 nm, 22 nm, 32 nm, 45 nm, 65 nm
Intel Core	2006 - 2008	1.06 GHz - 2.33 GHz	65 nm
Intel Core 2	2006 - 2011	1.06 GHz - 3.33 GHz	45 nm, 65 nm
Intel Core i3	2010–present	1.2 GHz - 3.7 GHz	14 nm, 22 nm, 32 nm
Intel Core i5	2009–present	1.06 GHz - 4.2 GHz	14 nm, 22 nm, 32 nm, 45 nm
Intel Core i7	2008–present	1.6 GHz - 4.4 GHz	14 nm, 22 nm, 32 nm, 45 nm
Intel Core i7	2011–present	3.0 GHz - 4.0 GHz	14 nm, 22 nm, 32 nm

EVOLUTION OF MICROPROCESSORS

HOW INTEL MANUFACTURES CHIPS

https://www.youtube.com/watch?v=4oQoZF_KRCc

THANK YOU

by
prakash v