Lecture 4

الدكتور المهندس محمد سامي محمد

كلية التربية للعلوم الصرفة

قسم علوم الحاسبات

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تقنيات وتركيب الحاسوب – المرحلة الاولى

Memory System

Read Only Memory (ROM)

As we know, in the computer terminology, *read* means transferring data instruction from an input source to the computers, main memory (or CPU) and *write* is transferring data/instruction from computer's main memory to an output device.

Therefore, read only means data/ instruction can be retrieved from the ROM chip but cannot be modified.

Memory System

Types of ROM

Basically, there are two types of ROM, namely, manufacturer programmed and user-programmed.

Manufacturer-Programmed Read Only Memory

Manufacturer-programmed ROM is one in which data is stored in it permanently by the manufacturer of the ROM. For example, a computer manufacturer may store the system boot program permanently in the ROM chip used on the motherboard.

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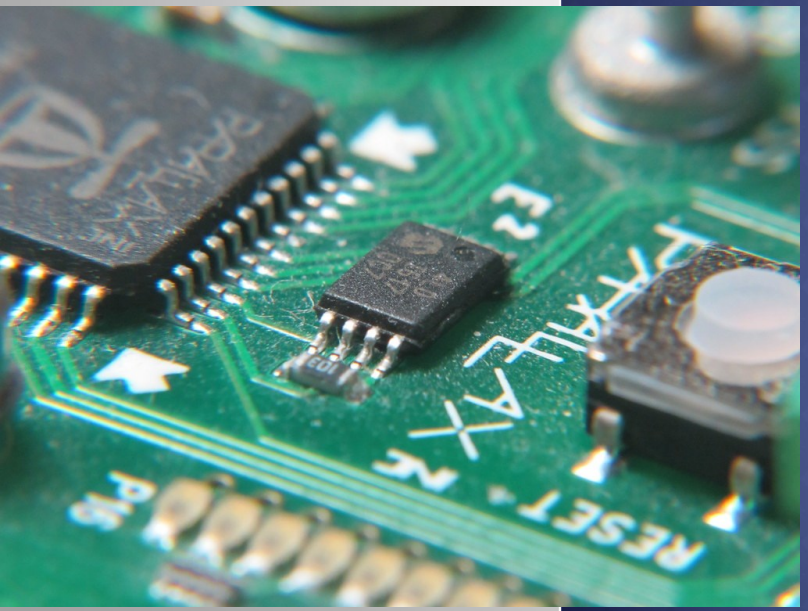
User-Programmed Read Only Memory

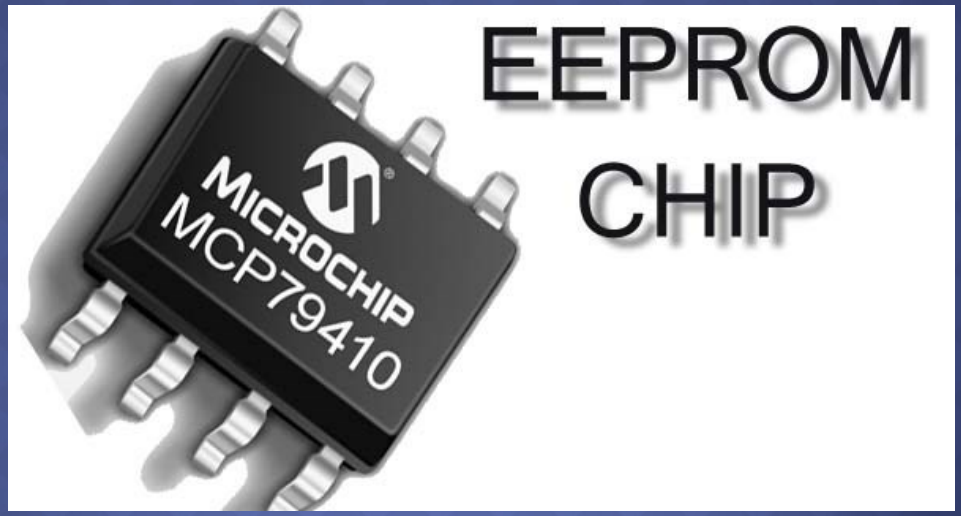
User-programmed ROM is one in which the user can load and store “read-only” programs and data. Such a ROM is commonly known as

PROM (programmable read-only memory), because, a user can program it. PROM is a memory chip on which we can store a program. But once the PROM has been used, we cannot wipe it clean and use it to store something else. Like ROMs, PROMs are non-volatile.

Other kinds of user-programmed ROM are EPROM and EEPROM. Both of these are special types of PROM. EPROM (erasable programmable read-only memory) can be erased by exposing it to ultraviolet light while EEPROM (electrically erasable programmable read-only memory) can be erased by exposing it to an electrical charge.

Memory System



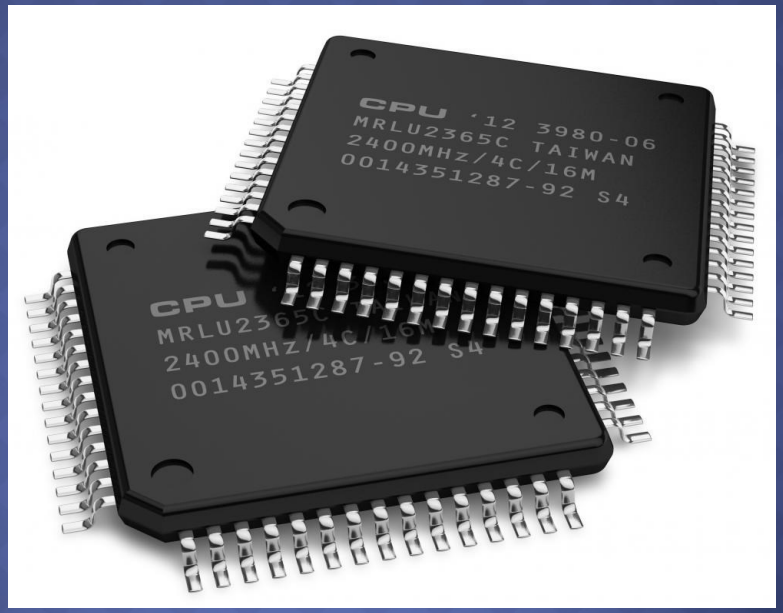


Memory System

Flash EEPROM memory

works much faster than traditional EEPROMs because instead of erasing one byte at a time, it erases a block or the entire chip, and then rewrites it.

The electrons in the cells of a Flash-memory chip can be returned to normal (“1”) by the application of an electric field, a higher-voltage charge.



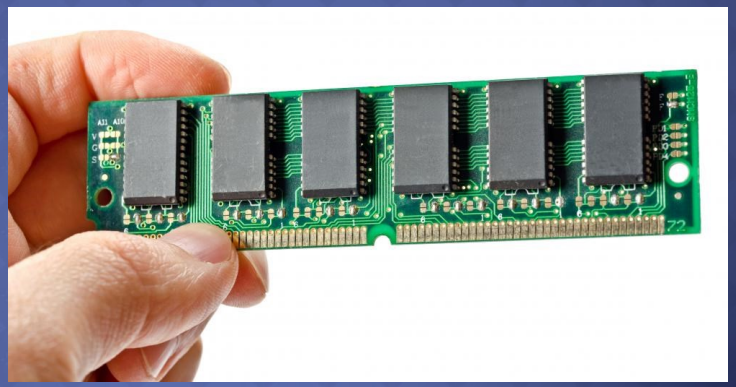
Memory System

Random Access Memory (RAM)

RAM chips are meant for primary storage. They hold temporarily (*a*) software/program instructions and (*b*) data before and after processing.

"Random Access" means that any location can be referenced in the same time and in the same manner, as it is independent of the address or location in the memory. It is a volatile memory. It holds data and instructions, during their execution.

The additional RAM chip can be plugged into the special socket on the motherboard known as Single In-Line Memory Module (SIMM). Random Access Memory capacity ranges from 16 MB to 4 GB on personal computers.



Memory System

Types of RAM

RAM chips are of two types, namely, *static* RAM (SRAM) and *dynamic* RAM (DRAM).

Static RAM (SRAM)

The SRAM can store data as long as power is applied, without the need for periodically rewriting the data into memory.

Contents (memory cell) of this RAM will stay in a given state (store a bit) indefinitely, provided that power to the memory circuit is not interrupted. The main applications of SRAM are in areas where only small amounts of memory are needed or where high speed is required.

Advantage

SRAM can provide very high speed.

Disadvantage

SRAM is costly and has low power packing density.

Memory System

Dynamic RAM (DRAM)

This memory stores data as charges on capacitors. With Dynamic RAM, the stored data will gradually disappear because of capacitor discharge, so that it is necessary to periodically refresh the data (i.e. recharge the capacitors).

In the process of refreshing, the information is read from the memory cell and written back in the same position.
Typically, each memory cell of a DRAM must be refreshed at least every 2 to 10 millisecond or its data will be lost.
Advantage
It has high capacity and power consumption is low.
Disadvantage
The need for refreshing of dynamic RAM because some external refreshing circuits is required.

Memory System

Comparison between ROM and RAM

RAM (Random Access Memory)	ROM (Read only Memory)
It is a volatile memory.	It is a non-volatile memory.
It is a read-write memory.	It is a read-only memory.
It loses the data stored in it when the power is turned off	The data inside it retains even if the power of the CPU is switched off.
It is a temporary storage.	It is a permanent storage.
It is costlier than ROM.	It is cheaper.
It can hold a large amount of data as compared to ROM.	It can only store small amount of data.
It is faster.	It is slower.
The data in RAM can be Modified easily.	ROM can be hardly or never be modified.
It is used in the normal operations of a computer.	It is used primarily in the startup process of a computer