Lecture Notes 1: Memory Types

Contents

1 Memory classifications by access type

- Read-Only Memory (ROM):A memory storage device, whose contents can be read and accessed but cannot be modified.

- Read-Write Memory (RWM): A memory that can be read from and written to (e.g: RAM: Random Access Memory)

2 Read-Only Memory (ROM)

It's a non volatile memory.

- MPROM (Mask-programmed ROM):

  - It's programmed at the factory
  - Program (or data) isn't erasable
  - The oldest type of ROM
  - Ideal for high volume, low cost production

- PROM(Programmable ROM):

  - It can be programmed by the user only once
  - The circuit uses high voltage to permanently eliminate inner links
  - Bipolar transistor is typically used in theses devices, so it's fast and uses relatively high power.

- EPROM(Erasable-Programmable ROM):

  - Read-Mostly
  - It can be programmed more than one time by applying voltage
  - Data is erased by UV Light
  - floating-gate MOSFET is used in theses devices
  - you can only erase all the data.
  - It's not erased in place.

- EEPROM(Electrically Erasable PROM):

  - Read-Mostly
  - Can be erased and reprogrammed by electrical signals.
  - Floating-gate MOSFET is used in theses devices.
  - Data is erased on byte level

- It can be erased in place.

- Flash:

  - Read-Mostly
  - special type of EEPROM
  - Faster than EEPROM
  - Programmed in larger blocks
  - Data is erased on block level

2.1 How floating-gate MOSFET works

Flash memory works by adding (charging) or removing (discharging) electrons to and from a floating gate. A bit's 0 or 1 state depends on whether the floating gate is charged or uncharged. When electrons are present on the floating gate, current can't flow through the transistor and the bit state is 0. When a bit is programmed, this is the normal state for a floating gate transistor. When electrons are removed from the floating gate, the current is allowed to flow and the bit state is 1.

3 Random Access Memory (RAM)

It's a volatile memory.

	SRAM (Static RAM)	DRAM (Dynamic RAM)
Basic cell	flip flop (6 transistors)	capacitor (1 transistor)
Speed	very fast	fast
Power consumtion	consumes more power	consumes less power
Cost	expensive	cheap
Size	larger	smaller
refreshment circuit	doesn't need one	needs one
interface	simple	more complex