

# Types of Main Memories

Computer Organization and architecture

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# Semiconductor Memory Types

Memory Type	Category	Erasure	Write Mechanism	Volatility
Random-access memory (RAM)	Read-write memory	Electrically, byte-level	Electrically	Volatile
Read-only memory (ROM)	Read-only memory	Not possible	Masks	Nonvolatile
Programmable ROM (PROM)			Electrically	
Erasable PROM (EPROM)	Read-mostly memory	UV light, chip-level		
Electrically Erasable PROM (EEPROM)		Electrically, byte-level		
Flash memory		Electrically, block-level		

# Semiconductor Memories

- Read Only Memory (ROM)
- Random Access Memory (RAM)
- **RAM**
  - All semiconductor memory is random access
  - Reading and writing is possible
  - Both are accomplished using electrical signals.
  - Volatile – so, used only as temporary storage.
  - Two technologies
    - Static RAM (SRAM)
    - Dynamic RAM (DRAM)

# Dynamic RAM

- Stores data as charge on capacitors
- Needs refreshing cycle as capacitors have a tendency of discharging.
- Simpler construction
- Smaller per bit
- Less expensive
- Need refresh circuits
- Slower
- Main memory
- Essentially analog
  - Level of charge determines value

# Static RAM

- Bits stored as on/off switches
- No charges to leak
- No refreshing needed when powered
- More complex construction
- Larger per bit
- More expensive
- Does not need refresh circuits
- Faster
- Cache
- Digital
  - Uses flip-flops

# SRAM v DRAM

- Both volatile
  - Power needed to preserve data
- Dynamic cell
  - Simpler to build, smaller
  - More dense
  - Less expensive
  - Needs refresh
  - Larger memory units
- Static
  - Faster
  - Cache

# SRAM

- Volatile
- Faster
- smaller memory units
- Complex construction
- Don't require refreshing circuit
- Cache memory
- Larger per bit
- Digital

# DRAM

- Volatile
- Slower
- larger memory units
- simpler to build
- require refresh circuit
- Main memory
- smaller per bit
- analog

# Read Only Memory (ROM)

- Permanent storage
  - Nonvolatile
- Applications
  - Microprogramming
  - Library subroutines
  - Systems programs (BIOS)
  - Function tables



# Types of ROM

- Written during manufacture
  - Very expensive for small runs
- Programmable (once)
  - PROM
  - Needs special equipment to program
- Read “mostly”
  - Erasable Programmable (EPROM)
    - Erased by UV
  - Electrically Erasable (EEPROM)
    - Takes much longer to write than read
  - Flash memory
    - Erase whole memory electrically