**Electric current** refers to the flow of electricity in an electronic circuit, and to the amount of electricity flowing through a circuit. It is measured in amperes (A). The larger the value in amperes, the more electricity is flowing in the circuit.

**Difference Between Intrinsic and Extrinsic Semiconductors:** A semiconductor is an electrical material that exists between an insulator and a conductor. The most known semiconductors are Si and Ge. Semiconductors are classified into two types: intrinsic semiconductors and extrinsic semiconductors (p-type and n-type). The major difference between Intrinsic and Extrinsic Semiconductors is that in intrinsic semiconductors, a semiconductor is in its purest form whereas it does not happen in extrinsic semiconductors.

The intrinsic semiconductor is pure, whereas the extensive semiconductor contains impurities to make it conductive. At room temperature, intrinsic conductivity is zero, while extrinsic conductivity is quite low. This article presents an overview of intrinsic and extrinsic semiconductors using doping and energy band diagrams along with the difference between intrinsic and extrinsic semiconductors.

**Difference Between Intrinsic and Extrinsic Semiconductors**

We have provided the difference between intrinsic and extrinsic semiconductors listed in the table below.

**Key Differences Between Intrinsic and Extrinsic Semiconductors**

|  |  |
| --- | --- |
| **Intrinsic Semiconductors** | **Extrinsic Semiconductors** |
| Semiconductor in its purest form. | Semiconductor in its impure form. |
| It has low conductivity. | It has a higher conductivity than an intrinsic semiconductor. |
| The band gap between the conduction and valence bands is quite narrow. | The energy gap is greater than that of an intrinsic semiconductor. |
| Fermi level can be found in the forbidden energy gap. | The presence of a Fermi level depends on the type of extrinsic semiconductor. |
| Temperature alone determines electrical conductivity. | Electrical conductivity in a pure semiconductor is affected by temperature as well as the quantity of impurity doping. |
| Pure Silicon and Germanium crystalline forms are examples. | Impurities such as As, Sb, P, In, Bi, Al, and others are doped with Germanium and Silicon atoms. |

**What is an Intrinsic Semiconductor?**

An intrinsic semiconductor is made from an extremely pure semiconductor material, thus they are often referred to as pure semiconductors. These are fundamentally undoped semiconductors with no doped impurities. Intrinsic semiconductors have essentially no conductivity at ambient temperature. Because no other element is present in its crystalline form.

Intrinsic semiconductors have essentially no conductivity at ambient temperature. Because no other element is present in its crystalline form. The periodic table’s group IV elements combine to generate an inherent semiconductor. However, silicon and germanium are the most commonly used materials. This is because, in their instance, only a minimal amount of energy is required to break the covalent bond.

**What is an Extrinsic Semiconductor?**

Extrinsic semiconductors are those that have had an impurity supplied to them at a controlled rate in order to make them conductive. While insulating materials can be doped to form semiconductors, intrinsic semiconductors can also be doped to form extrinsic semiconductors. These are naturally extremely conductive. Extrinsic semiconductors, on the other hand, are of two types: p-type and n-type semiconductors.

It is worth noting that the type of element doped to the pure semiconductor determines the categorization of the extrinsic semiconductor. By inserting group III elements or trivalent impurities into pure semiconductors, p-type semiconductors are created. Because a trivalent impurity contains just three electrons in its valence shell, it is also known as an acceptor impurity. The addition of group V elements or pentavalent impurities to a clean semiconductor produces n-type semiconductors. Because a pentavalent impurity has 5 electrons in its valence shell, these are known as donor impurities.

**Advantages of semiconductor devices:**

Semiconductor devices have no filaments hence there is no power needed to heat them to cause the emission of the electrons.

As we know the semiconductor device does not produce any humming noise.

Semiconductor devices have shockproof.

The semiconductor device is cheaper as compared to vacuum tubes.

The semiconductor device has an almost unlimited life.

The semiconductor device has a small size, so the circuits involving devices are very compact.

No heating is required so semiconductor devices are set into operation as soon as the circuit is switched on.

Semiconductor devices occupy less space on any type of printed circuit board.

As we know that when no vacuum has to be created in semiconductor devices they have no vacuum deterioration trouble.

Semiconductor devices require low voltage operation as compared to the vacuum tubes.

**Disadvantages of semiconductor devices:**

The noise level is too much higher in semiconductor devices as compared to the vacuum tubes.

In when we have to use the ordinary semiconductor devices cannot handle as more power as ordinary vacuum tubes can do.

In the high-frequency range, they have poor performance.

This topic is all about the different types of semiconductor devices include two terminals, three terminals, and four-terminal devices. We hope that you have got a better understanding of this concept. Furthermore, any quires regarding this concept or some electrical and electronics projects give your feedback in the comment section below.

**Difference between Primary and Secondary Memory**

Memory is the main component of every system that stores data and instructions. A computer's memory is mainly categorized into two types: primary and secondary memory. Primary memory is the main memory of the system, and it is often random access memory (RAM) and is used to store data that the CPU requires quick access to. Secondary memory is the additional memory of the system. It is used to store the data that the CPU does not require immediate access to, which is typically in the form of hard drives, solid-state drives, or detachable storage devices (such as USB drives).

In this article, you will learn the difference between **Primary** and **Secondary Memory**. But before discussing the differences, you must know about Primary and Secondary Memory with their features and types.

**What is Primary memory?**

The **primary memory** of a PC system is its primary memory. The instructions that must be performed at the time are copied to primary memory because the CPU may directly access data from the primary memory. Accessing data from this memory is faster because it is the internal memory, and the CPU accesses data from primary memory via the data bus.

Primary memory is typically volatile in nature, which implies that information in primary memory doesn't exist if the information is not stored in the event of a power loss. It is more costly than secondary memory because it is made of semiconductors, and primary memory capacity in a computer is restricted and is always less than secondary memory.

PauseNext

Unmute

Current TimeÂ 1:11

/

DurationÂ 18:10

Loaded: 12.11%

Â

Fullscreen

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**Types of Primary Memory**

**RAM (Random Access Memory)** and **ROM (Read Only Memory)** are the two types of primary memory.

**1. RAM (Random Access Memory)**

RAM is both a read and writes type of memory. The information that has to be currently processed is stored in RAM, which the CPU may immediately access. It is a volatile memory that loses data when the electricity is turned off. RAM may be static or dynamic in nature.

**2. ROM (Read Only Memory)**

ROM is a read-only memory, which implies that its contents may not be altered. It contains the instructions that are executed when the system boots up. It is a non-volatile memory, which implies that it preserves its contents even after the power is turned off. It has three types of ROM, such as PROM, EPROM, and EEPROM.

**Features of Primary Memory**

There are various features of Primary Memory. Some important features of Primary Memory are as follows:

It is faster to access when compared to secondary memory.

If the power is turned off, you may lose data.

It is the computer's working memory.

It is known as primary memory.

Without primary memory, the system cannot function.

It is also known to as volatile memory.

**What is Secondary Memory?**

**Secondary memory** is additional computer memory. Secondary memory stores data that must be preserved permanently. The CPU cannot directly access secondary memory data, and the data must first be copied to primary memory before the CPU can process it. As a result, accessing data from secondary memory takes longer. The secondary memory may be accessed via the input-output channel.

It is non-volatile memory, which implies that its content remains even after the power is turned off. It is optical or magnetic memory, which is less expensive than primary memory.

Secondary memory is always more plentiful than primary memory. As an external memory, a computer may even function without secondary memory. Secondary memory includes hard disks, CDs, DVDs, floppy disks, etc.

**Types of Secondary Memory**

There are various types of secondary memory. Some of them are as follows:

**1. Floppy Disk**

It is a magnetic disk that is enclosed in a square plastic box. Its main goal is to store information and then move it from one system to another. Floppy disks come in two sizes (1) Size: 3.5 inches, storage capacity: **1.44 MB (2) 5.25-inch** display and **1.2-MB storage capacity**. A system contains a floppy disk drive to use a floppy disk. DVDs, CDs, and flash drives have mostly replaced this type of storage media.

**2. Hard Disk**

Hard disks are storage devices that may hold a large amount of data. Hard disks are often known as hard disk drives. It comes in a range of storage capacities (For instance, **256 GB, 500 GB, 1 TB, and 2 TB**). It is constructed of platters, which are collections of disks. The plates are piled on top of one another and covered in a magnetic coating. Each plate is composed of a series of invisible circles, each with an identical core track. Hard disks are classified into two types: internal and external.

**3. Blu-ray Disk**

It looks like a CD/DVD; however, it may carry up to 25 GigaBytes of data. You'll require a Blu-ray reader if you want to utilize a Blu-ray disk. The name Blu-ray is derived from the technology that is utilized to read the disk: **'Blu'** stands for a **blue-violet laser**, and **'ray'** stands for an **optical ray**.

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**4. SD Card**

It is a type of memory card that is often utilized to store data in portable devices like cameras and cell phones. It is available in several capacities, such as **1, 2, 4, 8, 16, 32, and 64 GB**. The data on the SD card can be accessed by removing it from the system and placing it into a system through a card reader. The SD card data is stored in memory chips, and there are no moving parts, as there are on a hard disk.

**Features of Secondary Memory**

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There are various features of Secondary Memory. Some important features of Secondary Memory are as follows:

These are optical and magnetic memories.

It is a sort of non-volatile memory.

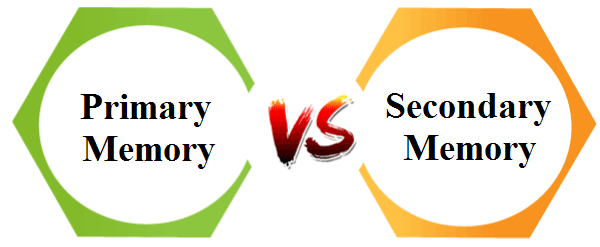
It aids in the storage of data in a PC.

The data is stored permanently, even when the system is turned off.

The system can function without secondary memory.

It is slower than the primary memory.

**Key differences between Primary and Secondary Memory**



There are various key differences between **Primary** and **Secondary Memory**. Some of the key differences between Primary and Secondary Memory are as follows:

The primary memory of a computer system is also known as the PC's main memory. In contrast, secondary memory is known as auxiliary memory.

The CPU has immediate access to primary memory. On the other hand, the CPU cannot directly access secondary memory.

Primary memory is a semiconductor memory. In contrast, secondary memories are magnetic and optical memories.

When the pricing of primary and secondary storage alternatives are compared, primary storage costs more than secondary storage, while secondary storage costs less than primary storage.

The speed of data accessing in the primary memory is faster. In contrast, the data accessing speed of the secondary memory is slower.

The data to be processed currently is in primary memory. In contrast, the data that has to be maintained permanently is stored in secondary memory.

The primary memory is accessed via the data bus. In contrast, secondary memory is accessed through input-output channels.

Primary memory is a volatile storage medium. In contrast, secondary memory is non-volatile memory.

The storage capacity of primary memory is quite less than that of secondary memory.

Primary memory is more expansive than secondary memory. In contrast, secondary memory is cheaper than primary memory.

**Head-to-head comparison between Primary and Secondary Memory**

Here, you will learn the head-to-head comparisons between Primary and Secondary Memory. The main differences between Primary and Secondary Memory are as follows:

|  |  |  |
| --- | --- | --- |
| **Features** | **Primary Memory** | **Secondary Memory** |
| **Definition** | The primary memory of a computer is the main memory that is utilized to store data temporarily. | Secondary memory defines to additional storage devices that are utilized to store data permanently. |
| It is directly accessible by the processor. | It is not directly accessible via the processor. |  |
| **Nature of Memory** | It is both volatile and non-volatile memory. | It is a non-volatile memory in nature. |
| **Other names** | It is also known as the main memory of the system. | It is also known as the secondary or auxiliary memory of a computer system. |
| **Formation** | It is composed of semiconductors. | It is composed of magnetic and optical materials. |
| **Data** | The data that must be executed is copied to the main memory. | It is utilized to store data that requires should be stored permanently. |
| **Access Speed** | The speed of accessing data is faster in primary memory. | The speed of accessing data is slower in secondary memory. |
| **Cost** | It is more costly than secondary memory. | It is cheaper than primary memory. |
| **Size** | The size of primary memory is small. | The size of secondary memory is large. |
| **Memory** | It is internal memory. | It is an external memory. |
| **Types** | It is mainly of two types: RAM and ROM. | Magnetic memory, semiconductor memory, and optical memory are the three most popular types of secondary memory. |
| **Access** | It is accessed via the data bus. | It is accessed via the input-output channel. |

**Conclusion**

Computer memory is divided into two types: primary and secondary memory. Primary memory is the computer's main memory or internal memory, which is utilized to store frequently needed data and instructions. It allows fast memory access due to its volatile nature, making it simple for the processor unit to get information directly from the main memory. In contrast, secondary memory refers to external storage devices that are utilized to store large amounts of data in hard drives, flash drives, magnetic tapes, CDs, floppy disks, DVDs, etc. The processor does not immediately access secondary memory.

Types of Compact Disc

Compact Discs can be categorized on:

**Operations:** Read-only, Recordable, Rewritable

**End-use:** Video, Audio, Photo, Graphics

**Quality of the content:** Super Audio, Super Video, Digital versatile disk (DVD)

1. CD-ROM

ROM denotes Read-only memory. The content stored in these types of CDs can only be read but cannot be altered by anyone. Any standard Compact Disc player will be able to play this CD. Initially, this media was prominently used in the pre-recorded music market. However, it has since been utilized for distributing computer software, licenses, data, and educational content. These types of CDs have a storage capacity of 650 MB, allowing for the storage of sizable amounts of data.

2. Recordable CD (CD-R)

Contents can be written in this media by CD drive attached to a computer or an external CD drive. A fresh CD is coated with a dye that will undergo a change in color when light is passed on it. This dye is photosensitive in nature. CD writer, while writing data (burning data), passes special laser rays on the dye and the change dye’s color. These CDs can be read through any normal CD player. While reading, the change in the color is sensed, and data is read, similar to reading data thru pits and lands in a normal CD.

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The physical dye layer has a shelf-life; over the years, its characteristics may deteriorate, leading to errors. The life of a CD is dependent on the storage conditions and quality of the CD. Recording can be done only once on any given portion of the CD and cannot be rewritten or altered. Information can be added to the CD in the unburnt area.

3. Rewritable CD (CD-RW)

This media uses metallic alloy as against dye in CD-R. The laser rays change the metallic alloy layer’s properties during CD writing. Any change in the properties of the alloy, viz., crystalline or amorphous, can be tracked by its reflectivity, and this change is used while reading. Most CD readers can read the CDs burnt this way, bypassing lower intensity laser without altering the properties. Data in this CD can be erased, and new data can be stored any number of times.

During the writing process, the metallic layer is initialized by melting it using laser rays, and the data is subsequently stored. However, it is important to note that writing on this medium takes more time compared to CD-R.

4. Audio CD

Sony and Philips came out with the format of this media in a document called Red Book, named after the color of the document’s cover. The official name of this format is Compact Disc Digital Audio (CD-DA). Standard Audio CDs reserve a designated area of 5KB size to store additional text information such as the album name, song titles, and artist names.

These audio CDs can store graphical information also, but it requires an exclusive CD cum graphics player to display graphical data. When playing the song, the players primarily display the lyrics, which are stored in a graphical format. Occasionally, users connect the players to a TV or PC monitor to show the lyrics alongside the song playback. The extended graphics version stores additional text/video information in sub-code channels, and there were few takers for this format.

5. Super Audio CD

This format was again developed by Sony and Philips in 1999, providing a higher-fidelity audio format. These read-only optical discs filled the ears of music lovers with high-resolution quality. It had hybrid versions in which both a standard audio format and a super audio format were available.

6. CD-MIDI

Used in storing music performance data and enabling audio synthesizing when it is played back in electronic instruments.

7. Video CD

Video content is stored in a standard digital format on a CD. VCD standard, known as the white book standard, was developed in 1999 by Matsushita, JVC, Sony, and Philips. VCDs have a similar picture quality as that of VHS, and the quality of VCD does not deteriorate as fast as VHS upon its usage. This CD can be played on computers, VCD, and in some DVD players, and it has a resolution of 352 x 240.

8. Super Video CD

It is a superior version with 2.7 times the resolution of VCD. It is placed in between VCD and Digital video disc in terms of picture quality and technical features. It can hold long lengths of videos.

9. Photo CD

Exclusively designed by Kodak to store high-quality scanned prints, slides, and images through encoding features. Any computers with specific software or photo CD players can play these CDs.

10. CD-i

These Interactive discs store audio, video, and images; a CD-I player is needed to play the contents in this multimedia disc.

11. DVD

Digital Videodisc has 6 times the capacity of a normal CD and can store up to 4.7GB of content. High-quality movie releases extensively utilize DVDs, which are considered far superior to VCDs and VHS tapes. DVDs offer unique features like interactive menus, commentaries, and deleted scenes. It can store data on both sides (top and bottom). It stores data in more than one layer aside. The size and the technology used are the same as that of normal CDs, but the multiple sides and multiple layers inside storage features give a clear edge to DVD.

Read Only Memory (ROM)

Memory

Memory is basically a device that has the capacity to store information. Moreover, it is the most important component of a computer system as it cannot perform even simple tasks without it. Basically, c[omputer memory](https://www.toppr.com/guides/computer-aptitude-and-knowledge/basics-of-computers/computer-memory/) is of two types namely, **primary memory** (Random Access Memory (RAM) and Read Only Memory (ROM)) and **secondary memory**(CD, DVD, hard disk, etc). Let us study the read only memory in detail.

Read Only Memory (ROM)

As the name suggests, we can only read from this memory and cannot write on it. Moreover, it is **non-volatile** in nature which means that it does not lose data after the power supply is cut off. Furthermore, its main function is to store the program and instructions which are important to boot (start) the system. This is the **bootstrap**process.

Other than computers, many devices like calculators, washing machines, ovens, etc use the ROM.

Features of Read Only Memory

The ROM has the features as follows:

It is non-volatile in nature.

Less costly than the RAM.

As, only read operation is allowed therefore, no changes can occur.

It is easy to test the ROM.

Due to its nature, it is more reliable than RAM.

Does not require any refreshing.

Types of Read Only Memory

There are 4 types of ROM out of them, 3 are the most common. These are as follows:

MROM (masked read only memory)

PROM (programmable read only memory)

EPROM(erasable and programmable read only memory)

EEPROM(electrically erasable and programmable read only memory)

**MROM (Masked Read Only Memory)**

These were the very first ROMs. Furthermore, these are hard-wired devices that contain a pre-programmed set of data and instructions. Moreover, they are inexpensive in nature.

**PROM (Programmable Read Only Memory)**

It is the programmable ROM that the user can program but only once. Furthermore, the user writes the data and instructions using a PROM program. Moreover, after writing once the user cannot change or erase the data and instructions.

**EPROM (Erasable and Programmable Read Only Memory)**

We can reprogram this memory by erasing the data. Furthermore to erase the data it has to be exposed to ultraviolet light. During the programming, a charge is trapped in the insulated gate region. Besides, on exposing it to the ultraviolet light for around 40 minutes this charge destroys. Hence, in this way, the data gets erased. After erasing the data we can now reprogram the ROM.

**EEPROM (Electrically Erasable and Programmable Read Only Memory)**

We can program and erase this memory electrically. Furthermore, we do not require any ultraviolet light to erase the data. Moreover, erasing and reprogramming is possible many times. Besides, we can erase any particular location of the memory selectively. At the same time, we can delete only one byte from the memory at a time rather than erasing the whole chip. Therefore, the process of reprogramming is flexible and slow.

**Browse more Topics under Primary Memory**

[Cache Memory](https://www.toppr.com/guides/computer-science/computer-fundamentals/primary-memory/cache-memory/)

[ROM](https://www.toppr.com/guides/computer-science/computer-fundamentals/primary-memory/rom-read-only-memory/)

Difference Between PROM and EPROM

|  |  |
| --- | --- |
| **PROM** | **EPROM** |
| PROM is non-reusable. | It is reusable in nature. |
| Less costly. | More expensive than PROM. |
| If we write the data once, it is permanent and we cannot erase it. | Data is not permanent, we can erase and rewrite it. |
| The storage capacity is high. | Storage capacity is less than the PROM. |
| If there is any error or bug in the PROM’s program it becomes useless as we cannot rewrite it. | Whereas we can erase and fix the previous code in EPROM. |
| It uses a bipolar transistor. | It uses a MOS transistor. |

RAM (Random Access Memory)

RAM stands for Random Access Memory. It is the internal memory in the computer’s CPU which stores different types of data and information as per the requirement. Moreover, we can also call it the **main memory, primary memory, or read/write memory**. RAM stores all the data that the CPU requires during the execution of a program. Moreover, it is a **volatile**memory i.e. it loses data as soon as the power is cut off.

Difference Between RAM and ROM

|  |  |
| --- | --- |
| **RAM** | **ROM** |
| It is temporary storage. | It is permanent storage. |
| Storage capacity is in MBs. | Storage capacity is in GBs. |
| It is volatile in nature. | It is non-volatile in nature. |
| Stores the data and information of the programs and applications currently on the system. | On the other hand, it stores programs during the startup of the system. |
| We can access and change the data. | We can only read the data. |
| Speed is high. | Speed is much less in comparison to RAM. |
| It is expensive. | It is less expensive than RAM. |
| RAM is used as the cache or primary memory. | The firmware uses it as microcontrollers. |
| Its types are SRAM and DRAM. | Its types are PROM, EPROM, and EEPROM. |

**Types of Switches.**

Switches can be categorised into two types:

**1. Mechanical Switches:**

These switches need to be operated physically for the ON/OFF action.

**2. Electronic Switches:**

These switches are controlled through semiconductor action and don’t need manual operation.

### ****Types of Mechanical Switches.****

Mechanical Switches can be further classified into different types. Some of the types of mechanical switches based on different factors are as below.

**Number of Contacts:**

* Single contact switches
* Multi-contact switches

**Actuation Method:**

* Manual switches
* Limit switches
* Process switches

**Number of Poles & Throws:**

* SPST (Single Pole Single Throw)
* SPDT (Single Pole Double Throw)
* DPDT (Double Pole Double Throw)
* DPST (Double Pole Single Throw)

**Operation of the Switch:**

* Push-button switches
* Toggle switches
* Rotary switches
* Joysticks

**Below, we will see some of the more popular mechanical switches in further details:**

#### **Push Button Switches**

[**Push Button Switches**](https://www.bulgin.com/en/products/range/switches/push-button.html) are activated by manually pushing using a finger. The button, when pushed, activates or deactivates the switch. When released, the button comes back to its normal position. It has a spring mechanism inside, which helps operate the pressed and released states.

#### **Toggle Switches**

[**Toggle Switches**](https://www.bulgin.com/en/products/range/switches/toggle-switches.html) are mechanical switches with a lever or mechanical handle for operation. They come with lever positions in the versions of SPST, SPDT, DPST, and DPDT. With different ratings and styles, they are widely used across different applications.

#### **Rocker Switches**

A [**Rocker Switch**](https://www.bulgin.com/en/products/range/switches/rocker-switches.html) rocks ON and OFF on a pivot point. They are low-cost switches that are used across various consumer and household applications. They come in different sizes, features and styles.

#### **Touch Switches**

[**Touch Switches**](https://www.bulgin.com/en/products/range/switches/touch-switches.html) are operated by just touching it. It is used for lamps or as a wall switch. Typically, touch switches are used on surfaces with metal exteriors

#### **Slide Switches**

[**Slide Switches**](https://www.bulgin.com/en/products/range/switches/slide-switches.html) are mechanical switches that use a sliding mechanism to make or break a circuit. It is best used for small circuits. They stay in one state (ON or OFF) until the state is changed by sliding again.

#### **Voltage Selector Switches**

[**Voltage Selector Switches**](https://www.bulgin.com/en/products/range/switches/voltage-selector.html)are used to select an internal circuit depending on the expected incoming voltage. They enable the user to tell which electrical equipment is to be used based on what the switch indicates. The switch helps the current to flow through the components that are meant to handle the voltage selected.

#### **Refrigerator Switches**

[**Refrigerator Switches**](https://www.bulgin.com/en/products/range/switches/refrigerator-switches.html) are switches that are fixed to the refrigerator doors. They operate the light inside the refrigerator which is switched ON as the door opens and switched OFF when the door is closed. They come with both single pole and double pole options.

### ****Types of Electronic Switches.****

Electronic switches are also known as solid-state switches. This is because they do not have any moving parts or physical contacts. These switches are basically semiconductor switches and are used in systems using electrical motor drives or in HVAC systems.

Some of the Electronic Switches used today are:

**Power Diode:**

Power diodes are built using p-type and n-type semiconductor materials to get a PN junction. When the diode is forward biased, it starts conducting (i.e. ON state). When it is reverse biased, it stops conducting (OFF state)

**MOSFET:**

A MOSFET (Metal Oxide Semiconductor Field Effect Transistor) is commonly used in power electronics applications. It is a voltage-controlled device and has three terminals – drain, source, and gate. By controlling the gate to source voltage, the resistance between the drain and the source can be controlled. This resistance decides whether the switch is ON or OFF.

**SCR:**

An SCR (Silicon Controlled Rectifier) is a unidirectional device with three terminals – anode, cathode, and gate. It is controlled by controlling the gate input and biasing the anode and cathode.

Some other switches electronic switches include:

* GTO (Gate Turn-off Thyristor),
* DIAC (Diode AC),
* TRIAC (Triode AC),
* IGBT (Insulated Gate Bipolar Transistor), etc