



SEMICONDUCTOR ELECTRONICS

Electronic devices work by controlling the flow of electrons and form the foundation of all modern electronic circuits. Before the invention of the transistor in 1948, electronic systems mainly relied on vacuum tubes (valves) such as diodes, triodes, tetrodes, and pentodes. These devices used a heated cathode to release electrons, and their movement was controlled by applying voltages between different electrodes.

However, vacuum tubes had several disadvantages:

- Large and bulky in size
- High power consumption
- Operated at high voltages (around 100 V)
- Generated excessive heat
- Limited lifespan and low reliability

The development of semiconductor technology in the 1930s revolutionized electronics. Scientists discovered that certain materials, called semiconductors, could control the flow of charge carriers (electrons and holes) within the solid material itself. Their conductivity could be easily modified by light, heat, or a small applied voltage.

Advantages of Semiconductor Devices

Compared to vacuum tubes, semiconductor devices:

- Are compact and lightweight
- Consume very little power
- Operate at low voltages
- Produce less heat
- Have a longer lifespan
- Offer higher reliability and efficiency

As a result, bulky vacuum-tube technologies such as Cathode Ray Tubes (CRTs) used in televisions and computer monitors have largely been replaced by modern Liquid Crystal Display (LCD) and LED technologies based on semiconductor electronics.

Beginning of Semiconductor Devices

Even before the theory of semiconductors was fully understood, a naturally occurring crystal called Galena (Lead Sulphide, PbS) was used as a detector for radio signals. This discovery paved the way for modern semiconductor research.

Today, semiconductor devices such as:

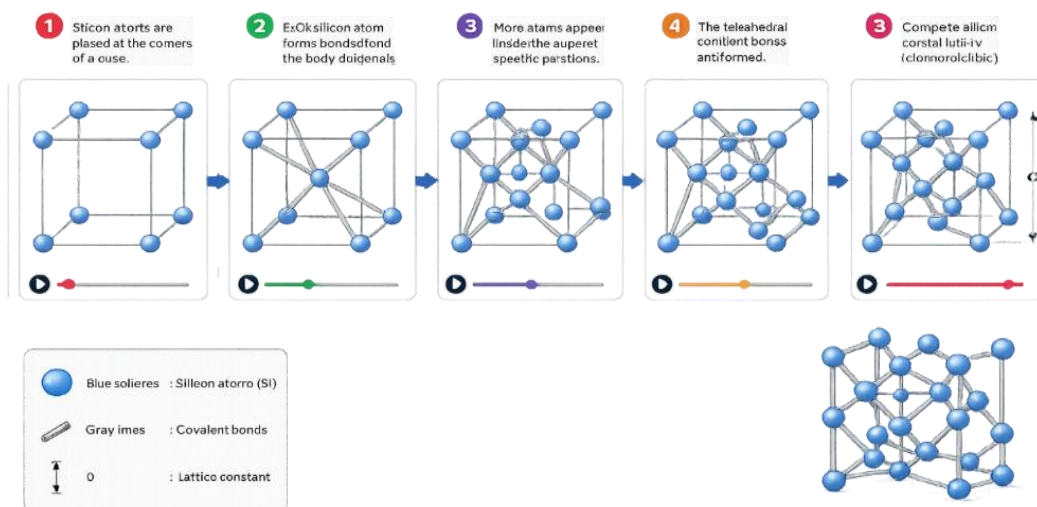
- PN Junction Diodes
- Transistors
- Integrated Circuits (ICs)
- Microprocessors

Applications of Semiconductor Electronics

- Computers and laptops
- Smartphones and tablets
- Solar cells
- LED lighting systems
- Medical equipment
- Communication satellites
- Artificial Intelligence hardware
- Robotics and automation

Conclusion

The invention of semiconductor devices marked a major turning point in the history of electronics. Their small size, low power consumption, high reliability, and ability to control electrical signals efficiently have made them indispensable in modern technology. Semiconductor electronics is therefore considered the foundation of the digital age and continues to drive advancements in science and engineering.



Mrs.T.Kavitha

Head & Assistant Professor, Department of Physics with Computer Applications

St. Joseph's College (Arts & Science),

Chennai - 600128