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Types of Semiconductor, Its Uses and Application

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Abstract: ***The semiconductor was first time used in the early 19th century. The modern creation of the semiconductor device was the invention of the transistor in December, 1947 by Bardeen and Brattain. After that so many inventions and major advances and techniques came in the material like minority carrier injection, invention of the junction diode etc..Further development of semiconductor materials and the constraints which they impose on speed, power and impedance.*** *Semiconductor devices are the* ***electronic component*** *that exploits the electronic properties of semiconductor materials, like as silicon, germanium, and gallium arsenide, as well as organic semiconductors. Vacuum tubes have been replaced by the semi-conductor.* ***.Recent growth in semiconductor devices includes the field of silicon nano- electronics in which Si/SiGe/SiO_2 structures are used to fabricate single electron metal-oxide-semiconductor transistors. Today so many applications used in the semiconductor devices***

Keywords: *Interference,* ***diode, doping, p-n junction, depletion layer, vacuum tubes.***

I. INTRODUCTION

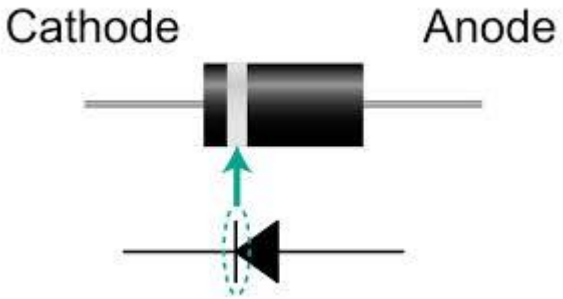
Semiconductor devices are the electronic component that exploits the electronic properties of semiconductor materials, like as silicon, germanium, and gallium arsenide, as well as organic semiconductors. Vacuum tubes have been replaced by the semi-conductor in many applications. Semiconductor devices are design for both discrete devices and integrated circuits .Semiconductor materials easily manipulated by the addition of impurities is known as doping.

They are free from electrons and holes, collectively known as charge carriers. When a doped semiconductor contains excess holes it is called “p-type” semiconductor, and when it contains excess of free electrons, it is known as “n-type semiconductor. The junctions which formed n-type and p-type semiconductors are joined together is called p–n junction.

A. DIODE

A diode is a two-terminal device that conducts current primarily in one direction; it has low resistance in one direction, and high resistance in the other. A semiconductor diode, today most commonly, is a crystalline piece of semiconductor material with a p–n junction connected to two electrical terminals. The first semiconductor electronic devices were Semiconductor diodes. Today, in spite of silicon, but other materials such as gallium arsenide and germanium are used.

The junction of a semiconductor p-type and n-type forms a depletion region where current conduction is reserved by the deficiency of mobile charge carriers, depletion region is reduced .When the device is forward biased and allowing for significant conduction, when the diode is reverse biased, the only less current can be achieved and the depletion region can be expanded. a semiconductor can produce electron hole pairs, which increases the number of free carriers and the conductivity.



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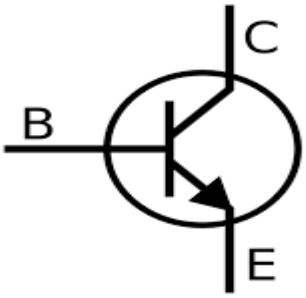
B. Transistor

A transistor is a semiconductor device used to magnify or switch electronic signals and electrical power. To controls the current through one pair of terminals a voltage or current applied to another pair of the transistor's terminals. In field effect transistor only one kind of charge carrier is present, and in bipolar junction transistor two kinds of charge carriers. BJT are design by two p-n junctions, either p-n-p or n-p-n configuration. The field-effect transistor is a voltage controlled device, it operates on the principle that semiconductor conductivity can increase or decreased by the presence of an electric field. Thus changing its conductivity an electric field can increase the number of electrons and holes in a semiconductor. Two types of FET are JFET (junction field effect transistor) and MOSFET (metal oxide semiconductor field effect transistor). The conductivity of silicon is increased by adding a small amount of impurity in the form of pentavalent (antimony, phosphorus, or arsenic) or trivalent (boron, gallium, indium) atoms this process is known as doping and as a result semiconductors are known as doped or extrinsic semiconductor Almost today's electronic technology involves the use of semiconductors, the most important is the integrated circuit (IC), which are found in laptops, scanners, cell-phones, etc…There is a combination of various processes that is used to prepare semiconducting materials for ICs. Thermal oxidation is the one, which forms silicon dioxide on the surface of the silicon.



C. Applications

All types of transistor can be used as the building blocks of logic gates which is useful to design of digital circuits. In digital circuits like as microprocessors, transistors etc..The transistors are used for analog circuits do not act as switches (on-off); relatively, they respond to a continuous range of input with a continuous range of output. A transistor can be used to amplify current. Sound waves that are fed into the microphone cause the diaphragm in the microphone to vibrate. The electrical output of the microphone changes according to the sound wave Loudspeaker: To change the electrical signal to sound wave. The transistor act as a switch**.** An integrated circuit (IC) consists of transistors, resistors, diodes and capacitors combined together in one wafer-thin chip of silicon. This is one wafer-thin chip is called a microchip

D.Advantages Of Semiconductor Devices

As semiconductor devices have no filaments, then no power is required to heat them to cause the ejection of electrons.
As soon as the circuit is switched on semiconductor devices are set into operation when no heating is given.
During operation, semiconductor devices do not produce any buzzing noise.
As compared to vacuum tubes semiconductor devices are require low voltage operation
Due to their small sizes, the circuits involving semiconductor devices are very hard.
Semiconductor devices are disturbance free.
As compared to vacuum tubes semiconductor devices is low cost.
Semiconductor devices have an almost endless life.

E. Disadvantages Of Semiconductor Devices

As compared to vacuum tubes their noise level is higher.
As ordinary vacuum tubes ordinary semiconductor devices cannot handle more power
They have poor responder in high frequency range

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II. CONCLUSION

Semiconductor devices have unique characteristics such as low power consumption, high resistance to temperature, high breakdown voltage, and better thermal stability, as well as high mobility of electrons make them more applicable,

From the above discussion it is concluded that Graphene is a material which has the capability to eliminate the current semiconductors such as silicon and form a new era of superfast micro electronics.

From recent researches it is observed that the most likely applications for Graphene will be in analogue system such as radar, satellite communication and imaging devices.

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[5] Charles Kittel(1995) Introduction to Solid State Physics, 7th ed. Wiley, ISBN 0-471-11181-Thomas Johann Seebeck was the first to notice an effect due to semiconductors, in 1821.
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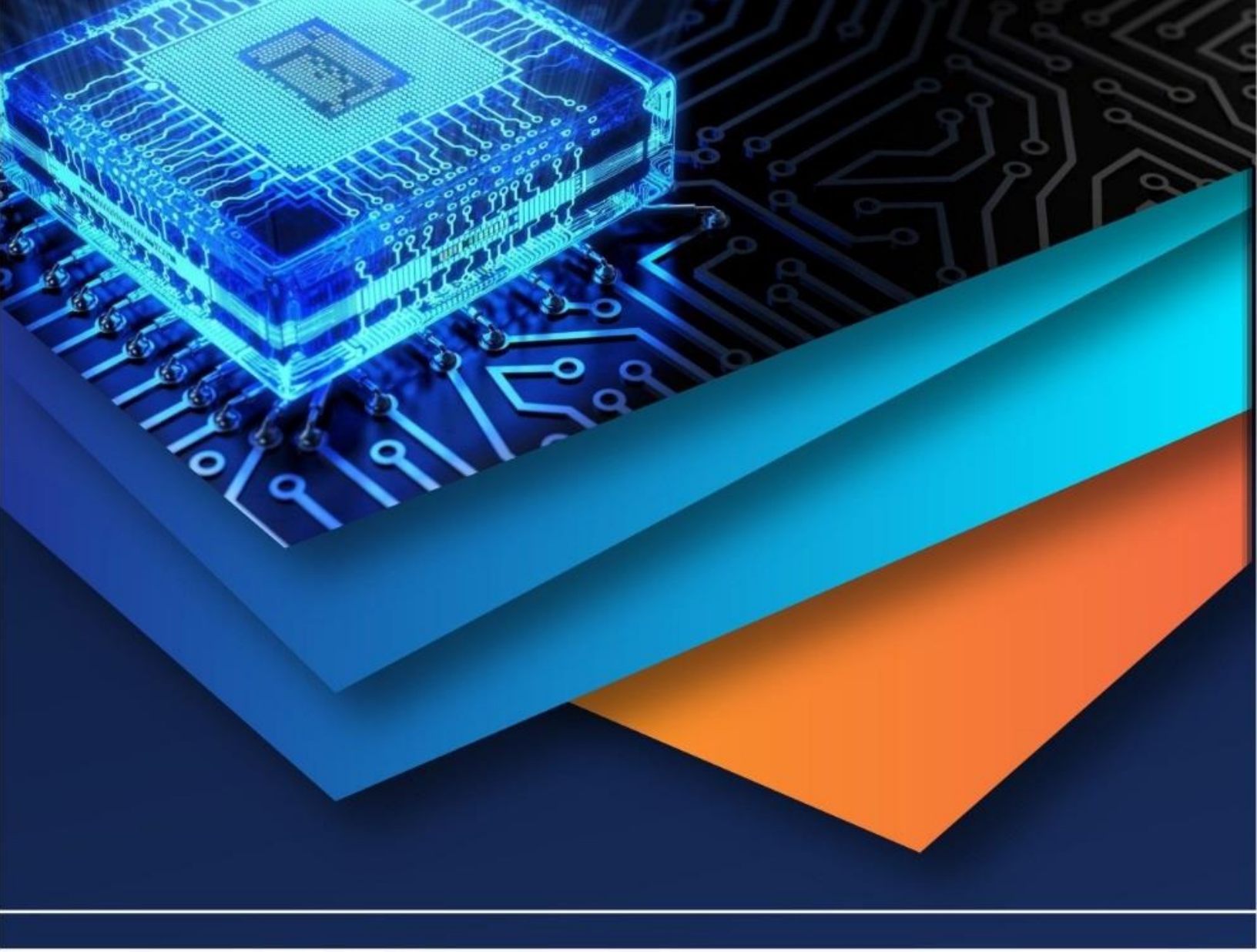

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