

Semiconductor Devices

Short Notes

PN Junction

P-type: When trivalent impurities are added or doped to pure (intrinsic) semiconductor, p-type semiconductor is formed.

Trivalent Impurities → Gallium, Indium, etc.

N-type: When pentavalent impurities are added or doped to pure semiconductor, n-type semiconductor is formed.

Pentavalent Impurities → Antimony, Arsenic

P-type
Holes (+ve charge)
Majority charge carriers
Electrons (-ve charge)
Minority charge carriers

N-type
Electrons
Majority charge carriers
Holes
Minority charge carriers

Majority and minority charge carriers vary like? → 100% P-type or 100% N-type semiconductor contains some amount of electron in holes and N-type contains some amount of holes in electrons. So, P-type has electron as minority charge carriers and N-type has holes as minority charge carriers.



If P-type & N-type are attached, diffusion phenomena occurs. Charges get diffused or moved to another end, which creates a potential barrier or depletion layer.



PN Diode (Diode - Device)

Diode is a device made by use of semiconductor.



Fig: Diode



Fig: Symbolical representation of PN Junction diode

Forward Biasing of Diode



Fig: Forward Biasing. Positive charges have to get holes, and electrons have to get electrons. In the depletion layer, there is a flow of charge, electricity through the diode.



Fig: Reverse Biasing. No flow of electricity. Yes, there is a -ve charge attraction, but the side has accumulated positive charges, so electricity does not flow.

Forward Biasing Characteristics



Fig: Circuit diagram of Forward Biasing



Fig: Forward Characteristics

Series rheostat to help in voltage regulation, current control, etc. Yes, the meaning of potential barrier is potential difference. Voltage supply is not a potential barrier, it's a voltage source.

potential barrier. As voltage increases, gradual increase of current, at point where potential barrier is overcome, current sharply increases.

Reverse Biasing Characteristics



Fig: Circuit diagram of reverse biasing



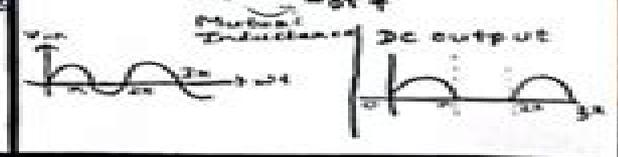
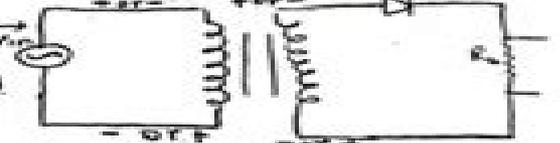
Fig: Reverse Characteristics

Semiconductor is a pure state. In a pure state, there are no free electrons. P-type has holes, N-type has electrons. As minority charge carriers, they move towards the junction. Minority charge carriers are not free to move, so they are not free to move.

Yes, the breakdown voltage is a current sharply increase.

Rectification: Process of converting AC to DC

1. Half-wave Rectification



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Table of Contents Semiconductor 12th Class Chapter Notes

1. Understanding the eBook Semiconductor 12th Class Chapter Notes
 - The Rise of Digital Reading Semiconductor 12th Class Chapter Notes
 - Advantages of eBooks Over Traditional Books
2. Identifying Semiconductor 12th Class Chapter Notes
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Semiconductor 12th Class Chapter Notes
 - User-Friendly Interface
4. Exploring eBook Recommendations from Semiconductor 12th Class Chapter Notes
 - Personalized Recommendations
 - Semiconductor 12th Class Chapter Notes User Reviews and Ratings
 - Semiconductor 12th Class Chapter Notes and Bestseller Lists
5. Accessing Semiconductor 12th Class Chapter Notes Free and Paid eBooks

- Semiconductor 12th Class Chapter Notes Public Domain eBooks
 - Semiconductor 12th Class Chapter Notes eBook Subscription Services
 - Semiconductor 12th Class Chapter Notes Budget-Friendly Options
6. Navigating Semiconductor 12th Class Chapter Notes eBook Formats
 - ePub, PDF, MOBI, and More
 - Semiconductor 12th Class Chapter Notes Compatibility with Devices
 - Semiconductor 12th Class Chapter Notes Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Semiconductor 12th Class Chapter Notes
 - Highlighting and Note-Taking Semiconductor 12th Class Chapter Notes
 - Interactive Elements Semiconductor 12th Class Chapter Notes
 8. Staying Engaged with Semiconductor 12th Class Chapter Notes
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Semiconductor 12th Class Chapter Notes
 9. Balancing eBooks and Physical Books Semiconductor 12th Class Chapter Notes
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Semiconductor 12th Class Chapter Notes
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Semiconductor 12th Class Chapter Notes
 - Setting Reading Goals Semiconductor 12th Class Chapter Notes
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Semiconductor 12th Class Chapter Notes
 - Fact-Checking eBook Content of Semiconductor 12th Class Chapter Notes
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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