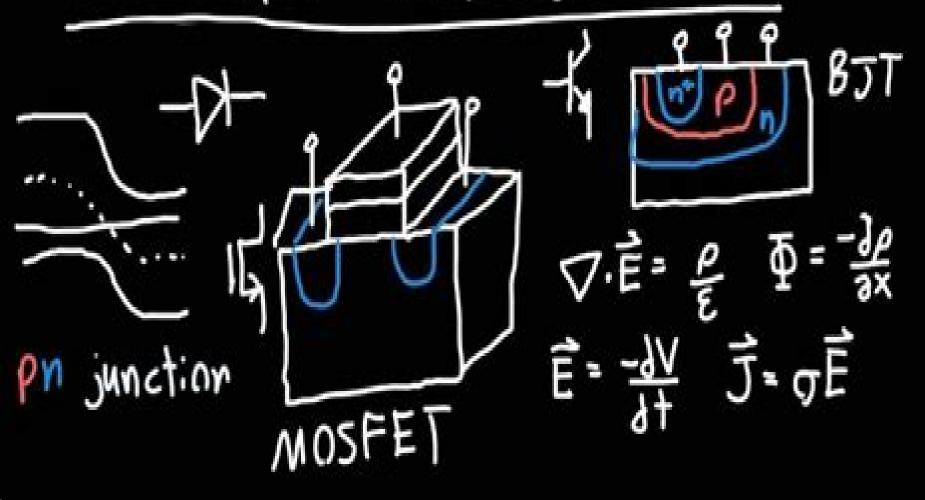
# Semiconductor Physics and Devices



# **Semiconductor Physics**

Dilip K Roy

#### **Semiconductor Physics:**

The Physics of Semiconductors Marius Grundmann, 2015-12-24 The 3rd edition of this successful textbook contains ample material for a comprehensive upper level undergraduate or beginning graduate course guiding readers to the point where they can choose a special topic and begin supervised research. The textbook provides a balance between essential aspects of solid state and semiconductor physics on the one hand and the principles of various semiconductor devices and their applications in electronic and photonic devices on the other It highlights many practical aspects of semiconductors such as alloys strain heterostructures nanostructures that are necessary in modern semiconductor research but typically omitted in textbooks Coverage also includes additional advanced topics such as Bragg mirrors resonators polarized and magnetic semiconductors nanowires quantum dots multi junction solar cells thin film transistors carbon based nanostructures and transparent conductive oxides The text derives explicit formulas for many results to support better understanding of the topics The Physics of Semiconductors requires little or no prior knowledge of solid state physics and evolved from a highly regarded two semester course In the third edition several topics are extended and treated in more depth including surfaces disordered materials amorphous semiconductors polarons thermopower and noise More than 1800 references guide the reader to historic and current literature including original and review papers and books Semiconductor Physics Karlheinz Seeger, 2013-04-17 It is a pleasure to take the opportunity to express my sincere grati tude to many colleagues who provided valuable hints for improvements even including lists of misprints which I hope have now been completely eliminated It is not possible to name all of them and so I will only mention the interesting discussions over so many years I had with Pro fessor Hans W P tzl of the Technical University of Vienna on the oc casion of our common weekly semiconductor seminar I am grateful to Professor H J Queisser and Professor M Cardona for helpful criticism Special thanks are due to Frau Jitka Fucik for typing and Frau Viktoria K ver for drawing services The cooperation with Dr H K Lotsch of Springer Verlag has been a pleasure Vienna January 1982 K Seeger Contents 1 Elementary Properties of Semiconductors I 1 1 Insulator Semiconductor Semimetal Metal 1 1 2 The Positive Hole 3 1 3 Conduction Processes Compensation Law of Mass Action 4 Problems 8 2 Energy Band Structure 10 2 1 Single and Periodically Repeated Potential Well 10 2 2 Energy Bands by Tight Binding of Electrons to Atoms 17 2 3 The Brillouin Zone 21 2 4 Constant Energy Surfaces 30 Problems 33 3 Semiconductor Statistics 34 3 1 Fermi Statistics 35 3 2 Occupation Probabilities of Impurity Levels 39 Problems 45 4 Charge and Energy Transport in a Nondegenerate Electron Gas Semiconductor Physics and Applications M. Balkanski, Richard Fisher Wallis, 2000-08-31 The textbook combines a thorough theoretical treatment of the basic physics of semiconductors with applications to practical devices by putting special emphasis on the physical principles upon which these devices operate Graduate students and lecturers in semiconductor physics condensed matter physics electromagnetic theory and quantum mechanics will find this a useful textbook and reference work Jacket Fundamentals of Semiconductor Physics and Devices ,1997 This book is

an introduction to the principles of semiconductor physics linking its scientific aspects with practical applications It is addressed to both readers who wish to learn semiconductor physics and those seeking to understand semiconductor devices It is particularly well suited for those who want to do both **Semiconductor Devices** Jasprit Singh, 2000-08-03 This introductory text designed for the first course in semiconductor physics presents a well balanced coverage of semiconductor physics and device operation and shows how devices are optimized for applications The text begins with an exploration of the basic physical processes upon which all semiconductor devices diodes transistor light emitters and detectors are based Topics such as bandstructure effective masses holes doping carrier transport and lifetimes are discussed Next the author focuses on the operation of the important semiconductor devices along with issues relating to the optimization of device performance Issues such as how doping device dimensions and parasitic effects influence device operation are also included The book is appropriate for the following courses Device Physics Semiconductor Devices Device Electronics Physics of Semiconductor Devices Integrated Circuit Devices Device Electronics Solid State Devices Fundamentals of Semiconductors Peter YU, Manuel Cardona, 2010-04-07 Excellent bridge between general solid state physics textbook and research articles packed with providing detailed explanations of the electronic vibrational transport and optical properties of semiconductors The most striking feature of the book is its modern outlook provides a wonderful foundation The most wonderful feature is its efficient style of exposition an excellent book Physics Today Presents the theoretical derivations carefully and in detail and gives thorough discussions of the experimental results it presents This makes it an excellent textbook both for learners and for more experienced researchers wishing to check facts I have enjoyed reading it and strongly recommend it as a text for anyone working with semiconductors I know of no better text I am sure most semiconductor physicists will find this book useful and I recommend it to them Contemporary Physics Offers much new material an extensive appendix about the important and by now well established deep center known as the DX center additional problems and the solutions to over fifty of the problems at the end of the various chapters Semiconductor **Physics** Karlheinz Seeger, 2013-11-09 This book has been designed primarily as a text book for a three semester three hour per week senior or graduate course in semiconductor physics for students In electrical engineering and physics It may be supplemented by a solid state phy ics course Prerequisites are courses in electrodynamics and for some of the chapters basic quantum mechanics Emphasis has been laid on physical rather than technological aspects Semiconductor physics is in fact an excellent and d manding training ground for a future physicist or electrical engineer givina him an opportunity to practice a large variety of physical laws he was introduced to in the more fundamental courses A detailed treatment of the transport and optical properties of semiconducton is given It was decided to omit the usual description of the material propertkl of certain semiconductors and instead to include the in between equations In mathematical derivations which I hope will make life simpler for a non theorell ciano In view of the many thousands of papers which appear every y ar in th field of

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Fundamentals of Semiconductor Physics MIJOE JOSEPH,2015-04-28 Semiconductors have made an enormous impact on 20 th century science and technology This is because components made from semiconductors have very favorable properties such as low energy consumption compactness and high reliability and so they now dominate electronics and radio engineering Semiconductors are indispensable for space exploration where the requirements of small size low weight and low energy consumption are especially stringent This book uses quantum mechanical concepts and band theory to present the theory of semiconductors in a comprehensible term It also describes how basic semiconductor devices eg diodes transistors and losers operate The book was written for senior high school and B E B Tech students interested in semiconductor physics

Basic Semiconductor Physics Chihiro Hamaguchi,2023-04-29 This textbook presents a detailed

description of basic semiconductor physics covering a wide range of important phenomena in semiconductors from simple to advanced It introduces and explains four different methods of energy band calculations in the full band region and covers fundamental topics such as the effective mass approximation and electron motion in a periodic potential the Boltzmann transport equation and deformation potentials used for the analysis of transport properties. The text also examines experimental and theoretical analyses of cyclotron resonance in detail and reviews essential optical and transport properties while covering optical transitions electron phonon interaction and electron mobility It presents numerical calculations of scattering rate relaxation time and mobility for typical semiconductors with bulk quantum well and HEMT structures including wideband gap materials such as GaN and SiC in addition to IV and III V semiconductors The updated fourth edition includes coverage of new topics such as surface modulated superlattices Wannier Stark effect Bloch oscillation wide band gap semiconductors and photonic crystals Featuring full color diagrams calculated with updated physical parameters as well as chapter end problems and solutions this tried and tested textbook on the basics of semiconductors physics is the cornerstone to any graduate or upper level undergraduate course on the subject **Introduction to Semiconductor Physics** Holger T. Grahn, 1999 This book covers the physics of semiconductors on an introductory level assuming that the reader already has some knowledge of condensed matter physics Crystal structure band structure carrier transport phonons scattering processes and optical properties are presented for typical semiconductors such as silicon but III V and II VI compounds are also included In view of the increasing importance of wide gap semiconductors the electronic and optical properties of these materials are dealt with too **Introduction to Semiconductor Physics** R. B. Adler, 1964

Semiconductor Physics And Devices Donald Neamen, 2011 Provides a basis for understanding the characteristics operation and limitations of semiconductor devices This title deals with the electrical properties and characteristics of semiconductor materials and devices It intends to bring together quantum mechanics the quantum theory of solids and semiconductor material physics

The Physics of Semiconductor Devices D. A. Fraser, 1979

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