
Semiconductor Physics And Devices Basic Principles

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Physics of Semiconductor Devices John Wiley & Sons
Physics of Semiconductor Devices covers both basic classic topics such as energy band theory and the gradual-channel model of the MOSFET as well as advanced concepts and devices such as MOSFET short-channel effects, low-dimensional devices and single-electron transistors. Concepts are introduced to the reader in a simple way, often using comparisons to everyday-life experiences such as simple fluid mechanics. They are then explained in depth and mathematical developments are fully described. Physics of Semiconductor Devices contains a list of problems that can be used as homework assignments or can be

solved in class to exemplify the theory. Many of these problems make use of Matlab and are aimed at illustrating theoretical concepts in a graphical manner.

The Physics of Semiconductors McGraw-Hill Education

Semiconductor Physics And Devices McGraw-Hill

Science/Engineering/Math

Physics of Semiconductor Devices Oxford University Press

This is a first undergraduate textbook in Solid State Physics or Condensed Matter Physics. While most textbooks on the subject are extremely dry, this book is written to be much more exciting, inspiring, and entertaining.

Modern Semiconductor Device Physics CRC Press

Optoelectronics has become an important part of our lives.

Wherever light is used to transmit information, tiny semiconductor devices are needed to transfer electrical current

into optical signals and vice versa. Examples include light emitting diodes in radios and other appliances, photodetectors in elevator doors and digital cameras, and laser diodes that transmit phone calls through glass fibers. Such optoelectronic devices take advantage of sophisticated interactions between electrons and light. Nanometer scale semiconductor structures are often at the heart of modern optoelectronic devices. Their shrinking size and increasing complexity make computer simulation an important tool to design better devices that meet ever rising performance requirements. The current need to apply advanced design software in optoelectronics follows the trend observed in the 1980's with simulation software for silicon devices. Today, software for technology computer-aided design (TCAD) and electronic design automation (EDA) represents a fundamental part of the silicon industry. In optoelectronics, advanced commercial device software has emerged recently and it is expected to play an increasingly important role in the near future. This book will enable students, device engineers, and researchers to more effectively use advanced design software in optoelectronics. Provides fundamental knowledge in semiconductor physics and in electromagnetics, while helping to understand and use advanced device simulation software Demonstrates the combination of measurements and simulations in order to obtain realistic results and provides data on all required material parameters Gives deep insight into the physics of state-of-the-art devices and helps to design and analyze of modern optoelectronic devices

Basic Principles World Scientific

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.

Semiconductor Devices Prentice Hall

This book is a comprehensive text on the physics of semiconductors and nanostructures for a large spectrum of students at the final undergraduate level studying physics, material science and electronics engineering. It offers introductory and advanced courses on solid state and semiconductor physics on one hand and the physics of low dimensional semiconductor structures on the other in a single text book. Key Features Presents basic concepts of quantum theory, solid state physics, semiconductors, and quantum nanostructures such as quantum well, quantum wire, quantum dot and superlattice In depth description of semiconductor heterojunctions, lattice strain and modulation doping technique Covers transport in nanostructures under an electric and magnetic field with the topics: quantized conductance, Coulomb blockade, and integer and fractional quantum Hall effect Presents the optical processes in nanostructures under a magnetic field Includes illustrative problems with hints for solutions in each chapter Physics of Semiconductors and Nanostructures will be helpful to students initiating PhD work in the field of semiconductor nanostructures and devices. It follows a unique tutorial approach meeting the requirements of students who find learning the concepts difficult and want to study from a physical perspective.

Fundamentals of Semiconductors Springer Science & Business Media

The Third Edition of the standard textbook and reference in the field of semiconductor devices This classic book has set the standard for advanced study and reference in the semiconductor device field. Now completely updated and reorganized to reflect the tremendous advances in device concepts and performance, this Third Edition remains the most detailed and exhaustive single source of information on the most important semiconductor devices. It gives readers immediate access to detailed descriptions of the underlying physics and performance characteristics of all major bipolar, field-effect, microwave, photonic, and sensor devices. Designed for graduate textbook adoptions and reference needs, this new edition includes: A complete update of the latest developments New devices such as three-dimensional MOSFETs, MODFETs, resonant-tunneling diodes, semiconductor sensors, quantum-cascade lasers, single-electron transistors, real-space transfer devices, and more Materials completely reorganized Problem sets at the end of each chapter All figures reproduced at the highest quality Physics of Semiconductor Devices, Third Edition offers engineers, research scientists, faculty, and students a practical basis for understanding the most important devices in use today and for evaluating future device performance and limitations. A Solutions Manual is available from the editorial department.

Physics of Semiconductor Devices Wiley-Blackwell

An in-depth, up-to-date presentation of the physics and operational principles of all modern semiconductor devices The companion volume to Dr. Sze's classic *Physics of Semiconductor*

Devices, Modern Semiconductor Device Physics covers all the significant advances in the field over the past decade. To provide the most authoritative, state-of-the-art information on this rapidly developing technology, Dr. Sze has gathered the contributions of world-renowned experts in each area. Principal topics include bipolar transistors, compound-semiconductor field-effect-transistors, MOSFET and related devices, power devices, quantum-effect and hot-electron devices, active microwave diodes, high-speed photonic devices, and solar cells. Supported by hundreds of illustrations and references and a problem set at the end of each chapter, *Modern Semiconductor Device Physics* is the essential text/reference for electrical engineers, physicists, material scientists, and graduate students actively working in microelectronics and related fields.

Semiconductor Device Physics and Design CRC Press
 "An Introduction to Semiconductor Devices by Donald Neamen is designed to provide a fundamental understanding of the characteristics, operations, and limitations of semiconductor devices. In order to meet this goal, the book brings together explanations of fundamental physics of semiconductor materials and semiconductor device physics." "This new text provides an accessible and modern approach to the material. Aimed at the undergraduate, Neamen keeps coverage of quantum mechanics to a minimum and labels the most advanced material as optional. MOS transistors are covered before bipolar transistors to reflect the dominance of MOS coverage in today's world."--BOOK JACKET.

Semiconductor Physics and Devices World Scientific
 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. Intended as a teaching vehicle, the book is written in an expository manner aimed at conveying a deep and coherent understanding of the field. It provides clear and complete derivations of the basic concepts of modern semiconductor physics. The mathematical arguments and physical interpretations are well balanced: they are presented in a measure designed to ensure the integrity of the delivery of the subject matter in a fully comprehensible form. Experimental procedures and measured data are included as well. The reader is generally not expected to have background in quantum mechanics and solid state physics beyond the most elementary level. Nonetheless, the presentation of this book is planned to bring the student to the point of research/design capability as a scientist or engineer. Moreover, it is sufficiently well endowed with detailed knowledge of the field, including recent developments bearing on submicron semiconductor structures, that the book also constitutes a valuable reference resource. In Chapter 1, basic features of the atomic structures, chemical nature and the macroscopic properties of semiconductors are discussed. The band structure of ideal semiconductor crystals is treated in Chapter 2, together with the underlying one-electron picture and other fundamental concepts. Chapter 2 also provides the requisite background of the tight binding method and the k.p-method, which are later used extensively. The electron states of shallow and deep centers, clean semiconductor surfaces,

quantum wells and superlattices, as well as the effects of external electric and magnetic fields, are treated in Chapter 3. The one- or multi-band effective mass theory is used wherever this method is applicable. A summary of group theory for application in semiconductor physics is given in an Appendix. Chapter 4 deals with the statistical distribution of charge carriers over the band and localized states in thermodynamic equilibrium. Non-equilibrium processes in semiconductors are treated in Chapter 5. The physics of semiconductor junctions (pn-, hetero-, metal-, and insulator-) is developed in Chapter 6 under conditions of thermodynamic equilibrium, and in Chapter 7 under non-equilibrium conditions. On this basis, the most important electronic and opto-electronic semiconductor devices are treated, among them uni- and bi-polar transistors, photodetectors, solar cells, and injection lasers. A summary of group theory for applications in semiconductors is given in an Appendix.

Contents: Characterization of Semiconductors
 Electronic Structure of Ideal Crystals
 Electronic Structure of Semiconductor Crystals with Perturbations
 Electron System in Thermodynamic Equilibrium
 Non-Equilibrium Processes in Semiconductors
 Semiconductor Junctions in Thermodynamic Equilibrium
 Semiconductor Junctions Under Non-Equilibrium Conditions
 Readership: Undergraduates, graduates and researchers in the fields of physics and engineering.

keywords: Semiconductors; Transistor; Devices; Heterojunctions; Microstructures; Band-Structure; Luttinger-Kohn-Model; Kane-Model; Deep-Levels; Transport; Semiconductor Physics; Fundamental Physical Phenomena; General Background; Characterization of Semiconductor; Electronic Structur

of Semiconductors; Semiconductor Junctions the Thermodynamic Equilibrium; Semiconductor Junctions Under Non-Equilibrium Conductions; "... The reader who has only a first acquaintance with semiconductor physics will find that this book has fully detailed explanations of the fundamental physical phenomena, providing a good general background ... A brilliant discussion of artificial atomic superstructures of nanometer length scale establishes a link to the most active field of semiconductor physics ... In my opinion the book of R Enderlein and N J M Horing Fundamentals of Semiconductor Physics and Devices is a valuable contribution to the modern didactic literature on the physics of semiconductors. Moreover, it is of considerable value as a reference for specialists as well." J T Devreese Professor at the Physics Department University of Antwerpen, Belgium "In Fundamentals of Semiconductor Physics and Devices, R Enderlein and N J M Horing have provided a very extensive and detailed text on the physics underlying semiconductor devices. More so than any other current text, this book provides a greatly expanded discussion of modern tight-binding methods, helping the students to understand these aspects of electronic structure in clear, simple terms. In connection with this the authors offer a very detailed discussion of deep levels in semiconductors, which are so important to semiconducting properties. Also, in the discussion of transport properties, the book goes into much greater depth about nonlinear and nonequilibrium processes than is usual. It is quite a unique contribution, containing the basic physics which tends to be missing from device-oriented books, but going much further into the essentials needed for device development than any solid-state-physics text." Walter A

Harrison Professor of Applied Physics Stanford University, USA
The Physics of Semiconductor Devices John Wiley & Sons
 Semiconductor Device Physics and Design teaches readers how to approach device design from the point of view of someone who wants to improve devices and can see the opportunity and challenges. It begins with coverage of basic physics concepts, including the physics behind polar heterostructures and strained heterostructures. The book then details the important devices ranging from p-n diodes to bipolar and field effect devices. By relating device design to device performance and then relating device needs to system use the student can see how device design works in the real world.

Semiconductor Device Physics and Simulation Springer
 University Physics is designed for the two- or three-semester calculus-based physics course. The text has been developed to meet the scope and sequence of most university physics courses and provides a foundation for a career in mathematics, science, or engineering. The book provides an important opportunity for students to learn the core concepts of physics and understand how those concepts apply to their lives and to the world around them. Due to the comprehensive nature of the material, we are offering the book in three volumes for flexibility and efficiency.
 Coverage and Scope Our University Physics textbook adheres to the scope and sequence of most two- and three-semester physics courses nationwide. We have worked to make physics interesting and accessible to students while maintaining the mathematical rigor inherent in the subject. With this objective in mind, the content of this textbook has been developed and arranged to provide a logical progression from fundamental to more

advanced concepts, building upon what students have already learned and emphasizing connections between topics and between theory and applications. The goal of each section is to enable students not just to recognize concepts, but to work with them in ways that will be useful in later courses and future careers. The organization and pedagogical features were developed and vetted with feedback from science educators dedicated to the project.

VOLUME III Unit 1: Optics Chapter 1: The Nature of Light Chapter 2: Geometric Optics and Image Formation Chapter 3: Interference Chapter 4: Diffraction

Unit 2: Modern Physics Chapter 5: Relativity Chapter 6: Photons and Matter Waves Chapter 7: Quantum Mechanics Chapter 8: Atomic Structure Chapter 9: Condensed Matter Physics Chapter 10: Nuclear Physics Chapter 11: Particle Physics and Cosmology

Semiconductor Physics Springer Science & Business Media

This book provides one of the most rigorous treatments of compound semiconductor device physics yet published. A complete understanding of modern devices requires a working knowledge of low-dimensional physics, the use of statistical methods, and the use of one-, two-, and three-dimensional analytical and numerical analysis techniques. With its systematic and detailed discussion of these topics, this book is ideal for both the researcher and the student. Although the emphasis of this text is on compound semiconductor devices, many of the principles discussed will also be useful to those interested in silicon devices. Each chapter ends with exercises that have been designed to reinforce concepts, to complement arguments or derivations, and to emphasize the nature of approximations by critically evaluating realistic conditions. One of the most rigorous

treatments of compound semiconductor device physics yet published**Essential reading for a complete understanding of modern devices**Includes chapter-ending exercises to facilitate understanding

Basic Principles World Scientific Publishing Company

Semiconductors have made an enormous impact on 20th 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 and where the requirements of small size, low weight and low energy consumption are especially stringent. The book uses quantum-mechanical concepts and band theory to present the theory of semiconductors in a comprehensible form. It also describes how basic semiconductor devices (e.g. diodes, transistors, and lasers) operate. The book was written for senior high-school students interested in physics.

Introductory Semiconductor Device Physics Springer Science & Business Media

Filling the gap in the literature currently available, this book presents an overview of our knowledge of the physics behind organic semiconductor devices. Contributions from 18 international research groups cover various aspects of this field, ranging from the growth of organic layers and crystals, their electronic properties at interfaces, their photophysics and electrical transport properties to the application of these materials in such different devices as organic field-effect transistors, photovoltaic cells and organic light-emitting diodes.

From the contents: * Excitation Dynamics in Organic Semiconductors * Organic Field-Effect Transistors * Spectroscopy of Organic Semiconductors * Interfaces between Organic Semiconductors and Metals * Analysis and Modeling of Devices * Exciton Formation and Energy Transfer in Organic Light Emitting Diodes * Deposition and Characterization

The Oxford Solid State Basics Springer Science & Business Media

This textbook describes the basic physics of semiconductors, including the hierarchy of transport models, and connects the theory with the functioning of actual semiconductor devices. Details are worked out carefully and derived from the basic physical concepts, while keeping the internal coherence of the analysis and explaining the different levels of approximation. Coverage includes the main steps used in the fabrication process of integrated circuits: diffusion, thermal oxidation, epitaxy, and ion implantation. Examples are based on silicon due to its industrial importance. Several chapters are included that provide the reader with the quantum-mechanical concepts necessary for understanding the transport properties of crystals. The behavior of crystals incorporating a position-dependent impurity distribution is described, and the different hierarchical transport models for semiconductor devices are derived (from the Boltzmann transport equation to the hydrodynamic and drift-diffusion models). The transport models are then applied to a detailed description of the main semiconductor-device architectures (bipolar, MOS, CMOS), including a number of solid-state sensors. The final chapters are devoted to the measuring methods for semiconductor-device parameters, and to a brief illustration of the scaling rules and numerical methods applied to

the design of semiconductor devices.

Essentials of Semiconductor Physics John Wiley & Sons

Market_Desc: · Electrical Engineers Special Features: · Over 150 solved examples that clarify concepts are integrated throughout the text. · End-of-chapter summary tables and hundreds of figures are included to reinforce the intricacies of modern semiconductor devices· Coverage of device optimization issues shows the reader how in each device one has to trade one performance against another About The Book: This introductory text 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 are based. Next, the author focuses on the operation of the important semiconductor devices along with issues relating to the optimization of device performance.

Physics and Technology Wiley Global Education

Neamen's *Semiconductor Physics and Devices*, Third Edition.

deals with the electrical properties and characteristics of semiconductor materials and devices. The goal of this book is to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics, and semiconductor device physics in a clear and understandable way.

Semiconductor Physics and Devices Academic Press

The purpose of this workshop is to spread the vast amount of information available on semiconductor physics to every possible field throughout the scientific community. As a result, the latest findings, research and discoveries can be quickly disseminated. This workshop provides all participating research groups with an

excellent platform for interaction and collaboration with other members of their respective scientific community. This workshop's technical sessions include various current and significant topics for applications and scientific developments, including • Optoelectronics • VLSI & ULSI Technology • Photovoltaics • MEMS & Sensors • Device Modeling and Simulation • High Frequency/ Power Devices • Nanotechnology and Emerging Areas • Organic Electronics • Displays and Lighting Many eminent scientists from various national and international organizations are actively participating with their latest research works and also equally supporting this mega event by joining the various organizing committees.

Physics of Semiconductor Devices Elsevier

Introduction to Semiconductor Device Physics is a popular and established text that offers a thorough introduction to the underlying physics of semiconductor devices. It begins with a

review of basic solid state physics, then goes on to describe the properties of semiconductors including energy bands, the concept of effective mass, carrier concentration, and conduction in more detail. Thereafter the book is concerned with the principles of operation of specific devices, beginning with the Gunn Diode and the p-n junction. The remaining chapters cover the on specific devices, including the LED, the bipolar transistor, the field-effect transistor, and the semiconductor laser. The book concludes with a chapter providing a brief introduction to quantum theory. Not overtly mathematical, Introduction to Semiconductor Device Physics introduces only those physical concepts required for an understanding of the semiconductor devices being considered. The author's intuitive style, coupled with an extensive set of worked problems, make this the ideal introductory text for those concerned with understanding electrical and electronic engineering, applied physics, and related subjects.

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