

Principles Of Semiconductor Devices

Optical Properties of Crystalline and Amorphous Semiconductors
 Solutions Manual for Principles of Semiconductor Devices
 Physics of Semiconductor Devices
 Operating Principles of Semiconductor Devices
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 Modern Semiconductor Device Physics
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 Introductory Semiconductor Device Physics
 Semiconductor Devices and Integrated Electronics

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Optical Properties of Crystalline and Amorphous Semiconductors
 Cambridge University Press

For some time there has been a need for a semiconductor device book that carries diode and transistor theory beyond an introductory level and yet has space to touch on a wider range of semiconductor device principles and applications. Such topics are covered in specialized monographs numbering many hundreds, but the voluminous nature of this literature limits access for students. This book is the outcome of attempts to develop a broad course on devices and integrated electronics for university students at about senior-year level. The educational prerequisites are an introductory course in semiconductor junction and transistor concepts, and a course on analog and digital circuits that has introduced the concepts of rectification, amplification, oscillators, modulation and logic and switching circuits. The book should also be of value to professional engineers and physicists because of both, the information included and the detailed guide to the literature given by the references. The aim has been to bring some measure of order into the subject area examined and to provide a basic structure from which teachers may develop themes that are of most interest to students and themselves. Semiconductor devices and integrated circuits are reviewed and fundamental factors that control power levels, frequency, speed, size and cost are discussed. The text also briefly mentions how devices are used and presents circuits and comments on representative applications. Thus, the book seeks a balance between the extremes of device physics and circuit design. *Solutions Manual for Principles of Semiconductor Devices* McGraw-Hill Education

Adopting a uniquely pedagogical approach, this comprehensive textbook on the quantum mechanics of semiconductor materials and devices focuses on the materials, components and devices themselves whilst incorporating a substantial amount of fundamental physics related to condensed matter theory and quantum mechanics. Written primarily for advanced undergraduate students in physics and engineering, this book can also be used as a supporting text for introductory quantum mechanics courses, and will be of interest to anyone interested in how electronic devices function at a fundamental level. Complete with numerous exercises, and with all the necessary mathematics and physics included in appendices, this book guides the reader seamlessly through the principles of quantum mechanics and the quantum theory of metals and semiconductors, before describing in detail how devices are exploited within electric circuits and in

the hardware of computers, for example as amplifiers, switches and transistors.

Physics of Semiconductor Devices Elsevier
 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.

Operating Principles of Semiconductor Devices CRC Press
 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.

Principles of Semiconductor Network Testing Springer Science & Business Media

The goal of this text is to provide the basic principles of common semiconductor devices, with a special focus on Metal-Oxide-Semiconductor Field-Effect-Transistors (MOSFETs).

Compact Modeling Springer Science & Business Media
 Providing an important link between the theoretical knowledge in the field of non-linear physics and practical application problems in microelectronics, the purpose of the book is popularization of the physical approach for reliability assurance. Another unique aspect of the book is the coverage given to the role of local structural defects, their mathematical description, and their impact on the reliability of the semiconductor devices.

Introductory Semiconductor Device Physics Springer Science & Business Media

Semiconductor power devices are the heart of power electronics. They determine the performance of power converters and allow topologies with high efficiency. Semiconductor properties, pn-junctions and the physical phenomena for understanding power devices are discussed in depth. Working principles of state-of-the-art power diodes, thyristors, MOSFETs and IGBTs are explained in detail, as well as key aspects of semiconductor device production technology. In practice, not only the semiconductor, but also the thermal and mechanical properties of packaging and interconnection technologies are essential to predict device behavior in circuits. Wear and aging mechanisms are identified and reliability analyses principles are developed. Unique information on destructive mechanisms, including typical failure pictures, allows assessment of the ruggedness of power devices. Also parasitic effects, such as device induced electromagnetic interference problems, are addressed. The book concludes with modern power electronic system integration techniques and trends.

Semiconductor Physics and Devices Oxford University Press, USA

This text aims to provide the fundamentals necessary to understand semiconductor device characteristics, operations and limitations. Quantum mechanics and quantum theory are explored, and this background helps give students a deeper understanding of the essentials of physics and semiconductors. *Principles of Semiconductor Devices* Springer Science & Business Media

The purpose of this book is to provide the reader with a self-contained treatment of fundamental solid state and semiconductor device physics. The material presented in the text is based upon the lecture notes of a one-year graduate course sequence taught by this author for many years in the Department of Electrical Engineering of the University of Florida. It is intended as an introductory textbook for graduate students in electrical engineering. However, many students from other disciplines and backgrounds such as chemical engineering, materials science, and physics have also taken this course sequence, and will be interested in the material presented herein. This book may also serve as a general reference for device engineers in the semiconductor industry. The present volume covers a wide variety of topics on basic solid state physics and physical principles of various semiconductor devices. The main subjects covered include crystal structures, lattice dynamics, semiconductor statistics, energy band theory, excess carrier phenomena and recombination mechanisms, carrier transport and scattering mechanisms, optical properties, photoelectric effects, metal-semiconductor devices, the p-n junction diode, bipolar junction transistor, MOS devices, photonic devices, quantum effect devices, and high speed III-V semiconductor devices. The

text presents a unified and balanced treatment of the physics of semiconductor materials and devices. It is intended to provide physicists and materials scientists with more device backgrounds, and device engineers with a broader knowledge of fundamental solid state physics.

Principles of Solar Cells, LEDs and Diodes Springer Science & Business Media

Designed for senior and first year graduates students in electrical and computer engineering departments, taking a semiconductor device course. This text focuses on the fundamentals of semiconductor devices and the physical operating principles within them. It provides the underlying theories, with applications of semiconductor-device physics.

Advanced Theory of Semiconductor Devices John Wiley & Sons
The technological progress is closely related to the developments of various materials and tools made of those materials. Even the different ages have been defined in relation to the materials used. Some of the major attributes of the present-day age (i.e., the electronic materials' age) are such common tools as computers and fiber-optic telecommunication systems, in which semiconductor materials provide vital components for various micro-electronic and optoelectronic devices in applications such as computing, memory storage, and communication. The field of semiconductors encompasses a variety of disciplines. This book is not intended to provide a comprehensive description of a wide range of semiconductor properties or of a continually increasing number of the semiconductor device applications. Rather, the main purpose of this book is to provide an introductory perspective on the basic principles of semiconductor materials and their applications that are described in a relatively concise format in a single volume. Thus, this book should especially be suitable as an introductory text for a single course on semiconductor materials that may be taken by both undergraduate and graduate engineering students. This book should also be useful, as a concise reference on semiconductor materials, for researchers working in a wide variety of fields in physical and engineering sciences.

Principles of the Physics of Semiconductor Devices John Wiley & Sons

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.

Nitride Semiconductor Devices Elsevier

Most of the recent texts on compact modeling are limited to a particular class of semiconductor devices and do not provide comprehensive coverage of the field. Having a single comprehensive reference for the compact models of most commonly used semiconductor devices (both active and passive) represents a significant advantage for the reader. Indeed, several kinds of semiconductor devices are routinely encountered in a single IC design or in a single modeling support group. Compact Modeling includes mostly the material that after several years of IC design applications has been found both theoretically sound and practically significant. Assigning the individual chapters to the groups responsible for the definitive work on the subject assures the highest possible degree of expertise on each of the covered models.

Physics of Electronic Materials Elsevier

For over thirty years, Stan Amos has provided students and practitioners with a text they could rely on to keep them at the forefront of transistor circuit design. This seminal work has now been presented in a clear new format and completely updated to include the latest equipment such as laser diodes, Trapatt diodes, optocouplers and GaAs transistors, and the most recent line output stages and switch-mode power supplies. Although integrated circuits have widespread application, the role of discrete transistors is undiminished, both as important building blocks which students must understand and as practical solutions to design problems, especially where appreciable power output or high voltage is required. New circuit techniques covered for the first time in this edition include current-dumping amplifiers, bridge output stages, dielectric resonator oscillators, crowbar protection circuits, thyristor field timebases, low-noise blocks and SHF amplifiers in satellite receivers, video clamps, picture enhancement circuits, motor drive circuits in video recorders and camcorders, and UHF modulators. The plan of the book remains the same: semiconductor physics is introduced, followed by details of the design of transistors, amplifiers, receivers, oscillators and generators. Appendices provide information on transistor manufacture and parameters, and a new appendix on transistor letter symbols has been included.

Fundamentals of Semiconductors Springer Science & Business Media

Semiconductor lithography is one of the key steps in the manufacturing of integrated silicon-based circuits. In fabricating a semiconductor device such as a transistor, a series of hot processes consisting of vacuum film deposition, oxidations, and dopant implantation are all patterned into microscopic circuits by the wet processes of lithography. Lithography, as adopted by the semiconductor industry, is the process of drawing or printing the pattern of an integrated circuit in a resist material. The pattern is formed and overlaid to a previous circuit layer as many as 30 times in the manufacture of logic and memory devices. With the resist pattern acting as a mask, a permanent device structure is formed by subtractive (removal) etching or by additive deposition of metals or insulators. Each process step in lithography uses inorganic or organic materials to physically transform semiconductors of silicon, insulators of oxides, nitrides, and organic polymers, and metals, into useful electronic devices. All forms of electromagnetic radiation are used in the processing. Lithography is a multidisciplinary science of materials, processes, and equipment, interacting to produce three-dimensional structures. Many aspects of chemistry, electrical engineering, materials science, and physics are involved. The purpose of this book is to bring together the work of many scientists and engineers over the last 10 years and focus upon the basic resist materials, the lithographic processes, and the fundamental principles behind each lithographic process.

Semiconductor Devices John Wiley & Sons

"This book is an introduction to the physical principles of modern semiconductor devices and their advanced fabrication technology. It begins with a brief historical review of major devices and key technologies and is then divided into three sections: semiconductor material properties, physics of semiconductor devices and processing technology to fabricate these semiconductor devices."--Publisher's description.

Principles of the Physics of Semiconductor Devices Springer

This is the first book to be published on physical principles, mathematical models, and practical simulation of GaN-based devices. Gallium nitride and its related compounds enable the fabrication of highly efficient light-emitting diodes and lasers for a broad spectrum of wavelengths, ranging from red through yellow and green to blue and ultraviolet. Since the breakthrough demonstration of blue laser diodes by Shuji Nakamura in 1995, this field has experienced tremendous growth worldwide. Various applications can be seen in our everyday life, from green traffic lights to full-color outdoor displays to high-definition DVD players. In recent years, nitride device modeling and simulation has gained importance and advanced software tools are emerging. Similar developments occurred in the past with other semiconductors such as silicon, where computer simulation is now an integral part of device development and fabrication. This book presents a review of modern device concepts and models, written by leading researchers in the field. It is intended for scientists and device engineers who are interested in employing computer simulation for nitride device design and analysis.

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Electrical Engineering Advanced Theory of Semiconductor Devices
Semiconductor devices are ubiquitous in today's world and are found increasingly in cars, kitchens and electronic door locks, attesting to their presence in our daily lives. This comprehensive book provides the fundamentals of semiconductor device theory from basic quantum physics to computer-aided design. Advanced Theory of Semiconductor Devices will improve your understanding of computer simulation of devices through a thorough discussion of basic equations, their validity, and numerical solutions as they are contained in current simulation tools. You will gain state-of-the-art knowledge of devices used in both III-V compounds and silicon technology. Specially featured are novel approaches and explanations of electronic transport, particularly in p-n junction diodes. Close attention is also given to innovative treatments of quantum-well laser diodes and hot electron effects in silicon technology. This in-depth book is written for engineers, graduate students, and research scientists in solid-state electronics who want to gain a better understanding of the principles underlying semiconductor devices.

Semiconductor Materials Oxford University Press, USA

Optical Properties of Crystalline and Amorphous Semiconductors: Materials and Fundamental Principles presents an introduction to the fundamental optical properties of semiconductors. This book presents tutorial articles in the categories of materials and fundamental principles (Chapter 1), optical properties in the reststrahlen region (Chapter 2), those in the interband transition region (Chapters 3 and 4) and at or below the fundamental absorption edge (Chapter 5). **Optical Properties of Crystalline and Amorphous Semiconductors: Materials and Fundamental Principles** is presented in a form which could serve to teach the underlying concepts of semiconductor optical properties and their implementation. This book is an invaluable resource for device engineers, solid-state physicists, material scientists and students specializing in the fields of semiconductor physics and device engineering.

Semiconductor Lithography Springer Science & Business Media

The new edition of the most detailed and comprehensive single-volume reference on major semiconductor devices. The Fourth Edition of **Physics of Semiconductor Devices** remains the standard reference work on the fundamental physics and operational characteristics of all major bipolar, unipolar, special microwave, and optoelectronic devices. This fully updated and expanded edition includes approximately 1,000 references to original research papers and review articles, more than 650 high-quality technical illustrations, and over two dozen tables of material parameters. Divided into five parts, the text first provides a summary of semiconductor properties, covering energy band, carrier concentration, and transport properties. The second part surveys the basic building blocks of semiconductor devices, including p-n junctions, metal-semiconductor contacts, and metal-insulator-semiconductor (MIS) capacitors. Part III examines bipolar transistors, MOSFETs (MOS field-effect transistors), and other field-effect transistors such as JFETs (junction field-effect transistors) and MESFETs (metal-semiconductor field-effect transistors). Part IV focuses on negative-resistance and power devices. The book concludes with coverage of photonic devices and sensors, including light-emitting diodes (LEDs), solar cells, and various photodetectors and semiconductor sensors. This classic volume, the standard textbook and reference in the field of semiconductor devices: Provides the practical foundation necessary for understanding the devices currently in use and evaluating the performance and limitations of future devices. Offers completely updated and revised information that reflects advances in device concepts, performance, and application. Features discussions of topics of contemporary interest, such as applications of photonic devices that convert optical energy to electric energy. Includes numerous problem sets, real-world examples, tables, figures, and illustrations; several useful appendices; and a detailed solutions manual for Instructor's only. Explores new work on leading-edge technologies such as MODFETs, resonant-tunneling diodes, quantum-cascade lasers, single-electron transistors, real-space-transfer devices, and MOS-controlled thyristors. **Physics of Semiconductor Devices, Fourth Edition** is an indispensable resource for design engineers, research scientists, industrial and electronics engineering managers, and graduate students in the field.