Principles Of Semiconductor Devices

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Principles Of Semiconductor Devices ***2023-02-21***

SELLERS STERLING

Physical Principles of Semiconductor Devices Springer Science & Business Media
The purpose of this book is to provide the reader with a self-contained treatment of fundamen tal 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 mat erials scientists with more device backgrounds, and device engineers with a broader knowledge of fundamental solid state physics.
Introduction to Semiconductor Physics Wiley-Interscience
A textbook introducing the physical concepts required for acomprehensive understanding of p-n junction devices,

light emittingdiodes and solar cells. Semiconductor devices have made a major impact on the way wework and live. Today semiconductor p-n junction diode devices are experiencing substantial growth:solar cells are used on an unprecedented scale in the renewable energy industry; and light emitting diodes(LEDs) are revolutionizing energy efficient lighting. These twoemerging industries based on p-n junctions make a significantcontribution to the reduction in fossil fuel consumption. Principles of Solar Cells, LEDs and Diodes covers the twomost important applications of semiconductor diodes - solar cells and LEDs - together with quantitative coverageof the physics of the p-n junction. _ e reader will gain a thorough understanding of p-n junctions asthe text begins with semiconductor and junction device fundamentalsand extends to the practical implementation of semiconductors inboth photovoltaic and LED devices. _ e treatment of a range of importantsemiconductor materials and device structures is also presented in a readable manner. Topics are divided into the following six chapters; • Semiconductor Physics • The PN Junction Diode • Photon Emission and Absorption • The Solar Cell • Light Emitting Diodes • Organic Semiconductors, OLEDs and Solar Cells Containing student problems at the end of each chapter andworked example problems throughout, this textbook is intended forsenior level undergraduate students doing courses in electricalengineering, physics and materials science. Researchers working onsolar cells and LED devices, and those in the electronics industrywould also benefit from the background information the bookprovides.

Introductory Semiconductor Device Physics John Wiley & Sons

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).

Principles of Semiconductor Network Testing Principles of Semiconductor Devices

The subject of semiconductor physics today includes not only many of the aspects that constitute solid state physics, but also much more. It includes what happens at the nanoscale and at surfaces and interfaces, behavior with few interaction events and few carriers —- electrons and their quasi-particle holes —- in the valence bands, the exchange of energies in various forms, the coupling of energetic events over short and long length scales, quantum reversibility tied to macroscale linearity and eventually to nonlinearities, the thermodynamic and statistical consequences of fluctuation-dissipation, and others. This text brings together traditional solid-state approaches from the 20th century with developments of the early part of the 21st century, to reach an understanding of semiconductor physics in its multifaceted forms. It reveals how an understanding of what happens within the material can lead to insights into what happens in its use. The collection of four textbooks in the Electroscience series culminates in a comprehensive understanding of nanoscale devices — electronic, magnetic, mechanical and optical — in the 4th volume. The series builds up to this last subject with volumes devoted to underlying semiconductor and solid-state physics.

Semiconductor Devices

Virtualbookworm Publishing
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 Semiconductor Physics and Devices World Scientific Publishing Company
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.

Theory, Design and Experiment Springer
Semiconductor Circuits: Theory, Design and Experiment focuses on the design and modification of circuits involving transistors and related semiconductor devices. This book is divided into three parts. The four chapters of Part I are concerned with the physical theory of semiconductors; production of pn junctions; and characteristics and equivalent circuits of transistors. The treatment of physical theory is briefly mentioned. Part II forms the major portion of this book and is made up of seven chapters. These chapters have been written at a practical level, including a number of complete circuit designs. Chapters 10 and 11, in particular, deal with the aspects of semiconductors. Several laboratory demonstrations and experiments with semiconductors are provided in Part III. This publication is written as an undergraduate and technical college textbook that helps electrical engineering students in choosing the right

component and device for a particular application.

Physical Principles of Semiconductor Devices Elsevier

Electronic components made out of semiconductors surround us in our daily lives. Semiconductor devices are used in computers, hand-held devices, and cell phones. They are also used to control the power in refrigerators, ovens, and dish-washers. They are used extensively in the cars we drive, the trains we ride in, and the airplanes we fly in. Semiconductor devices are also the principle component of solar panels on our homes. In short, semiconductor devices are present in most anything that pertains to energy, communications, or information. This book is an introduction to the operating principles of these semiconductor devices. This book is appropriate for undergraduate students in engineering.

Principles of Semiconductor Devices World Scientific

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.

Nitride Semiconductor Devices John Wiley & Sons

Basic Principles of Electronics, Volume 2: Semiconductors focuses on the properties, applications, and characteristics of semiconductors. The publication first elaborates on conduction in the solid state, conduction and heat, and semiconductors. Discussions focus on extrinsic or impurity semiconductors, electrons and holes, effect of temperature on the conductivity, mean free path, Joule heating effect, "vacancies" in crystals, and Drude's theory of metallic conduction. The text then ponders on semiconductor technology and simple devices, transistor, and transistor production and characteristics. Topics include strain gauges, thermistors, thermoelectric semiconductors, crystal preparation, photoconductors, and the Hall effect. The book elaborates on special devices, processes, and uses, common transistor circuitry, and a low-frequency equivalent circuit for common base, including radiation detection, optoelectronics, field effect transistors, sonar amplifier, oscillators, and multi-stage amplifiers. The publication is highly recommended for technical college students and researchers wanting to study semiconductors.

Introduction to the Design of Amplifiers, Receivers and Digital Circuits John Wiley &

Sons
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

Basic Principles Elsevier
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.

University Physics Irwin Professional Publishing
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.
Principles of Transistor Circuits Tata McGraw-Hill Education
Principles of Semiconductor Network Testing gathers together comprehensive information which test and process professionals will find invaluable. The techniques outlined will help ensure that test methods and data collected reflect actual device performance, rather than 'testing the tester' or being lost in the noise floor. This book addresses the fundamental issues underlying the semiconductor test discipline. The test engineer must understand the basic principles of semiconductor fabrication and process and have an in-depth knowledge of circuit functions, instrumentation and noise sources. Introduces a novel component-testing philosophy for semiconductor test, product and design engineers Best new source of information for experienced semiconductor engineers as well as entry-level personnel Eight chapters about semiconductor testing
Semiconductor Physics Wiley-Blackwell
Principles of Semiconductor DevicesOxford University Press, USA
Principles of Semiconductor Devices Springer
As is well known, Silicon widely dominates the market of semiconductor devices and circuits, and in particular is well suited for Ultra Large Scale Integration processes. However, a number of III-V compound semiconductor devices and circuits have recently been built, and the contributions in this volume are devoted to those types of materials, which offer a number of interesting properties. Taking into account the great variety of problems encountered and of their mutual correlations when fabricating a circuit or even a device, most of the aspects of III-V microelectronics, from fundamental physics to modelling and technology, from materials to devices and circuits are reviewed. Containing contributions from European researchers of international repute this volume is the definitive reference source for anyone interested in the latest advances and results of current experimental research in III-V microelectronics.
The Role of the PN Junction Academic Press
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.

Operating Principles of Semiconductor Devices Wiley-IEEE Press

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

Semiconductor Physics And Devices Oxford University Press

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.

Physics of Semiconductor Devices 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.