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# Principles Of Semiconductor Devices And Heterojunctions By Bart Van Zeghbroeck

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University Physics  
 Principles of Semiconductor Network Testing  
 Introductory Semiconductor Device Physics  
 Semiconductor Devices  
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 Semiconductor Devices : Basic Principles  
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 SEMICONDUCTOR DEVICES  
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 Operating Principles of Semiconductor Devices

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 And Heterojunctions By Bart Van  
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## EMILIO STEVENS

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**University Physics** Oxford University Press  
 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 Semiconductor Network Testing* CRC Press  
 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.

**Introductory Semiconductor Device Physics** 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.

**Semiconductor Devices** Springer Science & Business Media 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.

Principles of Semiconductor Devices Tata McGraw-Hill Education 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.

*Fundamentals of Semiconductor Physics and Devices* John Wiley & Sons

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.

*Principles and Simulation* Wiley-IEEE Press

Principles of Electrical Engineering Materials and Devices has been developed to bridge the gap between traditional electronic circuits texts and semiconductor texts

*The Role of the PN Junction* Springer

Aimed primarily at the undergraduate students pursuing courses in semiconductor physics and semiconductor devices, this text emphasizes the physical understanding of the underlying principles of the subject. Since engineers use semiconductor devices as circuit elements, device models commonly used in the circuit simulators, e.g. SPICE, have been discussed in detail. Advanced topics such as lasers, heterojunction bipolar transistors, second order effects in BJTs, and MOSFETs are also covered. With such in-depth coverage and a practical approach, practising engineers and PG students can also use this book as a ready reference.

*Principles Of Semiconductor Devices, Intr'l/e* McGraw-Hill Education

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, Practices, and Materials** Wiley-Interscience

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.

Modern Semiconductor Device Physics Wiley-Interscience

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.

Principles, Theory and Nanoscale Createspace Independent Publishing Platform

This is the first book to be published on physical principles,

mathematical models, and practical simulation of GaN-based devices. The first part of the book covers electronic, optical, and thermal material parameters of nitride semiconductors that are employed in device models.

Physics and Materials Properties Electrosience Series

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 the Physics of Semiconductor Devices**

Academic Press

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 and Technology* 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 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.

*Semiconductor Physics And Devices* Oxford University Press, USA

The monograph examines physical processes in semiconductor devices which determine their parameters and characteristics, peculiarities of circuit application, stability of parameters of semiconductor devices, and their reliability. A short description of the principle electrophysical properties of semiconductor materials is given along with basic information about the construction and technology of semiconductor devices and perspectives for the development of semiconductor technology.

*Semiconductor Lithography* Irwin Professional Publishing

Principles of Semiconductor Devices Oxford University Press, USA

*Semiconductor Physics* Elsevier

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 mic- 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.

**Semiconductor Physical Electronics** John Wiley & Sons Incorporated

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.

*Semiconductor Physics and Devices* World Scientific

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