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# Study For Semiconductor Device Fundamentals By Pierret

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Analysis of Piezoelectric Semiconductor Structures

MATLAB

Semiconductor Lasers I

Using MATLAB in the Teaching and Learning of Semiconductor Device Fundamentals

Fundamentals of Semiconductor Physics and Devices

Fundamentals of Semiconductor Manufacturing and Process Control

Fundamentals of Semiconductor Physics and Devices

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Micro and Nanoelectronics Devices, Circuits and Systems  
Introductory Semiconductor Device Physics for Chip Design and Manufacturing  
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## **PHELPS JIMENEZ**

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Analysis of Piezoelectric Semiconductor Structures John Wiley & Sons

This might be the first book that deals mostly with the 3D technology computer-aided design (TCAD) simulations of major state-of-the-art stress- and strain-engineered advanced semiconductor devices: MOSFETs, BJTs, HBTs, nonclassical MOS devices, finFETs, silicon-germanium hetero-FETs, solar cells, power devices, and memory devices. The book focuses on how to

set up 3D TCAD simulation tools, from mask layout to process and device simulation, including design for manufacturing (DFM), and from device modeling to SPICE parameter extraction. The book also offers an innovative and new approach to teaching the fundamentals of semiconductor process and device design using advanced TCAD simulations of various semiconductor structures. The simulation examples chosen are from the most popular devices in use today and provide useful technology and device physics insights. To extend the role of TCAD in today's advanced technology era, process compact modeling and DFM issues have been included for design-technology interface generation. Unique in approach, this book provides an integrated view of silicon

technology and beyond—with emphasis on TCAD simulations. It is the first book to provide a web-based online laboratory for semiconductor device characterization and SPICE parameter extraction. It describes not only the manufacturing practice associated with the technologies used but also the underlying scientific basis for those technologies. Written from an engineering standpoint, this book provides the process design and simulation background needed to understand new and future technology development, process modeling, and design of nanoscale transistors. The book also advances the understanding and knowledge of modern IC design via TCAD, improves the quality in micro- and nanoelectronics R&D, and supports the training of semiconductor specialists. It is intended as a textbook or reference for graduate students in the field of semiconductor fabrication and as a reference for engineers involved in VLSI technology development who have to solve device and process problems. CAD specialists will also find this book useful since it discusses the organization of the simulation system, in addition to presenting many case studies where the user applies TCAD tools in different situations.

*MATLAB* Springer Nature

From physical process to practical applications - Singh makes the complexities of modern semiconductor devices clear! The semiconductor devices that are driving today's information, technologies may seem remarkably complex, but they don't have to be impossible to understand. Filled with figures, flowcharts, and solved examples, Jasprit Singh's *Semiconductor Devices* provides an accessible, well-balanced introduction to semiconductor physics and its application to modern devices.

Beginning with the physical process behind semiconductor devices, Singh clearly explains difficult topics, including bandstructure, effective masses, holes, doping, carrier transport, and lifetimes. Following these physical fundamentals, you'll explore the operation of important semiconductor devices, such as diodes, transistors, light emitters, and detectors, along with issues relating to the optimization of device performance. Features Over 150 solved examples, integrated throughout the text, clarify difficult concepts. End-of-chapter summary tables and hundreds of figures reinforce the intricacies of modern semiconductor devices. Discussion of device optimization issues explains why you have to trade one performance against another in devices. Shows the relationship of physical parameters to SPICE parameters and its impact on circuit issues. Technology Roadmaps outline what's currently happening in the field and present a look at where device technology is headed in the future. A Bit of History sections, included in each chapter, explore the history of the concepts developed and provide a snapshot of the personalities involved and the challenges of the time.

*Semiconductor Lasers I* BoD - Books on Demand

In recent years, technological advancements have enabled higher-learning institutions to offer millions of independent learners the opportunity to participate in open-access online courses. As this practice expands, drawing considerable media attention, questions continue to arise regarding pedagogical methodology and the long-term viability of open learning. Furthering Higher Education Possibilities through Massive Open Online Courses seeks to provide a space for discussion of MOOCs: what they mean for the learning process, how they are redefining

the concept of a classroom, and what effects they may have on the role of teachers. Featuring emerging research on a variety of topics relating to distance education, informal learning, as well as educational costs and funding, this book is aimed at teachers, administrators, business professionals, and designers of both curricular resources and e-classroom technology.

Using MATLAB in the Teaching and Learning of Semiconductor Device Fundamentals GRIN Verlag

Although roughly a half-century old, the field of study associated with semiconductor devices continues to be dynamic and exciting. New and improved devices are being developed at an almost frantic pace. While the number of devices in complex integrated circuits increases and the size of chips decreases, semiconductor properties are now being engineered to fit design specifications. Semiconductor Device Fundamentals serves as an excellent introduction to this fascinating field. Based in part on the Modular Series on Solid State Devices, this textbook explains the basic terminology, models, properties, and concepts associated with semiconductors and semiconductor devices. The book provides detailed insight into the internal workings of building block device structures and systematically develops the analytical tools needed to solve practical device problems.

Fundamentals of Semiconductor Physics and Devices Springer

An introduction to the fundamentals of semiconductor physics and engineering This book discusses fundamental semiconductor physics of devices and on-chip interconnections for physicists and links these concepts to engineering applications and case studies of computer chips. The book is organized in three parts. The first part deals with the representation of information and

computation. The second part covers semiconductor device physics within the context of computation. The third part reviews chip design and semiconductor fabrication. The book includes relevant equations, with the aim of closing the gap in the existing literature with actual case studies and engineering applications. Examples are provided in each chapter to illustrate physical and electrical concepts through the use of high-performance silicon technologies. Introductory Semiconductor Device Physics for Chip Design and Manufacturing: Provides physical descriptions and illustrations with data visualizations to facilitate intuitive understanding of semiconductor physics, devices and on-chip interconnections Blends theoretical physics treatment with engineering applications and real case studies for manufactured chips Presents complementary-metal-oxide-semiconductor (CMOS) transistors in high-performance server microprocessors with static CMOS combinational digital circuit design examples Offers a rich array of student problem sets, mid-term exams, and final exams with a glossary at the end of the book M. Y. Lanzerotti, PhD, has over 15 years of engineering experience in designing integrated circuits for high-performance server chips and aerospace applications. Dr. Lanzerotti is Assistant Professor of Physics at Augsburg College and previously held positions as Associate Professor of Computer Engineering at Air Force Institute of Technology, Instructor at Harvard Summer School, Visiting Faculty Fellow at Pacific Lutheran University, Visiting Faculty Fellow at Sapienza University of Rome, and Research Staff Member at IBM Thomas J. Watson Research Center. This book is inspired from Dr. Lanzerotti's course, "Introductory Semiconductor Device Physics for Chip Design and

Manufacturing,” at Harvard Summer School. Dr. Lanzerotti holds physics degrees from Harvard College, the University of Cambridge, and Cornell University. Dr. Lanzerotti holds four U.S. patents, was awarded an IEEE Technical Innovation Award in 2007 and an IBM Outstanding Research Contribution Award in 1998, and was Editor-in-Chief of the IEEE Solid-State Circuits Society Magazine.

### **Fundamentals of Semiconductor Manufacturing and Process Control** IGI Global

This textbook gives a complete and fundamental introduction to the properties of III-V compound semiconductor devices, highlighting the theoretical and practical aspects of their device physics. Beginning with an introduction to the basics of semiconductor physics, it presents an overview of the physics and preparation of compound semiconductor materials, as well as a detailed look at the electrical and optical properties of compound semiconductor heterostructures. The book concludes with chapters dedicated to a number of heterostructure electronic and photonic devices, including the high-electron-mobility transistor, the heterojunction bipolar transistor, lasers, unipolar photonic devices, and integrated optoelectronic devices. Featuring chapter-end problems, suggested references for further reading, as well as clear, didactic schematics accompanied by six information-rich appendices, this textbook is ideal for graduate students in the areas of semiconductor physics or electrical engineering. In addition, up-to-date results from published research make this textbook especially well-suited as a self-study and reference guide for engineers and researchers in related industries.

### *Fundamentals of Semiconductor Physics and Devices* Springer Science & Business Media

The advent of the microelectronics technology has made ever-increasing numbers of small devices on a same chip. The rapid emergence of ultra-large-scaled-integrated (ULSI) technology has moved device dimension into the sub-quarter-micron regime and put more than 10 million transistors on a single chip. While traditional closed-form analytical models furnish useful intuition into how semiconductor devices behave, they no longer provide consistently accurate results for all modes of operation of these very small devices. The reason is that, in such devices, various physical mechanisms affect the device performance in a complex manner, and the conventional assumptions (i. e. , one-dimensional treatment, low-level injection, quasi-static approximation, etc. ) employed in developing analytical models become questionable. Thus, the use of numerical device simulation becomes important in device modeling. Researchers and engineers will rely even more on device simulation for device design and analysis in the future. This book provides comprehensive coverage of device simulation and analysis for various modern semiconductor devices. It will serve as a reference for researchers, engineers, and students who require in-depth, up-to-date information and understanding of semiconductor device physics and characteristics. The materials of the book are limited to conventional and mainstream semiconductor devices; photonic devices such as light emitting and laser diodes are not included, nor does the book cover device modeling, device fabrication, and circuit applications.

### **Physical and Chemical Aspects of Organic Electronics**

World Scientific Publishing Company

A thoroughly updated third edition of an classic and widely adopted text, perfect for practical transistor design and in the classroom. Covering a variety of recent developments, the internationally renowned authors discuss in detail the basic properties and designs of modern VLSI devices, as well as factors affecting performance. Containing around 25% new material, coverage has been expanded to include high-k gate dielectrics, metal gate technology, strained silicon mobility, non-GCA (Gradual Channel Approximation) modelling of MOSFETs, short-channel FinFETS, and symmetric lateral bipolar transistors on SOI. Chapters have been reorganized to integrate the appendices into the main text to enable a smoother learning experience, and numerous additional end-of-chapter homework exercises (+30%) are included to engage students with real-world problems and test their understanding. A perfect text for senior undergraduate and graduate students taking advanced semiconductor devices courses, and for practicing silicon device professionals in the semiconductor industry.

**Nitride Semiconductor Devices** John Wiley & Sons

The book summarizes Ting Lei's PhD study on a series of novel conjugated polymers for field-effect transistors (FETs). Studies contain many aspects of polymer FETs, including backbone design, side-chain engineering, property study, conformation effects and device fabrication. The research results have previously scattered in many important journals and conferences worldwide. The book is likely to be of interest to university researchers, engineers and graduate students in materials sciences and chemistry who wish to learn some principles,

strategy, and applications of polymer FETs.

Fundamentals of Semiconductors Springer

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 Structure 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 [Semiconductor Device Fundamentals](#) Springer Nature

Offers an innovative and accessible new approach to the teaching of the fundamentals of semiconductor components by exploiting simulation to explain the mechanisms behind current in semiconductor structures. Simulation is a popular tool used by engineers and scientists in device and process research and the accompanying two dimensional process and device simulation software 'MicroTec', enables students to make their own devices and allows the recreation of real performance under varying parameters. There is also an accompanying ftp site containing ICECREAM software (Integrated Circuits and Electronics group Computerized Remedial Education And Mastering) which improves understanding of the physics involved and covers semiconductor physics, junction diodes, silicon bipolar and MOS transistors and photonic devices like LEDs and lasers. Features include: \* MicroTec diskette containing a two-dimensional process and device simulator on which the many simulation exercises mentioned in the text can be performed thereby facilitating learning through experimentation \* Computer aided education software (accessible via ftp) featuring question and answer games, which enables students to enhance their understanding of the physics involved and allows lecturers to set assignments \* Broad coverage spanning the common devices: pn junctions, metal semiconductor junctions, photocells, lasers, bipolar transistors, and MOS transistors \* Discussion of fundamental

concepts and technological principles offering the student a valuable grounding in semiconductor physics \* Examination of the implications of recent research on small dimensions, reliability problems and breakdown mechanisms. *Semiconductor Devices Explained* offers a comprehensive new approach to teaching the fundamentals of semiconductor components based on the use of the accompanying process and device simulation software. Simulation is a popular tool used by engineers and scientists in device and process research. It supports the understanding of basic phenomena by linking the theory to hands on applications and real world problems with semiconductor devices. Throughout the text students are encouraged to augment their understanding by undertaking simulations and creating their own devices. The ICECREAM programme (Integrated Circuits and Electronics group Computerized Remedial Education And Mastering) question and answer game leads students through the concepts of common devices and makes learning fun. There is also a self-test element in which a data bank generates questions on the fundamentals of semiconductor junctions enabling students to assess their progress. Larger projects suitable for use as examination assignments are also incorporated. The test package is freely available to lecturers from the author on request. The remedial component of ICECREAM is available from the Wiley ftp site. MicroTec comes on a disk in the back of the book. *Semiconductor Devices Explained* World Scientific

We have reached the double conclusion: that invention is choice, that this choice is imperatively governed by the sense of scientific beauty. Hadamard (1945), Princeton University Press,



by permission. The great majority of all sources and amplifiers of microwave energy, and all devices for receiving or detecting microwaves, use a semiconductor active element. The development of microwave semiconductor devices, described in this book, has proceeded from the simpler, two-terminal, devices such as GUNN or IMPATT devices, which originated in the 1960s, to the sophisticated monolithic circuit MESFET three-terminal active elements, of the 1980s and 1990s. The microwave field has experienced a renaissance in electrical engineering departments in the last few years, and much of this growth has been associated with microwave semiconductor devices. The University of Massachusetts has recently developed a well recognized program in microwave engineering. Much of the momentum for this program has been provided by interaction with industrial companies, and the influx of a large number of industry-supported students. This program had a need for a course in microwave semiconductor devices, which covered the physical aspects, as well as the aspects of interest to the engineer who incorporates such devices in his designs. It was also felt that it would be important to introduce the most recently developed devices (HFETs, HBTs, and other advanced devices) as early as possible.

**Physics of Semiconductor Devices** Springer Science & Business Media

Semiconductor Device Fundamentals Pearson Education

**Furthering Higher Education Possibilities through Massive Open Online Courses** Wiley

This book is aimed at senior undergraduates, graduate students and researchers interested in quantitative understanding and

modeling of nanomaterial and device physics. With the rapid slow-down of semiconductor scaling that drove information technology for decades, there is a pressing need to understand and model electron flow at its fundamental molecular limits. The purpose of this book is to enable such a deconstruction needed to design the next generation memory, logic, sensor and communication elements. Through numerous case studies and topical examples relating to emerging technology, this book connects 'top down' classical device physics taught in electrical engineering classes with 'bottom up' quantum and many-body transport physics taught in physics and chemistry. The book assumes no more than a nodding acquaintance with quantum mechanics, in addition to knowledge of freshman level mathematics. Segments of this book are useful as a textbook for a course in nano-electronics.

*Introducing Technology Computer-Aided Design (TCAD)*  
Cambridge University Press

An introduction to the fundamentals of semiconductor physics and engineering This book discusses fundamental semiconductor physics of devices and on-chip interconnections for physicists and links these concepts to engineering applications and case studies of computer chips. The book is organized in three parts. The first part deals with the representation of information and computation. The second part covers semiconductor device physics within the context of computation. The third part reviews chip design and semiconductor fabrication. The book includes relevant equations, with the aim of closing the gap in the existing literature with actual case studies and engineering applications. Examples are provided in each chapter to illustrate physical and

electrical concepts through the use of high-performance silicon technologies. *Introductory Semiconductor Device Physics for Chip Design and Manufacturing*: Provides physical descriptions and illustrations with data visualizations to facilitate intuitive understanding of semiconductor physics, devices and on-chip interconnections Blends theoretical physics treatment with engineering applications and real case studies for manufactured chips Presents complementary-metal-oxide-semiconductor (CMOS) transistors in high-performance server microprocessors with static CMOS combinational digital circuit design examples Offers a rich array of student problem sets, mid-term exams, and final exams with a glossary at the end of the book M. Y. Lanzerotti, PhD, has over 15 years of engineering experience in designing integrated circuits for high-performance server chips and aerospace applications. Dr. Lanzerotti is Assistant Professor of Physics at Augsburg College and previously held positions as Associate Professor of Computer Engineering at Air Force Institute of Technology, Instructor at Harvard Summer School, Visiting Faculty Fellow at Pacific Lutheran University, Visiting Faculty Fellow at Sapienza University of Rome, and Research Staff Member at IBM Thomas J. Watson Research Center. This book is inspired from Dr. Lanzerotti's course, "Introductory Semiconductor Device Physics for Chip Design and Manufacturing," at Harvard Summer School. Dr. Lanzerotti holds physics degrees from Harvard College, the University of Cambridge, and Cornell University. Dr. Lanzerotti holds four U.S. patents, was awarded an IEEE Technical Innovation Award in 2007 and an IBM Outstanding Research Contribution Award in 1998, and was Editor-in-Chief of the IEEE Solid-State Circuits

Society Magazine.

*Introductory Semiconductor Device Physics for Chip Design and Manufacturing* Springer

This book covers the device physics of semiconductor lasers in five chapters written by recognized experts in this field. The volume begins by introducing the basic mechanisms of optical gain in semiconductors and the role of quantum confinement in modern quantum well diode lasers. Subsequent chapters treat the effects of built-in strain, one of the important recent advances in the technology of these lasers, and the physical mechanisms underlying the dynamics and high speed modulation of these devices. The book concludes with chapters addressing the control of photon states in squeezed-light and microcavity structures, and electron states in low dimensional quantum wire and quantum dot lasers. The book offers useful information for both readers unfamiliar with semiconductor lasers, through the introductory parts of each chapter, as well as a state-of-the-art discussion of some of the most advanced semiconductor laser structures, intended for readers engaged in research in this field. This book may also serve as an introduction for the companion volume, *Semiconductor Lasers II: Materials and Structures*, which presents further details on the different material systems and laser structures used for achieving specific diode laser performance features. Introduces the reader to the basics of semiconductor lasers Covers the fundamentals of lasing in semiconductors, including quantum confined and microcavity structures Beneficial to readers interested in the more general aspects of semiconductor physics and optoelectronic devices, such as quantum confined heterostructures and integrated optics

Each chapter contains a thorough introduction to the topic geared toward the non-expert, followed by an in-depth discussion of current technology and future trends Useful for professionals engaged in research and development Contains numerous schematic and data-containing illustrations

**Fundamentals of III-V Semiconductor MOSFETs** John Wiley & Sons

Scientific Essay from the year 2012 in the subject Physics - Electrodynamics, , language: English, abstract: A comprehensive study of p-n junction is necessary to design an electronic device as well as circuits. An electronic device controls the movement of electrons. The study of electronic devices requires a basic understanding of the relationship between electrons and other components of an atom. This leads to knowledge of the differences between conductors, insulators and semiconductors and to an understanding of p-type and n-type semiconductor material. p-n junction is formed by joining p-type and n-type semiconductor materials. So the concept of semiconductor, majority and minority carrier of p-type and n-type semiconductor, doping, depletion region of p-n junction, mobility and conductivity, drift and diffusion current, carrier concentration calculation and Fermi energy level is actually the comprehensive study of p-n junction.

VLSI and Hardware Implementations using Modern Machine Learning Methods Cambridge University Press

Machine learning is a potential solution to resolve bottleneck issues in VLSI via optimizing tasks in the design process. This book aims to provide the latest machine-learning-based methods, algorithms, architectures, and frameworks designed for

VLSI design. The focus is on digital, analog, and mixed-signal design techniques, device modeling, physical design, hardware implementation, testability, reconfigurable design, synthesis and verification, and related areas. Chapters include case studies as well as novel research ideas in the given field. Overall, the book provides practical implementations of VLSI design, IC design, and hardware realization using machine learning techniques.

Features: Provides the details of state-of-the-art machine learning methods used in VLSI design Discusses hardware implementation and device modeling pertaining to machine learning algorithms Explores machine learning for various VLSI architectures and reconfigurable computing Illustrates the latest techniques for device size and feature optimization Highlights the latest case studies and reviews of the methods used for hardware implementation This book is aimed at researchers, professionals, and graduate students in VLSI, machine learning, electrical and electronic engineering, computer engineering, and hardware systems.

*Fundamentals of Electronic Devices and Circuits* John Wiley & Sons

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.

*Fundamentals of Carrier Transport* World Scientific

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.

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