

# Semiconductors and Semimetals: Transport Phenomena v. 10

Willardson, Robert K.

# Semiconductors And Semimetals Volume 10 Transport Phenomena

**Görlich**



## **Semiconductors And Semimetals Volume 10 Transport Phenomena:**

*Semiconductors and Semimetals*, 1978-02-22 **Semiconductors and Semimetals Quantum Efficiency in Complex Systems, Part I**, 2010-12-14 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer Series as it is widely known has succeeded in publishing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers the volumes in Semiconductors and Semimetals have been and will continue to be of great interest to physicists chemists materials scientists and device engineers in modern industry

**Semiconductors and Semimetals** Robert K. Willardson, Albert C. Beer, 1966 **Fundamentals of III-V Semiconductor MOSFETs** Serge Oktyabrsky, Peide Ye, 2010-03-16 Fundamentals of III V Semiconductor MOSFETs presents the fundamentals and current status of research of compound semiconductor metal oxide semiconductor field effect transistors MOSFETs that are envisioned as a future replacement of silicon in digital circuits The material covered begins with a review of specific properties of III V semiconductors and available technologies making them attractive to MOSFET technology such as band engineered heterostructures effect of strain nanoscale control during epitaxial growth Due to the lack of thermodynamically stable native oxides on III V s such as SiO<sub>2</sub> on Si high k oxides are the natural choice of dielectrics for III V MOSFETs The key challenge of the III V MOSFET technology is a high quality thermodynamically stable gate dielectric that passivates the interface states similar to SiO<sub>2</sub> on Si Several chapters give a detailed description of materials science and electronic behavior of various dielectrics and related interfaces as well as physics of fabricated devices and MOSFET fabrication technologies Topics also include recent progress and understanding of various materials systems specific issues for electrical measurement of gate stacks and FETs with low and wide bandgap channels and high interface trap density possible paths of integration of different semiconductor materials on Si platform Physical Models for Quantum Wires, Nanotubes, and Nanoribbons Jean-Pierre Leburton, 2023-08-31 Quantum wires are artificial structures characterized by nanoscale cross sections that contain charged particles moving along a single degree of freedom With electronic motions constrained into standing modes along with the two other spatial directions they have been primarily investigated for their unidimensional dynamics of quantum confined charge carriers which eventually led to broad

applications in large scale nanoelectronics This book is a compilation of articles that span more than 30 years of research on developing comprehensive physical models that describe the physical properties of these unidimensional semiconductor structures The articles address the effect of quantum confinement on lattice vibrations carrier scattering rates and charge transport as well as present practical examples of solutions to the Boltzmann equation by analytical techniques and by numerical simulations such as the Monte Carlo method The book also presents topics on quantum transport and spin effects in unidimensional molecular structures such as carbon nanotubes and graphene nanoribbons in terms of non equilibrium Green s function approaches and density functional theory      **May 16** Görlich,2022-01-19 No detailed description available for May 16

**Spectroscopy of Nonequilibrium Electrons and Phonons** C.V. Shank,B.P. Zakharchenya,2012-12-02 The physics of nonequilibrium electrons and phonons in semiconductors is an important branch of fundamental physics that has many practical applications especially in the development of ultrafast and ultrasemiconductor devices This volume is devoted to different trends in the field which are presently at the forefront of research Special attention is paid to the ultrafast relaxation processes in bulk semiconductors and two dimensional semiconductor structures and to their study by different spectroscopic methods both pulsed and steady state The evolution of energy and space distribution of nonequilibrium electrons and the relaxation kinetics of hot carriers and phonons are considered under various conditions such as temperature doping and pumping intensity by leading experts in the field      *Ultrafast Spectroscopy of Semiconductors and Semiconductor Nanostructures* Jagdeep Shah,2013-11-11      **Heterostructures and Quantum Devices** Norman G. Einspruch,William R. Frensley,2014-06-28 Heterostructure and quantum mechanical devices promise significant improvement in the performance of electronic and optoelectronic integrated circuits ICs Though these devices are the subject of a vigorous research effort the current literature is often either highly technical or narrowly focused This book presents heterostructure and quantum devices to the nonspecialist especially electrical engineers working with high performance semiconductor devices It focuses on a broad base of technical applications using semiconductor physics theory to develop the next generation of electrical engineering devices The text covers existing technologies and future possibilities within a common framework of high performance devices which will have a more immediate impact on advanced semiconductor physics particularly quantum effects and will thus form the basis for longer term technology development

Spin-orbit Coupling Effects in Two-Dimensional Electron and Hole Systems Roland Winkler,2003-10-06 The first part provides a general introduction to the electronic structure of quasi two dimensional systems with a particular focus on group theoretical methods The main part of the monograph is devoted to spin orbit coupling phenomena at zero and nonzero magnetic fields Throughout the book the main focus is on a thorough discussion of the physical ideas and a detailed interpretation of the results Accurate numerical calculations are complemented by simple and transparent analytical models that capture the important physics      *Semiconductor Physical Electronics* Sheng S. Li,2012-12-06 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

**Semiconductor Devices and Integrated Electronics** A. G. Milnes, 2012-12-06 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

**Some Current Topics on Nonlinear Conservation Laws** Ling Hsiao, Zhouping Xin, 2000 This volume resulted from a year long program at the Morningside Center of Mathematics at the Academia Sinica in Beijing It presents an overview of nonlinear conservation laws and introduces developments in this expanding field Zhouping Xin's introductory overview of the subject is followed by lecture notes of leading experts who have made

fundamental contributions to this field of research A Bressan s theory of well posedness for entropy weak solutions to systems of nonlinear hyperbolic conservation laws in the class of viscosity solutions is one of the most important results in the past two decades G Chen discusses weak convergence methods and various applications to many problems P Degond details mathematical modelling of semi conductor devices B Perthame describes the theory of asymptotic equivalence between conservation laws and singular kinetic equations Z Xin outlines the recent development of the vanishing viscosity problem and nonlinear stability of elementary wave a major focus of research in the last decade and the volume concludes with Y Zheng s lecture on incompressible fluid dynamics This collection of lectures represents previously unpublished expository and research results of experts in nonlinear conservation laws and is an excellent reference for researchers and advanced graduate students in the areas of nonlinear partial differential equations and nonlinear analysis Titles in this series are co published with International Press Cambridge MA *Photovoltaic Modeling Handbook* Monika Freunek

Muller,2018-08-03 This book provides the reader with a solid understanding of the fundamental modeling of photovoltaic devices After the material independent limit of photovoltaic conversion the readers are introduced to the most well known theory of classical silicon modeling Based on this for each of the most important PV materials their performance under different conditions is modeled This book also covers different modeling approaches from very fundamental theoretic investigations to applied numeric simulations based on experimental values The book concludes with a chapter on the influence of spectral variations The information is supported by providing the names of simulation software and basic literature to the field The information in the book gives the user specific application with a solid background in hand to judge which materials could be appropriate as well as realistic expectations of the performance the devices could achieve

Faculty Publications and Doctoral Dissertations University of Illinois at Urbana-Champaign,1975 **Solar Energy Conversion** R.C. Neville,1995-01-30 A large number of solar cell and solar cell systems are described in this volume The theory of their operation their design and the levels of their performance is discussed Originally the book appeared in 1978 but extensive change over the intervening years in the fields of energy generation and consumption solar energy and solar cells has necessitated the publication of an updated version The text initially surveys the requirements of humanity the subsequent need for solar cells the nature of sunlight and the properties of semiconductors Concrete examples extensive references and theoretical arguments are then used to present a comparison of options available in the design and operation of solar cells and solar cell systems The cells constructed from single crystal polycrystalline and amorphous semiconductors and the systems have varying designs and differing levels of solar energy for input and produce electricity or electrical and thermal energies Solar cell production economics and environmental effects are considered throughout the publication

III-V Semiconductor Materials and Devices R.J. Malik,2012-12-02 The main emphasis of this volume is on III V semiconductor epitaxial and bulk crystal growth techniques Chapters are also included on material characterization and ion

implantation In order to put these growth techniques into perspective a thorough review of the physics and technology of III V devices is presented This is the first book of its kind to discuss the theory of the various crystal growth techniques in relation to their advantages and limitations for use in III V semiconductor devices     **Optica applicata** ,1989     **CRC Handbook of Thermoelectrics** D.M. Rowe,2018-12-07 Thermoelectrics is the science and technology associated with thermoelectric converters that is the generation of electrical power by the Seebeck effect and refrigeration by the Peltier effect Thermoelectric generators are being used in increasing numbers to provide electrical power in medical military and deep space applications where combinations of their desirable properties outweigh their relatively high cost and low generating efficiency In recent years there also has been an increase in the requirement for thermoelectric coolers Peltier devices for use in infrared detectors and in optical communications Information on thermoelectrics is not readily available as it is widely scattered throughout the literature The Handbook centralizes this information in a convenient format under a single cover Sixty of the world s foremost authorities on thermoelectrics have contributed to this Handbook It is comprised of fifty five chapters a number of which contain previously unpublished material The contents are arranged in eight sections general principles and theoretical considerations material preparation measurement of thermoelectric properties thermoelectric materials thermoelectric generation generator applications thermoelectric refrigeration and applications of thermoelectric cooling The CRC Handbook of Thermoelectrics has a broad based scope It will interest researchers technologists and manufacturers as well as students and the well informed non specialist reader     **Basic Semiconductor Physics** Chihiro Hamaguchi,2017-11-27 The new edition of this textbook presents a detailed description of basic semiconductor physics The text covers a wide range of important phenomena in semiconductors from the simple to the advanced Four different methods of energy band calculations in the full band region are explained local empirical pseudopotential non local pseudopotential KP perturbation and tight binding methods The effective mass approximation and electron motion in a periodic potential Boltzmann transport equation and deformation potentials used for analysis of transport properties are discussed Further the book examines experiments and theoretical analyses of cyclotron resonance in detail Optical and transport properties magneto transport two dimensional electron gas transport HEMT and MOSFET and quantum transport are reviewed while optical transition electron phonon interaction and electron mobility are also addressed Energy and electronic structure of a quantum dot artificial atom are explained with the help of Slater determinants The physics of semiconductor lasers is also described including Einstein coefficients stimulated emission spontaneous emission laser gain double heterostructures blue lasers optical confinement laser modes and strained quantum well lasers offering insights into the physics of various kinds of semiconductor lasers In this third edition energy band calculations in full band zone with spin orbit interaction are presented showing all the matrix elements and equipping the reader to prepare computer programs of energy band calculations The Luttinger Hamiltonian is discussed and used to analyze the valence band structure

Numerical calculations of scattering rate relaxation time and mobility are presented for typical semiconductors which are very helpful for understanding of transport Energy band structures and effective masses of nitrides such as GaN InN AlN and their ternary alloys are discussed because they are very important materials for the blue light emission and high power devices with and high frequency Learning and teaching with this textbook is supported by problems and solutions in the end of the chapters The book is written for bachelor and upper undergraduate students of physics and engineering



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