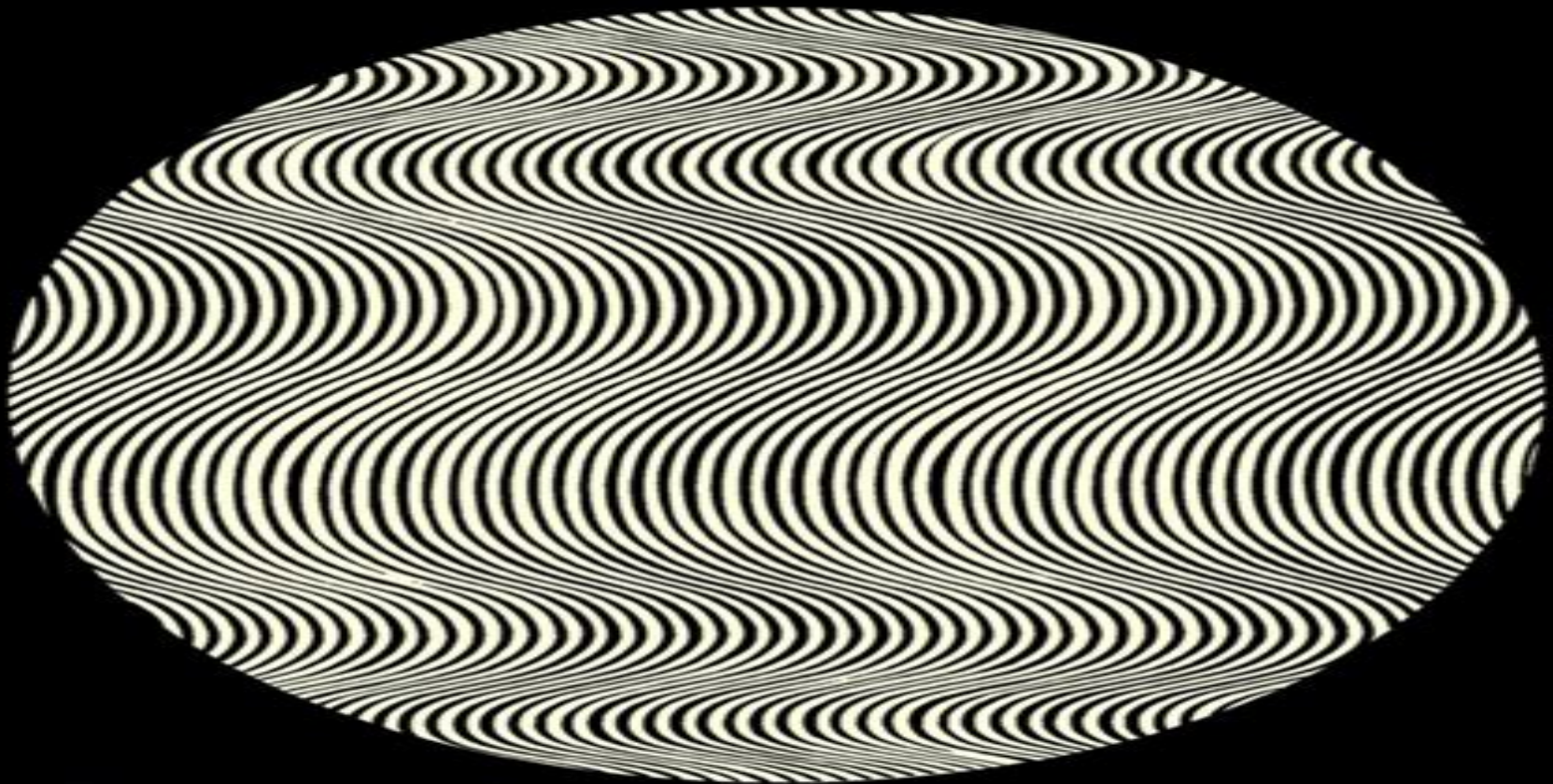


Semiconductor Opto-Electronics

T. S. Moss

G. J. Burrell

B. Ellis



Butterworths

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**Trevor Simpson Moss, Geoffrey John
Burrell, Brian Ellis**



Semiconductor Opto Electronics:

Semiconductor Optoelectronic Devices Joachim Piprek, 2013-10-22 Optoelectronics has become an important part of our lives. Wherever light is used to transmit information, tiny semiconductor devices are needed to transfer electrical current into optical signals and vice versa. Examples include light emitting diodes in radios and other appliances, photodetectors in elevator doors and digital cameras, and laser diodes that transmit phone calls through glass fibers. Such optoelectronic devices take advantage of sophisticated interactions between electrons and light. Nanometer scale semiconductor structures are often at the heart of modern optoelectronic devices. Their shrinking size and increasing complexity make computer simulation an important tool to design better devices that meet ever rising performance requirements. The current need to apply advanced design software in optoelectronics follows the trend observed in the 1980s with simulation software for silicon devices. Today software for technology computer aided design (TCAD) and electronic design automation (EDA) represents a fundamental part of the silicon industry. In optoelectronics, advanced commercial device software has emerged recently and it is expected to play an increasingly important role in the near future. This book will enable students, device engineers, and researchers to more effectively use advanced design software in optoelectronics. Provides fundamental knowledge in semiconductor physics and in electromagnetics while helping to understand and use advanced device simulation software. Demonstrates the combination of measurements and simulations in order to obtain realistic results and provides data on all required material parameters. Gives deep insight into the physics of state-of-the-art devices and helps to design and analyze modern optoelectronic devices.

Semiconductor Optoelectronic Devices Pallab Bhattacharya, 1994 The first true introduction to semiconductor optoelectronic devices, this book provides an accessible, well-organized overview of optoelectronic devices that emphasizes basic principles. Coverage begins with an optional review of key concepts such as properties of compound semiconductors, quantum mechanics, semiconductor statistics, carrier transport properties, optical processes, and junction theory, then progresses gradually through more advanced topics. The Second Edition has been both updated and expanded to include the recent developments in the field.

Semiconductor Opto-Electronics T.S. Moss, G.J. Burrell, B. Ellis, 2013-10-22 Semiconductor Opto Electronics focuses on optoelectronics, covering the basic physical phenomena and device behavior that arise from the interaction between electromagnetic radiation and electrons in a solid. The first nine chapters of this book are devoted to theoretical topics, discussing the interaction of electromagnetic waves with solids, dispersion theory, and absorption processes, magneto-optical effects, and non-linear phenomena. Theories of photo-effects and photo-detectors are treated in detail, including the theories of radiation generation and the behavior of semiconductor lasers and lamps. The rest of this text deals with the group IV elements, III-V compounds, and selection of the most important chalcogenides. This publication is intended primarily for physicists engaged in academic research or commercial device development and for honors students specializing in solid state physics.

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Opto-Electronics [By] T. S. Moss, G. J. Burrell, and B. Ellis Trevor Simpson Moss,1973 *Optoelectronic Semiconductor Devices* David Wood,1994 Optoelectronic Semiconductor Devices is a comprehensive new textbook offering a complete blend of theory and practice Starting with basic semiconductor theory it moves on through a discussion of light emitters and detectors and then to their actual manufacture Features of the book include full coverage of basic semiconductors and semiconductor lasers not seen in most optoelectronic textbooks of this level treatment of all types of detectors not just pin and avalanche diodes details of materials and fabrication and extensive references conceptual and numerical problems and worked examples Optoelectronic Semiconductor Devices can be used by undergraduate and postgraduate students in departments of physics or electrical engineering Semiconductor Opto-electronics Trevor Simpson Moss,Geoffrey John Burrell,Brian Ellis,1988 *Organic Semiconductors for Optoelectronics* Hiroyoshi Naito,2021-08-02 Comprehensive coverage of organic electronics including fundamental theory basic properties characterization methods device physics and future trends Organic semiconductor materials have vast commercial potential for a wide range of applications from self emitting OLED displays and solid state lighting to plastic electronics and organic solar cells As research in organic optoelectronic devices continues to expand at an unprecedented rate organic semiconductors are being applied to flexible displays biosensors and other cost effective green devices in ways not possible with conventional inorganic semiconductors Organic Semiconductors for Optoelectronics is an up to date review of the both the fundamental theory and latest research and development advances in organic semiconductors Featuring contributions from an international team of experts this comprehensive volume covers basic properties of organic semiconductors characterization techniques device physics and future trends in organic device development Detailed chapters provide key information on the device physics of organic field effect transistors organic light emitting diodes organic solar cells organic photosensors and more This authoritative resource Provides a clear understanding of the optoelectronic properties of organic semiconductors and their influence to overall device performance Explains the theories behind relevant mechanisms in organic semiconducting materials and in organic devices Discusses current and future trends and challenges in the development of organic optoelectronic devices Reviews electronic properties device mechanisms and characterization techniques of organic semiconducting materials Covers theoretical concepts of optical properties of organic semiconductors including fluorescent phosphorescent and thermally assisted delayed fluorescent emitters An important new addition to the Wiley Series in Materials for Electronic Optoelectronic Applications Organic Semiconductors for Optoelectronics bridges the gap between advanced books and undergraduate textbooks on semiconductor physics and solid state physics It is essential reading for academic researchers graduate students and industry professionals involved in organic electronics materials science thin film devices and optoelectronics research and development *Physics of Optoelectronics* Michael A. Parker,2018-10-03 Physics of Optoelectronics focuses on the properties of optical fields and their interaction with matter Understanding that lasers LEDs

and photodetectors clearly exemplify this interaction the author begins with an introduction to lasers LEDs and the rate equations then describes the emission and detection processes The book summarizes and reviews the mathematical background of the quantum theory embodied in the Hilbert space These concepts highlight the abstract form of the linear algebra for vectors and operators supplying the pictures that make the subject more intuitive A chapter on dynamics includes a brief review of the formalism for discrete sets of particles and continuous media It also covers the quantum theory necessary for the study of optical fields transitions and semiconductor gain This volume supplements the description of lasers and LEDs by examining the fundamental nature of the light that these devices produce It includes an analysis of quantized electromagnetic fields and illustrates inherent quantum noise in terms of Poisson and sub Poisson statistics It explains matter light interaction in terms of time dependent perturbation theory and Fermi's golden rule and concludes with a detailed discussion of semiconductor emitters and detectors

Semiconductor Devices for High-Speed Optoelectronics

Giovanni Ghione, 2009-10-01 Providing an all inclusive treatment of electronic and optoelectronic devices used in high speed optical communication systems this book emphasizes circuit applications advanced device design solutions and noise in sources and receivers Core topics covered include semiconductors and semiconductor optical properties high speed circuits and transistors detectors sources and modulators It discusses in detail both active devices heterostructure field effect and bipolar transistors and passive components lumped and distributed for high speed electronic integrated circuits It also describes recent advances in high speed devices for 40 Gbps systems Introductory elements are provided making the book open to readers without a specific background in optoelectronics whilst end of chapter review questions and numerical problems enable readers to test their understanding and experiment with realistic data

Mid-infrared Semiconductor Optoelectronics

Anthony Krier, 2007-05-22 Optoelectronic devices operating in the mid infrared wavelength range offer applications in a variety of areas from environmental gas monitoring around oil rigs to the detection of narcotics They could also be used for free space optical communications thermal imaging applications and the development of homeland security measures Mid infrared Semiconductor Optoelectronics is an overview of the current status and technological development in this rapidly emerging area the basic physics some of the problems facing the design engineer and a comparison of possible solutions are laid out the different lasers used as sources for mid infrared technology are considered recent work in detectors is reviewed the last part of the book is concerned with applications With a world wide authorship of experts working in many mid infrared related fields this book will be an invaluable reference for researchers and graduate students drawn from physics electronic and electrical engineering and materials science

Optoelectronics Jasprit Singh, 1996 Aimed at graduate students in electrical engineering this text provides a broad understanding of the rapidly growing field of optoelectronics An integrated approach is used covering topics in applied optics physics of optical response and semiconductor optoelectronic devices

Reliability of Semiconductor Lasers and Optoelectronic Devices

Robert Herrick, Osamu Ueda, 2021-03-06

Reliability of Semiconductor Lasers and Optoelectronic Devices simplifies complex concepts of optoelectronics reliability with approachable introductory chapters and a focus on real world applications This book provides a brief look at the fundamentals of laser diodes introduces reliability qualification and then presents real world case studies discussing the principles of reliability and what occurs when these rules are broken Then this book comprehensively looks at optoelectronics devices and the defects that cause premature failure in them and how to control those defects Key materials and devices are reviewed including silicon photonics vertical cavity surface emitting lasers VCSELs InGaN LEDs and lasers and AlGaIn LEDs covering the majority of optoelectronic devices that we use in our everyday lives powering the Internet telecommunication solid state lighting illuminators and many other applications This book features contributions from experts in industry and academia working in these areas and includes numerous practical examples and case studies This book is suitable for new entrants to the field of optoelectronics working in R D Includes case studies and numerous examples showing best practices and common mistakes affecting optoelectronics reliability written by experts working in the industry Features the first wide ranging and comprehensive overview of fiber optics reliability engineering covering all elements of the practice from building a reliability laboratory qualifying new products to improving reliability on mature products Provides a look at the reliability issues and failure mechanisms for silicon photonics VCSELs InGaN LEDs and lasers AlGaIn LEDs and more

Semiconductor Optoelectronics Marian A. Herman, 1980 **Integrated Optoelectronics** Karl J. Ebeling, 2012-12-06 The English edition is based upon the second edition of the German version of the book The author would like to thank Mr A H Armstrong for providing the basic English manuscript of the text his critical reading and valuable comments Thanks are also due to Mrs A Demmer Mr J Matern Mrs B Titze and Mrs S Pfetsch for preparing the camera ready manuscript and the figures Springer Verlag has generously supported the project and cooperating with them has been a great pleasure Ulm April 1992 K J Ebeling Preface to the First German Edition This book is a comprehensive introduction to waveguide optics and photonics in semiconductor crystals Interest is centered on integrated optoelectronic devices for the transmission and processing of optical signals These optical communications engineering devices are becoming increasingly important for optical disk storage systems for optical chip chip interconnections and of course for optical fiber transmission and exchange

The Physics of Semiconductors Kevin F. Brennan, 1999-02-13 Modern fabrication techniques have made it possible to produce semiconductor devices whose dimensions are so small that quantum mechanical effects dominate their behavior This book describes the key elements of quantum mechanics statistical mechanics and solid state physics that are necessary in understanding these modern semiconductor devices The author begins with a review of elementary quantum mechanics and then describes more advanced topics such as multiple quantum wells He then discusses equilibrium and nonequilibrium statistical mechanics Following this introduction he provides a thorough treatment of solid state physics covering electron motion in periodic potentials electron phonon interaction and recombination processes The final four

chapters deal exclusively with real devices such as semiconductor lasers photodiodes flat panel displays and MOSFETs The book contains many homework exercises and is suitable as a textbook for electrical engineering materials science or physics students taking courses in solid state device physics It will also be a valuable reference for practising engineers in optoelectronics and related areas

Semiconductor Optoelectronic Devices Joachim Piprek, 2003 This book builds a much needed bridge between theoretical and experimental research in optoelectronics by providing both fundamental knowledge in semiconductor physics and real world simulation examples

Physics of Optoelectronic Devices Shun Lien Chuang, 1995-09-08 Emphasizes the theory of semiconductor optoelectronic devices demonstrating comparisons between theoretical and experimental results Presents such important topics as semiconductor heterojunctions and band structure calculations near the band edges for bulk and quantum well semiconductors Details semiconductor lasers including double heterostructure stripe geometry gain guided semiconductor distributed feedback and surface emitting Systematically investigates high speed modulation of semiconductor lasers using linear and nonlinear gains Features new subjects such as the theories on the band structures of strained semiconductors and strained quantum well lasers Covers key areas behind the operation of semiconductor lasers modulators and photodetectors An Instructor's Manual presenting detailed solutions to all the problems in the book is available from the Wiley editorial department

Optical Semiconductor Devices Mitsuo Fukuda, 1998-12-24 This book is devoted to optical semiconductor devices and their numerous applications in telecommunications optoelectronics and consumer electronics areas where signal processing or the transmission of signals across fiber optic cables is paramount It introduces a new generation of devices that includes optical modulators quantum well QW lasers and photodiodes and explores new applications of more established devices such as semiconductor lasers light emitting diodes and photodiodes Mitsuo Fukuda examines the material properties operation principles fabrication packaging reliability and applications of each device and offers a unique industrial perspective discussing everything engineers and scientists need to know at different phases of research development and production This guide to the state of the art of optical semiconductor devices Helps you choose the right device for a given application Covers important performance data such as temperature and optical feedback noise in lasers Highlights epitaxial growth techniques and fabrication for each device Features one hundred figures and an extensive bibliography Provides a clear and concise treatment unencumbered by excessive theory Optical Semiconductor Devices is an essential resource for engineers and researchers in telecommunications and optoelectronics equipment designers and manufacturers and graduate students and scholars interested in this rapidly evolving field

III-Nitride Semiconductor Optoelectronics, 2017-01-05 III Nitride Semiconductor Optoelectronics covers the latest breakthrough research and exciting developments in the field of III nitride compound semiconductors It includes important topics on the fundamentals of materials growth characterization and optoelectronic device applications of III nitrides Bulk quantum well quantum dot and nanowire heterostructures are all

thoroughly explored Contains the latest breakthrough research in III nitride optoelectronics Provides a comprehensive presentation that covers the fundamentals of materials growth and characterization and the design and performance characterization of state of the art optoelectronic devices Presents an in depth discussion on III nitride bulk quantum well quantum dot and nanowire technologies **Semiconductor Optoelectronics** Jasprit Singh, 1995-01 Targeting one of the fastest growing areas of consumer electronics Semiconductor Optoelectronics covers both optoelectronics devices and applications focusing on the physics and technology of the hardware that is critical to the optoelectronic technology The text establishes a close link of lasers detectors modulators and switches to the global system demands and solved examples design related problems and physical insights along with mathematics are used throughout

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