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943 - DANIELA PATEL

Nanoelectronics: Physics, Materials and Devices addresses the concepts involved in the exploration of research on nanoscale electronics and photonic devices and their application in next-generation integrated circuits (ICs). The book presents a detailed discussion on the field of nanoscale electronic and photonic devices, as well as the most recent techniques for the modeling and simulation of these devices. It provides an in-depth analysis of theoretical frameworks, the fundamental physics underlying device operation, computational modeling, simulation methods, and circuit applications of nanoscale devices. The purpose of this book is to provide a desirable balance between basic background and concepts to improve device performance. In this book, both qualitative and quantitative approaches are considered to analyze and explore the contributions made by various researchers actively engaged in nanoscale device research. The book's main motivation is to help solve the challenges of analyzing and exploring the electrical behaviors of contemporary nanoscale device technolo-

gies. It purposefully builds the principles of nano electronic devices gradually, invigorating those of micro electronic devices. Addresses the conceptual, architectural, and design challenges faced by emerging nanoscale devices as a replacement of conventional MOSFET Serves as a guide to researchers by suggesting research directions and potential applications Explains the use of Technology Computer-Aided Design software (TCAD) to produce numerical simulations of nanoscale devices

This handbook introduces the basic principles and fundamentals of cyber security towards establishing an understanding of how to protect computers from hackers and adversaries. The highly informative subject matter of this handbook, includes various concepts, models, and terminologies along with examples and illustrations to demonstrate substantial technical details of the field. It motivates the readers to exercise better protection and defense mechanisms to deal with attackers and mitigate the situation. This handbook also outlines some of the exciting areas of future research where the existing approaches can be implemented. Exponential increase in the use of computers as a means of

storing and retrieving security-intensive information, requires placement of adequate security measures to safeguard the entire computing and communication scenario. With the advent of Internet and its underlying technologies, information security aspects are becoming a prime concern towards protecting the networks and the cyber ecosystem from variety of threats, which is illustrated in this handbook. This handbook primarily targets professionals in security, privacy and trust to use and improve the reliability of businesses in a distributed manner, as well as computer scientists and software developers, who are seeking to carry out research and develop software in information and cyber security. Researchers and advanced-level students in computer science will also benefit from this reference.

To surmount the continuous scaling challenges of MOSFET devices, FinFETs have emerged as the real alternative for use as the next generation device for IC fabrication technology. The objective of this book is to provide the basic theory and operating principles of FinFET devices and technology, an overview of FinFET device architecture and manufacturing processes, and detailed formulation of FinFET electrostatic and dynamic device characteristics for IC design and manufacturing. Thus, this book caters to practicing engineers transitioning to FinFET technology and prepares the next generation of device engineers and academic experts on mainstream device technology at the nanometer-nodes. This potentially unique work offers various approaches on the implementation of nanowires. As it is widely known, nanotechnology presents the control of matter at the nanoscale and nanodimensions within few nanometers, whereas this exclusive phenomenon enables us to determine novel applications. This book pre-

sents an overview of recent and current nanowire application and implementation research worldwide. We examine methods of nanowire synthesis, types of materials used, and applications associated with nanowire research. Wide surveys of global activities in nanowire research are presented, as well.

Micro and nanoelectronic devices are the prime movers for electronics, which is essential for the current information age. This unique monograph identifies the key stages of advanced device design and integration in semiconductor manufacturing. It brings into one resource a comprehensive device design using simulation. The book presents state-of-the-art semiconductor device design using the latest TCAD tools. Professionals, researchers, academics, and graduate students in electrical & electronic engineering and microelectronics will benefit from this reference text. Contents: Introduction Simulation Tools Simulation Methodology CMOS Technology Stress-Engineered CMOS Heterojunction Bipolar Transistors Stress-Engineered HBTs FinFETs Advanced Devices Memory Devices Power Devices Solar Cells Heterojunction Solar Cells SPICE Parameter Extraction Readership: Professionals, researchers, academics, and graduate students in electrical & electronic engineering and microelectronics.

What is the future of CMOS? Sustaining increased transistor densities along the path of Moore's Law has become increasingly challenging with limited power budgets, interconnect bandwidths, and fabrication capabilities. In the last decade alone, transistors have undergone significant design makeovers; from planar transistors of ten years ago, technological advancements have accelerated to today's FinFETs, which hardly resemble their bulky an-

cestors. FinFETs could potentially take us to the 5-nm node, but what comes after it? From gate-all-around devices to single electron transistors and two-dimensional semiconductors, a torrent of research is being carried out in order to design the next transistor generation, engineer the optimal materials, improve the fabrication technology, and properly model future devices. We invite insight from investigators and scientists in the field to showcase their work in this Special Issue with research papers, short communications, and review articles that focus on trends in micro and nanotechnology from fundamental research to applications. These two volumes present the proceedings of the International Conference on Technology and Instrumentation in Particle Physics 2017 (TIPP2017), which was held in Beijing, China from 22 to 26 May 2017. Gathering selected articles on the basis of their quality and originality, it highlights the latest developments and research trends in detectors and instrumentation for all branches of particle physics, particle astrophysics and closely related fields. This is the second volume, and focuses on the main themes Astrophysics and space instrumentation, Front-end electronics and fast data transmission, Trigger and data acquisition systems, Machine detectors, Interfaces and beam instrumentation, Backend readout structures and embedded systems, Medical imaging, and Security & other applications. The TIPP2017 is the fourth in a series of international conferences on detectors and instrumentation, held under the auspices of the International Union of Pure and Applied Physics (IUPAP). The event brings together experts from the scientific and industrial communities to discuss their current efforts and plan for the future. The conference's aim is to provide a stimulating atmosphere for scientists

and engineers from around the world.

This comprehensive reference text discusses novel semiconductor devices, including nanostructure field-effect transistors, photodiodes, high electron mobility transistors, and oxide-based devices. The text covers submicron semiconductor devices, device modeling, novel materials for devices, novel semiconductor devices, optimization techniques, and their application in detail. It covers such important topics as negative capacitance devices, surface-plasmon resonance devices, Fermi-level pinning, external stimuli-based optimization techniques, optoelectronic devices, and architecture-based optimization techniques. The book: Covers novel semiconductor devices with submicron dimensions Discusses comprehensive device optimization techniques Examines conceptualization and modeling of semiconductor devices Covers circuit and sensor-based application of the novel devices Discusses novel materials for next-generation devices This text will be useful for graduate students and professionals in fields including electrical engineering, electronics and communication engineering, materials science, and nanoscience.

This book will interest researchers, scientists, engineers and graduate students in many disciplines, who make use of mathematical modeling and computer simulation. Although it represents only a small sample of the research activity on numerical simulations, the book will certainly serve as a valuable tool for researchers interested in getting involved in this multidisciplinary field. It will be useful to encourage further experimental and theoretical researches in the above mentioned areas of numerical simulation.

Nanoscale memories are used everywhere. From your iPhone to a

supercomputer, every electronic device contains at least one such type. With coverage of current and prototypical technologies, *Nanoscale Semiconductor Memories: Technology and Applications* presents the latest research in the field of nanoscale memories technology in one place. It also covers a myriad of applications that nanoscale memories technology has enabled. The book begins with coverage of SRAM, addressing the design challenges as the technology scales, then provides design strategies to mitigate radiation induced upsets in SRAM. It discusses the current state-of-the-art DRAM technology and the need to develop high performance sense amplifier circuitry. The text then covers the novel concept of capacitorless 1T DRAM, termed as Advanced-RAM or A-RAM, and presents a discussion on quantum dot (QD) based flash memory. Building on this foundation, the coverage turns to STT-RAM, emphasizing scalable embedded STT-RAM, and the physics and engineering of magnetic domain wall "race-track" memory. The book also discusses state-of-the-art modeling applied to phase change memory devices and includes an extensive review of RRAM, highlighting the physics of operation and analyzing different materials systems currently under investigation. The hunt is still on for universal memory that fits all the requirements of an "ideal memory" capable of high-density storage, low-power operation, unparalleled speed, high endurance, and low cost. Taking an interdisciplinary approach, this book bridges technological and application issues to provide the groundwork for developing custom designed memory systems.

This book disseminates the current knowledge of semiconductor physics and its applications across the scientific community. It is based on a biennial workshop that provides the participating re-

search groups with a stimulating platform for interaction and collaboration with colleagues from the same scientific community. The book discusses the latest developments in the field of III-nitrides; materials & devices, compound semiconductors, VLSI technology, optoelectronics, sensors, photovoltaics, crystal growth, epitaxy and characterization, graphene and other 2D materials and organic semiconductors.

This book deals with the subject of secondary energy spectroscopy in the scanning electron microscope (SEM). The SEM is a widely used research instrument for scientific and engineering research and its low energy scattered electrons, known as secondary electrons, are used mainly for the purpose of nanoscale topographic imaging. This book demonstrates the advantages of carrying out precision electron energy spectroscopy of its secondary electrons, in addition to them being used for imaging. The book will demonstrate how secondary electron energy spectroscopy can transform the SEM into a powerful analytical tool that can map valuable material science information to the nanoscale, superimposing it onto the instrument's normal topographic mode imaging. The book demonstrates how the SEM can then be used to quantify/identify materials, acquire bulk density of states information, capture dopant density distributions in semiconductor specimens, and map surface charge distributions.

This book covers evolution, concept and applications of modern semiconductor devices such as tunnel field effect transistors (TFETs), vertical super-thin body MOSFETs, ion sensing FETs (ISFETs), non-conventional solar cells, opto-electro mechanical devices and thin film transistors (TFTs). Comprising of theory, experimen-

tation and applications of devices, the chapters describe state-of-art methods and techniques which shall be highly assistive in having an overall perspective on emerging technologies and working on a research area. The book is aimed at the scholars, enthusiasts and researchers who are currently working on devices in the contemporary era of semiconductor devices. Additionally, the chapters are lucid and descriptive and carry the potential of serving as a reference book for scholars in their undergraduate studies, who are looking ahead for a prospective career in semiconductor devices.

This book demonstrates how to use the Synopsys Sentaurus TCAD 2014 version for the design and simulation of 3D CMOS (complementary metal-oxide-semiconductor) semiconductor nanoelectronic devices, while also providing selected source codes (Technology Computer-Aided Design, TCAD). Instead of the built-in examples of Sentaurus TCAD 2014, the practical cases presented here, based on years of teaching and research experience, are used to interpret and analyze simulation results of the physical and electrical properties of designed 3D CMOSFET (metal-oxide-semiconductor field-effect transistor) nanoelectronic devices. The book also addresses in detail the fundamental theory of advanced semiconductor device design for the further simulation and analysis of electric and physical properties of semiconductor devices. The design and simulation technologies for nanosemiconductor devices explored here are more practical in nature and representative of the semiconductor industry, and as such can promote the development of pioneering semiconductor devices, semiconductor device physics, and more practically-oriented approaches to teaching and learning semiconductor engineer-

ing. The book can be used for graduate and senior undergraduate students alike, while also offering a reference guide for engineers and experts in the semiconductor industry. Readers are expected to have some preliminary knowledge of the field.

The book presents high-quality papers presented at a national conference on 'Advanced Detectors for Nuclear, High Energy and Astroparticle Physics'. The conference was organized to commemorate 100 years of Bose Institute. The book is based on the theme of the conference and provides a clear picture of basics and advancement of detectors for nuclear physics, high-energy physics and astroparticle physics together. The topics covered in the book include detectors for accelerator-based high energy physics; detectors for non-accelerator particle physics; nuclear physics detectors; detection techniques in astroparticle physics and dark matter; and applications and simulations. The book will be a good reference for researchers and industrial personnel working in the area of nuclear and astroparticle physics.

This book presents select proceedings of the International Conference on Micro and Nanoelectronics Devices, Circuits and Systems (MNDCS-2022). The book includes cutting-edge research papers in the emerging fields of micro and nanoelectronics devices, circuits, and systems from experts working in these fields over the last decade. The book is a unique collection of chapters from different areas with a common theme and is immensely useful to academic researchers and practitioners in the industry who work in this field.

This book constitutes the refereed proceedings of the 17th International Symposium on VLSI Design and Test, VDAT 2013, held in

Jaipur, India, in July 2013. The 44 papers presented were carefully reviewed and selected from 162 submissions. The papers discuss the frontiers of design and test of VLSI components, circuits and systems. They are organized in topical sections on VLSI design, testing and verification, embedded systems, emerging technology.

Compact Models for Integrated Circuit Design: Conventional Transistors and Beyond provides a modern treatise on compact models for circuit computer-aided design (CAD). Written by an author with more than 25 years of industry experience in semiconductor processes, devices, and circuit CAD, and more than 10 years of academic experience in teaching compact modeling courses, this first-of-its-kind book on compact SPICE models for very-large-scale-integrated (VLSI) chip design offers a balanced presentation of compact modeling crucial for addressing current modeling challenges and understanding new models for emerging devices. Starting from basic semiconductor physics and covering state-of-the-art device regimes from conventional micron to nanometer, this text: Presents industry standard models for bipolar-junction transistors (BJTs), metal-oxide-semiconductor (MOS) field-effect-transistors (FETs), FinFETs, and tunnel field-effect transistors (TFETs), along with statistical MOS models Discusses the major issue of process variability, which severely impacts device and circuit performance in advanced technologies and requires statistical compact models Promotes further research of the evolution and development of compact models for VLSI circuit design and analysis Supplies fundamental and practical knowledge necessary for efficient integrated circuit (IC) design using nanoscale devices Includes exercise problems at the end of each chapter and

extensive references at the end of the book Compact Models for Integrated Circuit Design: Conventional Transistors and Beyond is intended for senior undergraduate and graduate courses in electrical and electronics engineering as well as for researchers and practitioners working in the area of electron devices. However, even those unfamiliar with semiconductor physics gain a solid grasp of compact modeling concepts from this book.

This book presents a wide-band and technology independent, SPICE-compatible RLC model for through-silicon vias (TSVs) in 3D integrated circuits. This model accounts for a variety of effects, including skin effect, depletion capacitance and nearby contact effects. Readers will benefit from in-depth coverage of concepts and technology such as 3D integration, Macro modeling, dimensional analysis and compact modeling, as well as closed form equations for the through silicon via parasitics. Concepts covered are demonstrated by using TSVs in applications such as a spiral inductor and inductive-based communication system and bandpass filtering.

This book focusses on the spacer engineering aspects of novel MOS-based device-circuit co-design in sub-20nm technology node, its process complexity, variability, and reliability issues. It comprehensively explores the FinFET/tri-gate architectures with their circuit/SRAM suitability and tolerance to random statistical variations.

This book is devoted to the latest advances in the area of electrothermal modelling of electronic components and networks. It contains eight sections by different teams of authors. These sections contain the results of: (a) electro-thermal simulations of SiC

power MOSFETs using a SPICE-like simulation program; (b) modelling thermal properties of inductors taking into account the influence of the core volume on the efficiency of heat removal; (c) investigations into the problem of inserting a temperature sensor in the neighbourhood of a chip to monitor its junction temperature; (d) computations of the internal temperature of power LEDs situated in modules containing multiple-power LEDs, taking into account both self-heating in each power LED and mutual thermal couplings between each diode; (e) analyses of DC-DC converters using the electrothermal averaged model of the diode-transistor switch, including an IGBT and a rapid-switching diode; (f) electrothermal modelling of SiC power BJTs; (g) analysis of the efficiency of selected algorithms used for solving heat transfer problems at nanoscale; (h) analysis related to thermal simulation of the test structure dedicated to heat-diffusion investigation at the nanoscale.

Sustainable Developments by Artificial Intelligence and Machine Learning for Renewable Energies analyzes the changes in this energy generation shift, including issues of grid stability with variability in renewable energy vs. traditional baseload energy generation. Providing solutions to current critical environmental, economic and social issues, this book comprises various complex nonlinear interactions among different parameters to drive the integration of renewable energy into the grid. It considers how artificial intelligence and machine learning techniques are being developed to produce more reliable energy generation to optimize system performance and provide sustainable development. As the use of artificial intelligence to revolutionize the energy market and harness the potential of renewable energy is essential, this

reference provides practical guidance on the application of renewable energy with AI, along with machine learning techniques and capabilities in design, modeling and for forecasting performance predictions for the optimization of renewable energy systems. It is targeted at researchers, academicians and industry professionals working in the field of renewable energy, AI, machine learning, grid Stability and energy generation. Covers the best-performing methods and approaches for designing renewable energy systems with AI integration in a real-time environment Gives advanced techniques for monitoring current technologies and how to efficiently utilize the energy grid spectrum Addresses the advanced field of renewable generation, from research, impact and idea development of new applications

The purpose of this workshop is to spread the vast amount of information available on semiconductor physics to every possible field throughout the scientific community. As a result, the latest findings, research and discoveries can be quickly disseminated. This workshop provides all participating research groups with an excellent platform for interaction and collaboration with other members of their respective scientific community. This workshop's technical sessions include various current and significant topics for applications and scientific developments, including • Optoelectronics • VLSI & ULSI Technology • Photovoltaics • MEMS & Sensors • Device Modeling and Simulation • High Frequency/Power Devices • Nanotechnology and Emerging Areas • Organic Electronics • Displays and Lighting Many eminent scientists from various national and international organizations are actively participating with their latest research works and also equally supporting this mega event by joining the various organizing commit-

tees.

This book constitutes the refereed proceedings of the 21st International Symposium on VLSI Design and Test, VDAT 2017, held in Roorkee, India, in June/July 2017. The 48 full papers presented together with 27 short papers were carefully reviewed and selected from 246 submissions. The papers were organized in topical sections named: digital design; analog/mixed signal; VLSI testing; devices and technology; VLSI architectures; emerging technologies and memory; system design; low power design and test; RF circuits; architecture and CAD; and design verification.

This volume presents the results of a multi-year research programme funded by the Deutsche Forschungsgemeinschaft (German Research Council), which explains how organic solar cells work. In this new promising photovoltaic technology, carbon-based materials are deposited by low-cost methods onto flexible substrates, thus allowing devices which open completely new applications like transparent coatings for building, solar cells integrated into clothing or packages, and many more. The investigation of organic solar cells is an interdisciplinary topic, covering physics, chemistry and engineering. The different chapters address topics ranging from the synthesis of new organic materials, to the characterization of the elementary processes such as exciton transport and separation, and the principles of highly efficient device design. /div

This book is a collection of selected peer-reviewed papers presented at the International Conference on Signal Processing and Communication (ICSC 2018). It covers current research and developments in the fields of communications, signal processing, VLSI cir-

cuits and systems, and embedded systems. The book offers in-depth discussions and analyses of latest problems across different sub-fields of signal processing and communications. The contents of this book will prove to be useful for students, researchers, and professionals working in electronics and electrical engineering, as well as other allied fields.

This book provides readers with a variety of tools to address the challenges posed by hot carrier degradation, one of today's most complicated reliability issues in semiconductor devices. Coverage includes an explanation of carrier transport within devices and book-keeping of how they acquire energy ("become hot"), interaction of an ensemble of colder and hotter carriers with defect precursors, which eventually leads to the creation of a defect, and a description of how these defects interact with the device, degrading its performance.

The 2nd volume of 'Advances in Microelectronics: Reviews' Book Series is written by 57 contributors from academy and industry from 11 countries (Bulgaria, Hungary, Iran, Japan, Malaysia, Romania, Russia, Slovak Republic, Spain, Ukraine and USA). The book contains 13 chapters from different areas of microelectronics: MEMS, materials characterization, and various microelectronic devices. With unique combination of information in each volume, the Book Series will be of value for scientists and engineers in industry and at universities. Each of chapter is ending by well selected list of references with books, journals, conference proceedings and web sites. This book ensures that readers will stay at the cutting edge of the field and get the right and effective start point and road map for the further researches and developments.

Currently strain engineering is the main technique used to enhance the performance of advanced silicon-based metal-oxide-semiconductor field-effect transistors (MOSFETs). Written from an engineering application standpoint, *Strain-Engineered MOSFETs* introduces promising strain techniques to fabricate strain-engineered MOSFETs and to methods to assess the applications of these techniques. The book provides the background and physical insight needed to understand new and future developments in the modeling and design of n- and p-MOSFETs at nanoscale. This book focuses on recent developments in strain-engineered MOSFETS implemented in high-mobility substrates such as, Ge, SiGe, strained-Si, ultrathin germanium-on-insulator platforms, combined with high-k insulators and metal-gate. It covers the materials aspects, principles, and design of advanced devices, fabrication, and applications. It also presents a full technology computer aided design (TCAD) methodology for strain-engineering in Si-CMOS technology involving data flow from process simulation to process variability simulation via device simulation and generation of SPICE process compact models for manufacturing for yield optimization. Microelectronics fabrication is facing serious challenges due to the introduction of new materials in manufacturing and fundamental limitations of nanoscale devices that result in increasing unpredictability in the characteristics of the devices. The down scaling of CMOS technologies has brought about the increased variability of key parameters affecting the performance of integrated circuits. This book provides a single text that combines coverage of the strain-engineered MOSFETS and their modeling using TCAD, making it a tool for process technology development and the design of strain-engineered MOS-

FETs.

This volume comprises select papers from the International Conference on Microelectronics, Computing & Communication Systems(MCCS 2015). Electrical, Electronics, Computer, Communication and Information Technology and their applications in business, academic, industry and other allied areas. The main aim of this volume is to bring together content from international scientists, researchers, engineers from both academia and the industry. The contents of this volume will prove useful to researchers, professionals, and students alike.

Our mission is to provide a forum for world experts to discuss technologies, address the growing needs associated with silicon technology, and exchange their discoveries and solutions for current issues of high interest. We encourage collaboration, open discussion, and critical reviews at this conference. Furthermore, we hope that this conference will also provide collaborative opportunities for those who are interested in the semiconductor industry in Asia, particularly in China.

Responding to recent developments and a growing VLSI circuit manufacturing market, *Technology Computer Aided Design: Simulation for VLSI MOSFET* examines advanced MOSFET processes and devices through TCAD numerical simulations. The book provides a balanced summary of TCAD and MOSFET basic concepts, equations, physics, and new technologies related to TCAD and MOSFET. A firm grasp of these concepts allows for the design of better models, thus streamlining the design process, saving time and money. This book places emphasis on the importance of modeling and simulations of VLSI MOS transistors and TCAD software. Providing background concepts involved in the TCAD simulation

of MOSFET devices, it presents concepts in a simplified manner, frequently using comparisons to everyday-life experiences. The book then explains concepts in depth, with required mathematics and program code. This book also details the classical semiconductor physics for understanding the principle of operations for VLSI MOS transistors, illustrates recent developments in the area of MOSFET and other electronic devices, and analyzes the evolution of the role of modeling and simulation of MOSFET. It also provides exposure to the two most commercially popular TCAD simulation tools Silvaco and Sentaurus.

- Emphasizes the need for TCAD simulation to be included within VLSI design flow for nano-scale integrated circuits
- Introduces the advantages of TCAD simulations for device and process technology characterization
- Presents the fundamental physics and mathematics incorporated in the TCAD tools
- Includes popular commercial TCAD simulation tools (Silvaco and Sentaurus)
- Provides characterization of performances of VLSI MOSFETs through TCAD tools
- Offers familiarization to compact modeling for VLSI circuit simulation

R&D cost and time for electronic product development is drastically reduced by taking advantage of TCAD tools, making it indispensable for modern VLSI device technologies. They provide a means to characterize the MOS transistors and improve the VLSI circuit simulation procedure. The comprehensive information and systematic approach to design, characterization, fabrication, and computation of VLSI MOS transistor through TCAD tools presented in this book provides a thorough foundation for the development of models that simplify the design verification process and make it cost effective.

A comprehensive one-volume reference on current JLFET methods, techniques, and research Advancements in transistor technology have driven the modern smart-device revolution—many cell phones, watches, home appliances, and numerous other devices of everyday usage now surpass the performance of the room-filling supercomputers of the past. Electronic devices are continuing to become more mobile, powerful, and versatile in this era of internet-of-things (IoT) due in large part to the scaling of metal-oxide semiconductor field-effect transistors (MOSFETs). Incessant scaling of the conventional MOSFETs to cater to consumer needs without incurring performance degradation requires costly and complex fabrication process owing to the presence of metallurgical junctions. Unlike conventional MOSFETs, junctionless field-effect transistors (JLFETs) contain no metallurgical junctions, so they are simpler to process and less costly to manufacture. JLFETs utilize a gated semiconductor film to control its resistance and the current flowing through it. Junctionless Field-Effect Transistors: Design, Modeling, and Simulation is an inclusive, one-stop reference on the study and research on JLFETs. This timely book covers the fundamental physics underlying JLFET operation, emerging architectures, modeling and simulation methods, comparative analyses of JLFET performance metrics, and several other interesting facts related to JLFETs. A calibrated simulation framework, including guidance on Sentaurus TCAD software, enables researchers to investigate JLFETs, develop new architectures, and improve performance. This valuable resource: Addresses the design and architecture challenges faced by JLFET as a replacement for MOSFET Examines various approaches for analytical and compact modeling of JLFETs in circuit design and simula-

tion Explains how to use Technology Computer-Aided Design software (TCAD) to produce numerical simulations of JLFETs Suggests research directions and potential applications of JLFETs Junctionless Field-Effect Transistors: Design, Modeling, and Simulation is an essential resource for CMOS device design researchers and advanced students in the field of physics and semiconductor devices.

This volume contains the proceedings of the 12th International Conference on Simulation of Semiconductor Processes and Devices, SISPAD 2007, held September 2007 in Vienna, Austria. It provides a global forum for the presentation and discussion of recent advances and developments in the theoretical description, physical modeling and numerical simulation and analysis of semiconductor fabrication processes, device operation and system performance.

Unfriendly to conventional electronic devices, circuits, and systems, extreme environments represent a serious challenge to designers and mission architects. The first truly comprehensive guide to this specialized field, Extreme Environment Electronics explains the essential aspects of designing and using devices, circuits, and electronic systems intended to operate in extreme environments, including across wide temperature ranges and in radiation-intense scenarios such as space. The Definitive Guide to Extreme Environment Electronics Featuring contributions by some of the world's foremost experts in extreme environment electronics, the book provides in-depth information on a wide array of topics. It begins by describing the extreme conditions and then delves into a description of suitable semiconductor technologies and the modeling of devices within those technologies. It also dis-

cusses reliability issues and failure mechanisms that readers need to be aware of, as well as best practices for the design of these electronics. Continuing beyond just the "paper design" of building blocks, the book rounds out coverage of the design realization process with verification techniques and chapters on electronic packaging for extreme environments. The final set of chapters describes actual chip-level designs for applications in energy and space exploration. Requiring only a basic background in electronics, the book combines theoretical and practical aspects in each self-contained chapter. Appendices supply additional background material. With its broad coverage and depth, and the expertise of the contributing authors, this is an invaluable reference for engineers, scientists, and technical managers, as well as researchers and graduate students. A hands-on resource, it explores what is required to successfully operate electronics in the most demanding conditions.

Combining cutting-edge technologies and techniques with existing approaches, this book equips you with the tools and knowledge needed to develop new energy-efficient and environmentally friendly RFID systems. As well as covering RFID basics, a wide range of new technologies is discussed, including biodegradable and recyclable material use, energy scavenging, passive and chipless architectures, RFID passive sensors, networked RFID and RFID sensors, organic electronic devices, textile electronics, and distributed and wide area electronics. Providing a clear description of how RFID technology can enable the evolution of the Internet of Things, the book guides you down the path to facing new challenges as we move towards ubiquitous sensing for smart environments and a networked society. This is an ideal guide for re-

searchers in academia and industry, technical managers, and graduate students in RF and wireless communications.

This book facilitates the VLSI-interested individuals with not only in-depth knowledge, but also the broad aspects of it by explaining its applications in different fields, including image processing and biomedical. The deep understanding of basic concepts gives you the power to develop a new application aspect, which is very well taken care of in this book by using simple language in explaining the concepts. In the VLSI world, the importance of hardware description languages cannot be ignored, as the designing of such dense and complex circuits is not possible without them. Both Verilog and VHDL languages are used here for designing. The current needs of high-performance integrated circuits (ICs) including low power devices and new emerging materials, which can play a very important role in achieving new functionalities, are the most interesting part of the book. The testing of VLSI circuits becomes more crucial than the designing of the circuits in this nanometer technology era. The role of fault simulation algorithms is very well explained, and its implementation using Verilog is the key aspect of this book. This book is well organized into 20 chapters. Chapter 1 emphasizes on uses of FPGA on various image processing and biomedical applications. Then, the descriptions enlighten the basic understanding of digital design from the perspective of HDL in Chapters 2-5. The performance enhancement with alternate material or geometry for silicon-based FET designs is focused in Chapters 6 and 7. Chapters 8 and 9 describe the study of bimolecular interactions with biosensing FETs. Chapters 10-13 deal with advanced FET structures available in

various shapes, materials such as nanowire, HFET, and their comparison in terms of device performance metrics calculation. Chapters 14-18 describe different application-specific VLSI design techniques and challenges for analog and digital circuit designs. Chapter 19 explains the VLSI testability issues with the description of simulation and its categorization into logic and fault simulation for test pattern generation using Verilog HDL. Chapter 20 deals with a secured VLSI design with hardware obfuscation by hiding the IC's structure and function, which makes it much more difficult to reverse engineer.

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, im-

proves 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.