

Compact Modelling In Rf Cmos Technology Doras Dcu

This book provides the most comprehensive and in-depth coverage of the latest circuit design developments in RF CMOS technology. It is a practical and cutting-edge guide, packed with proven circuit techniques and innovative design methodologies for solving challenging problems associated with RF integrated circuits and systems. This invaluable resource features a collection of the finest design practices that may soon drive the system-on-chip revolution. Using this book's state-of-the-art design techniques, one can apply existing technologies in novel ways and to create new circuit designs for the future.

Advanced concepts for wireless technologies present a vision of technology that is embedded in our surroundings and practically invisible. From established radio techniques like GSM, 802.11 or Bluetooth to more emerging technologies, such as Ultra Wide Band and smart dust motes, a common denominator for future progress is the underlying integrated circuit technology. Wireless Technologies responds to the explosive growth of standard cellular radios and radically different wireless applications by presenting new architectural and circuit solutions engineers can use to solve modern design problems. This reference addresses state-of-the-art CMOS design in the context of emerging wireless applications, including 3G/4G cellular telephony, wireless sensor networks, and wireless medical application. Written by top international experts specializing in both the IC industry and academia, this carefully edited work uncovers new design opportunities in body area networks, medical implants, satellite communications, automobile radar detection, and wearable electronics. The book is divided into three sections: wireless system perspectives, chip architecture and implementation issues, and devices and technologies used to fabricate wireless integrated circuits. Contributors address key issues in the development of future silicon-based systems, such as scale of integration, ultra-low power dissipation, and the integration of heterogeneous circuit design style and processes onto one substrate. Wireless sensor network systems are now being applied in critical applications in commerce, healthcare, and security. This reference, which contains 25 practical and scientifically rigorous articles, provides the knowledge communications engineers need to design innovative methodologies at the circuit and system level.

Radio-frequency (RF) integrated circuits in CMOS technology are gaining increasing popularity in the commercial world, and CMOS technology has become the dominant technology for applications such as GPS receivers, GSM cellular transceivers, wireless LAN, and wireless short-range personal area networks based on IEEE 802.15.1 (Bluetooth) or IEEE 802.15.4 (ZigBee) standards. Furthermore, the increasing interest in wireless technologies and the widespread of wireless communications has prompted an ever increasing demand for radio frequency transceivers. Wireless Radio-Frequency Standards and System Design: Advanced Techniques provides perspectives on radio-frequency circuit and systems design, covering recent topics and developments in the RF area. Exploring topics such as LNA linearization, behavioral modeling and co-simulation of analog and mixed-signal complex blocks for RF applications, integrated passive devices for RF-ICs and baseband design techniques and wireless standards, this is a comprehensive reference for students as well as practicing professionals.

A practical, tutorial guide to the nonlinear methods and techniques needed to design real-world microwave circuits.

Technology Computer Aided Design for Si, SiGe and GaAs Integrated Circuits

Compact Models for Integrated Circuit Design (Open Access)

Transistor Level Modeling for Analog/RF IC Design

Compact Modelling in RF CMOS Technology

CMOS RF Device Modeling and Low-noise Amplifier Circuit Design

A MOS Model 9 Extension for GHz CMOS RF Circuit Design

This book contains the extended and revised editions of all the talks of the ninth AACD Workshop held in Hotel Bachmair, April 11 - 13 2000 in Rottach-Egem, Germany. The local organization was managed by Rudolf Koch of Infineon Technologies AG, Munich, Germany. The program consisted of six tutorials per day during three days. Experts in the field presented these tutorials and state of the art information is communicated. The audience at the end of the workshop selects program topics for the following workshop. The program committee, consisting of Johan Huijsing of Delft University of Technology, Willy Sansen of Katholieke Universiteit Leuven and Rudy van de Plassche of Broadcom Netherlands BV Bunnik elaborates the selected topics into a three-day program and selects experts in the field for presentation. Each AACD Workshop has given rise to publication of a book by Kluwer entitled "Analog Circuit Design". A series of nine books in a row provides valuable information and good overviews of all analog circuit techniques concerning design, CAD, simulation and device modeling. These books can be seen as a reference to those people involved in analog and mixed signal design. The aim of the workshop is to brainstorm on new and valuable design ideas in the area of analog circuit design. It is the hope of the program committee that this ninth book continues the tradition of emerging contributions to the design of analog and mixed signal systems in Europe and the rest of the world.

This volume contains the Proceedings of the International Conference on Simulation of Semiconductor Devices and Processes, SISPAD 01, held on September 5-7, 2001, in Athens. The conference provided an open forum for the presentation of the latest results and trends in process and device simulation. The trend towards shrinking device dimensions and increasing complexity in process technology demands the continuous development of advanced models describing basic physical phenomena involved. New simulation tools are developed to complete the hierarchy in the Technology Computer Aided Design simulation chain between microscopic and macroscopic approaches. The conference program featured 8 invited papers, 60 papers for oral presentation and 34 papers for poster presentation, selected from a total of 165 abstracts from 30 countries around the world. These papers disclose new and interesting concepts for simulating processes and devices. This is the first book dedicated to the next generation of MOSFET models. Addressed to circuit designers with an

in-depth treatment that appeals to device specialists, the book presents a fresh view of compact modeling, having completely abandoned the regional modeling approach. Both an overview of the basic physics theory required to build compact MOSFET models and a unified treatment of inversion-charge and surface-potential models are provided. The needs of digital, analog and RF designers as regards the availability of simple equations for circuit designs are taken into account. Compact expressions for hand analysis or for automatic synthesis, valid in all operating regions, are presented throughout the book. All the main expressions for computer simulation used in the new generation compact models are derived. Since designers in advanced technologies are increasingly concerned with fluctuations, the modeling of fluctuations is strongly emphasized. A unified approach for both space (matching) and time (noise) fluctuations is introduced.

This new book on Analog Circuit Design contains the revised contributions of all the tutorial speakers of the eight workshop AACD (Advances in Analog Circuit Design), which was held at Nice, France on March 23-25, 1999. The workshop was organized by Yves Leduc of TI Nice, France. The program committee consisted of Willy Sansen, K.U.Leuven, Belgium, Han Huijsing, T.U.Delft, The Netherlands and Rudy van de Plassche, T.U.Eindhoven, The Netherlands. The aim of these AACD workshops is to bring together a restricted group of about 100 people who are personally advancing the frontiers of analog circuit design to brainstorm on new possibilities and future developments in a restricted number of fields. They are concentrated around three topics. In each topic six speakers give a tutorial presentation. Eighteen papers are thus included in this book. The topics of 1999 are: (X)DSL and other communication systems RF MOST models Integrated filters and oscillators The other topics, which have been covered before, are: 1992 Operational amplifiers A-D Converters Analog CAD 1993 Mixed-mode A+D design Sensor interfaces Communication circuits 1994 Low-power low-voltage design Integrated filters Smart power 1995 Low-noise low-power low-voltage design Mixed-mode design with CAD tools Voltage, current and time references vii viii 1996 RF CMOS circuit design Bandpass sigma-delta and other data converters Translinear circuits 1997 RF A-D Converters Sensor and actuator interfaces Low-noise oscillators, PLL's and synthesizers 1998 I-Volt electronics Design and implementation of mixed-mode systems Low-noise amplifiers and RF power amplifiers for telecommunications

Conventional Transistors and Beyond

Small-signal Modeling for CMOS Devices for RF Applications

Silicon-Based Millimetre-wave Technology

(X)DSL and other Communication Systems; RF MOST Models; Integrated Filters and Oscillators

Modeling and Simulation in Engineering

Behavioral Modeling and Linearization of RF Power Amplifiers

This textbook is appropriate for use in graduate-level curricula in analog to digital conversion, as well as for practicing engineers in need of a state-of-the-art reference on data converters. It discusses various analog-to-digital conversion principles, including sampling, quantization, reference generation, nyquist architectures and sigma-delta modulation. This book presents an overview of the state-of-the-art in this field and focuses on issues of optimizing accuracy and speed, while reducing the power level. This new, second edition emphasizes novel calibration concepts, the specific requirements of new systems, the consequences of 22-nm technology and the need for a more statistical approach to accuracy. Pedagogical enhancements to this edition include more than twice the exercises available in the first edition, solved examples to introduce all key, new concepts and warnings, remarks and hints, from a practitioner's perspective, wherever appropriate. Considerable background information and practical tips, from designing a PCB, to lay-out aspects, to trade-offs on system level, complement the discussion of basic principles, making this book a valuable reference for the experienced engineer. Modern, large-scale analog integrated circuits (ICs) are essentially composed of metal-oxide semiconductor (MOS) transistors and their interconnections. As technology scales down to deep sub-micron dimensions and supply voltage decreases to reduce power consumption, these complex analog circuits are even more dependent on the exact behavior of each transistor. High-performance analog circuit design requires a very detailed model of the transistor, describing accurately its static and dynamic behaviors, its noise and matching limitations and its temperature variations. The charge-based EKV (Enz-Krummenacher-Vittoz) MOS transistor model for IC design has been developed to provide a clear understanding of the device properties, without the use of complicated equations. All the static, dynamic, noise, non-quasi-static models are completely described in terms of the inversion charge at the source and at the drain taking advantage of the symmetry of the device. Thanks to its hierarchical structure, the model offers several coherent description levels, from basic hand calculation equations to complete computer simulation model. It is also compact, with a minimum number of process-dependant device parameters. Written by its developers, this book provides a comprehensive treatment of the EKV charge-based model of the MOS transistor for the design and simulation of low-power analog and RF ICs. Clearly split into three parts, the authors systematically examine: the basic long-channel intrinsic charge-based model, including all the fundamental aspects of the EKV MOST model such as the basic large-signal static model, the noise model, and a discussion of temperature effects and matching properties; the extended charge-based model, presenting important information for understanding the operation of deep-submicron devices; the high-frequency model, setting out a complete MOS transistor model required for designing RF CMOS integrated circuits. Practising engineers and circuit designers in the semiconductor device and electronics systems industry will find this book a valuable guide to the modelling of MOS transistors for integrated circuits. It is also a useful reference for advanced students in electrical and computer engineering.

This practical book is the first comprehensive treatment of lumped elements, which are playing a critical role in the development of the circuits that make these cost-effective systems possible. The book offers professionals an in-depth understanding of the different types of RF and microwave circuit elements.

This volume contains the proceedings of the 10th edition of the International Conference on Simulation

of Semiconductor Processes and Devices (SISPAD 2004), held in Munich, Germany, on September 2-4, 2004. The conference program included 7 invited plenary lectures and 82 contributed papers for oral or poster presentation, which were carefully selected out of a total of 151 abstracts submitted from 14 countries around the world. Like the previous meetings, SISPAD 2004 provided a world-wide 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. The variety of topics covered by the conference contributions reflects the physical effects and technological problems encountered in consequence of the progressively shrinking device dimensions and the ever-growing complexity in device technology.

Simulation of Semiconductor Processes and Devices 2001

Device Modeling for Analog and RF CMOS Circuit Design

Circuits, Systems, and Devices

Simulation of Semiconductor Processes and Devices 2004

Selected Problems

Computational Intelligence in Analog and Mixed-Signal (AMS) and Radio-Frequency (RF) Circuit Design

Discover the concepts and techniques needed to design millimeter-wave circuits for current and emerging wireless system applications.

Circuit simulation is essential in integrated circuit design, and the accuracy of circuit simulation depends on the accuracy of the transistor model. BSIM3v3 (BSIM for Berkeley Short-channel IGFET Model) has been selected as the first MOSFET model for standardization by the Compact Model Council, a consortium of leading companies in semiconductor and design tools. In the next few years, many fabless and integrated semiconductor companies are expected to switch from dozens of other MOSFET models to BSIM3. This will require many device engineers and most circuit designers to learn the basics of BSIM3. MOSFET Modeling & BSIM3 User's Guide explains the detailed physical effects that are important in modeling MOSFETs, and presents the derivations of compact model expressions so that users can understand the physical meaning of the model equations and parameters. It is the first book devoted to BSIM3. It treats the BSIM3 model in detail as used in digital, analog and RF circuit design. It covers the complete set of models, i.e., I-V model, capacitance model, noise model, parasitics model, substrate current model, temperature effect model and non quasi-static model. MOSFET Modeling & BSIM3 User's Guide not only addresses the device modeling issues but also provides a user's guide to the device or circuit design engineers who use the BSIM3 model in digital/analog circuit design, RF modeling, statistical modeling, and technology prediction. This book is written for circuit designers and device engineers, as well as device scientists worldwide. It is also suitable as a reference for graduate courses and courses in circuit design or device modelling. Furthermore, it can be used as a textbook for industry courses devoted to BSIM3. MOSFET Modeling & BSIM3 User's Guide is comprehensive and practical. It is balanced between the background information and advanced discussion of BSIM3. It is helpful to experts and students alike.

The design of radio-frequency (RF) integrated circuits (ICs) in deep-submicron CMOS processes requires accurate and scalable compact models of the MOS transistor that are valid in the GHz frequency range and beyond. Unfortunately, the currently available compact models give inaccurate results if they are not modified adequately. This paper presents the basis of the modeling of the MOS transistor for circuit simulation at RF. A physical and scalable equivalent circuit that can easily be implemented as a Spice subcircuit is described. The small-signal and noise models are discussed and measurements made on a 0.25 μ m CMOS process are presented that validate the RF MOST model up to 10GHz.

The editors and authors present a wealth of knowledge regarding the most relevant aspects in the field of MOS transistor modeling. The variety of subjects and the high quality of content of this volume make it a reference document for researchers and users of MOSFET devices and models. The book can be recommended to everyone who is involved in compact model developments, numerical TCAD modeling, parameter extraction, space-level simulation or model standardization. The book will appeal equally to PhD students who want to understand the ins and outs of MOSFETs as well as to modeling designers working in the analog and high-frequency areas.

International Conference, AIM 2011, Nagpur, Maharashtra, India, April 21-22, 2011, Proceedings

MOSFET Modeling & BSIM3 User's Guide

Models and CAD Techniques for High-Level Design

Millimeter-Wave Circuits for 5G and Radar

Nonlinear Circuit Simulation and Modeling

Lumped Elements for RF and Microwave Circuits

Most of the recent texts on compact modeling are limited to a particular class of semiconductor devices and do not provide comprehensive coverage of the field. Having a single comprehensive reference for the compact models of most commonly used semiconductor devices (both active and passive) represents a significant advantage for the reader. Indeed, several kinds of semiconductor devices are routinely encountered in a single IC design or in a single modeling support group. Compact Modeling includes mostly the material that after several years of IC design applications has been found both theoretically sound and practically significant. Assigning the individual chapters to the groups responsible for the definitive work on the subject assures the highest possible degree of expertise on each of the covered models.

Wireless voice and data communications have made great improvements, with connectivity now virtually ubiquitous.

Users are demanding essentially perfect transmission and reception of voice and data. The infrastructure that supports this wide connectivity and nearly error-free delivery of information is complex, costly, and continually being improved.

This resource describes the mathematical methods and practical implementations of linearization techniques for RF power amplifiers for mobile communications. This includes a review of RF power amplifier design for high efficiency operation.

Readers are also provided with mathematical approaches to modeling nonlinear dynamical systems, which can be applied in the context of modeling the PA for identification in a pre-distortion system. This book also describes typical approaches to linearization and digital pre-distortion that are used in practice.

System-level modeling of MEMS - microelectromechanical systems - comprises integrated approaches to simulate, understand, and optimize the performance of sensors, actuators, and microsystems, taking into account the intricacies of the interplay between mechanical and electrical properties, circuitry, packaging, and design considerations. Thereby, system-level modeling overcomes the limitations inherent to methods that focus only on one of these aspects and do not incorporate their mutual dependencies. The book addresses the two most important approaches of system-level modeling, namely physics-based modeling with lumped elements and mathematical modeling employing model order reduction methods, with an emphasis on combining single device models to entire systems. At a clearly understandable

and sufficiently detailed level the readers are made familiar with the physical and mathematical underpinnings of MEMS modeling. This enables them to choose the adequate methods for the respective application needs. This work is an invaluable resource for all materials scientists, electrical engineers, scientists working in the semiconductor and/or sensor industry, physicists, and physical chemists.

Compact Modelling in RF CMOS Technology
Cmos Rf Modeling, Characterization And Applications
World Scientific
Fundamentals for Microwave Design
Compact Modeling
Design of CMOS RF Integrated Circuits and Systems
Analog Circuit Design
Extreme Environment Electronics

This book summarizes the state-of-the-art, regarding noise in nanometer semiconductor devices. Readers will benefit from this leading-edge research, aimed at increasing reliability based on physical microscopic models. Authors discuss the most recent developments in the understanding of point defects, e.g. via ab initio calculations or intricate measurements, which have paved the way to more physics-based noise models which are applicable to a wider range of materials and features, e.g. III-V materials, 2D materials, and multi-state defects. Describes the state-of-the-art, regarding noise in nanometer semiconductor devices; Enables readers to design more reliable semiconductor devices; Offers the most up-to-date information on point defects, based on physical microscopic models.

The first book to deal with a broad spectrum of process and device design, and modeling issues related to semiconductor devices, bridging the gap between device modelling and process design using TCAD. Presents a comprehensive perspective of emerging fields and covers topics ranging from materials to fabrication, devices, modelling and applications. Aimed at research-and-development engineers and scientists involved in microelectronics technology and device design via Technology CAD, and TCAD engineers and developers.

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 discusses 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.

Bridges the gap between device modelling and analog circuit design. Includes dedicated software enabling actual circuit design. Covers the three significant models: BSIM3, Model 9 &, and EKV. Presents practical guidance on device development and circuit implementation. The authors offer a combination of extensive academic and industrial experience.

Wireless Radio-Frequency Standards and System Design: Advanced Techniques

The EKV Model for Low-Power and RF IC Design

MOSFET Modeling for Circuit Analysis and Design

High-Speed Analog-to-Digital Converters, Mixed Signal Design; PLLs and Synthesizers

Compact MOSFET Models for VLSI Design

Analog-to-Digital Conversion

This book is dedicated to the analysis of parametric amplification with special emphasis on the MOS discrete-time implementation. This implementation is demonstrated by the presentation of several circuits where the MOS parametric amplifier cell is used: gain amplifier, comparator with embedded pre-amplification, discrete-time mixer/IIR-Filter, and analog-to-digital converter (ADC). Experimental results are shown to validate the overall design technique.

Reliability concerns and the limitations of process technology can sometimes restrict the innovation process involved in designing nano-scale analog circuits. The success of nano-scale analog circuit design requires repeat experimentation, correct analysis of the device physics, process technology, and adequate use of the knowledge database. Starting with the basics, Nano-Scale CMOS Analog Circuits: Models and CAD Techniques for High-Level Design introduces the essential fundamental concepts for designing analog circuits with optimal performances. This book explains the links between the physics and technology of scaled MOS transistors and the design and simulation of nano-scale analog circuits. It also explores the development of structured computer-aided design (CAD) techniques for architecture-level and circuit-level design of analog circuits. The book outlines the general trends of technology scaling with respect to device geometry, process parameters, and supply voltage. It describes models and optimization techniques, as well as the compact modeling of scaled MOS transistors for VLSI circuit simulation. • Includes two learning-based methods: the artificial neural network (ANN) and the least-squares support vector machine (LS-SVM) method • Provides case studies demonstrating the practical use of these two methods • Explores circuit sizing and specification translation tasks • Introduces the particle swarm optimization technique and provides examples of sizing analog circuits • Discusses the advanced effects of scaled MOS transistors like narrow width effects, and vertical and lateral channel engineering Nano-Scale CMOS Analog Circuits: Models and CAD Techniques for High-Level Design describes the models and CAD

techniques, explores the physics of MOS transistors, and considers the design challenges involving statistical variations of process technology parameters and reliability constraints related to circuit design.

This book explains the application of recent advances in computational intelligence – algorithms, design methodologies, and synthesis techniques – to the design of integrated circuits and systems. It highlights new biasing and sizing approaches and optimization techniques and their application to the design of high-performance digital, VLSI, radio-frequency, and mixed-signal circuits and systems. This first of two related volumes addresses the design of analog and mixed-signal (AMS) and radio-frequency (RF) circuits, with 17 chapters grouped into parts on analog and mixed-signal applications, and radio-frequency design. It will be of interest to practitioners and researchers in computer science and electronics engineering engaged with the design of electronic circuits.

Practicing designers, students, and educators in the semiconductor field face an ever expanding portfolio of MOSFET models. *Compact MOSFET Models for VLSI Design*, A.B. Bhattacharyya presents a unified perspective on the topic, allowing the practitioner to view and interpret device phenomena concurrently using different modeling strategies. Readers will learn to link device physics with model parameters, helping to close the gap between device understanding and its use for optimal circuit performance. Bhattacharyya also lays bare the core physical concepts that will drive the future of VLSI development, allowing readers to stay ahead of the curve, despite the relentless evolution of new models. Adopts a unified approach to guide students through the confusing array of MOSFET models Links MOS physics to device models to prepare practitioners for real-world design activities Helps fabless designers bridge the gap with off-site foundries Features rich coverage of: quantum mechanical related phenomena Si-Ge strained-Silicon substrate non-classical structures such as Double Gate MOSFETs Presents topics that will prepare readers for long-term developments in the field Includes solutions in every chapter Can be tailored for use among students and professionals of many levels Comes with MATLAB code downloads for independent practice and advanced study This book is essential for students specializing in VLSI Design and indispensable for design professionals in the microelectronics and VLSI industries. Written to serve a number of experience levels, it can be used either as a course textbook or practitioner reference. Access the MATLAB code, solution manual, and lecture materials at the companion website:

www.wiley.com/go/bhattacharyya

Cmos Rf Modeling, Characterization And Applications

Advances in Imaging and Electron Physics

Parametric Analog Signal Amplification Applied to Nanoscale CMOS Technologies

Noise in Nanoscale Semiconductor Devices

High Frequency MOSFET Modeling for RF Applications

SISPAD 01

Achieve higher levels of performance, integration, compactness, and cost-effectiveness in the design and modeling of radio-frequency (RF) power amplifiers RF power amplifiers are important components of any wireless transmitter, but are often the limiting factors in achieving better performance and lower cost in a wireless communication system—presenting the RF IC design community with many challenges. The next-generation technological advances presented in this book are the result of cutting-edge research in the area of large-signal device modeling and RF power amplifier design at the Georgia Institute of Technology, and have the potential to significantly address issues of performance and cost-effectiveness in this area. Richly complemented with hundreds of figures and equations, Modeling and Design Techniques for RF Power Amplifiers introduces and explores the most important topics related to RF power amplifier design under one concise cover. With a focus on efficiency enhancement techniques and the latest advances in the field, coverage includes: Device modeling for CAD Empirical modeling of bipolar devices Scalable modeling of RF MOSFETs Power amplifier IC design Power amplifier design in silicon Efficiency enhancement of RF power amplifiers The description of state-of-the-art techniques makes this book a valuable and handy reference for practicing engineers and researchers, while the breadth of coverage makes it an ideal text for graduate- and advanced undergraduate-level courses in the area of RF power amplifier design and modeling.

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. The Open Access version of this book, available at <https://doi.org/10.1201/b19117>, has been made available under a Creative Commons Attribution-Non Commercial-No Derivatives 4.0 license.

CMOS technology has now reached a state of evolution, in terms of both frequency and noise, where it is becoming a serious contender for radio frequency (RF) applications in the GHz range. Cutoff frequencies of about 50 GHz have

been reported for 0.18 μm CMOS technology, and are expected to reach about 100 GHz when the feature size shrinks to 100 nm within a few years. This translates into CMOS circuit operating frequencies well into the GHz range, which covers the frequency range of many of today's popular wireless products, such as cell phones, GPS (Global Positioning System) and Bluetooth. Of course, the great interest in RF CMOS comes from the obvious advantages of CMOS technology in terms of production cost, high-level integration, and the ability to combine digital, analog and RF circuits on the same chip. This book discusses many of the challenges facing the CMOS RF circuit designer in terms of device modeling and characterization, which are crucial issues in circuit simulation and design.

This book constitutes the refereed proceedings of the International Conference on Advances in Information Technology and Mobile Communication, AIM 2011, held at Nagpur, India, in April 2011. The 31 revised full papers presented together with 27 short papers and 34 poster papers were carefully reviewed and selected from 313 submissions. The papers cover all current issues in theory, practices, and applications of Information Technology, Computer and Mobile Communication Technology and related topics.

Principles, Techniques and Applications

Analysis and Experimental Results of RF CMOS Mixers

Wireless Technologies

Modeling and Design Techniques for RF Power Amplifiers

Charge-Based MOS Transistor Modeling

Information Technology and Mobile Communication

Advances in Imaging and Electron Physics merges two long-running series--Advances in Electronics and Electron Physics and Advances in Optical and Electron Microscopy. This series features extended articles on the physics of electron devices (especially semiconductor devices), particle optics at high and low energies, microlithography, image science and digital image processing, electromagnetic wave propagation, electron microscopy, and the computing methods used in all these domains. Contributions from leading authorities Informs and updates on all the latest developments in the field

The general aim of this book is to present selected chapters of the following types: chapters with more focus on modeling with some necessary simulation details and chapters with less focus on modeling but with more simulation details. This book contains eleven chapters divided into two sections: Modeling in Continuum Mechanics and Modeling in Electronics and Engineering. We hope our book entitled "Modeling and Simulation in Engineering - Selected Problems" will serve as a useful reference to students, scientists, and engineers.

This book primarily focuses on the radiation effects and compact model of silicon-germanium (SiGe) heterojunction bipolar transistors (HBTs). It introduces the small-signal equivalent circuit of SiGe HBTs including the distributed effects, and proposes a novel direct analytical extraction technique based on non-linear rational function fitting. It also presents the total dose effects irradiated by gamma rays and heavy ions, as well as the single-event transient induced by pulse laser microbeams. It offers readers essential information on the irradiation effects technique and the SiGe HBTs model using that technique.

This paper presents an extension to the compact MOS model 9 that enables accurate simulation of CMOS RF circuits in the GHz range. The MOS model 9 is generally accepted for low frequency design, but it is quite inaccurate at GHz frequencies if device parasitics are not considered. The presented model is based on a MOS model 9, extended by a network of parasitics, consisting of six resistors, five capacitors, and two JUNCAP diode models. A model developed for a 0.25 μm CMOS technology shows good accuracy in the measured frequency range up to 12 GHz and over a wide bias range. By applying simple rules for scaling of parasitics and a unit transistor layout approach, the model also shows scalability with respect to device width. The model also predicts third-order intercept point with good accuracy, and simulations and measurements on a 2 GHz CMOS amplifier shows also good agreement.

Nano-scale CMOS Analog Circuits

Research on the Radiation Effects and Compact Model of SiGe HBT

MOS Transistor Modeling for RF IC Design

Advanced Techniques

System-level Modeling of MEMS