Compact Modelling In Rf Cmos Technology Doras Dcu

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.

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.

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 mea-surements made on a 0.25?m CMOS process are presented that validate the RF MOST model up to 10GHz.

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.

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

Simulation of Semiconductor Processes and Devices 2004

Analog-to-Digital Conversion

High Performance Logic And Circuits For High-speed Electronic Systems

Analysis and Experimental Results of RF CMOS Mixers

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.
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.
Practicing designers, students, and educators in the semiconductor field face an ever expanding portfolio of MOSFET models. In 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 indispensible 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 ' s reference. Access the MATLAB code, solution manual, and lecture materials at the companion website: www.wiley.com/go/bhattacharyya
A MOS Model 9 Extension for GHz CMOS RF Circuit Design
Modeling and Design Techniques for RF Power Amplifiers
High Frequency MOSFET Modeling for RF Applications
Compact MOSFET Models for VLSI Design
Cmos Rf Modeling, Characterization And Applications
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.
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.
This book provides a comprehensive review of the state-of-the-art in the development of new and innovative materials, and of advanced modeling and characterization methods for nanoscale CMOS devices. Leading global industry bodies including the International Technology Roadmap for Semiconductors (ITRS) have created a forecast of performance improvements that will be delivered in the foreseeable future – in the form of a roadmap that will lead to a substantial enlargement in the number of materials, technologies and device architectures used in CMOS devices. This book addresses the field of materials development, which has been the subject of a major research drive aimed at finding new ways to enhance the performance of semiconductor technologies. It covers three areas that will each have a dramatic impact on the development of future CMOS devices: global and local strained and alternative materials for high speed channels on bulk substrate and insulator; very low access resistance; and various high dielectric constant gate stacks for power scaling. The book also provides information on the most appropriate modeling and simulation methods for electrical properties of advanced MOSFETs, including ballistic transport, gate leakage, atomistic simulation, and compact models for single and multi-gate devices, nanowire and carbon-based FETs. Finally, the book presents an in-depth investigation of the main nanocharacterization techniques that can be used for an accurate determination of transport parameters, interface defects, channel strain as well as RF properties, including capacitance-conductance, improved split C-V, magnetoresistance, charge pumping, low frequency noise, and Raman spectroscopy.
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.

Charge-Based MOS Transistor Modeling

Nanoscale CMOS

Advances in Imaging and Electron Physics

Silicon-Based Millimetre-wave Technology

2018 25th International Conference Mixed Design of Integrated Circuits and System (MIXDES)

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.

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.

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 coverd 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-voltge 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

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.

Research on the Radiation Effects and Compact Model of SiGe HBT

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

System-level Modeling of MEMS

Wireless Technologies

Noise in Nanoscale Semiconductor Devices

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.

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.

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 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.

Design of CMOS RF Integrated Circuits and Systems

Analog Circuit Design

Selected Problems

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

Device Modeling for Analog and RF CMOS Circuit Design

Industry Standard FDSOI Compact Model BSIM-IMG for IC Design helps readers develop an understanding of a FDSOI device and its simulation model. It covers the physics and operation of the FDSOI device, explaining not only how FDSOI enables further scaling, but also how it offers unique possibilities in circuits. Following chapters cover the industry standard compact model BSIM-IMG for FDSOI devices. The book addresses core surface-potential calculations and the plethora of real devices and potential effects. Written by the original developers of the industrial standard model, this book is an excellent reference for the new BSIM-IMG compact model for emerging FDSOI technology. The authors include chapters on step-by-step parameters extraction procedure for BSIM-IMG model and rigorous industry grade tests that the BSIM-IMG model has undergone. There is also a chapter on analog and RF circuit design in FDSOI technology using the BSIM-IMG model. Provides a detailed discussion of the BSIM-IMG model and the industry standard simulation model for FDSOI, all presented by the developers of the model Explains the complex operation of the FDSOI device and its use of two independent control inputs Addresses the parameter extraction challenges for those using this model

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.

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.

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.

MOSFET Modeling & BSIM3 User ' s Guide

Modeling and Simulation in Engineering

Information Technology and Mobile Communication

The EKV Model for Low-Power and RF IC Design

Wireless Radio-Frequency Standards and System Design: Advanced Techniques

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 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: small 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.
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.
Advances in Imaging and Electron Physics merges two long-running serials--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
Ultra High-Speed CMOS Circuits
MOSFET Modeling for Circuit Analysis and Design
Computational Intelligence in Analog and Mixed-Signal (AMS) and Radio-Frequency (RF) Circuit Design
Innovative Materials, Modeling and Characterization
Lumped Elements for RF and Microwave Circuits

The MIXDES Conference covers research in design, modeling, simulation, testing and manufacturing in various areas such as micro and nanoelectronics, semiconductors, sensors, actuators and power devices

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.

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 ?m 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.

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.

Compact Modelling in RF CMOS Technology
Circuits, Systems, and Devices
Transistor Level Modeling for Analog/RF IC Design
Small-signal Modeling for CMOS Devices for RF Applications
MOS Transistor Modeling for RF IC Design

In this volume, we have put together papers spanning a broad range — from the area of modeling of strain and misfit dislocation densities, microwave absorption characteristics of nanocomposites, to X-ray diffraction studies.Specific topics in this volume include:In summary, papers selected in this volume cover various aspects of high performance logic and circuits for high-speed electronic systems.

The book covers the CMOS-based millimeter wave circuits and devices and presents methods and design techniques to use CMOS technology for circuits operating beyond 100 GHz. Coverage includes a detailed description of both active and passive devices, including modeling techniques and performance optimization. Various mm-wave circuit blocks are discussed, emphasizing their design distinctions from low-frequency design methodologies. This book also covers a device-oriented circuit design technique that is essential for ultra high speed circuits and gives some examples of device/circuit co-design that can be used for mm-wave technology.

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.

Principles, Techniques and Applications

SISPAD 01

Parametric Analog Signal Amplification Applied to Nanoscale CMOS Technologies

Simulation of Semiconductor Processes and Devices 2001

Conventional Transistors and Beyond