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Computer-Aided Analysis of Power Electronic Systems Venkatachari Rajagopalan: 1987-04-29

MOSFET Models for VLSI Circuit Simulation Narain D. Arora 2012-12-06 Metal Oxide Semiconductor (MOS) transistors are the basic building block of MOS integrated circuits (I C). Very Large Scale Integrated (VLSI) circuits using MOS technology have emerged as the dominant technology in the semiconductor industry. Over the past decade, the complexity of MOS IC's has increased at an astonishing rate. This is realized mainly through the reduction of MOS transistor dimensions in addition to the improvements in processing. Today VLSI circuits with over 3 million transistors on a chip, with effective or electrical channel lengths of 0.5 microns, are in volume production. Designing such complex chips is virtually impossible without simulation tools which help to predict circuit behavior before actual circuits are fabricated. However, the utility of simulators as a tool for the design and analysis of circuits depends on the adequacy of the device models used in the simulator. This problem is further aggravated by the technology trend towards smaller and smaller device dimensions which increases the complexity of the models. There is extensive literature available on modeling these short channel devices. However, there is a lot of confusion too. Often it is not clear what model to use and which model parameter values are important and how to determine them. After working over 15 years in the field of semiconductor device modeling, I have felt the need for a book which can fill the gap between the theory and the practice of MOS transistor modeling. This book is an attempt in that direction.

Engineering Education 1982

Emerging Nanoelectronics Adrian M. Ionescu 2005-01-01 This book contains state-of-the-art material and envisions evolutions concerning limits foreseen for CMOS technology, single electron devices and circuits, hybrid CMOS-SET circuit architecture, and other novel devices and circuits operating with a few electrons. An engineering, practical point of view is systematically followed.

Simulation Sheldon M. Ross 2013 "In formulating a stochastic model to describe a real phenomenon, it used to be that one compromised between choosing a model that is a realistic replica of the actual situation and choosing one whose mathematical analysis is tractable. That is, there did not seem to be any payoff in choosing a model that faithfully conformed to the phenomenon under study if it were not possible to mathematically analyze that model. Similar considerations have led to the concentration on asymptotic or steady-state results as opposed to the more useful ones on transient time. However, the relatively recent advent of fast and inexpensive computational power has opened up another approach--namely, to try to model the phenomenon as faithfully as possible and then to rely on a simulation study to analyze it"--
BSIM4 and MOSFET Modeling For IC Simulation

Official Gazette of the United States Patent and Trademark Office United States. Patent

and Trademark Office 1998

Logic Non-volatile Memory: The Nvm Solutions For Ememory Hsu Charles Ching-hsiang 2014-03-18 Would you like to add the capabilities of the Non-Volatile Memory (NVM) as a storage element in your silicon integrated logic circuits, and as a trimming sector in your high voltage driver and other silicon integrated analog circuits? Would you like to learn how to embed the NVM into your silicon integrated circuit products to improve their performance? This book is written to help you. It provides comprehensive instructions on fabricating the NVM using the same processes you are using to fabricate your logic integrated circuits. We at our eMemory company call this technology the embedded Logic NVM. Because embedded Logic NVM has simple fabrication processes, it has replaced the conventional NVM in many traditional and new applications, including LCD driver, LED driver, MEMS controller, touch panel controller, power management unit, ambient and motion sensor controller, micro controller unit (MCU), security ID setting tag, RFID, NFC, PC camera controller, keyboard controller, and mouse controller. The recent explosive growth of the Logic NVM indicates that it will soon dominate all NVM applications. The embedded Logic NVM was invented and has been implemented in users' applications by the 200+ employees of our eMemory company, who are also the authors and author-assistants of this book. This book covers the following Logic NVM products: One Time Programmable (OTP) memory, Multiple Times Programmable (MTP) memory, Flash memory, and Electrically Erasable Programmable Read Only Memory (EEPROM). The fundamentals of the NVM are described in this book, which include: the physics and operations of the memory transistors, the basic building block of the memory cells and the access circuits. All of these products have been used continuously by the industry worldwide. In-depth readers can attain expert proficiency in the implementation of the embedded Logic NVM technology in their products.

Mosfet Modeling for Circuit Analysis and Design

Nanometer CMOS ICs Harry J.M. Veendrick 2017-04-28 This textbook provides a comprehensive, fully-updated introduction to the essentials of nanometer CMOS integrated circuits. It includes aspects of scaling to even beyond 12nm CMOS technologies and designs. It clearly describes the fundamental CMOS operating principles and presents substantial insight into the various aspects of design implementation and application. Coverage includes all associated disciplines of nanometer CMOS ICs, including physics, lithography, technology, design, memories, VLSI, power consumption, variability, reliability and signal integrity, testing, yield, failure analysis, packaging, scaling trends and road blocks. The text is based upon in-house Philips, NXP Semiconductors, Applied Materials, ASML, IMEC, ST-Ericsson, TSMC, etc., courseware, which, to date, has been completed by more than 4500 engineers working in a large variety of related disciplines: architecture, design, test, fabrication process, packaging, failure analysis and software.

Semiconductor Devices and Technologies for Future Ultra Low Power Electronics D. Nirmal

2021-12-09 This book covers the fundamentals and significance of 2-D materials and related semiconductor transistor technologies for the next-generation ultra low power applications. It provides comprehensive coverage on advanced low power transistors such as NCFETs, FinFETs, TFETs, and flexible transistors for future ultra low power applications owing to their better subthreshold swing and scalability. In addition, the text examines the use of field-effect transistors for biosensing applications and covers design considerations and compact modeling of advanced low power transistors such as NCFETs, FinFETs, and TFETs. TCAD simulation examples are also provided. FEATURES Discusses the latest updates in the field of ultra low power semiconductor transistors Provides both experimental and analytical solutions for TFETs and NCFETs Presents synthesis and fabrication processes for FinFETs Reviews details on 2-D materials and 2-D transistors Explores the application of FETs for biosensing in the healthcare field This book is aimed at researchers, professionals, and graduate students in electrical engineering, electronics and communication engineering, electron devices, nanoelectronics and nanotechnology, microelectronics, and solid-state circuits.

Electronic Packaging Science and Technology King-Ning Tu 2021-12-14 Must-have reference on electronic packaging technology! The electronics industry is shifting towards system packaging technology due to the need for higher chip circuit density without increasing production costs. Electronic packaging, or circuit integration, is seen as a necessary strategy to achieve a performance growth of electronic circuitry in next-generation electronics. With the implementation of novel materials with specific and tunable electrical and magnetic properties, electronic packaging is highly attractive as a solution to achieve denser levels of circuit integration. The first part of the book gives an overview of electronic packaging and provides the reader with the fundamentals of the most important packaging techniques such as wire bonding, tap automatic bonding, flip chip solder joint bonding, microbump bonding, and low temperature direct Cu-to-Cu bonding. Part two consists of concepts of electronic circuit design and its role in low power devices, biomedical devices, and circuit integration. The last part of the book contains topics based on the science of electronic packaging and the reliability of packaging technology.

MOSFET Modeling & BSIM3 User's Guide Yuhua Cheng 2007-05-08 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.

Modern Power Electronics PC Sen 2005 I May observed that recent developments in power electronics have proceeded in two different directions, namely, low power range power supplies

using high frequency PWM technique and medium to high power range energy control systems to serve specific Purpose.

Portable Design 2000

Digital Integrated Circuit Design Hubert Kaeslin 2008-04-28 Top-down approach to practical, tool-independent, digital circuit design, reflecting how circuits are designed.

FinFETs and Other Multi-Gate Transistors J.-P. Colinge 2008 This book explains the physics and properties of multi-gate field-effect transistors (MuGFETs), how they are made and how circuit designers can use them to improve the performances of integrated circuits. It covers the emergence of quantum effects and novel electrical transport phenomena due to the reduced size of the devices. In addition, this book describes the evolution of the MOS transistor from classical structures to SOI (silicon-on-insulator) and then to MuGFETs. It includes descriptions of the technological challenges and options, including a physically based compact model, that are presented by these devices. It also describes the most advanced models of MuGFET properties based on quantum modeling as well as other MuGFET applications that include advanced circuits and radiation-hard electronic devices.

Basic VLSI Design Technology Cherry Bhargava 2022-09-01 The current cutting-edge VLSI circuit design technologies provide end-users with many applications, increased processing power and improved cost effectiveness. This trend is accelerating, with significant implications on future VLSI and systems design. VLSI design engineers are always in demand for front-end and back-end design applications. The book aims to give future and current VLSI design engineers a robust understanding of the underlying principles of the subject. It not only focuses on circuit design processes obeying VLSI rules but also on technological aspects of fabrication. The Hardware Description Language (HDL) Verilog is explained along with its modelling style. The book also covers CMOS design from the digital systems level to the circuit level. The book clearly explains fundamental principles and is a guide to good design practices. The book is intended as a reference book for senior undergraduate, first-year post graduate students, researchers as well as academicians in VLSI design, electronics & electrical engineering and materials science. The basics and applications of VLSI design from digital system design to IC fabrication and FPGA Prototyping are each covered in a comprehensive manner. At the end of each unit is a section with technical questions including solutions which will serve as an excellent teaching aid to all readers. Technical topics discussed in the book include: • Digital System Design • Design flow for IC fabrication and FPGA based prototyping • Verilog HDL • IC Fabrication Technology • CMOS VLSI Design • Miscellaneous (It covers basics of Electronics, and Reconfigurable computing, PLDs, Latest technology etc.).

Interactive Business Communities Mitsuru Kodama 2016-05-23 Innovation in technology and services was once the result of specialist knowledge developed within a single corporation; now, a single focus on the development of new products and services is no longer enough. In *Interactive Business Communities*, Mitsuru Kodama shows how a new business approach can enable managers to access, share and integrate diverse knowledge both inside and outside the corporation using Boundary Networks to operate across more formal organizational and knowledge boundaries at all levels. Drawing on his studies of large corporations in America and the Far East, Mitsuru, shows how different companies have already started to take this path. He explains the kind of networks and strategic partnerships that have emerged and gives practical guidelines on how to begin forming in-house business communities and extending this to interactive business communities with customers and other organizations. This book is a valuable resource for business educators and researchers, and senior executives responsible for strategy, particularly in high-tech industries, will find insights and ideas to tackle 21st century market and business discontinuities.

Electronic Devices And Circuit Theory,9/e With Cd Boylestad 2007

Health Economics Jay Bhattacharya 2018-10-19 Comprehensive in coverage this textbook, written by academics from leading institutions, discusses current developments and debates in

modern health economics from an international perspective. Economic models are presented in detail, complemented by real-life explanations and analysis, and discussions of the influence of such theories on policymaking. Offering sound pedagogy and economic rigor, Health Economics focuses on building intuition alongside appropriate mathematical formality, translating technical language into accessible economic narrative. Rather than shying away from intellectual building blocks, students are introduced to technical and theoretical foundations and encouraged to apply these to inform empirical studies and wider policymaking. Health Economics provides: - A broad scope, featuring comparative health policy and empirical examples from around the world to help students relate the principles of health economics to everyday life - Coverage of topical issues such as the obesity epidemic, economic epidemiology, socioeconomic health disparities, and behavioural economics - A rich learning resource, complete with hundreds of exercises to help solidify and extend understanding. This book is designed for advanced undergraduate courses in health economics and policy but may also interest postgraduate students in economics, medicine and health policy.

Scientific and Technical Aerospace Reports 1993

FinFET Modeling for IC Simulation and Design Yogesh Singh Chauhan 2015-03-17 This book is the first to explain FinFET modeling for IC simulation and the industry standard - BSIM-CMG - describing the rush in demand for advancing the technology from planar to 3D architecture, as now enabled by the approved industry standard. The book gives a strong foundation on the physics and operation of FinFET, details aspects of the BSIM-CMG model such as surface potential, charge and current calculations, and includes a dedicated chapter on parameter extraction procedures, providing a step-by-step approach for the efficient extraction of model parameters. With this book you will learn: Why you should use FinFET The physics and operation of FinFET Details of the FinFET standard model (BSIM-CMG) Parameter extraction in BSIM-CMG FinFET circuit design and simulation Authored by the lead inventor and developer of FinFET, and developers of the BSIM-CM standard model, providing an experts' insight into the specifications of the standard The first book on the industry-standard FinFET model - BSIM-CMG
An Introduction to Semiconductor Devices Donald A. Neamen 2006 An Introduction to Semiconductor Devices by Donald Neamen provides an understanding of the characteristics, operations and limitations of semiconductor devices. In order to provide this understanding, the book brings together the fundamental physics of the semiconductor material and the semiconductor device physics. This new text provides an accessible and modern presentation of material. Quantum mechanic material is minimal, and the most advanced material is designated with an icon. Excellent pedagogy is present throughout the book in the form of interesting chapters openers, worked examples, a variety of exercises, key terms, and end of chapter problems.

CMOS Integrated Switching Power Converters Gerard Villar Piqué 2011-05-20 This book describes the structured design and optimization of efficient, energy processing integrated circuits. The approach is multidisciplinary, covering the monolithic integration of IC design techniques, power electronics and control theory. In particular, this book enables readers to conceive, synthesize, design and implement integrated circuits with high-density high-efficiency on-chip switching power regulators. Topics covered encompass the structured design of the on-chip power supply, efficiency optimization, IC-compatible power inductors and capacitors, power MOSFET switches and efficient switch drivers in standard CMOS technologies.

Green Computing with Emerging Memory Takayuki Kawahara 2012-05 This volume describes computing innovation using non-volatile memory for a sustainable world. The text presents methods of design and implementation for non-volatile memory, allowing devices to be turned off normally when not in use, yet operate with full performance when needed.

Dissertation Abstracts International 2008

Solar Cells Chenming Hu 1983

Modern Semiconductor Devices for Integrated Circuits 2009-09

Halide Perovskites Tze-Chien Sum 2019-02-11 Real insight from leading experts in the field into the causes of the unique photovoltaic performance of perovskite solar cells, describing the fundamentals of perovskite materials and device architectures. The authors cover materials research and development, device fabrication and engineering methodologies, as well as current knowledge extending beyond perovskite photovoltaics, such as the novel spin physics and multiferroic properties of this family of materials. Aimed at a better and clearer understanding of the latest developments in the hybrid perovskite field, this is a must-have for material scientists, chemists, physicists and engineers entering or already working in this booming field.

3D IC and RF SiPs: Advanced Stacking and Planar Solutions for 5G Mobility Lih-Tyng Hwang 2018-03-28 An interdisciplinary guide to enabling technologies for 3D ICs and 5G mobility, covering packaging, design to product life and reliability assessments Features an interdisciplinary approach to the enabling technologies and hardware for 3D ICs and 5G mobility Presents statistical treatments and examples with tools that are easily accessible, such as Microsoft's Excel and Minitab Fundamental design topics such as electromagnetic design for logic and RF/passives centric circuits are explained in detail Provides chapter-wise review questions and powerpoint slides as teaching tools

Industry Standard FDSOI Compact Model BSIM-IMG for IC Design Chenming Hu 2019-05-21 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

CMOS Telecom Data Converters Angel Rodríguez-Vázquez 2013-03-09 CMOS Telecom Data Converters compiles the latest achievements regarding the design of high-speed and high-resolution data converters in deep submicron CMOS technologies. The four types of analog-to-digital converter architectures commonly found in this arena are covered, namely sigma-delta, pipeline, folding/interpolating and flash. For all these types, latest achievements regarding the solution of critical architectural and circuital issues are presented, and illustrated through IC prototypes with measured state-of-the-art performances. Some of these prototypes are conceived to be employed at the chipset of newest generation wireline modems (ADSL and ADSL+). Others are intended for wireless transceivers. Besides analog-to-digital converters, the book also covers other functions needed for communication systems, such as digital-to-analog converters, analog filters, programmable gain amplifiers, digital filters, and line drivers.

Organic Light-Emitting Transistors Michele Muccini 2016-04-25 This book puts Organic Light Emitting Transistors (OLETs) in the context of organic electronics and photonics, exploring devices' physics principles, the properties of currently available materials, processing and fabrication techniques, and the different approaches adopted to structure the active channel and to control organic and hybrid interfaces. Major applications in different fields as well as the industry's roadmap for future implementation are also reviewed in detail.

High Dielectric Constant Materials Howard Huff 2006-03-30 Issues relating to the high-K gate dielectric are among the greatest challenges for the evolving International Technology

Roadmap for Semiconductors (ITRS). More than just an historical overview, this book will assess previous and present approaches related to scaling the gate dielectric and their impact, along with the creative directions and forthcoming challenges that will define the future of gate dielectric scaling technology.

Proceedings 1996

Analog Circuit Design Willy M.C. Sansen 2013-03-09 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

Toward Quantum FinFET Weihua Han 2013-11-23 This book reviews a range of quantum phenomena in novel nanoscale transistors called FinFETs, including quantized conductance of 1D transport, single electron effect, tunneling transport, etc. The goal is to create a fundamental bridge between quantum FinFET and nanotechnology to stimulate readers' interest in developing new types of semiconductor technology. Although the rapid development of micro-nano fabrication is driving the MOSFET downscaling trend that is evolving from planar channel to nonplanar FinFET, silicon-based CMOS technology is expected to face fundamental limits in the near future. Therefore, new types of nanoscale devices are being investigated aggressively to take advantage of the quantum effect in carrier transport. The quantum confinement effect of FinFET at room temperatures was reported following the breakthrough to sub-10nm scale technology in silicon nanowires. With chapters written by leading scientists throughout the world, *Toward Quantum FinFET* provides a comprehensive introduction to the field as well as a platform for knowledge sharing and dissemination of the latest advances. As a roadmap to guide

further research in an area of increasing importance for the future development of materials science, nanofabrication technology, and nano-electronic devices, the book can be recommended for Physics, Electrical Engineering, and Materials Science departments, and as a reference on micro-nano electronic science and device design. Offers comprehensive coverage of novel nanoscale transistors with quantum confinement effect Provides the keys to understanding the emerging area of the quantum FinFET Written by leading experts in each research area Describes a key enabling technology for research and development of nanofabrication and nanoelectronic devices

Analysis and Solutions for Switching Noise Coupling in Mixed-Signal ICs X. Aragonés 2013-03-09 Modern microelectronic design is characterized by the integration of full systems on a single die. These systems often include large high performance digital circuitry, high resolution analog parts, high driving I/O, and maybe RF sections. Designers of such systems are constantly faced with the challenge to achieve compatibility in electrical characteristics of every section: some circuitry presents fast transients and large consumption spikes, whereas others require quiet environments to achieve resolutions well beyond millivolts. Coupling between those sections is usually unavoidable, since the entire system shares the same silicon substrate bulk and the same package. Understanding the way coupling is produced, and knowing methods to isolate coupled circuitry, and how to apply every method, is then mandatory knowledge for every IC designer. *Analysis and Solutions for Switching Noise Coupling in Mixed-Signal ICs* is an in-depth look at coupling through the common silicon substrate, and noise at the power supply lines. It explains the elementary knowledge needed to understand these phenomena and presents a review of previous works and new research results. The aim is to provide an understanding of the reasons for these particular ways of coupling, review and suggest solutions to noise coupling, and provide criteria to apply noise reduction. *Analysis and Solutions for Switching Noise Coupling in Mixed-Signal ICs* is an ideal book, both as introductory material to noise-coupling problems in mixed-signal ICs, and for more advanced designers facing this problem.

Modern Semiconductor Devices for Integrated Circuits Chenming Hu 2010 Modern Semiconductor Devices for Integrated Circuits, First Edition introduces readers to the world of modern semiconductor devices with an emphasis on integrated circuit applications. KEY TOPICS: Electrons and Holes in Semiconductors; Motion and Recombination of Electrons and Holes; Device Fabrication Technology; PN and Metal-Semiconductor Junctions; MOS Capacitor; MOS Transistor; MOSFETs in ICs—Scaling, Leakage, and Other Topics; Bipolar Transistor. MARKET: Written by an experienced teacher, researcher, and expert in industry practices, this succinct and forward-looking text is appropriate for anyone interested in semiconductor devices for integrated circuits, and serves as a suitable reference text for practicing engineers.