

## Variation Aware Analog And Mixed Signal Circuit Design In Emerging Multi Gate Cmos Technologies Springer Series In Advanced Microelectronics

This book enables readers to achieve ultra-low energy digital system performance. The author's main focus is the energy consumption of microcontroller architectures in digital (sub)-systems. The book covers a broad range of topics extensively: from circuits through design strategy to system architectures. The result is a set of techniques and a context to realize minimum energy digital systems. Several prototype silicon implementations are discussed, which put the proposed techniques to the test. The achieved results demonstrate an extraordinary combination of variation-resilience, high speed performance and ultra-low energy.

This book addresses key aspects of analog integrated circuits and systems design related to system level electrostatic discharge (ESD) protection. It is an invaluable reference for anyone developing systems-on-chip (SoC) and systems-on-package (SoP), integrated with system-level ESD protection. The book focuses on both the design of semiconductor integrated circuit (IC) components with embedded, on-chip system level protection and IC-system co-design. The readers will be enabled to bring the system level ESD protection solutions to the level of integrated circuits, thereby reducing or completely eliminating the need for additional, discrete components on the printed circuit board (PCB) and meeting system-level ESD requirements. The authors take a systematic approach, based on IC-system ESD protection co-design. A detailed description of the available IC-level ESD testing methods is provided, together with a discussion of the correlation between IC-level and system-level ESD testing methods. The IC-level ESD protection design is demonstrated with representative case studies which are analyzed with various numerical simulations and ESD testing. The overall methodology for IC-system ESD co-design is presented as a step-by-step procedure that involves both ESD testing and numerical simulations.

This book presents a framework for the reuse-based design of AMS circuits. The framework is founded on three key elements: (1) a CAD-supported hierarchical design flow; (2) a complete, clear definition of the AMS reusable block; (3) the design for a reusability set of tools, methods, and guidelines. The book features a detailed tutorial and in-depth coverage of all issues and must-have properties of reusable AMS blocks.

This book highlights key design issues and challenges to guarantee the development of successful applications of analog circuits. Researchers around the world share acquired experience and insights to develop advances in analog circuit design, modeling and simulation. The key contributions of the sixteen chapters focus on recent advances in analog circuits to accomplish academic or

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industrial target specifications.

Summer maybe cooling off but things are heating up for the Witch girls. It's easy for the girls to be distracted with a new school term starting, new boys to flirt with and old boyfriends to flirt with. But somewhere across the dimensions, a new enemy lurks in an icy prison and the girls, must prepare to suffer the consequences of Witch.

Since process variation and chip performance uncertainties have become more pronounced as technologies scale down into the nanometer regime, accurate and efficient modeling or characterization of variations from the device to the architecture level have become imperative for the successful design of VLSI chips. This book provides readers with tools for variation-aware design methodologies and computer-aided design (CAD) of VLSI systems, in the presence of process variations at the nanometer scale. It presents the latest developments for modeling and analysis, with a focus on statistical interconnect modeling, statistical parasitic extractions, statistical full-chip leakage and dynamic power analysis considering spatial correlations, statistical analysis and modeling for large global interconnects and analog/mixed-signal circuits. Provides readers with timely, systematic and comprehensive treatments of statistical modeling and analysis of VLSI systems with a focus on interconnects, on-chip power grids and clock networks, and analog/mixed-signal circuits; Helps chip designers understand the potential and limitations of their design tools, improving their design productivity; Presents analysis of each algorithm with practical applications in the context of real circuit design; Includes numerical examples for the quantitative analysis and evaluation of algorithms presented. Provides readers with timely, systematic and comprehensive treatments of statistical modeling and analysis of VLSI systems with a focus on interconnects, on-chip power grids and clock networks, and analog/mixed-signal circuits; Helps chip designers understand the potential and limitations of their design tools, improving their design productivity; Presents analysis of each algorithm with practical applications in the context of real circuit design; Includes numerical examples for the quantitative analysis and evaluation of algorithms presented.

This book presents a collection of papers emphasizing applications of mathematical models and methods to real-world problems of relevance for industry, life science, environment, finance and so on. The biannual Conference of ECMI (the European Consortium of Mathematics in Industry) held in 2014 focused on various aspects of industrial and applied mathematics. The five main topics addressed at the conference were mathematical models in life science, material science and semiconductors, mathematical methods in the environment, design automation and industrial applications, and computational finance.

Several other topics have been treated, such as, among others, optimization and inverse problems, education, numerical methods for stiff pdes, model reduction, imaging processing, multi physics simulation, mathematical models in textile industry. The conference, which brought together applied mathematicians and

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experts from industry, provided a unique opportunity to exchange ideas, problems and methodologies, bridging the gap between mathematics and industry and contributing to the advancement of science and technology. The conference has included a presentation of EU-Maths-In (European Network of Mathematics for Industry and Innovation), a recent joint initiative of ECMI and EMS. The proceedings from this conference represent a snapshot of the current activity in industrial mathematics in Europe, and are highly relevant to anybody interested in the latest applications of mathematics to industrial problems.

This book presents a new methodology with reduced time impact to address the problem of analog integrated circuit (IC) yield estimation by means of Monte Carlo (MC) analysis, inside an optimization loop of a population-based algorithm. The low time impact on the overall optimization processes enables IC designers to perform yield optimization with the most accurate yield estimation method, MC simulations using foundry statistical device models considering local and global variations. The methodology described by the authors delivers on average a reduction of 89% in the total number of MC simulations, when compared to the exhaustive MC analysis over the full population. In addition to describing a newly developed yield estimation technique, the authors also provide detailed background on automatic analog IC sizing and optimization.

Recent years have witnessed significant research efforts in flexible organic and amorphous-metal-oxide analogue electronics, in view of its formidable potential for applications such as smart sensor systems. This Element provides a comprehensive overview of this growing research area. After discussing the properties of organic and amorphous-metal-oxide technologies relevant to analogue circuits, this Element focuses on their application to two key circuit blocks: amplifiers and analogue-to-digital converters. The Element thus provides a fresh look at the evolution and immediate opportunities of the field, and identifies the remaining challenges for these technologies to become the platform of choice for flexible analogue electronics.

The book will address the-state-of-the-art in integrated circuit design in the context of emerging systems. New exciting opportunities in body area networks, wireless communications, data networking, and optical imaging are discussed. Emerging materials that can take system performance beyond standard CMOS, like Silicon on Insulator (SOI), Silicon Germanium (SiGe), and Indium Phosphide (InP) are explored. Three-dimensional (3-D) CMOS integration and co-integration with sensor technology are described as well. The book is a must for anyone serious about circuit design for future technologies. The book is written by top notch international experts in industry and academia. The intended audience is practicing engineers with integrated circuit background. The book will be also used as a recommended reading and supplementary material in graduate course curriculum. Intended audience is professionals working in the integrated circuit design field. Their job titles might be : design engineer, product manager, marketing manager, design team leader, etc. The book will be also used by

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graduate students. Many of the chapter authors are University Professors. Circuit Design = Science + Art! Designers need a skilled “gut feeling” about circuits and related analytical techniques, plus creativity, to solve all problems and to adhere to the specifications, the written and the unwritten ones. You must anticipate a large number of influences, like temperature effects, supply voltages changes, offset voltages, layout parasitics, and numerous kinds of technology variations to end up with a circuit that works. This is challenging for analog, custom-digital, mixed-signal or RF circuits, and often researching new design methods in relevant journals, conference proceedings and design tools gives the impression unfortunately that just a “wild bunch” of “advanced techniques” exist. On the other hand, state-of-the-art tools nowadays indeed offer a good cockpit to steer the design flow, which include clever statistical methods and optimization techniques. Actually, this almost presents a second breakthrough, like the introduction of circuit simulators 40 years ago! Users can now conveniently analyze all the problems (discover, quantify, verify), and even exploit them, for example for optimization purposes. Most designers are caught up on everyday problems, so we fit that “wild bunch” into a systematic approach for variation-aware design, a designer’s field guide and more. That is where this book can help! Circuit Design: Anticipate, Analyze, Exploit Variations starts with best-practise manual methods and links them tightly to up-to-date automation algorithms. We provide many tractable examples and explain key techniques you have to know. We then enable you to select and setup suitable methods for each design task – knowing their prerequisites, advantages and, as too often overlooked, their limitations as well. The good thing with computers is that you yourself can often verify amazing things with little effort, and you can use software not only to your direct advantage in solving a specific problem, but also for becoming a better skilled, more experienced engineer. Unfortunately, EDA design environments are not good at all to learn about advanced numerics. So with this book we also provide two apps for learning about statistic and optimization directly with circuit-related examples, and in real-time so without the long simulation times. This helps to develop a healthy statistical gut feeling for circuit design. The book is written for engineers, students in engineering and CAD / methodology experts. Readers should have some background in standard design techniques like entering a design in a schematic capture and simulating it, and also know about major technology aspects.

This book provides a holistic view of modelling for analogue, high frequency, mixed signal, and heterogeneous systems for designers working towards improving efficiency, reducing design times, and addressing the challenges of representing aging, variability, and other technical challenges at the nanometre scale.

This book presents physical understanding, modeling and simulation, on-chip characterization, layout solutions, and design techniques that are effective to enhance the reliability of various circuit units. The authors provide readers with

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techniques for state of the art and future technologies, ranging from technology modeling, fault detection and analysis, circuit hardening, and reliability management.

Unlike books currently on the market, this book attempts to satisfy two goals: combine circuits and electronics into a single, unified treatment, and establish a strong connection with the contemporary world of digital systems. It will introduce a new way of looking not only at the treatment of circuits, but also at the treatment of introductory coursework in engineering in general. Using the concept of "abstraction," the book attempts to form a bridge between the world of physics and the world of large computer systems. In particular, it attempts to unify electrical engineering and computer science as the art of creating and exploiting successive abstractions to manage the complexity of building useful electrical systems. Computer systems are simply one type of electrical systems. +Balances circuits theory with practical digital electronics applications. +Illustrates concepts with real devices. +Supports the popular circuits and electronics course on the MIT OpenCourse Ware from which professionals worldwide study this new approach. +Written by two educators well known for their innovative teaching and research and their collaboration with industry. +Focuses on contemporary MOS technology.

Since scaling of CMOS is reaching the nanometer area serious limitations enforce the introduction of novel materials, device architectures and device concepts. Multi-gate devices employing high-k gate dielectrics are considered as promising solution overcoming these scaling limitations of conventional planar bulk CMOS. Variation Aware Analog and Mixed-Signal Circuit Design in Emerging Multi-Gate CMOS Technologies provides a technology oriented assessment of analog and mixed-signal circuits in emerging high-k and multi-gate CMOS technologies.

Despite the fact that in the digital domain, designers can take full benefits of IPs and design automation tools to synthesize and design very complex systems, the analog designers' task is still considered as a 'handcraft', cumbersome and very time consuming process. Thus, tremendous efforts are being deployed to develop new design methodologies in the analog/RF and mixed-signal domains. This book collects 16 state-of-the-art contributions devoted to the topic of systematic design of analog, RF and mixed signal circuits. Divided in the two parts Methodologies and Techniques recent theories, synthesis techniques and design methodologies, as well as new sizing approaches in the field of robust analog and mixed signal design automation are presented for researchers and R/D engineers.

Every other day we hear about new ways to put deep learning to good use: improved medical imaging, accurate credit card fraud detection, long range weather forecasting, and more. PyTorch puts these superpowers in your hands, providing a comfortable Python experience that gets you started quickly and then grows with you as you—and your deep learning skills—become more sophisticated. Deep Learning with PyTorch will make that journey engaging and fun. Summary Every other day we hear about new ways to put deep learning to

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good use. Improved medical imaging, accurate credit card fraud detection, long range weather forecasting, and more. PyTorch puts these superpowers in your hands, providing a comfortable Python experience that gets you started quickly and then grows with you as you—and your deep learning skills—become more sophisticated. Deep Learning with PyTorch will make that journey engaging and fun. Foreword by Soumith Chintala, Cocreator of PyTorch. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology Although many deep learning tools use Python, the PyTorch library is truly Pythonic. Instantly familiar to anyone who knows PyData tools like NumPy and scikit-learn, PyTorch simplifies deep learning without sacrificing advanced features. It's excellent for building quick models, and it scales smoothly from laptop to enterprise. Because companies like Apple, Facebook, and JPMorgan Chase rely on PyTorch, it's a great skill to have as you expand your career options. It's easy to get started with PyTorch. It minimizes cognitive overhead without sacrificing the access to advanced features, meaning you can focus on what matters the most - building and training the latest and greatest deep learning models and contribute to making a dent in the world. PyTorch is also a snap to scale and extend, and it partners well with other Python tooling. PyTorch has been adopted by hundreds of deep learning practitioners and several first-class players like FAIR, OpenAI, FastAI and Purdue. About the book Deep Learning with PyTorch teaches you to create neural networks and deep learning systems with PyTorch. This practical book quickly gets you to work building a real-world example from scratch: a tumor image classifier. Along the way, it covers best practices for the entire DL pipeline, including the PyTorch Tensor API, loading data in Python, monitoring training, and visualizing results. After covering the basics, the book will take you on a journey through larger projects. The centerpiece of the book is a neural network designed for cancer detection. You'll discover ways for training networks with limited inputs and start processing data to get some results. You'll sift through the unreliable initial results and focus on how to diagnose and fix the problems in your neural network. Finally, you'll look at ways to improve your results by training with augmented data, make improvements to the model architecture, and perform other fine tuning. What's inside Training deep neural networks Implementing modules and loss functions Utilizing pretrained models from PyTorch Hub Exploring code samples in Jupyter Notebooks About the reader For Python programmers with an interest in machine learning. About the author Eli Stevens had roles from software engineer to CTO, and is currently working on machine learning in the self-driving-car industry. Luca Antiga is cofounder of an AI engineering company and an AI tech startup, as well as a former PyTorch contributor. Thomas Viehmann is a PyTorch core developer and machine learning trainer and consultant. consultant based in Munich, Germany and a PyTorch core developer. Table of Contents PART 1 - CORE PYTORCH 1 Introducing deep learning and the PyTorch Library 2 Pretrained networks 3 It starts with a tensor 4 Real-world data representation using tensors 5 The mechanics of learning 6 Using a neural network to fit the data 7 Telling birds from airplanes: Learning from images 8 Using convolutions to generalize PART 2 - LEARNING FROM IMAGES IN THE REAL WORLD: EARLY DETECTION OF LUNG CANCER 9 Using PyTorch to fight cancer 10 Combining data sources into a unified dataset 11 Training a classification model to detect suspected tumors 12 Improving training with metrics and augmentation 13 Using segmentation to find suspected nodules 14 End-to-end nodule analysis, and where to go next PART 3 - DEPLOYMENT 15 Deploying to production This book brings together a selection of the best papers from the seventeenth edition of the Forum on specification and Design Languages Conference (FDL), which took place on October 14-16, 2014, in Munich, Germany. FDL is a well-established international forum devoted to dissemination of research results, practical experiences and new ideas in the application of specification, design and verification languages to the design, modeling and verification of integrated circuits, complex hardware/software embedded systems, and mixed-

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technology systems.

Improving the performance of existing technologies has always been a focal practice in the development of computational systems. However, as circuitry is becoming more complex, conventional techniques are becoming outdated and new research methodologies are being implemented by designers. Performance Optimization Techniques in Analog, Mix-Signal, and Radio-Frequency Circuit Design features recent advances in the engineering of integrated systems with prominence placed on methods for maximizing the functionality of these systems. This book emphasizes prospective trends in the field and is an essential reference source for researchers, practitioners, engineers, and technology designers interested in emerging research and techniques in the performance optimization of different circuit designs.

This book describes the new generation of discrete choice methods, focusing on the many advances that are made possible by simulation. Researchers use these statistical methods to examine the choices that consumers, households, firms, and other agents make. Each of the major models is covered: logit, generalized extreme value, or GEV (including nested and cross-nested logits), probit, and mixed logit, plus a variety of specifications that build on these basics. Simulation-assisted estimation procedures are investigated and compared, including maximum simulated likelihood, method of simulated moments, and method of simulated scores.

Procedures for drawing from densities are described, including variance reduction techniques such as anithetics and Halton draws. Recent advances in Bayesian procedures are explored, including the use of the Metropolis-Hastings algorithm and its variant Gibbs sampling. The second edition adds chapters on endogeneity and expectation-maximization (EM) algorithms. No other book incorporates all these fields, which have arisen in the past 25 years. The procedures are applicable in many fields, including energy, transportation, environmental studies, health, labor, and marketing.

We often come across computational optimization virtually in all branches of engineering and industry. Many engineering problems involve heuristic search and optimization, and, once discretized, may become combinatorial in nature, which gives rise to certain difficulties in terms of solution procedure. Some of these problems have enormous search spaces, are NP-hard and hence require heuristic solution techniques. Another difficulty is the lack of ability of classical solution techniques to determine appropriate optima of non-convex problems. Under these conditions, recent advances in computational optimization techniques have been shown to be advantageous and successful compared to classical approaches. This Volume presents some of the latest developments with a focus on the design of algorithms for computational optimization and their applications in practice. Through the chapters of this book, researchers and practitioners share their experience and newest methodologies with regard to intelligent optimization and provide various case studies of the application of intelligent optimization techniques in real-world applications. This book can serve as an excellent reference for researchers and graduate students in computer science, various engineering disciplines and the industry.

"Symbolic analyzers have the potential to offer knowledge to sophomores as well as practitioners of analog circuit design. Actually, they are an essential complement to numerical simulators, since they provide insight into circuit behavior which numerical "

This book constitutes the refereed proceedings of the 11th International Symposium on Applied Reconfigurable Computing, ARC 2015, held in Bochum, Germany, in April 2015. The 23 full papers and 20 short papers presented in this volume were carefully reviewed and selected from 85 submissions. They are organized in topical headings named: architecture and modeling; tools and compilers; systems and applications; network-on-a-chip; cryptography applications; extended abstracts of posters. In addition, the book contains invited papers on funded R&D - running and completed projects and Horizon 2020 funded projects.

Welcome to the proceedings of the 19th International Workshop on Power and

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Timing Modeling, Optimization and Simulation, PATMOS 2009. Over the years, PATMOS has evolved into an important European event, where researchers from both industry and academia discuss and investigate the emerging challenges in future and contemporary applications, design methodologies, and tools required for the development of the upcoming generations of integrated circuits and systems. PATMOS 2009 was organized by TU Delft, The Netherlands, with sponsorship by the NIRICT Design Lab and Cadence Design Systems, and technical co-sponsorship by the IEEE. Further information about the workshop is available at <http://ens.ewi.tudelft.nl/patmos09>. The technical program of PATMOS 2009 contained state-of-the-art technical contributions, three invited keynote presentations, and a special session on SystemC-AMS Extensions. The technical program focused on timing, performance, and power consumption, as well as architectural aspects with particular emphasis on modeling, design, characterization, analysis, and optimization in the nanometer era. The Technical Program Committee, with the assistance of additional expert reviewers, selected the 36 papers presented at PATMOS. The papers were organized into 7 oral sessions (with a total of 26 papers) and 2 poster sessions (with a total of 10 papers). As is customary for the PATMOS workshops, full papers were required for review, and a minimum of three reviews were received per manuscript.

Computational intelligence techniques are becoming more and more important for automated problem solving nowadays. Due to the growing complexity of industrial applications and the increasingly tight time-to-market requirements, the time available for thorough problem analysis and development of tailored solution methods is decreasing. There is no doubt that this trend will continue in the foreseeable future. Hence, it is not surprising that robust and general automated problem solving methods with satisfactory performance are needed.

This book provides comprehensive coverage of the dependability challenges in today's advanced computing systems. It is an in-depth discussion of all the technological and design-level techniques that may be used to overcome these issues and analyzes various dependability-assessment methods. The impact of individual application scenarios on the definition of challenges and solutions is considered so that the designer can clearly assess the problems and adjust the solution based on the specifications in question. The book is composed of three sections, beginning with an introduction to current dependability challenges arising in complex computing systems implemented with nanoscale technologies, and of the effect of the application scenario. The second section details all the fault-tolerance techniques that are applicable in the manufacture of reliable advanced computing devices. Different levels, from technology-level fault avoidance to the use of error correcting codes and system-level checkpointing are introduced and explained as applicable to the different application scenario requirements. Finally the third section proposes a roadmap of future trends in and perspectives on the dependability and manufacturability of advanced computing systems from the special point of view of industrial stakeholders. Dependable Multicore Architectures at Nanoscale showcases the original ideas and concepts introduced into the field of nanoscale manufacturing and systems reliability over nearly four years of work within COST Action IC1103 MEDIAN, a think-tank with participants from 27 countries. Academic researchers and graduate students working in multi-core computer systems and their manufacture will find this book of interest as will industrial design and manufacturing engineers working in VLSI companies.

Reliability concerns and the limitations of process technology can sometimes restrict the innovation process involved in designing nano-scale analog circuits. The success of

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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.

Covering both the classical and emerging nanoelectronic technologies being used in mixed-signal design, this book addresses digital, analog, and memory components. Winner of the Association of American Publishers' 2016 PROSE Award in the Textbook/Physical Sciences & Mathematics category. Nanoelectronic Mixed-Signal System Design offers professionals and students a unified perspective on the science, engineering, and technology behind nanoelectronics system design. Written by the director of the NanoSystem Design Laboratory at the University of North Texas, this comprehensive guide provides a large-scale picture of the design and manufacturing aspects of nanoelectronic-based systems. It features dual coverage of mixed-signal circuit and system design, rather than just digital or analog-only. Key topics such as process variations, power dissipation, and security aspects of electronic system design are discussed. Top-down analysis of all stages--from design to manufacturing

Coverage of current and developing nanoelectronic technologies--not just nano-CMOS

Describes the basics of nanoelectronic technology and the structure of popular electronic systems

Reveals the techniques required for design excellence and manufacturability

This book targets custom IC designers who are encountering variation issues in their designs, especially for modern process nodes at 45nm and below, such as statistical process variations, environmental variations, and layout effects. It teaches them the state-of-the-art in Variation-Aware Design tools, which help the designer to analyze quickly the variation effects, identify the problems, and fix the problems. Furthermore, this book describes the algorithms and algorithm behavior/performance/limitations, which is of use to designers considering these tools, designers using these tools, CAD researchers, and CAD managers.

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Design exibility and power consumption in addition to the cost, have always been the most important issues in design of integrated circuits (ICs), and are the main concerns of this research, as well. Energy Consumptions: Power dissipation ( $P$ ) and energy consumption are - diss pecially important when there is a limited amount of power budget or limited source of energy. Very common examples are portable systems where the battery life time depends on system power consumption. Many different techniques have been - veloped to reduce or manage the circuit power consumption in this type of systems. Ultra-low power (ULP) applications are another examples where power dissipation is the primary design issue. In such applications, the power budget is so restricted that very special circuit and system level design techniques are needed to satisfy the requirements. Circuits employed in applications such as wireless sensor networks (WSN), wearable battery powered systems [1], and implantable circuits for biol- ical applications need to consume very low amount of power such that the entire system can survive for a very long time without the need for changing or recharging battery [2–4]. Using new power supply techniques such as energy harvesting [5] and printable batteries [6], is another reason for reducing power dissipation. Devel- ing special design techniques for implementing low power circuits [7–9], as well as dynamic power management (DPM) schemes [10] are the two main approaches to control the system power consumption. Design Flexibility: Design exibility is the other important issue in modern in- grated systems.

The present book includes extended and revised versions of a set of selected papers from the 1st International Conference on Simulation and Modeling Methodologies, Technologies and Applications (SIMULTECH 2011) which was sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC) and held in Noordwijkerhout, The Netherlands. SIMULTECH 2011 was technically co-sponsored by the Society for Modeling & Simulation International (SCS), GDR I3, Lionphant Simulation and Simulation Team and held in cooperation with ACM Special Interest Group on Simulation and Modeling (ACM SIGSIM) and the AIS Special Interest Group of Modeling and Simulation (AIS SIGMAS).

This book describes new tools for front end analog designers, starting with global variation-aware sizing, and extending to novel variation-aware topology design. The tools aid design through automation, but more importantly, they also aid designer insight through automation. We now describe four design tasks, each more general than the previous, and how this book contributes design aids and insight aids to each. The ?rst designer task targeted is global robust sizing. This task is supported by a design tool that does automated, globally reliable, variation-aware s- ing (SANGRIA), and an insight-aiding tool that extracts designer-interpretable whitebox models that relate sizings to circuit performance (CAFFEINE). SANGRIA searches on several levels of problem dif?cultly simultaneously, from lower cheap-to-evaluate “exploration” layers to higher full-evaluation “exploitation” layers (structural homotopy). SANGRIA makes maximal use of circuit simulations by performing scalable data mining on simulation results to choose new candidate designs. CAFFEINE accomplishes its task by tre- ing function induction as a tree-search problem. It constrains its tree search space via a canonical-functional-form grammar, and searches the space with grammatically constrained genetic programming. The second designer task is topology selection/topology design. Topology selection tools must consider a broad variety of

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topologies such that an appropriate topology is selected, must easily adapt to new semiconductor process nodes, and readily incorporate new topologies. Topology design tools must allow designers to creatively explore new topology ideas as rapidly as possible.

Based on the popular Artech House classic, Digital Communication Systems Engineering with Software-Defined Radio, this book provides a practical approach to quickly learning the software-defined radio (SDR) concepts needed for work in the field. This up-to-date volume guides readers on how to quickly prototype wireless designs using SDR for real-world testing and experimentation. This book explores advanced wireless communication techniques such as OFDM, LTE, WLA, and hardware targeting. Readers will gain an understanding of the core concepts behind wireless hardware, such as the radio frequency front-end, analog-to-digital and digital-to-analog converters, as well as various processing technologies. Moreover, this volume includes chapters on timing estimation, matched filtering, frame synchronization message decoding, and source coding. The orthogonal frequency division multiplexing is explained and details about HDL code generation and deployment are provided. The book concludes with coverage of the WLAN toolbox with OFDM beacon reception and the LTE toolbox with downlink reception. Multiple case studies are provided throughout the book. Both MATLAB and Simulink source code are included to assist readers with their projects in the field.

This book introduces readers to a variety of tools for automatic analog integrated circuit (IC) sizing and optimization. The authors provide a historical perspective on the early methods proposed to tackle automatic analog circuit sizing, with emphasis on the methodologies to size and optimize the circuit, and on the methodologies to estimate the circuit's performance. The discussion also includes robust circuit design and optimization and the most recent advances in layout-aware analog sizing approaches. The authors describe a methodology for an automatic flow for analog IC design, including details of the inputs and interfaces, multi-objective optimization techniques, and the enhancements made in the base implementation by using machine learning techniques. The Gradient model is discussed in detail, along with the methods to include layout effects in the circuit sizing. The concepts and algorithms of all the modules are thoroughly described, enabling readers to reproduce the methodologies, improve the quality of their designs, or use them as starting point for a new tool. An extensive set of application examples is included to demonstrate the capabilities and features of the methodologies described.

This book describes several techniques to address variation-related design challenges for analog blocks in mixed-signal systems-on-chip. The methods presented are results from recent research works involving receiver front-end circuits, baseband filter linearization, and data conversion. These circuit-level techniques are described, with their relationships to emerging system-level calibration approaches, to tune the performances of analog circuits with digital assistance or control. Coverage also includes a strategy to utilize on-chip temperature sensors to measure the signal power and linearity characteristics of analog/RF circuits, as demonstrated by test chip measurements. Describes a variety of variation-tolerant analog circuit design examples, including from RF front-ends, high-performance ADCs and baseband filters; Includes built-in testing techniques, linked to current industrial trends; Balances digitally-assisted performance tuning with analog performance tuning and mismatch reduction approaches; Describes theoretical concepts as well as experimental results for test chips designed with variation-aware techniques.

This book is devoted to the subject of adaptive techniques for smart analog and mixed signal design whereby fully functional first-pass silicon is achievable. To our knowledge, this is the first book devoted to this subject. The techniques described should lead to quantum improvement in design productivity of complex analog and mixed signal systems while

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significantly cutting the spiraling costs of product development in emerging nanometer technologies.

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.

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