Low Power Digital VLSI Design
Circuits And Systems 1st Edition

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Low-Power Design of Nanometer FPGAs Hassan Hassan 2009-09-14 Low-Power Design of Nanometer FPGAs Architecture and EDA is an invaluable reference for researchers and practicing engineers concerned with power-efficient, FPGA design. State-of-the-art power reduction techniques for FPGAs will be described and compared. These techniques can be applied at the circuit, architecture, and electronic design automation levels to describe both the dynamic and leakage power sources and enable strategies for codesign. Low-power techniques presented at key FPGA design
levels for circuits, architectures, and electronic design automation, form critical, "bridge" guidelines for codesign Comprehensive review of leakage-tolerant techniques empowers designers to minimize power dissipation Provides valuable tools for estimating power efficiency/savings of current, low-power FPGA design techniques

**Low Power Methodology Manual**
David Flynn 2007-07-31 This book provides a practical guide for engineers doing low power System-on-Chip (SoC) designs. It covers various aspects of low power design from architectural issues and design techniques to circuit design of power gating switches. In addition to providing a theoretical basis for these techniques, the book addresses the practical issues of implementing them in today’s designs with today’s tools.

**Low Power Digital VLSI Design**
Circuits and Systems
Ramamurthy 2014

**Low-Power Digital VLSI Design**
Abdellatif Bellaouar 2012-12-06

Low-Power Digital VLSI Design: Circuits and Systems addresses both process technologies and device modeling. Power dissipation in CMOS circuits, several practical circuit examples, and low-power techniques are discussed. Low-voltage issues for digital CMOS and BiCMOS circuits are emphasized. The book also provides an extensive study of advanced CMOS subsystem design. A low-power design methodology is presented with various power minimization techniques at the circuit, logic, architecture and algorithm levels. Features: Low-voltage CMOS device modeling, technology files, design rules Switching activity concept, low-power guidelines to engineering practice Pass-transistor logic families Power dissipation of I/O circuits Multi- and low-VT CMOS logic, static power reduction circuit techniques State of the art design of low-voltage BiCMOS and CMOS circuits Low-power techniques in CMOS SRAMS and DRAMS Low-power on-chip voltage down converter design Numerous advanced
CMOS subsystems (e.g. adders, multipliers, data path, memories, regular structures, phase-locked loops) with several design options trading power, delay and area. Low-power design methodology, power estimation techniques. Power reduction techniques at the logic, architecture and algorithm levels. More than 190 circuits explained at the transistor level.

Low-voltage, Low-power Digital BiCMOS Circuits  Samir S. Rofail  2000

Modern VLSI Design  Wayne Wolf  2002-01-14

For Electrical Engineering and Computer Engineering courses that cover the design and technology of very large scale integrated (VLSI) circuits and systems. May also be used as a VLSI reference for professional VLSI design engineers, VLSI design managers, and VLSI CAD engineers. Modern VLSI Design provides a comprehensive “bottom-up” guide to the design of VLSI systems, from the physical design of circuits through system architecture with focus on the latest solution for system-on-chip (SOC) design. Because VLSI system designers face a variety of challenges that include high performance, interconnect delays, low power, low cost, and fast design turnaround time, successful designers must understand the entire design process. The Third Edition also provides a much more thorough discussion of hardware description languages, with introduction to both Verilog and VHDL. For that reason, this book presents the entire VLSI design process in a single volume.

Gain-Cell Embedded DRAMs for Low-Power VLSI Systems-on-Chip  Pascal Meinerzhagen  2017-07-06

This book pioneers the field of gain-cell embedded DRAM (GC-eDRAM) design for low-power VLSI systems-on-chip (SoCs). Novel GC-eDRAMs are specifically designed and optimized for a range of low-power VLSI SoCs, ranging from ultra-low power to power-aware high-performance applications. After a detailed review of prior-art GC-eDRAMs, an analytical
retention time distribution model is introduced and validated by silicon measurements, which is key for low-power GC-eDRAM design. The book then investigates supply voltage scaling and near-threshold voltage (NTV) operation of a conventional gain cell (GC), before presenting novel GC circuit and assist techniques for NTV operation, including a 3-transistor full transmission-gate write port, reverse body biasing (RBB), and a replica technique for optimum refresh timing. Next, conventional GC bitcells are evaluated under aggressive technology and voltage scaling (down to the subthreshold domain), before novel bitcells for aggressively scaled CMOS nodes and soft-error tolerance as presented, including a 4-transistor GC with partial internal feedback and a 4-transistor GC with built-in redundancy.

Low Power VLSI Design
Angsuman Sarkar 2016-08-08
This book teaches basic and advanced concepts, new methodologies and recent developments in VLSI technology with a focus on low power design. It provides insight on how to use Tanner Spice, Cadence tools, Xilinx tools, VHDL programming and Synopsis to design simple and complex circuits using latest state-of-the-art technologies. Emphasis is placed on fundamental transistor circuit-level design concepts.

Top-Down Digital VLSI Design
Hubert Kaeslin 2014-12-04
Top-Down VLSI Design: From Architectures to Gate-Level Circuits and FPGAs represents a unique approach to learning digital design. Developed from more than 20 years teaching circuit design, Doctor Kaeslin’s approach follows the natural VLSI design flow and makes circuit design accessible for professionals with a background in systems engineering or digital signal processing. It begins with hardware architecture and promotes a system-level view, first considering the type of intended application and letting that guide your design choices. Doctor Kaeslin presents modern
considerations for handling circuit complexity, throughput, and energy efficiency while preserving functionality. The book focuses on application-specific integrated circuits (ASICs), which along with FPGAs are increasingly used to develop products with applications in telecommunications, IT security, biomedical, automotive, and computer vision industries. Topics include field-programmable logic, algorithms, verification, modeling hardware, synchronous clocking, and more. Demonstrates a top-down approach to digital VLSI design. Provides a systematic overview of architecture optimization techniques. Features a chapter on field-programmable logic devices, their technologies and architectures. Includes checklists, hints, and warnings for various design situations. Emphasizes design flows that do not overlook important action items and which include alternative options when planning the development of microelectronic circuits. 

CMOS/BiCMOS ULSI Kiat Seng Yeo 2002 For upper level and graduate level Electrical and Computer Engineering courses in Integrated Circuit Design as well as professional circuit designers, engineers and researchers working in portable wireless communications hardware. This book presents the fundamentals of Complementary Metal Oxide Semiconductor (CMOS) and Bipolar compatible Complementary Metal Oxide Semiconductor (BiCMOS) technology, as well as the latest technological advances in the field. It discusses the concepts and techniques of new integrated circuit design for building high performance and low power circuits and systems for current and future very-large-scale-integration (VLSI) and giga-scale-integration (GSI) applications. CMOS/BiCMOS ULSI: Low-Voltage Low-Power is an essential resource for every professional moving toward lower voltage, lower power, and higher performance VLSI circuits and subsystems design.
Designing CMOS Circuits for Low Power provides the fundamentals of low power design for logic, circuit, and physical design level as well as the "design story" of two innovative low power systems developed in the context of European Low Power Initiative for Electronic System Design. The main objective is to present in-depth analytical and design capabilities for low power design CMOS circuits.

Part I starts with the description of the main principles of dynamic, short-circuit, static, and leakage power dissipation together with the low power strategies for reducing each power component. A typical low power design flow consists of power optimization and estimation techniques, which should be applied in each design level. Starting with the formulation of logic optimization problem, technology independent and technology-dependent power optimization steps for combinational and sequential logic circuits are presented. The power characteristics of different logic styles such as dynamic logic and pass transistor logic and alternative implementations of basic digital circuits are studied and compared in terms of performance, area and power dissipation. Efficient implementations and comparisons of adder and multiplier circuits for various topologies are addressed. Furthermore, novel techniques that reduce the power based on alternative arithmetic schemes are investigated. Then, we tackle with the power reduction techniques for SRAM and DRAM memories. In the physical design level, the power optimization issues of clock distribution, interconnect, and layout design are described. The first part ends up with the
advantages and drawbacks of the simulation-based and probabilistic power estimation methods of a logic circuit. The second part gives the architecture and the design techniques used for the low power implementation of a Safety-Critical Application Specific Instruction Processor and ultrasound beamformer application specific integrated circuit. Designing CMOS Circuits for Low Power can be used as a textbook for undergraduate and graduate students, and, VLSI design engineers and professionals from academia and industry, who have had a basic knowledge of Microelectronics and CMOS digital design.

Low-Power CMOS Wireless Communications
Samuel Sheng
2012-12-06

Low-Power CMOS Wireless Communications: A Wideband CDMA System Design focuses on the issues behind the development of a high-bandwidth, silicon complementary metal-oxide silicon (CMOS) low-power transceiver system for mobile RF wireless data communications. In the design of any RF communications system, three distinct factors must be considered: the propagation environment in question, the multiplexing and modulation of user data streams, and the complexity of hardware required to implement the desired link. None of these can be allowed to dominate. Coupling between system design and implementation is the key to simultaneously achieving high bandwidth and low power and is emphasized throughout the book. The material presented in Low-Power CMOS Wireless Communications: A Wideband CDMA System Design is the result of broadband wireless systems research done at the University of California, Berkeley. The wireless development was motivated by a much larger collaborative effort known as the Infopad Project, which was centered on developing a mobile information terminal for multimedia content - a wireless ‘network computer’. The desire for mobility, combined with the
need to support potentially hundreds of users simultaneously accessing full-motion digital video, demanded a wireless solution that was of far lower power and higher data rate than could be provided by existing systems. That solution is the topic of this book: a case study of not only wireless systems designs, but also the implementation of such a link, down to the analog and digital circuit level.

**Advanced VLSI Design and Testability Issues** Suman Lata Tripathi 2020-09-15 This book facilitates the VLSI-interested individuals with not only in-depth knowledge, but also the broad aspects of it by explaining its applications in different fields, including image processing and biomedical. The deep understanding of basic concepts gives you the power to develop a new application aspect, which is very well taken care of in this book by using simple language in explaining the concepts. In the VLSI world, the importance of hardware description languages cannot be ignored, as the designing of such dense and complex circuits is not possible without them. Both Verilog and VHDL languages are used here for designing. The current needs of high-performance integrated circuits (ICs) including low power devices and new emerging materials, which can play a very important role in achieving new functionalities, are the most interesting part of the book. The testing of VLSI circuits becomes more crucial than the designing of the circuits in this nanometer technology era. The role of fault simulation algorithms is very well explained, and its implementation using Verilog is the key aspect of this book.

This book is well organized into 20 chapters. Chapter 1 emphasizes on uses of FPGA on various image processing and biomedical applications. Then, the descriptions enlighten the basic understanding of digital design from the perspective of HDL in Chapters 2–5. The performance enhancement with alternate material or geometry for silicon-based FET designs is focused in Chapters 6 and 7.
Chapters 8 and 9 describe the study of bimolecular interactions with biosensing FETs. Chapters 10–13 deal with advanced FET structures available in various shapes, materials such as nanowire, HFET, and their comparison in terms of device performance metrics calculation. Chapters 14–18 describe different application-specific VLSI design techniques and challenges for analog and digital circuit designs. Chapter 19 explains the VLSI testability issues with the description of simulation and its categorization into logic and fault simulation for test pattern generation using Verilog HDL. Chapter 20 deals with a secured VLSI design with hardware obfuscation by hiding the IC’s structure and function, which makes it much more difficult to reverse engineer.

**Logic Synthesis for Low Power VLSI Designs** Sasan Iman 2012-12-06 Logic Synthesis for Low Power VLSI Designs presents a systematic and comprehensive treatment of power modeling and optimization at the logic level. More precisely, this book provides a detailed presentation of methodologies, algorithms and CAD tools for power modeling, estimation and analysis, synthesis and optimization at the logic level. Logic Synthesis for Low Power VLSI Designs contains detailed descriptions of technology-dependent logic transformations and optimizations, technology decomposition and mapping, and post-mapping structural optimization techniques for low power. It also emphasizes the trade-off techniques for two-level and multi-level logic circuits that involve power dissipation and circuit speed, in the hope that the readers can better understand the issues and ways of achieving their power dissipation goal while meeting the timing constraints. Logic Synthesis for Low Power VLSI Designs is written for VLSI design engineers, CAD professionals, and students who have had a basic knowledge of CMOS digital design and logic synthesis.

**Low Power Digital CMOS Design**
Anantha P. Chandrakasan

2012-12-06 Power consumption has become a major design consideration for battery-operated, portable systems as well as high-performance, desktop systems. Strict limitations on power dissipation must be met by the designer while still meeting ever higher computational requirements. A comprehensive approach is thus required at all levels of system design, ranging from algorithms and architectures to the logic styles and the underlying technology. Potentially one of the most important techniques involves combining architecture optimization with voltage scaling, allowing a trade-off between silicon area and low-power operation. Architectural optimization enables supply voltages of the order of 1 V using standard CMOS technology. Several techniques can also be used to minimize the switched capacitance, including representation, optimizing signal correlations, minimizing spurious transitions, optimizing sequencing of operations, activity-driven power down, etc. The high-efficiency of DC-DC converter circuitry required for efficient, low-voltage and low-current level operation is described by Stratakos, Sullivan and Sanders. The application of various low-power techniques to a chip set for multimedia applications shows that orders-of-magnitude reduction in power consumption is possible. The book also features an analysis by Professor Meindl of the fundamental limits of power consumption achievable at all levels of the design hierarchy. Svensson, of ISI, describes emerging adiabatic switching techniques that can break the $CV^2f$ barrier and reduce the energy per computation at a fixed voltage. Srivastava, of AT&T, presents the application of aggressive shut-down techniques to microprocessor applications.

Low-Power Electronics Design Christian Piguet

2018-10-03 The power consumption of integrated circuits is one of the most problematic considerations...
affecting the design of high-performance chips and portable devices. The study of power-saving design methodologies now must also include subjects such as systems on chips, embedded software, and the future of microelectronics. Low-Power Electronics Design covers all major aspects of low-power design of ICs in deep submicron technologies and addresses emerging topics related to future design. This volume explores, in individual chapters written by expert authors, the many low-power techniques born during the past decade. It also discusses the many different domains and disciplines that impact power consumption, including processors, complex circuits, software, CAD tools, and energy sources and management. The authors delve into what many specialists predict about the future by presenting techniques that are promising but are not yet reality. They investigate nanotechnologies, optical circuits, ad hoc networks, e-textiles, as well as human powered sources of energy.

Low-Power Electronics Design delivers a complete picture of today's methods for reducing power, and also illustrates the advances in chip design that may be commonplace 10 or 15 years from now.

**Ultra Low Power Bioelectronics** Rahul Sarpeshkar 2010-02-22 This book provides, for the first time, a broad and deep treatment of the fields of both ultra low power electronics and bioelectronics. It discusses fundamental principles and circuits for ultra low power electronic design and their applications in biomedical systems. It also discusses how ultra energy efficient cellular and neural systems in biology can inspire revolutionary low power architectures in mixed-signal and RF electronics. The book presents a unique, unifying view of ultra low power analog and digital electronics and emphasizes the use of the ultra energy efficient subthreshold regime of transistor operation in both.

Chapters on batteries, energy
harvesting, and the future of energy provide an understanding of fundamental relationships between energy use and energy generation at small scales and at large scales. A wealth of insights and examples from brain implants, cochlear implants, biomolecular sensing, cardiac devices, and bio-inspired systems make the book useful and engaging for students and practicing engineers.

Low-Power CMOS VLSI Circuit Design Kaushik Roy 2009-02-02
This is the first book devoted to low power circuit design, and its authors have been among the first to publish papers in this area. Low-Power CMOS VLSI Design: Physics of Power Dissipation in CMOS FET Devices: Power Estimation: Synthesis for Low Power: Design and Test of Low-Voltage CMOS Circuits: Low-Power Static Ram Architectures: Low-Energy Computing Using Energy Recovery Techniques: Software Design for Low Power

Low Power Design Essentials Jan Rabaey 2009-04-21
This book contains all the topics of importance to the low power designer. It first lays the foundation and then goes on to detail the design process. The book also discusses such special topics as power management and modal design, ultra low power, and low power design methodology and flows. In addition, coverage includes projections of the future and case studies.

Low Power Design in Deep Submicron Electronics W. Nebel 2013-06-29
Low Power Design in Deep Submicron Electronics deals with the different aspects of low power design for deep submicron electronics at all levels of abstraction from system level to circuit level and technology. Its objective is to guide industrial and academic engineers and researchers in the selection of methods, technologies and tools and to provide a baseline for further developments. Furthermore the book has been written to serve as a textbook for postgraduate student courses. In order to achieve both goals, it is structured into different chapters each of which
addresses a different phase of the design, a particular level of abstraction, a unique design style or technology. These design-related chapters are amended by motivations in Chapter 2, which presents visions both of future low power applications and technology advancements, and by some advanced case studies in Chapter 9. From the Foreword: `... This global nature of design for low power was well understood by Wolfgang Nebel and Jean Mermet when organizing the NATO workshop which is the origin of the book. They invited the best experts in the field to cover all aspects of low power design. As a result the chapters in this book are covering deep-submicron CMOS digital system design for low power in a systematic way from process technology all the way up to software design and embedded software systems. Low Power Design in Deep Submicron Electronics is an excellent guide for the practicing engineer, the researcher and the student interested in this crucial aspect of actual CMOS design. It contains about a thousand references to all aspects of the recent five years of feverish activity in this exciting aspect of design.' Hugo de Man Professor, K.U. Leuven, Belgium Senior Research Fellow, IMEC, Belgium

Sub-threshold Design for Ultra Low-Power Systems Alice Wang 2006-12-11 Based on the work of MIT graduate students Alice Wang and Benton Calhoun, this book surveys the field of sub-threshold and low-voltage design and explores such aspects of sub-threshold circuit design as modeling, logic and memory circuit design. One important chapter of the book is dedicated to optimizing energy dissipation - a key metric for energy constrained designs. This book also includes invited chapters on the subject of analog sub-threshold circuits. CMOS Digital Integrated Circuits Sung-Mo Kang 2002 The fourth edition of CMOS Digital Integrated Circuits: Analysis and Design continues the well-established tradition of the earlier editions by offering the
most comprehensive coverage of digital CMOS circuit design, as well as addressing state-of-the-art technology issues highlighted by the widespread use of nanometer-scale CMOS technologies. In this latest edition, virtually all chapters have been re-written, the transistor model equations and device parameters have been revised to reflect the significant changes that must be taken into account for new technology generations, and the material has been reinforced with up-to-date examples. The broad-ranging coverage of this textbook starts with the fundamentals of CMOS process technology, and continues with MOS transistor models, basic CMOS gates, interconnect effects, dynamic circuits, memory circuits, arithmetic building blocks, clock and I/O circuits, low power design techniques, design for manufacturability and design for testability.

**Low-Voltage/Low-Power Integrated Circuits and Systems**

Electrical Engineering Low-Voltage/Low-Power Integrated Circuits and Systems Low-Voltage Mixed-Signal Circuits

Leading experts in the field present this collection of original contributions as a practical approach to low-power analog and digital circuit theory and design, illustrated with important applications and examples. **Low-Voltage/Low-Power Integrated Circuits and Systems** features comprehensive coverage of the latest techniques for the design, modeling, and characterization of low-power analog and digital circuits. **Low-Voltage/Low-Power Integrated Circuits and Systems** will help you improve your understanding of the trade-offs between analog and digital circuits and systems. It is an invaluable resource for enhancing your designs. This book is intended for senior and graduate students. It is also intended as a key reference for designers in the semiconductor and communication industries. Highlighted applications include: Low-voltage analog
The modern electronic testing has a forty year history. Test professionals hold some fairly large conferences and numerous workshops, have a journal, and there are over one hundred books on testing. Still, a full course on testing is offered only at a few universities, mostly by professors who have a research interest in this area. Apparently, most professors would not have taken a course on electronic testing when they were students. Other than the computer engineering curriculum being too crowded, the major reason cited for the absence of a course on electronic testing is the lack of a suitable textbook. For VLSI
readers.

**Low-Power CMOS Circuits**
Christian Piguet 2018-10-03
The power consumption of microprocessors is one of the most important challenges of high-performance chips and portable devices. In chapters drawn from Piguet's recently published Low-Power Electronics Design, Low-Power CMOS Circuits: Technology, Logic Design, and CAD Tools addresses the design of low-power circuitry in deep submicron technologies. It provides a focused reference for specialists involved in designing low-power circuitry, from transistors to logic gates. The book is organized into three broad sections for convenient access. The first examines the history of low-power electronics along with a look at emerging and possible future technologies. It also considers other technologies, such as nanotechnologies and optical chips, that may be useful in designing integrated circuits. The second part explains the techniques used to reduce power consumption at low levels. These include clock gating, leakage reduction, interconnecting and communication on chips, and adiabatic circuits. The final section discusses various CAD tools for designing low-power circuits. This section includes three chapters that demonstrate the tools and low-power design issues at three major companies that produce logic synthesizers. Providing detailed examinations contributed by leading experts, Low-Power CMOS Circuits: Technology, Logic Design, and CAD Tools supplies authoritative information on how to design and model for high performance with low power consumption in modern integrated circuits. It is a must-read for anyone designing modern computers or embedded systems.

**Low Power VCO Design in CMOS**
Marc Tiebout
2006-01-25
This work covers the design of CMOS fully integrated low power low phase noise voltage controlled oscillators for telecommunication or...
The need for low power is obvious, as mobile wireless telecommunications are battery operated. As wireless telecommunication systems use oscillators in frequency synthesizers for frequency translation, the selectivity and signal to noise ratio of receivers and transmitters depend heavily on the low phase noise performance of the implemented oscillators. Data communication systems need low jitter, the time-domain equivalent of low phase noise, clocks for data detection and recovery. The power consumption is less critical. The need for multi-band and multi-mode systems pushes the high-integration of telecommunication systems. This is offered by sub-micron CMOS featuring digital flexibility. The recent crisis in telecommunication clearly shows that mobile hand-sets became mass-market high-volume consumer products, where low-cost is of prime importance. This need for low-cost products - liven tremendously research towards CMOS alternatives for the bipolar or BiCMOS solutions in use today.

**Low Power Digital Circuits**
Prabhu Subramaniam 2013
This book contains basic concepts about digital logic circuits and briefly explains the low power error tolerant adders and design of basic VLSI circuits in Tanner Electronic design automation tool and discussed the power consumption of the various low power circuits, totally it deals about error tolerant adder also design of various circuits and area optimization through transistor count. This book is much useful for those who are all working under the area of low power VLSI design and student who studying masters in VLSI design.

**Extreme Low-Power Mixed Signal IC Design**
Armin Tajalli 2010-09-14
Design flexibility 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
Energy Consumptions: Power dissipation (P) and energy consumption are especially 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 developed 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 biological 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 powersupplytechniques such as energy harvesting [5] and printable batteries [6], is another reason for reducing power dissipation. Developing 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 flexibility is the other important issue in modern integrated systems.

Low Power VLSI Design
Angsuman Sarkar 2016-08-08
This book teaches basic and advanced concepts, new methodologies and recent developments in VLSI technology with a focus on low power design. It provides insight on how to use Tanner Spice, Cadence tools, Xilinx tools, VHDL programming and Synopsis to design simple and complex circuits using latest state-of-the-art technologies. Emphasis is placed on fundamental transistor circuit-level design concepts.
Design and Modeling of Low Power VLSI Systems Ruchi Gautam 2016-05-27 "This book analyzes various traditional and modern low power techniques for integrated circuit design in addition to the limiting factors of existing techniques and methods for optimization, offering a research-based discussion of the technicalities involved in the VLSI hardware development process cycle"--

Low Power Design of Standard Cell Digital VLSI Circuits Siri Uppalapati 2004

Low-Power High-Level Synthesis for Nanoscale CMOS Circuits Saraju P. Mohanty 2008-05-31 This self-contained book addresses the need for analysis, characterization, estimation, and optimization of the various forms of power dissipation in the presence of process variations of nano-CMOS technologies. The authors show very large-scale integration (VLSI) researchers and engineers how to minimize the different types of power consumption of digital circuits. The material deals primarily with high-level (architectural or behavioral) energy dissipation.

Low Power Design Methodologies Jan M. Rabaey 2012-12-06 Low Power Design Methodologies presents the first in-depth coverage of all the layers of the design hierarchy, ranging from the technology, circuit, logic and architectural levels, up to the system layer. The book gives insight into the mechanisms of power dissipation in digital circuits and presents state of the art approaches to power reduction. Finally, it introduces a global view of low power design methodologies and how these are being captured in the latest design automation environments. The individual chapters are written by the leading researchers in the area, drawn from both industry and academia. Extensive references are included at the end of each chapter. Audience: A broad introduction for anyone interested in low power design. Can also be used as a text book for an advanced graduate class. A starting point for any aspiring researcher.
Low Power VLSI Design and Technology Gary K. Yeap 1996
Low-power and low-energy VLSI has become an important issue in today's consumer electronics. This book is a collection of pioneering applied research papers in low power VLSI design and technology. A comprehensive introductory chapter presents the current status of the industry and academic research in the area of low power VLSI design and technology. Other topics cover logic synthesis, floorplanning, circuit design and analysis, from the perspective of low power requirements. The readers will have a sampling of some key problems in this area as the low power solutions span the entire spectrum of the design process. The book also provides excellent references on up-to-date research and development issues with practical solution techniques. Design and Modeling of Low Power VLSI Systems Sharma, Manoj 2016-06-06 Very Large Scale Integration (VLSI) Systems refer to the latest development in computer microchips which are created by integrating hundreds of thousands of transistors into one chip. Emerging research in this area has the potential to uncover further applications for VLSI technologies in addition to system advancements. Design and Modeling of Low Power VLSI Systems analyzes various traditional and modern low power techniques for integrated circuit design in addition to the limiting factors of existing techniques and methods for optimization. Through a research-based discussion of the technicalities involved in the VLSI hardware development process cycle, this book is a useful resource for researchers, engineers, and graduate-level students in computer science and engineering.

Practical Low Power Digital VLSI Design Gary K. Yeap 2012-12-06 Practical Low Power Digital VLSI Design emphasizes the optimization and trade-off techniques that involve power dissipation, in the hope that the readers are better prepared the next time they are presented with a low power design.
The book highlights the basic principles, methodologies and techniques that are common to most CMOS digital designs. The advantages and disadvantages of a particular low power technique are discussed. Besides the classical area-performance trade-off, the impact to design cycle time, complexity, risk, testability and reusability are discussed. The wide impacts to all aspects of design are what make low power problems challenging and interesting. Heavy emphasis is given to top-down structured design style, with occasional coverage in the semicustom design methodology. The examples and design techniques cited have been known to be applied to production scale designs or laboratory settings. The goal of Practical Low Power Digital VLSI Design is to permit the readers to practice the low power techniques using current generation design style and process technology. Practical Low Power Digital VLSI Design considers a wide range of design abstraction levels spanning circuit, logic, architecture and system. Substantial basic knowledge is provided for qualitative and quantitative analysis at the different design abstraction levels. Low power techniques are presented at the circuit, logic, architecture and system levels. Special techniques that are specific to some key areas of digital chip design are discussed as well as some of the low power techniques that are just appearing on the horizon. Practical Low Power Digital VLSI Design will be of benefit to VLSI design engineers and students who have a fundamental knowledge of CMOS digital design.

Low-Power VLSI Circuits and Systems

Ajit Pal 2014-11-17

The book provides a comprehensive coverage of different aspects of low power circuit synthesis at various levels of design hierarchy; starting from the layout level to the system level. For a seamless understanding of the subject, basics of MOS circuits has been introduced at transistor, gate and circuit
level; followed by various low-power design methodologies, such as supply voltage scaling, switched capacitance minimization techniques and leakage power minimization approaches. The content of this book will prove useful to students, researchers, as well as practicing engineers. Analog Circuit Design Rudy J. van de Plassche 2013-06-29

The realization of signal sampling and quantization at high sample rates with low power dissipation is an important goal in many applications, including portable video devices such as camcorders, personal communication devices such as wireless LAN transceivers, in the read channels of magnetic storage devices using digital data detection, and many others. This paper describes architecture and circuit approaches for the design of high-speed, low-power pipeline analog-to-digital converters in CMOS. Here the term high speed is taken to imply sampling rates above 1 Mhz. In the first section the different conversion techniques applicable in this range of sample rates is discussed. Following that the particular problems associated with power minimization in video-rate pipeline ADCs is discussed. These include optimization of capacitor sizes, design of low-voltage transmission gates, and optimization of switched capacitor gain blocks and operational amplifiers for minimum power dissipation. As an example of the application of these techniques, the design of a power-optimized 10-bit pipeline A/D converter (ADC) that achieves ≈1.67 mW per MS/s of sampling rate from 1 MS/s to 20 MS/s is described. 2. Techniques for CMOS Video-Rate Analog-to-Digital Conversion Analog-to-digital conversion techniques can be categorized in many ways. One convenient means of comparing techniques is to examine the number of "analog clock cycles" required to produce one effective output sample of the signal being quantized. Digital Integrated Circuit Design Hubert Kaeslin 2008-04-28 Top-
down approach to practical, tool-independent, digital circuit design, reflecting how circuits are designed. **Low Voltage, Low Power VLSI Subsystems** Kiat Seng Yeo 2005 Designers developing the low voltage, low power chips that enable small, portable devices, face a very particular set of challenges. This monograph details cutting-edge design techniques for the low power circuitry required by the many new miniaturized business and consumer products driving the electronics market.