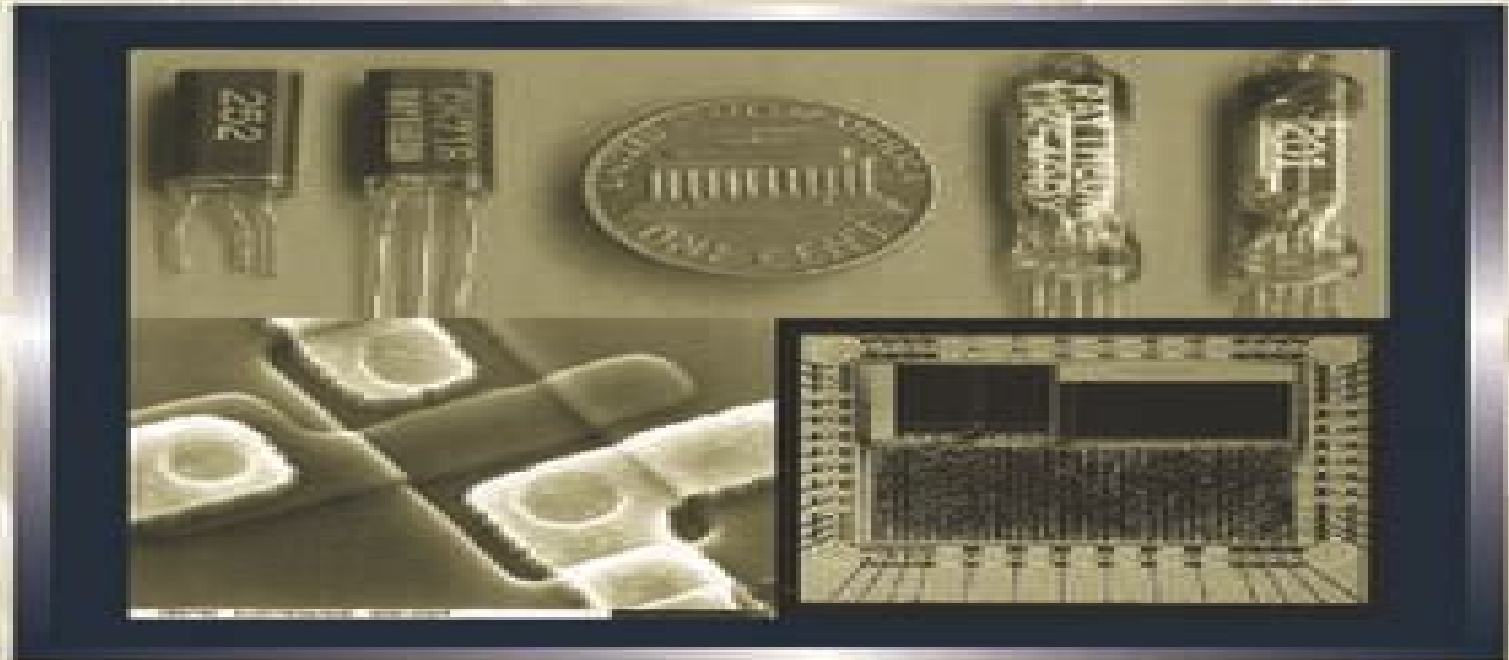


# Low-Power Electronics Design



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# Low Power Electronics Design

**D. Nirmal,J. Ajayan,Patrick J. Fay**



## **Low Power Electronics Design:**

**Power Electronics Design Handbook** Nihal Kularatna, 1998-09-09 Power Electronics Design Handbook covers the basics of power electronics theory and components while emphasizing modern low power components and applications Coverage includes power semiconductors converters power supplies batteries protection systems and power ICs One of the unique features of the Power Electronics Design Handbook is the integration of component and system theory with practical applications particularly energy saving low power applications Many chapters also include a section that looks forward to future developments in that area References for further information or more in depth technical reading are also included Nihal Kularatna is a principal research engineer with the Arthur C Clarke Foundation in Sri Lanka He is also the author of Modern Electronic Test and Measuring Instruments published by the Institute of Electrical Engineers Emphasizes low and medium power components Offers a unique mix of theory and practical application Provides a useful guide to further reading

**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 Electronics and Design** E. Macii, 2004 Power consumption is a key limitation in many high speed and high data rate electronic systems today ranging from mobile telecom to portable and desktop computing systems especially when moving to nanometer technologies Ultra Low Power Electronics and Design offers to the reader the unique opportunity of accessing in an easy and integrated fashion a mix of tutorial material and advanced research results contributed by leading scientists from academia and industry covering the most hot and up to date issues in the field of the design of ultra low power devices systems and applications **Low Power Circuit Design Using Advanced CMOS Technology** Milin Zhang, Zhihua Wang, Jan Van der Spiegel, 2022-09-01 Low Power Circuit Design Using Advanced CMOS Technology is a summary of lectures from the first Advanced CMOS Technology Summer School ACTS 2017 The slides are selected from the handouts while the text was edited according to the lecturers talk ACTS is a joint activity supported by the IEEE Circuit and

System Society CASS and the IEEE Solid State Circuits Society SSCS The goal of the school is to provide society members as well researchers and engineers from industry the opportunity to learn about new emerging areas from leading experts in the field ACTS is an example of high level continuous education for junior engineers teachers in academe and students ACTS was the results of a successful collaboration between societies the local chapter leaders and industry leaders This summer school was the brainchild of Dr Zhihua Wang with strong support from volunteers from both the IEEE SSCS and CASS In addition the local companies Synopsys China and Beijing IC Park provided support This first ACTS was held in the summer 2017 in Beijing The lectures were given by academic researchers and industry experts who presented each 6 hour long lectures on topics covering process technology EDA skill and circuit and layout design skills The school was hosted and organized by the CASS Beijing Chapter SSCS Beijing Chapter and SSCS Tsinghua Student Chapter The co chairs of the first ACTS were Dr Milin Zhang Dr Hanjun Jiang and Dr Liyuan Liu The first ACTS was a great success as illustrated by the many participants from all over China as well as by the publicity it has been received in various media outlets including Xinhua News one of the most popular news channels in China

**Electronic Design Automation for IC System Design, Verification, and Testing** Luciano Lavagno,Igor L. Markov,Grant Martin,Louis K. Scheffer,2017-12-19 The first of two volumes in the Electronic Design Automation for Integrated Circuits Handbook Second Edition Electronic Design Automation for IC System Design Verification and Testing thoroughly examines system level design microarchitectural design logic verification and testing Chapters contributed by leading experts authoritatively discuss processor modeling and design tools using performance metrics to select microprocessor cores for integrated circuit IC designs design and verification languages digital simulation hardware acceleration and emulation and much more New to This Edition Major updates appearing in the initial phases of the design flow where the level of abstraction keeps rising to support more functionality with lower non recurring engineering NRE costs Significant revisions reflected in the final phases of the design flow where the complexity due to smaller and smaller geometries is compounded by the slow progress of shorter wavelength lithography New coverage of cutting edge applications and approaches realized in the decade since publication of the previous edition these are illustrated by new chapters on high level synthesis system on chip SoC block based design and back annotating system level models Offering improved depth and modernity Electronic Design Automation for IC System Design Verification and Testing provides a valuable state of the art reference for electronic design automation EDA students researchers and professionals

Integrated Circuit Design. Power and Timing Modeling, Optimization and Simulation Bertrand Hochet,Antonio J. Acosta,2002-08-28 This book constitutes the refereed proceedings of the 12th International Workshop on Power and Timing Modeling Optimization and Simulation PATMOS 2002 held in Seville Spain in September 2002 The 37 revised full papers and 12 poster papers presented were carefully reviewed and selected from numerous submissions The papers are organized in topical sections on arithmetics low level modeling and characterization asynchronous and adiabatic techniques CAD tools and

algorithms timing gate level modeling and design and communications modeling and activity reduction      **Electronics, Power Electronics, Optoelectronics, Microwaves, Electromagnetics, and Radar** Richard C. Dorf, 2018-10-03 In two editions spanning more than a decade The Electrical Engineering Handbook stands as the definitive reference to the multidisciplinary field of electrical engineering Our knowledge continues to grow and so does the Handbook For the third edition it has expanded into a set of six books carefully focused on a specialized area or field of study Electronics Power Electronics Optoelectronics Microwaves Electromagnetics and Radar represents a concise yet definitive collection of key concepts models and equations in these areas thoughtfully gathered for convenient access Electronics Power Electronics Optoelectronics Microwaves Electromagnetics and Radar delves into the fields of electronics integrated circuits power electronics optoelectronics electromagnetics light waves and radar supplying all of the basic information required for a deep understanding of each area It also devotes a section to electrical effects and devices and explores the emerging fields of microlithography and power electronics Articles include defining terms references and sources of further information Encompassing the work of the world's foremost experts in their respective specialties Electronics Power Electronics Optoelectronics Microwaves Electromagnetics and Radar features the latest developments the broadest scope of coverage and new material in emerging areas      **Integrated Circuit and System Design** Enrico Macii, Vassilis Paliouras, Odysseas Koufopavlou, 2004-09-07 This book constitutes the refereed proceedings of the 14th International Workshop on Power and Timing Optimization and Simulation PATMOS 2004 held in Santorini Greece in September 2004 The 85 revised papers presented together with abstracts of 6 invited presentations were carefully reviewed and selected from 152 papers submitted The papers are organized in topical sections on buses and communication circuits and devices low power issues architectures asynchronous circuits systems design interconnect and physical design security and safety low power processing digital design and modeling and simulation      **Low Power Design Essentials** Jan Rabaey, 2009-04-21 Low Power Design Essentials contains all the topics of importance to the low power designer The book lays the foundation with background chapters entitled Advanced MOS Transistors and Their Models and Power Basics These chapters are followed by chapters on the design process including optimization architecture and algorithm level memory run time standby logic and standby memory Chapters on special topics are also included power management and modal design ultra low power and low power design methodology and flows The book concludes with a chapter on case studies as well as a chapter on Projection into the Future These chapters are all based on the extensive amount of teaching that the author has carried out both at universities and companies worldwide All chapters have been drawn up specifically for self study They aim however at different levels of understanding All the chapters start with elementary material but most also contain advanced material      **Design and Modeling of Low Power VLSI Systems** Sharma, Manoj, Gautam, Ruchi, Khan, Mohammad Ayoub, 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

**Low Power Digital CMOS Design** Anantha P. Chandrakasan, Robert W. Brodersen, 1995-06-30 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 Stratakis 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<sup>2</sup>f 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

**Introduction to Low-Power Design in VLSIs** Patrick Lee, 2011-12-12 This book discusses one increasingly important issue in the VLSI design low power It covers the following topics a basic concepts of low power design b low power design methods and applications in industry chips and c commercial CAD tools on low power design This book discusses the concepts a set of known methods industry cases and CAD tools on the low power design It is organized in four chapters and a glossary is provided at the end of the book

**Nanoelectronic Circuit Design** Niraj K. Jha, Deming Chen, 2010-12-21 This book is about large scale electronic circuits design driven by nanotechnology where nanotechnology is broadly defined as building circuits using nanoscale devices that are either implemented with nanomaterials e g nanotubes or nanowires or following an unconventional method e g FinFET or III V compound based devices These nanoscale devices have significant potential to revolutionize the fabrication and integration of electronic systems and scale beyond the perceived scaling limitations of traditional CMOS While innovations in nanotechnology originate at the individual device level realizing the true

impact of electronic systems demands that these device level capabilities be translated into system level benefits This is the first book to focus on nanoscale circuits and their design issues bridging the existing gap between nanodevice research and nanosystem design      **Low Power Vlsi Design And Technology** Farid N Najm,Garey K-h Yeap,1996-08-30 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

**Low-Power Variation-Tolerant Design in Nanometer Silicon** Swarup Bhunia,Saibal Mukhopadhyay,2010-11-10 Design considerations for low power operations and robustness with respect to variations typically impose contradictory requirements Low power design techniques such as voltage scaling dual threshold assignment and gate sizing can have large negative impact on parametric yield under process variations This book focuses on circuit architectural design techniques for achieving low power operation under parameter variations We consider both logic and memory design aspects and cover modeling and analysis as well as design methodology to achieve simultaneously low power and variation tolerance while minimizing design overhead This book will discuss current industrial practices and emerging challenges at future technology nodes      *Integrated Circuit and System Design. Power and Timing Modeling, Optimization and Simulation* Vassilis Paliouras,2005-09-06 This book constitutes the refereed proceedings of the 15th International Workshop on Power and Timing Optimization and Simulation PATMOS 2005 held in Leuven Belgium in September 2005 The 74 revised full papers presented were carefully reviewed and selected from numerous submissions The papers are organized in topical sections on low power processors code optimization for low power high level design telecommunications and signal processing low power circuits system on chip design busses and interconnections modeling design automation low power techniques memory and register files applications digital circuits and analog and physical design      **Low-Power CMOS Design**

Anantha Chandrakasan,Robert W. Brodersen,1998-02-11 This collection of important papers provides a comprehensive overview of low power system design from component technologies and circuits to architecture system design and CAD techniques LOW POWER CMOS DESIGN summarizes the key low power contributions through papers written by experts in this evolving field      **Electronic Design Automation for IC Implementation, Circuit Design, and Process**

**Technology** Luciano Lavagno,Igor L. Markov,Grant Martin,Louis K. Scheffer,2017-02-03 The second of two volumes in the Electronic Design Automation for Integrated Circuits Handbook Second Edition Electronic Design Automation for IC Implementation Circuit Design and Process Technology thoroughly examines real time logic RTL to GDSII a file format used

to transfer data of semiconductor physical layout design flow analog mixed signal design physical verification and technology computer aided design TCAD Chapters contributed by leading experts authoritatively discuss design for manufacturability DFM at the nanoscale power supply network design and analysis design modeling and much more New to This Edition Major updates appearing in the initial phases of the design flow where the level of abstraction keeps rising to support more functionality with lower non recurring engineering NRE costs Significant revisions reflected in the final phases of the design flow where the complexity due to smaller and smaller geometries is compounded by the slow progress of shorter wavelength lithography New coverage of cutting edge applications and approaches realized in the decade since publication of the previous edition these are illustrated by new chapters on 3D circuit integration and clock design Offering improved depth and modernity Electronic Design Automation for IC Implementation Circuit Design and Process Technology provides a valuable state of the art reference for electronic design automation EDA students researchers and professionals

Semiconductor Devices and Technologies for Future Ultra Low Power Electronics D. Nirmal,J. Ajayan,Patrick J. Fay,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 Integrated Circuit and System Design: Power and Timing Modeling, Optimization and Simulation José Monteiro,Rene van Leuken,2010-02-18 This book constitutes the thoroughly refereed post conference proceedings of 19th International Workshop on Power and Timing Modeling Optimization and Simulation PATMOS 2009 featuring Integrated Circuit and System Design held in Delft The Netherlands during September 9 11 2009 The 26 revised full papers and 10 revised poster papers presented were carefully reviewed and selected from numerous submissions The papers are organized in topical sections on variability statistical timing circuit level techniques power management low power circuits technology system level techniques power timing optimization techniques self timed circuits low power circuit analysis optimization and low power design studies

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