

DIGITAL INTEGRATED CIRCUITS

A DESIGN PERSPECTIVE

SECOND EDITION



JAN M. RABAEY
ANANTHA CHANDRAKASAN
BORIVOJE NIKOLIĆ

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Digital Integrated Circuits Jan M. Rabaey, 2003 Contents p pChapter 1 Introductionp pChapter 2 The Manufacturing Processp pChapter 3 The Devicesp pChapter 4 The Wirep pChapter 5 The CMOS Inverterp pChapter 6 Designing Combinational Logic Gates in CMOS Introduction to VLSI Systems Ming-Bo Lin, 2011-11-28 With the advance of semiconductors and ubiquitous computing the use of system on a chip SoC has become an essential technique to reduce product cost With this progress and continuous reduction of feature sizes and the development of very large scale integration VLSI circuits addressing the harder problems requires fundamental understanding **Embedded Systems** James K. Peckol, 2019-06-10 Embedded Systems A Contemporary Design Tool Second Edition Embedded systems are one of the foundational elements of today's evolving and growing computer technology From operating our cars managing our smart phones cleaning our homes or cooking our meals the special computers we call embedded systems are quietly and unobtrusively making our lives easier safer and more connected While working in increasingly challenging environments embedded systems give us the ability to put increasing amounts of capability into ever smaller and more powerful devices Embedded Systems A Contemporary Design Tool Second Edition introduces you to the theoretical hardware and software foundations of these systems and expands into the areas of signal integrity system security low power and hardware software co design The text builds upon earlier material to show you how to apply reliable robust solutions to a wide range of applications operating in today's often challenging environments Taking the user's problem and needs as your starting point you will explore each of the key theoretical and practical issues to consider when designing an application in today's world Author James Peckol walks you through the formal hardware and software development process covering Breaking the problem down into major functional blocks Planning the digital and software architecture of the system Utilizing the hardware and software co design process Designing the physical world interface to external analog and digital signals Addressing security issues as an integral part of the design process Managing signal integrity problems and reducing power demands in contemporary systems Debugging and testing throughout the design and development cycle Improving performance Stressing the importance of security safety and reliability in the design and development of embedded systems and providing a balanced treatment of both the hardware and the software aspects Embedded Systems A Contemporary Design Tool Second Edition gives you the tools for creating embedded designs that solve contemporary real world challenges Visit the book's website at <http://bcs.wiley.com> he bcs Books action index bcsId 11853 itemId 1119457505 Building Embedded Systems Changyi Gu, 2016-05-26 Develop the software and hardware you never think about We're talking about the nitty gritty behind the buttons on your microwave inside your thermostat inside the keyboard used to type this description and even running the monitor on which you are reading it now Such stuff is termed embedded systems and this book shows how to design and develop embedded systems at a professional level Because yes many people quietly make a

successful career doing just that Building embedded systems can be both fun and intimidating Putting together an embedded system requires skill sets from multiple engineering disciplines from software and hardware in particular Building Embedded Systems is a book about helping you do things in the right way from the beginning of your first project Programmers who know software will learn what they need to know about hardware Engineers with hardware knowledge likewise will learn about the software side Whatever your background is Building Embedded Systems is the perfect book to fill in any knowledge gaps and get you started in a career programming for everyday devices Author Changyi Gu brings more than fifteen years of experience in working his way up the ladder in the field of embedded systems He brings knowledge of numerous approaches to embedded systems design including the System on Programmable Chips SOPC approach that is currently growing to dominate the field His knowledge and experience make Building Embedded Systems an excellent book for anyone wanting to enter the field or even just to do some embedded programming as a side project What You Will Learn Program embedded systems at the hardware level Learn current industry practices in firmware development Develop practical knowledge of embedded hardware options Create tight integration between software and hardware Practice a work flow leading to successful outcomes Build from transistor level to the system level Make sound choices between performance and cost Who This Book Is For Embedded system engineers and intermediate electronics enthusiasts who are seeking tighter integration between software and hardware Those who favor the System on a Programmable Chip SOPC approach will in particular benefit from this book Students in both Electrical Engineering and Computer Science can also benefit from this book and the real life industry practice it provides

Dual Mode Logic Itamar Levi,Alexander Fish,2020-12-15 This book presents Dual Mode Logic DML a new design paradigm for digital integrated circuits DML logic gates can operate in two modes each optimized for a different metric Its on the fly switching between these operational modes at the gate block and system levels provide maximal E D optimization flexibility Each highly detailed chapter has multiple illustrations showing how the DML paradigm seamlessly implements digital circuits that dissipate less energy while simultaneously improving performance and reducing area without a significant compromise in reliability All the facets of the DML methodology are covered starting from basic concepts through single gate optimization general module optimization design trade offs and new ways DML can be integrated into standard design flows using standard EDA tools DML logic is compatible with numerous applications but is particularly advantageous for ultra low power reliable high performance systems and advanced scaled technologies Written in language accessible to students and design engineers each topic is oriented toward immediate application by all those interested in an alternative to CMOS logic Describes a novel promising alternative to conventional CMOS logic known as Dual Mode Logic DML with which a single gate can be operated selectively in two modes each optimized for a different metric e g energy consumption performance size Demonstrates several techniques at the architectural level which can result in high energy savings and improved system performance Focuses on the tradeoffs between power area and speed including

optimizations at the transistor and gate level including alternatives to DML basic cells Illustrates DML efficiency for a variety of VLSI applications

Integrated Circuit and System Design. Power and Timing Modeling, Optimization and Simulation Johan Vounckx, Nadine Azemard, Philippe Maurine, 2006-09-07 This book constitutes the refereed proceedings of the 16th International Workshop on Power and Timing Modeling Optimization and Simulation PATMOS 2006 The book presents 41 revised full papers and 23 revised poster papers together with 4 key notes and 3 industrial abstracts Topical sections include high level design power estimation and modeling memory and register files low power digital circuits busses and interconnects low power techniques applications and SoC design modeling and more

Advances in Optical Science and Engineering Vasudevan Lakshminarayanan, Indrani Bhattacharya, 2015-06-02 The Proceedings of First International Conference on Opto Electronics and Applied Optics 2014 IEM OPTRONIX 2014 presents the research contributions presented in the conference by researchers from both India and abroad Contributions from established scientists as well as students are included The book is organized to enable easy access to various topics of interest The first part includes the Keynote addresses by Phillip Russell Max Planck Institute of the Light Sciences Erlangen Germany and Lorenzo Pavesi University of Trento Italy The second part focuses on the Plenary Talks given by eminent scientists namely Azizur Rahman City University London London Bishnu Pal President The Optical Society of India Kamakhya Ghatak National Institute of Technology Agartala Kehar Singh Former Professor India Institute of Technology Delhi Mourad Zghal SUPCOM University of Carthage Tunisia Partha Roy Chaudhuri IIT Kharagpur S K Bhadra CSIR Central Glass and Ceramic Research Institute Kolkata Sanjib Chatterjee Raja Ramanna Centre for Advanced Technology Indore Takeo Sasaki Tokyo University Japan Lakshminarayan Hazra Emeritus Professor University of Calcutta Kolkata Shyam Akashe ITM University Gwalior and Vasudevan Lakshminarayanan University of Waterloo Canada The subsequent parts focus on topic wise contributory papers in Application of Solar Energy Diffraction Tomography E M Radiation Theory and Antenna Fibre Optics and Devices Photonics for Space Applications Micro Electronics and VLSI Nano Photonics Bio Photonics and Bio Medical Optics Non linear Phenomena and Chaos Optical and Digital Data and Image Processing Optical Communications and Networks Optical Design Opto Electronic Devices Opto Electronic Materials and Quantum Optics and Information Processing

United States Air Force Academy United States Air Force Academy, *The Computer Engineering Handbook* Vojin G. Oklobdzija, 2001-12-26 There is arguably no field in greater need of a comprehensive handbook than computer engineering The unparalleled rate of technological advancement the explosion of computer applications and the now in progress migration to a wireless world have made it difficult for engineers to keep up with all the developments in specialties outside their own References published only a few years ago are now sorely out of date The Computer Engineering Handbook changes all of that Under the leadership of Vojin Oklobdzija and a stellar editorial board some of the industry s foremost experts have joined forces to create what promises to be the definitive resource for computer design and engineering Instead

of focusing on basic introductory material it forms a comprehensive state of the art review of the field's most recent achievements outstanding issues and future directions The world of computer engineering is vast and evolving so rapidly that what is cutting edge today may be obsolete in a few months While exploring the new developments trends and future directions of the field The Computer Engineering Handbook captures what is fundamental and of lasting value **The Electrical Engineering Handbook** Wai Kai Chen, 2004-11-16 The Electrical Engineer's Handbook is an invaluable reference source for all practicing electrical engineers and students Encompassing 79 chapters this book is intended to enlighten and refresh knowledge of the practicing engineer or to help educate engineering students This text will most likely be the engineer's first choice in looking for a solution extensive complete references to other sources are provided throughout No other book has the breadth and depth of coverage available here This is a must have for all practitioners and students The Electrical Engineer's Handbook provides the most up to date information in Circuits and Networks Electric Power Systems Electronics Computer Aided Design and Optimization VLSI Systems Signal Processing Digital Systems and Computer Engineering Digital Communication and Communication Networks Electromagnetics and Control and Systems About the Editor in Chief Wai Kai Chen is Professor and Head Emeritus of the Department of Electrical Engineering and Computer Science at the University of Illinois at Chicago He has extensive experience in education and industry and is very active professionally in the fields of circuits and systems He was Editor in Chief of the IEEE Transactions on Circuits and Systems Series I and II President of the IEEE Circuits and Systems Society and is the Founding Editor and Editor in Chief of the Journal of Circuits Systems and Computers He is the recipient of the Golden Jubilee Medal the Education Award and the Meritorious Service Award from the IEEE Circuits and Systems Society and the Third Millennium Medal from the IEEE Professor Chen is a fellow of the IEEE and the American Association for the Advancement of Science 77 chapters encompass the entire field of electrical engineering THOUSANDS of valuable figures tables formulas and definitions Extensive bibliographic references

CMOS Time-Mode Circuits and Systems Fei Yuan, 2018-09-03 Time mode circuits where information is represented by time difference between digital events offer a viable and technology friendly means to realize mixed mode circuits and systems in nanometer complementary metal oxide semiconductor CMOS technologies Various architectures of time based signal processing and design techniques of CMOS time mode circuits have emerged however an in depth examination of the principles of time based signal processing and design techniques of time mode circuits has not been available until now CMOS Time Mode Circuits and Systems Fundamentals and Applications is the first book to deliver a comprehensive treatment of CMOS time mode circuits and systems Featuring contributions from leading experts this authoritative text contains a rich collection of literature on time mode circuits and systems The book begins by presenting a critical comparison of voltage mode current mode and time mode signaling for mixed mode signal processing and then Covers the fundamentals of time mode signal processing such as voltage to time converters all digital phase locked loops and

frequency synthesizers Investigates the performance characteristics architecture design techniques and implementation of time to digital converters Discusses time mode delta sigma based analog to digital converters placing a great emphasis on time mode quantizers Includes a detailed study of ultra low power integrated time mode temperature measurement systems CMOS Time Mode Circuits and Systems Fundamentals and Applications provides a valuable reference for circuit design engineers hardware system engineers graduate students and others seeking to master this fast evolving field

Analog Circuits and Devices Wai-Kai Chen, 2003-03-26 The Principles and Application in Engineering Series is a new series of convenient economical references sharply focused on particular engineering topics and subspecialties Each volume in this series comprises chapters carefully selected from CRC's bestselling handbooks logically organized for optimum convenience and thoughtfully priced to fit

Adiabatic Logic Philip Teichmann, 2011-10-29 Adiabatic logic is a potential successor for static CMOS circuit design when it comes to ultra low power energy consumption Future development like the evolutionary shrinking of the minimum feature size as well as revolutionary novel transistor concepts will change the gate level savings gained by adiabatic logic In addition the impact of worsening degradation effects has to be considered in the design of adiabatic circuits The impact of the technology trends on the figures of merit of adiabatic logic energy saving potential and optimum operating frequency are investigated as well as degradation related issues Adiabatic logic benefits from future devices is not susceptible to Hot Carrier Injection and shows less impact of Bias Temperature Instability than static CMOS circuits Major interest also lies on the efficient generation of the applied power clock signal This oscillating power supply can be used to save energy in short idle times by disconnecting circuits An efficient way to generate the power clock is by means of the synchronous 2N2P LC oscillator which is also robust with respect to pattern induced capacitive variations An easy to implement but powerful power clock gating supplement is proposed by gating the synchronization signals Diverse implementations to shut down the system are presented and rated for their applicability and other aspects like energy reduction capability and data retention Advantageous usage of adiabatic logic requires compact and efficient arithmetic structures A broad variety of adder structures and a Coordinate Rotation Digital Computer are compared and rated according to energy consumption and area usage and the resulting energy saving potential against static CMOS proves the ultra low power capability of adiabatic logic In the end a new circuit topology has to compete with static CMOS also in productivity On a 130nm test chip a large scale test vehicle containing an FIR filter was implemented in adiabatic logic utilizing a standard library based design flow fabricated measured and compared to simulations of a static CMOS counterpart with measured saving factors compliant to the values gained by simulation This leads to the conclusion that adiabatic logic is ready for productive design due to compatibility not only to CMOS technology but also to electronic design automation EDA tools developed for static CMOS system design

Low Power Design in Deep Submicron Electronics W. Nebel, Jean Mermet, 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

Curriculum Handbook with General Information Concerning ... for the United States Air Force Academy

United States Air Force Academy,1991 *Wireless Communications Circuits and Systems* Institution of Electrical Engineers,2004 This book examines integrated circuits systems and transceivers for wireless and mobile communications It covers the most recent developments in key RF IF analogue mixed signal components and single chip transceivers in CMOS technology *Digital Design and Fabrication* Vojin G. Oklobdzija,2017-12-19 In response to tremendous growth and new technologies in the semiconductor industry this volume is organized into five information rich sections Digital Design and Fabrication surveys the latest advances in computer architecture and design as well as the technologies used to manufacture and test them Featuring contributions from leading experts the book also includes a new section on memory and storage in addition to a new chapter on nonvolatile memory technologies Developing advanced concepts this sharply focused book Describes new technologies that have become driving factors for the electronic industry Includes new information on semiconductor memory circuits whose development best illustrates the phenomenal progress encountered by the fabrication and technology sector Contains a section dedicated to issues related to system power consumption Describes reliability and testability of computer systems Pinpoints trends and state of the art advances in fabrication and CMOS technologies Describes performance evaluation measures which are the bottom line from the user s point of view Discusses design techniques used to create modern computer systems including high speed computer arithmetic and high frequency design timing and clocking and PLL and DLL design *Advances in Computer Science and Information Technology. Computer*

Science and Engineering Natarajan Meghanathan, Nabendu Chaki, Dhinakaran Nagamalai, 2012-04-24 The three volume set LNICST 84 LNICST 86 constitute the refereed proceedings of the Second International Conference on Computer Science and Information Technology CCSIT 2012 held in Bangalore India in January 2012 The 70 revised full papers presented in this volume were carefully reviewed and selected from numerous submissions and address all major fields of the Computer Science and Information Technology in theoretical methodological and practical or applicative aspects The papers feature cutting edge development and current research in computer science and engineering

Noise Contamination in Nanoscale VLSI Circuits Selahattin Sayil, 2022-08-31 This textbook provides readers with a comprehensive introduction to various noise sources that significantly reduce performance and reliability in nanometer scale integrated circuits The author covers different types of noise such as crosstalk noise caused by signal switching of adjacent wires power supply noise or IR voltage drop in the power line due to simultaneous buffer gate switching events substrate coupling noise radiation induced transients thermally induced noise and noise due to process and environmental Coverages also includes the relationship between some of these noise sources as well as compound effects and modeling and mitigation of noise mechanisms

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

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