# DIGITAL DIGITAL INTEGRATED CIRCUITS

A DESIGN PERSPECTIVE

SECOND EDITION



JAN M. RABAEY ANANTHA CHANDRAKASAN BORIVOJE NIKOLIĆ





# <u>Digital Integrated Circuits A Design Perspective Second</u> <u>Edition</u>

**Evgeni Perelroyzen** 

# **Digital Integrated Circuits A Design Perspective Second Edition:**

Digital Integrated Circuits Jan M. Rabaey, 2003 Contents p pChapter 1 Introduction pChapter 2 The Manufacturing Processp pChapter 3 The Devicesp pChapter 4 The Wirep pChapter 5 The CMOS Inverterp pChapter 6 Designing **Digital Integrated Circuits** Jan M. Rabaey, 2003 **Digital Integrated Circuits** Combinational Logic Gates in CMOS Evgeni Perelroyzen, 2018-10-03 A current trend in digital design the integration of the MATLAB components Simulink and Stateflow for model building simulations system testing and fault detection allows for better control over the design flow process and ultimately for better system results Digital Integrated Circuits Design for Test Using Simulink and Stateflow illustrates the construction of Simulink models for digital project test benches in certain design for test fields The first two chapters of the book describe the major tools used for design for test The author explains the process of Simulink model building presents the main library blocks of Simulink and examines the development of finite state machine modeling using Stateflow diagrams Subsequent chapters provide examples of Simulink modeling and simulation for the latest design for test fields including combinational and sequential circuits controllability and observability deterministic algorithms digital circuit dynamics timing verification built in self test BIST architecture scan cell operations and functional and diagnostic testing The book also discusses the automatic test pattern generation ATPG process the logical determinant theory and joint test action group JTAG interface models Digital Integrated Circuits explores the possibilities of MATLAB s tools in the development of application specific integrated circuit ASIC design systems The book shows how to incorporate Simulink and Stateflow into the process of modern digital design Ultra-Low Power Integrated Circuit Design Nianxiong Nick Tan, Dongmei Li, Zhihua Wang, 2013-10-23 This book describes the design of CMOS circuits for ultra low power consumption including analog radio frequency RF and digital signal processing circuits DSP The book addresses issues from circuit and system design to production design and applies the ultra low power circuits described to systems for digital hearing aids and capsule endoscope devices Provides a valuable introduction to ultra low power circuit design aimed at practicing design engineers Describes all key building blocks of ultra low power circuits from a systems perspective Applies circuits and systems described to real product examples such as hearing aids and capsule endoscopes VLSI Design Esteban Tlelo-Cuautle, Sheldon X.-D. Tan, 2012-01-20 This book provides some recent advances in design nanometer VLSI chips The selected topics try to present some open problems and challenges with important topics ranging from design tools new post silicon devices GPU based parallel computing emerging 3D integration and antenna design The book consists of two parts with chapters such as VLSI design for multi sensor smart systems on a chip Three dimensional integrated circuits design for thousand core processors Parallel symbolic analysis of large analog circuits on GPU platforms Algorithms for CAD tools VLSI design A multilevel memetic algorithm for large SAT encoded problems etc **Electronic Design Automation** Laung-Terng Wang, Yao-Wen Chang, Kwang-Ting (Tim) Cheng, 2009-03-11 This book provides broad and comprehensive

coverage of the entire EDA flow EDA VLSI practitioners and researchers in need of fluency in an adjacent field will find this an invaluable reference to the basic EDA concepts principles data structures algorithms and architectures for the design verification and test of VLSI circuits Anyone who needs to learn the concepts principles data structures algorithms and architectures of the EDA flow will benefit from this book Covers complete spectrum of the EDA flow from ESL design modeling to logic test synthesis verification physical design and test helps EDA newcomers to get up and running quickly Includes comprehensive coverage of EDA concepts principles data structures algorithms and architectures helps all readers improve their VLSI design competence Contains latest advancements not yet available in other books including Test compression ESL design modeling large scale floorplanning placement routing synthesis of clock and power ground networks helps readers to design develop testable chips or products Includes industry best practices wherever appropriate in most chapters helps readers avoid costly mistakes AN INTRODUCTION TO VLSI DESIGN AND TESTING P. Brundavani ,B. Abdul Raheem ,Rachapudi Prabahakar ,2025-05-20 VLSI Design and Testing provides a concise yet comprehensive quide to the design analysis and testing of integrated circuits Covering key topics such as IC types Moore s Law MOSFET and CMOS fabrication and SOI technology the book builds a strong foundation in VLSI principles It explores the design flow CMOS logic gates layout techniques and both static and dynamic logic circuits Readers will also learn about circuit performance parameters scaling theory and subsystem design including adders shifters and comparators The book concludes with essential concepts in VLSI design styles FPGA gate array full custom and CMOS testing including fault models ATPG and BIST Ideal for students and professionals it blends theory with practical design strategies in modern VLSI systems Visit garuda publishers com Modern VLSI Design Wayne Wolf,2008-12-21 The Number 1 VLSI Design Guide Now Fully Updated for IP Based Design and the Newest Technologies Modern VLSI Design Fourth Edition offers authoritative up to the minute guidance for the entire VLSI design process from architecture and logic design through layout and packaging Wayne Wolf has systematically updated his award winning book for today s newest technologies and highest value design techniques Wolf introduces powerful new IP based design techniques at all three levels gates subsystems and architecture He presents deeper coverage of logic design fundamentals clocking and timing and much more No other VLSI guide presents as much up to date information for maximizing performance minimizing power utilization and achieving rapid design turnarounds

Wearable Sensors Edward Sazonov,2020-11-10 Wearable Sensors Fundamentals Implementation and Applications has been written by a collection of experts in their field who each provide you with an understanding of how to design and work with wearable sensors Together these insights provide the first single source of information on wearable sensors that would be a fantastic addition to the library of any engineers working in this field Wearable Sensors covers a wide variety of topics associated with development and applications of wearable sensors It also provides an overview and a coherent summary of many aspects of wearable sensor technology Both professionals in industries and academic researchers need this package of

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interdisciplinary area Short visionary articles by Nicolaas Bloembergen Nobel Laureate in Physics 1981 Konstantin Likharev distinguished professor at Stony Brook University and Stanley Williams senior fellow and director of the Quantum Science Research group at Hewlett Packard offer unique perspectives and insights Nanoelectronics and Photonics is essential reading for researchers and graduate students in materials science device physics and electrical and computer engineering Key Features Provides an authoritative overview of the current status and future trends of nanoelectronics and photonics Presents broad ranging tutorials on both theoretical and experimental aspects of key topics in nanotechnology Written by recognized international experts in each area Addresses the needs of both graduate students and nanotechnology gurus

Modeling Microprocessor Performance Bibiche Geuskens, Kenneth Rose, 2012-12-06 Modeling Microprocessor Performance focuses on the development of a design and evaluation tool named RIPE Rensselaer Interconnect Performance Estimator This tool analyzes the impact on wireability clock frequency power dissipation and the reliability of single chip CMOS microprocessors as a function of interconnect device circuit design and architectural parameters It can accurately predict the overall performance of existing microprocessor systems For the three major microprocessor architectures DEC PowerPC and Intel the results have shown agreement within 10% on key parameters. The models cover a broad range of issues that relate to the implementation and performance of single chip CMOS microprocessors. The book contains a detailed discussion of the various models and the underlying assumptions based on actual design practices As such RIPE and its models provide an insightful tool into single chip microprocessor design and its performance aspects At the same time it provides design and process engineers with the capability to model evaluate compare and optimize single chip microprocessor systems using advanced technology and design techniques at an early design stage without costly and time consuming implementation RIPE and its models demonstrate the factors which must be considered when estimating tradeoffs in device and interconnect technology and architecture design on microprocessor performance Through Silicon Vias Brajesh Kumar Kaushik, Vobulapuram Ramesh Kumar, Manoj Kumar Majumder, Arsalan Alam, 2016-11-30 Recent advances in semiconductor technology offer vertical interconnect access via that extend through silicon popularly known as through silicon via TSV This book provides a comprehensive review of the theory behind TSVs while covering most recent advancements in materials models and designs Furthermore depending on the geometry and physical configurations different electrical equivalent models for Cu carbon nanotube CNT and graphene nanoribbon GNR based TSVs are presented Based on the electrical equivalent models the performance comparison among the Cu CNT and GNR based TSVs are also Noise Contamination in Nanoscale VLSI Circuits Selahattin Sayil,2022-08-31 This textbook provides readers discussed 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 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 Timing Performance of Nanometer Digital Circuits Under Process Variations Victor Champac, Jose Garcia Gervacio, 2018-04-18 This book discusses the digital design of integrated circuits under process variations with a focus on design time solutions. The authors describe a step by step methodology going from logic gates to logic paths to the circuit level Topics are presented in comprehensively without overwhelming use of analytical formulations Emphasis is placed on providing digital designers with understanding of the sources of process variations their impact on circuit performance and tools for improving their designs to comply with product specifications Various circuit level design hints are highlighted so that readers can use then to improve their designs A special treatment is devoted to unique design issues and the impact of process variations on the performance of FinFET based circuits This book enables readers to make optimal decisions at design time toward more efficient circuits with better yield and higher reliability **Proceedings of Second International Conference on Computational Electronics for** Wireless Communications Sanyog Rawat, Sandeep Kumar, Pramod Kumar, Jaume Anguera, 2023-01-27 This book includes high quality papers presented at Second International Conference on Computational Electronics for Wireless Communications ICCWC 2022 held at National Institute of Technology Surathkal Karnataka India during June 9 10 2022 The book presents original research work of academics and industry professionals to exchange their knowledge of the state of the art research and development in computational electronics with an emphasis on wireless communications The topics covered in the book are radio frequency and microwave signal processing microelectronics and wireless networks Handbook of Integrated Circuit Industry Yangyuan Wang, Min-Hwa Chi, Jesse Jen-Chung Lou, Chun-Zhang Chen, 2023-11-27 Written by hundreds experts who have made contributions to both enterprise and academics research these excellent reference books provide all necessary knowledge of the whole industrial chain of integrated circuits and cover topics related to the technology evolution trends fabrication applications new materials equipment economy investment and industrial developments of integrated circuits Especially the coverage is broad in scope and deep enough for all kind of readers being interested in integrated circuit industry Remarkable data collection update marketing evaluation enough working knowledge of integrated circuit fabrication clear and accessible category of integrated circuit products and good equipment insight explanation etc can make general readers build up a clear overview about the whole integrated circuit industry This encyclopedia is designed as a reference book for scientists and engineers actively involved in integrated circuit research and

development field In addition this book provides enough guide lines and knowledges to benefit enterprisers being interested in integrated circuit industry <u>Distributed Intelligent Circuits And Systems</u> Balwinder Baj, Brij B Gupta, Shailendra Singh, Monirujjaman Khan, 2024-03-06 The main objective of this book is to provide insights into recent advances in distributed intelligent circuits systems and their applications Distributed intelligence is the key enabler for innovations in machine to machine communications. The innovations are directed towards keeping existing algorithms as the base and developing new intelligent systems by employing smart technologies Artificial intelligence AI and more specifically deep learning DL are receiving significant attention in assisting doctors in the detection of disease patterns without much human intervention In agriculture robots automate slow repetitive and dull tasks allowing farmers to focus more on improving overall production yields The evolving trends point to the interface of artificial intelligence with machines being a factor in enhancing the decision making capabilities of smart machines This book provides relevant theoretical frameworks that include basic models algorithms circuit designs and the latest developments in experimental aspects in the field of distributed intelligence systems for industrial applications. The challenges encountered in the development of models for distributed intelligence systems for environmental monitoring are mitigated with artificial intelligence machine learning and deep learning This book identifies challenges and helps in applying solutions in the development of advanced intelligent systems for environmental monitoring **Ambient Intelligence** Werner Weber, Jan Rabaey, Emile H.L. Aarts, 2005-12-12 Ambient intelligence is the vision of a technology that will become invisibly embedded in our natural surroundings present whenever we need it enabled by simple and effortless interactions attuned to all our senses adaptive to users and context sensitive and autonomous High quality information access and personalized content must be available to everybody anywhere and at any time This book addresses ambient intelligence used to support human contacts and accompany an individual s path through the complicated modern world From the technical standpoint distributed electronic intelligence is addressed as hardware vanishing into the background Devices used for ambient intelligence are small low power low weight and very importantly low cost they collaborate or interact with each other and they are redundant and error tolerant This means that the failure of one device will not cause failure of the whole system Since wired connections often do not exist radio methods will play an important role for data transfer This book addresses various aspects of ambient intelligence from applications that are imminent since they use essentially existing technologies to ambitious ideas whose realization is still far away due to major unsolved technical challenges

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