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### 6XBN7K - BECKER ARI

This introductory book assumes minimal knowledge of the existence of integrated circuits and of the terminal behavior of electronic components such as resistors, diodes, and MOS and bipolar transistors. It presents to readers the basic information necessary for more advanced processing and design books. Focuses mainly on the basic processes used in fabrication, including lithography, oxidation, diffusion, ion implementation, and thin film deposition. Covers interconnection technology, packaging, and yield. Appropriate for readers interested in the area of fabrication of solid state devices and integrated circuits.

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<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.

This book conveys an understanding of CMOS technology, circuit design, layout, and system design sufficient to the designer. The book deals with the technology down to the layout level of detail, thereby providing a bridge from a circuit to a form that may be fabricated. The early chapters provide a circuit view of the CMOS IC design, the middle chapters cover a sub-system view of CMOS VLSI, and the final section illustrates these techniques using a real-world case study.

designer for new challenges that might be waiting around the corner. Design-oriented perspectives are advocated throughout. Design challenges and guidelines are h... The publisher, Prentice-Hall Engineering/Science/Mathematics Progressive in content and form, this practical text successfully bridges the gap between the circuit perspective and system perspective of digital integrated circuit design. Beginning with solid discussions on the operation of electronic devices and in-depth analysis of the nucleus of digital design, the text maintains a consistent, logical flow of subject matter throughout, addressing today's most significant and compelling industry topics: the impact of interconnect, design for low power, issues

CMOS, MOS.

The second edition of VLSI Design is a comprehensive textbook designed for undergraduate students of electrical, electronics, and electronics and communication engineering. It provides a thorough understanding of the fundamental concepts and design of VLSI systems.

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.

Learn the basic properties and designs of modern VLSI devices, as well as the factors affecting performance, with this thoroughly updated second edition. The first edition has been widely adopted as a standard textbook in microelectronics in many major US universities and worldwide. The internationally renowned authors highlight the intricate interdependencies and subtle trade-offs between various practically important device parameters, and provide an in-depth discussion of device scaling and scaling limits of CMOS and bipolar devices. Equations and parameters provided are checked continuously against the reality of silicon data, making the book equally useful in practical transistor design and in the classroom. Every chapter has been updated to include the latest developments, such as MOSFET scale length theory, high-field transport model and SiGe-base bipolar devices.

Low-Power CMOS Wireless Communications: A Wideband CDMA System Design focuses on the is-

sues 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.

Until the 1990s, the reduction of the minimum feature sizes used to fabricate integrated circuits, called "scaling", has highlighted serious advantages as integration density, speed, power consumption, functionality and cost. Direct consequence was the decrease of cost-per-function, so the electronic productivity has largely progressed in this period. Another usually cited trend is the evolution of the integration density as expressed by the well-known Moore's Law in 1975: the number of devices per chip doubles every 2 years. This evolution has allowed improving significantly the circuit complexity, offering a great computing power in the case of microprocessor, for example. However, since few years, significant issues appeared such as the increase of the circuit heating, device complexity, variability and difficulties to improve the integration density. These new trends generate an important growth in development and production costs. Though is it, since 40 years, the evolution of the microelectronics always followed the Moore's law and each difficulty has found a solution.

This practical, tool-independent guide to designing digital circuits takes a unique, top-down approach, reflecting the nature of the design process in industry. Starting with architecture design, the book comprehensively explains the why and how of digital circuit design, using the physics designers need to know, and no more.

Never HIGHLIGHT a Book Again! Virtually all of the testable terms, concepts, persons, places, and events from the textbook are included. Cram101 Just the FACTS101 studyguides give all of the outlines, highlights, notes, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompany: 9780130909961 .

This edition provides an important contemporary view of a wide range of analog/digital circuit blocks, the BSIM model, data converter architectures, and more. The authors develop design techniques for both long- and short-channel CMOS technologies and then compare the two.

This comprehensive book on application-specific integrated circuits (ASICs) describes the latest methods in VLSI-systems design. ASIC design, using commercial tools and pre-designed cell libraries, is the fastest, most cost-effective, and least error-prone method of IC design. As a conse-

quence, ASICs and ASIC-design methods have become increasingly popular in industry for a wide range of applications. The book covers both semicustom and programmable ASIC types. After describing the fundamentals of digital logic design and the physical features of each ASIC type, the book turns to ASIC logic design - design entry, logic synthesis, simulation, and test - and then to physical design - partitioning, floorplanning, placement, and routing. You will find here, in practical well-explained detail, everything you need to know to understand the design of an ASIC, and everything you must do to begin and to complete your own design. Features Broad coverage includes, in one information-packed volume, cell-based ICs, gate arrays, field-programmable gate arrays (FPGAs), and complex programmable logic devices (PLDs). Examples throughout the book have been checked with a wide range of commercial tools to ensure their accuracy and utility. Separate chapters and appendixes on both Verilog and VHDL, including material from IEEE standards, serve as a complete reference for high-level, ASIC-design entry. As in other landmark VLSI books published by Addison-Wesley - from Mead and Conway to Weste and Eshraghian - the author's teaching expertise and industry experience illuminate the presentation of useful design methods. Any engineer, manager, or student who is working with ASICs in a design project, or who is simply interested in knowing more about the different ASIC types and design styles, will find this book to be an invaluable resource, reference, and guide.

The authors present readers with a compelling, one-stop, advanced system perspective on the intrinsic issues of digital system design. This invaluable reference prepares readers to meet the emerging challenges of the device and circuit issues associated with deep submicron technology. It incorporates future trends with practical, contemporary methodologies.

*Computer Architecture: A Quantitative Approach*, Sixth Edition has been considered essential reading by instructors, students and practitioners of computer design for over 20 years. The sixth edition of this classic textbook from Hennessy and Patterson, winners of the 2017 ACM A.M. Turing Award recognizing contributions of lasting and major technical importance to the computing field, is fully revised with the latest developments in processor and system architecture. The text now features examples from the RISC-V (RISC Five) instruction set architecture, a modern RISC instruction set developed and designed to be a free and openly adoptable standard. It also includes a new chapter on domain-specific architectures and an updated chapter on warehouse-scale computing that features the first public information on Google's newest WSC. True to its original mission of demystifying computer architecture, this edition continues the longstanding tradition of focusing on areas where the most exciting computing innovation is happening, while always keeping an emphasis on good engineering design. Winner of a 2019 Textbook Excellence Award (Texty) from the Textbook and Academic Authors Association Includes a new chapter on domain-specific architectures, explaining how they are the only path forward for improved performance and energy efficiency given the end of Moore's Law and Dennard scaling Features the first publication of several DSAs from industry Features extensive updates to the chapter on warehouse-scale computing, with the first public information on the newest Google WSC Offers updates to other chapters including new material dealing with the use of stacked DRAM; data on the performance of new NVIDIA Pascal GPU vs. new AVX-512 Intel Skylake CPU; and extensive additions to content covering multicore architecture and organization Includes "Putting It All Together" sections near the end of every chapter, providing real-world technolo-

gy examples that demonstrate the principles covered in each chapter Includes review appendices in the printed text and additional reference appendices available online Includes updated and improved case studies and exercises ACM named John L. Hennessy and David A. Patterson, recipients of the 2017 ACM A.M. Turing Award for pioneering a systematic, quantitative approach to the design and evaluation of computer architectures with enduring impact on the microprocessor industry

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.

Exponential improvement in functionality and performance of digital integrated circuits has revolutionized the way we live and work. The continued scaling down of MOS transistors has broadened the scope of use for circuit technology to the point that texts on the topic are generally lacking after a few years. The second edition of *Digital Integrated Circuits: Analysis and Design* focuses on timeless principles with a modern interdisciplinary view that will serve integrated circuits engineers from all disciplines for years to come. Providing a revised instructional reference for engineers involved with Very Large Scale Integrated Circuit design and fabrication, this book delves into the dramatic advances in the field, including new applications and changes in the physics of operation made possible by relentless miniaturization. This book was conceived in the versatile spirit of the field to bridge a void that had existed between books on transistor electronics and those covering VLSI design and fabrication as a separate topic. Like the first edition, this volume is a crucial link for integrated circuit engineers and those studying the field, supplying the cross-disciplinary connections they require for guidance in more advanced work. For pedagogical reasons, the author uses SPICE level 1 computer simulation models but introduces BSIM models that are indispensable for VLSI design. This enables users to develop a strong and intuitive sense of device and circuit design by drawing direct connections between the hand analysis and the SPICE models. With four new chapters, more than 200 new illustrations, numerous worked examples, case studies, and support provided on a dynamic website, this text significantly expands concepts presented in the first edition.

The third edition of Hodges and Jackson's *Analysis and Design of Digital Integrated Circuits* has been thoroughly revised and updated by a new co-author, Resve Saleh of the University of British Columbia. The new edition combines the approachability and concise nature of the Hodges and Jackson classic with a complete overhaul to bring the book into the 21st century. The new edition has replaced the emphasis on BiPolar with an emphasis on CMOS. The outdated MOS transistor model used throughout the book will be replaced with the now standard deep submicron model. The material on memory has been expanded and updated. As well the book now includes more on SPICE simulation and new problems that reflect recent technologies. The emphasis of the book is on design, but it does not neglect analysis and has as a goal to provide enough information so that a student can carry out analysis as well as be able to design a circuit. This book provides an excellent and balanced introduction to digital circuit design for both students and professionals.

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.

This book constitutes the refereed proceedings of the Second International Conference on Advances in Communication, Network, and Computing, CNC 2011, held in Bangalore, India, in March 2011. The 41 revised full papers, presented together with 50 short papers and 39 poster papers, were carefully reviewed and selected for inclusion in the book. The papers feature current research in the field of Information Technology, Networks, Computational Engineering, Computer and Telecommunication Technology, ranging from theoretical and methodological issues to advanced applications.

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 of circuit and layout design issues. Furthermore, engineers can often develop their physical intuition to estimate the behavior of circuits rapidly without relying predominantly on computer-aided design (CAD) tools. *Introduction to VLSI Systems: A Logic, Circuit, and System Perspective* addresses the need for teaching such a topic in terms of a logic, circuit, and system design perspective. To achieve the above-mentioned goals, this classroom-tested book focuses on: Implementing a digital system as a full-custom integrated circuit Switch logic design and useful paradigms that may apply to various static and dynamic logic families The fabrication and layout designs of complementary metal-oxide-semiconductor (CMOS) VLSI Important issues of modern CMOS processes, including deep submicron devices, circuit optimization, interconnect modeling and optimization, signal integrity, power integrity, clocking and timing, power dissipation, and electrostatic discharge (ESD) *Introduction to VLSI Systems* builds an understanding of integrated circuits from the bottom up, paying much attention to logic circuit, layout, and system designs. Armed with these tools, readers can not only comprehensively understand the features and limitations of modern VLSI technologies, but also have enough background to adapt to this ever-changing field.

The impact of digital integrated circuits on our modern society has been pervasive. They are the enabling technology of the current computer and information-technology revolution. This is largely true because of the immense amount of signal and computer processing that can be realized in a single integrated circuit; modern IC's may contain millions of logic gates. This text book is intended to take a reader having only a minimal background and knowledge in electronics to the point where they can design state-of-the-art digital integrated circuits. Designing high-performance digital integrated circuits requires expertise in many different areas. These include semiconductor physics, integrated circuit processing, transistor-level design, logic-level design, system-level design, testing, etc. As-



pects of these topics are covered throughout this text, although the emphasis is on transistor-level design of digital integrated circuits and systems. This is in contrast to the perspective in many other texts, which takes a system-level or VLSI approach where transistor-level details are minimized. It is the author's belief that before system-level considerations can be properly evaluated, an in-depth transistor-level understanding must first be obtained. Important system-level considerations such as timing, pipe-lining, clock distribution, and system building blocks are covered in detail, but the emphasis on transistors first. Throughout the book, physical and intuitive explanations are given, and although mathematical quantitative analysis of many circuits have necessarily been presented, Martin has attempted not to "miss seeing the forest because of the trees". This book presents the critical underlying concepts without becoming entangled in tedious and over-complicated circuit analyses. It is intended for senior/graduate level students in electrical and computer engineering. This course assumes the Sedra/Smith Microelectronic Circuits course as a prerequisite.

CD-ROM contains: AIM SPICE (from AIM Software) -- Micro-Cap 6 (from Spectrum Software) -- Silos III Verilog Simulator (from Simucad) -- Adobe Acrobat Reader 4.0 (from Adobe).

Provides the only up-to-date source on the most recent advances in this often complex and fascinating topic. The only book to be entirely devoted to clocking. Clocking has become one of the most important topics in the field of digital system design. A "must have" book for advanced circuit engineers. This is an up-to-date treatment of the analysis and design of CMOS integrated digital logic circuits.

The self-contained book covers all of the important digital circuit design styles found in modern CMOS chips, emphasizing solving design problems using the various logic styles available in CMOS.

Power Aware Design Methodologies was conceived as an effort to bring all aspects of power-aware design methodologies together in a single document. It covers several layers of the design hierarchy from technology, circuit logic, and architectural levels up to the system layer. It includes discussion of techniques and methodologies for improving the power efficiency of CMOS circuits (digital and analog), systems on chip, microelectronic systems, wirelessly networked systems of computational nodes and so on. In addition to providing an in-depth analysis of the sources of power dissipation in VLSI circuits and systems and the technology and design trends, this book provides a myriad of state-of-the-art approaches to power optimization and control. The different chapters of Power Aware Design Methodologies have been written by leading researchers and experts in their respective areas. Contributions are from both academia and industry. The contributors have reported the various technologies, methodologies, and techniques in such a way that they are understandable and useful.

Designers of high-speed integrated circuits face a bewildering array of choices and too often spend frustrating days tweaking gates to meet speed targets. Logical Effort: Designing Fast CMOS Circuits makes high speed design easier and more methodical, providing a simple and broadly applicable method for estimating the delay resulting from factors such as topology, capacitance, and gate sizes. The brainchild of circuit and computer graphics pioneers Ivan Sutherland and Bob Sproull, "logical effort" will change the way you approach design challenges. This book begins by equipping you with a sound understanding of the method's essential procedures and concepts-so you can start using it immediately. Later chapters explore the theory and finer points of the method and detail its specialized applications. Features Explains the method and how to apply it in two practically focused

chapters. Improves circuit design intuition by teaching simple ways to discern the consequences of topology and gate size decisions. Offers easy ways to choose the fastest circuit from among an array of potential circuit designs. Reduces the time spent on tweaking and simulations-so you can rapidly settle on a good design. Offers in-depth coverage of specialized areas of application for logical effort: skewed or unbalanced gates, other circuit families (including pseudo-NMOS and domino), wide structures such as decoders, and irregularly forking circuits. Presents a complete derivation of the method-so you see how and why it works.

Market\_Desc: Engineers Special Features: " Updates the coverage of bipolar technologies" Enhances the discussion of biCMOS" Provides a more unified treatment of digital and analog circuit design while strengthening the coverage of CMOS" Removes the chapter on non-linear analog circuits" Adds a new operational amplifier example to chapter 11 About The Book: This is the only comprehensive book in the market for engineers that covers CMOS, bipolar technologies, and biCMOS integrated circuits. The fifth edition retains its completeness, updates the coverage of bipolar technologies, and enhances the discussion of biCMOS. It provides a more unified treatment of digital and analog circuit design while strengthening the coverage of CMOS. The chapter on non-linear analog circuits has been removed and chapter 11 has been updated to include an operational amplifier example. With its streamlined and up-to-date coverage, more engineers can turn to this resource to explore key concepts in the field.

VERILOG HDL, Second Edition by Samir Palnitkar With a Foreword by Prabhu Goel Written for both experienced and new users, this book gives you broad coverage of Verilog HDL. The book stresses the practical design and verification perspective of Verilog rather than emphasizing only the language aspects. The information presented is fully compliant with the IEEE 1364-2001 Verilog HDL standard. Among its many features, this edition- 

- Describes state-of-the-art verification methodologies
- Provides full coverage of gate, dataflow (RTL), behavioral and switch modeling
- Introduces you to the Programming Language Interface (PLI)
- Describes logic synthesis methodologies
- Explains timing and delay simulation
- Discusses user-defined primitives
- Offers many practical modeling tips

 Includes over 300 illustrations, examples, and exercises, and a Verilog resource list. Learning objectives and summaries are provided for each chapter. About the CD-ROM The CD-ROM contains a Verilog simulator with a graphical user interface and the source code for the examples in the book. What people are saying about Verilog HDL- "Mr. Palnitkar illustrates how and why Verilog HDL is used to develop today's most complex digital designs. This book is valuable to both the novice and the experienced Verilog user. I highly recommend it to anyone exploring Verilog based design." -Rajeev Madhavan, Chairman and CEO, Magma Design Automation "This book is unique in its breadth of information on Verilog and Verilog-related topics. It is fully compliant with the IEEE 1364-2001 standard, contains all the information that you need on the basics, and devotes several chapters to advanced topics such as verification, PLI, synthesis and modeling techniques." -Michael McNamara, Chair, IEEE 1364-2001 Verilog Standards Organization This has been my favorite Verilog book since I picked it up in college. It is the only book that covers practical Verilog. A must have for beginners and experts." -Berend Ozceri, Design Engineer, Cisco Systems, Inc. "Simple, logical and well-organized material with plenty of illustrations, makes this an ideal textbook." -Arun K. Somani, Jerry R. Junkins Chair Professor, Department of Electrical and Computer Engineering, Iowa State University,

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Beginning with discussions on the operation of electronic devices and analysis of the nucleus of digital design, the text addresses: the impact of interconnect, design for low power, issues in timing and clocking, design methodologies, and the effect of design automation on the digital design perspective.

High-speed, power-efficient analog integrated circuits can be used as standalone devices or to interface modern digital signal processors and micro-controllers in various applications, including multimedia, communication, instrumentation, and control systems. New architectures and low device geometry of complementary metaloxidesemiconductor (CMOS) technologies have accelerated the movement toward system on a chip design, which merges analog circuits with digital, and radio-frequency components.

Low-Energy FPGAs: Architecture and Design is a primary resource for both researchers and practi-

ing engineers in the field of digital circuit design. The book addresses the energy consumption of Field-Programmable Gate Arrays (FPGAs). FPGAs are becoming popular as embedded components in computing platforms. The programmability of the FPGA can be used to customize implementations of functions on an application basis. This leads to performance gains, and enables reuse of expensive silicon. Chapter 1 provides an overview of digital circuit design and FPGAs. Chapter 2 looks at the implication of deep-submicron technology on FPGA power dissipation. Chapter 3 describes the exploration environment to guide and evaluate design decisions. Chapter 4 discusses the architectural optimization process to evaluate the trade-offs between the flexibility of the architecture, and the effect on the performance metrics. Chapter 5 reviews different circuit techniques to reduce the performance overhead of some of the dominant components. Chapter 6 shows methods to configure FPGAs to minimize the programming overhead. Chapter 7 addresses the physical realization of some of the critical components and the final implementation of a specific low-energy FPGA. Chapter 8 compares the prototype array to an equivalent commercial architecture.