Real World Fpga Design With Verilog

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.

The practical guide for every circuit designer creating FPGA designs with Verilog! Walk through design step-by-step-from coding through silicon. Partitioning, synthesis, simulation, test benches, combinatorial and sequential designs, and more. Real World FPGA Design with Verilog guides you through every key challenge associated with designing FPGAs and ASICs using Verilog, one of the world's leading hardware design languages. You'll find irreverent, yet rigorous coverage of what it really takes to translate HDL code into hardware–and how to avoid the pitfalls that can occur along the way. Ken Coffman presents no-frills, real-world design techniques that can improve the stability and reliability of virtually any design. Start by walking a typical Verilog design all the way through to silicon; then, review basic Verilog syntax, design simulation and testing, advanced simulation, and more. Coverage includes: Essential digital design strategies: recognizing the underlying analog building blocks used to create digital primitives; implementing logic with LUTs; clocking strategies, logic minimization, and more Key engineering tradeoffs, including operating speed vs. latency Combinatorial and sequential designs Verilog test fixtures: compiler directives and automated testing A detailed comparison of alternative architectures and software-including a never-before-published FPGA technology selection checklist Real World FPGA Design with Verilog introduces libraries and reusable modules, points out opportunities to reuse your own code, and helps you decide when to purchase existing IP designs instead of building from scratch. Essential rules for designing with ASIC conversion in mind are presented. If you're involved with digital hardware design with Verilog, Ken Coffman is a welcome voice of experience-showing you the shortcuts, helping you over the rough spots, and helping you achieve competence faster than you ever expected!

The idea of evolving machines, whose origins can be traced to the cybernetics movementofthe1940sand1950s,hasrecentlyresurgedintheformofthenascent ?eld of bio-inspired systems and evolvable hardware. The inaugural workshop, Towards Evolvable Hardware, took place in Lausanne in October 1995, followed by the First International Conference on Evolvable Systems: From Biology to Hardware (ICES), held in Tsukuba, Japan in October 1996. The second ICES conference was held in Lausanne in September 1998, with the third and fourth being held in Edinburgh, April 2000 and Tokyo, October 2001 respectively. This has become the leading conference in the ?eld of evolvable systems and the 2003 conference promised to be at least as good as, if not better than, the four that preceeded it. The ?fth international conference was built on the success of its predec- sors, aiming at presenting the latest developments in the ?eld. In addition, it brought together researchers who use biologically inspired concepts to imp- ment real systems in arti?cial intelligence, arti?cial life, robotics, VLSI design and related domains. We would say that this ?fth conference followed on from the previous four in that it consisted of a number of high-quality interesting thought-provoking papers.

The push to move products to market as quickly and cheaply as possible is fiercer than ever, and accordingly, engineers are always looking for new ways to provide their companies with the edge over the competition. Field-Programmable Gate Arrays (FPGAs), which are faster, denser, and more cost-effective than traditional programmable logic devices (PLDs), are quickly becoming one of the most widespread tools that embedded engineers can utilize in order to gain that needed edge. FPGAs are especially popular for prototyping designs, due to their superior speed and efficiency. This book hones in on that rapid prototyping aspect of FPGA use, showing designers exactly how they can cut time off production cycles and save their companies money drained by costly mistakes, via prototyping designs with FPGAs first. Reading it will take a designer with a basic knowledge of implementing FPGAs to the "next-level of FPGA use because unlike broad beginner books on FPGAs, this book presents the required design skills in a focused, practical, example-oriented manner. In-the-trenches expert authors assure the most applicable advice to practicing engineers Dual focus on successfully making critical decisions and avoiding common pitfalls appeals to engineers pressured for speed and perfection Hardware and software are both covered, in order to address the growing trend toward "cross-pollination" of engineering expertise

Using Verilog and VHDL

Principles and Practices

Harnessing VLSI System Design with EDA Tools

Digital Design and Computer Organization

FPGAs: Instant Access

A Practical Approach

This book provides the advanced issues of FPGA design as the underlying theme of the work. In practice, an engineer typically needs to be mentored for several years before these principles are appropriately utilized. The topics that will be discussed in this book are essential to designing FPGA's beyond moderate complexity. The goal of the book is to present practical design techniques that are otherwise only available through mentorship and real-world experience.

This book was written for new designers looking for a solid foundation in PCB design although designers with more experience will find the reference material, software, and explanations of the values that manufacturers use invaluable as well.

The purpose of this book is to provide a practical approach to managing security in FPGA designs for researchers and practitioners in the electronic design automation (EDA) and FPGA communities, including corporations, industrial and government research labs, and academics. This book combines theoretical underpinnings with a practical design approach and worked examples for combating real world threats. To address the spectrum of lifecycle and operational threats against FPGA systems, a holistic view of FPGA security is presented, from formal top level speci?cation to low level policy enforcement mechanisms, which integrates recent advances in the ?elds of computer security theory, languages, compilers, and hardware. The net effect is a diverse set of static and runtime techniques that, working in coope- tion, facilitate the composition of robust, dependable, and trustworthy systems using commodity components. We wish to acknowledge the many people who helped us ensure the success of ourworkonrecon?gurablehardwaresecurity.Inparticular,wewishtothankAndrei Paun and Jason Smith of Louisiana Tech University for providing us with a Lin- compatible version of Grail+. We also wish to thank those who gave us comments on drafts of this book, including Marco Platzner of the University of Paderborn, and Ali Irturk and Jason Oberg of the University of California, San Diego. This research was funded in part by National Science Foundation Grant CNS-0524771 and NSF Career Grant CCF-0448654.

In August of 2006, an engineering VP from one of Altera's customers approached Misha Burich, VP of Engineering at Altera, asking for help in reliably being able to predict the cost, schedule and quality of system designs reliant on FPGA designs. At this time, I was responsible for defining the design flow requirements for the Altera design software and was tasked with investigating this further. As I worked with the customer to understand what worked and what did not work reliably in their FPGA design process, I noted that this problem was not unique to this one customer. The characteristics of the problem are shared by many Corporations that implement designs in FPGAs. The Corporation has many design teams at different locations and the success of the FPGA projects vary between the teams. There is a wide range of design experience across the teams. There is no working process for sharing design blocks between engineering teams. As I analyzed the data that I had received from hundreds of customer visits in the past, I noticed that design reuse among engineering teams was a challenge. I also noticed that many of the design teams at the same Companies and even within the same design team used different design methodologies. Altera had recently solved this problem as part of its own FPGA design software and IP development process.

Modern VLSI Design

Simplified

Design Verification with E

Evolvable Systems: From Biology to Hardware

Handbook of Nature-Inspired and Innovative Computing

Rapid System Prototyping with FPGAs

Field Programmable Gate Arrays (FPGAs) are devices that provide a fast, low-cost way for embedded system designers to customize products and deliver new versions with upgraded features, because they can handle very complicated functions, and be reconfigured an infinite number of times. In addition to introducing the various architectural features available in the latest generation of FPGAs, The Design Warrior ' s Guide to FPGAs also covers different design tools and flows. This book covers information ranging from schematic-driven entry, through traditional HDL/RTL-based simulation and logic synthesis, all the way up to the current state-of-the-art in pure C/C++ design capture and synthesis technology. Also discussed are specialist areas such as mixed hardward/software and DSP-based design flows, along with innovative new devices such as field programmable node arrays (FPNAs). Clive "Max" Maxfield is a bestselling author and engineer with a large following in the electronic design automation (EDA)and embedded systems industry. In this comprehensive book, he covers all the issues of interest to designers working with, or contemplating a move to, FPGAs in their product designs. While other books cover fragments of FPGA technology or applications this is the first to focus exclusively and comprehensively on FPGA use for embedded systems. First book to focus exclusively and comprehensively on FPGA use in embedded designs World-renowned best-selling author Will help engineers get familiar and succeed with this new technology by providing much-needed advice on choosing the right FPGA for any design project

Smart grids are linked with smart homes and smart meters. These smart grids are the new topology for generating, distributing, and consuming energy. If these smart devices are not connected in a smart grid, then they cannot work properly; hence, the conventional power systems are swiftly changing in order to improve the quality of electrical energy. This book covers the fundamentals of power systems—which are the pillars for smart grids —with a focus on defining the smart grid with theoretical and experimental electrical concepts. Power System Fundamentals begins by discussing electric circuits, the basic systems in smart grids, and finishes with a complete smart grid concept. The book allows the reader to build a foundation of understanding with basic and advanced exercises that run on simulation before moving to experimental results. It is intended for readers who want to comprehensively cover both the basic and advanced concepts of smart grids.

High-Speed Signal Propagation: Advanced Black Magic brings together state-of-the-art techniques for building digital devices that can transmit faster and farther than ever before. Dr. Howard Johnson presents brand-new examples and design guidance, and a complete, unified theory of signal propagation for all metallic media. Coverage includes: understanding signal impairments; managing speed/distance tradeoffs; differential signaling; inter-cabinet connections; clock distribution; simulation, and much more.

& Describes the engineering needs addressed by the individual EDA tools and covers EDA from both the provider and user viewpoints. & & Learn the importance of marketing and business trends in the EDA industry. & & The EDA consortium is made up of major corporations including SUN, HP, and Intel.

Signal Integrity Issues and Printed Circuit Board Design

IP-Based Design

Design Recipes for FPGAs: Using Verilog and VHDL

Embedded Systems Design with Platform FPGAs

Printed Circuit Board Designer's Reference

A Concise Introduction for FPGA Design

With the proliferation of VHDL, the reference material also grew in the same order. Today there is good amount of scholarly literature including many books describing various aspects of VHDL. However, an indepth review of these books reveals a different story. Many of them have emerged simply as an improved version of the manual. While some of them deal with the system design issues, they lack appropriate exemplifying to illustrate the concepts. Others give large number of examples, but lack the VLSI system design issues. In nutshell, the fact which gone unnoticed by most of the books, is the growth of the VLSI is not merely due to the language itself, but more due to the development of large number of third party tools useful from the FPGA or semicustom ASIC realization point of view. In the proposed book, the authors have synergized the VHDL programming with appropriate EDA tools so as to present a full proof system design to the readers. In this book along with the VHDL coding issues, the simulation and synthesis with the various toolsets enables the potential reader to visualize the final design. The VHDL design codes have been synthesized using different third party tools such as Xilinx Web pack Ver.11, Modelsim PE, Leonrado Spectrum and Synplify Pro. Mixed flow illustrated by using the above mentioned tools presents an insight to optimize the design with reference to the spatial, temporal and power metrics.

The #1 guide to signal integrity, updated with all-new coverage of power integrity, high-speed serial links, and more * * Up-to-the-minute comprehensive guidance: everything engineers need to know to understand and design for signal integrity. * Authored by world-renowned signal integrity trainer, educator, and columnist Eric Bogatin. * Focuses on intuitive understanding, practical tools, and engineering discipline - not theoretical derivation or mathematical rigor. Today's marketplace demands faster devices and systems that deliver more functionality and longer life in smaller packaging. Signal Integrity - Simplified, Second Edition is the first book to bring together all the up-to-the-minute techniques designers need to overcome all of those challenges. Renowned expert Eric Bogatin thoroughly reviews the root causes of all four families of signal integrity problems, and shows how to design them out early in the design cycle. Drawing on his experience teaching 5,000+ engineers, he illuminates signal integrity, physical design, bandwidth, inductance, and impedance; presents practical tools for solving signal integrity problems; and offers specific design guidelines and solutions. In this edition, Bogatin adds extensive coverage of power integrity and high speed serial links: topics at the forefront of signal integrity design. Three new chapters address: * * Designing power delivery networks to support high-speed signal processing. * Using 4-Port S-parameters, the emerging standard for describing interconnects in high speed serial links. * Working with today's measurement and simulation tools and technologies

Every day, companies call upon their signal integrity engineers to make difficult decisions about design constraints and timing margins. Can I move these wires closer together? How many holes can I drill in this net? How far apart can I place these chips? Each design is unique: there's no single recipe that answers all the questions. Today's designs require ever greater precision, but design guides for specific digital interfaces are by nature conservative. Now, for the first time, there's a complete guide to timing analysis and simulation that will help you manage the tradeoffs between signal integrity, performance, and cost. Writing from the perspective of a practicing SI engineer and team lead, Greg Edlund of IBM presents deep knowledge and quantitative techniques for making better decisions about digital interface design. Edlund shares his insights into how and why digital interfaces fail, revealing how fundamental sources of pathological effects can combine to create fault conditions. You won't just learn Edlund's expert techniques for avoiding failures: you'll learn how to develop the right approach for your own projects and environment. Coverage includes • Systematically ensure that interfaces will operate with positive timing margin over the product's lifetime–without incurring excess cost • Understand essential chip-to-chip timing concepts in the context of signal integrity • Collect the right information upfront, so you can analyze new designs more effectively • Review the circuits that store information in CMOS state machines–and how they fail • Learn how to time common-clock, source synchronous, and high-speed serial transfers • Thoroughly understand how interconnect electrical characteristics affect timing: propagation delay, impedance profile, crosstalk, resonances, and frequency-dependent loss • Model 3D discontinuities using electromagnetic field solvers • Walk through four case studies: coupled differential vias, land grid array connector, DDR2 memory data transfer, and PCI Express channel • Appendices present a refresher on SPICE modeling and a high-level conceptual framework for electromagnetic field behavior Objective, realistic, and practical, this is the signal integrity resource engineers have been searching for.

Preface xiii Acknowledgments xvi About the Author xix About the Cover xx Chapter 1: Engineering Reliable Digital Interfaces 1 Chapter 2: Chip-to-Chip Timing 13 Chapter 3: Inside IO Circuits 39 Chapter 4: Modeling 3D Discontinuities 73 Chapter 5: Practical 3D Examples 101 Chapter 6: DDR2 Case Study 133 Chapter 7: PCI Express Case Study 175 Appendix A: A Short CMOS and SPICE Primer 209 Appendix B: A Stroll Through 3D Fields 219 Endnotes 233 Index 235

This thorough review of the fundamental principles associated with signal integrity provides engineering principles behind signal integrity effects, and applies this understanding to solving problems.

Architecture, Implementation, and Optimization

100 Power Tips for FPGA Designers

Accelerating the Design Process

FPGAs: World Class Designs

Signal and Power Integrity--simplified

Make: FPGAs

**** Choose the right programmable logic devices and development tools * Understand the design, verification, and testing issues * Plan schedules and allocate resources efficiently Choose the right programmable logic devices with this guide to the technolog***

Digital Systems Design with FPGAs and CPLDs explains how to design and develop digital electronic systems using programmable logic devices (PLDs). Totally practical in nature, the book features numerous (quantify when known) case study designs using a variety of Field Programmable Gate Array (FPGA) and Complex Programmable Logic Devices (CPLD), for a range of applications from control and instrumentation to semiconductor automatic test equipment. Key features include: * Case studies that provide a walk through of the design process, highlighting the trade-offs involved. * Discussion of real world issues such as choice of device, pin-out, power supply, power supply decoupling, signal integrity- for embedding FPGAs within a PCB based design. With this book engineers will be able to: * Use PLD technology to develop digital and mixed signal electronic systems * Develop PLD based designs using both schematic capture and VHDL synthesis techniques * Interface a PLD to digital and mixed-signal systems * Undertake complete design exercises from design concept through to the build and test of PLD based electronic hardware This book will be ideal for electronic and computer engineering students taking a practical or Lab based course on digital systems development using PLDs and for engineers in industry looking for concrete advice on developing a digital system using a FPGA or CPLD as its core. Case studies that provide a walk through of the design process, highlighting the trade-offs involved. Discussion of real world issues such as choice of device, pin-out, power supply, power supply decoupling, signal integrity- for embedding FPGAs within a PCB based design. With this book engineers will be able to: * Use PLD technology to develop digital and mixed signal electronic systems * Develop PLD based designs using both schematic capture and VHDL synthesis techniques * Interface a PLD to digital and mixed-signal systems * Undertake complete design exercises from design concept through to the build and test of PLD based electronic hardware This book will be ideal for electronic and computer engineering students taking a practical or Lab based course on digital systems development using PLDs and for engineers in industry looking for concrete advice on developing a digital system using a FPGA or CPLD as its core. Case studies that provide a walk through of the design process, highlighting the trade-offs involved. Discussion of real world issues such as choice of device, pin-out, power supply, power supply decoupling, signal integrity- for embedding FPGAs within a PCB based design.

This easy-to-use, fast-moving tutorial introduces you to functional programming with Haskell. You'll learn how to use Haskell in a variety of practical ways, from short scripts to large and demanding applications. Real World Haskell takes you through the basics of functional programming at a brisk pace, and then helps you increase your understanding of Haskell in real-world issues like I/O, performance, dealing with data, concurrency, and more as you move through each chapter.

Design Recipes for FPGAs: Using Verilog and VHDL provides a rich toolbox of design techniques and templates to solve practical, every-day problems using FPGAs. Using a modular structure, the book gives 'easy-to-find' design techniques and templates at all levels, together with functional code. Written in an informal and 'easy-to-grasp' style, it goes beyond the principles of FPGA s and hardware description languages to actually demonstrate how specific designs can be synthesized, simulated and downloaded onto an FPGA. This book's 'easy-to-find' structure begins with a design application to demonstrate the key building blocks of FPGA design and how to connect them, enabling the experienced FPGA designer to quickly select the right design for their application, while providing the less experienced a 'road map' to solving their specific design problem. The book also provides advanced techniques to create 'real world' designs that fit the device required and which are fast and reliable to implement. This text will appeal to FPGA designers of all levels of experience. It is also an ideal resource for embedded system development engineers, hardware and software engineers, and undergraduates and postgraduates studying an embedded system which focuses on FPGA design. A rich toolbox of practical FGPA design techniques at an engineer's finger tips Easy-to-find structure that allows the engineer to quickly locate the information to solve their FGPA design problem, and obtain the level of detail and understanding needed

5th International Conference, ICES 2003, Trondheim, Norway, March 17-20, 2003, Proceedings

Timing Analysis and Simulation for Signal Integrity Engineers

Advanced Black Magic

Design Recipes for FPGAs

Devices, Tools and Flows

Advanced FPGA Design

Get started with FPGA programming using SystemVerilog, and develop real-world skills by building projects, including a calculator and a keyboard Key FeaturesExplore different FPGA usage methods and the FPGA tool flowLearn how to design, test, and implement hardware circuits using SystemVerilogBuild real-world FPGA projects such as a calculator and a keyboard using FPGA resourcesBook Description Field Programmable Gate Arrays (FPGAs) have now become a core part of most modern electronic and computer systems. However, to implement your ideas in the real world, you need to get your head around the FPGA architecture, its toolset, and critical design considerations. FPGA Programming for Beginners will help you bring your ideas to life by guiding you through the entire process of programming FPGAs and designing hardware circuits using SystemVerilog. The book will introduce you to the FPGA and Xilinx architectures and show you how to work on your first project, which includes toggling an LED. You'll then cover SystemVerilog RTL designs and their implementations. Next, you'll get to grips with using the combinational Boolean logic design and work on several projects, such as creating a calculator and updating it using FPGA resources. Later, the book will take you through the advanced concepts of AXI and show you how to create a keyboard using PS/2. Finally, you'll be able to consolidate all the projects in the book to create a unified output using a Video Graphics Array (VGA) controller that you'll design. By the end of this SystemVerilog FPGA book, you'll have learned how to work with FPGA systems and be able to design hardware circuits and boards using SystemVerilog programming. What you will learnUnderstand the FPGA architecture and its implementationGet to grips with writing SystemVerilog RTLMake FPGA projects using SystemVerilog programmingWork with computer math basics, parallelism, and pipeliningExplore the advanced topics of AXI and keyboard interfacing with PS/2Discover how you can implement a VGA interface in your projectsWho this book is for This FPGA design book is for embedded system developers, engineers, and programmers who want to learn FPGA and SystemVerilog programming from scratch. FPGA designers looking to gain hands-on experience in working on real-world projects will also find this book useful.

From ASICs to SOCs: A Practical Approach, by Farzad Nekoogar and Faranak Nekoogar, covers the techniques, principles, and everyday realities of designing ASICs and SOCs. Material includes current issues in the field, front-end and back-end designs, integration of IPs on SOC designs, and low-power design techniques and methodologies. Appropriate for practicing chip designers as well as graduate students in electrical engineering.

Master FPGA digital system design and implementation with Verilog and VHDL This practical guide explores the development and deployment of FPGA-based digital systems using the two most popular hardware description languages, Verilog and VHDL. Written by a pair of digital circuit design experts, the book offers a solid grounding in FPGA principles, practices, and applications and provides an overview of more complex topics. Important concepts are demonstrated through real-world examples, ready-to-run code, and inexpensive start-to-finish projects for both the Basys and Arty boards. Digital System Design with FPGA: Implementation Using Verilog and VHDL covers: • Field programmable gate array fundamentals • Basys and Arty FPGA boards • The Vivado design suite • Verilog and VHDL • Data types and operators • Combinational circuits and circuit blocks • Data storage elements and sequential circuits • Soft-core microcontroller and digital interfacing • Advanced FPGA applications • The future of FPGA

As part of the Modern Semiconductor Design series, this book details a broad range of e-based topics including modelling, constraint-driven test generation, functional coverage and assertion checking.

High-speed Signal Propagation

Handbook of FPGA Design Security

Digital System Design with FPGA: Implementation Using Verilog and VHDL

High-Speed Physical Layer Characterization

FPGA Programming for Beginners

Basics

FPGAs are central to electronic design! The engineers designing these devices are in need of essential information at a moment's notice. The Instant Access Series provides all the critical content that a computer design engineer needs in his or her daily work. This book provides an introduction to FPGAs as well as succinct overviews of fundamental concepts and basic programming. FPGAs are a customizable chip flexible enough to be deployed in a wide range of products and applications. There are several basic design flows detailed including ones based in C/C++, DSP, and HDL. This book is filled with images, figures, tables, and easy to find tips and tricks for the engineer that needs material fast to complete projects to deadline. Table of Contents CHAPTER 1 The Fundamentals CHAPTER 2 FPGA Architectures CHAPTER 3 Programming (Configuring) an FPGA CHAPTER 4 FPGA vs. ASIC Designs CHAPTER 5 "Traditional Design Flows CHAPTER 6 Other Design Flows CHAPTER 7 Using Design Tools CHAPTER 8 Choosing the Right Device *Tips and tricks feature that will help engineers get info fast and move on to the next issue *Easily searchable content complete with tabs, chapter table of contents, bulleted lists, and boxed features *Just the essentials, no need to page through material not needed for the current project

This textbook explains how to design and develop digital electronic systems using programmable logic devices (PLDs). Totally practical in nature, the book features numerous (quantify when known) case study designs using a variety of Field Programmable Gate Array (FPGA) and Complex Programmable Logic Devices (CPLD), for a range of applications from control and instrumentation to semiconductor automatic test equipment. Key features include: * Case studies that provide a walk through of the design process, highlighting the trade-offs involved. * Discussion of real world issues such as choice of device, pin-out, power supply, power supply decoupling, signal integrity- for embedding FPGAs within a PCB based design. With this book engineers will be able to: * Use PLD technology to develop digital and mixed signal electronic systems * Develop PLD based designs using both schematic capture and VHDL synthesis techniques * Interface a PLD to digital and mixed-signal systems * Undertake complete design exercises from design concept through to the build and test of PLD based electronic hardware This book will be ideal for electronic and computer engineering students taking a practical or Lab based course on digital systems development using PLDs and for engineers in industry looking for concrete advice on developing a digital system using a FPGA or CPLD as its core. *Case studies that provide a walk through of the design process, highlighting the trade-offs involved. *Discussion of real world issues such as choice of device, pin-out, power supply, power supply decoupling, signal integrity- for embedding FPGAs within a PCB based design.

Complicated concepts explained succinctly and in laymen's terms to both experienced and novice PCB designers. Numerous examples allow reader to visualize how high-end software simulators see various types of SI problems and then their solutions. Author is a frequent and recognized seminar leader in the industry.

The First Comprehensive, Example-Rich Guide to Power Integrity Modeling Professionals such as signal integrity engineers, package designers, and system architects need to thoroughly understand signal and power integrity issues in order to successfully design packages and boards for high speed systems. Now, for the first time, there's a complete guide to power integrity modeling: everything you need to know, from the basics through the state of the art. Using realistic case studies and downloadable software examples, two leading experts demonstrate today's best techniques for designing and modeling interconnects to efficiently distribute power and minimize noise. The authors carefully introduce the core concepts of power distribution design, systematically present and compare leading techniques for modeling noise, and link these techniques to specific applications. Their many examples range from the simplest (using analytical equations to compute power supply noise) through complex system-level applications. The authors Introduce power delivery network components, analysis, high-frequency measurement, and modeling requirements Thoroughly explain modeling of power/ground planes, including plane behavior, lumped modeling, distributed circuit-based approaches, and much more Offer in-depth coverage of simultaneous switching noise, including modeling for return currents using time- and frequency-domain analysis Introduce several leading time-domain simulation methods, such as macromodeling, and discuss their advantages and disadvantages Present the application of the modeling methods on several advanced case studies that include high-speed servers, high-speed differential signaling, chip package analysis, materials characterization, embedded decoupling capacitors, and electromagnetic bandgap structures This book's system-level focus and practical examples will make it indispensable for every student and professional concerned with power integrity, including electrical engineers, system designers, signal integrity engineers, and materials scientists. It will also be valuable to developers building software that helps to analyze high-speed systems.

Essential Electronic Design Automation (EDA)

Real World FPGA Design with Verilog

Power System Fundamentals

Digital Communications Test and Measurement

Integrating Classical Models with Emerging Technologies

Verilog by Example

As computing devices proliferate, demand increases for an understanding of emerging computing paradigms and models based on natural phenomena. Neural networks, evolution-based models, quantum computing, and DNA-based computing and simulations are all a necessary part of modern computing analysis and systems development. Vast literature exists on these new paradigms and their implications for a wide array of applications. This comprehensive handbook, the first of its kind to address the connection between nature-inspired and traditional computational paradigms, is a repository of case studies dealing with different problems in computing and solutions to these problems based on nature-inspired paradigms. The "Handbook of Nature-Inspired and Innovative Computing: Integrating Classical Models with Emerging Technologies" is an essential compilation of models, methods, and algorithms for researchers, professionals, and advanced-level students working in all areas of computer science, IT, biocomputing, and network engineering.

All the design and development inspiration and direction a harware engineer needs in one blockbuster book! Clive "Max" Maxfield renowned author, columnist, and editor of PL DesignLine has selected the very best FPGA design material from the Newnes portfolio and has compiled it into this volume. The result is a book covering the gamut of FPGA design from design fundamentals to optimized layout techniques with a strong pragmatic emphasis. In addition to specific design techniques and practices, this book also discusses various approaches to solving FPGA design problems and how to successfully apply theory to actual design tasks. The material has been selected for its timelessness as well as for its relevance to contemporary FPGA design issues. Contents Chapter 1 Alternative FPGA Architectures Chapter 2 Design Techniques, Rules, and Guidelines Chapter 3 A VHDL Primer: The Essentials Chapter 4 Modeling Memories Chapter 5 Introduction to Synchronous State Machine Design and Analysis Chapter 6 Embedded Processors Chapter 7 Digital Signal Processing Chapter 8 Basics of Embedded Audio Processing Chapter 9 Basics of Embedded Video and Image Processing Chapter 10 Programming Streaming FPGA Applications Using Block Diagrams In Simulink Chapter 11 Ladder and functional block programming Chapter 12 Timers *Hand-picked content selected by Clive "Max" Maxfield, character, luminary, columnist, and author *Proven best design practices for FPGA development, verification, and low-power *Case histories and design examples get you off and running on your current project

A Comprehensive Guide to Physical Layer Test and Measurement of Digital Communication Links Today's new data communication and computer interconnection systems run at unprecedented speeds, presenting new challenges not only in the design, but also in troubleshooting, test, and measurement. This book assembles contributions from practitioners at top test and measurement companies, component manufacturers,and universities. It brings together information that has never been broadly accessible before—information that was previously buried in application notes, seminar and conference presentations, short courses, and unpublished works. Readers will gain a thorough understanding of the inner workings of digital high-speed systems, and learn how the different aspects of such systems can be tested. The editors and contributors cover key areas in test and measurement of transmitters (digital waveform and jitter analysis and bit error ratio), receivers (sensitivity, jitter tolerance, and PLL/CDR characterization), and high-speed channel characterization (in time and frequency domain). Extensive illustrations are provided throughout. Coverage includes Signal integrity from a measurement point of view Digital waveform analysis using high bandwidth real-time and sampling (equivalent time) oscilloscopes Bit error ratio measurements for both electrical and optical links Extensive coverage on the topic of jitter in high-speed networks State-of-the-art optical sampling techniques for analysis of 100 Gbit/s + signals Receiver characterization: clock recovery, phase locked loops, jitter tolerance and transfer functions, sensitivity testing, and stressed-waveform receiver testing Channel and system characterization: TDR/T and frequency domain-based alternatives Testing and measuring PC architecture communication links: PCIexpress, SATA, and FB DIMM

Digital Design and Computer Organization introduces digital design as it applies to the creation of computer systems. It summarizes the tools of logic design and their mathematical basis, along with in depth coverage of combinational and sequential circuits. The book includes an accompanying CD that includes the majority of circuits highlig

Code You Can Believe In

Power Integrity Modeling and Design for Semiconductors and Systems

Turning Software into Hardware with Eight Fun and Easy DIY Projects

FPGA Design

Real World Haskell

Signal Integrity

This book provides a rich toolbox of design techniques and templates to solve practical, every-day problems using FPGAs. Using a modular structure, it provides design techniques and templates at all levels, together with functional code, which you can easily match and apply to your application. Written in an informal and easy to grasp style, this invaluable resource goes beyond the principles of FPGAs and hardware description languages to demonstrate how specific designs can be synthesized, simulated and downloaded onto an FPGA. In addition, the book provides advanced techniques to create 'real world' designs that fit the device required and which are fast and reliable to implement. Examples are rewritten and tested in Verilog and VHDL Describes high-level applications as examples and provides the building blocks to implement them, enabling the student to start practical work straight away Singles out the most important parts of the language that are needed for design, giving the student the information needed to get up and running quickly

A practical primer for the student and practicing engineer already familiar with the basics of digital design, the reference develops a working grasp of the verilog hardware description language step-by-step using easy-to-understand examples. Starting with a simple but workable design sample, increasingly more complex fundamentals of the language are introduced until all major features of verilog are brought to light. Included in the coverage are state machines, modular design, FPGA-based memories, clock management, specialized I/O, and an introduction to techniques of simulation. The goal is to prepare the reader to design real-world FPGA solutions. All the sample code used in the book is available online. What Strunk and White did for the English language with "The Elements of Style," VERILOG BY EXAMPLE does for FPGA design.

What if you could use software to design hardware? Not just any hardware--imagine specifying the behavior of a complex parallel computer, sending it to a chip, and having it run on that chip--all without any manufacturing? With Field-Programmable Gate Arrays (FPGAs), you can design such a machine with your mouse and keyboard. When you deploy it to the FPGA, it immediately takes on the behavior that you defined. Want to create something that behaves like a display driver integrated circuit? How about a CPU with an instruction set you dreamed up? Or your very own Bitcoin miner You can do all this with

FPGAs. Because you're not writing programs--rather, you're designing a chip whose sole purpose is to do what you tell it--it's faster than anything you can do in code. With Make: FPGAs, you'll learn how to break down problems into something that can be solved on an FPGA, design the logic that will run on your FPGA, and hook up electronic components to create finished projects.

Embedded Systems Design with Platform FPGAs introduces professional engineers and students alike to system development using Platform FPGAs. The focus is on embedded systems but it also serves as a general guide to building custom computing systems. The text describes the fundamental technology in terms of hardware, software, and a set of principles to guide the development of Platform FPGA systems. The goal is to show how to systematically and creatively apply these principles to the construction of application-specific embedded system architectures. There is a strong focus on using free and open source software to increase productivity. Each chapter is organized into two parts. The white pages describe concepts, principles, and general knowledge. The gray pages provide a technical rendition of the main issues of the chapter and show the concepts applied in practice. This includes step-by-step details for a specific development board and tool chain so that the reader can carry out the same steps on their own. Rather than try to demonstrate the concepts on a broad set of tools and boards, the text uses a single set of tools (Xilinx Platform Studio, Linux, and GNU) throughout and uses a single developer board (Xilinx ML-510) for the examples. Explains how to use the Platform FPGA to meet complex design requirements and improve product performance Presents both fundamental concepts together with pragmatic, step-by-step instructions for building a system on a Platform FPGA Includes detailed case studies, extended real-world examples, and lab exercises

Bring your ideas to life by creating hardware designs and electronic circuits with SystemVerilog

The Design Warrior's Guide to FPGAs

From ASICs to SOCs

Best Practices for Team-based Design

Digital Systems Design with FPGAs and CPLDs

Designing with FPGAs and CPLDs

High-Performance Computing using FPGA covers the area of high performance reconfigurable computing (HPRC). This book provides an overview of architectures, tools and applications for High-Performance Reconfigurable Computing (HPRC). FPGAs offer very high I/O bandwidth and fine-grained, custom and flexible parallelism and with the ever-increasing computational needs coupled with the frequency/power wall, the increasing maturity and capabilities of FPGAs, and the advent of multicore processors which has caused the acceptance of parallel computational models. The Part on architectures will introduce different FPGA-based HPC platforms: attached co-processor HPRC architectures such as the CHREC's Novo-G and EPCC's Maxwell systems; tightly coupled HRPC architectures, e.g. the Convey hybrid-core computer; reconfigurably networked HPRC architectures, e.g. the QPACE system, and standalone HPRC architectures such as EPFL's CONFETTI system. The Part on Tools will focus on high-level programming approaches for HPRC, with chapters on C-to-Gate tools (such as Impulse-C, AutoESL, Handel-C, MORA-C++); Graphical tools (MATLAB-Simulink, NI LabVIEW); Domain-specific languages, languages for heterogeneous computing(for example OpenCL, Microsoft's Kiwi and Alchemy projects). The part on Applications will present case from several application domains where HPRC has been used successfully, such as Bioinformatics and Computational Biology; Financial Computing; Stencil computations; Information retrieval; Lattice QCD; Astrophysics simulations; Weather and climate modeling.

High-Performance Computing Using FPGAs