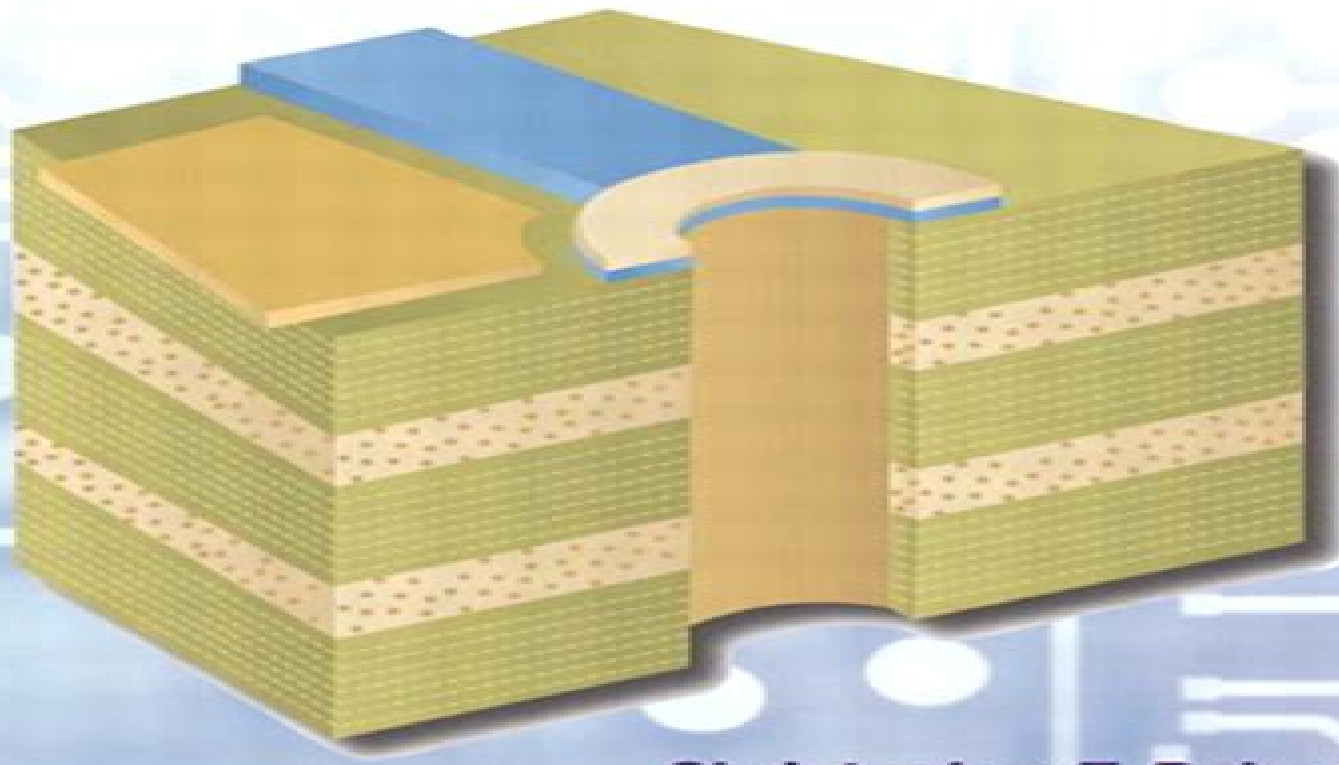


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Christopher T. Robertson

Prentice Hall Modern Semiconductor Design Series

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Jens Lienig, Juergen Scheible



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designs require ever greater precision but design guides for specific digital interfaces are by nature conservative Now for the first time there is 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

Essential Electronic Design Automation (EDA) Mark Birnbaum, 2004 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

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

Power Integrity Modeling and Design for Semiconductors and Systems Madhavan Swaminathan, Ege Engin, 2007-11-19

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

Engineering the Complex SOC Chris Rowen, 2008-11-11 Engineering the Complex SOC The first unified hardware software guide to processor centric SOC design Processor centric approaches enable SOC designers to complete far larger projects in far less time Engineering the Complex SOC is a comprehensive example driven guide to creating designs with configurable extensible processors Drawing upon Tensilica s Xtensa architecture and TIE language Dr Chris Rowen systematically illuminates the issues opportunities and challenges of processor centric design Rowen introduces a radically new design methodology then covers its essential techniques processor configuration extension hardware software co generation multiple processor partitioning communication and more Coverage includes Why extensible processors are necessary shortcomings of current design methods Comparing extensible processors to traditional processors and hardwired logic Extensible processor architecture and mechanisms of processor extensibility Latency throughput coordination of parallel functions hardware interconnect options management of design complexity and other issues Multiple processor SOC architecture for embedded systems Task design from the viewpoints of software and hardware developers Advanced techniques implementing complex state machines task to task synchronization power optimization and more Toward a sea of

processors Long term trends in SOC design and semiconductor technology For all architects hardware engineers software designers and SOC program managers involved with complex SOC design and for all managers investing in SOC designs platforms processors or expertise PRENTICE HALL Professional Technical Reference Upper Saddle River NJ 07458 www.phptr.com *Fundamentals of Layout Design for Electronic Circuits* Jens Lienig, Juergen Scheible, 2020-03-19 This book covers the fundamental knowledge of layout design from the ground up addressing both physical design as generally applied to digital circuits and analog layout Such knowledge provides the critical awareness and insights a layout designer must possess to convert a structural description produced during circuit design into the physical layout used for IC PCB fabrication The book introduces the technological know how to transform silicon into functional devices to understand the technology for which a layout is targeted Chap 2 Using this core technology knowledge as the foundation subsequent chapters delve deeper into specific constraints and aspects of physical design such as interfaces design rules and libraries Chap 3 design flows and models Chap 4 design steps Chap 5 analog design specifics Chap 6 and finally reliability measures Chap 7 Besides serving as a textbook for engineering students this book is a foundational reference for today s circuit designers For Slides and Other Information <https://www.ifte.de/books/pd/index.html> **Real World FPGA Design with Verilog** Ken Coffman, 1999-12-08 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

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