# Signal Integrity Issues And Printed Circuit Board Design Paperback Prentice Hall Modern Semiconductor Design

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!

This is the enhanced eBook version of the printed book. It contains 1 hour and 48 minutes of video conversations and circuit animations from the industry's leading circuit design engineer, Doug Brooks. Today, PCB designers must deal with issues such as crosstalk and EMI–issues that were once associated only with components. This requires electronics knowledge that many PCB designers never gain through formal training. In PCB Currents, renowned PCB designer Douglas Brooks teaches these essentials descriptively, in plain English, with as little reliance on mathematics as possible. Building on his widely praised seminars, Brooks explains what current is, how it flows, and how it reacts. He begins by reviewing the nature of current, and then explains current flow in basic circuits, discusses sources that supply and drive current, and addresses the unique problems associated with current on PCBs. Brooks concludes by thoroughly illuminating signal integrity issues caused by current flow. He offers practical design solutions for each common type of problem, as well as for complex challenges involving very high frequency harmonics and very short wavelengths. The text is written to be accessible and valuable for PCB designers at all levels of experience, whether they have engineering training or not. Finally, in this Enhanced eBook Edition, some videos and animations have been incorporated as

an additional benefit. They fall into four categories. First, there is an introductory video at the beginning of the Preface. It is intended to help put the entire book into a perspective. Second, each section has an introductory video that outlines what is contained within that section and, in most cases, the most important points to be discovered in that section. Third, each chapter has its own, short introduction, again highlighting the most important points within the chapter. Finally, in Chapters 17 and 18, we have some animation videos to help explain some dynamic interactions. It is hard to envision what is happening when a signal reflects off the far end of a trace, or when a signal couples into an adjacent trace (crosstalk) as it travels along using just static figures. But an animation video makes these phenomena much easier to understand. These videos are an important benefit available to you, the ebook reader, and one that cannot be incorporated into a print edition.

"PCB Signal Integrity LiveLessons is a complete, detailed course on signal integrity for printed circuit board designers. There is no other media (including in person seminars) that provides so much material in such an easy-to-learn, convenient format. Doug starts the course by introducing the basic electronic background information necessary for understanding the rest of the material. This includes his perspective on the historical evolution of signal integrity issues on PCBs. He then devotes the next six lessons on specific signal integrity topics, ranging from EMI and crosstalk to bypass capacitors, to the skin effect, their impact, and solutions to the problems they impose. Before concluding with some final thoughts, Doug adds a lesson on the relationship between trace currents and temperatures, and how to address very large current surges that might melt (fuse) a trace."--Resource description page.

Noise Coupling is the root-cause of the majority of Systems on Chip (SoC) product fails. The book discusses a breakthrough substrate coupling analysis flow and modelling toolset, addressing the needs of the design community. The flow provides capability to analyze noise components, propagating through the substrate, the parasitic interconnects and the package. Using this book, the reader can analyze and avoid complex noise coupling that degrades RF and mixed signal design performance, while reducing the need for conservative design practices. With chapters written by leading international experts in the field, novel methodologies are provided to identify noise coupling in silicon. It additionally features case studies that can be found in any modern CMOS SoC product for mobile communications, automotive applications and readout front ends.

As demand for on-chip functionalities and requirements for low power operation continue to increase as a result of the emergence in mobile, wearable and internet-of-things (IoT) products, 3D/2.5D have been identified as an inevitable path moving forward. As circuits become more and more complex, especially three-dimensional ones, new insights have to be developed in many domains, including electrical, thermal, noise, interconnects, and parasites. It is the entanglement of such domains that begins the very key challenge as we enter in 3D nano-electronics. This book aims to develop this new paradigm, going to a synthesis beginning between many technical aspects.

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.

The #1 Practical Guide to Signal Integrity Design—Now Updated with Extensive New Coverage! This book brings together up-to-the-minute techniques for finding, fixing, and avoiding signal integrity problems in your design. Drawing on his work teaching more than five thousand engineers, world-class signal and power integrity expert Eric Bogatin systematically reviews the root causes of all six families of signal integrity problems and shows how to design them out early in the design cycle. This edition's extensive new content includes a brand-new chapter on S-parameters in signal integrity applications, and another on power integrity and power distribution network design—topics at the forefront of contemporary electronics design. Coverage includes A fully up-to-date introduction to signal integrity and physical design How design and technology selection can make or break the performance of the power distribution network Exploration of key concepts, such as plane impedance, spreading inductance, decoupling capacitors, and capacitor loop inductance Practical techniques for analyzing resistance, capacitance, inductance, and impedance Solving signal integrity problems via rules of thumb, analytic approximation, numerical simulation, and measurement Understanding how interconnect physical design impacts signal integrity Managing differential pairs and losses Harnessing the full power of S-parameters in high-speed serial link applications Ensuring power integrity throughout the entire power distribution path Realistic design guidelines for improving signal integrity, and much more Unlike books that concentrate on theoretical derivation and mathematical rigor, this book emphasizes intuitive understanding, practical tools, and engineering discipline. Designed for electronics industry professionals from beginners to experts it will be an invaluable resource for getting signal integrity designs

right the first time, every time.

Signal integrity issues remain a concern for many in the electronics industry. This micro eBook details the importance of eliminating signal integrity challenges. Written by signal integrity engineer Fadi Deek of Mentor, A Siemens Business, the chapters explore four possible signal integrity problems using an understanding of essential signal integrity principles.Deek explores how to reach effective design solutions and make strong engineering tradeoffs through analysis techniques, best design principles, and software tools to achieve accurate simulations and measurements. This eBook has something to offer for any engineer interested in identifying problems, root causes, and solutions surrounding electronic transmissions.

A very important part of printed circuit board (PCB) design involves sizing traces and vias to carry the required current. This exciting new book will explore how hot traces and vias should be and what board, circuit, design, and environmental parameters are the most important. PCB materials (copper and dielectrics) and the role they play in the heating and cooling of traces are covered. The IPC curves found in IPC 2152, the equations that fit those curves and computer simulations that fit those curves and equations are detailed. Sensitivity analyses that show what happens when environments are varied, including adjacent traces and planes, changing trace lengths, and thermal gradients are presented. Via temperatures and what determines them are explored, along with fusing issues and what happens when traces are overloaded. Voltage drops across traces and vias, the thermal effects going around right-angle corners, and frequency effects are covered. Readers learn how to measure the thermal conductivity of dielectrics and how to measure the resistivity of copper traces and why many prior attempts to do so have been doomed to failure. Industrial CT Scanning, and whether or not they might replace microsections for measuring trace parameters are also considered. Complete PCB Design Using OrCad Capture and Layout provides instruction on how to use the OrCAD design suite to design and manufacture printed circuit boards. The book is written for both students and practicing engineers who need a quick tutorial on how to use the software and who need in-depth knowledge of the capabilities and limitations of the software package. There are two goals the book aims to reach: The primary goal is to show the reader how to design a PCB using OrCAD Capture and OrCAD Layout. Capture is used to build the schematic diagram of the circuit, and Layout is used to design the circuit board so that it can be manufactured. The secondary goal is to show the reader how to add PSpice simulation capabilities to the design, and how to develop custom schematic parts, footprints and PSpice models. Often times separate designs are produced for documentation, simulation and board fabrication. This book shows how to perform all three functions from the same schematic design. This approach saves time and money and ensures continuity between the design and the manufactured product. Information is presented in the exact order a circuit and PCB are designed Straightforward, realistic examples present the how and why the designs work, providing a comprehensive toolset for understanding the OrCAD software Introduction to the IPC, JEDEC, and IEEE standards relating to PCB design Full-color interior and extensive illustrations allow readers to learn features of the product in the most realistic manner possible

A synergistic approach to signal integrity for high-speeddigital design This book is designed to provide contemporary readers with

anunderstanding of the emerging high-speed signal integrity issuesthat are creating roadblocks in digital design. Written by theforemost experts on the subject, it leverages concepts andtechniques from non-related fields such as applied physics andmicrowave engineering and applies them to high-speed digitaldesign—creating the optimal combination between theory andpractical applications. Following an introduction to the importance of signal integrity,chapter coverage includes: Electromagnetic fundamentals for signal integrity Transmission line fundamentals Crosstalk Non-ideal conductor models, including surface roughness andfrequency-dependent inductance Frequency-dependent properties of dielectrics Differential signaling Mathematical requirements of physical channels S-parameters for digital engineers Non-ideal return paths and via resonance I/O circuits and models Equalization Modeling and budgeting of timing jitter and noise System analysis using response surface modeling Each chapter includes many figures and numerous examples to helpreaders relate the concepts to everyday design and concludes withproblems for readers to test their understanding of the material.Advanced Signal Integrity for High-Speed Digital Designs issuitable as a textbook for graduate-level courses on signalintegrity, for programs taught in industry for professionalengineers, and as a reference for the high-speed digitaldesigner. Embedded Systems: A Contemporary Design Tool, Second Edition Embedded systems are one of the foundational elements of today's evolving and growing computer technology. From operating our cars, managing our smart phones, cleaning our homes, or cooking our meals, the special computers we call embedded systems are quietly and unobtrusively making our lives easier, safer, and more connected. While working in increasingly challenging environments, embedded systems give us the ability to put increasing amounts of capability into ever-smaller and more powerful devices. Embedded Systems: A Contemporary Design Tool, Second Edition introduces you to the theoretical hardware and software foundations of these systems and expands into the areas of signal integrity, system security, low power, and hardware-software co-design. The text builds upon earlier material to show you how to apply reliable, robust solutions to a wide range of applications operating in today's often challenging environments. Taking the user's problem and needs as your starting point, you will explore each of the key theoretical and practical issues to consider when designing an application in today's world. Author James Peckol walks you through the formal hardware and software development process covering: Breaking the problem down into major functional blocks; Planning the digital and software architecture of the system; Utilizing the hardware and software co-design process; Designing the physical world interface to external analog and digital signals; Addressing security issues as an integral part of the design process; Managing signal integrity problems and reducing power demands in contemporary systems; Debugging and testing throughout the design and development cycle; Improving performance. Stressing the importance of security, safety, and reliability in the design and development of embedded systems and providing a balanced treatment of both the hardware and the software aspects, Embedded Systems: A Contemporary Design Tool, Second Edition gives you the tools for creating embedded designs that solve contemporary real-world challenges.

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.

Abstract: Signal integrity issues are known as problems related to the transmission of high-speed signals in printed circuit boards. Several publications exist offering rules of thumb and generic design guidelines to prevent signal integrity problems. However, few of these publications offer analytical reasoning behind the rules of thumb, and as a result signal integrity can be misunderstood leading to poor design practices.

FPGA brings high performance applications to market quickly – this book covers the many emerging platforms in a proven, effective manner.

This accessible, new reference work shows how and why RF energy iscreated within a printed circuit board and the manner in whichpropagation occurs. With lucid explanations, this book enablesengineers to grasp both the fundamentals of EMC theory and signalintegrity and the mitigation process needed to prevent an EMCevent. Author Montrose also shows the relationship between time andfrequency domains to help you meet mandatory compliancerequirements placed on printed circuit boards. Using real-world examples the book features: Clear discussions, without complex mathematical analysis, offlux minimization concepts Extensive analysis of capacitor usage for variousapplications Detailed examination of components characteristics with variousgrounding methodologies, including implementation techniques An in-depth study of transmission line theory A careful look at signal integrity, crosstalk, andtermination

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

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 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.

This book is a collection of works dealing with the important technologies and mathematical concepts behind today's optical fiber communications and devices. It features 17 selected topics such as architecture and topologies of optical networks, secure optical communication, PONs, LANs, and WANs and thus provides an overall view of current research trends and technology on these topics. The book compiles worldwide contributions from many prominent universities and research centers, bringing together leading academics and scientists in the field of photonics and optical communications. This compendium is an invaluable reference edited by three scientists with a wide knowledge of the field and the community. Researchers and practitioners working in photonics and optical communications will find this book a valuable resource.

The high reliability and operating speed (high clock frequencies) are essential elements for electronic equipment. With the increase in the speed of operation of the circuits on printed circuit boards (PCB), the wavelength becomes comparable to the length of interconnections. This implies in the circuit analysis being then made in terms of transmission line. From this fact, undesirable effects such as failure to signal integrity (SI) may occur, for example, the crosstalk noise. This problem of signal integrity can bring serious harm to the functioning of a printed circuit board. It is important that such failure is remediated in the initial phase of the project, since the correction becomes even simpler and less costly. In fact, some computational tricks were used to try to measure integrity issues of crosstalk-type signal, because without such tools, advanced calculations, which would cause delays in the process, would be needed.

As circuit boards are increasingly required to transmit signals at higher and higher speeds, signal and power integrity become increasingly crucial. Rules of thumb that you have used over and over again to prevent signal loss no longer apply to these new, high-speed, high-density circuit designs. This leading-edge circuit design resource offers you the knowledge needed to quickly pinpoint transmission problems that can compromise your entire circuit design. Discussing both design and debug issues at gigabit per second data rates, the book serves as a practical reference for your projects involving high-speed serial signaling on printed wiring boards.

The tremendous growth of wireless technologies and semiconductor technology lead to smaller feature size, higher frequency of

operation and faster speed. Therefore more signal lines of circuits or components are placed in a constrained space of printed circuit board. The close proximity of signal lines cause electromagnetic coupling. This electromagnetic coupling leads to signal integrity problems such as crosstalk and crosstalk induced jitter. Signal integrity is a major concern to measure the quality of signal. It can be minimized by the proper design of signal lines or interconnect lines. This book mainly focuses on interconnect design to reduce crosstalk. The analysis and design of this interconnect structure helps to printed circuit board designers and manufacturers for proper function of printed circuit board for high speed applications.

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.

Develop the software and hardware you never think about. We're talking about the nitty-gritty behind the buttons on your microwave, inside your thermostat, inside the keyboard used to type this description, and even running the monitor on which you are reading it now. Such stuff is termed embedded systems, and this book shows how to design and develop embedded systems at a professional level. Because yes, many people quietly make a successful career doing just that. Building embedded systems can be both fun and intimidating. Putting together an embedded system requires skill sets from multiple engineering disciplines, from software and hardware in particular. Building Embedded Systems is a book about helping you do things in the right way from the beginning of your first project: Programmers who know software will learn what they need to know about hardware. Engineers with hardware knowledge likewise will learn about the software side. Whatever your background is, Building Embedded Systems is the perfect book to fill in any knowledge gaps and get you started in a career programming for everyday devices. Author Changyi Gu brings more than fifteen years of experience in working his way up the ladder in the field of embedded systems. He brings knowledge of numerous approaches to embedded systems design, including the System on Programmable Chips (SOPC) approach that is currently growing to dominate the field. His knowledge and experience make Building Embedded Systems an excellent book for anyone wanting to enter the field, or even just to do some embedded programming as a side project. What You Will Learn Program embedded systems at the hardware level Learn current industry practices in firmware development Develop practical knowledge of embedded hardware options Create tight integration between software and hardware Practice a work flow leading to successful outcomes Build from transistor level to the system level Make sound choices between performance and cost Who This Book Is For Embedded-system engineers and intermediate electronics enthusiasts who are seeking tighter integration between software and hardware. Those who favor the System on a Programmable Chip (SOPC) approach will in particular benefit from this book. Students in both Electrical Engineering and Computer Science can also benefit from this book and the real-life

industry practice it provides.

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.

Software engineering requires specialized knowledge of a broad spectrum of topics, including the construction of software and the platforms, applications, and environments in which the software operates as well as an understanding of the people who build and use the software. Offering an authoritative perspective, the two volumes of the Encyclopedia of Software Engineering cover the entire multidisciplinary scope of this important field. More than 200 expert contributors and reviewers from industry and academia across 21 countries provide easy-to-read entries that cover software requirements, design, construction, testing, maintenance, configuration management, quality control, and software engineering management tools and methods. Editor Phillip A. Laplante uses the most universally recognized definition of the areas of relevance to software engineering, the Software Engineering Body of Knowledge (SWEBOK®), as a template for organizing the material. Also available in an electronic format, this encyclopedia supplies software engineering students, IT professionals, researchers, managers, and scholars with unrivaled coverage of the topics that encompass this ever-changing field. Also Available Online This Taylor & Francis encyclopedia is also available through online subscription, offering a variety of extra benefits for researchers, students, and librarians, including: Citation tracking and alerts Active reference linking Saved searches and marked lists HTML and PDF format options Contact Taylor and Francis for more information or to inquire about subscription options and print/online combination packages. US: (Tel) 1.888.318.2367; (E-mail) e-reference@taylorandfrancis.com International: (Tel) +44 (0) 20 7017 6062; (E-mail) online.sales@tandf.co.uk

The Plain-English Guide to Electronics and Current Flow for Every PCB Designer Today, PCB designers must deal with issues such as crosstalk and EMI-—issues that were once associated only with components. This requires electronics knowledge that many PCB designers never gain through formal training. In PCB Currents, renowned PCB designer Douglas Brooks teaches these essentials descriptively, in plain English, with as little reliance on mathematics as possible. Building on his widely praised seminars, Brooks explains what current is, how it flows, and how it reacts. He begins by reviewing the nature of current, and then explains current flow in basic circuits, discusses sources that supply and drive current, and addresses the unique problems associated with current on PCBs. Brooks concludes by thoroughly illuminating signal integrity issues caused by current flow. He offers practical design solutions for each common type of problem, as well as for complex challenges involving very high frequency harmonics and very short wavelengths. Coverage includes • Current: its fundamental nature, basic definitions, and key concepts • Five fundamental laws of current, including Kirchoff's law and Ohm's law • Basic circuit concepts: resistive circuits, reactive circuits, and impedance • Voltage and current sources: Where electrons come from and why they move • Current-related PCB issues: temperature, transmission lines, reflections, coupled currents, power distribution, skin effect, dielectric losses, and vias • Solutions for signal integrity issues caused by current flow, from on-board inductance and apparent resistance changes to more complex problems The text is written to be accessible and valuable for PCB designers at all levels of experience, whether they

have engineering training or not.

This unique book provides you with practical guidance on understanding and interpreting signal integrity (SI) performance to help you with your challenging circuit board design projects. You find high-level discussions of important SI concepts presented in a clear and easily accessible format, including question and answer sections and bulleted lists.This valuable resource features rules of thumb and simple equations to help you make estimates of critical signal integrity parameters without using circuit simulators of CAD (computer-aided design). The book is supported with over 120 illustrations, nearly 100 equations, and detailed reference lists at the end of each chapter.

This Expert Guide gives you the knowledge, methods and techniques to develop and manage embedded systems successfully. It shows that teamwork, development procedures, and program management require unique and wide ranging skills to develop a system, skills that most people can attain with persistence and effort. With this book you will: Understand the various business aspects of a project from budgets and schedules through contracts and market studies Understand the place and timing for simulations, bench tests, and prototypes, and understand the differences between various formal methods such as FMECA, FTA, ETA, reliability, hazard analysis, and risk analysis Learn general design concerns such as the user interface, interfaces and partitioning, DFM, DFA, DFT, tradeoffs such as hardware versus software, buy versus build, processor choices, and algorithm choices, acquisition concerns, and interactions and comparisons between electronics, functions, software, mechanics, materials, security, maintenance, and support Covers the life cycle for developing an embedded system: program management, procedures for design and development, manufacturing, maintenance, logistics, and legal issues Includes proven and practical techniques and advice on tackling critical issues reflecting the authors' expertise developed from years of experience

This leading-edge circuit design resource offers the knowledge needed to quickly pinpoint transmission problems that can compromise circuit design. Discusses both design and debug issues at gigabit per second data rates.

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 SOCis 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 andhardware 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

Before putting digital systems for information technology or telecommunication applications on the market, an essential requirement is to perform tests in order to comply with the limits of radiated emission imposed by the standards. This book provides an investigation into signal integrity (SI) and electromagnetic interference (EMI) problems. Topics such as reflections, crosstalk, switching noise and radiated emission (RE) in high-speed digital systems are covered, which are essential for IT and telecoms applications. The highly important topic of modelling is covered which can reduce costs by enabling simulation data to demonstrate that a product meets design specifications and regulatory limits. According to the new European EMC directive, this can help to avoid the expensive use of large semi-anechoic chambers or open area test sites for radiated emission assessments. Following a short introduction to signalling and radiated interference in digital systems, the book provides a detailed characterization of logic families in terms of static and dynamic characteristic useful for modelling techniques. Crosstalk in multi-coupled line structures are investigated by analytical, graphical and circuit-based methods, and techniques to mitigate these phenomena are provided. Grounding, filtering and shielding with multilayer PCBs are also examined and design rules given. Written by authors with extensive experience in industry and academia. Explains basic conceptual problems from a theoretical and practical point of view by using numerous measurements and simulations. Presents models for mathematical and SPICE-like circuit simulators. Provides examples of using full-wave codes for SI and RE investigations. Companion website containing lists of codes and sample material. Signal Integrity and Radiated Emission of High-Speed Digital Systems is a valuable resource to industrial designers of information technology, telecommunication equipment and automation equipment as well as to development engineers. It will also be of interest to managers and designers of consumer electronics, and researchers in electronics.

A Signal Integrity Engineer's Companion Real-Time Test and Measurement and Design Simulation Geoff Lawday David Ireland Greg Edlund Foreword by Chris Edwards, Editor, IET Electronics Systems and Software magazine Prentice Hall Modern Semiconductor Design Series Prentice Hall Signal Integrity Library Use Real-World Test and Measurement Techniques to Systematically Eliminate Signal Integrity Problems This is the industry's most comprehensive, authoritative, and practical guide to modern Signal Integrity (SI) test and measurement for high-speed digital designs. Three of the field's leading experts guide you through systematically detecting, observing, analyzing, and rectifying both modern logic signal defects and embedded system malfunctions. The authors cover the entire life cycle of embedded system design from specification and simulation onward, illuminating key techniques and concepts with easy-to-understand illustrations. Writing for all electrical engineers, signal integrity engineers, and chip designers, the authors show how to use real-time test and measurement to address today's increasingly

difficult interoperability and compliance requirements. They also present detailed, start-to-finish case studies that walk you through commonly encountered design challenges, including ensuring that interfaces consistently operate with positive timing margins without incurring excessive cost; calculating total jitter budgets; and managing complex tradeoffs in high-speed serial interface design. Coverage includes Understanding the complex signal integrity issues that arise in today's high-speed designs Learning how eye diagrams, automated compliance tests, and signal analysis measurements can help you identify and solve SI problems Reviewing the electrical characteristics of today's most widely used CMOS IO circuits Performing signal path analyses based on intuitive Time-Domain Reflectometry (TDR) techniques Achieving more accurate real-time signal measurements and avoiding probe problems and artifacts Utilizing digital oscilloscopes and logic analyzers to make accurate measurements in high-frequency environments Simulating real-world signals that stress digital circuits and expose SI faults Accurately measuring jitter and other RF parameters in wireless applications About the Authors: Dr. Geoff Lawday is Tektronix Professor in Measurement at Buckinghamshire New University, England. He delivers courses in signal integrity engineering and high performance bus systems at the University Tektronix laboratory, and presents signal integrity seminars throughout Europe on behalf of Tektronix. David Ireland, European and Asian design and manufacturing marketing manager for Tektronix, has more than 30 years of experience in test and measurement. He writes regularly on signal integrity for leading technical journals. Greg Edlund, Senior Engineer, IBM Global Engineering Solutions division, has participated in development and testing for ten high-performance computing platforms. He authored Timing Analysis and Simulation for Signal Integrity Engineers (Prentice Hall).

Digital Design: An Embedded Systems Approach Using VHDL provides a foundation in digital design for students in computer engineering, electrical engineering and computer science courses. It takes an up-to-date and modern approach of presenting digital logic design as an activity in a larger systems design context. Rather than focus on aspects of digital design that have little relevance in a realistic design context, this book concentrates on modern and evolving knowledge and design skills. Hardware description language (HDL)-based design and verification is emphasized--VHDL examples are used extensively throughout. By treating digital logic as part of embedded systems design, this book provides an understanding of the hardware needed in the analysis and design of systems comprising both hardware and software components. Includes a Web site with links to vendor tools, labs and tutorials. Presents digital logic design as an activity in a larger systems design context Features extensive use of VHDL examples to demonstrate HDL (hardware description language) usage at the abstract behavioural level and register transfer level, as well as for low-level verification and verification environments Includes worked examples throughout to enhance the reader's understanding and retention of the material Companion Web site includes links to tools for FPGA design from Synplicity, Mentor Graphics, and Xilinx, VHDL source code for all the examples in the book, lecture slides, laboratory projects, and solutions to exercises

PCB Signal Integrity LiveLessons is a complete, detailed course on signal integrity for printed circuit board designers. There is no other media (including in person seminars) that provides so much material in such an easy-to-learn, convenient format. Doug

starts the course by introducing the basic electronic background information necessary for understanding the rest of the material. This includes his perspective on the historical evolution of signal integrity issues on PCBs. He then devotes the next six lessons on specific signal integrity topics, ranging from EMI and crosstalk to bypass capacitors, to the skin effect, their impact, and solutions to the problems they impose. Before concluding with some final thoughts, Doug adds a lesson on the relationship between trace currents and temperatures, and how to address very large current surges that might melt (fuse) a trace. Skill Level All Levels What You Will Learn The role of rise time in signal integrity issues. The root cause of the various signal integrity issues. The "problem" and impact of the various issues. PCB design solutions to those signal integrity issues. Problems to avoid in implementing the solutions. Who Should Take This Course Literally, anyone who designs printed circuit boards. The problems and solutions discussed in these lessons can apply to ALL circuit boards. Although this material would not be required for people in related industries (e.g. board fabrication and board assembly), it would be beneficial for them to also understand these issues. Course Requirements Although there are no prerequisites to this course, it would be beneficial for the student to have a basic understanding of electronic circuits and of how circuit boards are designed and fabricated. About the Author: Douglas Brooks has an MS/EE from Stanford University and a PhD from the University of Washington. He has spent most of his career in the electronics industry in positions of engineering, marketing, general management, and as CEO of several companies. He has owned UltraCAD Design Inc. since 1992. He is the author of numerous articles in several disciplines, and has written articles and given seminars all over the world on Signal Integrity issues since founding UltraCAD. His first book, Printed Circuit Board Design and Signal Integrity Issues was published by Prentice Hall in 2003. That was followed by his second book, PCB Currents; How They Flow, How They React , in 2013, also published by Prentice...

This book provides instruction on how to use the OrCAD design suite to design and manufacture printed circuit boards. The primary goal is to show the reader how to design a PCB using OrCAD Capture and OrCAD Editor. Capture is used to build the schematic diagram of the circuit, and Editor is used to design the circuit board so that it can be manufactured. The book is written for both students and practicing engineers who need in-depth instruction on how to use the software, and who need background knowledge of the PCB design process. Beginning to end coverage of the printed circuit board design process. Information is presented in the exact order a circuit and PCB are designed Over 400 full color illustrations, including extensive use of screen shots from the software, allow readers to learn features of the product in the most realistic manner possible Straightforward, realistic examples present the how and why the designs work, providing a comprehensive toolset for understanding the OrCAD software Introduces and follows IEEE, IPC, and JEDEC industry standards for PCB design. Unique chapter on Design for Manufacture covers padstack and footprint design, and component placement, for the design of manufacturable PCB's FREE CD containing the OrCAD demo version and design files

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