

Reliability Analysis Of Logic Circuits

This book constitutes the refereed proceedings of the 14th International Conference on Pattern Recognition and Information Processing, PRIP 2019, held in Minsk, Belarus, in May 2019. The 25 revised full papers were carefully reviewed and selected from 120 submissions. The papers of this volume are organized in topical sections on pattern recognition and image analysis; information processing and applications.

This book introduces a novel framework for accurately modeling the errors in nanoscale CMOS technology and developing a smooth tool flow at high-level design abstractions to estimate and mitigate the effects of errors. The book presents novel techniques for high-level fault simulation and reliability estimation as well as architecture-level and system-level fault tolerant designs. It also presents a survey of state-of-the-art problems and solutions, offering insights into reliability issues in digital design and their cross-layer countermeasures.

This book covers recent advances in the field of logic synthesis and design, including Boolean Matching, Logic Decomposition, Boolean satisfiability, Advanced Synthesis Techniques and Applications of Logic Design. All of these topics are valuable to CAD engineers working in Logic Design, Logic Optimization, and Verification. Engineers seeking opportunities for optimizing VLSI integrated circuits will find this book as an invaluable reference, since there is no existing book that covers this material in a systematic fashion.

This book presents physical understanding, modeling and simulation, on-chip characterization, layout solutions, and design techniques that are effective to enhance the reliability of various circuit units. The authors provide readers with techniques for state of the art and future

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technologies, ranging from technology modeling, fault detection and analysis, circuit hardening, and reliability management.

The study of the reliability of logic circuits with series and parallel connected elements during random malfunctions is given. Generalized failure formulas are obtained for a trigger with a counting input and differentiating elements at the output, and an estimate is made of the reliability of the series circuit of the trigger. The result is compared with an estimate of the reliability of this same circuit obtained by taking catastrophic failures into account. A three input majority circuit with random malfunctions is considered, and generalized failure formulas are obtained for it. An estimate of the reliability of a majority circuit with random malfunctions is compared with an estimate obtained with allowance for catastrophic failures. It is found that in the case of both series and parallel connected elements substantially different results are obtained depending on whether the reliability is calculated with allowance for random malfunctions or catastrophic failures. (Author).

Mathematical Models for the Study of the Reliability of Systems

This book examines mechatronics and automatic control systems. The book covers important emerging topics in signal processing, control theory, sensors, mechanic manufacturing systems and automation. The book presents papers from the 2013 International Conference on Mechatronics and Automatic Control Systems in Hangzhou, held in China during August 10-11, 2013.

This volume constitutes the thoroughly refereed post-conference proceedings of the 7th International Doctoral Workshop on Mathematical and Engineering

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Methods in Computer Science, MEMICS 2011, held in Lednice, Czech Republic, on October 14-16, 2011. The 13 revised full papers presented together with 6 invited talks were carefully reviewed and selected from 38 submissions. The papers address all current issues of mathematical and engineering methods in computer science, especially: software and hardware dependability, computer security, computer-aided analysis and verification, testing and diagnostics, simulation, parallel and distributed computing, grid computing, computer networks, modern hardware and its design, non-traditional computing architectures, software engineering, computational intelligence, quantum information processing, computer graphics and multimedia, signal, text, speech, and image processing, and theoretical computer science.

As the complexity and the density of VLSI chips increase with shrinking design rules, the evaluation of long-term reliability of MOS VLSI circuits is becoming an important problem. The assessment and improvement of reliability on the circuit level should be based on both the failure mode analysis and the basic understanding of the physical failure mechanisms observed in integrated circuits. Hot-carrier induced degradation of MOS transistor characteristics is one of the primary mechanisms affecting the long-term reliability of MOS VLSI circuits. It is likely to become even more important in future generation chips, since the down

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ward scaling of transistor dimensions without proportional scaling of the operating voltage aggravates this problem. A thorough understanding of the physical mechanisms leading to hot-carrier related degradation of MOS transistors is a prerequisite for accurate circuit reliability evaluation. It is also being recognized that important reliability concerns other than the post-manufacture reliability qualification need to be addressed rigorously early in the design phase. The development and use of accurate reliability simulation tools are therefore crucial for early assessment and improvement of circuit reliability : Once the long-term reliability of the circuit is estimated through simulation, the results can be compared with predetermined reliability specifications or limits. If the predicted reliability does not satisfy the requirements, appropriate design modifications may be carried out to improve the resistance of the devices to degradation.

Reliability Analysis of Dynamic Logic Circuits Under Transistor Aging Effects in Nanotechnology Design, Analysis and Test of Logic Circuits Under Uncertainty Springer Science & Business Media

This book addresses a modern topic in reliability: multi-state and continuous-state system reliability, which has been intensively developed in recent years. It offers an up-to-date overview of the latest developments in reliability theory for multi-state systems, engineering applications to a variety of technical problems,

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and case studies that will be of interest to reliability engineers and industrial managers. It also covers corresponding theoretical issues, as well as case studies illustrating the applications of the corresponding theoretical advances. The book is divided into two parts: Modern Mathematical Methods for Multi-state System Reliability Analysis (Part 1), and Applications and Case Studies (Part 2), which examines real-world multi-state systems. It will greatly benefit scientists and researchers working in reliability, as well as practitioners and managers with an interest in reliability and performability analysis. It can also be used as a textbook or as a supporting text for postgraduate courses in Industrial Engineering, Electrical Engineering, Mechanical Engineering, Applied Mathematics, and Operations Research.

The book will address the-state-of-the-art in integrated circuit design in the context of emerging systems. New exciting opportunities in body area networks, wireless communications, data networking, and optical imaging are discussed. Emerging materials that can take system performance beyond standard CMOS, like Silicon on Insulator (SOI), Silicon Germanium (SiGe), and Indium Phosphide (InP) are explored. Three-dimensional (3-D) CMOS integration and co-integration with sensor technology are described as well. The book is a must for anyone serious about circuit design for future technologies. The book is written by top

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notch international experts in industry and academia. The intended audience is practicing engineers with integrated circuit background. The book will be also used as a recommended reading and supplementary material in graduate course curriculum. Intended audience is professionals working in the integrated circuit design field. Their job titles might be : design engineer, product manager, marketing manager, design team leader, etc. The book will be also used by graduate students. Many of the chapter authors are University Professors. The book covers recent trends in the field of devices, wireless communication and networking. It presents the outcomes of the International Conference in Communication, Devices and Networking (ICCDN 2018), which was organized by the Department of Electronics and Communication Engineering, Sikkim Manipal Institute of Technology, Sikkim, India on 2–3 June, 2018. Gathering cutting-edge research papers prepared by researchers, engineers and industry professionals, it will help young and experienced scientists and developers alike to explore new perspectives, and offer them inspirations on addressing real-world problems in the field of electronics, communication, devices and networking. This first-of-its-kind resource is completely dedicated to spin transfer torque (STT) based devices, circuits, and memory. A wide range of topics including, STT MRAMs, MTJ based logic circuits, simulation and modeling strategies,

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fabrication of MTJ CMOS circuits, non-volatile computing with STT MRAMs, all spin logic, and spin information processing are explored. State-of-the-art modeling and simulation strategies of spin transfer torque based devices and circuits in a lucid manner are covered. Professional engineers find practical guidance in the development of micro-magnetic models of spin-torque based devices in object-oriented micro-magnetic framework (OOMMF) and compact modeling of STT based magnetic tunnel junctions in Verilog-A. The performance parameters and design aspects of STT MRAMs and MTJ based hybrid spintronic CMOS circuits are covered and case studies are presented demonstrating STT-MRAM design and simulation with a detailed analysis of results. The fundamental physics of STT based devices are presented with an emphasis on new advancements from recent years. Advanced topics are also explored including, micromagnetic simulations, multi-level STT MRAMs, giant spin Hall Effect (GSHE) based MRAMs, non-volatile computing, all spin logic and all spin information processing.

This book has been written with the intention to fill two big gaps in the reliability and risk literature: the risk-based reliability analysis as a powerful alternative to the traditional reliability analysis and the generic principles for reducing technical risk. An important theme in the book is the generic principles and techniques for reducing technical risk.

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These have been classified into three major categories: preventive (reducing the likelihood of failure), protective (reducing the consequences from failure) and dual (reducing both, the likelihood and the consequences from failure). Many of these principles (for example: avoiding clustering of events, deliberately introducing weak links, reducing sensitivity, introducing changes with opposite sign, etc.) are discussed in the reliability literature for the first time. Significant space has been allocated to component reliability. In the last chapter of the book, several applications are discussed of a powerful equation which constitutes the core of a new theory of locally initiated component failure by flaws whose number is a random variable. Offers a shift in the existing paradigm for conducting reliability analyses Covers risk-based reliability analysis and generic principles for reducing risk Provides a new measure of risk based on the distribution of the potential losses from failure as well as the basic principles for risk-based design Incorporates fast algorithms for system reliability analysis and discrete-event simulators Includes the probability of failure of a structure with complex shape expressed with a simple equation

Very Large Scale Integration (VLSI) Systems refer to the latest development in computer microchips which are created by integrating hundreds of thousands of transistors into one chip. Emerging research in this area has the potential to uncover further applications for VSLI technologies in addition to system advancements. Design and Modeling of Low Power VLSI Systems analyzes various traditional and modern low

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power techniques for integrated circuit design in addition to the limiting factors of existing techniques and methods for optimization. Through a research-based discussion of the technicalities involved in the VLSI hardware development process cycle, this book is a useful resource for researchers, engineers, and graduate-level students in computer science and engineering.

Contemporary time has seen alarming environmental revolt that is calls for attention and concern about the biosphere world, a condition that calls for need to use advantage of human improved knowledge and civilization in science engineering to develop proactive, efficient and predictive based system that meet reliability and sustainability requirement as well to reduce uncertainty components of system design. Proactive based philosophy under safety and environmental framework should be exercise on all level of system life cycle, including design, construction, operation and disposal. Selection of all element of the life cycle should be responsibly done and pollution impact of the system to the environment and community should be mitigated. The book present application of risk and reliability analysis to various cases of marine system and subsystem, application of risk method ranging from qualitative, quantitative to simulation and analytical approach is presented.

This book explains the application of recent advances in computational intelligence – algorithms, design methodologies, and synthesis techniques – to the design of integrated circuits and systems. It highlights new biasing and sizing approaches and

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optimization techniques and their application to the design of high-performance digital, VLSI, radio-frequency, and mixed-signal circuits and systems. This second of two related volumes addresses digital and network designs and applications, with 12 chapters grouped into parts on digital circuit design, network optimization, and applications. It will be of interest to practitioners and researchers in computer science and electronics engineering engaged with the design of electronic circuits.

This book contains 12 contributions on stochastic models in reliability and maintenance. Written by the leading researchers on each topic, each contribution surveys the current status on stochastic models emphasizing mathematical formulation and optimization applications. Each contribution is self-contained and has a thorough bibliography. The topics include renewal processes, semi-Markov processes, Markovian deterioration models, maintenance and replacement models, software reliability models and Monte-Carlo simulation. This book provides researchers, reliability engineers and graduate students with the current status of the field and future developments of the subject.

This book constitutes the proceedings of the 39th International Conference on Computer Safety, Reliability and Security, SAFECOMP 2020, held in Lisbon, Portugal, in September 2020.* The 27 full and 2 short papers included in this volume were carefully reviewed and selected from 116 submissions. They were organized in topical sections named: safety cases and argumentation; formal verification and analysis; security modelling and methods; assurance of learning-enabled systems; practical

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experience and tools; threat analysis and risk mitigation; cyber-physical systems security; and fault injection and fault tolerance. *The conference was held virtually due to the COVID-19 pandemic. The chapter 'Assurance Argument Elements for Off-the-Shelf, Complex Computational Hardware' is available open access under an Open Government License 3.0 via link.springer.com.

One of the grand challenges in the nano-scopic computing era is guarantees of robustness. Robust computing system design is confronted with quantum physical, probabilistic, and even biological phenomena, and guaranteeing high reliability is much more difficult than ever before. Scaling devices down to the level of single electron operation will bring forth new challenges due to probabilistic effects and uncertainty in guaranteeing 'zero-one' based computing. Minuscule devices imply billions of devices on a single chip, which may help mitigate the challenge of uncertainty by replication and redundancy. However, such device densities will create a design and validation nightmare with the shear scale. The questions that confront computer engineers regarding the current status of nanocomputing material and the reliability of systems built from such minuscule devices, are difficult to articulate and answer. We have found a lack of resources in the confines of a single volume that at least partially attempts to answer these questions. We believe that this volume contains a large amount of research material as well as new ideas that will be very useful for some one starting research in the arena of nanocomputing, not at the device level, but the problems one

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would face at system level design and validation when nanoscopic physicality will be present at the device level.

The book presents papers delivered by researchers, industrial experts and academicians at the Conference on Emerging Trends in Computing and Communication (ETCC 2014). As such, the book is a collection of recent and innovative works in the field Network Security and Cryptography, Cloud Computing and Big Data Analytics, Data Mining and Data Warehouse, Communication and Nanotechnology and VLSI and Image Processing.

This book contains extended and revised versions of the best papers presented at the 27th IFIP WG 10.5/IEEE International Conference on Very Large Scale Integration, VLSI-SoC 2019, held in Cusco, Peru, in October 2019. The 15 full papers included in this volume were carefully reviewed and selected from the 28 papers (out of 82 submissions) presented at the conference. The papers discuss the latest academic and industrial results and developments as well as future trends in the field of System-on-Chip (SoC) design, considering the challenges of nano-scale, state-of-the-art and emerging manufacturing technologies. In particular they address cutting-edge research fields like heterogeneous, neuromorphic and brain-inspired, biologically-inspired, approximate computing systems.

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Logic circuits are becoming increasingly susceptible to probabilistic behavior caused by external radiation and process variation. In addition, inherently probabilistic quantum- and nano-technologies are on the horizon as we approach the limits of CMOS scaling. Ensuring the reliability of such circuits despite the probabilistic behavior is a key challenge in IC design---one that necessitates a

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fundamental, probabilistic reformulation of synthesis and testing techniques. This monograph will present techniques for analyzing, designing, and testing logic circuits with probabilistic behavior.

This three volume book set constitutes the proceedings of the Third International Conference on Machine Learning for Cyber Security, ML4CS 2020, held in Xi'an, China in October 2020. The 118 full papers and 40 short papers presented were carefully reviewed and selected from 360 submissions. The papers offer a wide range of the following subjects: Machine learning, security, privacy-preserving, cyber security, Adversarial machine Learning, Malware detection and analysis, Data mining, and Artificial Intelligence.

This book focuses on modeling, simulation and analysis of analog circuit aging. First, all important nanometer CMOS physical effects resulting in circuit unreliability are reviewed. Then, transistor aging compact models for circuit simulation are discussed and several methods for efficient circuit reliability simulation are explained and compared. Ultimately, the impact of transistor aging on analog circuits is studied. Aging-resilient and aging-immune circuits are identified and the impact of technology scaling is discussed. The models and simulation techniques described in the book are intended as an aid for device engineers, circuit designers and the EDA community to understand and to

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mitigate the impact of aging effects on nanometer CMOS ICs.

Embedded computing systems play an important and complex role in the functionality of electronic devices. With our daily routines becoming more reliant on electronics for personal and professional use, the understanding of these computing systems is crucial. *Embedded Computing Systems: Applications, Optimization, and Advanced Design* brings together theoretical and technical concepts of intelligent embedded control systems and their use in hardware and software architectures. By highlighting formal modeling, execution models, and optimal implementations, this reference source is essential for experts, researchers, and technical supporters in the industry and academia.

This book is intended to give a general overview of reliability, faults, fault models, nanotechnology, nanodevices, fault-tolerant architectures and reliability evaluation techniques. Additionally, the book provides an in depth state-of-the-art research results and methods for fault tolerance as well as the methodology for designing fault-tolerant systems out of highly unreliable components.

"Reliability theory and applications become major concerns of engineers and managers engaged in making high quality products and designing highly reliable systems. This book aims to survey new research topics in reliability theory and useful applied techniques in reliability engineering." "The reader will learn new topics and techniques, and how to apply reliability models to actual ones. The book will serve as an essential guide to a subject of study for

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graduate students and researchers and as a useful guide for reliability engineers engaged not only in maintenance work but also in management and computer works." --Book Jacket. Issues in Computer Engineering / 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Circuits Research. The editors have built Issues in Computer Engineering: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Circuits Research in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Computer Engineering: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at <http://www.ScholarlyEditions.com/>.

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