

# Digital Circuit Testing and Testability



# Digital Circuit Testing And Testability

**Hans-Joachim Wunderlich**



## **Digital Circuit Testing And Testability:**

**Digital Circuit Testing and Testability** Parag K. Lala, 1997 An easy to use introduction to the practices and techniques in the field of digital circuit testing Lala writes in a user friendly and tutorial style making the book easy to read even for the newcomer to fault tolerant system design Each informative chapter is self contained with little or no previous knowledge of a topic assumed Extensive references follow each chapter

**Digital Circuit Testing** Francis C. Wong, 2012-12-02 Recent technological advances have created a testing crisis in the electronics industry smaller more highly integrated electronic circuits and new packaging techniques make it increasingly difficult to physically access test nodes New testing methods are needed for the next generation of electronic equipment and a great deal of emphasis is being placed on the development of these methods Some of the techniques now becoming popular include design for testability DFT built in self test BIST and automatic test vector generation ATVG This book will provide a practical introduction to these and other testing techniques For each technique introduced the author provides real world examples so the reader can achieve a working knowledge of how to choose and apply these increasingly important testing methods

*An Introduction to Logic Circuit Testing* Parag K. Lala, 2022-06-01 An Introduction to Logic Circuit Testing provides a detailed coverage of techniques for test generation and testable design of digital electronic circuits systems The material covered in the book should be sufficient for a course or part of a course in digital circuit testing for senior level undergraduate and first year graduate students in Electrical Engineering and Computer Science The book will also be a valuable resource for engineers working in the industry This book has four chapters Chapter 1 deals with various types of faults that may occur in very large scale integration VLSI based digital circuits Chapter 2 introduces the major concepts of all test generation techniques such as redundancy fault coverage sensitization and backtracking Chapter 3 introduces the key concepts of testability followed by some ad hoc design for testability rules that can be used to enhance testability of combinational circuits Chapter 4 deals with test generation and response evaluation techniques used in BIST built in self test schemes for VLSI chips Table of Contents Introduction Fault Detection in Logic Circuits Design for Testability Built in Self Test References

**Test and Design-for-Testability in Mixed-Signal Integrated Circuits** José Luis Huertas, 2004-10-18 Test and Design for Testability in Mixed Signal Integrated Circuits deals with test and design for test of analog and mixed signal integrated circuits Especially in System on Chip SoC where different technologies are intertwined analog digital sensors RF test is becoming a true bottleneck of present and future IC projects Linking design and test in these heterogeneous systems will have a tremendous impact in terms of test time cost and proficiency Although it is recognized as a key issue for developing complex ICs there is still a lack of structured references presenting the major topics in this area The aim of this book is to present basic concepts and new ideas in a manner understandable for both professionals and students Since this is an active research field a comprehensive state of the art overview is very valuable introducing the main problems as well as the ways of solution that seem promising emphasizing

their basis strengths and weaknesses In essence several topics are presented in detail First of all techniques for the efficient use of DSP based test and CAD test tools Standardization is another topic considered in the book with focus on the IEEE 1149 4 Also addressed in depth is the connecting design and test by means of using high level behavioural description techniques specific examples are given Another issue is related to test techniques for well defined classes of integrated blocks like data converters and phase locked loops Besides these specification driven testing techniques fault driven approaches are described as they offer potential solutions which are more similar to digital test methods Finally in Design for Testability and Built In Self Test two other concepts that were taken from digital design are introduced in an analog context and illustrated for the case of integrated filters In summary the purpose of this book is to provide a glimpse on recent research results in the area of testing mixed signal integrated circuits specifically in the topics mentioned above Much of the work reported herein has been performed within cooperative European Research Projects in which the authors of the different chapters have actively collaborated It is a representative snapshot of the current state of the art in this emergent field

Random Testing of Digital Circuits David,2020-11-25 Introduces a theory of random testing in digital circuits for the first time and offers practical guidance for the implementation of random pattern generators signature analyzers design for random testability and testing results Contains several new and unpublished results

**Computers, Software Engineering, and Digital Devices** Richard C. Dorf,2018-10-03 In two editions spanning more than a decade The Electrical Engineering Handbook stands as the definitive reference to the multidisciplinary field of electrical engineering Our knowledge continues to grow and so does the Handbook For the third edition it has expanded into a set of six books carefully focused on a specialized area or field of study Each book represents a concise yet definitive collection of key concepts models and equations in its respective domain thoughtfully gathered for convenient access Computers Software Engineering and Digital Devices examines digital and logical devices displays testing software and computers presenting the fundamental concepts needed to ensure a thorough understanding of each field It treats the emerging fields of programmable logic hardware description languages and parallel computing in detail Each article includes defining terms references and sources of further information Encompassing the work of the world s foremost experts in their respective specialties Computers Software Engineering and Digital Devices features the latest developments the broadest scope of coverage and new material on secure electronic commerce and parallel computing

VLSI Test Principles and Architectures Laung-Terng Wang,Cheng-Wen Wu,Xiaoqing Wen,2006-08-14 This book is a comprehensive guide to new DFT methods that will show the readers how to design a testable and quality product drive down test cost improve product quality and yield and speed up time to market and time to volume Most up to date coverage of design for testability Coverage of industry practices commonly found in commercial DFT tools but not discussed in other books Numerous practical examples in each chapter illustrating basic VLSI test principles and DFT architectures

**Defect Oriented Testing for CMOS Analog and Digital**

**Circuits** Manoj Sachdev, 2013-06-29 Defect oriented testing is expected to play a significant role in coming generations of technology. Smaller feature sizes and larger die sizes will make ICs more sensitive to defects that can not be modeled by traditional fault modeling approaches. Furthermore with increased level of integration an IC may contain diverse building blocks. Such blocks include digital logic PLAs, volatile and non volatile memories and analog interfaces. For such diverse building blocks traditional fault modeling and test approaches will become increasingly inadequate. Defect oriented testing methods have come a long way from a mere interesting academic exercise to a hard industrial reality. Many factors have contributed to its industrial acceptance. Traditional approaches of testing modern integrated circuits ICs have been found to be inadequate in terms of quality and economics of test. In a globally competitive semiconductor market place overall product quality and economics have become very important objectives. In addition electronic systems are becoming increasingly complex and demand components of highest possible quality. Testing in general and defect oriented testing in particular help in realizing these objectives. Defect Oriented Testing for CMOS Analog and Digital Circuits is the first book to provide a complete overview of the subject. It is essential reading for all design and test professionals as well as researchers and students working in the field. A strength of this book is its breadth. Types of designs considered include analog and digital circuits, programmable logic arrays and memories. Having a fault model does not automatically provide a test. Sometimes design for testability hardware is necessary. Many design for testability ideas supported by experimental evidence are included from the Foreword by Vishwani D Agrawal. **Lecture Notes in Analog Electronics** Vančo B.

Litovski, 2025-01-17 Prof Van o Litovski was born in 1947 in Rakita South Macedonia Greece. He graduated from the Faculty of Electronic Engineering in Ni in 1970 and obtained his M Sc in 1974 and his Ph D in 1977. He was appointed as a teaching assistant at the Faculty of Electronic Engineering in 1970 and became a full professor at the same faculty in 1987. He was elected as a visiting professor honoris causa at the University of Southampton in 1999. From 1987 until 1990 he was a consultant to the CEO of Ei and was the head of the Chair of Electronics at the Faculty of Electronic Engineering in Ni for 12 years. From 2015 to 2017 he was a researcher at the University of Bath. He received several awards including from the Faculty of Electronic Engineering Charter in 1980, Charter in 1985 and a Special Recognition in 1995 and the University of Ni Plaque 1985. **Qualität und Testbarkeit hochintegrierter Schaltungen** Mehrdad Bidjan-irani, 2013-03-12 Dieses

Buch beschreibt ein hochkomplexes und neuartiges System zur Überprüfung der technischen Entwurfsregeln bei digitalen Schaltungen und Systemen. Im Gegensatz zu traditionellen Ansätzen ist diese Analyse im vorliegenden Fall regelbasiert und erlaubt damit die Verarbeitung unterschiedlicher Regeln. Weitere Besonderheiten sind der hierarchische Ansatz und die Anwendbarkeit über die Gatterebene hinaus auch auf der Registertransfer Ebene. Das System wird abgerundet durch eine Regelaufbereitungskomponente in Form eines speziellen Expertensystems, die es erlaubt, zu berücksichtigende DFT Design For Testability Regeln benutzerfreundlich einzugeben. Das konzipierte System ist von konsequenter Modularität und bietet in

jeder Richtung Schaltungsbeschreibung Abstraktionsebene Bibliothekselemente Regeln tze weitestgehende Flexibilität Zur Ausgestaltung des Systems wurden geeignete Methoden aus verschiedenen Bereichen der Informatik zu diesem neuartigen Ansatz kombiniert beteiligt sind die Gebiete Compilerbau Algorithmen Software Engineering besonders aber Hardware Test Logische Programmierung und Expertensysteme *Introduction to Advanced System-on-Chip Test Design and Optimization* Erik Larsson, 2006-03-30 SOC test design and its optimization is the topic of Introduction to Advanced System on Chip Test Design and Optimization It gives an introduction to testing describes the problems related to SOC testing discusses the modeling granularity and the implementation into EDA electronic design automation tools The book is divided into three sections i test concepts ii SOC design for test and iii SOC test applications The first part covers an introduction into test problems including faults fault types design flow design for test techniques such as scan testing and Boundary Scan The second part of the book discusses SOC related problems such as system modeling test conflicts power consumption test access mechanism design test scheduling and defect oriented scheduling Finally the third part focuses on SOC applications such as integrated test scheduling and TAM design defect oriented scheduling and integrating test design with the core selection process **Hochintegrierte Schaltungen: Prüfgerechter Entwurf und Test** Hans-Joachim

Wunderlich, 2013-03-13 Mit dem vorliegenden Lehrbuch werden erstmalig in deutscher Sprache der pr fgerechte Entwurf und der Test hochintegrierter Schaltungen in umfassender Weise behandelt Das Werk wendet sich an alle die in Studium Lehre Forschung und Entwicklung Kenntnisse auf diesem Gebiet erwerben oder vertiefen m chten Insbesondere erh lt der Schaltungsentwickler einen berblick ber die Ma nahmen die zur Verbesserung der Testbarkeit seiner Schaltung beitragen k nnen der Entwickler von Entwurfssystemen findet zahlreiche teilweise neue Algorithmen und Verfahren f r den automatisierten Entwurf testbarer Schaltungen und f r die zugeh rige Testerzeugung Die Verfahren werden in einem einheitlichen theoretischen Rahmen vorgestellt Bei dieser einheitlichen Modellierung der Schaltung und der Algorithmen bleibt jedoch stets die Verbindung zur konkreten technischen Realisierung gewahrt **Design to Test** John

Turino, 2012-12-06 This book is the second edition of Design to Test The first edition written by myself and H Frank Binnendyk and first published in 1982 has undergone several printings and become a standard in many companies even in some countries Both Frank and I are very proud of the success that our customers have had in utilizing the information all of it still applicable to today s electronic designs But six years is a long time in any technology field I therefore felt it was time to write a new edition This new edition while retaining the basic testability prin ciples first documented six years ago contains the latest material on state of the art testability techniques for electronic devices boards and systems and has been completely rewritten and up dated Chapter 15 from the first edition has been converted to an appendix Chapter 6 has been expanded to cover the latest tech nology devices Chapter 1 has been revised and several examples throughout the book have been revised and updated But some times the more things change the more they stay the same All of the guidelines and

information presented in this book deal with the three basic testability principles partitioning control and visibility They have not changed in years But many people have gotten smarter about how to implement those three basic test ability principles and it is the aim of this text to enlighten the reader regarding those new and old testability implementation techniques

Probabilistische Verfahren für den Test hochintegrierter Schaltungen Hans-Joachim Wunderlich,2013-03-07 Die Arbeit behandelt den Selbsttest hochintegrierter digitaler Schaltungen mit zufällig erzeugten Mustern Es wird ein neues Verfahren vorgestellt um die Wahrscheinlichkeit abzuschätzen mit der ein Fehler durch ein zufällig erzeugtes Muster erkannt wird und um darauf aufbauend die notwendige Zahl von Zufallsmustern zu bestimmen Beim konventionellen Zufallstest benötigen viele Schaltungen unwirtschaftlich große Mustermengen Um dieses Problem zu lösen wird eine Methode vorgeschlagen für Zufallsmuster solche optimalen Verteilungen zu bestimmen die eine besonders hohe Fehlererfassung erwarten lassen In vielen Fällen kann so die benötigte Musterzahl um mehrere Größenordnungen gesenkt werden Zur Ausführung eines einfachen Selbsttests wird ein Modul vorgestellt der auf dem Chip integriert werden kann und im Testmodus die Muster mit den geforderten Verteilungen erzeugt Der Mehraufwand an Schaltelementen für den Selbsttest mit optimierten Zufallsmustern ist mit dem herkömmlichen Zufallstest vergleichbar Aufgrund der behandelten Verfahren kann daher die Klasse der Schaltungen vergrößert werden die mit Zufallsmustern selbsttestbar sind ohne dass signifikante Mehrkosten anfallen

**Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits** M. Bushnell,Vishwani Agrawal,2006-04-11 The modern electronic testing has a forty year history Test professionals hold some fairly large conferences and numerous workshops have a journal and there are over one hundred books on testing Still a full course on testing is offered only at a few universities mostly by professors who have a research interest in this area Apparently most professors would not have taken a course on electronic testing when they were students Other than the computer engineering curriculum being too crowded the major reason cited for the absence of a course on electronic testing is the lack of a suitable textbook For VLSI the foundation was provided by semiconductor device technology circuit design and electronic testing In a computer engineering curriculum therefore it is necessary that foundations should be taught before applications The field of VLSI has expanded to systems on a chip which include digital memory and mixed signalsubsystems To our knowledge this is the first textbook to cover all three types of electronic circuits We have written this textbook for an undergraduate foundations course on electronic testing Obviously it is too voluminous for a one semester course and a teacher will have to select from the topics We did not restrict such freedom because the selection may depend upon the individual expertise and interests Besides there is merit in having a larger book that will retain its usefulness for the owner even after the completion of the course With equal tenacity we address the needs of three other groups of readers

*New Methods of Concurrent Checking* Michael Gössel,Vitaly Ocheretny,Egor Sogomonyan,Daniel Marienfeld,2008-04-26 Computers are everywhere around us We for example as air passengers car drivers laptop users with Internet connection cell phone owners hospital patients

inhabitants in the vicinity of a nuclear power station students in a digital library or customers in a supermarket are dependent on their correct operation Computers are incredibly fast inexpensive and equipped with almost unimaginable large storage capacity Up to 100 million transistors per chip are quite common today a single transistor for each citizen of a large capital city in the world can be easily accommodated on an ordinary chip The size of such a chip is less than 1 cm This is a fantastic achievement for an unbelievably low price However the very small and rapidly decreasing dimensions of the transistors and their connections over the years are also the reason for growing problems with reliability that will dramatically increase for the nano technologies in the near future Can we always trust computers Are computers always reliable Are chips sufficiently tested with respect to all possible permanent faults if we buy them at a low price or have errors due to undetected permanent faults to be discovered by current checking Besides permanent faults many temporary or transient faults are also to be expected

*Testverfahren in der Mikroelektronik* Wilfried Daehn, 2013-03-07 Die Akzeptanz mikroelektronischer Systemleistungen in industriellen und privaten Anwendungsbereichen hängt in starkem Maße von der Fehlerfreiheit und Zuverlässigkeit der eingesetzten elektronischen Schaltungen ab Dies ist durch Verbesserungen in der Fertigung allein nicht mehr zu gewährleisten Die Komplexität heutiger VLSI Schaltungen hat dabei den Anteil der Testkosten an den gesamten Herstellungskosten eines digitalen Systems in rasanter Weise steigen lassen Das Buch gibt einen Überblick über die Algorithmen Methoden und Werkzeuge um diesen Herausforderungen zu begegnen Die mathematisch exakte Formulierung der Testaufgabe zieht sich dabei als roter Faden durch das ganze Buch von der Fehlermodellierung bis hin zum testfreundlichen Schaltungsentwurf

Zuverlässige Bauelemente für elektronische Systeme Titu-Marius I. Băjenescu, 2020-01-03 Speicher Mikroprozessoren Opto MEMS und NEMS Bauteile zusammen mit den passiven Komponenten sind das Hauptthema des Buches Praktische Methoden zur Untersuchung der Zuverlässigkeit sind ergänzt durch umfangreiche Tabellen und veranschaulicht durch zahlreiche Diagramme Damit erhält der Leser präzise praxisnah und umfassend sämtliche Zuverlässigkeitsaspekte einfacher und komplexer elektronischer Bauelemente von der Fehlerphysik über die Prüfpraxis und Ausfallmechanismen bis zur Qualitätsüberwachung

**Design of Logic Systems** DAVID PROTHEROE DOUGLAS LEWIN, 2013-11-21 *Integrated Circuit Test Engineering* Ian A. Grout, 2005-08-22 Using the book and the software provided with it the reader can build his/her own tester arrangement to investigate key aspects of analog digital and mixed system circuits Plan of attack based on traditional testing circuit design and circuit manufacture allows the reader to appreciate a testing regime from the point of view of all the participating interests Worked examples based on theoretical bookwork practical experimentation and simulation exercises teach the reader how to test circuits thoroughly and effectively

## Unveiling the Magic of Words: A Report on "**Digital Circuit Testing And Testability**"

In some sort of defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their ability to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Digital Circuit Testing And Testability**," a mesmerizing literary masterpiece penned by a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve in to the book is central themes, examine its distinctive writing style, and assess its profound effect on the souls of its readers.

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