

Analog Circuits And Systems For Voltage Mode And Current Mode Sensor Interfacing Applications Analog Circuits And Signal Processing

The tools and techniques you need to break the analog design bottleneck! Ten years ago, analog seemed to be a dead-end technology. Today, System-on-Chip (SoC) designs are increasingly mixed-signal designs. With the advent of application-specific integrated circuits (ASIC) technologies that can integrate both analog and digital functions on a single chip, analog has become more crucial than ever to the design process. Today, designers are moving beyond hand-crafted, one-transistor-at-a-time methods. They are using new circuit and physical synthesis tools to design practical analog circuits; new modeling and analysis tools to allow rapid exploration of system level alternatives; and new simulation tools to provide accurate answers for analog circuit behaviors and interactions that were considered impossible to handle only a few years ago. To give circuit designers and CAD professionals a better understanding of the history and the current state of the art in the field, this volume collects in one

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place the essential set of analog CAD papers that form the foundation of today's new analog design automation tools. Areas covered are: Analog synthesis Symbolic analysis Analog layout Analog modeling and analysis Specialized analog simulation Circuit centering and yield optimization Circuit testing Computer-Aided Design of Analog Integrated Circuits and Systems is the cutting-edge reference that will be an invaluable resource for every semiconductor circuit designer and CAD professional who hopes to break the analog design bottleneck.

This comprehensive text discusses the fundamentals of analog electronics applications, design, and analysis. Unlike the physics approach in other analog electronics books, this text focuses on an engineering approach, from the main components of an analog circuit to general analog networks. Concentrating on development of standard formulae for conventional analog systems, the book is filled with practical examples and detailed explanations of procedures to analyze analog circuits. The book covers amplifiers, filters, and op-amps as well as general applications of analog design.

Unlike books currently on the market, this book attempts to satisfy two goals: combine circuits and electronics into a single, unified treatment, and establish a strong connection with the contemporary world of digital systems. It will introduce a new way of looking not

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only at the treatment of circuits, but also at the treatment of introductory coursework in engineering in general. Using the concept of 'abstraction,' the book attempts to form a bridge between the world of physics and the world of large computer systems. In particular, it attempts to unify electrical engineering and computer science as the art of creating and exploiting successive abstractions to manage the complexity of building useful electrical systems. Computer systems are simply one type of electrical systems. +Balances circuits theory with practical digital electronics applications. +Illustrates concepts with real devices. +Supports the popular circuits and electronics course on the MIT OpenCourse Ware from which professionals worldwide study this new approach. +Written by two educators well known for their innovative teaching and research and their collaboration with industry. +Focuses on contemporary MOS technology.

IS THE TOPIC ANALOG TESTING AND DIAGNOSIS TIMELY? Yes, indeed it is. Testing and Diagnosis is an important topic and fulfills a vital need for the electronic industry. The testing and diagnosis of digital electronic circuits has been successfully developed to the point that it can be automated. Unfortunately, its development for analog electronic circuits is still in its Stone Age. The engineer's intuition is still the most powerful tool used in the industry! There

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are two reasons for this. One is that there has been no pressing need from the industry. Analog circuits are usually small in size. Sometimes, the engineer's experience and intuition are sufficient to fulfill the need. The other reason is that there are no breakthrough results from academic research to provide the industry with critical ideas to develop tools. This is not because of a lack of effort. Both academic and industrial research groups have made major efforts to look into this problem. Unfortunately, the problem for analog circuits is fundamentally different from and much more difficult than its counterpart for digital circuits. These efforts have led to some important findings, but are still not at the point of being practically useful. However, these situations are now changing. The current trend for the design of VLSI chips is to use analog/digital hybrid circuits, instead of digital circuits from the past. Therefore, even though the analog circuit may be small, the total circuit under testing is large.

Digital and Analog Circuits and Systems

Symbolic Analysis for Automated Design of Analog Integrated Circuits

Computer-aided Design of Microelectronic Circuits and Systems: General introduction and analog-circuit aspects

Computer-Aided Design of Analog Circuits and Systems

Design of Analog Circuits Through Symbolic Analysis

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This volume of Analog Circuit Design concentrates on three topics: Volt Electronics; Design and Implementation of Mixed-Mode Systems; Low-Noise and RF Power Amplifiers for Telecommunication. The book comprises six papers on each topic written by internationally recognised experts. These papers are tutorial in nature and together make a substantial contribution to improving the design of analog circuits. The book is divided into three parts: Part I, Volt Electronics, presents some of the circuit design challenges which are having to be met as the need for more electronics on a chip forces smaller transistor dimensions, and thus lower breakdown voltages. The papers cover techniques for 1-Volt electronics. Part II, Design and Implementation of Mixed-Mode Systems, deals with the various problems that are encountered in mixed analog-digital design. In the future, all integrated circuits are bound to contain both digital and analog sub-blocks. Problems such as substrate bounce and other substrate coupling effects cause deterioration in signal integrity. Both aspects of mixed-signal design have been addressed in this section and it illustrates that careful layout techniques embedded in a hierarchical design methodology can allow us to cope with most of the challenges presented by mixed analog-digital design. Part III, Low-noise and RF Power Amplifiers for Telecommunication, focuses on telecommunications systems. In these systems low-noise amplifiers are

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front-ends of receiver designs. At the transmitter part a high-performance, high-efficiency power amplifier is a critical design. Examples of both system parts are described in this section. Analog Circuit Design is an essential reference source for analog design engineers and researchers wishing to keep abreast with the latest developments in the field. The tutorial nature of the contributions also makes it suitable for use in an advanced course. A reference volume of analog electronic circuits based on the op-amp, containing practical detail and technical advice.

This book provides insight into organic electronics technology and in analog circuit techniques that can be used to increase the performance of both analog and digital organic circuits. It explores the domain of organic electronics technology for analog circuit applications, specifically smart sensor systems. It focuses on all the building blocks in the data path of an organic sensor system between the sensor and the digital processing block. Sensors, amplifiers, analog-to-digital converters and DC-DC converters are discussed in detail. Coverage includes circuit techniques, circuit implementation, design decisions and measurement results of the building blocks described.

This book shows readers to avoid common mistakes in circuit design, and presents classic circuit concepts and design approaches from the transistor

to the system levels. The discussion is geared to be accessible and optimized for practical designers who want to learn to create circuits without simulations. Topic by topic, the author guides designers to learn the classic analog design skills by understanding the basic electronics principles correctly, and further prepares them to feel confident in designing high-performance, state-of-the art CMOS analog systems. This book combines and presents all in-depth necessary information to perform various design tasks so that readers can grasp essential material, without reading through the entire book. This top-down approach helps readers to build practical design expertise quickly, starting from their understanding of electronics fundamentals.

Analog Electronics

Volt Electronics; Mixed-Mode Systems; Low-Noise and RF Power Amplifiers for Telecommunication

Integrated Circuits for Analog Signal Processing

Methodology for the Digital Calibration of Analog Circuits and Systems

Analog Layout Generation for Performance and Manufacturability

This book describes intuitive and "back-of-the-envelope" techniques for designing and analyzing analog circuits, including transistor amplifiers (CMOS, JFET, and bipolar), transistor switching, noise in

analog circuits, thermal circuit design, magnetic circuit design, and control systems.

"Symbolic analyzers have the potential to offer knowledge to sophomores as well as practitioners of analog circuit design. Actually, they are an essential complement to numerical simulators, since they provide insight into circuit behavior which numerical "

- Applicable for bookstore catalogue

Computer-Aided Design of Analog Circuits and Systems brings together in one place important contributions and state-of-the-art research results in the rapidly advancing area of computer-aided design of analog circuits and systems. This book serves as an excellent reference, providing insights into some of the most important issues in the field.

Analog Circuits and Systems for Voltage-Mode and Current-Mode Sensor Interfacing Applications

Computer-Aided Design of Analog Integrated Circuits and Systems Fundamentals of Design and Analysis

Analog Electronics Applications

Special Issue on Computer-aided Design of Analog Circuits and

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This book introduces the basic mathematical tools used to describe noise and its propagation through linear systems and provides a basic description of the improvement of signal-to-noise ratio by signal averaging and linear filtering. The text also demonstrates how op amps are the keystone of modern analog signal conditioning systems design, and it

Analog integrated circuits are very important as interfaces between the digital parts of integrated electronic systems and the outside world. A large portion of the effort involved in designing these circuits is spent in the layout phase. Whereas the physical design of digital circuits is automated to a large extent, the layout of analog circuits is still a manual, time-consuming and error-prone task. This is mainly due to the continuous nature of analog signals, which causes analog circuit performance to be very sensitive to layout parasitics. The parasitic elements associated with interconnect wires cause loading and coupling effects that degrade the frequency behaviour and the noise performance of analog circuits. Device mismatch and thermal effects put a fundamental limit on the achievable accuracy of circuits. For successful automation of analog layout, advanced place and route tools that can handle these critical parasitics are required. In the past, automatic analog layout tools tried to optimize the layout without quantifying the

performance degradation introduced by layout parasitics. Therefore, it was not guaranteed that the resulting layout met the specifications and one or more layout iterations could be needed. In Analog Layout Generation for Performance and Manufacturability, the authors propose a performance driven layout strategy to overcome this problem. In this methodology, the layout tools are driven by performance constraints, such that the final layout, with parasitic effects, still satisfies the specifications of the circuit. The performance degradation associated with an intermediate layout solution is evaluated at runtime using predetermined sensitivities. In contrast with other performance driven layout methodologies, the tools proposed in this book operate directly on the performance constraints, without an intermediate parasitic constraint generation step. This approach makes a complete and sensible trade-off between the different layout alternatives possible at runtime and therefore eliminates the possible feedback route between constraint derivation, placement and layout extraction. Besides its influence on the performance, layout also has a profound impact on the yield and testability of an analog circuit. In Analog Layout Generation for Performance and Manufacturability, the authors outline a new criterion to quantify the detectability of a fault and combine this with a yield model to evaluate the testability of an integrated circuit

layout. They then integrate this technique with their performance driven routing algorithm to produce layouts that have optimal manufacturability while still meeting their performance specifications. Analog Layout Generation for Performance and Manufacturability will be of interest to analog engineers, researchers and students.

This book describes several techniques to address variation-related design challenges for analog blocks in mixed-signal systems-on-chip. The methods presented are results from recent research works involving receiver front-end circuits, baseband filter linearization, and data conversion. These circuit-level techniques are described, with their relationships to emerging system-level calibration approaches, to tune the performances of analog circuits with digital assistance or control. Coverage also includes a strategy to utilize on-chip temperature sensors to measure the signal power and linearity characteristics of analog/RF circuits, as demonstrated by test chip measurements. Describes a variety of variation-tolerant analog circuit design examples, including from RF front-ends, high-performance ADCs and baseband filters; Includes built-in testing techniques, linked to current industrial trends; Balances digitally-assisted performance tuning with analog performance tuning and mismatch reduction approaches; Describes theoretical concepts as well as experimental results for test chips designed

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with variation-aware techniques.

Newnes has worked with Robert Pease, a leader in the field of analog design to select the very best design-specific material that we have to offer. The Newnes portfolio has always been known for its practical no nonsense approach and our design content is in keeping with that tradition. This material has been chosen based on its timeliness and timelessness.

Designers will find inspiration between these covers highlighting basic design concepts that can be adapted to today's hottest technology as well as design material specific to what is happening in the field today. As an added bonus the editor of this reference tells you why this is important material to have on hand at all times. A library must for any design engineers in these fields. *Hand-picked content selected by analog design legend Robert Pease *Proven best design practices for op amps, feedback loops, and all types of filters *Case histories and design examples get you off and running on your current project

Art, Science, and Personalities

RF Circuits: Wide band, Front-Ends, DAC's, Design Methodology and Verification for RF and Mixed-Signal Systems, Low Power and Low Voltage

Analog Electronics with Op-amps

Circuits, Systems, and Applications

Methodology for the Digital Calibration of Analog Circuits and Systems shows how to relax the extreme design constraints in analog circuits, allowing the realization of high-precision systems even with low-performance components. A complete methodology is proposed, and three applications are detailed. To start with, an in-depth analysis of existing compensation techniques for analog circuit imperfections is carried out. The $M/2+M$ sub-binary digital-to-analog converter is thoroughly studied, and the use of this very low-area circuit in conjunction with a successive approximations algorithm for digital compensation is described. A complete methodology based on this compensation circuit and algorithm is then proposed. The detection and correction of analog circuit imperfections is studied, and a simulation tool allowing the transparent simulation of analog circuits with automatic compensation blocks is introduced. The first application shows how the sub-binary $M/2+M$ structure can be employed as a conventional digital-to-analog converter if two calibration and radix conversion algorithms are implemented. The second application, a SOI 1T DRAM, is then presented. A digital algorithm chooses a suitable reference value that compensates several circuit imperfections together, from the sense amplifier offset to the dispersion of the memory read currents. The third application is the calibration of the sensitivity of a current measurement microsystem based on a Hall magnetic field sensor. Using a variant of the chopper modulation, the spinning current

technique, combined with a second modulation of a reference signal, the sensitivity of the complete system is continuously measured without interrupting normal operation. A thermal drift lower than 50 ppm/°C is achieved, which is 6 to 10 times less than in state-of-the-art implementations. Furthermore, the calibration technique also compensates drifts due to mechanical stresses and ageing.

Analog CMOS Microelectronic Circuits describes novel approaches for analog electronic interfaces design, especially for resistive and capacitive sensors showing a wide variation range, with the intent to cover a lack of solutions in the literature. After an initial description of sensors and main definitions, novel electronic circuits, which do not require any initial calibrations, are described; they show both AC and DC excitation voltage for the employed sensor, and use both voltage-mode and current-mode approaches. The proposed interfaces can be realized both as prototype boards, for fast characterization (in this sense, they can be easily implemented by students and researchers), and as integrated circuits, using modern low-voltage low-power design techniques (in this case, specialist analog microelectronic researchers will find them useful). The primary audience of Analog CMOS Microelectronic Circuits are: analog circuit designers, sensor companies, Ph.D. students on analog microelectronics, undergraduate and postgraduate students in electronic engineering.

The microelectronics market, with special emphasis to the production of complex mixed-signal systems-on-chip (SoC), is driven by three main dynamics, time--market, productivity and managing complexity. Pushed by the progress in nanometer technology, the design teams are facing a curve of complexity that grows exponentially, thereby slowing down the productivity design rate. Analog design automation tools are not developing at the same pace of technology, once custom design, characterized by decisions taken at each step of the analog design flow, - lies most of the time on designer knowledge and expertise. Actually, the use of - sign management platforms, like the Cadences Virtuoso platform, with a set of - tegrated CAD tools and database facilities to deal with the design transformations from the system level to the physical implementation, can significantly speed-up the design process and enhance the productivity of analog/mixed-signal integrated circuit (IC) design teams. These design management platforms are a valuable help in analog IC design but they are still far behind the development stage of design automation tools already available for digital design. Therefore, the development of new CAD tools and design methodologies for analog and mixed-signal ICs is essential to increase the designer's productivity and reduce design productivitygap. The work presented in this book describes a new design automation approach to the problem of sizing analog ICs.

Methodology for the Digital Calibration of Analog Circuits and Systems With Case Studies Springer Science & Business Media

System-level Techniques for Analog Performance Enhancement

The Designer's Companion

Trade-Offs in Analog Circuit Design

Analog Circuit Design for Process Variation-Resilient Systems-on-a-Chip

Analog Circuits

The content has been carefully designed to meet the requirements of first and second year students of electronic engineering, communications engineering and telecommunications, following full honours degree programs or two-year courses including HNC/HND. A completely new analog electronics textbook for the digital age Coverage ideal for courses with a communications / wireless focus

Analog circuit and system design today is more essential than ever before. With the growth of digital systems, wireless communications, complex industrial and automotive systems, designers are challenged to develop sophisticated analog solutions. This comprehensive source book of circuit design solutions will aid systems designers with elegant and practical design techniques that focus on common circuit design challenges. The book's in-depth application examples provide insight into circuit design and application solutions that you can apply in today's demanding designs. Covers the fundamentals of linear/analog circuit and system design to guide engineers with their design challenges Based on the

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Application Notes of Linear Technology, the foremost designer of high performance analog products, readers will gain practical insights into design techniques and practice Broad range of topics, including power management tutorials, switching regulator design, linear regulator design, data conversion, signal conditioning, and high frequency/RF design Contributors include the leading lights in analog design, Robert Dobkin, Jim Williams and Carl Nelson, among others

This book presents theory, design methods and novel applications for integrated circuits for analog signal processing. The discussion covers a wide variety of active devices, active elements and amplifiers, working in voltage mode, current mode and mixed mode. This includes voltage operational amplifiers, current operational amplifiers, operational transconductance amplifiers, operational transresistance amplifiers, current conveyors, current differencing transconductance amplifiers, etc. Design methods and challenges posed by nanometer technology are discussed and applications described, including signal amplification, filtering, data acquisition systems such as neural recording, sensor conditioning such as biomedical implants, actuator conditioning, noise generators, oscillators, mixers, etc. Presents analysis and synthesis methods to generate all circuit topologies from which the designer can select the best one for the desired application; Includes design guidelines for active devices/elements with low voltage and low power constraints; Offers guidelines for selecting the right active devices/elements in the design of linear and nonlinear circuits;

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Discusses optimization of the active devices/elements for process and manufacturing issues of nanometer technology.

Enables the reader to test an analog circuit that is implemented either in bipolar or MOS technology. Examines the testing and fault diagnosis of analog and analog part of mixed signal circuits. Covers the testing and fault diagnosis of both bipolar and Metal Oxide Semiconductor (MOS) circuits and introduces . Also contains problems that can be used as quiz or homework.

Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation

Microelectronics

Analog Organic Electronics

Analog Circuit Design
with Case Studies

This book describes the design of CMOS circuits for ultra-low power consumption including analog, radio frequency (RF), and digital signal processing circuits (DSP). The book addresses issues from circuit and system design to production design, and the ultra-low power circuits described to systems for digital hearing aids and camera endoscope devices. Provides a valuable introduction to ultra-low power circuit design aimed at practicing design engineers; Describes all key building blocks of ultra-low power circuits, from a systems perspective; Applies circuits and systems described

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product examples such as hearing aids and capsule endoscopes.

It is a great honor to provide a few words of introduction for Dr. Georges Gielen Prof. Willy Sansen's book "Symbolic analysis for automated design of analog integrated circuits". The symbolic analysis method presented in this book represents a significant step forward in the area of analog circuit design. As demonstrated in this book, symbolic analysis opens up new possibilities for the development of computer-aided design tools that can analyze an analog circuit topology and automatically size the components for a given set of specifications. Symbolic analysis even has the potential to improve the training of young analog circuit designers and to guide more experienced designers through second-order phenomena such as distortion. This book can also serve as an excellent reference for researchers in the analog circuit design area and creators of design tools, as it provides a comprehensive overview and comparison of various approaches to analog circuit design automation and an extensive bibliography. The world is essentially analog in nature, hence most electronic systems involve both analog and digital components. As the number of transistors that can be integrated on a single integrated circuit chip substrate steadily increases over time, an ever increasing number of systems will be implemented with one, or a few, very complex ICs because of their lower production costs.

This book is an undergraduate textbook for students of electrical and electronic

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engineering. It is written with second year students particularly in mind, and discusses analogue circuits used in various fields.

Analog Circuit Design

A Tutorial Guide to Applications and Solutions

Building Blocks for Organic Smart Sensor Systems on Foil

Circuits, Systems and Signal Processing

Ultra-Low Power Integrated Circuit Design

Intuitive Analog Circuit Design

As the frequency of communication systems increases and the dimensions of transistors are reduced, more and more stringent performance requirements are placed on analog circuits. This is a trend that is bound to continue for the foreseeable future and while it does, understanding performance trade-offs will constitute a vital part of the analog design process. It is the insight and intuition obtained from a fundamental understanding of performance conflicts and trade-offs, that ultimately provides the designer with the basic tools necessary for effective and creative analog design. Trade-offs in Analog Circuit Design, which is devoted to the understanding of trade-offs in analog design, is quite unique in that it draws together fundamental material from, and identifies interrelationships within, a number of key analog circuits. The book covers ten subject areas: Design methodology, Technology, General Performance, Filters,

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Switched Circuits, Oscillators, Data Converters, Transceivers, Neural Processing, and Analog CAD. Within these subject areas it deals with a wide diversity of trade-offs ranging from frequency-dynamic range and power, gain-bandwidth, speed-dynamic range and phase noise, to tradeoffs in design for manufacture and IC layout. The book has by far transcended its original scope and has become both a designer's companion as well as a graduate textbook. An important feature of this book is that it promotes an intuitive approach to understanding analog circuits by explaining fundamental relationships and, in many cases, providing practical illustrative examples to demonstrate the inherent basic interrelationships and trade-offs. Trade-offs in Analog Circuit Design draws together 34 contributions from some of the world's most eminent analog circuits-and-systems designers to provide, for the first time, a comprehensive text devoted to a very important and timely approach to analog circuit design. Analog Circuit Design contains the contribution of 18 tutorials of the 14th workshop on Advances in Analog Circuit Design. Each part discusses a specific todote topic on new and valuable design ideas in the area of analog circuit design. Each part is presented by six experts in that field and state of the art information is shared and overviewed. This book is number 14 in this successful series of Analog Circuit Design, providing valuable information and excellent overviews of analog circuit design, CAD and RF systems. Analog Circuit Design is an essential reference source for analog circuit designers and researchers wishing to keep abreast with the latest development in the

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field. The tutorial coverage also makes it suitable for use in an advanced design course. Intuitive Analog Circuit Design outlines ways of thinking about analog circuits and systems that let you develop a feel for what a good, working analog circuit design should be. This book reflects author Marc Thompson's 30 years of experience designing analog and power electronics circuits and teaching graduate-level analog circuit design, and is the ideal reference for anyone who needs a straightforward introduction to the subject. In this book, Dr. Thompson describes intuitive and "back-of-the-envelope" techniques for designing and analyzing analog circuits, including transistor amplifiers (CMOS, JFET, and bipolar), transistor switching, noise in analog circuits, thermal circuit design, magnetic circuit design, and control systems. The application of some simple rules of thumb and design techniques is the first step in developing an intuitive understanding of the behavior of complex electrical systems. Introducing analog circuit design with a minimum of mathematics, this book uses numerous real-world examples to help you make the transition to analog design. The second edition is an ideal introductory text for anyone new to the area of analog circuit design. Design examples are used throughout the text, along with end-of-chapter examples. Covers real-world parasitic elements in circuit design and their effects. It follows with a thorough treatment of design operational and operational transconductance amplifiers, and concludes with a unified presentation of sample-data and continuous-time signal processing systems.

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Processing

Analog Electronic Circuits and Systems

Testing and Diagnosis of Analog Circuits and Systems

Foundations of Analog and Digital Electronic Circuits

With Case Studies

Analog Circuits and Systems Optimization based on Evolutionary Computation

Techniques