Integrated Inductors And Transformers Characterization Design And Modeling For Rf And Mm Wave Applications

This book provides the most comprehensive and in-depth coverage of the latest circuit design developments in RF CMOS technology. It is a practical and cutting-edge guide, packed with proven circuit techniques and innovative design methodologies for solving challenging problems associated with RF integrated circuits and systems. This invaluable resource features a collection of the finest design practices that may soon drive the system-on-chip revolution. Using this book's state-of-the-art design techniques, one can apply existing technologies in novel ways and to create new circuit designs for the future.

Guiding readers through the basics of these rapidly emerging networks to more advanced concepts and future expectations, this book examines the most pressing research issues in Mobile Ad hoc Networks (MANETs). Leading researchers, industry professionals, and academics provide an authoritative perspective of the state of the art in MANETs. The book includes surveys of recent publications that investigate key areas of interest such as limited resources and the mobility of mobile nodes. It considers routing, multicast, energy, security, channel assignment, and ensuring quality of service.

The result of decades of research and international project experience, Multimedia Communications and Networking provides authoritative insight into recent developments in multimedia, digital communications, and networking services and technologies. Supplying you with the required foundation in these areas, it illustrates the means that will allow

Updated and expanded, Physical Principles of Wireless Communications, Second Edition illustrates the relationship between scientific discoveries and their application to the invention and engineering of wireless communication systems. The second edition of this popular textbook starts with a review of the relevant physical laws, including Planck’s Law of Blackbody Radiation, Maxwell’s equations, and the laws of Special and General Relativity. It describes sources of electromagnetic noise, operation of antennas and antenna arrays, propagation losses, and satellite operation in sufficient detail to allow students to perform their own system designs and engineering calculations. Illustrating the operation of the physical layer of wireless communication systems—including cell phones, communication satellites, and wireless local area networks—the text covers the basic equations of electromagnetism, the principles of probability theory, and the operation of antennas. It explores the propagation of electromagnetic waves and describes the losses and interference effects that waves encounter as they propagate through cities, inside buildings, and to and from satellites orbiting the earth. Important natural phenomena are also described, including Cosmic Microwave Background Radiation, ionospheric reflection, and tropospheric refraction. New in the Second Edition: Descriptions of 3G and 4G cell phone systems Discussions on the relation between the basic laws of quantum and relativistic physics and the engineering of modern wireless communication systems A new section on Planck’s Law of Blackbody Radiation Expanded discussions on general relativity and special relativity and their relevance to GPS system design An expanded chapter on antennas that includes wire loop antennas Expanded discussion of shadowing correlations and their effect on cell phone system design The text covers the physics of Geostationary Earth Orbiting satellites, Medium Earth Orbiting satellites, and Low Earth Orbiting satellites enabling students to evaluate and make first order designs of SATCOM systems. It also reviews the principles of probability theory to help them accurately determine the margins that must be allowed to account for statistical variation in path loss. The included problem sets and sample solutions provide students with the understanding of contemporary wireless systems needed to participate in the development of future systems.

Radio-Frequency Microelectronic Circuits for Telecommunication Applications covers the design issues of radio-frequency microelectronic circuits for telecommunication applications with emphasis on devices and circuit-level design. It uses a large number of real examples from industrial design as a vehicle both to teach the principles and to ensure relevance starting from device level modeling to basic RF microelectronic circuit cell design. Modeling for high-frequency operation of both active and passive integrated devices is covered starting from the bipolar transistor to the MOS transistor to the modeling of integrated spiral inductors, resistors, capacitors, varactors and package parasitics structures. A chapter is also devoted to the presentation of the basic definitions and terminology used in RF IC design. The book continues with the presentation of the principal building blocks of an integrated RF front-end, namely, the LNA, the mixer, the VCO and integrated filters. Design paradigms are provided classified on the technology used in each case: pure bipolar, CMOS, BiCMOS or SiGe. Radio-Frequency Microelectronic Circuits for Telecommunication Applications is essential reading for all researchers, practising engineers and designers working in RF electronics. It is also a reference for use in advanced undergraduate or graduate courses in the same field.

This book describes the structured design and optimization of efficient, energy processing integrated circuits. The approach is multidisciplinary, covering the monolithic integration of IC design techniques, power electronics and control theory. In particular, this book enables readers to conceive, synthesize, design and implement integrated circuits with high-density high-efficiency on-chip switching power regulators. Topics covered encompass the structured design of the on-chip power supply, efficiency optimization, IC-compatible power inductors and capacitors, power MOSFET switches and efficient switch drivers in standard CMOS technologies.

Microelectromechanical systems (MEMS) refer to a collection of micro-sensors and actuators, which can react to environmental change under micro- circuit control. The integration of MEMS into traditional Radio Frequency (RF) circuits has resulted in systems with superior performance levels and lower manufacturing costs. The incorporation of MEMS based fabrication technologies into micro and millimeter wave systems offers viable routes to ICs with MEMS actuators, antennas, switches and transmission lines. The resultant systems operate with an increased bandwidth and increased radiation efficiency and have considerable scope for implementation within the expanding area of wireless personal communication devices. This text provides leading edge coverage of this increasingly important area and highlights the overlapping information requirements of the RF and MEMS research and development communities. * Provides an introduction to micromachining techniques and their use in the fabrication of micro switches, capacitors and inductors * Includes coverage of MEMS devices for wireless and Bluetooth enabled systems Essential reading for RF Circuit design practitioners and researchers requiring an introduction to MEMS technologies, as well as practitioners and researchers in MEMS and silicon technology requiring an introduction to RF circuit design.

After a review of PLL essentials, this uniquely comprehensive workbench guide takes you step-by-step through operation principles, design procedures, phase noise analysis, layout considerations, and CMOS realizations for each PLL building block. You get full details on LC tank oscillators including modeling and optimization techniques, followed by design options for CMOS frequency dividers covering flip-flop implementation, the divider by 2 component, and other key factors. The book includes design alternatives for phase detectors that feature methods to minimize jitter caused by the dead zone effect. You also find a sample design of a fully integrated PLL for WLAN applications that demonstrates every step and detail right down to the circuit schematics and layout diagrams. Supported by over 150 diagrams and photos, this one-stop toolkit helps you produce superior PLL designs faster, and deliver more effective solutions for low-cost integrated circuits in all RF applications.

This book provides a comprehensive, single-source on resonant switched-capacitor converters. It is written in the style of a handbook, with systematic guidelines, and includes implementation examples. The authors explore integrated hybrid resonant DCDC converters in order to achieve highly compact, energy efficient and cost-effective power

management solutions in the growing fields of wearables and internet-of-things applications. They provide an introduction into hybrid converters as a new and promising converter class, which merges capacitive and inductive conversion concepts into one. Coverage ranges from fundamentals to implementation details, including topics such as power stage design, gate drive schemes, different control mechanisms for resonant operation and integrated passives. Introduces a new, multi-ratio resonant converter architecture, which enables lower switching frequencies and better passive component utilization; Discusses circuit block design for high efficiency of the power stage; Explores implementation details and concepts for integrated passives; Derives models, implements and compares to each other different control mechanisms.

If you are looking for a complete study of the fundamental concepts in magnetic theory, read this book. No other textbook covers magnetic components of inductors and transformers for high-frequency applications in detail. This unique text examines design techniques of the major types of inductors and transformers used for a wide variety of high-frequency applications including switching-mode power supplies (SMPS) and resonant circuits. It describes skin effect and proximity effect in detail to provide you with a sound understanding of high-frequency phenomena. As well as this, you will discover thorough coverage on: integrated inductors and the self-capacitance of inductors and transformers, with expressions for self-capacitances in magnetic components; criteria for selecting the core material, as well as core shape and size, and an evaluation of soft ferromagnetic materials used for magnetic cores; winding resistance at high frequencies; expressions for winding and core power losses when non-sinusoidal inductor or transformer current waveforms contain harmonics. Case studies, practical design examples and procedures (using the area product method and the geometry coefficient method) are expertly combined with concept-orientated explanations and student-friendly analysis. Supplied at the end of each chapter are summaries of the key concepts, review questions, and problems, the answers to which are available in a separate solutions manual. Such features make this a fantastic textbook for graduates, senior level undergraduates and professors in the area of power electronics in addition to electrical and computer engineering. This is also an inimitable reference guide for design engineers of power electronics circuits, high-frequency transformers and inductors in areas such as (SMPS) and RF power amplifiers and circuits.

Based on the fundamentals of electromagnetics, this clear and concise text explains basic and applied principles of transformer and inductor design for power electronic applications. It details both the theory and practice of inductors and transformers employed to filter currents, store electromagnetic energy, provide physical isolation between circuits, and perform stepping up and down of DC and AC voltages. The authors present a broad range of applications from modern power conversion systems. They provide rigorous design guidelines based on a robust methodology for inductor and transformer design. They offer real design examples, informed by proven and working field examples. Key features include: emphasis on high frequency design, including optimisation of the winding layout and treatment of non-sinusoidal waveforms a chapter on planar magnetic with analytical models and descriptions of the processing technologies analysis of the role of variable inductors, and their applications for power factor correction and solar power unique coverage on the measurements of inductance and transformer capacitance, as well as tests for core losses at high frequency worked examples in MATLAB, end-of-chapter problems, and an accompanying website containing solutions, a full set of instructors' presentations, and copies of all the figures. Covering the basics of the magnetic components of power electronic converters, this book is a comprehensive reference for students and professional engineers dealing with specialised inductor and transformer design. It is especially useful for senior undergraduate and graduate students in electrical engineering and electrical energy systems, and engineers working with power supplies and energy conversion systems who want to update their knowledge on a field that has progressed considerably in recent years.

Build high-performance, energy-efficient circuits with this cutting-edge guide to designing, modeling, analysing, implementing and testing new mm-wave systems.

Describes a new method of generating a lumped-parameter equivalent-circuit (EC) for on-chip inductors based on fundamental electromagnetic principles and parameter optimization, resulting in accurate analytical expressions for inductor equivalent circuits. Applies nonlinear least squares fitting to numerical data obtained from a very large number of single-time ASITIC (analysis and simulation of inductors and transformers for integrated circuits) runs for a given process. Develops a Matlab interface to process the ASITIC simulation results.

"Passive inductive components have experienced an extraordinary growth in RF ICs. They are widely employed to improve performance, reduce fabrication costs and increase integration levels of both the RX and TX parts of the RF front-end. Knowledge of basic concepts concerning design, fabrication, and modeling of monolithic inductors and transformers has become an essential prerequisite for process engineers and circuit designers. In this book, monolithic passive components are discussed to provide a complete overview on fabrication technology, design and optimization techniques, and modeling. Equal emphasis is given to technological aspects and circuit-oriented applications"--Provided by publisher

SiGe HBT BiCMOS technology is the obvious groundbreaker of the Si heterostructures application space. To date virtually every major player in the communications electronics market either has SiGe up and running in-house or is using someone else's SiGe fab as foundry for their designers. Key to this success lies in successful integration of the SiGe HBT and Si CMOS, with no loss of performance from either device. Filled with contributions from leading experts, Fabrication of SiGe HBT BiCMOS Technologies brings together a complete discussion of these topics into a single resource. Drawn from the comprehensive and well-reviewed Silicon Heterostructure Handbook, this volume examines the design, fabrication, and application of silicon heterostructure transistors. A novel aspect of this book the inclusion of numerous snapshot views of the industrial state-of-the-art for SiGe HBT BiCMOS technology. It has been carefully designed to provide a useful basis of comparison for the current status and future course of the global industry. In addition to

the copious technical material and the numerous references contained in each chapter, the book includes easy-to-reference appendices on the properties of Si and Ge, the generalized Moll-Ross relations, integral charge-control relations, and sample SiGe HBT compact model parameters.

This newly revised and expanded edition of the 2003 Artech House classic, Radio Frequency Integrated Circuit Design, serves as an up-to-date, practical reference for complete RFIC know-how. The second edition includes numerous updates, including greater coverage of CMOS PA design, RFIC design with on-chip components, and more worked examples with simulation results. By emphasizing working designs, this book practically transports you into the authorsOCO own RFIC lab so you can fully understand the function of each design detailed in this book. Among the RFIC designs examined are RF integrated LC-based filters, VCO automatic amplitude control loops, and fully integrated transformer-based circuits, as well as image reject mixers and power amplifiers.If you are new to RFIC design, you can benefit from the introduction to basic theory so you can quickly come up to speed on how RFICs perform and work together in a communications device. A thorough examination of RFIC technology guides you in knowing when RFICs are the right choice for designing a communication device. This leading-edge resource is packed with over 1,000 equations and more than 435 illustrations that support key topics."

This is a thorough survey of the state-of-the-art in Integrated Passive Component Technology. Describes the processes available for creating integrated passives, measuring their properties, and applying them. Brings reader up to date in a fast-moving technology. Enables reader to implement the technology into a manufacturing environment. Covers existing and potential technologies for various substrate systems such as FR4, ceramic, and HDI. Describes applications favorable to integrated passives and the economic tradeoffs associated with their implementation.

Improving the performance of existing technologies has always been a focal practice in the development of computational systems. However, as circuitry is becoming more complex, conventional techniques are becoming outdated and new research methodologies are being implemented by designers. Performance Optimization Techniques in Analog, Mix-Signal, and Radio-Frequency Circuit Design features recent advances in the engineering of integrated systems with prominence placed on methods for maximizing the functionality of these systems. This book emphasizes prospective trends in the field and is an essential reference source for researchers, practitioners, engineers, and technology designers interested in emerging research and techniques in the performance optimization of different circuit designs.

Radio-frequency (RF) integrated circuits in CMOS technology are gaining increasing popularity in the commercial world, and CMOS technology has become the dominant technology for applications such as GPS receivers, GSM cellular transceivers, wireless LAN, and wireless short-range personal area networks based on IEEE 802.15.1 (Bluetooth) or IEEE 802.15.4 (ZigBee) standards. Furthermore, the increasing interest in wireless technologies and the widespread of wireless communications has prompted an ever increasing demand for radio frequency transceivers. Wireless Radio-Frequency Standards and System Design: Advanced Techniques provides perspectives on radio-frequency circuit and systems design, covering recent topics and developments in the RF area. Exploring topics such as LNA linearization, behavioral modeling and co-simulation of analog and mixed-signal complex blocks for RF applications, integrated passive devices for RF-ICs and baseband design techniques and wireless standards, this is a comprehensive reference for students as well as practicing professionals.

Intended for engineers who are starting out in the design of integrated inductors, this book describes the whole design flow, basic selection of the geometry and optimisation of the quality by redesigning the geometry, measurement and de-embedding and characterisation.

From basic concepts to research grade material, Mobile Web 2.0: Developing and Delivering Services to Mobile Devices provides complete and up-to-date coverage of the range of technical topics related to Mobile Web 2.0. It brings together the work of 51 pioneering experts from around the world who identify the major challenges in Mobile Web 2.0 applications and provide authoritative insight into many of their own innovations and advances in the field. To help you address contemporary challenges, the text details a conceptual framework that provides modeling facilities for context-aware, multi-channel Web applications. It compares various platforms for developing mobile services—from the developer and user perspectives—and explains how to use high-level modeling constructs to drive the application development process through automatic code generation. Proposes an expanded model of mobile application context Explores mobile social software as an Information and Communications Technology (ICT) Discusses the effect of context on mobile usability Through empirical study, the book tests a number of hypotheses on the use of software implementation technology and location context in mobile applications. It introduces Reusable End-User Customization (REUC)—a technique that allows users to adapt the layout of Web pages and automatically reapplies those preferences on subsequent visits. It also investigates the need for non-visual feedback with long system response times, particularly when downloading Web pages to mobile devices.

The book addresses the critical challenges faced by the ever-expanding wireless communication market and the increasing frequency of operation due to continuous innovation of high performance integrated passive devices. The challenges like low quality factor, design complexity, manufacturability, processing cost, etc., are studied with examples and specifics. Silicon on-chip inductor was first reported in 1990 by Nguyen and Meyer in a 0.8 ?m silicon bipolar complementary metal oxide semiconductor technology (BiCMOS). Since then, there has been an enormous progress in the research on the performance trends, design and optimization, modeling, quality factor enhancement techniques, etc., of spiral inductors and significant results are reported in literature for various applications. This book introduces an efficient method of determining the optimized layout of on chip spiral inductor. The important fundamental tradeoffs of the design like quality factor and area, quality factor and inductance, quality factor and operating frequency, maximum quality factor and the peak frequency is also explored. The authors proposed an algorithm for accurate design and optimization of spiral inductors using a 3D electromagnetic simulator with minimum number of inductor structure simulations and thereby reducing its long computation time. A new multilayer pyramidal symmetric inductor structure is also proposed in this book. Being multilevel, the proposed inductor achieves high inductance to area ratio and hence occupies smaller silicon area.

This practical book is the first comprehensive treatment of lumped elements, which are playing a critical role in the development of the circuits that make these cost-effective systems possible. The book offers professionals an in-depth understanding of the different types of RF and microwave circuit elements.

The modern wireless communication industry has put great demands on circuit designers for smaller, cheaper transceivers in the gigahertz frequency range. One tool which has assisted designers in satisfying these requirements is the use of on-chip inductiveelements (inductors and transformers) in silicon (Si) radio-frequency (RF) integrated circuits (ICs). These elements allow greatly improved levels of performance in Si monolithic low-noise amplifiers, power amplifiers, up-conversion and down-conversion mixers and local oscillators. Inductors can be used to improve the intermodulation distortion performance and noise figure of small-signal amplifiers and mixers. In addition, the gain of amplifier stages can be enhanced and the realization of low-cost on-chip local oscillators with good phase noise characteristics is made feasible. In order to reap these benefits, it is essential that the IC designer be able to predict and optimize the characteristics of on-chip inductiveelements. Accurate knowledge of

inductance values, quality factor (Q) and the influence of ad- cent elements (on-chip proximity effects) and substrate losses is essential. In this book the analysis, modeling and application of on-chip inductive elements is considered. Using analyses based on Maxwells equations, an accurate and efficient technique is developed to model these elements over a wide frequency range. Energy loss to the conductive substrate is modeled through several mechanisms, including electrically induced displacement and conductive c- rents and by magnetically induced eddy currents. These techniques have been compiled in a user-friendly software tool ASITIC (Analysis and Simulation of Inductors and Transformers for Integrated Circuits).

A rapidly growing number of services and applications along with a dramatic shift in users' consumption models have made media networks an area of increasing importance. Do you know all that you need to know?Supplying you with a clear understanding of the technical and deployment challenges, Media Networks: Architectures, Applications, and Standard

With the ability to improve performance, reduce fabrication costs, and increase integration levels of both RX and TX sections of the RF/mm-wave front-end, passive inductive components have experienced extraordinary growth in ICs. Therefore, a fundamental understanding of monolithic inductors and transformers has become essential for all process engineers and circuit designers. Supplying balanced coverage of the technology and applications, Integrated Inductors and Transformers: Characterization, Design and Modeling for RF and mm-Wave Applications provides a complete overview of the design, fabrication, and modeling of monolithic inductors and transformers. It considers the underlying physics and theoretical background of inductive components fabricated on a semiconductor substrate. Deals with both inductors and transformers and their application in RF/mm-wave ICs Focuses on silicon-based inductive components and their performance optimization in RF/mm-wave ICs Provides insight into lumped scalable modeling of both inductors and transformers Covers concepts of system calibration, test pattern parasitics, and de-embedding for on-wafer measurements of passive devices Illustrates practical applications of theoretical concepts by means of meaningful circuit design examples Highlighting the pressing requirements of the wireless market and evolving communication standards, the text provides a comprehensive review of recently developed modeling techniques and applications. It also includes helpful rule-of-thumb design guidelines and commonly employed optimization strategies to help kick-start your design, fabrication, and modeling efforts.

In Physical Unclonable Functions in Theory and Practice, the authors present an in-depth overview of various topics concerning PUFs, providing theoretical background and application details. This book concentrates on the practical issues of PUF hardware design, focusing on dedicated microelectronic PUF circuits. Additionally, the authors discuss the whole process of circuit design, layout and chip verification. The book also offers coverage of: Different published approaches focusing on dedicated microelectronic PUF circuits Specification of PUF circuits General design issues Minimizing error rate from the circuit’s perspective Transistor modeling issues of Montecarlo mismatch simulation and solutions Examples of PUF circuits including an accurate description of the circuits and testing/measurement results Different error rate reducing pre-selection techniques This monograph gives insight into PUFs in general and provides knowledge in the field of PUF circuit design and implementation. It could be of interest for all circuit designers confronted with PUF design, and also for professionals and students being introduced to the topic.

This book provides in-depth coverage of transformer-based design techniques that enable CMOS oscillators and frequency dividers to achieve state-of-the-art performance. Design, optimization, and measured performance of oscillators and frequency dividers for different applications are discussed in detail, focusing on not only ultra-low supply voltage but also ultra-wide frequency tuning range and locking range. This book will be an invaluable reference for anyone working or interested in CMOS radio-frequency or mm-Wave integrated circuits and systems.

Design and Modeling of Millimeter-wave CMOS Circuits for Wireless Transceivers describes in detail some of the interesting developments in CMOS millimetre-wave circuit design. This includes the re-emergence of the slow-wave technique used on passive devices, the license-free 60GHz band circuit blocks and a 76GHz voltage-controlled oscillator suitable for vehicular radar applications. All circuit solutions described are suitable for digital CMOS technology. Digital CMOS technology developments driven by Moore’s law make it an inevitable solution for low cost and high volume products in the marketplace. Explosion of the consumer wireless applications further makes this subject a hot topic of the day. The book begins with a brief history of millimetre-wave research and how the silicon transistor is born. Originally meant for different purposes, the two technologies converged and found its way into advanced chip designs. The second part of the book describes the most important passive devices used in millimetre-wave CMOS circuits. Part three uses these passive devices and builds circuit blocks for the wireless transceiver. The book completes with a comprehensive list of references for further readings. Design and Modeling of Millimeter-wave CMOS Circuits for Wireless Transceivers is useful to show the analogue IC designer the issues involved in making the leap to millimetre-wave circuit designs. The graduate student and researcher can also use it as a starting point to understand the subject or proceed to innovative from the works described herein.

Varactors are passive semiconductor devices used in electronic circuits, as a voltage-controlled way of storing energy in order to boost the amount of electric charge produced. In the past, the use of low-cost fabrication processes such as complementary metal oxide semiconductor (CMOS) and silicon germanium (SiGe) were kept for integrated circuits working in frequency ranges below the GHz. Now, the increased working frequency of radio frequency integrated circuits (RF ICs) for communication devices, and the trend of system-on-chip technology, has pushed the requirements of varactors to the limit. As the frequency of RF applications continues to rise, it is essential that passive devices such as varactors are of optimum quality, making this a critical design issue. Initially describing the physical phenomena that occur in passive devices within standard IC fabrication

processes, Design and Characterization of Integrated Varactors for RF Applications goes on to: present information on the design of wide band electrical varactor models (up to 5 GHz) which enable the accurate prediction of device performance; propose a specific methodology for the measurement of integrated varactors, covering on-wafer measurement structures, the calibration process, and detailed descriptions of the required equipment; explain de-embedding techniques and also analyse confidence level and uncertainty linked to the test set-up; examine the design of a voltage controlled oscillator (VCO) circuit as a practical example of the employment of methods discussed in the book. Providing the reader with the necessary technical knowledge for dealing with challenging VCO designs, this book is an essential guide for practising RF and microwave engineers working on the design of electronic devices for integrated circuits. It is also a useful reference for postgraduate students and researchers interested in electronic design for RF applications.

An extraordinary combination of material science, manufacturing processes, and innovative thinking spurred the development of SiGe heterojunction devices that offer a wide array of functions, unprecedented levels of performance, and low manufacturing costs. While there are many books on specific aspects of Si heterostructures, the Silicon Heterostructure Handbook: Materials, Fabrication, Devices, Circuits, and Applications of SiGe and Si Strained-Layer Epitaxy is the first book to bring all aspects together in a single source. Featuring broad, comprehensive, and in-depth discussion, this handbook distills the current state of the field in areas ranging from materials to fabrication, devices, CAD, circuits, and applications. The editor includes "snapshots" of the industrial state-of-the-art for devices and circuits, presenting a novel perspective for comparing the present status with future directions in the field. With each chapter contributed by expert authors from leading industrial and research institutions worldwide, the book is unequalled not only in breadth of scope, but also in depth of coverage, timeliness of results, and authority of references. It also includes a foreword by Dr. Bernard S. Meyerson, a pioneer in SiGe technology. Containing nearly 1000 figures along with valuable appendices, the Silicon Heterostructure Handbook authoritatively surveys materials, fabrication, device physics, transistor optimization, optoelectronics components, measurement, compact modeling, circuit design, and device simulation.

Integrated Inductors and TransformersCharacterization, Design and Modeling for RF and MM-Wave ApplicationsCRC Press

This work covers the design of CMOS fully integrated low power low phase noise voltage controlled oscillators for telecommunication or datacommuni- tion systems. The need for low power is obvious, as mobile wireless telecommunications are battery operated. As wireless telecommunication systems use oscillators in frequency synthesizers for frequency translation, the selectivity and signal to noise ratio of receivers and transmitters depend heavily on the low phase noise performance of the implemented oscillators. Datacommunication s- tems need low jitter, the time-domain equivalent of low phase noise, clocks for data detection and recovery. The power consumption is less critical. The need for multi-band and multi-mode systems pushes the high-integration of telecommunication systems. This is o?ered by sub-micron CMOS feat- ing digital ?exibility. The recent crisis in telecommunication clearly shows that mobile hand-sets became mass-market high-volume consumer products, where low-cost is of prime importance. This need for low-cost products - livens tremendously research towards CMOS alternatives for the bipolar or BiCMOS solutions in use today.

This book describes methods to design distributed amplifiers useful for performing circuit functions such as duplexing, paraphrase amplification, phase shifting power splitting and power combiner applications. A CMOS bidirectional distributed amplifier is presented that combines for the first time device-level with circuit-level linearization, suppressing the third-order intermodulation distortion. It is implemented in 0.13um RF CMOS technology for use in highly-linear, low-cost UWB Radio-over-Fiber communication systems.

This second edition of the highly acclaimed RF Power Amplifiers has been thoroughly revised and expanded to reflect the latest challenges associated with power transmitters used in communications systems. With more rigorous treatment of many concepts, the new edition includes a unique combination of class-tested analysis and industry-proven design techniques. Radio frequency (RF) power amplifiers are the fundamental building blocks used in a vast variety of wireless communication circuits, radio and TV broadcasting transmitters, radars, wireless energy transfer, and industrial processes. Through a combination of theory and practice, RF Power Amplifiers, Second Edition provides a solid understanding of the key concepts, the principle of operation, synthesis, analysis, and design of RF power amplifiers. This extensive update boasts: up to date end of chapter summaries; review questions and problems; an expansion on key concepts; new examples related to real-world applications illustrating key concepts and brand new chapters covering ‘hot topics’ such as RF LC oscillators and dynamic power supplies. Carefully edited for superior readability, this work remains an essential reference for research & development staff and design engineers. Senior level undergraduate and graduate electrical engineering students will also find it an invaluable resource with its practical examples & summaries, review questions and end of chapter problems. Key features: • A fully revised solutions manual is now hosted on a companion website alongside new simulations. • Extended treatment of a broad range of topologies of RF power amplifiers. • In-depth treatment of state-of-the art of modern transmitters and a new chapter on oscillators. • Includes problem-solving methodology, step-by-step derivations and closed-form design equations with illustrations.

On-chip passive components such as interconnects, inductors and transformers are widely used in CMOS high speed digital, mixed-signal and radio frequency integrated circuits (ICs). Therefore, accurate modeling of circuit behavior, especially for these passive components, is crucial for first-time-right designs. This book focus on modeling and characterization of on-chip interconnects, inductors and transformers. Firstly, a fully scalable and SPICE-compatible interconnects model is established and is accurate over a wideband frequency range up to 110 GHz. Secondly, frequency- and temperature-dependent characteristics of on-chip coupled asymmetrical and symmetrical interconnects are investigated in detail. Furthermore, an eleven-element equivalent circuit model is established for on-chip spiral inductors. Additionally, a vertical tapered solenoidal inductor is

designed to achieve a high resonance frequency. Finally, extensive studies on the performances of on-chip transformers with and without patterned ground shields at different temperatures are carried out. This book targets at those who are interested in the CMOS IC designs, and would like to develop passive devices models.