

# High Frequency Integrated Circuits The Cambridge Rf And Microwave Engineering Series

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*Microwave and RF Vacuum Electronic Power Sources* Richard G. Carter 2018-03-31 Get up-to-speed on the theory, principles and design of vacuum electron devices.

**Nonlinear RF Circuits and Nonlinear Vector Network Analyzers** Patrick Roblin 2011-06-02 With increasingly low-cost and power-efficient RF electronics demanded by today's wireless communication systems, it is essential to keep up to speed with new developments. This book presents key advances in the field that you need to know about and emerging patterns in large-signal measurement techniques, modeling and nonlinear circuit design theory supported by practical examples. Topics covered include:

- Novel large-signal measurement techniques that have become available with the introduction of nonlinear vector network analyzers (NVNA), such as the LSNA, PNA-X and SWAP
- Direct extraction of device models from large-signal RF dynamic loadlines
- Characterization of memory effects (self-heating, traps) with pulsed RF measurements
- Interactive design of power-efficient amplifiers (PA) and oscillators using ultra-fast multi-harmonic active load-pull
- Volterra and poly-harmonic distortion (X-parameters) behavioral modeling
- Oscillator phase noise theory
- Balancing, modeling and poly-harmonic linearization of broadband RFIC modulators
- Development of a frequency selective predistorter to linearize PAs

*RF Circuit Design* Christopher Bowick 2014-06-28 Essential reading for experts in the field of RF circuit design and engineers needing a good reference. This book provides complete design procedures for multiple-pole Butterworth, Chebyshev, and Bessel filters. It also covers capacitors, inductors, and other components with their behavior at RF frequencies discussed in detail. Provides complete design procedures for multiple-pole Butterworth, Chebyshev, and Bessel filters Covers capacitors, inductors, and other components with their behavior at RF frequencies discussed in detail

**Fundamentals of High Frequency CMOS Analog Integrated Circuits** Duran Leblebici 2021 This textbook is ideal for senior undergraduate and graduate courses in RF CMOS circuits, RF circuit design, and high-frequency analog circuit design. It is aimed at electronics engineering students, as well as IC design engineers in the field, who wish to gain a deeper understanding of circuit fundamentals and go beyond the widely-used automated design procedures. A design-centric approach is adopted in order to bridge the gap between fundamental analog electronic circuits textbooks and more advanced RF IC design texts. The structure and operation of the building blocks of high-frequency ICs are introduced in a systematic manner, with an emphasis on transistor-level operation, the influence of device characteristics and parasitic effects, and input-output behavior in the time and frequency domains. This second edition has been revised extensively to expand and clarify some of the key topics and to provide a wide range of design examples and problems. New material has been added for

basic coverage of core topics, such as wide-band LNAs, noise feedback concept and noise cancellation, inductive-compensated band widening techniques for flat-gain or flat-delay characteristics, and basic communication system concepts that exploit the convergence and co-existence of Analog and Digital building blocks in RF systems. A new chapter (Chapter 5) has been added on Noise and Linearity, addressing key topics in a comprehensive manner. All of the other chapters have also been revised and largely re-written, with the addition of numerous solved design examples and exercise problems. Designed for senior undergraduate and graduate courses in RF CMOS circuits, RF circuit design, and high-frequency analog circuit design; Uses simple circuit models to enable a robust understanding of high-frequency design fundamentals; Employs solved design examples to familiarize the reader with the design flow, starting with knowledge-based and model-based hand-design and progressing to SPICE simulations; Introduces fine-tuning procedures in circuit design with an emphasis on key trade-offs; Demonstrates key criteria and parameters that are used to describe system-level performance. .

**Advances in Analog and RF IC Design for Wireless Communication Systems** Gabriele Manganaro 2013-05-13 The recent and dramatic increase in demand for mobile data communication, driven by consumer devices such as smartphones and tablets, is resulting in heightened technical challenges for the wireless infrastructure that lies as a bridge in-between these mobile terminals and the wired network transferring the data between final users. Several challenges arise in the design of the electronics behind the wireless infrastructure access points, or base-stations. This Chapter provides an overview of the present state, challenges and trends in the RF, analog and mixed signal electronics for wireless infrastructure and provides a frame to orient the reader of this book to the following chapters covering the specifics of the technologies involved.

**Low Power RF Circuit Design in Standard CMOS Technology** Unai Alvarado 2011-10-18 Low Power Consumption is one of the critical issues in the performance of small battery-powered handheld devices. Mobile terminals feature an ever increasing number of wireless communication alternatives including GPS, Bluetooth, GSM, 3G, WiFi or DVB-H. Considering that the total power available for each terminal is limited by the relatively slow increase in battery performance expected in the near future, the need for efficient circuits is now critical. This book presents the basic techniques available to design low power RF CMOS analogue circuits. It gives circuit designers a complete guide of alternatives to optimize power consumption and explains the application of these rules in the most common RF building blocks: LNA, mixers and PLLs. It is set out using practical examples and offers a unique perspective as it targets designers working within the standard CMOS process and all the limitations inherent in these technologies.

*Radio-Frequency Electronics* Jon B. Hagen 2009-06-11  
Covering the fundamentals applying to all radio devices, this is a perfect introduction to the subject for students and professionals.

*RF Circuit Design* Richard C. Li 2012-08-24 Summarizes the schemes and technologies in RF circuit design, describes the basic parameters of an RF system and the fundamentals of RF system design, and presents an introduction of the individual RF circuit block design. Forming the backbone of today's mobile and satellite communications networks, radio frequency (RF) components and circuits are incorporated into everything that transmits or receives a radio wave, such as mobile phones, radio, WiFi, and walkie talkies. *RF Circuit Design, Second Edition* immerses practicing and aspiring industry professionals in the complex world of RF design. Completely restructured and reorganized with new content, end-of-chapter exercises, illustrations, and an appendix, the book presents integral information in three complete sections: Part One explains the different methodologies between RF and digital circuit design and covers voltage and power transportation, impedance matching in narrow-band case and wide-band case, gain of a raw device, measurement, and grounding. It also goes over equipotentiality and current coupling on ground surface, as well as layout and packaging, manufacturability of product design, and radio frequency integrated circuit (RFIC). Part Two includes content on the main parameters and system analysis in RF circuit design, the fundamentals of differential pair and common-mode rejection ratio (CMRR), Balun, and system-on-a-chip (SOC). Part Three covers low-noise amplifier (LNA), power amplifier (PA), voltage-controlled oscillator (VCO), mixers, and tunable filters. *RF Circuit Design, Second Edition* is an ideal book for engineers and managers who work in RF circuit design and for courses in electrical or electronic engineering.

**Practical Digital Wireless Signals** Earl McCune 2010-02-04 Do you need to know what signal type to select for a wireless application? Quickly develop a useful expertise in digital modulation with this practical guide, based on the author's experience of over thirty years in industrial design. You will understand the physical meaning behind the mathematics of wireless signals and learn the intricacies and tradeoffs in signal selection and design. Six modulation families and twelve modulation types are covered in depth, together with a quantitative ranking of relative cost incurred to implement any of twelve modulation types. Extensive discussions of the Shannon Limit, Nyquist filtering, efficiency measures and signal-to-noise measures are provided, radio wave propagation and antennas, multiple access techniques, and signal coding principles are all covered, and spread spectrum and wireless system operation requirements are presented.

*Microwave Electronics* Giovanni Ghione 2017-11-30 A self-contained guide to microwave electronics, covering passive and active components, linear, low-noise and power amplifiers, microwave measurements, and CAD techniques. It is the ideal text for graduate and senior undergraduate students taking courses in microwave and radio-frequency electronics, as well as professional microwave engineers.

**Micromachined Circuits and Devices** Shiban Kishen Koul 2022-03-08 This book presents the design of different switching and resonant devices using the present state-of-the-art radio frequency (RF) micromachining (MEMS) technology. Different topologies of MEMS switches have been discussed considering optimum performances over microwave to millimeter wave frequency range. Wide varieties of micromachined switching networks starting from single-pole-double-throw (SPDT) to single-pole-fourteen-throw (SP14T) are discussed utilizing vertical and lateral actuation movements of the switch. Different transduction mechanisms of micromachined resonators are

highlighted that includes capacitive, piezoelectric, and piezoresistive types. The book provides major design guidelines for the development of MEMS-based digital phase shifters, tunable filters, and antennas with extensive measurement data. Apart from the radio frequency (RF) requirements, an extensive guideline is given for the improvement of the reliability of micromachined switches and digital phase shifters where multiple switches are operating simultaneously. It takes multiple iterations and extensive characterizations to conclude with a reliable MEMS digital phase shifter, and these aspects are given one of the prime attentions in this book. Detailed performance analysis of metamaterial inspired MEMS switches is then discussed for application in millimeter wave frequency bands up to about 170 GHz. The book concludes with future research activities of RF MEMS technology and its potential in space, defense, sensors, and biomedical applications.

**Radio Frequency Integrated Circuit Design** John W. M. Rogers 2014-05-14 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 authors' 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."

*RF Circuit Design* Reinhold Ludwig 2000-01 For upper-level Electrical Engineering introductory courses in RF Circuit Design and analog integrated circuits. This practical and comprehensive book introduces RF circuit design fundamentals with an emphasis on design methodologies. \* Provides MATLAB routines to carry out simple transmission line computations and allow the graphical display of the resulting impedance behaviors as part of the Smith Chart. \* Allows students to implement these software tools on their own PC. All m-files will be included on a bound in CD-ROM. \* Presents RF Amplifier Designs, including small and large signal designs, narrow versus broad band, low noise, and many others. \* Provides students with useful broad-based knowledge of common amplifier designs used in the industry. \* Discusses Matching Networks, such as T and P matching networks and single and double stub matching. It also includes Discrete and Microstrip Line matching techniques with computer simulations... \* Presents Scattering parameters such as realistic listings of S-parameters for transistors and transmission line. \* Highlights practical use of S-parameters in circuit design and performance evaluation. resistor, capacitor, and inductor networks. It also includes simulations in MATLAB to provide graphical display of circuit behavior and performance analysis. \* Introduces the Smith Chart as a design tool to monitor electric behavior of circuits. \* Introduces the generic forms of Oscillators and Mixers, including negative resistance condition, fixed-frequency, and YIG-tuned designs. \* Explains the most common oscillator designs used in many RF systems. \* Provides an overview of common filter types, including low, high, bandpass, Butterworth, and Chebyshev filters.



\* Provides design tools to enable students to develop a host of practically realizable filters. \* Discusses the high-frequency behavior of common circuit components, including the behavior of resistors, capacitors, and inductors. \* Helps students understand the difference of low versus high frequency responses. \* Introduces the theory of distributed parameters through a discussion on Transmission Lines. This includes line parameters, sources and load terminations, and voltage and current waves. circuits. \* Analyzes active/passive RF circuits through various network description models, especially the two-port network. This discussion also covers impedance, admittance, ABCD, h-parameter networks, and interrelations. \* Includes a number of important pedagogical features--Intersperses examples throughout each chapter, and includes self-written MATLAB routines and circuit simulations by a commercial RF software package. \* Assists students by clarifying and explaining the theoretical developments.

*Microwave and Wireless Measurement Techniques* Nuno Borges Carvalho 2013-10-03 Provides practical information on microwave and wireless metrology, from typical metrology parameters to building your own measurement benches.

*Radio-Frequency Integrated-Circuit Engineering* Cam Nguyen 2015-03-03 Radio-Frequency Integrated-Circuit Engineering addresses the theory, analysis and design of passive and active RFIC's using Si-based CMOS and Bi-CMOS technologies, and other non-silicon based technologies. The materials covered are self-contained and presented in such detail that allows readers with only undergraduate electrical engineering knowledge in EM, RF, and circuits to understand and design RFICs. Organized into sixteen chapters, blending analog and microwave engineering, Radio-Frequency Integrated-Circuit Engineering emphasizes the microwave engineering approach for RFICs. • Provides essential knowledge in EM and microwave engineering, passive and active RFICs, RFIC analysis and design techniques, and RF systems vital for RFIC students and engineers • Blends analog and microwave engineering approaches for RFIC design at high frequencies • Includes problems at the end of each chapter

**LCP for Microwave Packages and Modules** Anh-Vu H. Pham 2012-06-21 A comprehensive overview of electrical design using Liquid Crystal Polymer (LCP) at package, component and system levels, providing a detailed look at everything you need to know to get up-to-speed on the subject, including successful design details, techniques and potential pitfalls.

**Modern RF and Microwave Measurement Techniques** Valeria Teppati 2013-06-20 A comprehensive, hands-on review of the most up-to-date techniques in RF and microwave measurement, including practical advice on deployment challenges.

**Design of CMOS Phase-Locked Loops** Behzad Razavi 2019-12-31 This modern, pedagogic textbook from leading author Behzad Razavi provides a comprehensive and rigorous introduction to CMOS PLL design, featuring intuitive presentation of theoretical concepts, extensive circuit simulations, over 200 worked examples, and 250 end-of-chapter problems. The perfect text for senior undergraduate and graduate students.

The Design of CMOS Radio-Frequency Integrated Circuits Thomas H. Lee 2004 This book, first published in 2004, is an expanded and revised edition of Tom Lee's acclaimed RFIC text.

*Fundamentals of High-Frequency CMOS Analog Integrated Circuits* Duran Leblebici 2009-05-28 Includes plenty of design examples together with the key issues encountered in real-world design scenarios, for students and practising engineers.

mm-Wave Silicon Power Amplifiers and Transmitters Hossein Hashemi 2016-04-04 Build high-performance, spectrally clean, energy-efficient mm-wave power

amplifiers and transmitters with this cutting-edge guide to designing, modeling, analysing, implementing and testing new mm-wave systems. Suitable for students, researchers and practicing engineers, this self-contained guide provides in-depth coverage of state-of-the-art semiconductor devices and technologies, linear and nonlinear power amplifier technologies, efficient power combining systems, circuit concepts, system architectures and system-on-a-chip realizations. The world's foremost experts from industry and academia cover all aspects of the design process, from device technologies to system architectures. Accompanied by numerous case studies highlighting practical design techniques, tradeoffs and pitfalls, this is a superb resource for those working with high-frequency systems. *High-Frequency Integrated Circuits* Sorin Voinigescu 2013-02-28 A transistor-level, design-intensive overview of high speed and high frequency monolithic integrated circuits for wireless and broadband systems from 2 GHz to 200 GHz, this comprehensive text covers high-speed, RF, mm-wave, and optical fibre circuits using nanoscale CMOS, SiGe BiCMOS, and III-V technologies. Step-by-step design methodologies, end-of chapter problems, and practical simulation and design projects are provided, making this an ideal resource for senior undergraduate and graduate courses in circuit design. With an emphasis on device-circuit topology interaction and optimization, it gives circuit designers and students alike an in-depth understanding of device structures and process limitations affecting circuit performance.

**Radio Frequency Circuit Design** W. Alan Davis 2003-06-11 A much-needed, up-to-date guide to the rapidly growing area of RF circuit design, this book walks readers through a whole range of new and improved techniques for the analysis and design of receiver and transmitter circuits, illustrating them through examples from modern-day communications systems. The application of MMIC to RF design is also discussed.

Radio Frequency Integrated Circuits and Technologies Frank Ellinger 2008-09-11 The striking feature of this book is its coverage of the upper GHz domain. However, the latest technologies, applications and broad range of circuits are discussed. Design examples are provided including cookbook-like optimization strategies. This state-of-the-art book is valuable for researchers as well as for engineers in industry. Furthermore, the book serves as fruitful basis for lectures in the area of IC design.

**Millimeter-Wave Circuits for 5G and Radar** Gernot Hueber 2019-05-31 Discover the concepts, architectures, components, tools, and techniques needed to design millimeter-wave circuits for current and emerging wireless system applications. Focusing on applications in 5G, connectivity, radar, and more, leading experts in radio frequency integrated circuit (RFIC) design provide a comprehensive treatment of cutting-edge physical-layer technologies for radio frequency (RF) transceivers - specifically RF, analog, mixed-signal, and digital circuits and architectures. The full design chain is covered, from system design requirements through to building blocks, transceivers, and process technology. Gain insight into the key novelties of 5G through authoritative chapters on massive MIMO and phased arrays, and learn about the very latest technology developments, such as FinFET logic process technology for RF and millimeter-wave applications. This is an essential reading and an excellent reference for high-frequency circuit designers in both academia and industry.

SiGe Heterojunction Bipolar Transistors Peter Ashburn 2004-02-06 SiGe HBTs is a hot topic within the microelectronics community because of its applications potential within integrated circuits operating at radio frequencies. Applications range from high speed optical networking to wireless communication devices. The

addition of germanium to silicon technologies to form silicon germanium (SiGe) devices has created a revolution in the semiconductor industry. These transistors form the enabling devices in a wide range of products for wireless and wired communications. This book features: SiGe products include chip sets for wireless cellular handsets as well as WLAN and high-speed wired network applications Describes the physics and technology of SiGe HBTs, with coverage of Si and Ge bipolar transistors Written with the practising engineer in mind, this book explains the operating principles and applications of bipolar transistor technology. Essential reading for practising microelectronics engineers and researchers. Also, optical communications engineers and communication technology engineers. An ideal reference tool for masters level students in microelectronics and electronics engineering.

**Fast Techniques for Integrated Circuit Design** Mikael Sahrling 2019-08-15 Learn how to use estimation techniques to solve real-world IC design problems and accelerate design processes with this practical guide. *mm-Wave Silicon Technology* Ali M. Niknejad 2008-01-03 This book compiles and presents the research results from the past five years in mm-wave Silicon circuits. This area has received a great deal of interest from the research community including several university and research groups. The book covers device modeling, circuit building blocks, phased array systems, and antennas and packaging. It focuses on the techniques that uniquely take advantage of the scale and integration offered by silicon based technologies.

Planar Microwave Engineering Thomas H. Lee 2004-08-30 Modern wireless communications hardware is underpinned by RF and microwave design techniques. This insightful book contains a wealth of circuit layouts, design tips, and practical measurement techniques for building and testing practical gigahertz systems. The book covers everything you need to know to design, build, and test a high-frequency circuit. Microstrip components are discussed, including tricks for extracting good performance from cheap materials. Connectors and cables are also described, as are discrete passive components, antennas, low-noise amplifiers, oscillators, and frequency synthesizers. Practical measurement techniques are presented in detail, including the use of network analyzers, sampling oscilloscopes, spectrum analyzers, and noise figure meters. Throughout the focus is practical, and many worked examples and design projects are included. There is also a CD-ROM that contains a variety of design and analysis programs. The book is packed with indispensable information for students taking courses on RF or microwave circuits and for practising engineers.

**Low-Voltage CMOS RF Frequency Synthesizers** Howard Cam Luong 2004-08-26 A frequency synthesizer is one of the most critical building blocks in any wireless transceiver system. Its design is getting more and more challenging as the demand for low-voltage low-power high-frequency wireless systems continuously grows. As the supply voltage is decreased, many existing design techniques are no longer applicable. This book provides the reader with architectures and design techniques to enable CMOS frequency synthesizers to operate at low supply voltage at high frequency with good phase noise and low power consumption. In addition to updating the reader on many of these techniques in depth, this book will also introduce useful guidelines and step-by-step procedure on behaviour simulations of frequency synthesizers. Finally, three successfully demonstrated CMOS synthesizer prototypes with detailed design consideration and description will be elaborated to illustrate potential applications of the architectures and design techniques described. For engineers, managers and researchers working in radio-frequency integrated-circuit design for wireless applications.

*Circuit Design for RF Transceivers* Domine Leenaerts 2007-05-08 Applicable for bookstore catalogue **Foundations for Microstrip Circuit Design** Terry C. Edwards 2016-02-01 Building on the success of the previous three editions, *Foundations for Microstrip Circuit Design* offers extensive new, updated and revised material based upon the latest research. Strongly design-oriented, this fourth edition provides the reader with a fundamental understanding of this fast expanding field making it a definitive source for professional engineers and researchers and an indispensable reference for senior students in electronic engineering. Topics new to this edition: microwave substrates, multilayer transmission line structures, modern EM tools and techniques, microstrip and planar transmission line design, transmission line theory, substrates for planar transmission lines, Vias, wirebonds, 3D integrated interposer structures, computer-aided design, microstrip and power-dependent effects, circuit models, microwave network analysis, microstrip passive elements, and slotline design fundamentals.

The Design of CMOS Radio-Frequency Integrated Circuits Thomas H. Lee 1998-01-13 This comprehensive and insightful book sets out in detail how to design gigahertz-speed radio-frequency integrated circuits in CMOS technology. Starting with a history of radio to establish a foundation and to differentiate the discrete era from the IC age, the book reviews passive RLC networks, the characteristics of IC components and transistor models. The design of high-frequency tuned and broadband amplifiers follows, with an emphasis on approximate methods that provide important design insight as a complement to simulation results. Key RF building blocks, such as low-noise amplifiers (LNAs), mixers, power amplifiers, high spectral purity oscillators and frequency synthesizers are studied in detail. The book closes with an examination of transceiver architectures. With over 350 circuit diagrams and illustrations, and many homework problems, this will be an ideal textbook for anyone taking advanced undergraduate or graduate courses in RF electronics, as well as a useful reference for practising engineers.

**Radio Frequency Integrated Circuits and Systems** Hooman Darabi 2020-02-29 Equips students with essential industry-relevant knowledge through in-depth explanations, practical applications, examples, and exercises.

*Radio-Frequency Integrated-Circuit Engineering* Cam Nguyen 2015-03-04 Radio-Frequency Integrated-Circuit Engineering addresses the theory, analysis and design of passive and active RFIC's using Si-based CMOS and Bi-CMOS technologies, and other non-silicon based technologies. The materials covered are self-contained and presented in such detail that allows readers with only undergraduate electrical engineering knowledge in EM, RF, and circuits to understand and design RFICs. Organized into sixteen chapters, blending analog and microwave engineering, *Radio-Frequency Integrated-Circuit Engineering* emphasizes the microwave engineering approach for RFICs. • Provides essential knowledge in EM and microwave engineering, passive and active RFICs, RFIC analysis and design techniques, and RF systems vital for RFIC students and engineers • Blends analog and microwave engineering approaches for RFIC design at high frequencies • Includes problems at the end of each chapter

*Integrated Frequency Synthesizers for Wireless Systems* Andrea Leonardo Lacaita 2007-06-28 The increasingly demanding performance requirements of communications systems, as well as problems posed by the continued scaling of silicon technology, present numerous challenges for the design of frequency synthesizers in modern transceivers. This book contains everything you need to know for the efficient design of frequency

synthesizers for today's communications applications. If you need to optimize performance and minimize design time, you will find this book invaluable. Using an intuitive yet rigorous approach, the authors describe simple analytical methods for the design of phase locked loop (PLL) frequency synthesizers using scaled silicon CMOS and bipolar technologies. The entire design process, from system-level specification to layout, is covered comprehensively. Practical design examples are included, and implementation issues are addressed. A key problem-solving resource for practitioners in IC design, the book will also be of interest to researchers and graduate students in electrical engineering.

*High-Frequency Integrated Circuits South Asia Edition*  
Sorin Voinigescu 2017-04-01 A transistor-level, design-intensive overview of high speed and high frequency monolithic integrated circuits for wireless and broadband systems from 2 GHz to 200 GHz, this comprehensive text covers high-speed, RF, mm-wave, and optical fibre circuits using nanoscale CMOS, SiGe BiCMOS, and III-V technologies. Step-by-step design methodologies, end-of chapter problems, and practical simulation and design projects are provided, making this an ideal resource for senior undergraduate and graduate courses in circuit design. With an emphasis on device-circuit topology interaction and optimization, it gives circuit designers and students alike an in-depth understanding of device structures and process limitations affecting circuit performance.

**High-Frequency Integrated Circuits** Sorin Voinigescu  
2013-02-28 A transistor-level, design-intensive overview of high speed and high frequency monolithic integrated circuits for wireless and broadband systems from 2 GHz to 200 GHz, this comprehensive text covers high-speed, RF, mm-wave and optical fiber circuits using nanoscale CMOS, SiGe BiCMOS and III-V technologies. Step-by-step design methodologies, end-of-chapter problems and practical simulation and design projects are provided, making this an ideal resource for senior undergraduate

and graduate courses in circuit design. With an emphasis on device-circuit topology interaction and optimization, it gives circuit designers and students alike an in-depth understanding of device structures and process limitations affecting circuit performance.

**Ultra-wideband RF System Engineering** Thomas Zwick  
2013-10-03 This comprehensive summary of the state of the art in Ultra Wideband (UWB) system engineering takes you through all aspects of UWB design, from components through the propagation channel to system engineering aspects. Mathematical tools and basics are covered, allowing for a complete characterisation and description of the UWB scenario, in both the time and the frequency domains. UWB MMICs, antennas, antenna arrays, and filters are described, as well as quality measurement parameters and design methods for specific applications. The UWB propagation channel is discussed, including a complete mathematical description together with modeling tools. A system analysis is offered, addressing both radio and radar systems, and techniques for optimization and calibration. Finally, an overview of future applications of UWB technology is presented. Ideal for scientists as well as RF system and component engineers working in short range wireless technologies.

*Advances in Electronics, Communication and Computing*  
Akhtar Kalam 2017-10-27 This book is a compilation of research work in the interdisciplinary areas of electronics, communication, and computing. This book is specifically targeted at students, research scholars and academicians. The book covers the different approaches and techniques for specific applications, such as particle-swarm optimization, Otsu's function and harmony search optimization algorithm, triple gate silicon on insulator (SOI)MOSFET, micro-Raman and Fourier Transform Infrared Spectroscopy (FTIR) analysis, high-k dielectric gate oxide, spectrum sensing in cognitive radio, microstrip antenna, Ground-penetrating radar (GPR) with conducting surfaces, and digital image forgery detection. The contents of the book will be useful to academic and professional researchers alike.