

Essentials Of Rf And Microwave Grounding

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Electronics for Microwave Backhaul - Vittorio Camarchia 2016-03-31

This timely new resource presents an overview of the electronics of mobile network backhaul. Infrastructure planning, architecture evolution, digital controls, and countermeasures are all presented highlighting the building blocks of specific backhaul features. Tx and Rx design and antenna requirements and covered while examining the overall construction of the microwave radio hardware blocks. Single blocks are explored: the antenna, the analog transmitter and receiver, and the modem, recalling the most important aspects of transport networks and microwave link dimensioning. Essential theory is provided for each hardware block with an emphasis on present solutions. Authored by academic and industrial experts in the field, development and design engineers will benefit from the practical guidance in solving realistic issues and providing useful tips throughout the design process. This book guides readers through the historical evolution of microwave radios and the components of the next generation of mobile networks.

Radar RF Circuit Design - Nickolas Kingsley 2016-03-01

This authoritative new resource presents practical techniques for optimizing RF and microwave circuits for applications in radar systems design with an emphasis on current and emerging technologies. Professionals learn how to design RF components for radar systems and how to choose appropriate materials and packaging methods. This book explains how to integrate components while avoiding higher-level assembly issues and troubleshooting problems on the measurement bench. Theory and practical information are provided while addressing topics ranging from heat removal to digital circuit integration. This book is divided into three sections: the first section introduces the basics of microwave design, including transmission line theory and common materials used in RF circuits. The methods for creating accurate device models for both passive and active circuits are presented. The second part details the design of power amplifiers, low noise amplifiers, and passive elements. Both conventional and state-of-the-art design techniques are included with ample 'tips and tricks.' The last section concludes with a focus on component integration providing details on design methods for military operations, high manufacturing yield, and preventing measurement issues.

RF Circuits and Applications for Practicing Engineers - Mouqun Dong 2020-10-31

This comprehensive resource explains the theory of RF circuits and systems and the practice of designing them. The fundamentals for linear and low noise amplifier designs, including the S and noise parameters and their applications in amplifier designs and matching network designs using the Smith chart are covered. Theories of RF power amplifiers and high efficiency power amplifiers are also explained. The underpinnings of wireless communications systems as well as passive components

commonly used in RF circuits and measurements are discussed. RF measurement techniques and RF switches are also presented. The book explores stability criteria and the invariant property of lossless networks and includes detailed theoretical treatments. The basic concepts and techniques covered in this book are routinely used in today's engineering practice, especially from the perspective of printed circuit board (PCB) based RF circuit design and system integration. Intended for practicing engineers and circuit designers, this book focuses on practical topics in circuit design and measurement techniques. It bridges the gap between academic materials and real circuit designs using real circuit examples and practical tips. Readers develop a numerical feel for RF problems as well as awareness of the concepts of design for cost and design for manufacturing, which is a critical skill set for today's engineers working in an environment of commercial product development.

Millimeter-Wave GaN Power Amplifier Design - Edmar Camargo 2022-05-31

This book gives you – in one comprehensive and practical resource -- everything you need to successfully design modern and sophisticated power amplifiers at mmWave frequencies. The book provides an in-depth treatment of the design methodology for MMIC power amplifiers, then brings you step by step through the various phases of design, from the selection of technology and preliminary architecture considerations, to the effective design of the matching circuits and conversion of electrical-to-electromagnetic models. Detailed figures and numerous practical applications are included to help you gain valuable insights into these technologies and learn to identify the best path to a successful design. You'll be guided through a range of new mmWave power applications that show particular promise to support new 5G systems, while mastering the use of GaN technology that continues to dominate the power mmWave applications due to its high power, gain, and efficiency. This is a valuable resource for power amplifier design engineers, technicians, industry R&D staff, and anyone getting into the area of power MMICs who wants to learn how to design at mmWave frequencies.

Microwave and RF Semiconductor Control Device Modeling - Robert H. Caverly 2016-02-01

This comprehensive new resource presents a detailed look at the modeling and simulation of microwave semiconductor control devices and circuits. Fundamental PIN, MOSFET, and MESFET nonlinear device modeling are discussed, including the analysis of transient and harmonic behavior. Considering various control circuit topologies, the book analyzes a wide range of models, from simple approximations, to sophisticated analytical approaches. Readers find clear examples that provide guidance in how to use specific modeling techniques for their challenging projects

in the field. Numerous illustrations help practitioners better understand important device and circuit behavior, revealing the relationship between key parameters and results. This authoritative volume covers basic and complex mathematical models for the most common semiconductor control elements used in today's microwave and RF circuits and systems.

CMOS RFIC Design Principles - Robert Caverly 2007

CMOS (complementary metal oxide semiconductor) is a key digital integrated circuit technology that is widely used throughout the wireless communications industry. This resource offers guidance on designing CMOS RF integrated circuits. It provides design details on elemental and advanced CMOS RF circuits.

Microwave Network Design Using the Scattering Matrix - Janusz A. Dobrowolski 2010

This authoritative resource provides you with comprehensive and detailed coverage of the wave approach to microwave network characterization, analysis, and design using scattering parameters. For the first time in any book, all aspects and approaches to wave variables and the scattering matrix are explored. The book compares and contrasts voltage waves, travelling waves, pseudo waves, and power waves, and explains the differences between real scattering parameters, pseudo scattering parameters, and power scattering parameters. You find important discussions on standard scattering matrices and wave quantities, mixed mode wave variables, and noise wave variables with noise wave correlation matrices.

Moreover, the book presents clear methods for standard single ended multiport network design and noise analysis. This in-depth reference is packed with over 1,100 equations and numerous illustrations.

Reliable RF Power Amplifier Design Based on a Partitioning Design Approach - Rui Ma 2010

Front cover -- Titelseite -- Impressum -- Acknowledgments -- Contents -- List of Abbreviations and Acronyms -- Abstract -- Zusammenfassung -- Chapter 1 Introduction -- 1.1 Principle of the Partitioning Design Approach -- 1.2 Dissertation Organization -- Chapter 2 Investigation of Planar-Interconnection -- 2.1 Active Chip Device Interconnection -- 2.1.1 Die Attach -- 2.1.2 Wire Bonding Pad-To-Microstrip -- 2.2 Microstrip-to-Microstrip Interconnection -- 2.2.1 Soldering -- 2.2.2 Multi-Wire Bonding -- 2.2.3 Copper Ribbon -- 2.2.4 Silver-Painting -- Chapter 3 Analysis and Modeling of Passive SMD Components -- 3.1 SMD Resistor -- 3.2 SMD Capacitor -- 3.3 SMD Inductor -- Chapter 4 Modeling of AlGaAs/GaAs HEMT Chip Device -- 4.1 AlGaAs/GaAs HEMT Chip -- 4.2 Modeling Approach Overview -- 4.3 Small-Signal Modeling -- 4.3.1 Extrinsic Parameter Extraction -- 4.3.2 Intrinsic Parameter Extraction -- 4.4 Large-Signal Modeling -- 4.4.1 Gate Current and Charge Models -- 4.4.2 Drain Current Model -- 4.4.3 Model Verification -- Chapter 5 Demonstrator Design of a Class-AB Power Amplifier Following -- 5.1 Micro-Packaged Device Characterization -- 5.1.1 Small-Signal Performance -- 5.1.2 Large-Signal Performance -- 5.2 Bias Network Design -- 5.2.1 Drain Bias Network -- 5.2.2 Gate Bias Network -- 5.3 Matching Network Design -- 5.3.1 Matching Impedance Determination -- 5.4 Power Amplifier Performance Evaluation -- 5.4.1 Small-Signal Performance -- 5.4.2 Large-Signal Performance -- Chapter 6 Conclusions and Outlook -- Appendix -- Appendix A THLR In-Fixture Calibration -- Appendix B Precise Determination of Substrate Permittivity -- Appendix C Schematic Circuit of the Designed Power Amplifier Demonstrator -- Appendix D Power Amplifier Design Following the Conventional Design Approach -- References -- Back cover

Introduction to RF and Microwave Passive Components - Richard Wallace 2015-08-01

This authoritative new resource provides an overview and introduction to working with RF, microwave, and high frequency components. From transmission lines,

antennas, millimeter waves, ferrites, hybrids, power dividers and filters, this book focuses on practical, time-to-market issues to help with projects in the field. Keeping mathematics to a minimum, this comprehensive volume is packed with over 700 illustrations that help clarify key concepts. The reader will gain an in-depth understanding of the special characteristics exploited in microwave and high frequency design. The book is also used in industrial training courses.

Solid-State Microwave High-Power Amplifiers - Franco Sechi 2014-05-14

This practical resource offers expert guidance on the most critical aspects of microwave power amplifier design. This comprehensive book provides descriptions of all the major active devices, discusses large signal characterization, explains all the key circuit design procedures. Moreover you gain keen insight on the link between design parameters and technological implementation, helping you achieve optimal solutions with the most efficient utilization of available technologies. The book covers a broad range of essential topics, from requirements for high-power amplifiers, device models, phase noise and power combiners. to high-efficiency amplifiers, linear amplifier design, bias circuits, and thermal design.

High-Speed Circuit Board Signal Integrity, Second Edition - Stephen C. Thierauf 2017-04-30

This thoroughly updated leading-edge circuit design resource offers the knowledge needed to quickly pinpoint transmission problems that can compromise the entire circuit design. This new edition demonstrates how to apply EM theory to solve signal integrity problems with a practical application-oriented approach. Discussing both design and debug issues at gigabit per second data rates, the book serves as a practical reference for projects involving high-speed serial signaling on printed wiring boards. Step-by-step, this book goes from reviewing the essentials of linear circuit theory, to examining practical issues of pulse propagation along lossless and lossy transmission lines. It provides detailed guidelines for crosstalk, attenuation, power supply decoupling, and layer stackup tradeoffs (including pad/antipad tradeoffs). Other key topics include the construction of etched conductors, analysis of return paths and split planes, microstrip and stripline characteristics, and SMT capacitors. Filled with on-the-job-proven examples, this hands-on reference is the book that engineers can turn to time and again to design out and troubleshoot circuit signal loss and impedance problems.

Essentials of RF and Microwave Grounding - Eric Holzman 2006

"Supported with more than 174 illustrations and utilizing simple derivations and results from numerical electromagnetic simulations of real components, this single resource provides broad, intuitive know-how that helps practitioners overcome design challenges with speed and confidence."--Jacket.

Radar RF Circuit Design, Second Edition - Nickolas Kingsley 2022-02-28

This new edition of a previous bestseller gives you practical techniques for optimizing RF and microwave circuits for applications in radar systems design, with an emphasis on current and emerging technologies. Completely updated with new material, the book shows you how to design RF components for radar systems and how to choose appropriate materials and packaging methods. It takes you through classic techniques, to the state of the art, and finally to emerging technologies. You will learn: How to design high-frequency circuits for use in radar applications How to integrate components while avoiding higher-level assembly issues and troubleshooting problems on the measurement bench How to properly simulate, build, assemble, and test high-frequency circuits How to debug issues with hardware on the bench How to connect microwave theory to practical circuit

design Theory and practical information are provided while addressing topics ranging from heat removal to digital circuit integration. The book serves as a teaching aid for classic techniques that are still relevant today. It also demonstrates how these techniques are serving as the foundation for technologies to come. You will be equipped to consider future needs and emerging enabling technologies and confidently think (and design) outside the box to ensure future needs are met. The book also shows you how to incorporate modern design techniques often overlooked or underused, and will help you to better understand the capabilities and limitations of today's technology and the emerging technologies that are on the horizon to mitigate those limitations. This is a must-have resource for system-level radar designers who want to up their game in RF/microwave component design. It is also a great tool for RF/microwave engineers tasked or interested in designing components for radar systems. Students and new designers of radar components will also benefit and be well prepared to start designing immediately.

RF and Microwave Circuit Design - Charles E. Free 2021-09-14

RF and Microwave Circuit Design Provides up-to-date coverage of the fundamentals of high-frequency microwave technology, written by two leading voices in the field RF and Microwave Circuit Design: Theory and Applications is an authoritative, highly practical introduction to basic RF and microwave circuits. With an emphasis on real-world examples, the text explains how distributed circuits using microstrip and other planar transmission lines can be designed and fabricated for use in modern high-frequency passive and active circuits and sub-systems. The authors provide clear and accurate guidance on each essential aspect of circuit design, from the theory of transmission lines to the passive and active circuits that form the basis of modern high-frequency circuits and sub-systems. Assuming a basic grasp of electronic concepts, the book is organized around first principles and includes an extensive set of worked examples to guide student readers with no prior grounding in the subject of high-frequency microwave technology. Throughout the text, detailed coverage of practical design using distributed circuits demonstrates the influence of modern fabrication processes. Filling a significant gap in literature by addressing RF and microwave circuit design with a central theme of planar distributed circuits, this textbook: Provides comprehensive discussion of the foundational concepts of RF and microwave transmission lines introduced through an exploration of wave propagation along a typical transmission line Describes fabrication processes for RF and microwave circuits, including etched, thick-film, and thin-film RF circuits Covers the Smith Chart and its application in circuit design, S-parameters, Mason's non-touching loop rule, transducer power gain, and stability Discusses the influence of noise in high-frequency circuits and low-noise amplifier design Features an introduction to the design of high-frequency planar antennas Contains supporting chapters on fabrication, circuit parameters, and measurements Includes access to a companion website with PowerPoint slides for instructors, as well as supplementary resources Perfect for senior undergraduate students and first-year graduate students in electrical engineering courses, RF and Microwave Circuit Design: Theory and Applications will also earn a place in the libraries of RF and microwave professionals looking for a useful reference to refresh their understanding of fundamental concepts in the field.

Partitioning Design Approach for the Reliable Design of Highly Efficient RF Power Amplifiers - Roshanak Lehna 2017-11-13

The modern wireless communication systems require modulated signals with wide

modulation bandwidth. This, in turns, requires signals with very high dynamic range and peak-to-average power ratio (PAPR). This means that the amplifier in the base-station has to work at a power back-off as large as the dynamic range of the signal, so that the amplifier has a high linearity in this region. For the standard single-stage amplifiers, this large power back-off reduces the efficiency dramatically. In this work, a three-way Doherty power amplifier (DPA) aiming at high power efficiency within a dynamic range of 9.5 dB, is designed and fabricated using partitioning design approach. The partitioning design approach decomposes a complex design task into small-sized, well-controllable, and verifiable subcircuits. This advanced straight forward method has shown very promising results. Using this design approach, a three-way DPA has been designed to demonstrate the advantages of this reliable design technique as well. Based on the design of a single-stage power amplifier and proposing a novel output power combiner, a 6 W three-way DPA has been designed which allows the mandatory load modulation principle in three-way DPA structures to be realized with simpler elements, whereas the design of a standard Doherty combiner would have been very challenging and not practical due to the extremely small value of its characteristic line impedance. The proposed combiner is calculated for a three-way DPA with 2-mm AlGaIn/GaN-HEMTs. The simulation result shows a very good load modulation for the amplifier, which confirms the theoretical expectation for a three-way DPA. The efficiency of the designed 6 W three-way DPA at large back-off shows very promising values compared to recently reported amplifiers. The measured IMD3 products confirm the good linearity of the amplifier as well. Accordingly, the proposed power combiner and the design strategy are recommended to be used as the preferred option for designing three-way DPA structures with very high output power.

Foundations for Radio Frequency Engineering - Geyi Wen 2015-03-13

The book provides a comprehensive coverage of the fundamental topics in microwave engineering, antennas and wave propagation, and electromagnetic compatibility, including electromagnetic boundary value problems, waveguide theory, microwave resonators, antennas and wave propagation, microwave circuits, principles of electromagnetic compatibility designs, information theory and systems. Deals systematically with fundamental problems in radio frequency engineering, this important volume provides an updated treatment of radio frequency theory and techniques. The book can be used as a one-semester course for senior and first-year graduate students or as a reference for radio frequency engineers and applied physicists. Contents: Solutions of Electromagnetic Field

Problems Waveguides Microwave Resonators Microwave Circuits Antennas Propagation of Radio Waves Electromagnetic Compatibility Information Theory and Systems Readership: Academics, researchers, postgraduates and undergraduates in electrical & electronic engineering and applied physics. Keywords: Microwave Engineering; Antenna; Wave Propagation; Electromagnetic Compatibility

Design of RF and Microwave Amplifiers and Oscillators - Pieter L. D. Abrie 2009

This newly revised edition offers a comprehensive and current treatment of the subject and includes expanded derivations and problem sets, helping to make the material even more accessible and easier to master.

An Engineer's Guide to Automated Testing of High-Speed Interfaces, Second Edition - Jose Moreira 2016-04-30

This second edition of An Engineer's Guide to Automated Testing of High-Speed Interfaces provides updates to reflect current state-of-the-art high-speed digital testing with automated test equipment technology (ATE). Featuring clear examples,

this one-stop reference covers all critical aspects of automated testing, including an introduction to high-speed digital basics, a discussion of industry standards, ATE and bench instrumentation for digital applications, and test and measurement techniques for characterization and production environment. Engineers learn how to apply automated test equipment for testing high-speed digital I/O interfaces and gain a better understanding of PCI-Express 4, 100Gb Ethernet, and MIPI while exploring the correlation between phase noise and jitter. This updated resource provides expanded material on 28/32 Gbps NRZ testing and wireless testing that are becoming increasingly more pertinent for future applications. This book explores the current trend of merging high-speed digital testing within the fields of photonic and wireless testing.

Distributed Power Amplifiers for RF and Microwave Communications - Narendra Kumar 2015-06-01

This new resource presents readers with all relevant information and comprehensive design methodology of wideband amplifiers. This book specifically focuses on distributed amplifiers and their main components, and presents numerous RF and microwave applications including well-known historical and recent architectures, theoretical approaches, circuit simulation, and practical implementation techniques. A great resource for practicing designers and engineers, this book contains numerous well-known and novel practical circuits, architectures, and theoretical approaches with detailed description of their operational principles.

Microwave Journal - 2008

Microwave Power Amplifier Design with MMIC Modules - Howard Hausman 2018-06-30

Solid state power amplifiers (SSPA) are a critical part of many microwave systems. Designing SSPAs with monolithic microwave integrated circuits (MMIC) has boosted device performance to much higher levels focused on PA modules. This cutting-edge book offers engineers practical guidance in selecting the best power amplifier module for a particular application and interfacing the selected module with other power amplifier modules in the system. It also explains how to identify and mitigate peripheral issues concerning the PA modules, SSPAs, and microwave systems. This authoritative volume presents the critical techniques and underpinnings of SSPA design, enabling professionals to optimize device and system performance. Engineers gain the knowledge they need to evaluate the optimum topologies for the design of a chain of microwave devices, including power amplifiers. Additionally, the book addresses the interface between the microwave subsystems and the primary DC power, the control and monitoring circuits, and the thermal and EMI paths. Packed with 240 illustrations and over 430 equations, this detailed book provides the practical tools engineers need for their challenging projects in the field.

Advanced Radio Frequency Antennas for Modern Communication and Medical Systems - Albert Sabban 2020-09-23

The main objective of this book is to present novel radio frequency (RF) antennas for 5G, IOT, and medical applications. The book is divided into four sections that present the main topics of radio frequency antennas. The rapid growth in development of cellular wireless communication systems over the last twenty years has resulted in most of world population owning smartphones, smart watches, I-pads, and other RF communication devices. Efficient compact wideband antennas are crucial in RF communication devices. This book presents information on planar antennas, cavity antennas, Vivaldi antennas, phased arrays, MIMO antennas, beamforming phased array reconfigurable Pabry-Perot cavity antennas, and time

modulated linear array.

Microwave Circulator Design, Second Edition - Douglas K. Linkhart 2014-02-01
Circulator design has advanced significantly since the first edition of this book was published 25 years ago. The objective of this second edition is to present theory, information, and design procedures that will enable microwave engineers and technicians to design and build circulators successfully. This resource contains a discussion of the various units used in the circulator design computations, as well as covers the theory of operation. This book presents numerous applications, giving microwave engineers new ideas about how to solve problems using circulators. Design examples are provided, which demonstrate how to apply the information to real-world design tasks.

American Book Publishing Record - 2005

Lumped Elements for RF and Microwave Circuits, Second Edition - Inder J. Bahl 2022-12-31

Fully updated and including entirely new chapters, this Second Edition provides in-depth coverage of the different types of RF and microwave circuit elements, including inductors, capacitors, resistors, transformers, via holes, airbridges, and crossovers. Featuring extensive formulas for lumped elements, design trade-offs, and an updated and current list of references, the book helps you understand the value and usefulness of lumped elements in the design of RF, microwave and millimeter wave components and circuits. You'll find a balanced treatment between standalone lumped elements and their circuits using MICs, MMICs and RFICs technologies. You'll also find detailed information on a broader range RFICs that was not available when the popular first edition was published. The book captures – in one consolidated volume -- the fundamentals, equations, modeling, examples, references and overall procedures to design, test and produce microwave components that are indispensable in industry and academia today. With its superb organization and expanded coverage of the subject, this is a must-have, go-to resource for practicing engineers and researchers in industry, government and university and microwave engineers working in the antenna area. Students will also find it a useful reference with its clear explanations, many examples and practical modeling guidelines.

The RF and Microwave Handbook - 3 Volume Set - Mike Golio 2018-10-08

By 1990 the wireless revolution had begun. In late 2000, Mike Golio gave the world a significant tool to use in this revolution: The RF and Microwave Handbook. Since then, wireless technology spread across the globe with unprecedented speed, fueled by 3G and 4G mobile technology and the proliferation of wireless LANs. Updated to reflect this tremendous growth, the second edition of this widely embraced, bestselling handbook divides its coverage conveniently into a set of three books, each focused on a particular aspect of the technology. Six new chapters cover WiMAX, broadband cable, bit error ratio (BER) testing, high-power PAs (power amplifiers), heterojunction bipolar transistors (HBTs), as well as an overview of microwave engineering. Over 100 contributors, with diverse backgrounds in academic, industrial, government, manufacturing, design, and research reflect the breadth and depth of the field. This eclectic mix of contributors ensures that the coverage balances fundamental technical issues with the important business and marketing constraints that define commercial RF and microwave engineering. Focused chapters filled with formulas, charts, graphs, diagrams, and tables make the information easy to locate and apply to practical cases. The new format, three tightly focused volumes, provides not only increased information but also ease of

use. You can find the information you need quickly, without wading through material you don't immediately need, giving you access to the caliber of data you have come to expect in a much more user-friendly format.

RF and Microwave Circuits, Measurements, and Modeling - Mike Golio 2018-10-08

Highlighting the challenges RF and microwave circuit designers face in their day-to-day tasks, *RF and Microwave Circuits, Measurements, and Modeling* explores RF and microwave circuit designs in terms of performance and critical design specifications. The book discusses transmitters and receivers first in terms of functional circuit block and then examines each block individually. Separate articles consider fundamental amplifier issues, low noise amplifiers, power amplifiers for handset applications and high power, power amplifiers. Additional chapters cover other circuit functions including oscillators, mixers, modulators, phase locked loops, filters and multiplexers. New chapters discuss high-power PAs, bit error rate testing, and nonlinear modeling of heterojunction bipolar transistors, while other chapters feature new and updated material that reflects recent progress in such areas as high-volume testing, transmitters and receivers, and CAD tools. The unique behavior and requirements associated with RF and microwave systems establishes a need for unique and complex models and simulation tools. The required toolset for a microwave circuit designer includes unique device models, both 2D and 3D electromagnetic simulators, as well as frequency domain based small signal and large signal circuit and system simulators. This unique suite of tools requires a design procedure that is also distinctive. This book examines not only the distinct design tools of the microwave circuit designer, but also the design procedures that must be followed to use them effectively.

Vertical GaN and SiC Power Devices - Kazuhiro Mochizuki 2018-04-30

This unique new resource provides a comparative introduction to vertical Gallium Nitride (GaN) and Silicon Carbide (SiC) power devices using real commercial device data, computer, and physical models. This book uses commercial examples from recent years and presents the design features of various GaN and SiC power components and devices. Vertical versus lateral power semiconductor devices are explored, including those based on wide bandgap materials. The abstract concepts of solid state physics as they relate to solid state devices are explained with particular emphasis on power solid state devices. Details about the effects of photon recycling are presented, including an explanation of the phenomenon of the family tree of photon-recycling. This book offers in-depth coverage of bulk crystal growth of GaN, including hydride vapor-phase epitaxial (HVPE) growth, high-pressure nitrogen solution growth, sodium-flux growth, ammonothermal growth, and sublimation growth of SiC. The fabrication process, including ion implantation, diffusion, oxidation, metallization, and passivation is explained. The book provides details about metal-semiconductor contact, unipolar power diodes, and metal-insulator-semiconductor (MIS) capacitors. Bipolar power diodes, power switching devices, and edge terminations are also covered in this resource.

RF and Microwave Circuit Design - Charles E. Free 2021-09-03

RF and Microwave Circuit Design Provides up-to-date coverage of the fundamentals of high-frequency microwave technology, written by two leading voices in the field. *RF and Microwave Circuit Design: Theory and Applications* is an authoritative, highly practical introduction to basic RF and microwave circuits. With an emphasis on real-world examples, the text explains how distributed circuits using microstrip and other planar transmission lines can be designed and fabricated for use in modern high-frequency passive and active circuits and sub-systems. The

authors provide clear and accurate guidance on each essential aspect of circuit design, from the theory of transmission lines to the passive and active circuits that form the basis of modern high-frequency circuits and sub-systems. Assuming a basic grasp of electronic concepts, the book is organized around first principles and includes an extensive set of worked examples to guide student readers with no prior grounding in the subject of high-frequency microwave technology. Throughout the text, detailed coverage of practical design using distributed circuits demonstrates the influence of modern fabrication processes. Filling a significant gap in literature by addressing RF and microwave circuit design with a central theme of planar distributed circuits, this textbook: Provides comprehensive discussion of the foundational concepts of RF and microwave transmission lines introduced through an exploration of wave propagation along a typical transmission line Describes fabrication processes for RF and microwave circuits, including etched, thick-film, and thin-film RF circuits Covers the Smith Chart and its application in circuit design, S-parameters, Mason's non-touching loop rule, transducer power gain, and stability Discusses the influence of noise in high-frequency circuits and low-noise amplifier design Features an introduction to the design of high-frequency planar antennas Contains supporting chapters on fabrication, circuit parameters, and measurements Includes access to a companion website with PowerPoint slides for instructors, as well as supplementary resources Perfect for senior undergraduate students and first-year graduate students in electrical engineering courses, *RF and Microwave Circuit Design: Theory and Applications* will also earn a place in the libraries of RF and microwave professionals looking for a useful reference to refresh their understanding of fundamental concepts in the field.

RF and Microwave Semiconductor Device Handbook - Mike Golio 2017-12-19

Offering a single volume reference for high frequency semiconductor devices, this handbook covers basic material characteristics, system level concerns and constraints, simulation and modeling of devices, and packaging. Individual chapters detail the properties and characteristics of each semiconductor device type, including: Varactors, Schottky diodes, transit-time devices, BJTs, HBTs, MOSFETs, MESFETs, and HEMTs. Written by leading researchers in the field, the *RF and Microwave Semiconductor Device Handbook* provides an excellent starting point for programs involving development, technology comparison, or acquisition of RF and wireless semiconductor devices.

Frequency Synthesizers - Alexander Chenakin 2011

A frequency synthesizer is an electronic system for generating any of a range of frequencies from a single fixed oscillator. They are found in modern devices like radio receivers, mobile phones, and GPS systems. This comprehensive resource offers RF and microwave engineers a thorough overview of both well-established and recently developed frequency synthesizer design techniques. Professionals find expert guidance on all design aspects, including main architectures, key building blocks, and practical circuit implementation. Engineers learn the development process and gain a solid understanding of how to build a synthesizer from a basic diagram to the final product. Starting with a simple single-loop PLL example, the book progressively examines various alternatives -- fractional-N, DDS, frequency offset, multiloop and more OCO to achieve required performance objectives. This unique volume gathers a collection of block diagrams, clever circuits, design recipes, and other hard-to-find information that is usually treated as OCO secrets. Written in a simple yet rigorous style with numerous illustrations, the book is an all-in-one reference for both beginner and experienced designers.

Frequency Measurement Technology - Ignacio Llamas-Garro 2017-12-31

This unique first-of-its-kind resource provides practical coverage of the design and implementation of frequency measurement receivers, which aid in identifying unknown signals. The technologies used in frequency measurement interferometry-based on-delay lines and filters are explored in this book. Practitioners also find concrete examples of microwave photonics implementations. The designs and concepts that cover conventional photonic instantaneous frequency measurement (IFM) circuits are explained. This book provides details on new designs for microwave photonic circuits and reconfigurable frequency measurement (RFM) circuits using diodes and MicroElectroMechanical Systems (MEMS). This book explains the many diverse applications of frequency measurement that are used in defense, radar, and communications. The instrumentation used to perform frequency measurements is explained, including the use of block analysis for network and spectrum analyzers and calibration techniques. Readers learn the advantages of using frequency measurement based on microwave/RF techniques, including immunity to electromagnetic interference, low loss, compatibility with fiber signal distribution, and parallel processing signals. Moreover, readers gain insight into the future of frequency measurement receivers. The book examines both the underpinnings and the implementation of frequency measurement receivers using many diverse technological platforms.

Nonlinear Design: FETs and HEMTs - Peter H. Ladbrooke 2021-11-30

Despite its continuing popularity, the so-called standard circuit model of compound semiconductor field-effect transistors (FETs) and high electron mobility transistors (HEMTs) is shown to have a limitation for nonlinear analysis and design: it is valid only in the static limit. When the voltages and currents are time-varying, as they must be for these devices to have any practical use, the model progressively fails for higher specification circuits. This book shows how to reform the standard model to render it fully compliant with the way FETs and HEMTs actually function, thus rendering it valid dynamically. Proof-of-principle is demonstrated for several practical circuits, including a frequency doubler and amplifiers with demanding performance criteria. Methods for extracting both the reformulated model and the standard model are described, including a scheme for re-constructing from S-parameters the bias-dependent dynamic (or RF) I(V) characteristics along which devices work in real-world applications, and as needed for the design of nonlinear circuits using harmonic-balance and time-domain simulators. The book includes a historical review of how variations on the standard model theme evolved, leading up to one of the most widely used—the Angelov (or Chalmers) model.

The RF and Microwave Handbook - Mike Golio 2000-12-20

The recent shift in focus from defense and government work to commercial wireless efforts has caused the job of the typical microwave engineer to change dramatically. The modern microwave and RF engineer is expected to know customer expectations, market trends, manufacturing technologies, and factory models to a degree that is unprecedented in the

Microwave Differential Circuit Design Using Mixed-mode S-parameters - William Richard Eisenstadt 2006

Gain hands-on understanding of powerful new mixed-mode scattering parameter techniques and their applications in microwave circuit design, straight from the inventors of the techniques themselves. This groundbreaking resource uses the original research and application work in the field to describe mixed-mode S-parameter principles. Supported with over 150 illustrations, the book thoroughly

explains practical techniques that help you more effectively analyze differential and multi-port systems; measure and describe multi-port circuit performance; and conduct differential circuit analyses for isolation, crosstalk, stability, noise reduction, and balance.

Substrate Noise Coupling in Analog/RF Circuits - Stephane Bronckers 2010

This book presents case studies to illustrate that careful modeling of the assembly characteristics and layout details is required to bring simulations and measurements into agreement. Engineers learn how to use a proper combination of isolation structures and circuit techniques to make analog/RF circuits more immune to substrate noise. Topics include substrate noise propagation, passive isolation structures, noise couple in active devices, measuring the coupling mechanisms in analog/RF circuits, prediction of the impact of substrate noise on analog/RF circuits, and noise coupling in analog/RF systems.

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.

On-Wafer Microwave Measurements and De-embedding - Errikos Lourandakis 2016-07-31

This new authoritative resource presents the basics of network analyzer measurement equipment and troubleshooting errors involved in the on-wafer microwave measurement process. This book bridges the gap between theoretical and practical information using real-world practices that address all aspects of on-wafer passive device characterization in the microwave frequency range up to 60GHz. Readers find data and measurements from silicon integrated passive devices fabricated and tested in advance CMOS technologies. Basic circuit equations, terms and fundamentals of time and frequency domain analysis are covered. This book also explores the basics of vector network analyzers (VNA), two port S-parameter measurement routines, signal flow graphs, network theory, error models and VNA calibrations with the use of calibration standards.

Microwave and Millimeter-Wave Vacuum Electron Devices: Inductive Output Tubes, Klystrons, Traveling-Wave Tubes, Magnetrons, Crossed-Field Amplifiers, and Gyrotrons - A.S. Gilmour, Jr. 2020-04-30

Written by an internationally recognized as an expert on the subject of microwave (MW) tubes, this book presents and describes the many types of microwave tubes, and despite competition from solid-state devices (those using GaN, SiC, et cetera), which continue to be used widely and find new applications in defense, communications, medical, and industrial drying. Helix traveling wave tubes (TWTs), as well as coupled cavity TWTs are covered. Klystrons, and how they work, are described, along with the physics behind it and examples of devices and their uses. Vacuum electron devices are explained in detail and examines the harsh environment that must exist in tubes if they are to operate properly. The secondary emission process and its role in the operation of crossed-field devices is also discussed. The design of collectors for linear-beam tubes, including power dissipation and power recovery, are explored. Discussions of important noise sources and techniques that can be used to minimize their effects are also included. Presented in full color, this book contains a balance of practical and theoretical material so that those new to microwave tubes as well as experienced microwave tube technicians, engineers, and managers can benefit from its use.

Si-RF Technology - Ayan Karmakar 2019-05-10

This book discusses the recent research developments of various passive microwave circuits on silicon substrate and demonstrated operations catering for multiple frequency bands. It covers the design, modelling, process fabrication and

characterization aspects with practical examples. The book will be of use to researchers and engineers working in the field of RF or microwave engineering, who can use the techniques and approaches effectively without having to refer to multiple sources.