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Since the 1997 publication of "Silicon Carbide - A Review of Fundamental Questions and Applications to Current Device Technology" edited by Choyke, et al., there has been impressive progress in both the fundamental and developmental aspects of the SiC field. So there is a growing need to update the scientific community on the important events in research and development since then. The editors have again gathered an outstanding team of the world's leading SiC researchers and design engineers to write on the most recent developments in SiC.

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

An up-to-date, practical guide on upgrading from silicon to GaN, and how to use GaN transistors in power conversion systems design This updated, third edition of a popular book on GaN transistors for efficient power conversion has been substantially expanded to keep students and practicing power conversion engineers ahead of the learning curve in GaN technology advancements. Acknowledging that GaN transistors are not one-to-one replacements for the current MOSFET technology, this book serves as a practical guide for understanding basic GaN transistor construction, characteristics, and applications. Included are discussions on the fundamental physics of these power semiconductors, layout, and other circuit design considerations, as well as specific application examples demonstrating design techniques when employing GaN devices. GaN Transistors for Efficient Power Conversion, 3rd Edition brings key updates to the chapters of Driving GaN Transistors; Modeling, Simulation, and Measurement of GaN Transistors; DC-DC Power Conversion; Envelope Tracking; and Highly Resonant Wireless Energy Transfer. It also offers new chapters on Thermal Management, Multilevel Converters, and Lidar, and revises many others throughout. Written by leaders in the power semiconductor field and industry pioneers in GaN power transistor technology and applications Updated with 35% new material, including three new chapters on Thermal Management, Multilevel Converters, Wireless Power, and Lidar Features practical guidance on formulating specific circuit designs when constructing power conversion systems using GaN transistors A valuable resource for professional engineers, systems designers, and electrical engineering students who need to fully understand the state-of-the-art GaN Transistors for Efficient Power Conversion, 3rd Edition is an essential learning tool and reference guide that enables power conversion engineers to design energy-efficient, smaller, and more cost-effective products using GaN transistors.

This book provides analysis and discusses the design of various MOSFET technologies which are used for the design of Double-Pole Four-Throw (DP4T) RF switches for next generation communication systems. The authors discuss the design of the (DP4T) RF switch by using the Double-Gate (DG) MOSFET, as well as the Cylindrical Surrounding double-gate (CSDG) MOSFET. The effect of HFO2 (high dielectric material) in the design of DG MOSFET and CSDG MOSFET is also explored. Coverage includes comparison of Single-gate MOSFET and Double-gate MOSFET switching parameters, as well as testing of MOSFETs parameters using image acquisition.

This book constitutes the proceedings of three International Conferences, NeCoM 2011, on Networks & Communications, WeST 2011, on Web and Semantic Technology, and WiMoN 2011, on Wireless and Mobile Networks, jointly held in Chennai, India, in July 2011. The 74 revised full papers presented were carefully reviewed and selected from numerous submissions. The papers address all technical and practical aspects of networks and communications in wireless and mobile networks dealing with issues such as network protocols and wireless networks, data communication technologies, and network security; they present knowledge and results in theory, methodology and applications of the Web and semantic technologies; as well as current research on wireless and mobile communications, networks, protocols and on wireless and mobile security.

Power Electronics Handbook, Fourth Edition, brings together over 100 years of combined experience in the specialist areas of power engineering to offer a fully revised and updated expert guide to total power solutions. Designed to provide the best technical and most commercially viable solutions available, this handbook undertakes any or all aspects of a project requiring specialist design, installation, commissioning and maintenance services. Comprising a complete revision throughout and enhanced chapters on semiconductor diodes and transistors and thyristors, this volume includes renewable resource content useful for the new generation of engineering professionals. This market leading reference has new chapters covering electric traction theory and motors and wide band gap (WBG) materials and devices. With this book in hand, engineers will be able to execute design, analysis and evaluation of assigned projects using sound engineering principles and adhering to the business policies and product/program requirements. Includes a list of leading international academic and professional contributors Offers practical concepts and developments for laboratory test plans Includes new technical chapters on electric vehicle charging and traction theory and motors Includes renewable resource content useful for the new generation of engineering professionals

During the last decade many new concepts have been proposed for improving the performance of power MOSFETs. The results of this research are dispersed in the technical literature among journal articles and abstracts of conferences. Consequently, the information is not readily available to researchers and practicing engineers in the power device

community. There is no cohesive treatment of the ideas to provide an assessment of the relative merits of the ideas. "Advanced Power MOSFET Concepts" provides an in-depth treatment of the physics of operation of advanced power MOSFETs. Analytical models for explaining the operation of all the advanced power MOSFETs will be developed. The results of numerical simulations will be provided to give additional insight into the device physics and validate the analytical models. The results of two-dimensional simulations will be provided to corroborate the analytical models and give greater insight into the device operation.

This exciting new resource investigates the function of RF communication in electronic warfare systems. The book provides in-depth coverage of how RF signals must be constructed to perform jamming missions, which prevent a receiver from properly extracting a target signal. Technical descriptions of oscillators and modulators, which generate the RF signals, are presented and explored. Power supplies that generate adequate power for fueling high power amplifiers are also described and their operations investigated. Oscillator basics, including principles of oscillator operation, phase locked loop synthesizers and direct digital synthesis are examined. Fundamentals of RF communications, including power supplies for RF power amplifiers, are included, making it useful for both novice and advanced practitioners. Written by a prominent expert in the field, this authoritative book is the first available that combines the topics of electronic warfare and oscillator design and analysis.

The IGBT device has proved to be a highly important Power Semiconductor, providing the basis for adjustable speed motor drives (used in air conditioning and refrigeration and railway locomotives), electronic ignition systems for gasolinepowered motor vehicles and energy-saving compact fluorescent light bulbs. Recent applications include plasma displays (flat-screen TVs) and electric power transmission systems, alternative energy systems and energy storage. This book is the first available to cover the applications of the IGBT, and provide the essential information needed by applications engineers to design new products using the device, in sectors including consumer, industrial, lighting, transportation, medical and renewable energy. The author, B. Jayant Baliga, invented the IGBT in 1980 while working for GE. His book will unlock IGBT for a new generation of engineering applications, making it essential reading for a wide audience of electrical engineers and design engineers, as well as an important publication for semiconductor specialists. Essential design information for applications engineers utilizing IGBTs in the consumer, industrial, lighting, transportation, medical and renewable energy sectors. Readers will learn the methodology for the design of IGBT chips including edge terminations, cell topologies, gate layouts, and integrated current sensors. The first book to cover applications of the IGBT, a device manufactured around the world by more than a dozen companies with sales exceeding \$5 Billion; written by the inventor of the device.

This book gathers a collection of papers by international experts that were presented at the International Conference on NextGen Electronic Technologies (ICNETS2-2016). ICNETS2 encompassed six symposia covering all aspects of the electronics and communications domains, including relevant nano/micro materials and devices. Highlighting the latest research on nanoelectronic materials and devices, the book offers a valuable guide for researchers, practitioners and students working in the core areas of functional electronics nanomaterials, nanocomposites for energy application, sensing and high strength materials and simulation of novel device design structures for ultra-low power applications. Power semiconductor devices are widely used for the control and management of electrical energy. The improving performance of power devices has enabled cost reductions and efficiency increases resulting in lower fossil fuel usage and less environmental pollution. This book provides the first cohesive treatment of the physics and design of silicon carbide power devices with an emphasis on unipolar structures. It uses the results of extensive numerical simulations to elucidate the operating principles of these important devices. Sample Chapter(s). Chapter 1: Introduction (72 KB). Contents: Material Properties and Technology; Breakdown Voltage; PiN Rectifiers; Schottky Rectifiers; Shielded Schottky Rectifiers; Metal-Semiconductor Field Effect Transistors; The Baliga-Pair Configuration; Planar Power MOSFETs; Shielded Planar MOSFETs; Trench-Gate Power MOSFETs; Shielded Trench-Gate MOSFETs; Charge Coupled Structures; Integral Diodes; Lateral High Voltage FETs; Synopsis. Readership: For practising engineers working on power devices, and as a supplementary textbook for a graduate level course on power devices.

This is a rigorous tutorial on radio frequency and microwave power amplifier design, teaching the circuit design techniques that form the microelectronic backbones of modern wireless communications systems. Suitable for self-study, corporate training, or Senior/Graduate classroom use, the book combines analytical calculations and computer-aided design techniques to arm electronic engineers with every possible method to improve their designs and shorten their design time cycles.

Fundamentals of Power Semiconductor Devices provides an in-depth treatment of the physics of operation of power semiconductor devices that are commonly used by the power electronics industry. Analytical models for explaining the operation of all power semiconductor devices are shown. The treatment here focuses on silicon devices but includes the unique attributes and design requirements for emerging silicon carbide devices. The book will appeal to practicing engineers in the power semiconductor device community.

This second edition has been substantially expanded to keep students and practicing power conversion engineers ahead of the learning curve in GaN technology advancements. Acknowledging that GaN transistors are not one-to-one replacements for the current MOSFET technology, it serves as a practical guide for understanding basic GaN transistor

construction, characteristics, and applications. Included are discussions on the fundamental physics of these power semiconductors, layout and other circuit design considerations, as well as specific application examples demonstrating design techniques when employing GaN devices. Topics include: discussions on device-circuit interactions; practical guidance on formulating specific circuit designs when constructing power conversion systems using GaN transistors. -- In recent years, power electronics have been intensely contributing to the development and evolution of new structures for the processing of energy. They can be used in a wide range of applications ranging from power systems and electrical machines to electric vehicles and robot arm drives. In conjunction with the evolution of microprocessors and advanced control theories, power electronics are playing an increasingly essential role in our society. Thus, in order to cope with the obstacles lying ahead, this book presents a collection of original studies and modeling methods which were developed and published in the field of electrical energy conditioning and control by using circuits and electronic devices, with an emphasis on power applications and industrial control. Researchers have contributed 19 selected and peer-reviewed papers covering a wide range of topics by addressing a wide variety of themes, such as motor drives, AC–DC and DC–DC converters, multilevel converters, varistors, and electromagnetic compatibility, among others. The overall result is a book that represents a cohesive collection of inter-/multidisciplinary works regarding the industrial applications of power electronics.

This extensively revised edition offers a comprehensive, practical, up-to-date understanding of how to tackle a power amplifier design with confidence and quickly determine the cause of malfunctioning hardware.

Silicon RF Power MOSFETS World Scientific

This book provides an overview of current efficiency enhancement and linearization techniques for silicon power amplifier designs. It examines the latest state of the art technologies and design techniques to address challenges for RF cellular mobile, base stations, and RF and mmW WLAN applications. Coverage includes material on current silicon (CMOS, SiGe) RF and mmW power amplifier designs, focusing on advantages and disadvantages compared with traditional GaAs implementations. With this book you will learn: The principles of linearization and efficiency improvement techniques The architectures allowing the optimum design of multimode Si RF and mmW power amplifiers How to make designs more efficient by employing new design techniques such as linearization and efficiency improvement Layout considerations Examples of schematic, layout, simulation and measurement results Addresses the problems of high power generation, faithful construction of non-constant envelope constellations, and efficient and well control power radiation from integrated silicon chips Demonstrates how silicon technology can solve problems and trade-offs of power amplifier design, including price, size, complexity and efficiency Written and edited by the top contributors to the field

Easily design today's wireless systems and circuits Design an entire radio system from the ground up instead of relying on a simple plug-in selection of circuits to be modified. Avoid an arduous trek through theory and mathematical derivations. Cotter Sayre's Complete Wireless Design covers wireless hardware design more thoroughly than any other handbook —and does it without burying you in math. This new guide from today's bestselling wireless author gives you all the skills you need to design wireless systems and circuits. If you want to climb the learning curve with grace, and start designing what you need immediately, this reasonably priced resource is your best choice. It's certain to be the most-used reference in your wireless arsenal for designing cutting-edge filters, amplifiers, RF switches, oscillators, and more. You get: Simplified calculations for impedance matching, analysis of wireless links, and completing a frequency plan Real-world examples of designing with RFIC's and MMIC's Full circuit and electromagnetic software simulations More

Cellular telephones, satellite communications and radar systems are adding to the increasing demand for radio frequency circuit design principles. At the same time, several generations of digitally-oriented graduates are missing the essential RF skills. This book contains a wealth of valuable design information difficult to find elsewhere. It's a complete 'tool kit' for successful RF circuit design. Written by experienced RF design engineers from Motorola's semiconductors product section. Book covers design examples of circuits (e.g. amplifiers; oscillators; switches; pulsed power; modular systems; wiring state-of-the-art devices; design techniques).

Major developments in the semiconductor industry are on the horizon through the use of two-dimensional (2D) materials, such as graphene and transition metal dichalcogenides, for integrated circuits (ICs). 2D Materials for Nanoelectronics is the first comprehensive treatment of these materials and their applications in nanoelectronic devices. Comprised of chapters authored by internationally recognised researchers, this book: Discusses the use of graphene for high-frequency analog circuits Explores logic and photonic applications of molybdenum disulfide (MoS<sub>2</sub>) Addresses novel 2D materials including silicene, germanene, stanene, and phosphorene Considers the use of 2D materials for both field-effect transistors (FETs) and logic circuits Provides background on the simulation of structural, electronic, and transport properties from first principles 2D Materials for Nanoelectronics presents extensive, state-of-the-art coverage of the fundamental and applied aspects of this exciting field.

This is a one-stop guide for circuit designers and system/device engineers, covering everything from CAD to reliability.

"The world-wide proliferation of cellular networks has revolutionized telecommunication systems. The transition from Analog to Digital RF technology enabled substantial increase in voice traffic using available spectrum, and subsequently the delivery of digitally based text messaging, graphics and even streaming video. The deployment of digital networks has required migration to multi-carrier RF power amplifiers with stringent demands on linearity and efficiency. This book describes the physics, design considerations and RF performance of silicon power Metal-Oxide-Semiconductor Field Effect Transistors (MOSFETs) that are at the heart of the power amplifiers. The recent invention and commercialization of RF power MOSFETs based on the super-linear mode of operation is described in this book for the first time. In addition to the analytical treatment of the physics, extensive

description of transistor operation is provided by using the results of numerical simulations. Many novel power MOSFET structures are analyzed and their performance is compared with those of the laterally-diffused (LD) MOSFET that are currently used in 2G and 3G networks."--BOOK JACKET.Title Summary field provided by Blackwell North America, Inc. All Rights Reserved

Magnetic resonance systems are used in almost every academic and industrial chemistry, physics and biochemistry department, as well as being one of the most important imaging modalities in clinical radiology. The design of such systems has become increasingly sophisticated over the years. Static magnetic fields increase continuously, large-scale arrays of receive elements are now ubiquitous in clinical MRI, cryogenic technology has become commonplace in high resolution NMR and is expanding rapidly in preclinical MRI, specialized high strength magnetic field gradients have been designed for studying the human connectome, and the commercial advent of ultra-high field human imaging has required new types of RF coils and static shim coils together with extensive electromagnetic simulations to ensure patient safety. This book covers the hardware and engineering that constitutes a magnetic resonance system, whether that be a high-resolution liquid or solid state system for NMR spectroscopy, a preclinical system for imaging animals or a clinical system used for human imaging. Written by a team of experts in the field, this book provides a comprehensive and instructional look at all aspects of current magnetic resonance technology, as well as outlooks for future developments.

'This is an excellent reference book for graduates or undergraduates studying semiconductor technology, or for working professionals who need a reference for detailed theory and working knowledge of processes in the field of power semiconductor devices.'IEEE Electrical Insulation Magazine

This descriptive textbook provides a clear look at the theories and process technologies necessary for understanding the modern power semiconductor devices, i.e. from the fundamentals of p-n junction electrostatics, unipolar MOSFET and superjunction structures, bipolar IGBT, to the most recent wide bandgap SiC and GaN devices. It also covers their associated semiconductor process technologies. Real examples based on actual fabricated devices, with the process steps described in clear detail are especially useful. This book is suitable for university courses on power semiconductor or power electronic devices. Device designers and researchers will also find this book a good reference in their work, especially for those focusing on the advanced device development and design aspects.

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.

The book summarizes and compares recent advancements in the development of novel lateral power transistors (LDMOS devices) for integrated circuits in power electronic applications. In its first part, the book motivates the necessity for lateral power transistors by a top-down approach: First, it presents typical energy conversion applications in modern industrial, automotive and consumer electronics. Next, it introduces common circuit topologies suitable for these applications, and discusses the feasibility for monolithic integration. Finally, the combination of power and logic functionality on a single chip is motivated and the requirements and limitations for the power semiconductor devices are deduced. The second part describes the evolution of lateral power transistors over the past decades from the simple pin-type concept to double-acting RESURF topologies. It describes the principle of operation for these LDMOS devices and discusses limitations of lateral power devices. Moreover, figures-of-merit are presented which can be used to evaluate the performance of the novel lateral power transistors described in this book with respect to the LDMOS devices. In the last part, [...] the fundamental physical concepts including charge compensation and trench gate topologies are discussed. Also, the status of research in LDMOS devices on silicon carbide is presented. Advantages and drawbacks for each of these integration approaches are summarized, and the feasibility with respect to power electronic applications is evaluated.

During the last 30 years, significant progress has been made to improve our understanding of gallium nitride and silicon carbide device structures, resulting in experimental demonstration of their enhanced performances for power electronic systems. Gallium nitride power devices made by the growth of the material on silicon substrates have gained a lot of interest. Power device products made from these materials have become available during the last five years from many companies. This comprehensive book discusses the physics of operation and design of gallium nitride and silicon carbide

power devices. It can be used as a reference by practicing engineers in the power electronics industry and as a textbook for a power device or power electronics course in universities. Request Inspection Copy

Achieve higher levels of performance, integration, compactness, and cost-effectiveness in the design and modeling of radio-frequency (RF) power amplifiers RF power amplifiers are important components of any wireless transmitter, but are often the limiting factors in achieving better performance and lower cost in a wireless communication system—presenting the RF IC design community with many challenges. The next-generation technological advances presented in this book are the result of cutting-edge research in the area of large-signal device modeling and RF power amplifier design at the Georgia Institute of Technology, and have the potential to significantly address issues of performance and cost-effectiveness in this area. Richly complemented with hundreds of figures and equations, Modeling and Design Techniques for RF Power Amplifiers introduces and explores the most important topics related to RF power amplifier design under one concise cover. With a focus on efficiency enhancement techniques and the latest advances in the field, coverage includes: Device modeling for CAD Empirical modeling of bipolar devices Scalable modeling of RF MOSFETs Power amplifier IC design Power amplifier design in silicon Efficiency enhancement of RF power amplifiers The description of state-of-the-art techniques makes this book a valuable and handy reference for practicing engineers and researchers, while the breadth of coverage makes it an ideal text for graduate- and advanced undergraduate-level courses in the area of RF power amplifier design and modeling.

The AlInGaN and ZnO materials systems have proven to be one of the scientifically and technologically important areas of development over the past 15 years, with applications in UV/visible optoelectronics and in high-power/high-frequency microwave devices. The pace of advances in these areas has been remarkable and the wide band gap community relies on books like the one we are proposing to provide a review and summary of recent progress.

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