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River Publishers Book Catalogue

Series in Electronic Materials and
Devices

The River Publishers Series in Electronic Materials and Devices

Silicon-Germanium Heterojunction Bipolar Transistors for mm-Wave Systems Technology, Modeling and Circuit Applications

Editors:

Niccolò Rinaldi, University of Naples, Italy

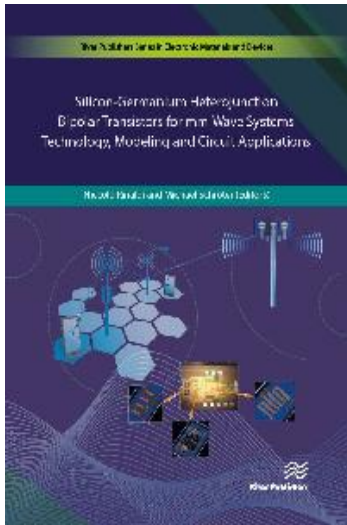
Michael Schröter, Technical University Dresden, Germany

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Description:

The semiconductor industry is a fundamental building block of the new economy, there is no area of modern life untouched by the progress of nanoelectronics. The electronic chip is becoming an ever-increasing portion of system solutions, starting initially from less than 5% in the 1970 microcomputer era, to more than 60% of the final cost of a mobile telephone, 50% of the price of a personal computer (representing nearly 100% of the functionalities) and 30% of the price of a monitor in the early 2000's.

Interest in utilizing the (sub-)mm-wave frequency spectrum for commercial and research applications has also been steadily increasing. Such applications, which constitute a diverse but sizeable future market, span a large variety of areas such as health, material science, mass transit, industrial automation, communications, and space exploration.

Silicon-Germanium Heterojunction Bipolar Transistors for mm-Wave Systems Technology, Modeling and Circuit Applications provides an overview of results of the DOTSEVEN EU research project, and as such focusses on key material developments for mm-Wave Device Technology. It starts with the motivation at the beginning of the project and a summary of its major achievements. The subsequent chapters provide a detailed description of the obtained research results in the various areas of process development, device simulation, compact device modeling, experimental characterization, reliability, (sub-)mm-wave circuit design and systems.

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The River Publishers Series in Electronic Materials and Devices

Circuit Design Considerations for Implantable Devices

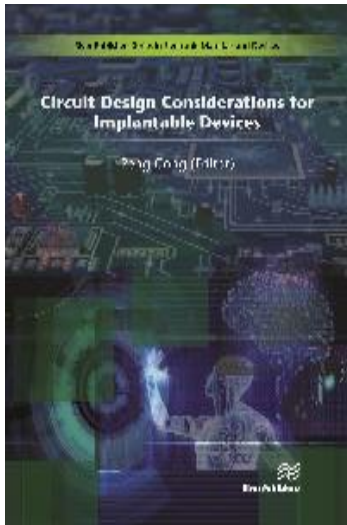
Editor: Peng Cong, Verily Life Science, USA

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Description:

Implantable devices are a unique area for circuit designers. A comprehensive understanding of design trade-offs at the system level is important to ensure device success. Circuit Design Considerations for Implantable Devices provides knowledge to CMOS circuit designers with limited biomedical background to understand design challenges and trade-offs for implantable devices, especially neural interfacing.

Technical topics discussed in the book include:

- Neural interface
- Neural sensing amplifiers
- Electrical stimulation
- Embedded Signal Analysis
- Wireless Power Transmission to mm-Sized Free-Floating Distributed Implants
- Next Generation Neural Interface Electronics

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Computational Electrodynamics

A Gauge Approach with Applications in Microelectronics

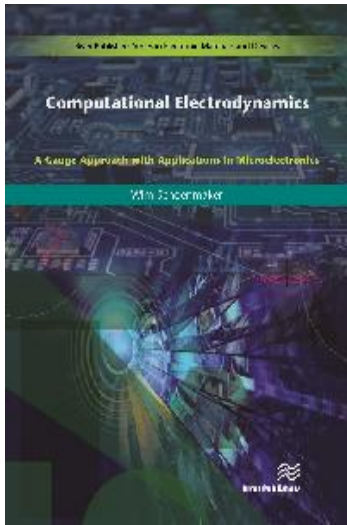
Author: Wim Schoenmaker, MAGWEL, Belgium

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Available From: May 2017

Price: € 90.00



Description:

Computational Electrodynamics is a vast research field with a wide variety of tools. In physics the principle of gauge invariance plays a pivotal role as a guide towards a sensible formulation of the laws of nature as well as computing the properties of elementary particles using the lattice formulation of gauge theories, yet the gauge principle has played a much less pronounced role in performing computation in classical electrodynamics. In this work the author will demonstrate that starting from the gauge formulation of electrodynamics using the electromagnetic potentials leads to computational tools that can very well compete with the conventional electromagnetic field-based tools. Once accepting the formulation based on gauge fields, the computational code is very transparent due to the mimetic mapping of the electrodynamic variables on the computational grid. Although the illustrations and applications originate from microelectronic engineering, the method has a much larger range of applicability. Therefore this book is of interest to everyone having interest in computational electrodynamics. The volume is organized as follows: In part 1, a detailed introduction and overview is presented of the Maxwell equations as well as the derivation of the current and charge densities in different materials. Semiconductors are responding to electromagnetic fields in a non-linear way and the induced complications are discussed in detail. In part 2, the transition of the theory of electrodynamics, using the gauge potentials, to a formulation that can serve as the gateway to computational code is presented. In part 3, the feasibility and success of the methods of part 2 are demonstrated by a collection of microelectronic device designs. Part 4 focuses on a set of topical themes that brings the reader to the frontier of research in building the simulation tools using the gauge principle in computational electrodynamics.

Technical topics discussed in the book include:

- Electromagnetic Field Equations
- Constitutive Relations
- Discretization and Numerical Analysis
- Finite Element and Finite Volume Methods
- Design of Integrated Passive Components

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