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MILLS PALMER

Radiation Imaging Detectors Using SOI Technology Springer Science & Business Media
The book will address the-state-of-the-art in integrated circuit design in the context of emerging systems. New exciting opportunities in body area networks, wireless communications, data networking, and optical imaging are discussed. Emerging materials that can take system performance beyond standard CMOS, like Silicon on Insulator (SOI), Silicon Germanium (SiGe), and Indium Phosphide (InP) are explored. Three-dimensional (3-D) CMOS integration and co-integration with sensor technology are described as well. The book is a must for anyone serious about circuit design for future technologies. The book is written by top notch international experts in industry and academia. The intended audience is practicing engineers with integrated circuit background. The book will be also used as a recommended reading and supplementary material in graduate course curriculum. Intended audience is professionals working in the integrated circuit design field. Their job titles might be : design engineer, product manager, marketing manager, design team leader, etc. The book will be also used by graduate students. Many of the chapter authors are University Professors.
Silicide Technology for Integrated Circuits Univ. Press of Mississippi
The growing demand for instant and reliable communication means that photonic circuits are increasingly finding applications in optical communications systems. One of the prime candidates to provide satisfactory performance at low cost in the photonic circuit is silicon. Whilst silicon photonics is less well developed as compared to some other material technologies, it is poised to make a serious impact on the telecommunications industry, as well as in many other applications, as other technologies fail to meet the yield/performance/cost trade-offs. Following a sympathetic tutorial approach, this first book on silicon photonics provides a comprehensive overview of the technology. Silicon Photonics explains the concepts of the technology, taking the reader through the introductory principles, on to more complex building blocks of the optical circuit. Starting with the basics of waveguides and the properties peculiar to silicon, the book also features: Key design issues in optical circuits. Experimental methods. Evaluation techniques. Operation of waveguide based devices. Fabrication of silicon waveguide circuits. Evaluation of silicon photonic systems. Numerous worked examples, models and case studies. Silicon Photonics is an essential tool for photonics engineers and young professionals working in the optical network, optical communications and semiconductor industries. This book is also an invaluable reference and a potential main text to senior undergraduates and postgraduate students studying fibre optics, integrated optics, or optical network technology.
Portraits in Silicon CRC Press
This title introduces state-of-the-art design principles for SOI circuit design, and is primarily concerned with circuit-related issues. It considers SOI material in terms of implementation that is promising or has been used elsewhere in circuit development, with historical perspective where appropriate.
MOS Devices for Low-Voltage and Low-Energy Applications McGraw Hill Professional
The Integrated Circuit industry is driven by the continuously shrinking feature size of devices. The era of planar bulk MOS transistor, however, is nearing its end. The performance of bulk MOS transistor is severely degraded by short channel effects in the sub-65nm regime. In such a scenario, the Silicon-on-Insulator (SOI) technology looks set to become the next driver of CMOS scaling. SOI has been proved capable of providing increased transistor speed, reduced power consumption and enhanced device scalability as demanded by the 65nm and beyond technology generations. The problems facing SOI include fabrication of thin silicon and buried oxide (BOX) films and high manufacturing cost. This thesis focuses on a novel approach to building a SOI substrate which uses an epitaxial oxide as template to grow silicon on top. The novel "Floating Epitaxy SOI" aims to guarantee thin silicon films and low manufacturing cost. This research work involves modeling ultra-thin body fully depleted SOI devices from 60nm gate length down to 10nm gate length. The device uses metalD igh-k gatestack and strained silicon as attractive features for better device performance. The goal of this work is to re-engineer the device structure and alter device design parameters at every gate length such that device performance meets the semiconductor roadmap projections in terms of off-state leakage current and ratio of drive current to leakage current as specified by International Technology Roadmap for Semiconductors. (ITRS) A challenge to better device performance is the high permittivity of candidate epitaxial oxides. It is well established that high permittivity buried oxide layer adds additional short channel effects. This makes device design and control of short channel effects more difficult. The major findings of this thesis are that ultra-thin body SOI devices based on "Floating Epitaxy SOI" meet ITRS projections down to 10nm gate length. Moreover, for sub-15nm devices that require ult.
Dielectric Materials in Silicon on Insulator (SOI) Technology Springer Science & Business Media
Silicon-on-Insulator (SOI) technology is widely used in high-performance and low-power

semiconductor devices. The SOI wafers have two layers of active silicon (Si), and normally the bottom Si layer is a mere physical structure. The idea of making intelligent pixel detectors by using the bottom Si layer as sensors for X-ray, infrared light, high-energy particles, neutrons, etc. emerged from very early days of the SOI technology. However, there have been several difficult issues with fabricating such detectors and they have not become very popular until recently. This book offers a comprehensive overview of the basic concepts and research issues of SOI radiation image detectors. It introduces basic issues to implement the SOI detector and presents how to solve these issues. It also reveals fundamental techniques, improvement of radiation tolerance, applications, and examples of the detectors. Since the SOI detector has both a thick sensing region and CMOS transistors in a monolithic die, many ideas have emerged to utilize this technology. This book is a good introduction for people who want to develop or use SOI detectors.

3D and Circuit Integration of MEMS John Wiley & Sons

This book first introduces SOI device physics and its fundamental idiosyncrasies. It then walks the reader through realizations of these mechanisms, which are observed in common high-speed microprocessor designs. The book also offers rules of thumb and comparisons to conventional bulk CMOS to guide implementation and describes a number of unique circuit topologies that SOI supports.

Silicon Photonics Cambridge University Press

Ultra-thin chips are the "smart skin" of a conventional silicon chip. This book shows how very thin and flexible chips can be fabricated and used in many new applications in microelectronics, Microsystems, biomedical and other fields. It provides a comprehensive reference to the fabrication technology, post processing, characterization and the applications of ultra-thin chips.

SOI Design Springer Science & Business Media

Meeting the long-felt need for in-depth information on one of the most advanced material characterization methods, a top team of editors and authors from highly prestigious facilities and institutions covers a range of synchrotron techniques that have proven useful for materials research. Following an introduction to synchrotron radiation and its sources, the second part goes on to describe the various techniques that benefit from this especially bright light, including X-ray absorption, diffraction, scattering, imaging, and lithography. The thrid and final part provides an overview of the applications of synchrotron radiation in materials science. bridging the gap between specialists in synchrotron research and material scientists, this is a unique and indispensable resource for academic and industrial researchers alike.

Radiation Imaging Detectors Using SOI Technology Springer Science & Business Media

Proceedings of the NATO Advanced Research Workshop, held in Kyiv, Ukraine, October 15-20, 2000

Circuits at the Nanoscale John Wiley & Sons

Silicon-On-Insulator (SOI) Technology: Manufacture and Applications covers SOI transistors and circuits, manufacture, and reliability. The book also looks at applications such as memory, power devices, and photonics. The book is divided into two parts; part one covers SOI materials and manufacture, while part two covers SOI devices and applications. The book begins with chapters that introduce techniques for manufacturing SOI wafer technology, the electrical properties of advanced SOI materials, and modeling short-channel SOI semiconductor transistors. Both partially depleted and fully depleted SOI technologies are considered. Chapters 6 and 7 concern junctionless and fin-on-oxide field effect transistors. The challenges of variability and electrostatic discharge in CMOS devices are also addressed. Part two covers recent and established technologies. These include SOI transistors for radio frequency applications, SOI CMOS circuits for ultralow-power applications, and improving device performance by using 3D integration of SOI integrated circuits. Finally, chapters 13 and 14 consider SOI technology for photonic integrated circuits and for micro-electromechanical systems and nano-electromechanical sensors. The extensive coverage provided by Silicon-On-Insulator (SOI) Technology makes the book a central resource for those working in the semiconductor industry, for circuit design engineers, and for academics. It is also important for electrical engineers in the automotive and consumer electronics sectors. Covers SOI transistors and circuits, as well as manufacturing processes and reliability Looks at applications such as memory, power devices, and photonics

CMOS VLSI Engineering The Electrochemical Society

Silicon-on-Insulator (SOI) technology is widely used in high-performance and low-power semiconductor devices. The SOI wafers have two layers of active silicon (Si), and normally the bottom Si layer is a mere physical structure. The idea of making intelligent pixel detectors by using the bottom Si layer as sensors for X-ray, infrared light, high-energy particles, neutrons, etc. emerged from very early days of the SOI technology. However, there have been several difficult issues with fabricating such detectors and they have not become very popular until recently. This book offers a comprehensive overview of the basic concepts and research issues of SOI radiation image detectors. It introduces basic issues to implement the SOI detector and presents how to solve these issues. It also reveals fundamental techniques, improvement of radiation tolerance, applications, and examples of the detectors. Since the SOI detector has both a thick sensing region and CMOS transistors in a monolithic die, many ideas have emerged to utilize this technology. This book is a good introduction for people who want to develop or use SOI detectors.

Device Design of Sub-100nm Fully-depleted Silicon-on-Insulator (SOI) Devices Based on High-k Epitaxial-Buried Oxide Taylor & Francis

A comprehensive guide to MEMS materials, technologies and manufacturing, examining the state of the art with a particular emphasis on current and future applications. Key topics covered include: Silicon as MEMS material Material properties and measurement techniques Analytical methods used in materials characterization Modeling in MEMS Measuring MEMS Micromachining technologies in MEMS Encapsulation of MEMS components Emerging process technologies, including ALD and porous silicon Written by 73 world class MEMS contributors from around the globe, this volume covers materials selection as well as the most important process steps in bulk micromachining, fulfilling the needs of device design engineers and process or development engineers working in manufacturing processes. It also provides a comprehensive reference for the industrial R&D and academic communities. Veikko Lindroos is Professor of Physical Metallurgy and Materials Science at Helsinki University of Technology, Finland. Markku Tilli is Senior Vice President of Research at Okmetic, Vantaa, Finland. Ari Lehto is Professor of Silicon Technology at Helsinki University of Technology, Finland. Teruaki Motooka is Professor at the Department of Materials Science and Engineering, Kyushu University, Japan. Provides vital packaging technologies and process knowledge

for silicon direct bonding, anodic bonding, glass frit bonding, and related techniques Shows how to protect devices from the environment and decrease package size for dramatic reduction of packaging costs Discusses properties, preparation, and growth of silicon crystals and wafers Explains the many properties (mechanical, electrostatic, optical, etc), manufacturing, processing, measuring (incl. focused beam techniques), and multiscale modeling methods of MEMS structures

Wafer Bonding Springer

Silicon-On-Insulator (SOI) CMOS technology has been regarded as another major technology for VLSI in addition to bulk CMOS technology. Owing to the buried oxide structure, SOI technology offers superior CMOS devices with higher speed, high density, and reduced second order effects for deep-submicron low-voltage, low-power VLSI circuits applications. In addition to VLSI applications, and because of its outstanding properties, SOI technology has been used to realize communication circuits, microwave devices, BICMOS devices, and even fiber optics applications. CMOS VLSI Engineering: Silicon-On-Insulator addresses three key factors in engineering SOI CMOS VLSI - processing technology, device modelling, and circuit designs are all covered with their mutual interactions. Starting from the SOI CMOS processing technology and the SOI CMOS digital and analog circuits, behaviors of the SOI CMOS devices are presented, followed by a CAD program, ST-SPICE, which incorporates models for deep-submicron fully-depleted mesa-isolated SOI CMOS devices and special purpose SOI devices including polysilicon TFTs. CMOS VLSI Engineering: Silicon-On-Insulator is written for undergraduate senior students and first-year graduate students interested in CMOS VLSI. It will also be suitable for electrical engineering professionals interested in microelectronics.

Handbook of Silicon Based MEMS Materials and Technologies Springer Science & Business Media

Silicon-on-Insulator Technology: Materials to VLSI, Third Edition, retraces the evolution of SOI materials, devices and circuits over a period of roughly twenty years. Twenty years of progress, research and development during which SOI material fabrication techniques have been born and abandoned, devices have been invented and forgotten, but, most importantly, twenty years during which SOI Technology has little by little proven it could outperform bulk silicon in every possible way. The turn of the century turned out to be a milestone for the semiconductor industry, as high-quality SOI wafers suddenly became available in large quantities. From then on, it took only a few years to witness the use of SOI technology in a wealth of applications ranging from audio amplifiers and wristwatches to 64-bit microprocessors. This book presents a complete and state-of-the-art review of SOI materials, devices and circuits. SOI fabrication and characterization techniques, SOI CMOS processing, and the physics of the SOI MOSFET receive an in-depth analysis. Silicon-on-Insulator Technology: Materials to VLSI, Third Edition, also describes the properties of other SOI devices, such as multiple gate MOSFETs, dynamic threshold devices and power MOSFETs. The advantages and performance of SOI circuits used in both niche and mainstream applications are discussed in detail. The SOI specialist will find this book invaluable as a source of compiled references covering the different aspects of SOI technology. For the non-specialist, the book serves an excellent introduction to the topic with detailed, yet simple and clear explanations. Silicon-on-Insulator Technology: Materials to VLSI, Third Edition is recommended for use as a textbook for classes on semiconductor device processing and physics at the graduate level.

Synchrotron Radiation in Materials Science CRC Press

Bringing you up-to-date with the latest developments in MEMS technology, this major revision of the best-selling An Introduction to Microelectromechanical Systems Engineering offers you a current understanding of this cutting-edge technology. You gain practical knowledge of MEMS materials, design, and manufacturing, and learn how it is being applied in industrial, optical, medical and electronic markets. The second edition features brand new sections on RF MEMS, photo MEMS, micromachining on materials other than silicon, reliability analysis, plus an expanded reference list. With an emphasis on commercialized products, this unique resource helps you determine whether your application can benefit from a MEMS solution, understand how other applications and companies have benefited from MEMS, and select and define a manufacturable MEMS process for your application. You discover how to use MEMS technology to enable new functionality, improve performance, and reduce size and cost. The book teaches you the capabilities and limitations of MEMS devices and processes, and helps you communicate the relative merits of MEMS to your company's management. From critical discussions on design operation and process fabrication of devices and systems, to a thorough explanation of MEMS packaging, this easy-to-understand book clearly explains the basics of MEMS engineering, making it an invaluable reference for your work in the field.

Silicon Wafer Bonding Technology Artech House

This book discusses the advantages and challenges of Body-Biasing for integrated circuits and systems, together with the deployment of the design infrastructure needed to generate this Body-Bias voltage. These new design solutions enable state of the art energy efficiency and system flexibility for the latest applications, such as Internet of Things and 5G communications.

Semiconductor-On-Insulator Materials for Nanoelectronics Applications Springer Science & Business Media

3D and Circuit Integration of MEMS Explore heterogeneous circuit integration and the packaging needed for practical applications of microsystems MEMS and system integration are important building blocks for the “More-Than-Moore” paradigm described in the International Technology Roadmap for Semiconductors. And, in 3D and Circuit Integration of MEMS, distinguished editor Dr. Masayoshi Esashi delivers a comprehensive and systematic exploration of the technologies for microsystem packaging and heterogeneous integration. The book focuses on the silicon MEMS that have been used extensively and the technologies surrounding system integration. You’ll learn about topics as varied as bulk micromachining, surface micromachining, CMOS-MEMS, wafer interconnection, wafer bonding, and sealing. Highly relevant for researchers involved in microsystem technologies, the book is also ideal for anyone working in the microsystems industry. It demonstrates the key technologies that will assist researchers and professionals deal with current and future application bottlenecks. Readers will also benefit from the inclusion of: A thorough introduction to enhanced bulk micromachining on MIS process, including pressure sensor fabrication and the extension of MIS process for various advanced MEMS devices An exploration of epitaxial poly Si surface micromachining, including process condition of epi-poly Si, and MEMS devices using epi-poly Si Practical discussions of Poly SiGe surface micromachining, including SiGe deposition and

LP CVD polycrystalline SiGe A concise treatment of heterogeneously integrated aluminum nitride MEMS resonators and filters Perfect for materials scientists, electronics engineers, and electrical and mechanical engineers, 3D and Circuit Integration of MEMS will also earn a place in the libraries of semiconductor physicists seeking a one-stop reference for circuit integration and the practical application of microsystems.

Silicon-On-Insulator (SOI) Technology Elsevier

This book describes the essentials of silicon wafer bonding from an engineering perspective. A beginning chapter deals with basic processes of wafer bonding in detail, and subsequent chapters cover bonding by mechanical removal, the Smart Cut method of hydrogen exfoliation, the ELTRAN thinning technique and hydrogen annealing, engineering methods of wafer characterization, and quality assurance for bonded wafers. A chapter on advanced applications looks at applications in optoelectronics, very large scale integration (VLSI), microelectromechanical systems (MEMS), and photonics. A glossary is included, plus a table comparing various bonding methods. The editors work in the private sector. Annotation copyrighted by Book News, Inc., Portland, OR

Development and Testing of a Silicon-on-insulator (SOI) Technology Process Springer Science & Business Media

The power consumption of microprocessors is one of the most important challenges of high-performance chips and portable devices. In chapters drawn from Piguet's recently published Low-Power Electronics Design, Low-Power CMOS Circuits: Technology, Logic Design, and CAD Tools addresses the design of low-power circuitry in deep submicron technologies. It provides a focused reference for specialists involved in designing low-power circuitry, from transistors to logic gates. The book is organized into three broad sections for convenient access. The first examines the history of low-power electronics along with a look at emerging and possible future technologies. It also considers other technologies, such as nanotechnologies and optical chips, that may be useful in designing integrated circuits. The second part explains the techniques used to reduce power consumption at low levels. These include clock gating, leakage reduction, interconnecting and communication on chips, and adiabatic circuits. The final section discusses various CAD tools for designing low-power circuits. This section includes three chapters that demonstrate the tools and low-power design issues at three major companies that produce logic synthesizers. Providing detailed examinations contributed by leading experts, Low-Power CMOS Circuits: Technology, Logic Design, and CAD Tools supplies authoritative information on how to design and model for high performance with low power consumption in modern integrated circuits. It is a must-read for anyone designing modern computers or embedded systems.

Fundamentals of Ultra-Thin-Body MOSFETs and FinFETs Springer Science & Business Media

This is the first book to provide guidance on the development and application of metal silicide technology as it emerges from the scientific to the prototype and manufacturing stages. Other key topics covered are fundamentals, present and future silicide technology for Si-based devices, and characterisation methods. Suitable for engineers and students in microelectronics.