

JOHNS HOPKINS APL

# TECHNICAL DIGEST

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Part I



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# Technical Digest

**Michael S. Shur**



## Technical Digest:

ULSI Process Integration Cor L. Claeys, 1999      **Handbook of Semiconductor Manufacturing Technology** Yoshio Nishi, Robert Doering, 2017-12-19 Retaining the comprehensive and in depth approach that cemented the bestselling first edition's place as a standard reference in the field the Handbook of Semiconductor Manufacturing Technology Second Edition features new and updated material that keeps it at the vanguard of today's most dynamic and rapidly growing field. Iconic experts Robert Doering and Yoshio Nishi have again assembled a team of the world's leading specialists in every area of semiconductor manufacturing to provide the most reliable authoritative and industry leading information available. Stay Current with the Latest Technologies In addition to updates to nearly every existing chapter this edition features five entirely new contributions on Silicon on insulator SOI materials and devices Supercritical CO<sub>2</sub> in semiconductor cleaning Low dielectrics Atomic layer deposition Damascene copper electroplating Effects of terrestrial radiation on integrated circuits ICs Reflecting rapid progress in many areas several chapters were heavily revised and updated and in some cases rewritten to reflect rapid advances in such areas as interconnect technologies gate dielectrics photomask fabrication IC packaging and 300 mm wafer fabrication While no book can be up to the minute with the advances in the semiconductor field the Handbook of Semiconductor Manufacturing Technology keeps the most important data methods tools and techniques close at hand.

*Lasers* Charles Blain, 2002 Developments in lasers continue to enable progress in many areas such as eye surgery the recording industry and dozens of others This book presents citations from the book literature for the last 25 years and groups them for ease of access which is also provided by subject author and titles indexes      *MEMS* Mohamed Gad-el-Hak, 2005-11-29 As our knowledge of microelectromechanical systems MEMS continues to grow so does The MEMS Handbook The field has changed so much that this Second Edition is now available in three volumes Individually each volume provides focused authoritative treatment of specific areas of interest Together they comprise the most comprehensive collection      GaAs Devices and Circuits Michael S. Shur, 2013-11-21 GaAs devices and integrated circuits have emerged as leading contenders for ultra high speed applications This book is intended to be a reference for a rapidly growing GaAs community of researchers and graduate students It was written over several years and parts of it were used for courses on GaAs devices and integrated circuits and on heterojunction GaAs devices developed and taught at the University of Minnesota Many people helped me in writing this book I would like to express my deep gratitude to Professor Lester Eastman of Cornell University whose ideas and thoughts inspired me and helped to determine the direction of my research work for many years I also benefited from numerous discussions with his students and associates and from the very atmosphere of the pursuit of excellence which exists in his group I would like to thank my former and present co workers and colleagues Drs Levinstein and Gelmont of the A F Ioffe Institute of Physics and Technology Professor Melvin Shaw of Wayne State University Dr Kastalsky of Bell Communications Professor Gary Robinson of Colorado State University Professor Tony

Valois and Dr Tim Drummond of Sandia Labs for their contributions to our joint research and for valuable discussions My special thanks to Professor Morko for his help his ideas and the example set by his pioneering work Since 1978 I have been working with engineers from Honeywell Inc Drs

**High-k Gate Dielectrics for CMOS Technology** Gang He,Zhaoqi Sun,2012-08-10 A state of the art overview of high k dielectric materials for advanced field effect transistors from both a fundamental and a technological viewpoint summarizing the latest research results and development solutions As such the book clearly discusses the advantages of these materials over conventional materials and also addresses the issues that accompany their integration into existing production technologies Aimed at academia and industry alike this monograph combines introductory parts for newcomers to the field as well as advanced sections with directly applicable solutions for experienced researchers and developers in materials science physics and electrical engineering

**The ESD Handbook** Steven H. Voldman,2021-03-02 A practical and comprehensive reference that explores Electrostatic Discharge ESD in semiconductor components and electronic systems The ESD Handbook offers a comprehensive reference that explores topics relevant to ESD design in semiconductor components and explores ESD in various systems Electrostatic discharge is a common problem in the semiconductor environment and this reference fills a gap in the literature by discussing ESD protection Written by a noted expert on the topic the text offers a topic by topic reference that includes illustrative figures discussions and drawings The handbook covers a wide range of topics including ESD in manufacturing garments wrist straps and shoes ESD Testing ESD device physics ESD semiconductor process effects ESD failure mechanisms ESD circuits in different technologies CMOS Bipolar etc ESD circuit types Pin Power Pin to Pin etc and much more In addition the text includes a glossary index tables illustrations and a variety of case studies Contains a well organized reference that provides a quick review on a range of ESD topics Fills the gap in the current literature by providing information from purely scientific and physical aspects to practical applications Offers information in clear and accessible terms Written by the accomplished author of the popular ESD book series Written for technicians operators engineers circuit designers and failure analysis engineers The ESD Handbook contains an accessible reference to ESD design and ESD systems

**Silicon Heterostructure Handbook** John D. Cressler,2018-10-03 An extraordinary combination of material science manufacturing processes and innovative thinking spurred the development of SiGe heterojunction devices that offer a wide array of functions unprecedented levels of performance and low manufacturing costs While there are many books on specific aspects of Si heterostructures the Silicon Heterostructure Handbook Materials Fabrication Devices Circuits and Applications of SiGe and Si Strained Layer Epitaxy is the first book to bring all aspects together in a single source Featuring broad comprehensive and in depth discussion this handbook distills the current state of the field in areas ranging from materials to fabrication devices CAD circuits and applications The editor includes snapshots of the industrial state of the art for devices and circuits presenting a novel perspective for comparing the present status with future directions in the field With each chapter

contributed by expert authors from leading industrial and research institutions worldwide the book is unequalled not only in breadth of scope but also in depth of coverage timeliness of results and authority of references It also includes a foreword by Dr Bernard S Meyerson a pioneer in SiGe technology Containing nearly 1000 figures along with valuable appendices the Silicon Heterostructure Handbook authoritatively surveys materials fabrication device physics transistor optimization optoelectronics components measurement compact modeling circuit design and device simulation      **Micro- and Nanoelectronics** Tomasz Brozek, 2017-12-19 Micro and Nanoelectronics Emerging Device Challenges and Solutions presents a comprehensive overview of the current state of the art of micro and nanoelectronics covering the field from fundamental science and material properties to novel ways of making nanodevices Containing contributions from experts in both industry and academia this cutting edge text Discusses emerging silicon devices for CMOS technologies fully depleted device architectures characteristics and scaling Explains the specifics of silicon compound devices SiGe SiC and their unique properties Explores various options for post CMOS nanoelectronics such as spintronic devices and nanoionic switches Describes the latest developments in carbon nanotubes iii v devices structures and more Micro and Nanoelectronics Emerging Device Challenges and Solutions provides an excellent representation of a complex engineering field examining emerging materials and device architecture alternatives with the potential to shape the future of nanotechnology      FinFET Devices for VLSI Circuits and Systems Samar K. Saha, 2020-07-15 To surmount the continuous scaling challenges of MOSFET devices FinFETs have emerged as the real alternative for use as the next generation device for IC fabrication technology The objective of this book is to provide the basic theory and operating principles of FinFET devices and technology an overview of FinFET device architecture and manufacturing processes and detailed formulation of FinFET electrostatic and dynamic device characteristics for IC design and manufacturing Thus this book caters to practicing engineers transitioning to FinFET technology and prepares the next generation of device engineers and academic experts on mainstream device technology at the nanometer nodes      **Silicon Based Unified Memory Devices and Technology** Arup Bhattacharyya, 2017-07-06 The primary focus of this book is on basic device concepts memory cell design and process technology integration The first part provides in depth coverage of conventional nonvolatile memory devices stack structures from device physics historical perspectives and identifies limitations of conventional devices The second part reviews advances made in reducing and or eliminating existing limitations of NVM device parameters from the standpoint of device scalability application extendibility and reliability The final part proposes multiple options of silicon based unified nonvolatile memory cell concepts and stack designs SUMs The book provides Industrial R D personnel with the knowledge to drive the future memory technology with the established silicon FET based establishments of their own It explores application potentials of memory in areas such as robotics avionics health industry space vehicles space sciences bio imaging genetics etc      *Liquid Crystal Flat Panel Displays* William C. O'Mara, 2013-11-11 We live in the silicon age and the quintessential item that defines our world is the

computer Silicon chips power the computer as well as many other products for work and leisure such as calculators radios and televisions In the forty years since the transistor was invented the solid state revolution has affected the lives of almost everyone in the world Based on silicon solid state devices and integrated circuits have revolutionized electronics data processing communications and the like The computer especially the personal computer would be impossible without silicon devices Only one computer was ever built using vacuum tubes and the tubes had to be constantly replaced because they generated too much heat and burned out Silicon devices allowed for reliable switching operations in arrays of hundreds and thousands of discrete devices As a result the very substantial industrial base that existed for producing vacuum tubes disappeared with one exception That exception is of course the CRT which is evident in televisions computer displays and a host of other information display terminals Until recently there was nothing that could take its place and it seemed that the CRT would remain as the electronic medium for all except the simplest displays The CRT is about to go the way of the other vacuum tubes It s dead but doesn t know it yet

**Electronic Devices Architectures for the NANO-CMOS Era** Simon Deleonibus,2019-05-08 In this book internationally recognized researchers give a state of the art overview of the electronic device architectures required for the nano CMOS era and beyond Challenges relevant to the scaling of CMOS nanoelectronics are addressed through different core CMOS and memory device options in the first part of the book The second part reviews new device concepts for nanoelectronics beyond CMOS The book covers the fundamental limits of core CMOS improving scaling by the introduction of new materials or processes new architectures using SOI multigates and multichannels and quantum computing Silicon Compatible Materials, and Technologies for Advanced Integrated Processes, Circuits and Emerging Applications 5 F. Roozeboom,V. Narayanan,K. Kakushima,P. J. Timans,E. P. Gusev,2015

**SiGe, Ge, and Related Compounds: Materials, Processing, and Devices** 8 Q. Liu,J.-M. Hartmann,A. Thean,S. Miyazaki,A. Ogura,X. Gong,M. Caymax,A. Schulze,G. Masini,A. Mai,M. Östling,G. Niu,D. Harame,2018-09-21 **Noise in Nanoscale Semiconductor Devices** Tibor Grasser,2020-04-26 This book summarizes the state of the art regarding noise in nanometer semiconductor devices Readers will benefit from this leading edge research aimed at increasing reliability based on physical microscopic models Authors discuss the most recent developments in the understanding of point defects e g via ab initio calculations or intricate measurements which have paved the way to more physics based noise models which are applicable to a wider range of materials and features e g III V materials 2D materials and multi state defects Describes the state of the art regarding noise in nanometer semiconductor devices Enables readers to design more reliable semiconductor devices Offers the most up to date information on point defects based on physical microscopic models ULSI Process Integration III Electrochemical Society. Meeting,2003

**Silicon-on-insulator Technology and Devices XI** Electrochemical Society. Meeting,2003 **CHIPS 2020 VOL. 2** Bernd Höfflinger,2015-09-19 The release of this second volume of CHIPS 2020 coincides with the 50th anniversary of Moore s Law a critical year marked by the end of the

nanometer roadmap and by a significantly reduced annual rise in chip performance At the same time we are witnessing a data explosion in the Internet which is consuming 40% more electrical power every year leading to fears of a major blackout of the Internet by 2020 The messages of the first CHIPS 2020 published in 2012 concerned the realization of quantum steps for improving the energy efficiency of all chip functions With this second volume we review these messages and amplify upon the most promising directions ultra low voltage electronics nanoscale monolithic 3D integration relevant data brain and human vision inspired processing and energy harvesting for chip autonomy The team of authors enlarged by more world leaders in low power monolithic 3D video and Silicon brains presents new vistas in nanoelectronics promising Moore like exponential growth sustainable through to the 2030s

**High Dielectric Constant Materials** Howard Huff, 2005 Issues relating to the high K gate dielectric are among the greatest challenges for the evolving International Technology Roadmap for Semiconductors ITRS More than just an historical overview this book will assess previous and present approaches related to scaling the gate dielectric and their impact along with the creative directions and forthcoming challenges that will define the future of gate dielectric scaling technology Topics include an extensive review of Moore s Law the classical regime for SiO<sub>2</sub> gate dielectrics the transition to silicon oxynitride gate dielectrics the transition to high K gate dielectrics including the drive towards equivalent oxide thickness in the single digit nanometer regime and future directions and issues for ultimate technology generation scaling The vision wisdom and experience of the team of authors will make this book a timely relevant and interesting resource focusing on fundamentals of the 45 nm Technology Generation and beyond

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