Sm Sze Vlsi Technology

Fully updated with the latest technologies, this edition covers thefundamental principles underlying fabrication processes forsemiconductor devices along with integrated circuits made fromsilicon and gallium arsenide. Stresses fabrication criteria forsuch circuits as CMOS, bipolar, MOS, FET, etc. These diversetechnologies are introduced separately and then consolidated intocomplete circuits. An Instructor's Manual presenting detailed solutions to all theproblems in the book is available from the Wiley editorialdepartment.

The development of micro- and nano-mechanical systems (MEMS and NEMS) foreshadows momentous changes not only in the technological world, but in virtually every aspect of human life. The future of the field is bright with opportunities, but also riddled with challenges, ranging from further theoretical development through advances in fabrication technologies, to developing high-performance nano- and microscale systems, devices, and structures, including transducers, switches, logic gates, actuators and sensors. MEMS and NEMS: Systems, Devices, and Structures is designed to help you meet those challenges and solve fundamental, experimental, and applied problems. Written from a multi-disciplinary perspective, this book forms the basis for the synthesis, modeling, analysis, simulation, control, prototyping, and fabrication of MEMS and NEMS. The author brings together the various paradigms, methods, and technologies associated with MEMS and NEMS to show how to synthesize, analyze, design, and fabricate them. Focusing on the basics, he illustrates the development of NEMS and MEMS architectures, physical representations, structural synthesis, and optimization. The applications of MEMS and NEMS in areas such as biotechnology, medicine, avionics,

transportation, and defense are virtually limitless. This book helps prepare you to take advantage of their inherent opportunities and effectively solve problems related to their configurations, systems integration, and control.

This is a superb state-of-the-art collection of contributed readings by nationally recognized authorities in VLSI technology. The emphasis of this text is on fabrication.

From Teflon to Velcro, from bandwidths to base pairs, the artifacts of engineering and technology reflect the broad scope--and frustrating limitations--of our imagination. Best-selling author James Adams takes readers on an enlightening tour of this exciting world, demystifying such endeavors as design, research, and manufacturing.

The awaited revision of Semiconductor Devices: Physics and Technology offers more than 50% new or revised material that reflects a multitude of important discoveries and advances in device physics and integrated circuit processing. Offering a basic introduction to physical principles of modern semiconductor devices and their advanced fabrication technology, the third edition presents students with theoretical and practical aspects of every step in device characterizations and fabrication, with an emphasis on integrated circuits. Divided into three parts, this text covers the basic properties of semiconductor materials, emphasizing silicon and gallium arsenide; the physics and characteristics of semiconductor devices bipolar, unipolar special microwave and photonic devices; and the latest processing technologies, from crystal growth to lithographic pattern transfer.

Silicon technology today forms the basis of a world-wide, multi-billion dollar component industry. The reason for this expansion can be found not only in the physical properties of silicon but also in the unique properties of the silicon-silicon dioxide interface. However, silicon devices are still subject to undesired electrical phenomena called "instabilities". These

are due mostly to the imperfect nature of the insulators used, to the not-so-perfect silicon-insulator interface and to the generation of defects and ionization phenomena caused by radiation. The problem of instabilities is addressed in this volume, the third of this book series. Vol.3 updates and supplements the material presented in the previous two volumes, and devotes five chapters to the problems of radiation-matter and radiation-device interactions. The volume will aid circuit manufacturers and circuit users alike to relate unstable electrical parameters and characteristics to the presence of physical defects and impurities or to the radiation environment which caused them.

VLSI Electronics Microstructure Science, Volume 15: VLSI Metallization discusses the various issues and problems related to VLSI metallization. It details the available solutions and presents emerging trends. This volume is comprised of 10 chapters. The two introductory chapters, Chapter 1 and 2 serve as general references for the electrical and metallurgical properties of thin conducting films. Subsequent chapters review the various aspects of VLSI metallization. The order of presentation has been chosen to follow the common processing sequence. In Chapter 3, some relevant metal deposition techniques are discussed. Chapter 4 presents the methods of VLSI lithography and etching. Conducting films are first deposited at the gate definition step; therefore, the issues related to gate metallization are discussed next in Chapter 5.In Chapter 6, contact metallization is elaborated, and Chapter 7 is devoted to multilevel metallization schemes. Long-time reliability is the subject of Chapter 8, which discusses the issues of contact and interconnect electromigration. GaAs metallization is tackled in Chapter 9. The volume concludes with a general discussion of the functions of interconnect systems in VLSI. Materials scientists, processing and design engineers, and

device physicists will find the book very useful.
Market_Desc: · Electrical Engineers· Scientists Special Features: · Provides strong coverage of all key semiconductor devices. Includes basic physics and material properties of key semiconductors· Covers all important processing technologies About The Book: This book is an introduction to the physical principles of modern semiconductor devices and their advanced fabrication technology. It begins with a brief historical review of major devices and key technologies and is then divided into three sections: semiconductor material properties, physics of semiconductor devices and processing technology to fabricate these semiconductor devices.
Technology computer-aided design, or TCAD, is critical to today's semiconductor technology and anybody working in this industry needs to know something about TCAD. This book is about how to use computer software to manufacture and test virtually semiconductor devices in 3D. It brings to life the topic of semiconductor device physics, with a hands-on, tutorial approach that de-emphasizes abstract physics and equations and emphasizes real practice and extensive illustrations. Coverage includes a comprehensive library of devices, representing the state of the art technology, such as SuperJunction LDMOS, GaN LED devices, etc.
This is an up-to-date treatment of the analysis and design of CMOS integrated digital logic circuits. The self-contained book covers all of the important digital circuit design styles found in modern CMOS chips, emphasizing solving design problems using the various

logic styles available in CMOS.

"Reviews the optics and fabrication methods of microoptic elements, paying particular attention to lenses and lens arrays and highlighting key applications. Includes an algorithm for a three-dimensional ray-race. Collects all microlens fabrication methods for the first time in a single volume."

Due to the development of microscale fabrication methods, microlenses are being used more and more in many unique applications, such as artificial implementations of compound eyes, optical communications, and labs-on-chips. Liquid microlenses, in particular, represent an important and growing research area yet there are no books devoted to this topic that summarize the research to date. Rectifying this deficiency, Microlenses: Properties, Fabrication and Liquid Lenses examines the recent progress in the emerging field of liquid-based microlenses. After describing how certain problems in optics can be solved by liquid microlenses, the book introduces the physics and fabrication methods involved in microlenses. It also details the facility and equipment requirements for general fabrication methods. The authors then present examples of various microlenses with non-tunable and tunable focal lengths based on different mechanisms, including: Non-tunable microlenses: Ge/SiO2 core/shell nanolenses, glass lenses made by isotropic etching, self-assembled lenses and lens arrays, lenses fabricated by direct photo-induced polymerization, lenses formed by thermally reflowing photoresist, lenses formed from inkjet printing, arrays fabricated through molding processes,

and injection-molded plastic lenses Electrically tuned microlenses: liquid crystal-based lenses and liquid lenses driven by electrostatic forces, dielectrophoretic forces, electrowetting, and electrochemical reactions Mechanically tunable microlenses: thin-membrane lenses with varying apertures, pressures, and surface shapes; swellable hydrogel lenses; liquid–liquid interface lenses actuated by environmentally stimuli-responsive hydrogels; and oscillating lens arrays driven by sound waves Horizontal microlenses: two-dimensional polymer lenses, tunable and movable liquid droplets as lenses, hydrodynamically tuned cylindrical lenses, liquid core and liquid cladding lenses, air–liquid interface lenses, and tunable liquid gradient refractive index lenses The book concludes by summarizing the importance of microlenses, shedding light on future microlens work, and exploring related challenges, such as the packaging of systems, effects of gravity, evaporation of liquids, aberrations, and integration with other optical components.

A comprehensive and "state-of-the-art" coverage of the design and fabrication of IGBT. All-in-one resource Explains the fundamentals of MOS and bipolar physics. Covers IGBT operation, device and process design, power modules, and new IGBT structures.

Single Crystals of Electronic Materials: Growth and Properties is a complete overview of the state-of-the-art growth of bulk semiconductors. It is not only a valuable update on the body of information on crystal growth of well-established electronic materials, such as silicon, III-V, II-VI and IV-VI semiconductors, but also includes

chapters on novel semiconductors, such as wide bandgap oxides like ZnO, Ga2, O3, In2, O3, Al2, O3, nitrides (AIN and GaN), and diamond. Each chapter focuses on a specific material, providing a comprehensive overview that includes applications and requirements, thermodynamic properties, schematics of growth methods, and more. Presents the latest research and most comprehensive overview of both standard and novel semiconductors Provides a systematic examination of important electronic materials, including their applications, growth methods, properties, technologies and defect and doping issues Takes a close look at emerging materials, including wide bandgap oxides, nitrides and diamond

The Science and Engineering of Microelectronic Fabrication provides a thorough introduction to the field of microelectronic processing. Geared toward a wide audience, it may be used for upper-level undergraduate or first year graduate courses and as a handy reference for professionals. The text covers all the basic unit processes used to fabricate integrated circuits, including photolithography, plasma and reactive ion etching, ion implantation, diffusin, oxidation, evaporation, vapor phase epitaxial growth, sputtering, and chemical vapor deposition. Advanced processing topics such as rapid thermal processing, non-optical lithography, molecular beam epitaxy, and metal organic chemica vapor deposition are also presented. The physics and chemistry of each process is introduced along with descriptions of the equipment used for the manufacturing of integrated circuits. The text also discusses the itnegration of these processes into common technologies such as CMOS, double poly bipolar, and GaAs MESFETs. Complexity/performance tradeoffs are evaluated

along with a description of the current state-of-the-art devices. Each chapter includes sample problems with solutions. The text makes use of the process simulation package SUPREM to demonstrate impurity profiles of practical interest. The new edition includes complete chapter coverage of MEMS including: Fundamentals of Mechanics, Stress in Thin Films, Mechanical to Electrical Transduction, Mechanics of Common MEMS Devices, Bulk Micromachining Etching Techniques, Bulk Micromachining Process Flow, Surface Micromachining Basics, Surface Micromachining Process Flow, MEMS Actuators, High Aspect Ratio Microsystems Technology (HARMST).

?The facets of IC fabrication technology is important for the students of VLSI for the better understanding of the implementation of VLSI Design. The book, Fundamentals of IC Fabrication Technology, is aimed at the novice reader, to develop a practical appreciation of the subject area, especially the processes to fabrication. In keeping with this ideology, the book has been written in a highly illustrative manner and a number of examples have been provided which reflect practical problems faced during the processes of fabrication.?

This practical book shows how an understanding of structure, thermodynamics, and electrical properties can explain some of the choices of materials used in microelectronics, and can assist in the design of new materials for specific applications. It emphasizes the importance of the phase chemistry of semiconductor and metal systems for ensuring the long-term stability of new devices. The book discusses single-crystal and polycrystalline silicon, aluminium- and gold-based metallisation schemes, packaging semiconductor devices, failure analysis, and the suitability of various materials for optoelectronic devices and solar cells. It has been designed for senior undergraduates, graduates, and researchers in

physics, electronic engineering, and materials science. Silicon, as a single-crystal semiconductor, has sparked a revolution in the field of electronics and touched nearly every field of science and technology. Though available abundantly as silica and in various other forms in nature, silicon is difficult to separate from its chemical compounds because of its reactivity. As a solid, silicon is chemically inert and stable, but growing it as a single crystal creates many technological challenges. Crystal Growth and Evaluation of Silicon for VLSI and ULSI is one of the first books to cover the systematic growth of silicon single crystals and the complete evaluation of silicon, from sand to useful wafers for device fabrication. Written for engineers and researchers working in semiconductor fabrication industries, this practical text: Describes different techniques used to grow silicon single crystals Explains how grown single-crystal ingots become a complete silicon wafer for integrated-circuit fabrication Reviews different methods to evaluate silicon wafers to determine suitability for device applications Analyzes silicon wafers in terms of resistivity and impurity concentration mapping Examines the effect of intentional and unintentional impurities Explores the defects found in regular silicon-crystal lattice Discusses silicon wafer preparation for VLSI and ULSI processing Crystal Growth and Evaluation of Silicon for VLSI and ULSI is an essential reference for different approaches to the selection of the basic silicon-containing compound, separation of silicon as metallurgical-grade pure silicon, subsequent purification, single-crystal growth, and defects and evaluation of the deviations within the grown crystals. Electronic materials are a dominant factor in many areas of modern technology. The need to understand'them is paramount; this book addresses that need. The main aim of this volume is to provide a broad unified view of electronic materials, including key aspects of their science and

technology and also, in many cases, their commercial implications. It was considered important that much of the contents of such an overview should be intelligible by a broad audience of graduates and industrial scientists, and relevant to advanced undergraduate studies. It should also be up to date and even looking forward to the future. Although more extensive, and written specifically as a text, the resulting book has much in common with a short course of the same name given at Coventry Polytechnic. The interpretation of the term "electronic materials" used in this volume is a very broad one, in line with the initial aim. The principal restriction is that, with one or two minor exceptions relating to aspects of device processing, for example, the materials dealt with are all active materials. Materials such as simple insulators or simple conductors, playing only a passive role, are not singled out for consider ation. Active materials might be defined as those involved in the processing of signals in a way that depends crucially on some specific property of those materials, and the immediate question then concerns the types of signals that might be considered.

The Handbook of Semiconductor Manufacturing Technology describes the individual processes and manufacturing control, support, and infrastructure technologies of silicon-based integrated-circuit manufacturing, many of which are also applicable for building devices on other semiconductor substrates. Discussing ion implantation, rapid thermal processing, photomask fabrication, chip testing, and plasma etching, the editors explore current and anticipated equipment, devices, materials, and practices of silicon-based manufacturing. The book includes a foreword by Jack S. Kilby, cowinner of the Nobel Prize in Physics 2000 "for his part in the invention of the integrated circuit."

This introductory book assumes minimal knowledge of the existence of integrated circuits and of the terminal behavior of

electronic components such as resistors, diodes, and MOS and bipolar transistors. It presents to readers the basic information necessary for more advanced processing and design books. Focuses mainly on the basic processes used in fabrication, including lithography, oxidation, diffusion, ion implementation, and thin film deposition. Covers interconnection technology, packaging, and yield. Appropriate for readers interested in the area of fabrication of solid state devices and integrated circuits.

This completely revised edition of a bestselling concise introduction to microsystems technology includes the latest trends in this emerging scientific discipline. The chapters on silicium and LIGA technology are greatly expanded, whilst new topics include application aspects in medicine and health technology, lithography and electroplating.

The performance of high-speed semiconductor devices—the genius driving digital computers, advanced electronic systems for digital signal processing, telecommunication systems, and optoelectronics—is inextricably linked to the unique physical and electrical properties of gallium arsenide. Once viewed as a novel alternative to silicon, gallium arsenide has swiftly moved into the forefront of the leading high-tech industries as an irreplaceable material in component fabrication. GaAs High-Speed Devices provides a comprehensive, state-of-the-science look at the phenomenally expansive range of engineering devices gallium arsenide has made possible—as well as the fabrication methods, operating principles, device models, novel device designs, and the material properties and physics of GaAs that are so keenly integral to their success. In a clear five-part format, the book systematically examines each of these aspects of GaAs device technology, forming the first authoritative study to consider so many important aspects at once and in such detail. Beginning with chapter 2 of part one, the book discusses such basic subjects

as gallium arsenide materials and crystal properties, electron energy band structures, hole and electron transport, crystal growth of GaAs from the melt and defect density analysis. Part two describes the fabrication process of gallium arsenide devices and integrated circuits, shedding light, in chapter 3, on epitaxial growth processes, molecular beam epitaxy, and metal organic chemical vapor deposition techniques. Chapter 4 provides an introduction to wafer cleaning techniques and environment control, wet etching methods and chemicals, and dry etching systems, including reactive ion etching, focused ion beam, and laser assisted methods. Chapter 5 provides a clear overview of photolithography and nonoptical lithography techniques that include electron beam, x-ray, and ion beam lithography systems. The advances in fabrication techniques described in previous chapters necessitate an examination of low-dimension device physics, which is carried on in detail in chapter 6 of part three. Part four includes a discussion of innovative device design and operating principles which deepens and elaborates the ideas introduced in chapter 1. Key areas such as metal-semiconductor contact systems, Schottky Barrier and ohmic contact formation and reliability studies are examined in chapter 7. A detailed discussion of metal semiconductor field-effect transistors, the fabrication technology, and models and parameter extraction for device analyses occurs in chapter 8. The fifth part of the book progresses to an up-to-date discussion of heterostructure field-effect (HEMT in chapter 9), potential-effect (HBT in chapter 10), and quantum-effect devices (chapters 11 and 12), all of which are certain to have a major impact on high-speed integrated circuits and optoelectronic integrated circuit (OEIC) applications. Every facet of GaAs device technology is placed firmly in a historical context, allowing readers to see instantly the significant developmental changes that have shaped it. Featuring a look at devices still under development

and device structures not yet found in the literature, GaAs High-Speed Devices also provides a valuable glimpse into the newest innovations at the center of the latest GaAs technology. An essential text for electrical engineers, materials scientists, physicists, and students, GaAs High-Speed Devices offers the first comprehensive and up-to-date look at these formidable 21st century tools. The unique physical and electrical properties of gallium arsenide has revolutionized the hardware essential to digital computers, advanced electronic systems for digital signal processing, telecommunication systems, and optoelectronics. GaAs High-Speed Devices provides the first fully comprehensive look at the enormous range of engineering devices gallium arsenide has made possible as well as the backbone of the technology—ication methods, operating principles, and the materials properties and physics of GaAs—device models and novel device designs. Featuring a clear, six-part format, the book covers: GaAs materials and crystal properties Fabrication processes of GaAs devices and integrated circuits Electron beam, x-ray, and ion beam lithography systems Metal-semiconductor contact systems Heterostructure field-effect, potential-effect, and quantum-effect devices GaAs Microwave Monolithic Integrated Circuits and Digital Integrated Circuits In addition, this comprehensive volume places every facet of the technology in an historical context and gives readers an unusual glimpse at devices still under development and device structures not yet found in the literature.

"This text follows the tradition of Sze's highly successful pioneering text on VLSI technology and is updated with the latest advances in the field of microelectronic chip fabrication. Since computer chips are foundations of modern electronics, these topics are essential for the next generation of USLI technologies, allowing more transistors to be packaged on a

single chip. Contributing to each chapter are industry experts, specializing in topics such as epitaxy with low temperature process, rapid thermal processes, low damage plasma reactive ion etching, fine line litography, cleaning technology, clean room technology, packing and reliability."--

'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 MagazineThis 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.

Improve your circuit-design potential with this expert guide to the devices and technology used in mixed analog-digital VLSI chips for such high-volume applications as hard-disk drives, wireless telephones, and consumer electronics. The book provides you with a critical understanding of device models, fabrication technology, and layout as they apply to mixed analog-digital circuits.You will learn about the many device-modeling requirements for analog work, as well as the pitfalls in models used today for computer simulators such as Spice. Also included is information on fabrication technologies

developed specifically for mixed-signal VLSI chips, plus guidance on the layout of mixed analog-digital chips for a high degree of analog-device matching and minimum digital-to-analog interference.This reference book features an intuitive introduction to MOSFET operation that will enable you to view with insight any MOSFET model ? besides thorough discussions on valuable large-signal and small-signal models.Filled with practical information, this first-of-its-kind book will help you grasp the nuances of mixed-signal VLSI-device models and layout that are crucial to the design of high-performance chips.

The purpose of this book is to provide the reader with a self-contained treatment of fundamen tal solid state and semiconductor device physics. The material presented in the text is based upon the lecture notes of a one-year graduate course sequence taught by this author for many years in the ·Department of Electrical Engineering of the University of Florida. It is intended as an introductory textbook for graduate students in electrical engineering. However, many students from other disciplines and backgrounds such as chemical engineering, materials science, and physics have also taken this course sequence, and will be interested in the material presented herein. This book may also serve as a general reference for device engineers in the semiconductor industry. The present volume covers a wide variety of topics on basic solid state physics and physical principles of various semiconductor devices. The main subjects covered include crystal structures, lattice dynamics, semiconductor statistics, energy band theory, excess carrier phenomena and recombination mechanisms, carrier transport and scattering mechanisms, optical properties, photoelectric effects, metal-semiconductor devices, the p--n junction diode, bipolar junction transistor, MOS devices, photonic devices, quantum effect devices, and high speed III-V semiconductor devices.

The text presents a unified and balanced treatment of the physics of semiconductor materials and devices. It is intended to provide physicists and mat erials scientists with more device backgrounds, and device engineers with a broader knowledge of fundamental solid state physics.

The 2nd edition of defect oriented testing has been extensively updated. New chapters on Functional, Parametric Defect Models and Inductive fault Analysis and Yield Engineering have been added to provide a link between defect sources and yield. The chapter on RAM testing has been updated with focus on parametric and SRAM stability testing. Similarly, newer material has been incorporated in digital fault modeling and analog testing chapters. The strength of Defect Oriented Testing for nano-Metric CMOS VLSIs lies in its industrial relevance.

Nanostructured materials is one of the hottest and fastest growing areas in today's materials science field, along with the related field of solid state physics. Nanostructured materials and their based technologies have opened up exciting new possibilites for future applications in a number of areas including aerospace, automotive, x-ray technology, batteries, sensors, color imaging, printing, computer chips, medical implants, pharmacy, and cosmetics. The ability to change properties on the atomic level promises a revolution in many realms of science and technology. Thus, this book details the high level of activity and significant findings are available for those involved in research and development in the field. It also covers industrial findings and corporate support. This five-volume set summarizes fundamentals of nano-science in a comprehensive way. The contributors enlisted by the editor are at elite

institutions worldwide. Key Features * Provides comprehensive coverage of the dominant technology of the 21st century * Written by 127 authors from 16 countries, making this truly international * First and only reference to cover all aspects of nanostructured materials and nanotechnology

Offers a basic, up-to-date introduction to semiconductor fabrication technology, including both the theoretical and practical aspects of all major steps in the fabrication sequence Presents comprehensive coverage of process sequences Introduces readers to modern simulation tools Addresses the practical aspects of integrated circuit fabrication Clearly explains basic processing theory

The new edition of the most detailed and comprehensive single-volume reference on major semiconductor devices The Fourth Edition of Physics of Semiconductor Devices remains the standard reference work on the fundamental physics and operational characteristics of all major bipolar, unipolar, special microwave, and optoelectronic devices. This fully updated and expanded edition includes approximately 1,000 references to original research papers and review articles, more than 650 high-quality technical illustrations, and over two dozen tables of material parameters. Divided into five parts, the text first provides a summary of semiconductor properties, covering energy band, carrier concentration, and transport properties. The second part surveys the basic building blocks of semiconductor devices, including p-n junctions, metal-semiconductor contacts, and metal-insulator-semiconductor (MIS) capacitors. Part III examines bipolar transistors, MOSFETs (MOS field-

effect transistors), and other field-effect transistors such as JFETs (junction field-effect-transistors) and MESFETs (metal-semiconductor field-effect transistors). Part IV focuses on negative-resistance and power devices. The book concludes with coverage of photonic devices and sensors, including light-emitting diodes (LEDs), solar cells, and various photodetectors and semiconductor sensors. This classic volume, the standard textbook and reference in the field of semiconductor devices: Provides the practical foundation necessary for understanding the devices currently in use and evaluating the performance and limitations of future devices Offers completely updated and revised information that reflects advances in device concepts, performance, and application Features discussions of topics of contemporary interest, such as applications of photonic devices that convert optical energy to electric energy Includes numerous problem sets, real-world examples, tables, figures, and illustrations; several useful appendices; and a detailed solutions manual Explores new work on leading-edge technologies such as MODFETs, resonant-tunneling diodes, quantum-cascade lasers, single-electron transistors, real-space-transfer devices, and MOS-controlled thyristors Physics of Semiconductor Devices, Fourth Edition is an indispensable resource for design engineers, research scientists, industrial and electronics engineering managers, and graduate students in the field.

Must-have reference on electronic packaging technology! The electronics industry is shifting towards system packaging technology due to the need for higher

chip circuit density without increasing production costs. Electronic packaging, or circuit integration, is seen as a necessary strategy to achieve a performance growth of electronic circuitry in next-generation electronics. With the implementation of novel materials with specific and tunable electrical and magnetic properties, electronic packaging is highly attractive as a solution to achieve denser levels of circuit integration. The first part of the book gives an overview of electronic packaging and provides the reader with the fundamentals of the most important packaging techniques such as wire bonding, tap automatic bonding, flip chip solder joint bonding, microbump bonding, and low temperature direct Cu-to-Cu bonding. Part two consists of concepts of electronic circuit design and its role in low power devices, biomedical devices, and circuit integration. The last part of the book contains topics based on the science of electronic packaging and the reliability of packaging technology.

Learn the basic properties and designs of modern VLSI devices, as well as the factors affecting performance, with this thoroughly updated second edition. The first edition has been widely adopted as a standard textbook in microelectronics in many major US universities and worldwide. The internationally renowned authors highlight the intricate interdependencies and subtle trade-offs between various practically important device parameters, and provide an in-depth discussion of device scaling and scaling limits of CMOS and bipolar devices. Equations and parameters provided are checked continuously against the reality of silicon data,

making the book equally useful in practical transistor design and in the classroom. Every chapter has been updated to include the latest developments, such as MOSFET scale length theory, high-field transport model and SiGe-base bipolar devices.

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