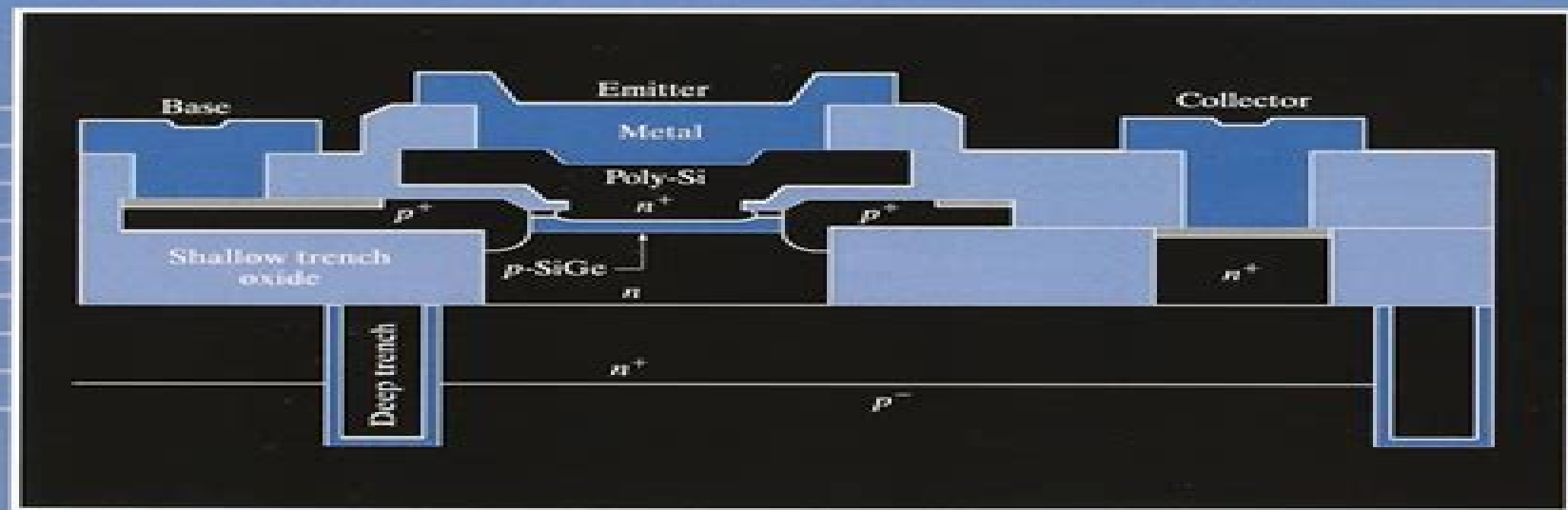


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SECOND EDITION

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Microelectronic Fabrication

Richard C. Dorf



Microelectronic Fabrication:

Introduction to Microelectronic Fabrication Richard C. Jaeger, 1988 This volume is a survey of techniques in the field It is devoted to processing and is highlighted by explanations The Science and Engineering of Microelectronic Fabrication Stephen A. Campbell, Professor in the Department of Electrical and Computer Engineering Stephen A. Campbell, 2001 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 diffusion 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 chemical 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 integration 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 *Reliability and Quality in Microelectronic Manufacturing* A. Christou, 2006

Electron-Beam Technology in Microelectronic Fabrication George Brewer, 2012-12-02 Electron Beam Technology in Microelectronic Fabrication presents a unified description of the technology of high resolution lithography This book is organized into six chapters each treating a major segment of the technology of high resolution lithography The book examines topics such as the physics of interaction of the electrons with the polymer resist in which the patterns are drawn the machines that generate and control the beam and ways of applying electron beam lithography in device fabrication and in the making of masks for photolithographic replication Chapter 2 discusses fundamental processes by which patterns are created in resist masks Chapter 3 describes electron beam lithography machines including some details of each of the major elements in the electron optical column and their effect on the focused electron beam Chapter 4 presents the use of electron beam lithography to make discrete devices and integrated circuits Chapter 5 looks at the techniques and economics of mask fabrication by the use of electron beams Finally Chapter 6 presents a comprehensive description and evaluation of the several high resolution replication processes currently under development This book will be of great value to students and to

engineers who want to learn the unique features of high resolution lithography so that they can apply it in research development or production of the next generation of microelectronic devices and circuits

Microelectronic Packaging M. Datta, Tetsuya Osaka, J. Walter Schultze, 2004-12-20 Microelectronic Packaging analyzes the massive impact of electrochemical technologies on various levels of microelectronic packaging Traditionally interconnections within a chip were considered outside the realm of packaging technologies but this book emphasizes the importance of chip wiring as a key aspect of microelectronic packaging and focuses on electrochemical processing as an enabler of advanced chip metallization Divided into five parts the book begins by outlining the basics of electrochemical processing defining the microelectronic packaging hierarchy and emphasizing the impact of electrochemical technology on packaging The second part discusses chip metallization topics including the development of robust barrier layers and alternative metallization materials Part III explores key aspects of chip package interconnect technologies followed by Part IV's analysis of packages boards and connectors which covers materials development technology trends in ceramic packages and multi chip modules and electroplated contact materials Illustrating the importance of processing tools in enabling technology development the book concludes with chapters on chemical mechanical planarization electroplating and wet etching cleaning tools Experts from industry universities and national laboratories submitted reviews on each of these subjects capturing the technological advances made in each area A detailed examination of how packaging responds to the challenges of Moore's law this book serves as a timely and valuable reference for microelectronic packaging and processing professionals and other industrial technologists

Fabrication and Design of Resonant Microdevices Behraad Bahreyni, 2008-10-20 This book discusses the main issues of fabrication and design and applications of micromachined resonant devices including techniques commonly used for processing the output signal of resonant micro electro mechanical systems MEMS Concepts of resonance are introduced with an overview of fabrication techniques for micromachined devices important to understand as design options will depend on how the device will be fabricated Also explained excitation and signal detection methods an analytic model of device behavior a valuable design tool numerical simulation techniques issues of damping and noise for resonant MEMS electronic interfacing packaging issues and numerous examples of resonant MEMS from academia and industry Offers numerous academic and industrial examples of resonant MEMS Provides an analytic model of device behaviour Explains two port systems in detail Devotes ample space to excitation and signal detection methods Covers issues of damping and noise for resonant MEMS two topics of particular importance for high Q devices

The Science and Engineering of Microelectronic Fabrication Stephen A. Campbell, 1996 The Science and Engineering of Microelectronic Fabrication provides an introduction to microelectronic processing Geared towards a wide audience it may be used as a textbook for both first year graduate and upper level undergraduate 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 diffusion oxidation evaporation vapor phase epitaxial growth sputtering and chemical vapor deposition Advanced processing topics such as rapid thermal processing nonoptical lithography molecular beam epitaxy and metal organic chemical 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 integration 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 book also makes use of the process simulation package SUPREM to demonstrate impurity profiles of practical interest

The Electrical Engineering Handbook, Second Edition Richard C. Dorf, 1997-09-26 In 1993 the first edition of *The Electrical Engineering Handbook* set a new standard for breadth and depth of coverage in an engineering reference work Now this classic has been substantially revised and updated to include the latest information on all the important topics in electrical engineering today Every electrical engineer should have an opportunity to expand his expertise with this definitive guide In a single volume this handbook provides a complete reference to answer the questions encountered by practicing engineers in industry government or academia This well organized book is divided into 12 major sections that encompass the entire field of electrical engineering including circuits signal processing electronics electromagnetics electrical effects and devices and energy and the emerging trends in the fields of communications digital devices computer engineering systems and biomedical engineering A compendium of physical chemical material and mathematical data completes this comprehensive resource Every major topic is thoroughly covered and every important concept is defined described and illustrated Conceptually challenging but carefully explained articles are equally valuable to the practicing engineer researchers and students A distinguished advisory board and contributors including many of the leading authors professors and researchers in the field today assist noted author and professor Richard Dorf in offering complete coverage of this rapidly expanding field No other single volume available today offers this combination of broad coverage and depth of exploration of the topics *The Electrical Engineering Handbook* will be an invaluable resource for electrical engineers for years to come

Microelectronics Manufacturing Diagnostics Handbook Abraham Landzberg, 2012-12-06 The world of microelectronics is filled with cusses measurement systems manufacturing many success stories From the use of semi control techniques test diagnostics and fail ure analysis It discusses methods for modeling conductors for powerful desktop computers to their use in maintaining optimum engine per and reducing defects and for preventing de formance in modem automobiles they have fects in the first place The approach described clearly improved our daily lives The broad while geared to the microelectronics world has useability of the technology is enabled how applicability to any manufacturing process of similar complexity The authors comprise some ever only by the progress made in reducing their cost and improving their reliability De of the best scientific minds in the world and fect reduction receives a significant

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DeGarmo's Materials and Processes in Manufacturing Ernest Paul DeGarmo, J. T. Black, Ronald A. Kohser, 2011-08-30 Now in its eleventh edition DeGarmo's Materials and Processes in Manufacturing has been a market leading text on manufacturing and manufacturing processes courses for more than fifty years Authors J T Black and Ron Kohser have continued this book's long and distinguished tradition of exceedingly clear presentation and highly practical approach to materials and processes presenting mathematical models and analytical equations only when they enhance the basic understanding of the material Completely revised and updated to reflect all current practices standards and materials the eleventh edition has new coverage of additive manufacturing lean engineering and processes related to ceramics polymers and plastics

Green Manufacturing David A. Dornfeld, 2012-12-09 Green Manufacturing Fundamentals and Applications introduces the basic definitions and issues surrounding green manufacturing at the process machine and system including supply chain levels It also shows by way of several examples from different industry sectors the potential for substantial improvement and the paths to achieve the improvement Additionally this book discusses regulatory and government motivations for green manufacturing and outlines the path for making manufacturing more green as well as making production more sustainable This book also Discusses new engineering approaches for manufacturing and provides a path from traditional manufacturing to green manufacturing Addresses regulatory and economic issues surrounding green manufacturing Details new supply chains that need to be in place before going green Includes state of the art case studies in the areas of automotive semiconductor and medical areas as well as in the supply chain and packaging areas

Encyclopedia of Chemical Processing (Online) Sunggyu Lee, 2005-11-01 This second edition Encyclopedia supplies nearly 350 gold standard articles on the methods practices products and standards influencing the chemical industries It offers expertly written articles on technologies at the forefront of the field to maximize and enhance the research and production phases of current and emerging chemical manufacturing practices and techniques This collecting of information is of vital interest to chemical polymer electrical mechanical and civil engineers as well as chemists and chemical researchers A complete reconceptualization of the classic reference series the Encyclopedia of Chemical Processing and Design whose first volume published in 1976 this resource offers extensive A Z treatment of the subject in five simultaneously published volumes with comprehensive indexing of all five volumes in the back

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Emerging Nanotechnologies for Manufacturing Waqar Ahmed,M. J. Jackson,Mark J Jackson,2009-11-24

Nanotechnology is a technology on the verge of commercialization In this important work an unrivalled team of international experts provides an exploration of the emerging nanotechnologies that are poised to make the nano revolution a reality in the manufacturing sector From their different perspectives the contributors explore how developments in nanotechnology are transforming areas as diverse as medicine advanced materials energy electronics and agriculture Key topics covered include Characterization of nanostructures Bionanotechnology Nanoelectronics Micro and nanomachining Self assembly techniques New applications of carbon nanotubes Environmental and health impacts This book provides an important and in depth guide to the applications and impact of nanotechnology to different manufacturing sectors As such it will find a broad readership from R D scientists and engineers to venture capitalists About the Authors Waqar Ahmed is Chair of Nanotechnology Advanced Manufacturing and the Director of the Institute of Advanced Manufacturing and Innovation at the University of Central Lancashire UK He has contributed to the wider industrial adoption of surface coating solutions through fundamental research and modeling of gas phase processes in CVD and studies of tribological behavior Mark J Jackson is a Professor at the Birck Nanotechnology Center and Center for Advanced Manufacturing College of Technology at Purdue University Dr Jackson is active in research work concerned with understanding the properties of materials in the field of microscale metal cutting micro and nanoabrasive machining and laser micromachining He is also involved in developing next generation manufacturing processes and biomedical engineering Explains how to use biological pathways to produce nanoelectric devices Presents data on new experimental designs Discusses the history of carbon nanotubes and how they are synthesized to fabricate novel nanostructures incl data on laser ablation Extensive use of illustrations tables and figures throughout

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