



**Fig. 3.68 Classification of semiconductor memories**

# Semiconductor Memories

**A. J. van de Goor**



## **Semiconductor Memories:**

*Semiconductor Memories and Systems* Andrea Redaelli, Fabio Pellizzer, 2022-06-07 *Semiconductor Memories and Systems* provides a comprehensive overview of the current state of semiconductor memory at the technology and system levels. After an introduction on market trends and memory applications, the book focuses on mainstream technologies illustrating their current status, challenges, and opportunities, with special attention paid to scalability paths. Technologies discussed include static random access memory (SRAM), dynamic random access memory (DRAM), non-volatile memory (NVM), and NAND flash memory. Embedded memory and requirements and system-level needs for storage-class memory are also addressed. Each chapter covers physical operating mechanisms, fabrication technologies, and the main challenges to scalability. Finally, the work reviews the emerging trends for storage-class memory, mainly focusing on the advantages and opportunities of phase-change-based memory technologies. Features contributions from experts from leading companies in semiconductor memory. Discusses physical operating mechanisms, fabrication technologies, and paths to scalability for current and emerging semiconductor memories. Reviews primary memory technologies including SRAM, DRAM, NVM, and NAND flash memory. Includes emerging storage-class memory technologies such as phase-change memory.

*Advanced Semiconductor Memories* Ashok K. Sharma, 2003 A valuable reference for the most vital microelectronic components in the marketplace. DRAMs are the technology drivers of high-volume semiconductor fabrication processes for new-generation products that, in addition to computer markets, are finding increased usage in automotive, aviation, military, and space telecommunications and wireless industries. A new generation of high-density and high-performance memory architectures evolving for mass-storage devices, including embedded memories and nonvolatile flash memories, are serving a diverse range of applications. Comprehensive and up-to-date. *Advanced Semiconductor Memories: Architectures, Designs, and Applications* offers professionals in the semiconductor and related industries an in-depth review of advanced semiconductor memory technology developments. It provides details on Static Random Access Memory technologies, including advanced architectures, low-voltage SRAMs, fast SRAMs, SOI SRAMs, and specialty SRAMs, multiport FIFOs, CAMs, High-Performance Dynamic Random Access Memory, DDRs, synchronous DRAM, SGRAM features and architectures, EDRAM, CDRAM, Gigabit DRAM scaling issues and architectures, multilevel storage DRAMs, and SOI DRAMs. Applications specific DRAM architectures and designs, VRAMs, DDR SGRAMs, RDRAMs, SLDRAMs, 3-D RAM, Advanced Nonvolatile Memory designs and technologies, including floating-gate cell theory, EEPROM, flash memory cell design, and multilevel flash, FRAMs, and reliability issues. Embedded memory designs and applications, including cache-merged processor DRAM architectures, memory cards, and multimedia applications. Future memory directions with megabytes to terabytes storage capacities using RTDs, single-electron memories, etc. A continuation of the topics introduced in *Semiconductor Memories: Technology, Testing, and Reliability*, the author's earlier work. *Advanced Semiconductor Memories: Architectures, Designs, and Applications* offers a much-needed reference to the major developments.

and future directions of advanced semiconductor memory technology

**Memories** Eugene R. Hnatek, 1977 A Wiley Interscience publication

Kurinec, Krzysztof Iniewski, 2017-07-28 Nanoscale memories are used everywhere From your iPhone to a supercomputer every electronic device contains at least one such type With coverage of current and prototypical technologies Nanoscale Semiconductor Memories Technology and Applications presents the latest research in the field of nanoscale memories technology in one place It also covers a myriad of applications that nanoscale memories technology has enabled The book begins with coverage of SRAM addressing the design challenges as the technology scales then provides design strategies to mitigate radiation induced upsets in SRAM It discusses the current state of the art DRAM technology and the need to develop high performance sense amplifier circuitry The text then covers the novel concept of capacitorless 1T DRAM termed as Advanced RAM or A RAM and presents a discussion on quantum dot QD based flash memory Building on this foundation the coverage turns to STT RAM emphasizing scalable embedded STT RAM and the physics and engineering of magnetic domain wall racetrack memory The book also discusses state of the art modeling applied to phase change memory devices and includes an extensive review of RRAM highlighting the physics of operation and analyzing different materials systems currently under investigation The hunt is still on for universal memory that fits all the requirements of an ideal memory capable of high density storage low power operation unparalleled speed high endurance and low cost Taking an interdisciplinary approach this book bridges technological and application issues to provide the groundwork for developing custom designed memory systems

**Semiconductor Memory Devices and Circuits** Shimeng Yu, 2022-04-19 This book covers semiconductor memory technologies from device bit cell structures to memory array design with an emphasis on recent industry scaling trends and cutting edge technologies The first part of the book discusses the mainstream semiconductor memory technologies The second part of the book discusses the emerging memory candidates that may have the potential to change the memory hierarchy and surveys new applications of memory technologies for machine deep learning applications This book is intended for graduate students in electrical and computer engineering programs and researchers or industry professionals in semiconductors and microelectronics Explains the design of basic memory bit cells including 6 transistor SRAM 1 transistor 1 capacitor DRAM and floating gate charge trap FLASH transistor Examines the design of the peripheral circuits including the sense amplifier and array level organization for the memory array Examines industry trends of memory technologies such as FinFET based SRAM High Bandwidth Memory HBM 3D NAND Flash and 3D X point array Discusses the prospects and challenges of emerging memory technologies such as PCM RRAM STT MRAM SOT MRAM and FeRAM FeFET Explores the new applications such as in memory computing for AI hardware acceleration

**Rad-hard Semiconductor Memories** Cristiano Calligaro, Umberto Gatti, 2022-09-01 Rad hard Semiconductor Memories is intended for researchers and professionals interested in understanding how to design and make a preliminary evaluation of

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Nanoscale Semiconductor Memories Santosh K.

rad hard semiconductor memories making leverage on standard CMOS manufacturing processes available from different silicon foundries and using different technology nodes In the first part of the book a preliminary overview of the effects of radiation in space with a specific focus on memories will be conducted to enable the reader to understand why specific design solutions are adopted to mitigate hard and soft errors The second part will be devoted to RHBD Radiation Hardening by Design techniques for semiconductor components with a specific focus on memories The approach will follow a top down scheme starting from RHBD at architectural level how to build a rad hard floor plan at circuit level how to mitigate radiation effects by handling transistors in the proper way and at layout level how to shape a layout to mitigate radiation effects After the description of the mitigation techniques the book enters in the core of the topic covering SRAMs synchronous asynchronous single port and dual port and PROMs based on AntiFuse OTP technologies describing how to design a rad hard flash memory and fostering RHBD toward emerging memories like ReRAM The last part will be a leap into emerging memories at a very early stage not yet ready for industrial use in silicon but candidates to become an option for the next wave of rad hard components Technical topics discussed in the book include Radiation effects on semiconductor components TID SEE Radiation Hardening by Design RHBD Techniques Rad hard SRAMs Rad hard PROMs Rad hard Flash NVMs Rad hard ReRAMs Rad hard emerging technologies

**Semiconductor Memories** Ashok K. Sharma, 2002-09-10 Semiconductor Memories provides in depth coverage in the areas of design for testing fault tolerance failure modes and mechanisms and screening and qualification methods including Memory cell structures and fabrication technologies Application specific memories and architectures Memory design fault modeling and test algorithms limitations and trade offs Space environment radiation hardening process and design techniques and radiation testing Memory stacks and multichip modules for gigabyte storage

Semiconductor Memories Betty Prince, 1991 This handbook gives a complete overview to the design manufacture and application of semiconductor memory technology The move towards application specific memories and the new developments in memory applications including smart memories computers and networks are explored The author also details the new trends in memory architecture and functionality such as multiplexing video memory architecture and error correction For embedded memories there is an explanation of the advantages and disadvantages testing methods and reliability Detailed consideration is given to future trends in memories VLSI technology commodity memories smart cards smart houses CIM speech synthesis and recognition RISC architecture neural processors and superconductors source 4 me de couv

**Testing Semiconductor Memories** A. J. van de Goor, 1991 Comprehensive coverage of memory test problems at chip array and board level is provided in this book For each of these test levels a class of fault models is introduced along with tests for these models The author also presents algorithms of relevant fault models together with proofs of their correctness Special attention is given to why a fault model belongs to a particular class and why it is of interest A software package suitable for use on IBM PCs and compatibles is also available which consists of a set of memory test programs and a

simulation package demonstrating how the algorithms are executed and the relationship of the algorithm with the memory

VLSI-Design of Non-Volatile Memories Giovanni Campardo, Rino Micheloni, David Novosel, 2005-01-18 VLSI Design for Non Volatile Memories is intended for electrical engineers and graduate students who want to enter into the integrated circuit design world Non volatile memories are treated as an example to explain general design concepts Practical illustrative examples of non volatile memories including flash types are showcased to give insightful examples of the discussed design approaches A collection of photos is included to make the reader familiar with silicon aspects Throughout all parts of this book the authors have taken a practical and applications driven point of view providing a comprehensive and easily understood approach to all the concepts discussed Giovanni Campardo and Rino Micheloni have a solid track record of leading design activities at the STMicroelectronics Flash Division David Novosel is President and founder of Intelligent Micro Design Inc Pittsburg PA

**Memory Devices and Microprocessors** Mr. Rohit Manglik, 2024-03-12 EduGorilla Publication is a trusted name in the education sector committed to empowering learners with high quality study materials and resources Specializing in competitive exams and academic support EduGorilla provides comprehensive and well structured content tailored to meet the needs of students across various streams and levels

**Nonvolatile Memory Design** Hai Li, Yiran Chen, 2017-12-19 The manufacture of flash memory which is the dominant nonvolatile memory technology is facing severe technical barriers So much so that some emerging technologies have been proposed as alternatives to flash memory in the nano regime Nonvolatile Memory Design Magnetic Resistive and Phase Changing introduces three promising candidates phase change memory magnetic random access memory and resistive random access memory The text illustrates the fundamental storage mechanism of these technologies and examines their differences from flash memory techniques Based on the latest advances the authors discuss key design methodologies as well as the various functions and capabilities of the three nonvolatile memory technologies

**Microelectronics, II.**, 1983

**Testing Static Random Access Memories** Said Hamdioui, 2013-06-29 Testing Static Random Access Memories covers testing of one of the important semiconductor memories types it addresses testing of static random access memories SRAMs both single port and multi port It contributes to the technical knowledge needed by those involved in memory testing engineers and researchers The book begins with outlining the most popular SRAMs architectures Then the description of realistic fault models based on defect injection and SPICE simulation are introduced Thereafter high quality and low cost test patterns as well as test strategies for single port two port and any p port SRAMs are presented together with some preliminary test results showing the importance of the new tests in reducing DPM level The impact of the port restrictions e g read only ports on the fault models tests and test strategies is also discussed Features Fault primitive based analysis of memory faults A complete framework of and classification memory faults A systematic way to develop optimal and high quality memory test algorithms A systematic way to develop test patterns for any multi port SRAM Challenges and trends in embedded memory testing

*Computer*

*Fundamentals* B. Ram, 2007 The fourth edition of this widely used book includes several new topics to make the coverage more comprehensive and contemporary The book presents an exhaustive and up to date exposition of CPUs peripherals supporting chips and bus standards The cov

**Nonvolatile Semiconductor Memories** Chenming Hu, 1991

**Fundamentals of Computers and Programming in C** J. B. Dixit, 2005 Digital Design and Fabrication Vojin G.

Oklobdzija, 2017-12-19 In response to tremendous growth and new technologies in the semiconductor industry this volume is organized into five information rich sections Digital Design and Fabrication surveys the latest advances in computer architecture and design as well as the technologies used to manufacture and test them Featuring contributions from leading experts the book also includes a new section on memory and storage in addition to a new chapter on nonvolatile memory technologies Developing advanced concepts this sharply focused book Describes new technologies that have become driving factors for the electronic industry Includes new information on semiconductor memory circuits whose development best illustrates the phenomenal progress encountered by the fabrication and technology sector Contains a section dedicated to issues related to system power consumption Describes reliability and testability of computer systems Pinpoints trends and state of the art advances in fabrication and CMOS technologies Describes performance evaluation measures which are the bottom line from the user s point of view Discusses design techniques used to create modern computer systems including high speed computer arithmetic and high frequency design timing and clocking and PLL and DLL design

**The Illiac IV** R.M. Hord, 2013-03-14 The Illiac IV was the first large scale array computer As the fore runner of today s advanced computers it brought whole classes of scientific computations into the realm of practicality Conceived initially as a grand experiment in computer science the revolutionary architecture incorporated both a high level of parallelism and pipe lining After a difficult gestation the Illiac IV became operational in November 1975 It has for a decade been a substantial driving force behind the development of computer technology Today the Illiac IV continues to service large scale scientific applications areas including computational fluid dynamics seismic stress wave propagation modeling climate simulation digital image processing astrophysics numerical analysis spectroscopy and other diverse areas This volume brings together previously published material adapted in an effort to provide the reader with a perspective on the strengths and weaknesses of the Illiac IV and the impact this unique computational resource has had on the development of technology The history and current status of the Illiac system the design and architecture of the hardware the programming languages and a considerable sampling of applications are all covered at some length A final section is devoted to commentary

**Semiconductor Memories** , 1980

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