

Ionizing Radiation Effects in Electronics

**From Memories
to Imagers**

EDITED BY
**MARTA BAGATIN
SIMONE GERARDIN**



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Nice Book Ionizing Radiation Effects Electronics Memories

Sanjeev Saksena,A. John Camm



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Ionizing Radiation Effects in Electronics Marta Bagatin, Simone Gerardin, 2018-09-03 *Ionizing Radiation Effects in Electronics From Memories to Imagers* delivers comprehensive coverage of the effects of ionizing radiation on state of the art semiconductor devices The book also offers valuable insight into modern radiation hardening techniques The text begins by providing important background information on radiation effects their underlying mechanisms and the use of Monte Carlo techniques to simulate radiation transport and the effects of radiation on electronics The book then Explains the effects of radiation on digital commercial devices including microprocessors and volatile and nonvolatile memories static random access memories SRAMs dynamic random access memories DRAMs and Flash memories Examines issues like soft errors total dose and displacement damage together with hardening by design solutions for digital circuits field programmable gate arrays FPGAs and mixed analog circuits Explores the effects of radiation on fiber optics and imager devices such as complementary metal oxide semiconductor CMOS sensors and charge coupled devices CCDs Featuring real world examples case studies extensive references and contributions from leading experts in industry and academia *Ionizing Radiation Effects in Electronics From Memories to Imagers* is suitable both for newcomers who want to become familiar with radiation effects and for radiation experts who are looking for more advanced material or to make effective use of beam time **Ionizing**

Radiation Effects in Electronics Marta Bagatin, Simone Gerardin, 2018-09-03 *Ionizing Radiation Effects in Electronics From Memories to Imagers* delivers comprehensive coverage of the effects of ionizing radiation on state of the art semiconductor devices The book also offers valuable insight into modern radiation hardening techniques The text begins by providing important background information on radiation effects their underlying mechanisms and the use of Monte Carlo techniques to simulate radiation transport and the effects of radiation on electronics The book then Explains the effects of radiation on digital commercial devices including microprocessors and volatile and nonvolatile memories static random access memories SRAMs dynamic random access memories DRAMs and Flash memories Examines issues like soft errors total dose and displacement damage together with hardening by design solutions for digital circuits field programmable gate arrays FPGAs and mixed analog circuits Explores the effects of radiation on fiber optics and imager devices such as complementary metal oxide semiconductor CMOS sensors and charge coupled devices CCDs Featuring real world examples case studies extensive references and contributions from leading experts in industry and academia *Ionizing Radiation Effects in Electronics From Memories to Imagers* is suitable both for newcomers who want to become familiar with radiation effects and for radiation experts who are looking for more advanced material or to make effective use of beam time 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 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

Radiation Effects in Semiconductors Krzysztof Iniewski, 2018-09-03

Space applications nuclear physics military operations medical imaging and especially electronics modern silicon processing are obvious fields in which radiation damage can have serious consequences i e degradation of MOS devices and circuits Zeroing in on vital aspects of this broad and complex topic Radiation Effects in Semiconductors addresses the ever growing need for a clear understanding of radiation effects on semiconductor devices and circuits to combat potential damage it can cause Features a chapter authored by renowned radiation authority Lawrence T Clark on Radiation Hardened by Design SRAM Strategies for TID and SEE Mitigation This book analyzes the radiation problem focusing on the most important aspects required for comprehending the degrading effects observed in semiconductor devices circuits and systems when they are irradiated It explores how radiation interacts with solid materials providing a detailed analysis of three ways this occurs Photoelectric effect Compton effect and creation of electron positron pairs The author explains that the probability of these three effects occurring depends on the energy of the incident photon and the atomic number of the target The book also discusses the effects that photons can have on matter in terms of ionization effects and nuclear displacement Written for post graduate researchers semiconductor engineers and nuclear and space engineers with some electronics background this carefully constructed reference explains how ionizing radiation is creating damage in semiconducting devices and circuits and systems and how that damage can be avoided in areas such as military space missions nuclear applications plasma damage and X ray based techniques It features top notch international experts in industry and academia who address emerging detector technologies circuit design techniques new materials and innovative system approaches

Ionizing Radiation Effects in MOS Devices and Circuits T. P. Ma, Paul V. Dressendorfer, 1989-04-18 The first comprehensive overview

describing the effects of ionizing radiation on MOS devices as well as how to design fabricate and test integrated circuits intended for use in a radiation environment Also addresses process induced radiation effects in the fabrication of high density circuits Reviews the history of radiation hard technology providing background information for those new to the field Includes a comprehensive review of the literature and an annotated listing of research activities in radiation hardness research

Advanced Semiconductor Memories Ashok K. Sharma, 2002-10-14 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 memories 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

Electrophysiological Disorders of the Heart E-Book Sanjeev Saxena, A. John Camm, 2011-12-12 The new edition of Electrophysiological Disorders of the Heart helps you diagnose and treat a full range of heart rhythm disorders using today s latest technologies and therapies It provides practical hands on coverage of hot topics such as pediatric EP imaging echocardiography guided EP procedures regenerative therapies cardiac pacing and more Now available in a new full color format the title also includes easy online access at www.expertconsult.com Discover new ways to treat and manage the full range of heart rhythm disorders with content focused on common clinical features diagnosis and management Review expert management strategies to help you handle complex patient problems Stay current with the latest molecular and technical advances as well as new treatment options implemented over the last few years Use the latest

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Rechensystemen H. Wettstein, 2013-03-12 **Extreme Environment Electronics** John D. Cressler, H. Alan

Mantooth, 2017-12-19 Unfriendly to conventional electronic devices circuits and systems extreme environments represent a serious challenge to designers and mission architects The first truly comprehensive guide to this specialized field Extreme Environment Electronics explains the essential aspects of designing and using devices circuits and electronic systems intended to operate in extreme environments including across wide temperature ranges and in radiation intense scenarios such as space The Definitive Guide to Extreme Environment Electronics Featuring contributions by some of the world's foremost experts in extreme environment electronics the book provides in depth information on a wide array of topics It begins by describing the extreme conditions and then delves into a description of suitable semiconductor technologies and the modeling of devices within those technologies It also discusses reliability issues and failure mechanisms that readers need to be aware of as well as best practices for the design of these electronics Continuing beyond just the paper design of building blocks the book rounds out coverage of the design realization process with verification techniques and chapters on electronic packaging for extreme environments The final set of chapters describes actual chip level designs for applications in energy and space exploration Requiring only a basic background in electronics the book combines theoretical and practical aspects in each self contained chapter Appendices supply additional background material With its broad coverage and depth and the expertise of the contributing authors this is an invaluable reference for engineers scientists and technical managers as well as researchers and graduate students A hands on resource it explores what is required to successfully operate electronics in the most demanding conditions

Radiation Effects and Soft Errors in Integrated Circuits and Electronic Devices Dan M. Fleetwood, 2004 This book provides a detailed treatment of radiation effects in electronic devices including effects at the material device and circuit levels The emphasis is on transient effects caused by single ionizing particles single event effects and soft errors and effects produced by the cumulative energy deposited by the radiation total ionizing dose effects Bipolar Si and SiGe metal oxide semiconductor MOS and compound semiconductor technologies are discussed In addition to considering the specific issues associated with high performance devices and technologies the book includes the background material necessary for understanding radiation effects at a more general level Contents Single Event Effects in Avionics and on the Ground E Normand Soft Errors in Commercial Integrated Circuits R C Baumann System Level Single Event Upset Mitigation Strategies W F Heidergott Space Radiation Effects in Optocouplers R A Reed et al The Effects of Space Radiation Exposure on Power MOSFETs A Review K Shenai et al Total Dose

Effects in Linear Bipolar Integrated Circuits H J Barnaby Hardness Assurance for Commercial Microelectronics R L Pease Switching Oxide Traps T R Oldham Online and Realtime Dosimetry Using Optically Stimulated Luminescence L Dusseau and other articles Readership Practitioners researchers managers and graduate students in electrical and electronic engineering semiconductor science and technology and microelectronics

Numerical Simulation Mykhaylo Andriychuk, 2012-09-19 Numerical Simulation from Theory to Industry is the edited book containing 25 chapters and divided into four parts Part 1 is devoted to the background and novel advances of numerical simulation second part contains simulation applications in the macro and micro electrodynamics Part 3 includes contributions related to fluid dynamics in the natural environment and scientific applications the last fourth part is dedicated to simulation in the industrial areas such as power engineering metallurgy and building Recent numerical techniques as well as software the most accurate and advanced in treating the physical phenomena are applied in order to explain the investigated processes in terms of numbers Since the numerical simulation plays a key role in both theoretical and industrial research this book related to simulation of many physical processes will be useful for the pure research scientists applied mathematicians industrial engineers and post graduate students

Nuclear Science Abstracts, 1976

Soft Errors Jean-Luc Autran, Daniela Munteanu, 2017-12-19 Soft errors are a multifaceted issue at the crossroads of applied physics and engineering sciences Soft errors are by nature multiscale and multiphysics problems that combine not only nuclear and semiconductor physics material sciences circuit design and chip architecture and operation but also cosmic ray physics natural radioactivity issues particle detection and related instrumentation Soft Errors From Particles to Circuits addresses the problem of soft errors in digital integrated circuits subjected to the terrestrial natural radiation environment one of the most important primary limits for modern digital electronic reliability Covering the fundamentals of soft errors as well as engineering considerations and technological aspects this robust text Discusses the basics of the natural radiation environment particle interactions with matter and soft error mechanisms Details instrumentation developments in the fields of environment characterization particle detection and real time and accelerated tests Describes the latest computational developments modeling and simulation strategies for the soft error rate estimation in digital circuits Explores trends for future technological nodes and emerging devices Soft Errors From Particles to Circuits presents the state of the art of this complex subject providing comprehensive knowledge of the complete chain of the physics of soft errors The book makes an ideal text for introductory graduate level courses offers academic researchers a specialized overview and serves as a practical guide for semiconductor industry engineers or application engineers

IEEE Circuits & Devices, 1991

VLSI Handbook Norman Einspruch, 2012-12-02 VLSI Handbook is a reference guide on very large scale integration VLSI microelectronics and its aspects such as circuits fabrication and systems applications This handbook readily answers specific questions and presents a systematic compilation of information regarding the VLSI technology There are a total of 52 chapters in this book and are grouped according to the fields of design

materials and processes and examples of specific system applications Some of the chapters under fields of design are design automation for integrated circuits and computer tools for integrated circuit design For the materials and processes there are many chapters that discuss this aspect Some of them are manufacturing process technology for metal oxide semiconductor MOS VLSI MOS VLSI circuit technology and facilities for VLSI circuit fabrication Other concepts and materials discussed in the book are the use of silicon material in different processes of VLSI nitrides silicides metallization and plasma This handbook is very useful to students of engineering and physics Also researchers in physics and chemistry of materials and processes device designers and system designers can also benefit from this book International Aerospace Abstracts ,1993

Micro Electronic and Mechanical Systems Kenichi Takahata,2009-12-01 This book discusses key aspects of MEMS technology areas organized in twenty seven chapters that present the latest research developments in micro electronic and mechanical systems The book addresses a wide range of fundamental and practical issues related to MEMS advanced metal oxide semiconductor MOS and complementary MOS CMOS devices SoC technology integrated circuit testing and verification and other important topics in the field Several chapters cover state of the art microfabrication techniques and materials as enabling technologies for the microsystems Reliability issues concerning both electronic and mechanical aspects of these devices and systems are also addressed in various chapters **Quantum Dots** Ameenah Al-Ahmadi,2012-04-04 The book Quantum dots A variety of a new applications provides some collections of practical applications of quantum dots This book is divided into four sections In section 1 a review of the thermo optical characterization of CdSe ZnS core shell nanocrystal solutions was performed The Thermal Lens TL technique was used and the thermal self phase Modulation TSPM technique was adopted as the simplest alternative method Section 2 includes five chapters where novel optical and lasing application are discussed In section 3 four examples of quantum dot system for different applications in electronics are given Section 4 provides three examples of using quantum dot system for biological applications This is a collaborative book sharing and providing fundamental research such as the one conducted in Physics Chemistry Biology Material Science Medicine with a base text that could serve as a reference in research by presenting up to date research work on the field of quantum dot systems

Soviet Science and Technology ,1987 **Floating Gate Devices: Operation and Compact Modeling** Paolo Pavan,Luca Larcher,Andrea Marmiroli,2007-05-08 Floating Gate Devices Operation and Compact Modeling focuses on standard operations and compact modeling of memory devices based on Floating Gate architecture Floating Gate devices are the building blocks of Flash EPROM EEPROM memories Flash memories which are the most versatile nonvolatile memories are widely used to store code BIOS Communication protocol Identification code and data solid state Hard Disks Flash cards for digital cameras The reader who deals with Floating Gate memory devices at different levels from test structures to complex circuit design will find an essential explanation on device physics and technology and also circuit issues which must be fully understood while developing a new device Device engineers will use this book to find simplified models to design

new process steps or new architectures Circuit designers will find the basic theory to understand the use of compact models to validate circuits against process variations and to evaluate the impact of parameter variations on circuit performances Floating Gate Devices Operation and Compact Modeling is meant to be a basic tool for designing the next generation of memory devices based on FG technologies

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