

**Electrical Overstress
Protection
for Electronic Devices**

Robert J. Antinone et al

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Electrical Overstress Protection For Electronic Devices

Steven H. Voldman



Electrical Overstress Protection For Electronic Devices:

Electrical Overstress Protection for Electronic Devices Robert J. Antinone, 1986 **Electrical Overstress (EOS)** Steven H. Voldman, 2013-08-27

Electrical Overstress EOS continues to impact semiconductor manufacturing semiconductor components and systems as technologies scale from micro to nano electronics This book teaches the fundamentals of electrical overstress and how to minimize and mitigate EOS failures The text provides a clear picture of EOS phenomena EOS origins EOS sources EOS physics EOS failure mechanisms and EOS on chip and system design It provides an illuminating insight into the sources of EOS in manufacturing integration of on chip and system level EOS protection networks followed by examples in specific technologies circuits and chips The book is unique in covering the EOS manufacturing issues from on chip design and electronic design automation to factory level EOS program management in today's modern world Look inside for extensive coverage on Fundamentals of electrical overstress from EOS physics EOS time scales safe operating area SOA to physical models for EOS phenomena EOS sources in today's semiconductor manufacturing environment and EOS program management handling and EOS auditing processing to avoid EOS failures EOS failures in both semiconductor devices circuits and system Discussion of how to distinguish between EOS events and electrostatic discharge ESD events e.g. such as human body model HBM charged device model CDM cable discharge events CDM charged board events CBE to system level IEC 61000 4 2 test events EOS protection on chip design practices and how they differ from ESD protection networks and solutions Discussion of EOS system level concerns in printed circuit boards PCB and manufacturing equipment Examples of EOS issues in state of the art digital analog and power technologies including CMOS LDMOS and BCD EOS design rule checking DRC LVS and ERC electronic design automation EDA and how it is distinct from ESD EDA systems EOS testing and qualification techniques and Practical off chip ESD protection and system level solutions to provide more robust systems

Electrical Overstress EOS Devices Circuits and Systems is a continuation of the author's series of books on ESD protection It is an essential reference and a useful insight into the issues that confront modern technology as we enter the nano electronic era

Protection of Electronic Circuits from Overvoltages Ronald B. Standler, 2012-04-30 Practical rules and strategies designed to protect electronic systems from damage by transient overvoltages include symptoms and threats remedies protective devices and their applications and validation of protective measures 1989 edition

Electrical Overstress (EOS) Steven H. Voldman, 2013-10-28 Electrical Overstress EOS continues to impact semiconductor manufacturing semiconductor components and systems as technologies scale from micro to nano electronics This book teaches the fundamentals of electrical overstress and how to minimize and mitigate EOS failures The text provides a clear picture of EOS phenomena EOS origins EOS sources EOS physics EOS failure mechanisms and EOS on chip and system design It provides an illuminating insight into the sources of EOS in manufacturing integration of on chip and system level EOS protection networks followed by examples in specific technologies circuits and chips The book is unique in covering the EOS

manufacturing issues from on chip design and electronic design automation to factory level EOS program management in today's modern world Look inside for extensive coverage on Fundamentals of electrical overstress from EOS physics EOS time scales safe operating area SOA to physical models for EOS phenomena EOS sources in today's semiconductor manufacturing environment and EOS program management handling and EOS auditing processing to avoid EOS failures EOS failures in both semiconductor devices circuits and system Discussion of how to distinguish between EOS events and electrostatic discharge ESD events e.g. such as human body model HBM charged device model CDM cable discharge events CDM charged board events CBE to system level IEC 61000 4 2 test events EOS protection on chip design practices and how they differ from ESD protection networks and solutions Discussion of EOS system level concerns in printed circuit boards PCB and manufacturing equipment Examples of EOS issues in state of the art digital analog and power technologies including CMOS LDMOS and BCD EOS design rule checking DRC LVS and ERC electronic design automation EDA and how it is distinct from ESD EDA systems EOS testing and qualification techniques and Practical off chip ESD protection and system level solutions to provide more robust systems Electrical Overstress EOS Devices Circuits and Systems is a continuation of the author's series of books on ESD protection It is an essential reference and a useful insight into the issues that confront modern technology as we enter the nano electronic era

ESD Steven H. Voldman, 2015-01-05 A comprehensive and in depth review of analog circuit layout schematic architecture device power network and ESD design This book will provide a balanced overview of analog circuit design layout analog circuit schematic development architecture of chips and ESD design It will start at an introductory level and will bring the reader right up to the state of the art Two critical design aspects for analog and power integrated circuits are combined The first design aspect covers analog circuit design techniques to achieve the desired circuit performance The second and main aspect presents the additional challenges associated with the design of adequate and effective ESD protection elements and schemes A comprehensive list of practical application examples is used to demonstrate the successful combination of both techniques and any potential design trade offs Chapter One looks at analog design discipline including layout and analog matching and analog layout design practices Chapter Two discusses analog design with circuits examining single transistor amplifiers multi transistor amplifiers active loads and more The third chapter covers analog design layout also MOSFET layout before Chapters Four and Five discuss analog design synthesis The next chapters introduce the reader to analog digital mixed signal design synthesis analog signal pin ESD networks and analog ESD power clamps Chapter Nine the last chapter covers ESD design in analog applications Clearly describes analog design fundamentals circuit fundamentals as well as outlining the various ESD implications Covers a large breadth of subjects and technologies such as CMOS LDMOS BCD SOI and thick body SOI Establishes an ESD analog design discipline that distinguishes itself from the alternative ESD digital design focus Focuses on circuit and circuit design applications Assessible with the artwork and tutorial style of the ESD book series PowerPoint slides are available for university faculty

members Even in the world of digital circuits analog and power circuits are two very important but under addressed topics especially from the ESD aspect Dr Voldman s new book will serve as an essential and practical guide to the greater IC community With high practical and academic values this book is a bible for professionals graduate students device and circuit designers for investigating the physics of ESD and for product designs and testing **The ESD Handbook** Steven H. Voldman, 2021-04-12 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 **ESD Basics** Steven H. Voldman, 2012-10-22 Electrostatic discharge ESD continues to impact semiconductor manufacturing semiconductor components and systems as technologies scale from micro to nano electronics This book introduces the fundamentals of ESD electrical overstress EOS electromagnetic interference EMI electromagnetic compatibility EMC and latchup as well as provides a coherent overview of the semiconductor manufacturing environment and the final system assembly It provides an illuminating look into the integration of ESD protection networks followed by examples in specific technologies circuits and chips The text is unique in covering semiconductor chip manufacturing issues ESD semiconductor chip design and system problems confronted today as well as the future of ESD phenomena and nano technology Look inside for extensive coverage on The fundamentals of electrostatics triboelectric charging and how they relate to present day manufacturing environments of micro electronics to nano technology Semiconductor manufacturing handling and auditing processing to avoid ESD failures ESD EOS EMI EMC and latchup semiconductor component and system level testing to demonstrate product resilience from human body model HBM transmission line pulse TLP charged device model CDM human metal model HMM cable discharge events CDE to system level IEC 61000 4 2 tests ESD on chip design and process manufacturing practices and solutions to improve ESD semiconductor chip solutions also practical off chip ESD protection and system level solutions to provide more robust

systems System level concerns in servers laptops disk drives cell phones digital cameras hand held devices automobiles and space applications Examples of ESD design for state of the art technologies including CMOS BiCMOS SOI bipolar technology high voltage CMOS HVCMOS RF CMOS smart power magnetic recording technology micro machines MEMs to nano structures ESD Basics From Semiconductor Manufacturing to Product Use complements the author s series of books on ESD protection For those new to the field it is an essential reference and a useful insight into the issues that confront modern technology as we enter the Nano electronic Era

ESD Testing Steven H. Voldman, 2016-12-19 With the evolution of semiconductor technology and global diversification of the semiconductor business testing of semiconductor devices to systems for electrostatic discharge ESD and electrical overstress EOS has increased in importance ESD Testing From Components to Systems updates the reader in the new tests test models and techniques in the characterization of semiconductor components for ESD EOS and latchup Key features Provides understanding and knowledge of ESD models and specifications including human body model HBM machine model MM charged device model CDM charged board model CBM cable discharge events CDE human metal model HMM IEC 61000 4 2 and IEC 61000 4 5 Discusses new testing methodologies such as transmission line pulse TLP to very fast transmission line pulse VF TLP and future methods of long pulse TLP to ultra fast TLP UF TLP Describes both conventional testing and new testing techniques for both chip and system level evaluation Addresses EOS testing electromagnetic compatibility EMC scanning to current reconstruction methods Discusses latchup characterization and testing methodologies for evaluation of semiconductor technology to product testing ESD Testing From Components to Systems is part of the authors series of books on electrostatic discharge ESD protection this book will be an invaluable reference for the professional semiconductor chip and system level ESD and EOS test engineer Semiconductor device and process development circuit designers quality reliability and failure analysis engineers will also find it an essential reference In addition its academic treatment will appeal to both senior and graduate students with interests in semiconductor process device physics semiconductor testing and experimental work

ESD Program Management G. Theodore Dangelmayer, 1999-01-31 This is a revision of the highly successful electronic manufacturing guide ESD Program Management A Realistic Approach to Continuous Measurable Improvement in Static Control This revision is comprehensive and explains how to develop implement and manage an ESD control program and includes up to date data many new chapters new case studies and much more New to this edition Extensive changes and additions to auditing techniques cost benefits data and materials evaluation Six new chapters on common myths issues related to smaller companies process controls ISO 9000 material characterization and training New case studies on field induced failures in the factory long distance central office system upsets and automation caused failures Expanded coverage of the needs of smaller companies including discussion of common problems and cost effective solutions A training breakthrough is presented Previously invisible ESD events can now be easily displayed for students at all levels Seeing is believing Inclusion of new

testing instruments such as the event detector and resistance probe The 12 critical factors in an ESD program have been updated to reflect changes and refinements in program management The author has also included the latest information on handling procedures and requirements from the Lucent ESD Control Handbook ESD Program Management A Realistic Approach to Continuous Measurable Improvement in Static Control Second Edition is a refreshingly unbiased guide for electronic manufacturing and quality control professionals

Power in Electronics: An Extensive Overview Pasquale De Marco, 2025-04-11 Embark on a journey through the fascinating world of power electronics with *Power in Electronics An Extensive Overview* an authoritative guide that delves into the intricacies of this transformative technology Written with clarity and precision this comprehensive book provides a thorough understanding of the fundamental concepts cutting edge devices and innovative applications of power electronics From the basic principles of power conversion to the latest advancements in wide bandgap semiconductors *Power in Electronics An Extensive Overview* covers a wide spectrum of topics catering to both students and professionals seeking to expand their knowledge in this dynamic field The book's comprehensive approach ensures a solid foundation in the fundamentals while equipping readers with the latest developments and emerging trends Discover the inner workings of power semiconductor devices the building blocks of power electronic circuits Explore the characteristics and applications of diodes transistors and thyristors gaining insights into their role in controlling and converting electrical energy Delve into the intricacies of power electronic circuits including DC DC converters AC DC converters and inverters understanding their topologies operation and control techniques With a focus on practical applications *Power in Electronics An Extensive Overview* showcases the versatility of power electronics in diverse industries Learn how power electronics enables the efficient operation of renewable energy systems electric vehicles uninterruptible power supplies and industrial motor drives Explore the role of power electronics in improving energy efficiency reducing carbon emissions and enhancing grid stability Stay at the forefront of power electronics innovation with in depth discussions on emerging trends and future prospects Gain insights into the potential of wide bandgap devices the integration of power electronics in smart grids and the application of power electronics in energy storage systems Discover how power electronics is shaping the future of energy and driving the transition towards a sustainable and electrified world Whether you are a student pursuing a career in power electronics an engineer seeking to expand your knowledge or a professional looking to stay updated with the latest advancements *Power in Electronics An Extensive Overview* is your essential resource Its comprehensive coverage clear explanations and practical examples make it an indispensable guide for anyone seeking to master the art of power electronics If you like this book write a review on google books

Protection of Electronic Equipment Against Electrical Overstress Quang Tran, 1994 **Electrostatic Discharge Protection** Juin J. Liou, 2017-12-19 Electrostatic discharge ESD is one of the most prevalent threats to electronic components In an ESD event a finite amount of charge is transferred from one object i e human body to another i e microchip This process can result in a

very high current passing through the microchip within a very short period of time Thus more than 35 percent of single event chip damages can be attributed to ESD events and designing ESD structures to protect integrated circuits against the ESD stresses is a high priority in the semiconductor industry Electrostatic Discharge Protection Advances and Applications delivers timely coverage of component and system level ESD protection for semiconductor devices and integrated circuits Bringing together contributions from internationally respected researchers and engineers with expertise in ESD design optimization modeling simulation and characterization this book bridges the gap between theory and practice to offer valuable insight into the state of the art of ESD protection Amply illustrated with tables figures and case studies the text Instills a deeper understanding of ESD events and ESD protection design principles Examines vital processes including Si CMOS Si BCD Si SOI and GaN technologies Addresses important aspects pertinent to the modeling and simulation of ESD protection solutions Electrostatic Discharge Protection Advances and Applications provides a single source for cutting edge information vital to the research and development of effective robust ESD protection solutions for semiconductor devices and integrated circuits

Automotive Electronics Reliability Ronald K Jurgen, 2010-08-10 Vehicle reliability problems continue to be the news because of major vehicle recalls from several manufacturers This book includes 40 SAE technical papers published from 2007 through 2010 that describe the latest research on automotive electronics reliability technology This book will help engineers and researchers focus on the design strategies being used to minimize electronics reliability problems and how to test and verify those strategies After an overview of durability risk assessment and failure mechanisms this book focuses on state of the art techniques for reliability based design and reliability testing and verification Topics include powertrain control monitoring distributed automotive embedded systems model based design x by wire systems battery durability design verification fault tree analysis The book also includes editor Ronald K Jurgen s introduction Striving for Maximum Reliability in a Highly Complex Electronic Environment and a concluding section on the future of electronics reliability including networking technology domain control units the use of AUTOSAR and embedded software

Basic ESD and I/O Design Sanjay Dabral, Timothy Maloney, 1998 This volume presents an integrated treatment of ESD I O and process parameter interactions that both I O designers and process designers can use It examines key factors in I O and ESD design and testing and helps the reader consider ESD and reliability issues up front when making I O choices Emphasizing clarity and simplicity this book focuses on design principles that can be applied widely as this dynamic field continues to evolve

Ceramic Materials for Electronics Relva C. Buchanan, 2018-10-08 The Third Edition of Ceramic Materials for Electronics studies a wide range of ceramic materials including insulators conductors piezoelectrics and ferroelectrics through detailed discussion of their properties characterization fabrication and applications in electronics The author summarizes the latest trends and advancements in the field and explores important topics such as ceramic thin film functional device technology and thick film technology Edited by a leading expert on the subject this new edition includes

more than 150 pages of new information restructured reference materials figures and tables as well as additional device application oriented segments

System of System Failures Takafumi Nakamura, 2018-05-09 This book provides the application of praxes in the field of engineering safety by learning from previous system failures And it addresses the most recent developments in the theoretical and practical aspects of these important fields which due to their special nature bring together in a systematic way many disciplines of engineering from the traditional to the most technologically advanced The authors of these chapters are involved in using the system thinking and system engineering approaches at the scale of increased complexity and advanced computational solutions to such systems The chapters cover the areas such as failure assessment in aeronautical engineering seismic resistance of offshore pipeline engineering electrical engineering critical infrastructure failure and system of system theory

Intelligent Electronic Devices Teen-Hang Meen, Wenbing Zhao, Cheng-Fu Yang, 2020-05-20 In a modern technological society electronic engineering and design innovations are both academic and practical engineering fields that involve systematic technological materialization through scientific principles and engineering designs Engineers and designers must work together with a variety of other professionals in their quest to find systems solutions to complex problems Rapid advances in science and technology have broadened the horizons of engineering while simultaneously creating a multitude of challenging problems in every aspect of modern life Current research is interdisciplinary in nature reflecting a combination of concepts and methods that often span several areas of mechanics mathematics electrical engineering control engineering and other scientific disciplines In addition the 2nd IEEE International Conference on Knowledge Innovation and Invention 2019 IEEE ICKII 2019 was held in Seoul South Korea on 12-15 July 2019 This book *Intelligent Electronic Devices* includes 13 excellent papers from 260 papers presented in this conference about intelligent electronic devices The main goals of this book were to encourage scientists to publish their experimental and theoretical results in as much detail as possible and to provide new scientific knowledge relevant to the topics of electronics

Energy Research Abstracts ,1987 *Scientific and Technical Aerospace Reports* ,1991

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