



# **Electrostatic discharge (ESD) protection in electronics**

# Circuit And Numerical Modeling Of Electrostatic Discharge

**S Baum**



## **Circuit And Numerical Modeling Of Electrostatic Discharge:**

**System Level ESD Co-Design** Charvaka Duvvury, Harald Gossner, 2017-05-05 An effective and cost efficient protection of electronic system against ESD stress pulses specified by IEC 61000 4 2 is paramount for any system design This pioneering book presents the collective knowledge of system designers and system testing experts and state of the art techniques for achieving efficient system level ESD protection with minimum impact on the system performance All categories of system failures ranging from hard to soft types are considered to review simulation and tool applications that can be used The principal focus of System Level ESD Co Design is defining and establishing the importance of co design efforts from both IC supplier and system builder perspectives ESD designers often face challenges in meeting customers system level ESD requirements and therefore a clear understanding of the techniques presented here will facilitate effective simulation approaches leading to better solutions without compromising system performance With contributions from Robert Ashton Jeffrey Dunninghoo Micheal Hopkins Pratik Maheshwari David Pomerence Wolfgang Reinprecht and Matti Usumaki readers benefit from hands on experience and in depth knowledge in topics ranging from ESD design and the physics of system ESD phenomena to tools and techniques to address soft failures and strategies to design ESD robust systems that include mobile and automotive applications The first dedicated resource to system level ESD co design this is an essential reference for industry ESD designers system builders IC suppliers and customers and also Original Equipment Manufacturers OEMs Key features Clarifies the concept of system level ESD protection Introduces a co design approach for ESD robust systems Details soft and hard ESD fail mechanisms Detailed protection strategies for both mobile and automotive applications Explains simulation tools and methodology for system level ESD co design and overviews available test methods and standards Highlights economic benefits of system ESD co design

Signal Integrity and Radiated Emission of High-Speed Digital Systems Spartaco Caniggia, Francescaromana Maradei, 2008-11-20 Before putting digital systems for information technology or telecommunication applications on the market an essential requirement is to perform tests in order to comply with the limits of radiated emission imposed by the standards This book provides an investigation into signal integrity SI and electromagnetic interference EMI problems Topics such as reflections crosstalk switching noise and radiated emission RE in high speed digital systems are covered which are essential for IT and telecoms applications The highly important topic of modelling is covered which can reduce costs by enabling simulation data to demonstrate that a product meets design specifications and regulatory limits According to the new European EMC directive this can help to avoid the expensive use of large semi anechoic chambers or open area test sites for radiated emission assessments Following a short introduction to signalling and radiated interference in digital systems the book provides a detailed characterization of logic families in terms of static and dynamic characteristic useful for modelling techniques Crosstalk in multi coupled line structures are investigated by analytical graphical and circuit based methods and techniques to mitigate these phenomena

are provided Grounding filtering and shielding with multilayer PCBs are also examined and design rules given Written by authors with extensive experience in industry and academia Explains basic conceptual problems from a theoretical and practical point of view by using numerous measurements and simulations Presents models for mathematical and SPICE like circuit simulators Provides examples of using full wave codes for SI and RE investigations Companion website containing lists of codes and sample material Signal Integrity and Radiated Emission of High Speed Digital Systems is a valuable resource to industrial designers of information technology telecommunication equipment and automation equipment as well as to development engineers It will also be of interest to managers and designers of consumer electronics and researchers in electronics

**The Proceedings of the 19th Annual Conference of China Electrotechnical Society** Qingxin Yang,Zhaohong Bie,Xu Yang,2025-04-26 This book compiles exceptional papers presented at the 19th Annual Conference of the China Electrotechnical Society CES held in Xi an China from September 20 to 22 2024 It encompasses a wide range of topics including electrical technology power systems electromagnetic emission technology and electrical equipment The book highlights innovative solutions that integrate concepts from various disciplines making it a valuable resource for researchers engineers practitioners research students and interested readers Electrical Overstress/Electrostatic Discharge Symposium Proceedings ,2004 **International Journal of Nanotechnology** ,2005 **Symposium Record** ,2003

**Conference Record of the 1991 IEEE Industry Applications Society Annual Meeting** IEEE Industry Applications Society. Meeting,1991 **Semiconductor Process Reliability in Practice** Zhenghao Gan,Waisum Wong,Jun J. Liou,2012-10-06 Proven processes for ensuring semiconductor device reliability Co written by experts in the field Semiconductor Process Reliability in Practice contains detailed descriptions and analyses of reliability and qualification for semiconductor device manufacturing and discusses the underlying physics and theory The book covers initial specification definition test structure design analysis of test structure data and final qualification of the process Real world examples of test structure designs to qualify front end of line devices and back end of line interconnects are provided in this practical comprehensive guide Coverage includes Basic device physics Process flow for MOS manufacturing Measurements useful for device reliability characterization Hot carrier injection Gate oxide integrity GOI and time dependent dielectric breakdown TDDB Negative bias temperature instability Plasma induced damage Electrostatic discharge protection of integrated circuits Electromigration Stress migration Intermetal dielectric breakdown ESD in Silicon Integrated Circuits E. Ajith Amerasekera,Charvaka Duvvury,1995 ESD in Silicon Integrated Circuits Ajith Amerasekera Charvaka Duvvury Texas Instruments Inc Dallas USA Electrostatic Discharge ESD effects in silicon integrated circuits have become a major concern as today s high circuit density technologies shrink to sub micro dimensions This book provides an understanding of the basic features related to ESD and deals with topics ranging from the physics of devices operating under ESD conditions to approaches for solving and improving ESD performance in advanced ICs Features include Description of the methods used to

reproduce ESD type events in a controlled test environment Analysis of the behavior of different semiconductor devices under ESD conditions including the physics and modeling of devices Detailed study of design and layout requirements for ESD protection circuits Case studies showing examples of approaches to solving ESD design problems including failure analysis Covering the state of the art in circuit design for ESD prevention this practical book is written from an industrial perspective and will appeal to engineers and scientists working in the fields of IC and transistor design Researchers and advanced students in the fields of device circuit modeling and semiconductor reliability seeking to understand the fundamentals of ESD phenomena will also find this book an invaluable reference source

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