

Electrostatic Discharge (ESD) Protection in 28-nm CMOS Technology Node and Beyond: Challenges and Solutions



-
- ▶ 일 시 : 2018년 10월 29일 월요일 16:00 ~ 18:00
 - ▶ 장 소 : 서울대학교 반도체공동연구소 도연홀
 - ▶ 연 사 : Juin J. Liou 교수 (Zhengzhou University, China)
-

Electrostatic discharge (ESD) is one of the most prevalent threats to the reliability of electronic components. It is an event in which a finite amount of charge is transferred from one object (i.e., human body) to the other (i.e., microchip). This process can result in a very high current passing through the microchip within a very short period of time, and hence more than 35% of single-event catastrophic damages can be attributed to the ESD event. This is a problem with increasing significance in modern and future nanoscale technologies in the context of diminishing device dimensions. As such, designing on-chip ESD structures to protect integrated circuits against the ESD stress is a high priority in the semiconductor industry. The continuing advancement in semiconductor technology makes the ESD-induced failures even more prominent. In fact, many semiconductor companies worldwide are having difficulties in meeting the increasingly stringent ESD protection requirements for various tech applications, and one can predict with certainty that the availability of effective and robust ESD protection solutions will become a critical and essential factor to the well-being and commercialization of next-generation electronics.

An overview on the ESD sources, models, protection schemes, and testing will first be given in this talk. This is followed by the introduction of ESD protection designs in the 28-nm CMOS process, and then the exploration and evaluation of ESD protection solutions in the sub 20-nm emerging Si FinFET and nanowire technologies. Status, challenges, and difficulties associated with the ESD design and optimization for these technologies will be addressed.

Biography of Juin J. Liou

Juin J. Liou received the B.S. (honors), M.S., and Ph.D. degrees in electrical engineering from the University of Florida, Gainesville, in 1982, 1983, and 1987, respectively. In 1987, he joined the Department of Electrical and Computer Engineering at the University of Central Florida (UCF), Orlando, Florida where he held the positions of Pegasus Distinguished Professor, Lockheed Martin St. Laurent Professor, and UCF-Analog Devices Fellow. His research interests are electrostatic discharge (ESD) protection design, modeling and simulation, and characterization. Currently, he serves as a chair professor of Zhengzhou University, China and endowed professor of Zhejiang University, China.

Dr. Liou holds 18 patents and has published 13 books (1 more in press), more than 300 journal papers (including 21 invited review articles), and more than 240 papers (including more than 110 keynote and invited papers) in international and national conference proceedings. He has been awarded more than \$14.0 million of research contracts and grants from federal agencies (i.e., NSF, DARPA, Navy, Air Force, NASA, NIST), state government, and industry (i.e., Semiconductor Research Corp., Intel Corp., Intersil Corp., Lucent Technologies, Alcatel Space, Conexant Systems, Texas Instruments, Fairchild Semiconductor, National Semiconductor, Analog Devices, Maxim Integrated Systems, Allegro Microsystems, RF Micro Device, Lockheed Martin), and has held consulting positions with research laboratories and companies in the United States, China, Japan, Taiwan, and Singapore. In addition, Dr. Liou has served as a technical reviewer for various journals and publishers, general chair or technical program chair for a large number of international conferences, regional editor (in USA, Canada and South America) of the *Microelectronics Reliability* journal, and guest editor of 7 special issues in the *IEEE Journal of Emerging and Selected Topics in Circuits and Systems*, *Microelectronics Reliability*, *Solid-State Electronics*, *World Scientific Journal*, and *International Journal of Antennas and Propagation*.

Dr. Liou received ten different awards on excellence in teaching and research from the University of Central Florida (UCF) and six different awards from the IEEE. Among them, he was awarded the UCF Pegasus Distinguished Professor (2009) – the highest honor bestowed to a faculty member at UCF, UCF Distinguished Researcher Award (four times: 1992, 1998, 2002, 2009), UCF Research Incentive Award (four times: 2000, 2005, 2010, 2015), IEEE Joseph M. Biedenbach Outstanding Engineering Educator Award in 2004 for exemplary engineering teaching, research, and international collaboration, and IEEE Electron Devices Society Education Award in 2014 for promoting and inspiring global education and learning in the field of electron devices. His other honors are Fellow of IEEE, Fellow of IET, Fellow of Singapore Institute of Manufacturing Technology, Fellow of UCF-Analog Devices, Distinguished Lecturer of IEEE Electron Device Society (EDS), and Distinguished Lecturer of National Science Council. He holds several honorary professorships, including the Chang Jiang Scholar Endowed Professor of Ministry of Education, China – the highest honorary professorship in China, NSVL Distinguished Professor of National Semiconductor Corp., USA, International Honorary Chair Professor of National Taipei University of Technology, Taiwan, Honorary Endowed Professor of National Taiwan University of Science and Technology, Taiwan, Chang Gung Endowed Professor of Chang Gung University, Taiwan, Feng Chia Chair Professor of Feng Chia University, Taiwan, Chunhui Eminent Scholar of Peking University, China, Cao Guang-Biao Endowed Professor of Zhejiang University, China, Honorary Professor of Xidian University, China, Consultant Professor of Huazhong University of Science and Technology, China, and Courtesy Professor of Shanghai Jiao Tong University, China. Dr. Liou was a recipient of U.S. Air Force Fellowship Award and National University Singapore Fellowship Award.

Dr. Liou had served as the IEEE EDS Vice-President of Regions/Chapters, IEEE EDS Treasurer, IEEE EDS Finance Committee Chair, Membe