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## IEEE MICROELECTRONICS DESIGN & TEST SYMPOSIUM

### Nanotechnologies enabling future on-chip ESD protection

ESD failure is a major IC reliability problem. On-chip ESD protection is required for all ICs. As IC technologies and chip complexity continue to advance, on-chip ESD protection becomes more and more challenging. While R&D efforts have led to various advances, existing ESD protection structures and design techniques cannot meet the needs of ESD protection for future chips. Nanotechnologies open a door for future ESD protection exploration. This paper reviews a few emerging nanotechnology-based ESD protection concepts, including phase-changing nano crossbar array, graphene NEMS switch and graphene ESD interconnects, which have the potential to revolutionize future ESD protection designs.

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#### Biography:

Albert Wang is a Professor of Electrical and Computer Engineering at University of California, Riverside, USA. He served as a Program Director of National Science Foundation, USA (2018-2021). He was a Si Valley IC designer at National Semiconductor before joining the academia. His research covers semiconductor devices, RF/AMX ICs, design-for-reliability, 3D heterogeneous integration, emerging nano devices and circuits, and LED visible light communications. He published two books and 300+ papers, and holds sixteen U.S. patents. His editorial board services include *IEEE Transactions on Circuits and Systems I*, *IEEE Electron Device Letters*, *IEEE Transactions on Circuits and Systems II*, *IEEE Transactions on Electron Devices*, *IEEE Journal of Solid-State Circuits*, *IEEE Transactions on Device and Materials Reliability*, *Journal of Engineering*, and *Power Electronic Devices and Components*. He has been *IEEE Distinguished Lecturer* for IEEE Electron Devices Society, IEEE Circuits and Systems Society and IEEE Solid-State Circuits Society. He was President of IEEE Electron Devices Society. He chaired the *IEEE CAS Analog Signal Processing Technical Committee*. His other committee services include the *International Technology Roadmap for Semiconductor (ITRS) Committee*, *IEEE Heterogeneous Integration Roadmap (HIR) Committee*, *IEEE 5G Initiatives Committee* and *IEEE Fellow Committee*. He was General Chair of *IEEE Electron Devices Technology and Manufacturing (EDTM) Conference* (2021) and *IEEE Radio-Frequency Integrated Circuits (RFIC) Symposium* (2016). Wang is a Fellow of National Academy of Inventors, an IEEE Fellow and an AAAS Fellow.

