



北京大学海外名家讲学计划

CMOS-MEMRISTOR HYBRID CIRCUITS: DEVICES, INTEGRATION, ARCHITECTURE, AND APPLICATIONS

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ABSTRACT: In this talk, we give an overview of our recent research efforts on monolithic 3D integration of CMOS and memristive nanodevices. These proposed hybrid circuits combine a CMOS subsystem with several layers of nanowire crossbars, consisting of arrays of two-terminal memristors, all connected by an area-distributed interface between the CMOS subsystem and the crossbars. This approach combines the advantages of CMOS technology, including its high flexibility, functionality and yield, with the extremely high density of nanowires, nanodevices and interface vias. As a result, the 3D hybrids can overcome limitations pertinent to other 3D integration techniques (such as through-silicon vias) and enable 3D circuits with unprecedented memory density and memory bandwidth at manageable power dissipation.

BIOGRAPHY: Cheng received his Ph.D. in EECS from the University of California, Berkeley in 1988. He worked at Bell Laboratories from 1988 to 1993 and joined the faculty at the University of California, Santa Barbara in 1993 where he is currently Associate Vice Chancellor for Research and Professor of ECE. He was the founding director of UCSB's Computer Engineering Program (1999-2002) and Chair of the ECE Department (2005-2008). He held a Visiting Professor position at TsingHua Univ. Taiwan (1999), Univ. of Tokyo, Japan (2008), and Hong Kong Univ. of Science and Technology (2012) and is current holding Adjunct Chair Professorship at Zhejiang University. His current research interests include mobile embedded systems, SoC design validation and test, and multimedia computing. He has published more than 350 technical papers, co-authored five books, and holds 12 U.S. Patents in these areas. He currently serves as Director for DoD/MURI Center for 3D hybrid circuits which aims at integrating CMOS with high-density memristors.

Cheng, an IEEE fellow, received 10 Best Paper Awards from various IEEE conferences and journals. He has also received the 2004-2005 UCSB College of Engineering Outstanding Teaching Faculty Award. He served as Editor-in-Chief of IEEE Design and Test of Computers and was a board member of IEEE Council of Electronic Design Automation's Board of Governors and IEEE Computer Society's Publication Board. He has also served as General and Program Chair for several international conferences including Program Chair for 2012 IEEE International Test Conference.

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