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Keynote Speaker: Prof. Eby G. Friedman

Eby G. Friedman received the B.S. degree from Lafayette College in 1979, and the M.S. and Ph.D. degrees from the University of California, Irvine, in 1981 and 1989, respectively, all in electrical engineering. From 1979 to 1991, he was with Hughes Aircraft Company, rising to the position of manager of the Signal Processing Design and Test Department, responsible for the design and test of high performance digital and analog IC's. He has been with the Department of Electrical and Computer Engineering at the University of Rochester since 1991, where he is a Distinguished Professor, the Director of the High Performance VLSI/IC Design and Analysis Laboratory, and the Director of the Center for Electronic Imaging Systems. He is also a Visiting Professor at the Technion - Israel Institute of Technology. His current research and teaching interests are in high performance synchronous digital and mixed-signal microelectronic design and analysis with application to high speed portable processors and low power wireless communications. He is the author of more than 300 papers and book chapters, several patents, and the author or editor of eight books in the fields of high speed and low power CMOS design techniques, high speed interconnect, and the theory and application of synchronous clock and power distribution networks. Dr. Friedman is the Regional Editor of the Journal of Circuits, Systems and Computers, a Member of the editorial boards of the Analog Integrated Circuits and Signal Processing, Microelectronics Journal, Journal of Low Power Electronics, and Journal of VLSI Signal Processing, Chair of the IEEE Transactions on Very Large Scale Integration (VLSI) Systems steering committee, and a Member of the technical program committee of a number of conferences. He previously was the Editor-in-Chief of the IEEE Transactions on Very Large Scale Integration (VLSI) Systems, a Member of the editorial board of the Proceedings of the IEEE and IEEE Transactions on Circuits and Systems II: Analog and Digital Signal Processing, a Member of the Circuits and Systems (CAS) Society Board of Governors, Program and Technical chair of several IEEE conferences, and a recipient of the University of Rochester Graduate Teaching Award, and a College of Engineering Teaching Excellence Award. Dr. Friedman is a Senior Fulbright Fellow and an IEEE Fellow.

Title: Research Challenges in High Performance VLSI/SoC Circuits and Systems

The presentation is composed of three parts. The initial topic will review the fundamental trends specific to high speed, high complexity integrated systems, emphasizing many of the primary issues that constrain existing and futuredigital and mixed-signal integrated systems-on-chip. These issues will be discussed in terms of the evolving criteria that affect the VLSI/SoC design and synthesis process.

The second portion of the presentation will review specific research problems and challenges that drive our current and near-term research focus in the field of VLSI/SoC design. Effort will be made to

distinguish between local vs. global research problems. Thus, topics such as dual Vt CMOS circuits and on-chip interconnect noise, determined by the local nature of the circuit structures, will be compared and contrasted with research problems that focus on the global nature of VLSI-based systems-on-chip such synchronization and clock and power distribution networks.

Finally, specific results recently developed at the presenter's research laboratory in response to these challenges will be reviewed and summarized. Time and interest permitting, different research results will be described in the areas of power distribution networks for high speed, high complexity applications, clock tree synthesis for increased tolerance to delay uncertainty, resonant clocking design methodologies, 3-D design methodologies and algorithms, design methodologies for placing on-chip decoupling capacitors, low swing dual Vt domino and adaptive body biasing circuit techniques for low power applications, shielding methodologies for high speed interconnect, on-chip DC-DC conversion, substrate coupling in mixed-signal systems, and design methodologies for inductive interconnect.