

SEMINAR

Room 119A ZE C

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Stability-Ensuring Design of IC Power Delivery with Distributed Voltage Regulators

by

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Abstract: Placing multiple voltage regulators onto the die is an effective way of enabling distributed on-chip voltage regulation and provides significant benefits in suppressing various types of power supply noise. However, the complex interactions between the active voltage regulators and the large passive sub-network may render the complete power delivery network (PDN) unstable, leading to design failures. While traditional stability measures such as phase margin are not applicable to regulated PDNs that have a large number of loops, a brute-force analysis of network stability can be impractical due to its computational complexity. In this talk, I will present a hybrid stability margin concept and the associated stability-checking method for PDNs with integrated linear low-dropout voltage regulators (LDOs). With theoretical rigor, the proposed approach is local in the sense that the stability of the entire network can be efficiently examined through a hybrid stability constraint that is defined locally for individual LDOs. In the same spirit, I will present a localized LDO design methodology that optimizes individual LDOs in a stand-alone manner while ensuring the network-level stability. Key circuit-level design considerations and tradeoffs involved in stability-ensuring LDO design will also be discussed.

Peng Li received the Ph.D. degree in ECE from Carnegie Mellon University in 2003. He is presently an associate professor at Department of ECE, Texas A&M University. He is a courtesy member of Faculty of Neuroscience and Health Science Center at Texas A&M. His interests are in the areas of integrated circuits, computer-aided design, aspects of parallel computing and computational neuroscience. He authored and co-authored over 160 publications in these areas. He is a recipient of three IEEE/ACM Design Automation Conference Best Paper Awards, an IEEE/ACM William J. McCalla ICCAD Best Paper Award, two Semiconductor Research Corporation Inventor Recognition Awards, two Inventor Recognition Awards from Microelectronics Advanced Research Corporation, and an NSF CAREER Award. He has consulted for the US semiconductor industry on VLSI CAD.