Modeling and Co-Simulation of Power Distribution Networks for Digital and Mixed Signal Systems

R. Mandrekar, J. Choi, K. Srinivasan and M. Swaminathan
EPISON Group, Georgia Institute of Technology
School of Electrical and Computer Engineering

Objective

- Co-simulation of Signal And Power Delivery Networks in Integrated Microsystems
- Modeling of Electromagnetic Interference
- Mitigation of Substrate Noise

Co-Simulation Methodology

M-FDM: Frequency-Domain Package PDN Simulator

M-FDM: Performance

Modal Decomposition Method

Modal Decomposition Results

Delay Based Causality

Non-Linear Driver Macromodeling

Noise Isolation

Mixed-Signal System Integration Using AI-EBG based Power Distribution Network

Noise Suppression using AI-EBG Structure based Power Distribution Network

Summary

- Design of high-performance analog/digital circuits in the package or in the chip requires careful understanding of the effects of the nonideal nature of the power and signal delivery networks (PDN/SDN) in the package and in the chip
- The following topics were addressed:
  - SDN/PDN Co-Simulation using Modal Decomposition Technique
  - Accurate simulation including delay based causality enforcement
  - Noise mitigation using EBG structures
  - Non-linear Driver macromodeling
- The authors would like to thank Ege Engin and Krishna Bharath