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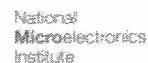
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Small Area Power Converter for Application to Distributed On-Chip Power Delivery

Eby Friedman

University of Rochester, USA

Abstract:

The presentation is composed of three parts. First, a recently manufactured test circuit of a small on-chip point-of-load voltage converter will be described. This active filter-based circuit is a hybrid combination of a switching DC-DC voltage converter and a linear voltage regulator, exploiting active circuitry rather than the bulky passive devices typically used in a buck converter. The voltage regulator can supply over 140 mA current while exhibiting high current efficiency greater than 99% and achieves fast load regulation (72 ns) while requiring only 0.026 mm² on-chip area. This circuit provides a means for distributing multiple local power supplies across an integrated circuit while providing high current efficiency. In the second part, simultaneous co-placement of these point-of-load power supplies with on-chip decoupling capacitors to improve overall signal integrity of the power grid will be discussed and the many highly complex interactions among the power supplies, decoupling capacitors, and load circuitry will be reviewed. In the third part, a distributed voltage regulator designed and manufactured in a 3-D IC technology will be briefly reviewed.

Bio:

Eby G. Friedman is a Distinguished Professor at the University of Rochester and a Visiting Professor at the Technion - Israel Institute of Technology. His research is in high performance synchronous digital and mixed-signal microelectronic circuit design. He is the author of almost 400 papers and book chapters and thirteen books in the fields of high speed and low power CMOS design techniques, high speed interconnect, and synchronous clock and power distribution networks. He previously was the Editor-in-Chief of the IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 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.