

G. Gildenblat
Penn State University

Abstract
Compact MOSFET models: directions and techniques

This presentation provides an introduction to the new ideas responsible for the recent dramatic change in the direction of compact modeling research and engineering practice. The interplay between MOS device physics, mathematical methods, and circuit simulation is illustrated using several “difficult” circuits (e.g. passive mixers and the “killer” NOR gate) that cannot be simulated properly with older MOSFET models. Different approaches to compact modeling are analyzed in terms of their accuracy, physical content, and simulation capabilities. In particular, it is shown that all existing compact MOSFET models are either surface-potential-based or represent special cases of this general formulation. Recently-developed compact modeling techniques such as symmetric linearization and spline collocation are discussed within the context of the new industry standard model - PSP (Penn State-Philips) model. The talk concludes with a brief discussion of the emerging engineering models of quasi-ballistic transport and of the optimal infrastructure for a successful compact modeling project.

Gennady Gildenblat received the MSEE (with honors) from the St. Petersburg Electrical Engineering Institute in 1975 and the Ph.D. degree in Solid-State Physics from the Rensselaer Polytechnic Institute, Troy, NY, in 1984. His research interests include semiconductor device physics and modeling, novel semiconductor devices, and semiconductor transport. He has over 130 publications in these areas including several books, invited articles and US patents. In 1980 he has joined the General Electric Corporate Research and Development Center in Schenectady, NY, where he was engaged in various aspects of semiconductor device physics and IC technology development. Between 1984 and 1986 he supervised the CryoCMOS device engineering study at the Digital Equipment Corporation in Hudson, MA. In 1986 Dr. Gildenblat joined The Pennsylvania State University where he presently is a Professor of Electrical Engineering. He has developed the advanced surface-potential-based SP and PSP compact MOSFET models. The PSP model (joint development with Philips) has been selected as a new industry standard by the Compact Modeling Council.