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Abstract

Channel Materials Engineering for Continuous MOSFET Performance Increase with Device Scaling

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Historical MOSFET performance data are analyzed based on a simple model that links MOSFET intrinsic switch delay to effective carrier velocity in the channel. It is shown that nearly continuous carrier velocity increase, most recently via the introduction of process induced strain, has been responsible for the inversely proportional historical device performance relationship to gate length. Channel material innovations that will be required in order to maintain this commensurate scaling beyond what can be achieved with process-induced strain, will be discussed along with some of the technological tradeoffs that will have to be faced for their introduction.

Brief Biography of Professor Dimitri A. Antoniadis

Dimitri A. Antoniadis is Ray and Maria Stata Professor of Electrical Engineering at MIT, Cambridge MA, 02139, (daa@mit.edu). He is Director of the multi-university Focus Research Center for Materials Structures and Devices, member of the National Academy of Engineering, IEEE Fellow, and recipient of several professional awards. He is author or coauthor of over 200 technical articles, and he currently works on extreme-submicron Si, SOI and Si/SiGe MOSFETs.