THM-TFET: A Physics-Based Verilog-A Compact Model of Tunnel-FETs for DC/AC Exploration of New Circuit Concepts

We present theVerilog-A compact model THM-TFET of a tunneling field-effect transistor (Tunnel-FET) that enables DC, AC and transient simulations in standard circuit simulators. The model was developed by deriving physics-based model equations for band-to-band and trap-assisted tunneling in double-gate device structures. Physically meaningful model parameters provide an accurate fitting of the model to numerical data from TCAD simulations andmeasurements. Furthermore, the flexibility of the model allows it to be used when exploringadvanced device geometries such as nanowires or line-tunneling concepts. Themodel's Verilog-A code is available on nanohub.org along with a tool for plotting of the IV and CV characteristics to support research of new design concepts using Tunnel-FET devices.

Bio:
Alexander Kloes is Professor at THM University of Applied Sciences in Germany and heads the Device Modeling Research Group at the Competence Center for Nanotechnology and Photonics. In 1996 he received the PhDdegree in electrical engineering from Technical University of Darmstadt, Germany. From 1997 to 2002 he gained industry experience as Project Manager for Research and Development at Braun Company in Germany, where he contributed toinfrared sensor technology on silicon. From this time,he holds 15 patents. Alexander is IEEE Senior Member.His research interests focus onthe compact modeling and simulation of semiconductor devices, particularly for nanoscale MOS devices and organic thin-film transistors for flexible electronics. His contributions to the research community cover emerging devices as Junctionless-FETs, multi-gate FETs, Schottky barrier FETs, Tunnel-FETs, ultra-short channel MOSFETs and submicron organic TFTs. He co-authored more than 170 research papers in these areas.

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