

BSIM Compact MOSFET Models

**Yogesh S. Chauhan, Ali Niknejad,
Chenming Hu**

UC Berkeley



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SPICE and Device Compact Models

that the diagonal elements of the nodal admittance matrix would be

sequent spread of circuit simulation and its negative side effect

Don Pederson correctly recognized that device models, not internal algorithms, were the keys to the success of a circuit simulation program.

adequate as pivot choices in effecting its factorization into lower and

the engineering intuition of circuit designers.

Ron Rohrer

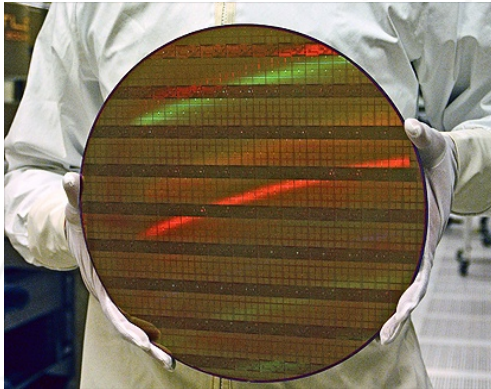
Special Issue on 40th Anniversary of SPICE

SPRING 2011

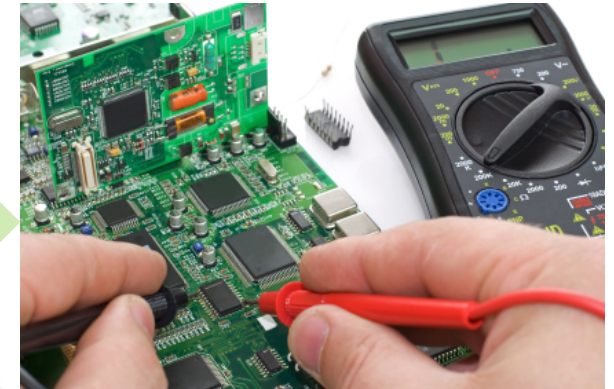
IEEE SOLID-STATE CIRCUITS MAGAZINE



SPIICE Transistor Modeling for Circuit Simulation



**Medium of
information
exchange**

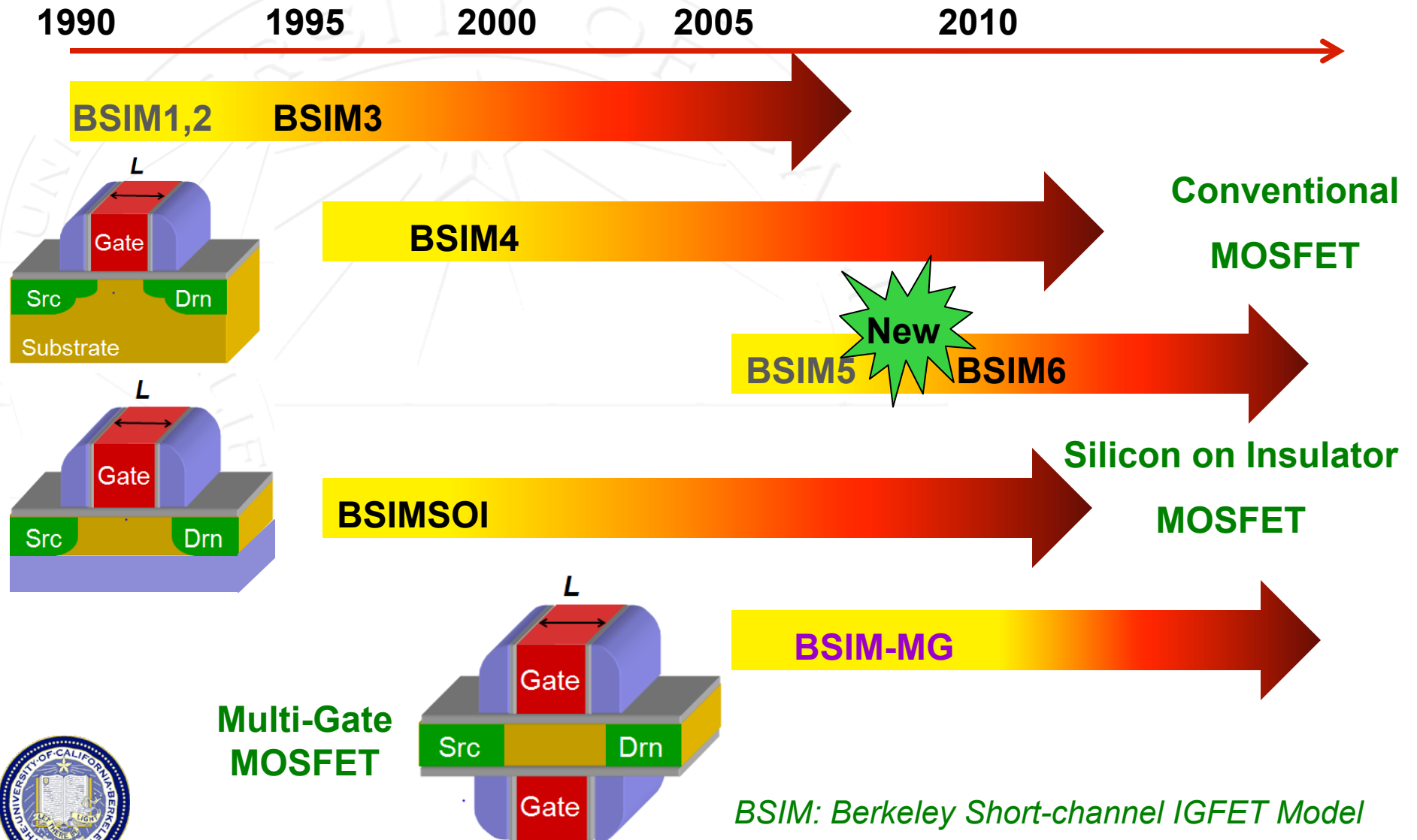


- **Simulation Time**
 - $\sim 10\mu\text{s}$ per DC data point
 - No complex numerical method allowed
- **Accuracy requirements**
 - $\sim 1\%$ RMS Error after fitting

- **Excellent Convergence**
- **Example: BSIM4**
 - 25,000 lines of C code
 - 200+ parameters
 - Open-source software implemented in all EDA tools



BSIM Family of Compact Device Models



Bulk MOSFET Models

- BSIM3
 - Threshold Voltage based MOSFET Model
 - First CMC standard Model
- BSIM4
 - Threshold Voltage based MOSFET Model with enhanced physics features (mobility, BTBT, gate leakage.....)
- BSIM6
 - Charge based Symmetric MOSFET Model
 - Charge based core
 - BSIM4 physics models and parameters
 - Under standardization review in CMC



BSIM-EPFL Collaboration

BSIM and EPFL groups have agreed to collaborate on the long-term development and support of BSIM6 as an open-source MOSFET SPICE models for worldwide use. This is an exciting opportunity to leverage the long history and large user base of the BSIM model with the long experience and active role of EPFL for furthering charge-based compact model.

