

BSIM Compact MOSFET Models

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Sept. 16, 2011

MOS-AK Workshop, Helsinki

SPICE and Device Compact Models

that the diagonal elements of the nodal admittance matrix would be

sequence 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

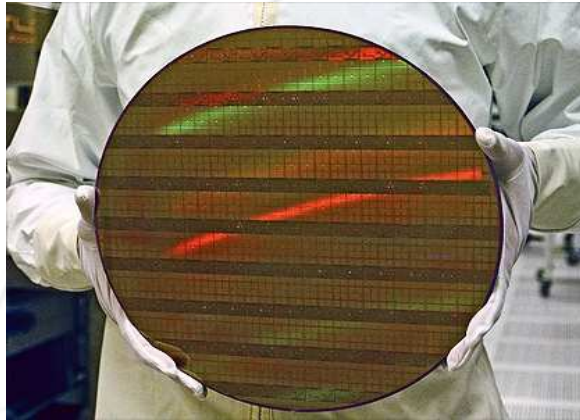
Special Issue on 40th Anniversary of SPICE

SPRING 2011

IEEE SOLID-STATE CIRCUITS MAGAZINE



SPICE 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

1990

1995

2000

2005

2010

BSIM1,2

BSIM3

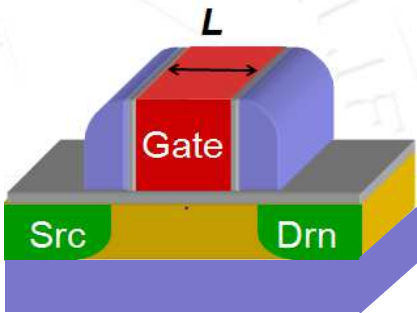
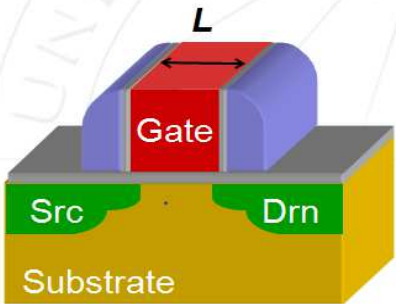
BSIM4

BSIM5

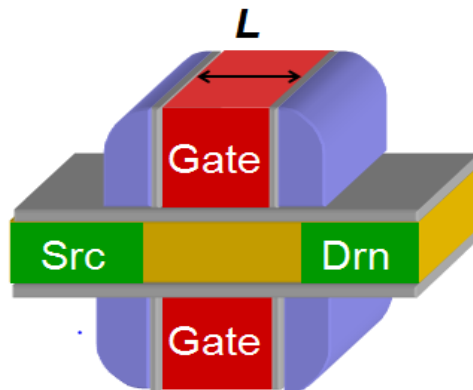
BSIM6

BSIMSOI

BSIM-MG



Multi-Gate
MOSFET



Conventional
MOSFET

Silicon on Insulator
MOSFET

BSIM: Berkeley Short-channel IGFET Model



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-EKV Collaboration

BSIM and EKV groups have agreed to collaborate on the long-term development and support of BSIM6 as an open-source MOSFET SPICE model 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 EKV in furthering charge-based compact model.

