BSIM Compact MOSFET Models

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SPICE and Device Compact Models

that the diagonal elements of the nodal admittance matrix would be

sequent spread of circuit sti tion and its negative side effec

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

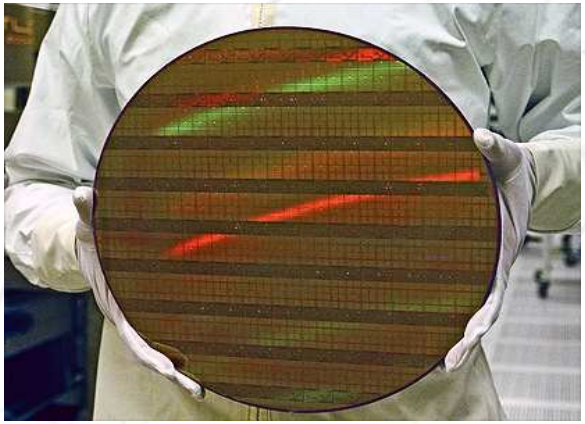
the engineering intuition of ci designers.

Ron Rohrer

Special Issue on 40th Anniversary of SPICE

SPRING 2011 IEEE SOLID-STATE CIRCUITS MAGAZINE

SPICE Transistor Modeling for Circuit Simulation



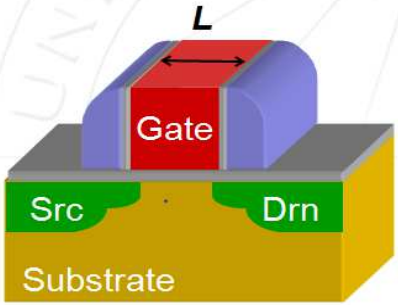
Medium of information exchange

- **Simulation Time**
  - ~ 10μs per DC data point
  - No complex numerical method allowed
- **Accuracy requirements**
  - ~ 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

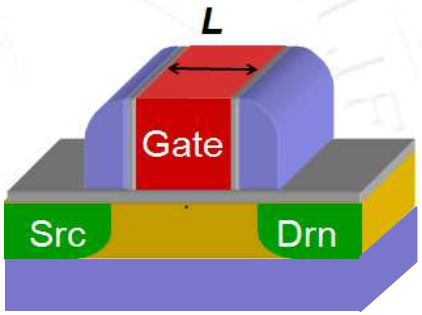


BSIM4

Conventional MOSFET

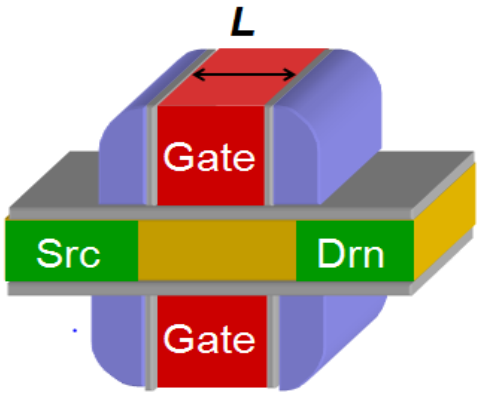
New

BSIM5 BSIM6



BSIMSOI

Silicon on Insulator MOSFET



BSIM-MG

Multi-Gate 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.