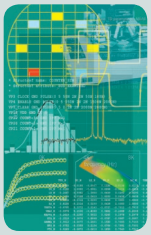


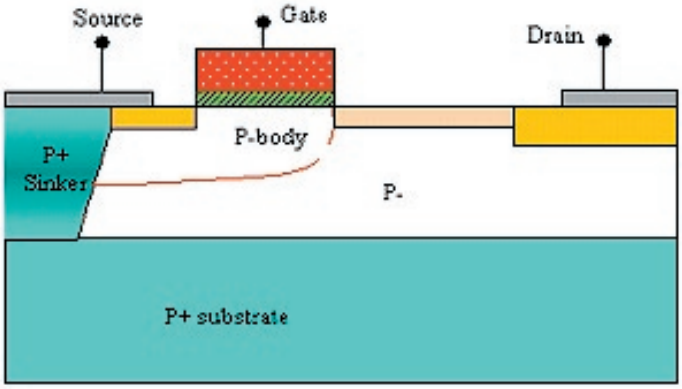
LDMOS

Surface Potential Based LDMOS Compact Model

Accurate SPICE Simulation of LDMOS Devices without using macro-models

Philips MOS20 provides a high-voltage-based LDMOS compact model that includes physical effects for both channel region and drift region under the gate.

LDMOS model is suitable to simulate Lateral (LDMOS), Vertical Double-diffused (VDMOS) as well as Extended-drain (EPMOS) devices.



Schematic cross-section of an LDMOS device.

Features

- Surface potential based compact model
- Single equation set avoids discontinuities between operating regions (no smoothing functions required).
- Continuous derivatives for fast and accurate simulation convergence
- Mobility reduction
- Self-heating
- Quasi-saturation
- Velocity saturation
- Drain-Induced Barrier Lowering (DIBL)
- Static feedback
- Channel length modulation
- Weak avalanche current

Philips MOS20 (SmartSpice LEVEL=20) accounts for the channel and drift regions, and computes the voltage at which the transition occurs internally. This provides much better convergence properties than using a macro-model based approach. Simulation speed is not hampered by increased circuit size as internal macro-model nodes are not required.

Simucad Implementation

- MOS20 model is part of SmartLib product-independent models library. It can be accessed within SmartSpice as LEVEL=20
- MOS20 is compatible with parallel architecture algorithms
- Advanced analyses, such as Transient Noise (with/without Philips native equations) or RF are available
- MOS20 is compatible with VZERO and BYPASS options in order to achieve great speed performance
- Internal warnings and diagnostic provide valuable information to help find convergence issues
- Usual MOS device variables like currents, conductances, charges and capacitances as well as MOS20-specific internal variables can be saved, printed, plotted and/or measured

SIMUCAD
DESIGN AUTOMATION

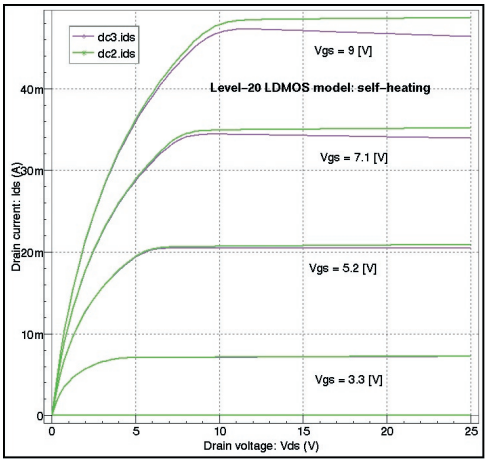
Benefits From All Philips™ and Simucad Model Improvements

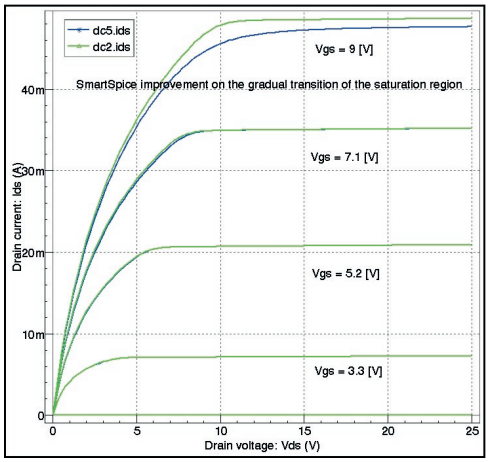
MOS20 model core is based on the SOI-LDMOS model developed at University of Southampton and is based on the computation of surface potential.

This critical part of the model formulation was implemented with the experience of MOS11 model. This approach provides only one set of equations for the whole operating range of the model.

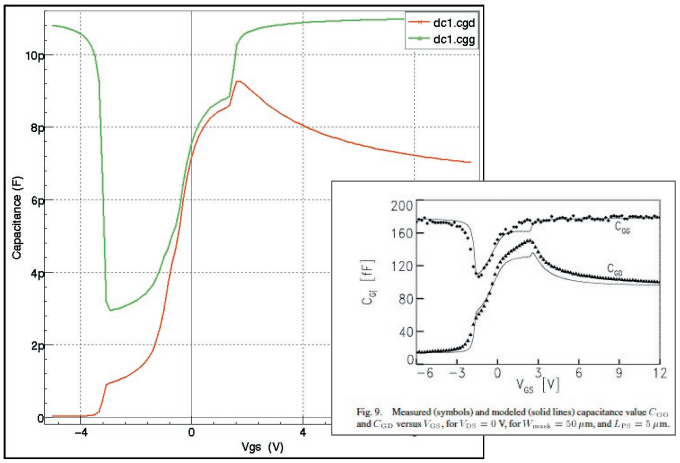
There is no longer one equation for the subthreshold region, and another for near threshold region with a smoothing function to make a continuous transition between them. The single equation set used is continuous over all modes of operation.

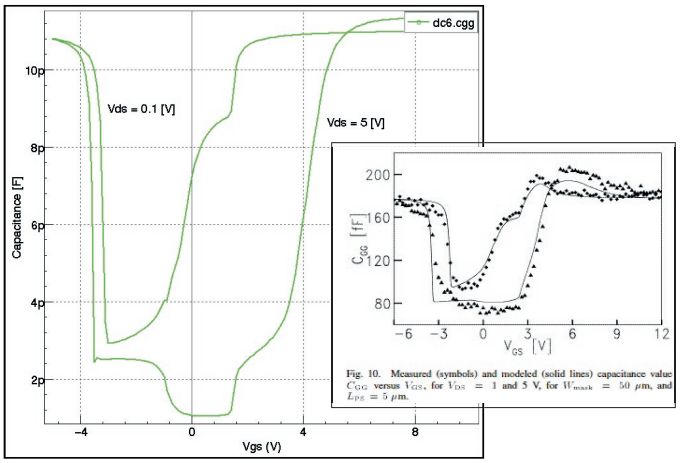
MOS20 has all the advantages of the Philips model development expertise, creating a robust model both in term of accuracy, convergence and speed.

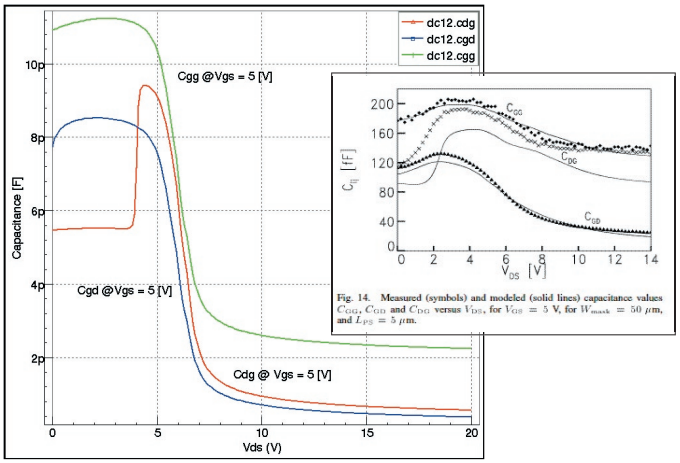




Self-heating and Quasi-saturation Device Behaviour supported by MOS20







Typical capacitance vs. bias characteristics. Some example measured data is inset *

** "A Surface-Potential-based High-Voltage Compact LDMOS Transistor Model", A.Aarts et al., IEEE Transactions On Electron Devices, Vol 52, No 5, May 2005*