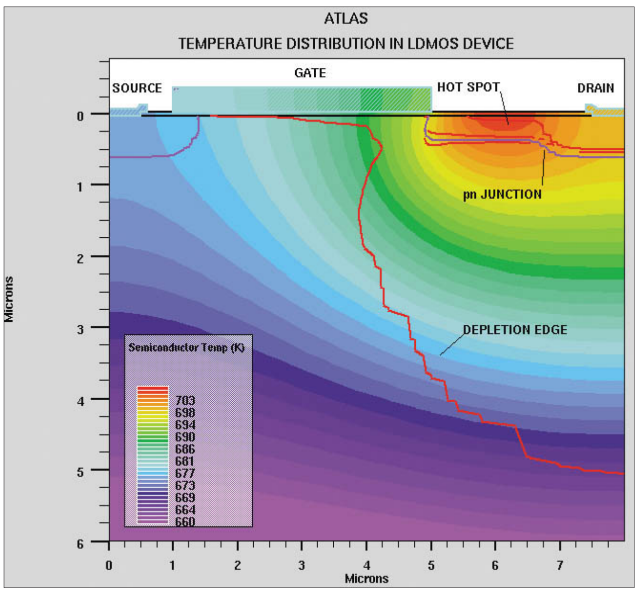
2D NON-ISOTHERMAL DEVICE SIMULATOR

Giga combined with S-Pisces and Blaze device simulators allows simulation of self heating effects. Models in Giga include heat generation, heat flow, lattice heating, heat sinks, and effects of local temperature on physical constants. Thermal and electrical physical effects are coupled through self-consistent calculations. Giga is a fully integrated component of the ATLAS device simulation framework.

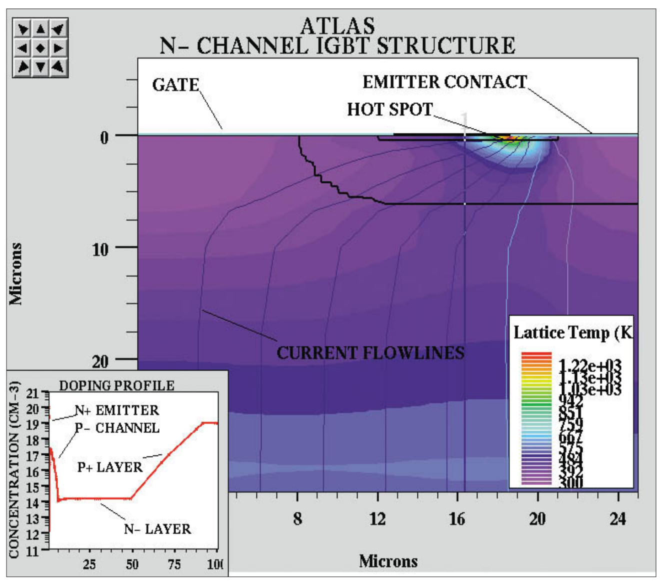
Giga provides an ideal environment for the design and optimization of power devices fabricated using MOS, bipolar, and mixed MOS-bipolar technologies. Other common applications include characterization of electrostatic discharge (ESD) protection, device design of HBT, HEMT and SOI devices, thermal failure analysis, and heat sink designs.

MOS and Bipolar Power Devices

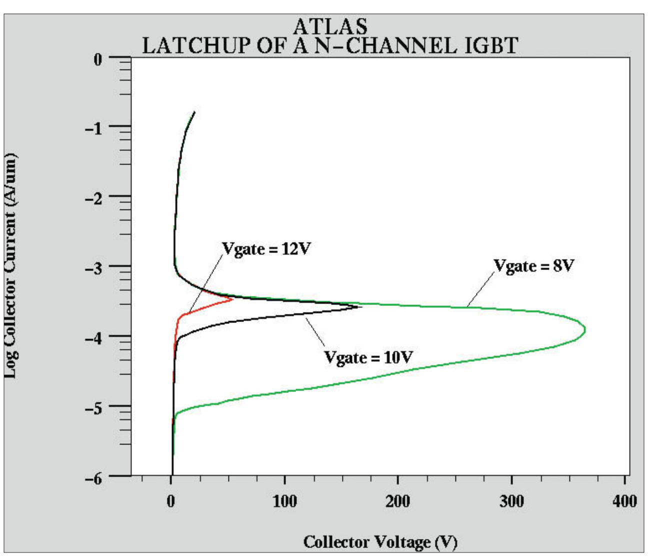
Giga provides the capability to investigate, design and optimize power devices. Simulation of measurable electrical characteristics, and conditions within the device that are temperature dependent, provide critical insight into device behavior. Probable failure mechanisms can be identified early in the process development cycle.



Temperature distribution in a Lateral DMOS transistor revealing a hot spot in the drift region. Giga is used to locate and evaluate local heating effects during high current operation.



Location of the hot spot and current flow with the device in a latched state.

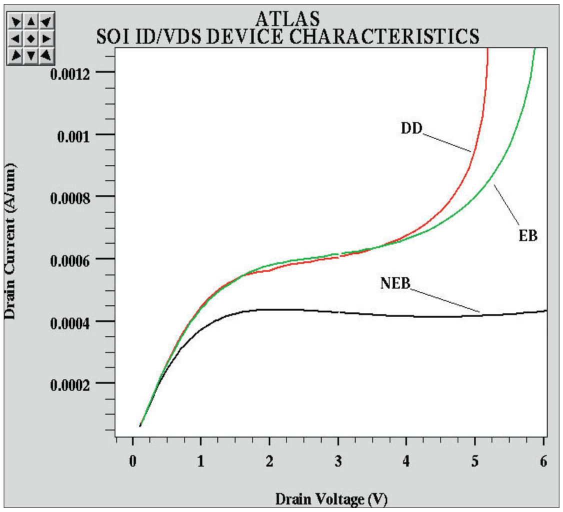


DC latchup characteristics as a function of gate voltage solved using a automatic curve tracing routine built into ATLAS.

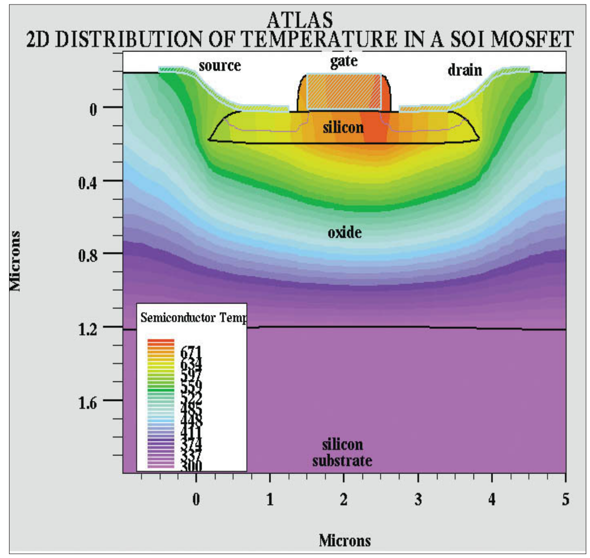
SILVACO

SOI Device Simulation

Non-isothermal effects are often important in silicon-on-insulator (SOI) devices because of the low thermal conductivity buried oxide. Accurate characterization of drain current, the kink effect and breakdown behavior of SOI devices requires non-isothermal calculation. Giga enables the analysis of the internal distributions of avalanche generation rates to assist in understanding thermal device performance effects.

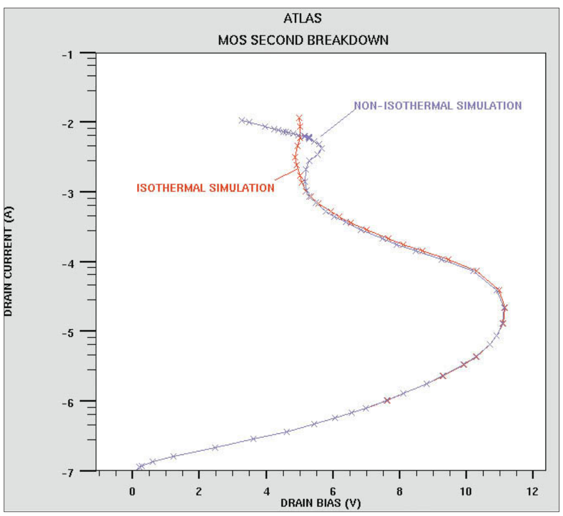


Simulated I/V curves for drift diffusion, energy balance and non-isothermal energy balance models.



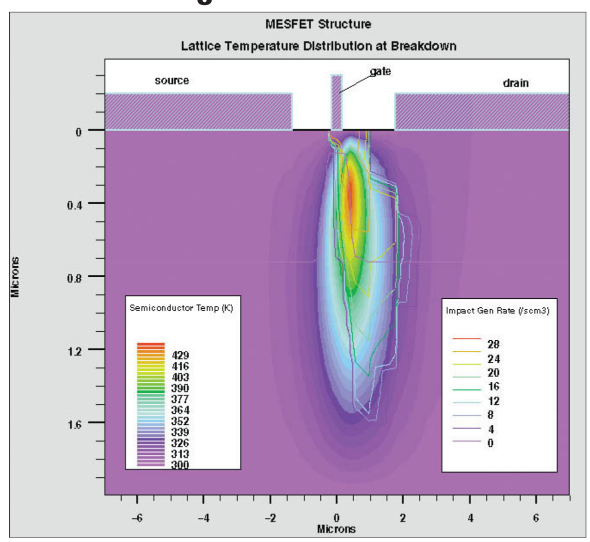
Temperature distribution inside an SOI MOSFET and associated LOCOS isolations. The device was defined using a LDD process sequence in ATHENA.

MOS Second Breakdown



The thermally dominated second breakdown voltage in MOSFETs can be predicted using Giga. An isothermal simulation under the same conditions fails to show the second breakdown. The simulated DC results provided by Giga, such as second breakdown voltages and trigger current, are useful for determining ESD pulse tolerance.

Local Heating in GaAs MESFETs



Temperature distribution within a GaAs MESFET during breakdown. Non-isothermal simulation is required to accurately characterize devices made from materials with low thermal conductivity substrates.

SILVACO

HEADQUARTERS

4701 Patrick Henry Drive, Bldg. 2

Santa Clara, CA 95054 USA

Phone: 408-654-4309

Fax: 408-496-6080

JAPAN jpsales@silvaco.com

EUROPE eusales@silvaco.com

KOREA krsales@silvaco.com

TAIWAN twsales@silvaco.com

SINGAPORE sgsales@silvaco.com

CALIFORNIA sales@silvaco.com 408-567-1000

MASSACHUSETTS masales@silvaco.com 978-323-7901

TEXAS txsales@silvaco.com 512-418-2929

ARIZONA azsales@silvaco.com 480-947-2900

WWW.SILVACO.COM

Rev. 013008_03