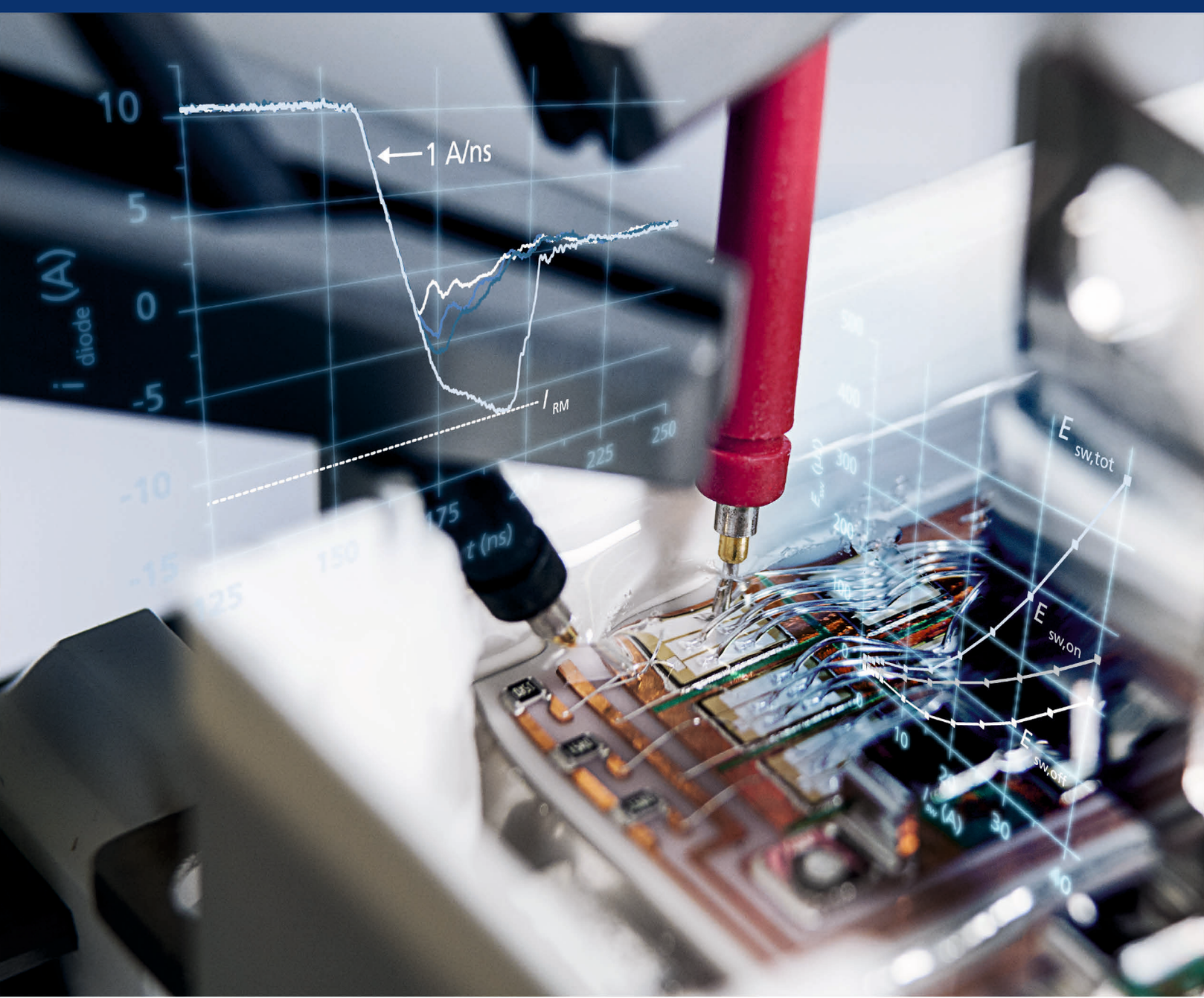
Fraunhofer
IISB

FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY

Virtual Prototyping with SiC & GaN Device Measurements and Modelling



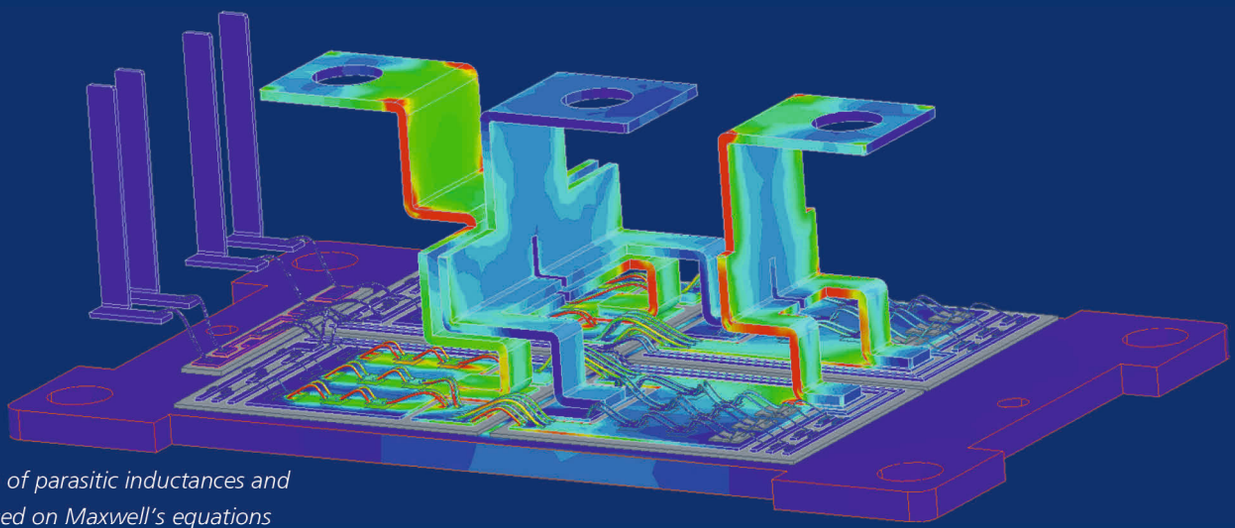


Fig. 1: Extraction of parasitic inductances and capacitances based on Maxwell's equations

Motivation

"A new era begins," "lowest losses," "Ultra fast switching," "50 MHz switching frequency," "10 x higher power density" – that's the current opinion of novel SiC and GaN power devices.

But do you want to know the real benefits of using SiC and GaN in your specific system? We are your manufacturer-independent partner for device evaluation and power semiconductor modelling for virtual prototyping.

Objectives

- Power semiconductor benchmarks
- Evaluation of novel devices in highly efficient power electronic systems
- Device modelling for computer-based system optimization and virtual prototyping
- Verification of measured and simulated device characteristics
- Goal: Modelling of all application-related device characteristics

Fraunhofer Institute for Integrated Systems and Device Technology IISB

Schottkystrasse 10
91058 Erlangen, Germany

Contact

Thomas Heckel
Tel.: +49 9131 761-436
Thomas.Heckel@iisb.fraunhofer.de

www.iisb.fraunhofer.de

Static Characterization

- Goal: Extraction of static parameters
- Custom measurement probes and compensation circuits for novel SiC and GaN devices
- Measurement of static transfer, output characteristics, break down voltage of power semiconductors and modules
- Measurement of module parasitics (stray inductance, self-capacitance)
- Up to 10kV, 1500A, 250°C

Dynamic Characterization

- Goal: Characterization of power semiconductor switching behaviour
- Hard and soft switching up to 2kV, 200 A, 250 °C
- Up to 200 V/ns and 10 A/ns
- Low inductance adapters for all kinds of packaged and bare die devices as well as modules

Fig. 2: Extremely low inductive (3nH) double pulse measurement setup

Modelling and Simulation

- Goal: Verified thermoelectric models for virtual prototyping of power electronic systems
- FEM quasi-static and full-wave solver to extract parasitic and conductor characteristics
- Dynamic model with internal gate resistance, nonlinear capacitances, gate charge etc.
- Thermal model for evaluation of paralleled devices

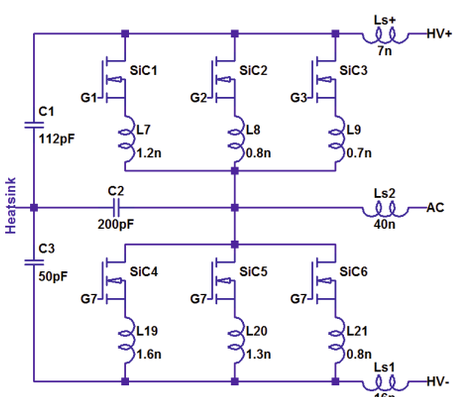


Fig. 3: Lumped circuit model of SiC half-bridge and bidirectional thermal model (optional)

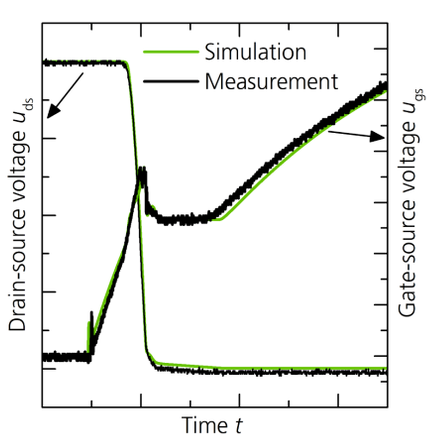


Fig. 4: Verification of double pulse measurement and simulation