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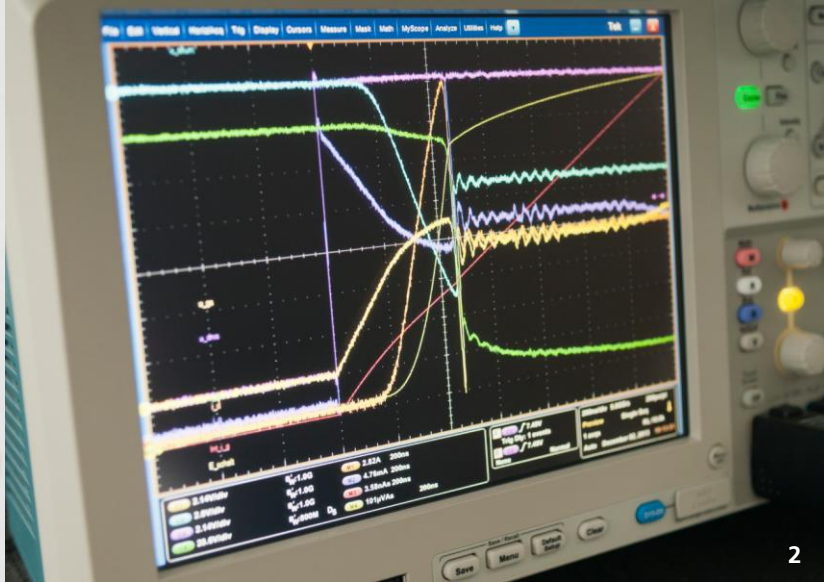
FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY

# Cool Systems with SiC and GaN

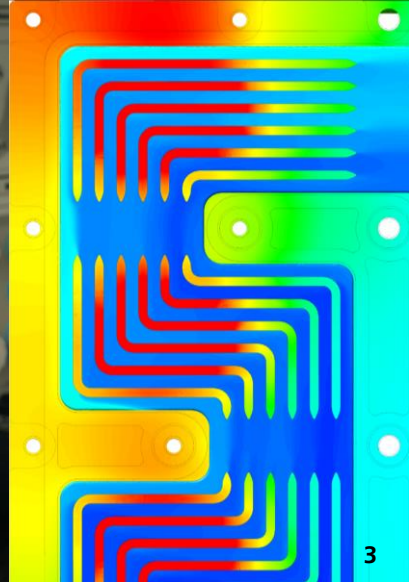




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## Euphoria and benefits to you

“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 benchmark power electronic solutions.

## Objectives

- Evaluation of novel devices in highly efficient power electronic systems
- Cost reduction by system integration
- Innovative solutions for automotive and energy transfer applications
- Comprehensive system concepts through expertise in materials, devices, modules, and systems
- Electrically and thermally optimized die attach technologies (Fig. 1)

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## Characterization

- Dynamic switching behavior of devices (Fig. 2,4)
- Burst ruggedness of gate control circuits
- EMC characterization and optimization up to mid-size cars
- System verification on lab bench up to 1000 V and 500 A



Fig. 4: Low-inductive measurement setup for dynamic device evaluation up to 2000 V, 100 A.

## Simulation

- Analytic evaluation of converter topologies
- Optimum operating points for power semiconductors and passive devices
- Determination of critical operating conditions by electro-thermal co-simulation and deduction of customized solutions (Fig. 3)

## Prototype systems

- Bidirectional DC / DC and AC / DC converters for automotive and energy management (Fig. 5)
- Inductive charging systems for electric cars
- Ultra-high power densities exceeding 100 kW/l and switching frequencies up to 1 MHz
- Multiport concepts with lowest profile
- Customized gate drivers for optimum device performance
- Fully digital control boards powered by microcontroller or FPGA with scalable CAN interface

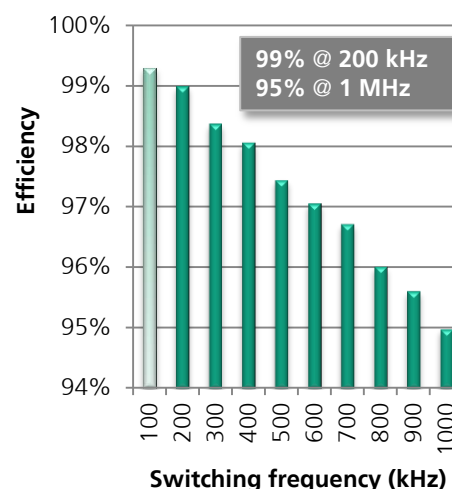


Fig. 5: Efficiency characteristics of 1.5 kW bidirectional DC / DC converter prototype with 600 V GaN transistors.