

1 Thermal characterization of power modules mounted on a water-glycol cooled heat sink

## THERMAL CHARACTERIZATION

Resistance  $R_{th}$  and impedance  $Z_{th}$  measurements

### Fields of research and service

- Thermal characterization of new packaging concepts, materials, devices and technologies for power electronic devices
- Static and dynamic thermal measurements ( $R_{th}$ ,  $Z_{th}$ )
- Heatsinks for single and multi devices (up to 20 samples per cold plate)
- Design and assembly of power modules for testing (silver sintering, soldering, wire bonding)
- FEM-Simulation of thermal behavior from semiconductor to coolant
- Workshops for test result interpretation

### Measurement system

- Temperature acquisition via device under test (indirect measurement principle)
- Direct temperature measurement by thermography, PT100 and thermo-couples
- Heating current from 0.1A up to 2000A
- Heating voltage up to 35V
- Heating and cooling power up to 20kW
- Coolant temperatures from - 60... + 350°C possible
- Coolant flow up to 25 l/min
- Maximum pressure: 8 bar

#### Fraunhofer Institute for Integrated Systems and Device Technology IISB

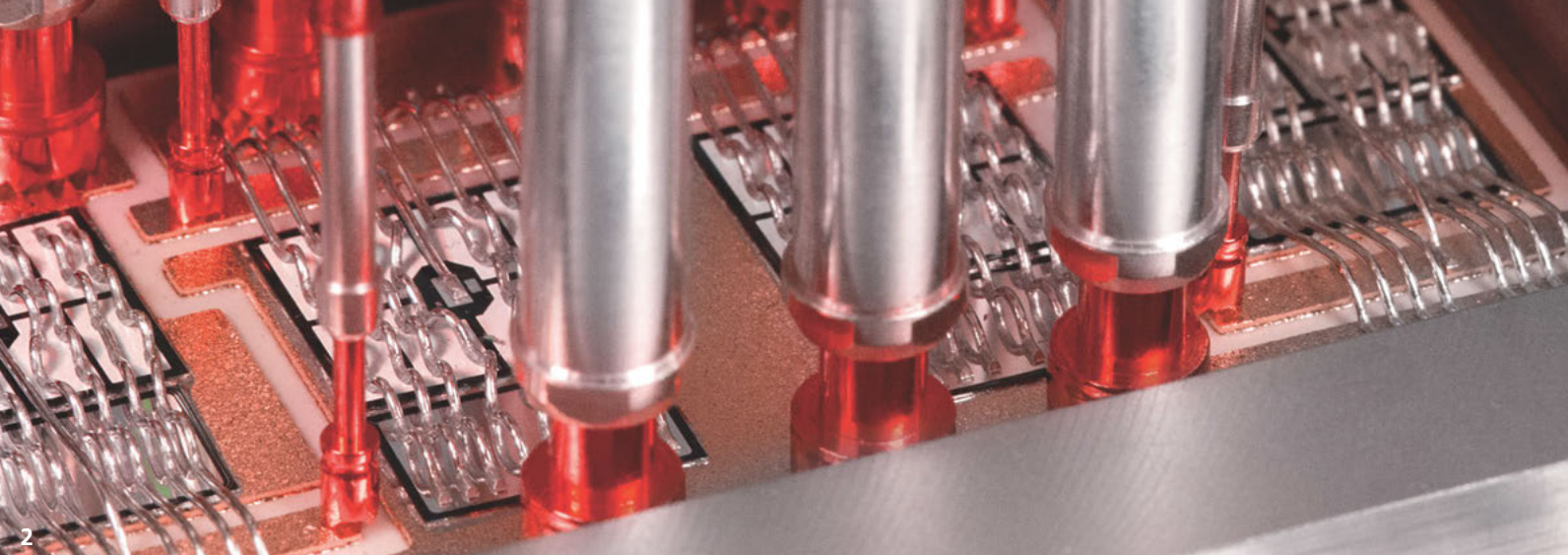
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### Devices for testing

- IGBTs, MOSFETs, JFETs, thyristors
- Resistors
- Schottky-diodes, pn-diodes
- Si, SiC and GaN devices

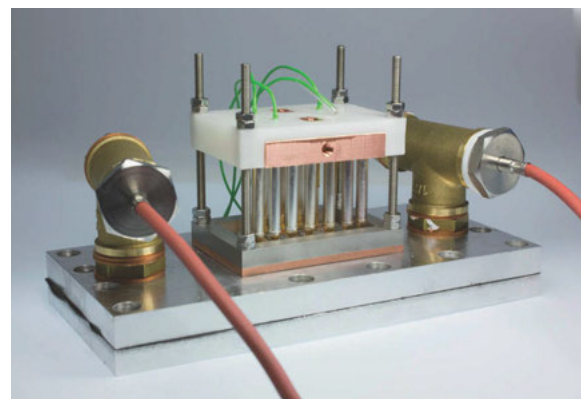
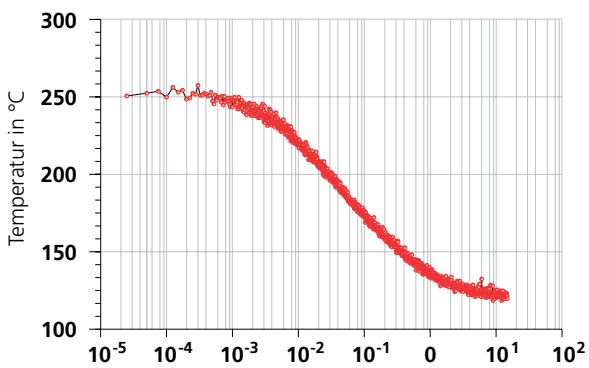
### Packaging for testing

- Power modules with or without baseplate
- PCB-Boards with discretes (to-devices, D<sup>2</sup>Paks, etc.)
- Direct / Indirect water cooled systems
- Liquid and air cooled devices
- With or without housing or molding
- In-house test layouts and samples

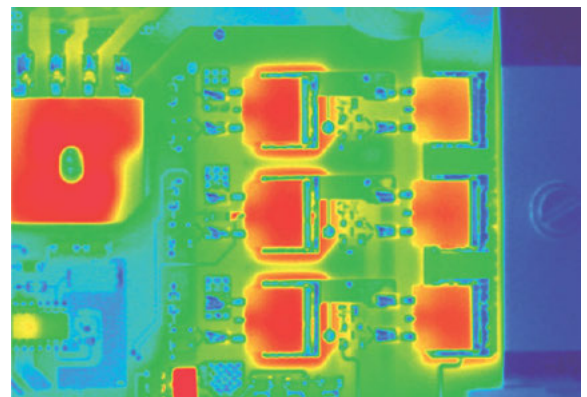
### Additional services

- Foster-Cauer network calculation
- Thermal management consulting
- FEM-simulations
- Statistical analysis

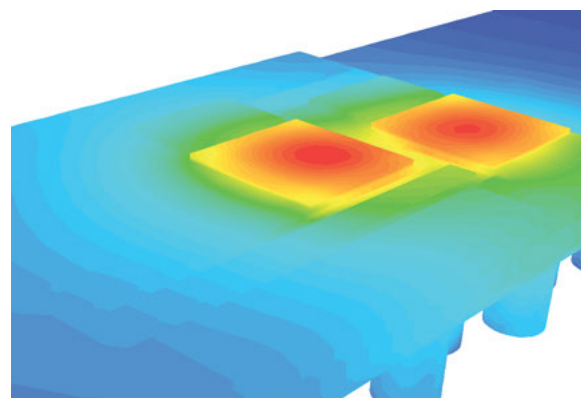
### Example of thermal impedance measurement



Device under test



Thermography



FEM Simulation