FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY

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

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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, D²Paks, 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

![Thermography](image)

![FEM Simulation](image)

Power module during thermal impedance measurement