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1 *Temperature distribution on a SiC-PIN diodes module due to a temperature dependent heat generation in the electronic devices.*

MULTIPHYSICS SIMULATION FOR POWER ELECTRONICS

Main topics in simulation

- Thermal simulation
- Electric and electromagnetic simulation
- Structure simulation
- Coupled multiphysics simulation (e.g. heating due to inductive coupling)
- Experimental measurements on power modules for evaluation of simulation results

Thermal simulation

- Fundamental assesment of the temperature distribution
- Steady-state and transient temperature behaviour
- Investigation of the temperature distribution of operating modules
- Temperature dependent heat generation in electronic devices
- Realistic power coupling and comparison of different cooling strategies
- Wide parameter studies on geometrical dependencies of temperature distribution (Influence of different materials, thermal properties, heatspreading with special materials etc.)

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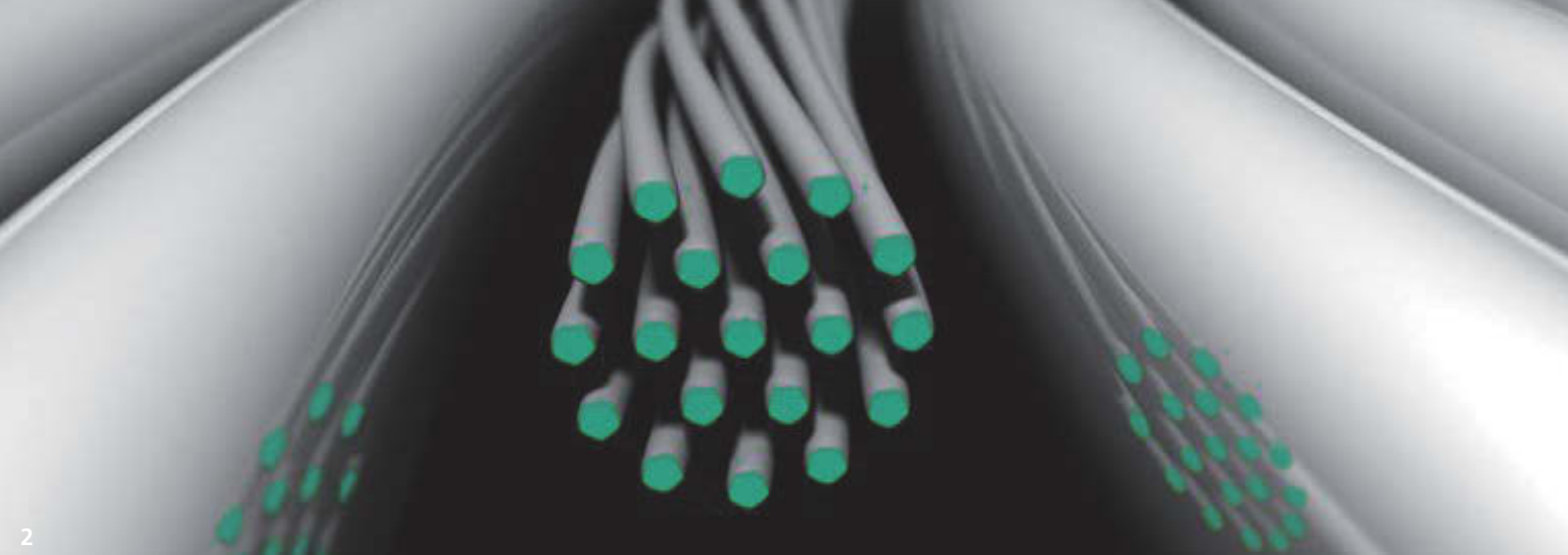
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Electric simulation

- Electric field strength distribution
- Identification of critical areas on the modules due to enhancement of the electric field strength
- Parametric studies of dependencies with respect to the field distribution

Electromagnetic simulation

- Electromagnetic losses in high frequency applications
- Wide parameter studies of power coupling through coils
- Illustration of the magnetic field distribution

Parasitic extraction in electronic packages

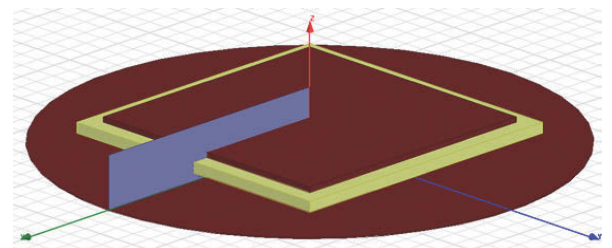
- Capacitive, conductance, inductance and resistance matrices

Structure simulation

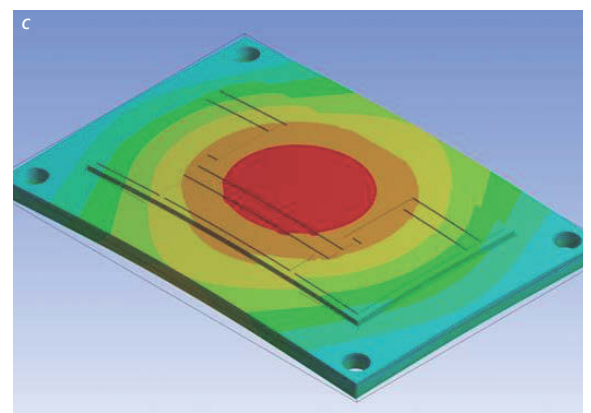
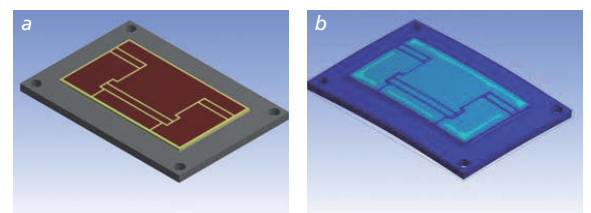
- Computation of the deformation of parts of power electronic modules due to temperature loads of the fabrication process or during operation
- Illustration of the internal stress of the linked-up materials in a stacked arrangement for power electronic uses

Software used in simulation

- Always up-to-date versions of simulation software for multiphysics and electromagnetic simulation (e.g., ANSYS)



Metal-ceramic-metal structure with a voltage load on the upper metallization, the potential distribution and the electric field strength enhancement.



DCB structure cooling down to ambient temperature after fabrication at higher temperature (a structure, b stress and c deformation through cooling)