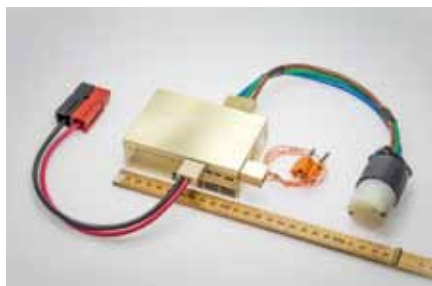


Power Electronics at Fraunhofer IZM

IZM has all necessary expertise in the entire development chain, from system design, packaging, thermal management, electromagnetic compatibility, through to reliability and damage analysis.



Solar converter with embedded module,
Little Box Challenge

Electrical System & Circuit Design

Applications for power electronic components are endless – in industrial drives, to generate renewable energy, in transport and more. The IZM is developing groundbreaking solutions for demands such as:

- High switching currents
- High voltages
- Very fast switching for SiC/GaN and highspeed Si-devices
- Mechanical stability



Embedded SiC-power module

- Strict EMC specifications
- An extremely long lifetime
- High reliability

Electromagnetic Compatibility

IZM is specialized in EMC and provides consulting and research for all phases of product development. Starting with basic research into interference phenomena in specific applications, we cover the entire spectrum, including troubleshooting after product delivery. We use in-house simulation processes developed specifically for frequent problems, as well as sophisticated measurement series.

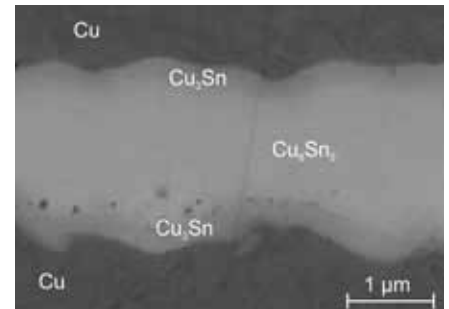
Thermal Management

The heat is dissipated from the chips through various interfaces, thermal interface materials, spreaders and substrates before being released into the environment by a heat exchanger (cooler). All of the specified points have to be optimized to guarantee that the heat is removed reliably and to meet the application's requirements.

Packaging

IZM has a wide area of packaging techniques at its disposal:

- Large-area solder joining; Ag sintering; diffusion soldering/bonding
- Heavy wire and ribbon bonding
- Embedding technologies as well as housing/encapsulation
- X-ray and US microscopy, visual inspection and mechanic testing



Diffusion bonded layer

Reliability

The damage behavior of materials and components are carefully analyzed and characterized in experiments; selected material and geometry parameters can be simulated (FEM). Technology-specific material properties are a particular focus of measurement technology at IZM. Among other things, such properties are the key extending the lifetime of a solder joint or a wire bond, and for measures that improve reliability.

Laboratories for power module and packaging qualification

- EMC-Lab
- Thermal measurement and thermal/mechanical simulation
- Active and passive power cycling
- Quality and reliability testing incl. combined and accelerated lifetime tests
- Material characterization: EBSD, FIB, SEM, EDX, Nano-Indentation