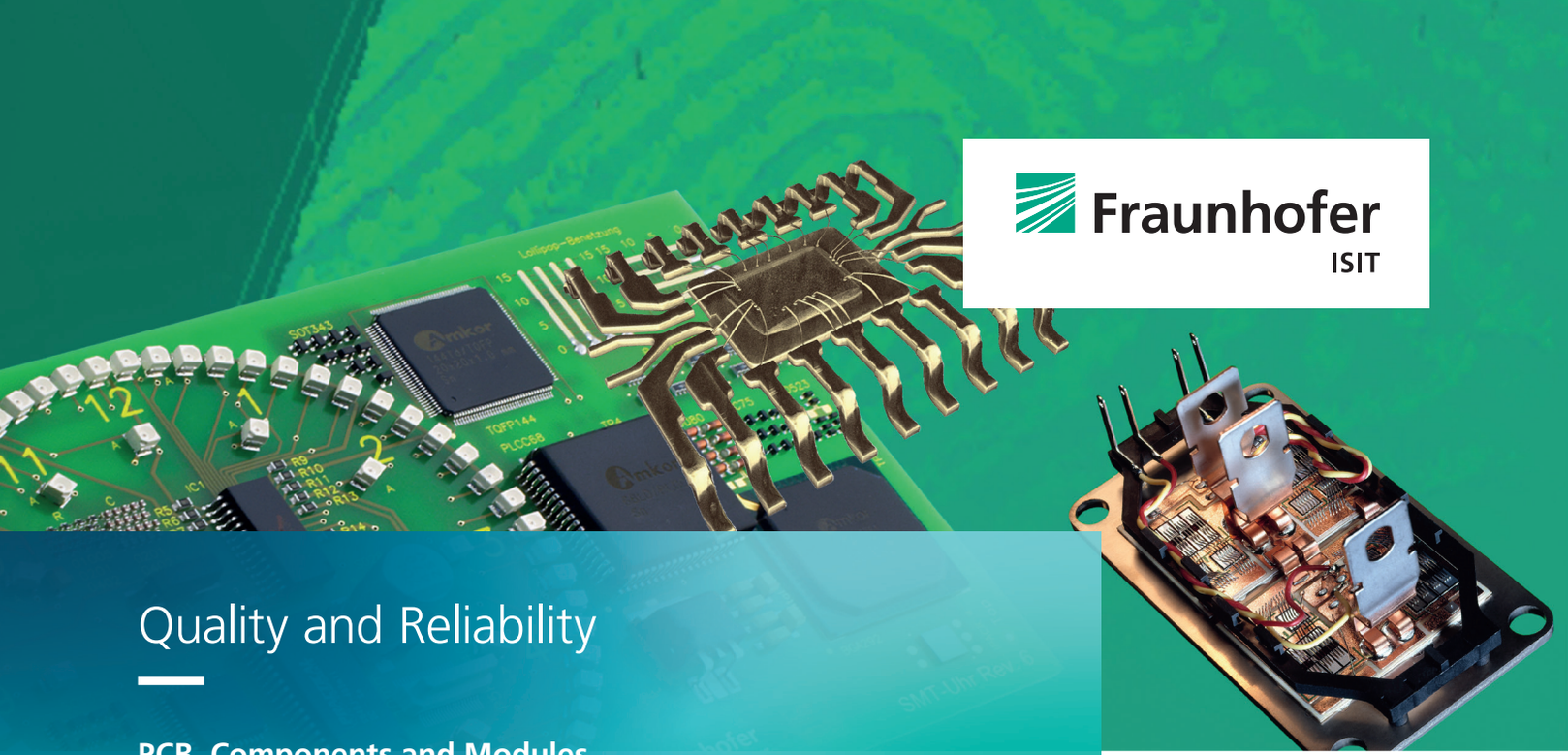
Fraunhofer ISIT



Quality and Reliability

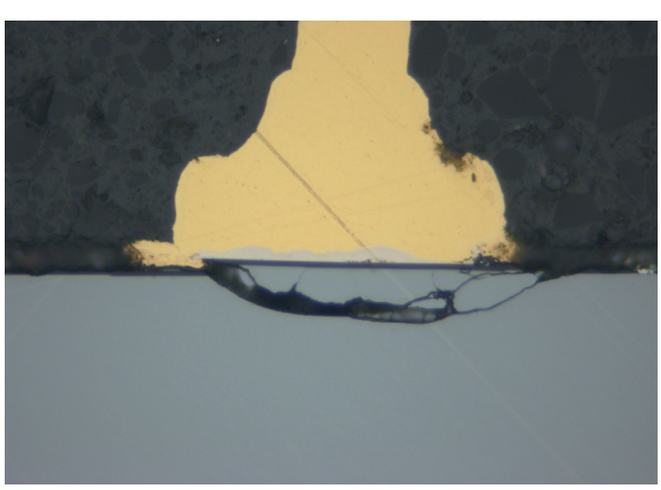
PCB, Components and Modules, Electronic Assemblies, Power Electronics

Integration of power modules in complex systems

Motivation

Controlled quality and reliability are competitive key factors. Fraunhofer ISIT supports its customers with service offers from the concept phase, through process control to the analysis of field return. During manufacturing and lifetime, all parts of an electronic assembly undergo deteriorative loads such as soldering heat, mounting stress and humidity/temperature cycles in field application. Material selection, design and process control are the decisive factors to deliver products of high quality. Based on many years of analyzing failures from field returns or accelerated aging, ISIT has developed a range of service offers that allow customers to actively increase the reliability of their products.

Crack in surface Si below a wire bond contact



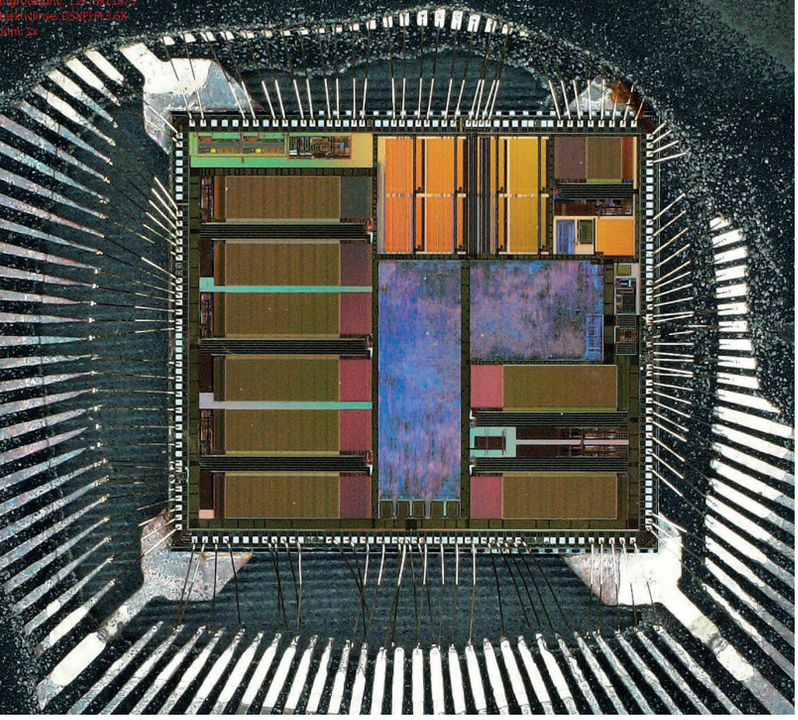
What we offer

- Analytics and environmental testing
- Individual consulting on design and process issues
- Training for production leaders and operators
- Targeted R&D projects with third party funding
- Networking with regional competence in industry and academia

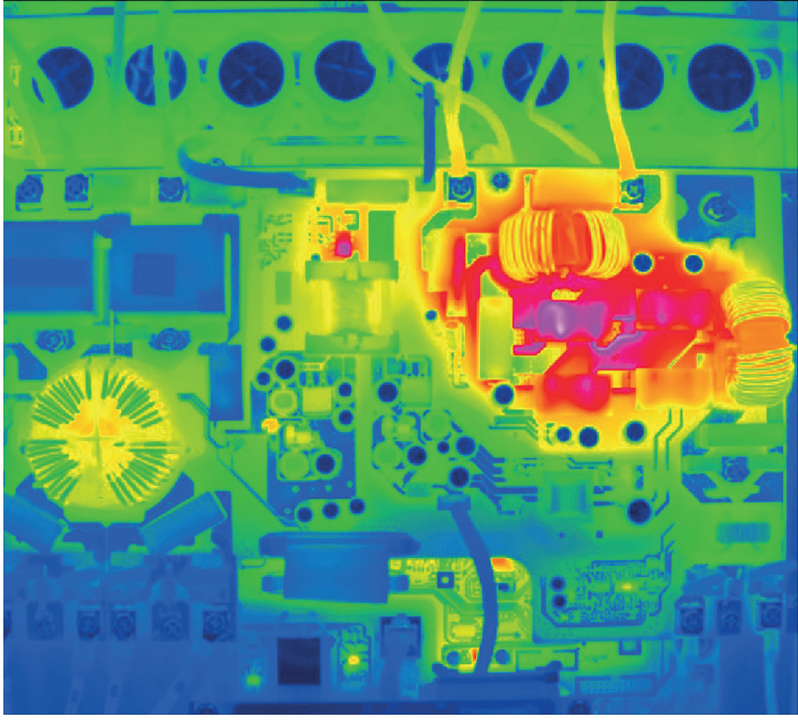
For the analysis of electronic devices and modules of most different kinds, a large variety of tools is available for metallographic preparation and characterization, e.g. a scanning electron microscope with EDX feature for element probing. Non-destructive techniques like microfocus X-Ray analysis, Computer Tomography, and scanning acoustic microscopy allow to localize failures precisely before the actual preparation or to screen a large amount of samples for known typical failures within a short time. Root cause analysis and development of solutions complete our service.

Damage and failure analysis by destructive and nondestructive analysis methods

- Thermomechanical damage mechanisms at solder joints, bond wire interconnects and material compounds
- Electrical overloads
- ESD (electrostatic discharge)
- Cracks, contamination, corrosion, dendrites, whisker, lacquer errors, delamination
- Dimensioning and positioning errors
- Parts counterfeits
- Reconstruction of complex damage processes



Wet-etch opened chip package



Heat image of a defect coil

Product quality evaluation

- Standard and system-related equipment for electrical and thermal measurements
- Automated electrical measurement (e.g. wafer prober)
- Consultance during electronics development, layout and assembling by IPC and legal experts

Non destructive analysis methods

- Solder joint and PCB inspection according to IPC-A610 and other standards (e.g. DIN, ISO, JEDEC, AEC-Q100 etc.)
- Optical inspection: Micro- and macro photography, digital microscopy, surface profile analysis (confocal laser profilometry), white light interferometry
- X-ray inspection: 2D radiography, digital computer tomography (CT)
- Scanning acoustic microscopy (SAM)
- Thermography
- Infrared spectroscopy
- Layer thickness and optical parameter (n,k) measurement: Monochromatic ellipsometry
- Laser vibrometry (e.g. for MEMS oscillating amplitude measurement)

Destructive analysis methods

- Cross section preparation and polishing
- Focussed Ion Beam (FIB)
- Selective metal etching
- Package opening
- Solder heat resistance
- Process and production capability, MSL
- Scanning electron microscopy (SEM)
- Material analysis: Energy dispersive X-ray spectroscopy (EDX)

Reliability testing and lifetime prediction

- Climate testing (Thermal shock, thermal variation, humidity storage, aging)
- Electrical load variation testing up to 2000A, intended damaging of parts and devices
- SIR-Testing up to 1500V applied voltage, 80 channels parallel
- Combined and automated testing (electrical - thermal - mechanical)
- Determination of mechanical and structural material parameter, e.g. young modulus, shear modulus, tear-off forces, elastic-plastic transition etc.:
- Draw, shear, strain and pressure testing, also combined with thermal loads
- Shock and vibration tests
- Nano indenting
- Pull- und shear tests (wire bonds, solder balls)
- Prediction on basis of observed failure mechanisms
- Contemporary statements obtained by suited accelerated aging mechanisms

Fraunhofer ISIT
is participant of the
Forschungsfabrik Mikroelektronik Deutschland

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