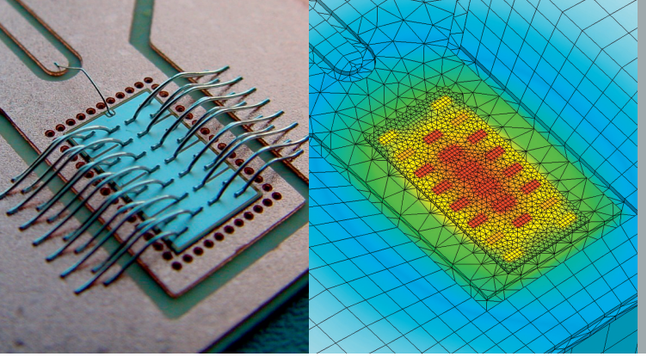


Fraunhofer
IZM

FRAUNHOFER INSTITUTE FOR
RELIABILITY AND MICROINTEGRATION IZM

SIMULATION

Modern electronic products are becoming increasingly complex and more and more diverse with every generation. High quality standards need to be reconciled with ever-faster development and innovation cycles, making numeric simulation indispensable for manufacturers. Forces and factors affecting a product's reliability need to and can be identified and optimized with due consideration for the defined use cases.

We can support you with:

- Theoretical reliability assessments for complex electronic systems
- Weak point analyses / Concept comparisons
- Development of design optimization strategies and design guidelines
- Modelling of environmental and qualification tests and defined use cases
- Impact analyses for failure mechanisms affecting product robustness
- Multiphysical simulations of failure mechanisms on the technology, component, and system levels
- (Thermo-)mechanical fatigue
- Aging and overstress due to mechanical, thermal, chemical, and electric stresses
- Fracture and delamination processes
- Thermal management (static, transient, flow calculation)

CONTACT

Fraunhofer Institute for Reliability and
Microintegration IZM
Gustav-Meyer-Allee 25, 13355 Berlin, Germany
www.izm.fraunhofer.de

Dr. Johannes Jaeschke
+49 30 46403-223
johannes.jaeschke@izm.fraunhofer.de

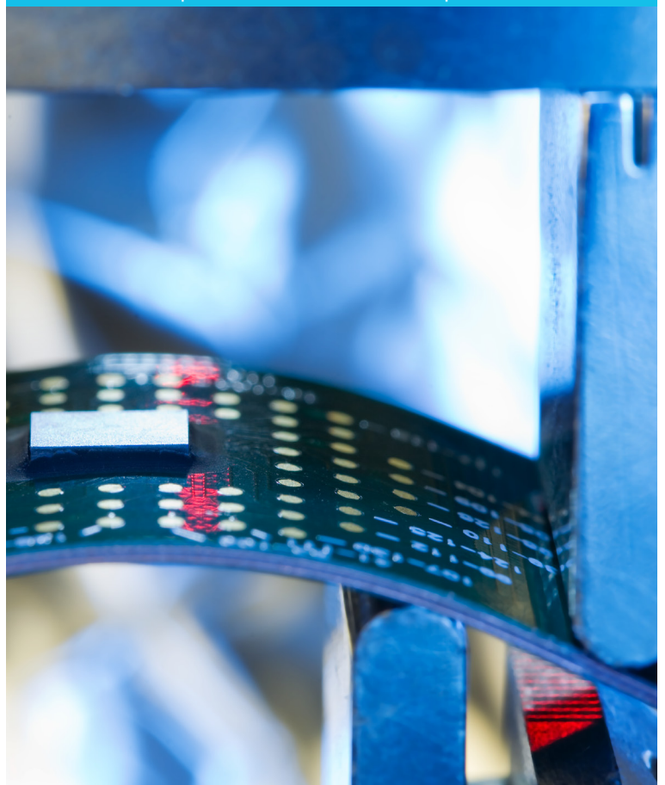
Dr. Matthias Hutter
+49 30 46403-167
matthias.hutter@izm.fraunhofer.de

In cooperation with

Technische Universität Berlin

ROBUSTNESS AND LIFE CYCLE ASSESSMENT

MISSION PROFILES | MONITORING | FAILURE ANALYSIS | MATERIALS TESTING | SIMULATION



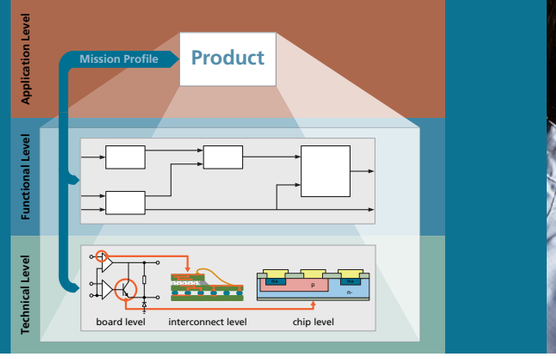
ABOUT US

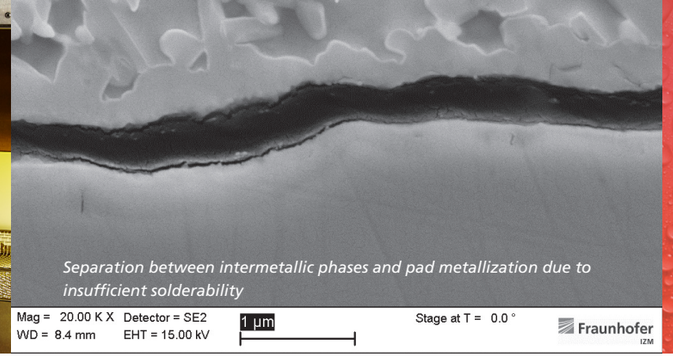
The development of new system integration technologies needs to consider the specific use case and use environment and test the resulting products under these conditions.

Traditional qualification standards are often no longer enough, as they deliver only pass-or-fail results and offer no meaningful information about the limits of a product's life cycle. This ignores important information about critical fault mechanisms and product robustness for use in product and process development.

Fraunhofer IZM steps into this breach and supports its partners with reliable projections of the life of processes and components and actionable input for product and process development.

This is made possible by identifying and understanding the relevant failure mechanisms at work and the right improvements to counter them.





Separation between intermetallic phases and pad metallization due to insufficient solderability

Deformation measurement under conditions of varying humidity and temperature

MISSION PROFILES AND TEST PLANNING

Any optimization and qualification tests need to consider both potential effects on the environment and intended use (mission profiles) and more functional considerations. We work with our clients to define these basic requirements for the qualification process and translate them into our reliability testing plans.

We can support you with:

- Holistic requirements analyses across system levels
- Definition of mission profiles
- Identification of predominant failure mechanisms and investigation of relevant forces
- System analyses by modelling (e.g. state models)
- Failure avoidance processes and effects analyses (e.g. FMEA)
- Projection of failure rates (e.g. MTTF)

Our evaluations of your products can apply a holistic and wide or narrow and specific focus, following accepted industry standards or your individual needs.
With our laboratory facilities, we can verify and validate the results of our system evaluations.

STRESS TESTS AND MONITORING

The stress tests conducted at Fraunhofer IZM cover a wide range of environmental forces and factors affecting electronic components:

- High-temperature conditioning
- Thermal range from -70° to 300° centigrade
- Humidity conditioning
- Highly Accelerated Stress Test (HAST)
- Pressure cooker
- Temperature and humidity variation
- Vibration tests
- Mechanical shock tests
- Tensile and bending tests
- HALT/HASS (6-axis random vibration)
- Combined temperature, humidity, and vibration tests
- Active thermal shock tests up to 800 A

We can monitor a comprehensive set of parameters affecting product reliability, ranging from traditional resistance tests to more complex constellations, including thermal impendance and multi-axis mechanical stresses.
We choose and adjust our procedures to match your needs for transfer after successful development.

FAILURE AND CAUSE ANALYSES

We support our clients in industry with failure and root cause analysis services for electronic assemblies or LED / other optoelectronics or power electronics modules by using our technological expertise combined with our versatile analytical resources.

In most cases, our services can pinpoint effective immediate counter measures and opportunities for further improvements. Fraunhofer IZM has particularly extensive experience with soldered and Ag-sintered interconnects that we can draw on to assess interconnects for a vast range of alloys and pad metallizations. One focus of our work lies on the evaluation of the aptitude of different surfaces for wetting and soldering.

The following is a selection of the many analytical methods at our disposal:

- High-resolution scanning electron microscopy and EDX
- X-ray photo electron spectroscopy (XPS or ESCA)
- Focused ion beam (FIB) preparation
- Infrared thermography
- Ultrasound microscopy
- X-ray microscopy and CT

MATERIALS TESTING

Understanding the properties of different materials in terms of damage and failure mechanisms has become indispensable for improving the reliability of complex systems on micro and nano scale.

In order to be able to predict the deformation, damage, or failure of materials and material compounds with reproducible certainty, the forces at work need to be tested under real-use conditions and evaluated with the additional insights won in mathematical simulations.

We can support you in the following areas:

- Mechanical characterization tests in different temperature and humidity scenarios
- Characterization of fatigue and fracture scenarios under mechanical loads
- Development and application of new characterization methods at the micro-to-nano-level transition
- Structural analyses to model material behaviour
- Investigation of corrosion effects
- Combination of testing methods