

Berliner Nanotest und Design GmbH

Company Portfolio



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Company Portfolio

- » Founded in 2004 as Fraunhofer spin-off
- » Continuous refining of expertise from general reliability to focus on thermal management and thermal characterization
- » Today partner of major European electronic industries and full-scale provider for thermal characterization and reliability analyses
- » Creative, flexible and multidisciplinary team of physicists, mathematicians, programmers and engineers
- » Member and co-founder of the Joint Lab Berlin for Thermal Management



NANOTEST in numbers

- » 19 years of experience
- » 30+ research projects
- » 33 motivated employees
- » 100+ satisfied customers

Material Level

System Level

TOCS®

- 🔍 Liquids and pastes
- 🔍 Slurries & resins

- ✦ Thermal conductivity
- ✦ Thermal diffusivity

- ★ Compact & versatile
- ★ Very quick testing

Features

- » Quick measurement
- » Curing and in-situ testing
- » Multi-use test chips
- » Integrated heating



TIMA®

- 🔍 Pastes to solids
- 🔍 TIM1 & TIM2

- ✦ Thermal conductivity
- ✦ Interface resistance

- ★ Automated testing
- ★ Aging investigation

Features

- » ASTM D 5470 complete
- » Curing and in-situ testing
- » Customizable test heads



LaTIMA®

- 🔍 Solids
- 🔍 Substrates & metals

- ✦ Thermal conductivity
- ✦ Thermal diffusivity

- ★ Two-in-one system
- ★ Dog-bone samples

Features

- » High conductivities
- » Industrial sample compatibility
- » Integrated sample integrity validation



TIMA®pulse

- 🔍 Active devices
- 🔍 FETs & IGBTs

- ✦ Thermal impedance
- ✦ Structure function

- ★ Compact & low-cost
- ★ Versatile software

Features

- » Complete thermal path reconstruction
- » Non-destructive
- » Structural information
- » Thermal modeling
- » Thermal frequency spectrum



TIFAS®

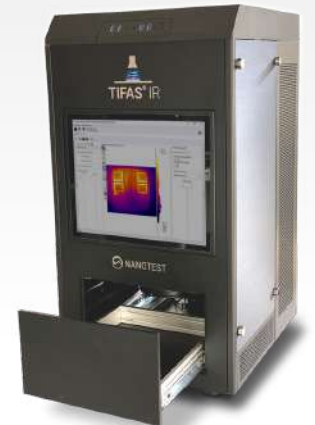
- 🔍 Systems & joints
- 🔍 Packages & modules

- ✦ Buried defects
- ✦ Thermal obstruction

- ★ Full-scale FA system
- ★ Compact & low-cost

Features

- » Non-destructive & contactless
- » Fast and thermovisual
- » Heat flow-correct



Characterization

Lab-Scale Products & Services

- » Thermal characterization of material, components and systems
- » Fracture mechanical characterization of interfaces
- » Material aging investigation
- » Standalone benchtop solutions



Failure Analysis

Multi-Scale Solutions & Scientific Services

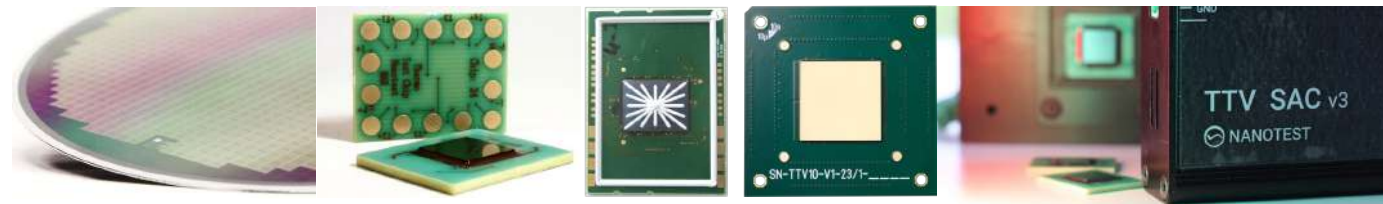
- » Thermal imaging
- » Failure detection and localization
- » Quality management solutions
 - › Contactless & non-destructive
 - › Lab-scale to inline



TTV

All-round Thermal Test Vehicle Supply

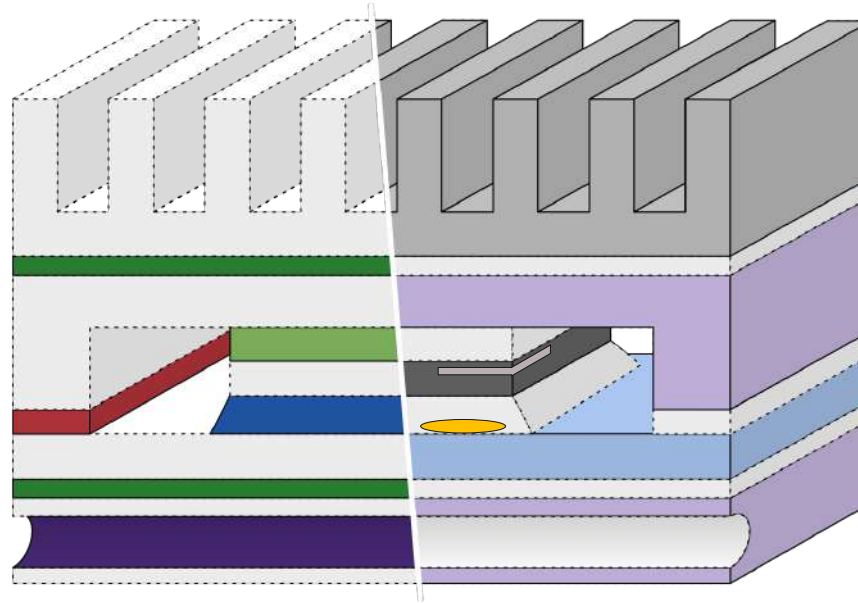
- » Thermal test chip wafers
- » Thermal test vehicle design and assembly
- » Measurement hard and software



TIMA[®]



- TIMs
- Sealant
- Underfill
- Die attach
- Substrate



LaTIMA[®]

- Metals ■
- Alloys ■
- Die material ■
- Substrate ■
- Die attach ■



TOCS[®]



- TIMs
- Sealant
- Underfill
- Coolant

TIMA[®] pulse



TIFAS[®] IR

- Delamination ■
- Buried defects ■



Fast-paced thermal material characterization

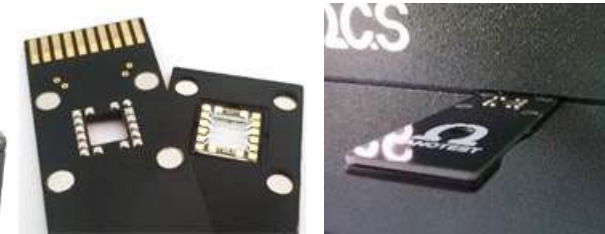
Material parameters

- › Bulk thermal conductivity
- › Thermal diffusivity

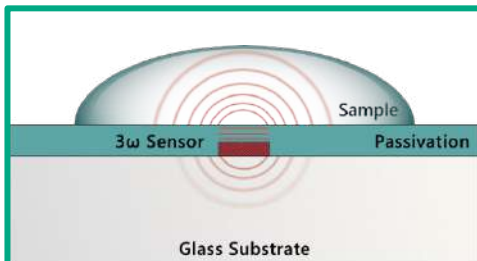
Feasible samples

- › Liquids
- › Gels
- › Pastes
- › Soft solids

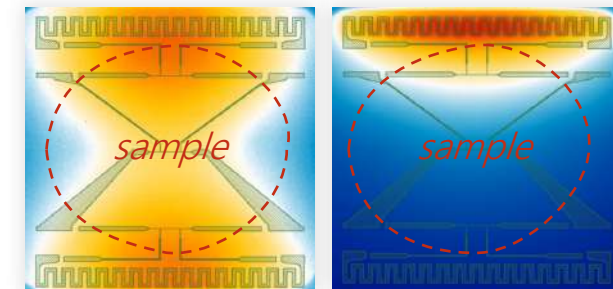
Sample material is simply applied on the test chip and tested with a mere buttonpress.



Measurement x-section



Custom temperature profiles

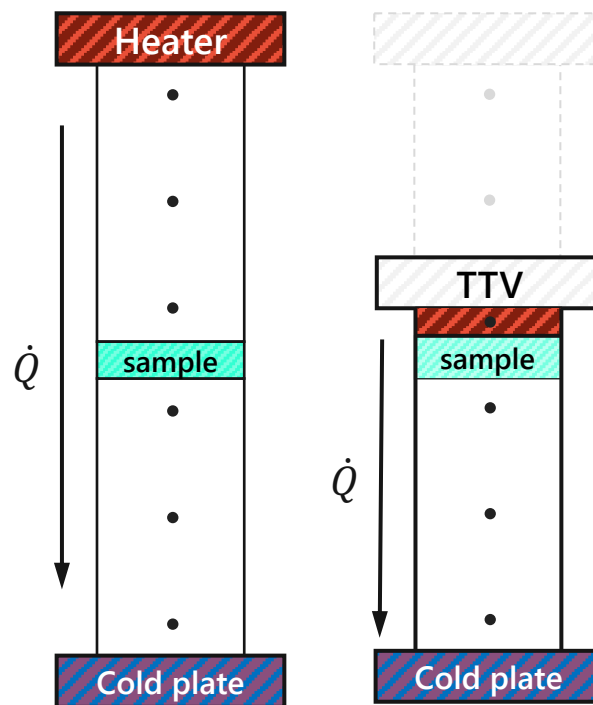


Beyond ASTM D5470

- » Effective and bulk thermal conductivity
- » Thermal effective and interface resistance
- » Temperature and pressure dependency
- » Aging and reliability testing
- » Compact all-in-one system

Feasible samples

- » Thermal interface material
- » Die attach materials
- » Underfill materials
- » Molding compound
- » Substrates
- » Multilayer samples



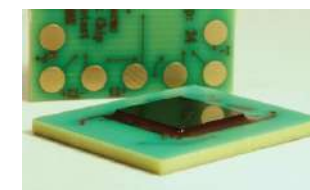
examples of feasible material samples



selection of available test heads



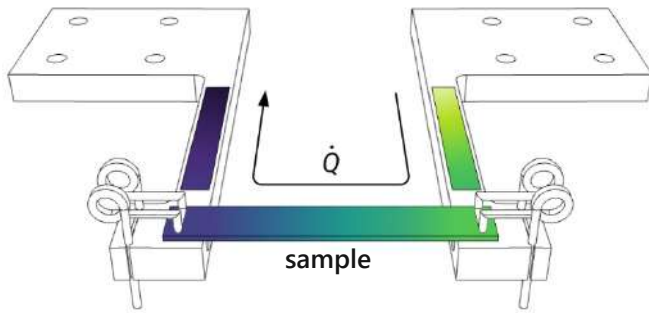
Assembly and curing tool adhesive



Thermal test chip

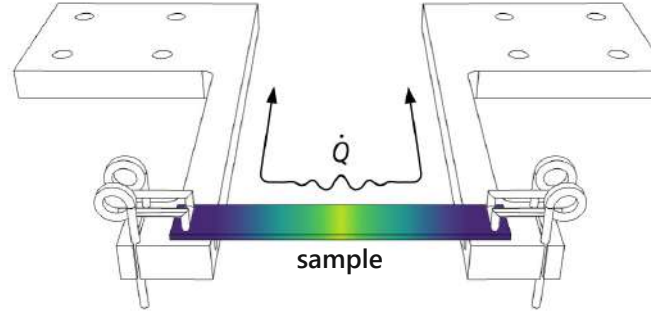
LaTIMA base

» Thermal conductivity



TIMA_{wave} add-on

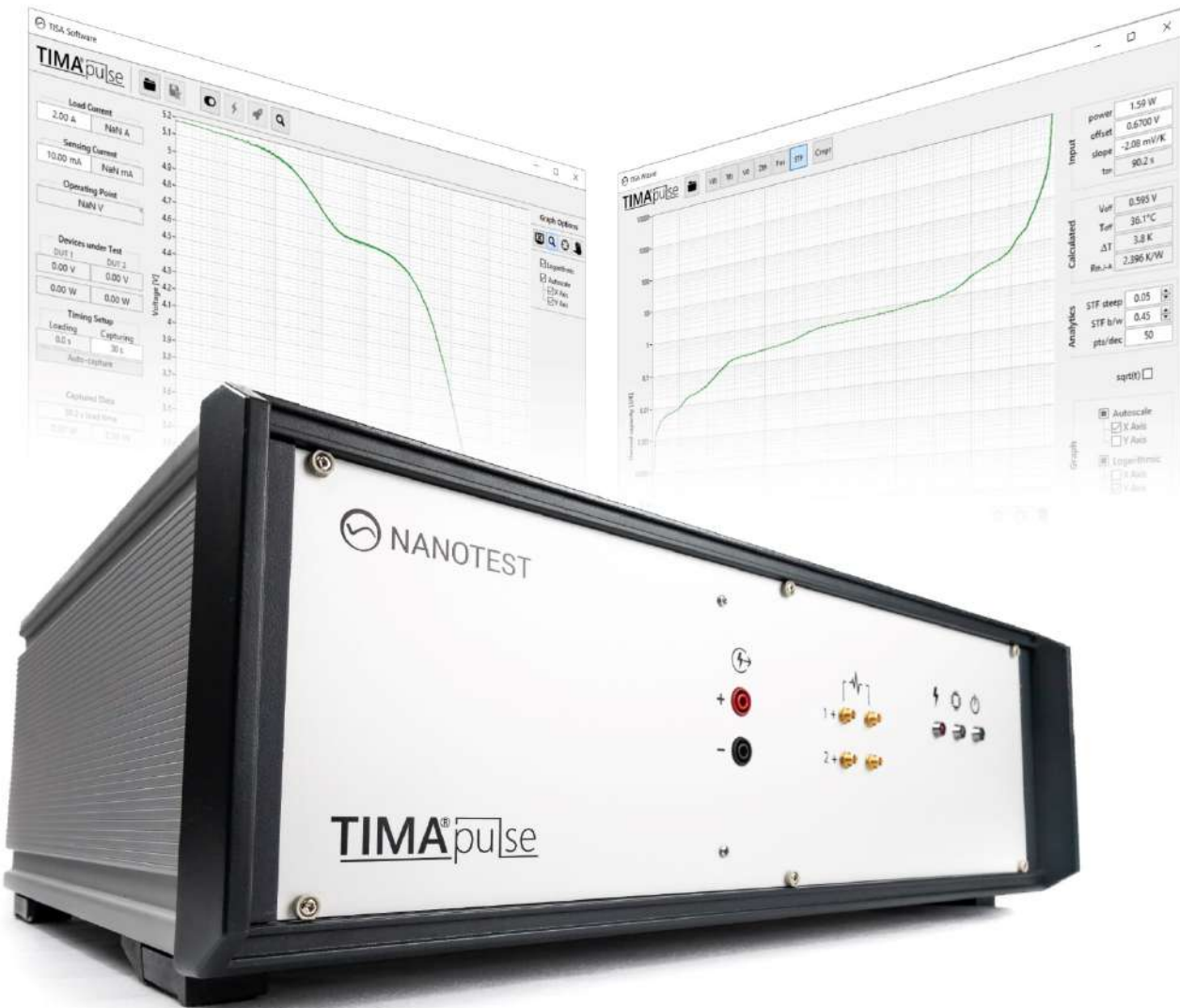
» Thermal diffusivity



For highly conductive materials

Feasible samples | Metals | Alloys | Substrates | Ceramics |
| Solder | Sintered material | Semiconductors | FRP |



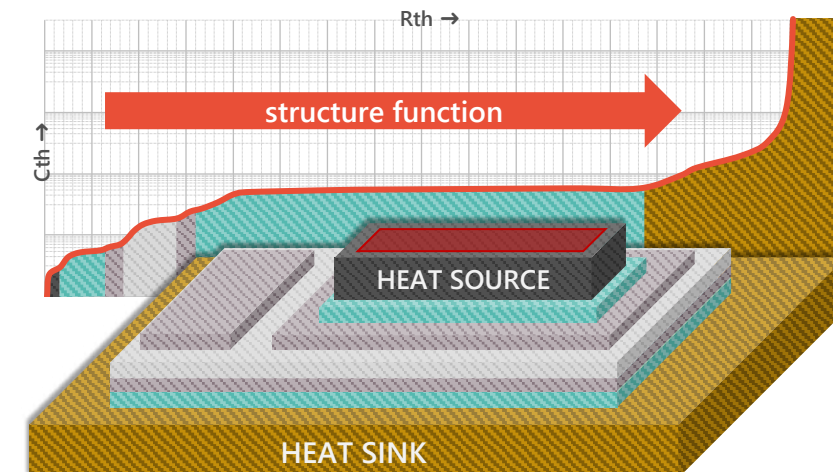
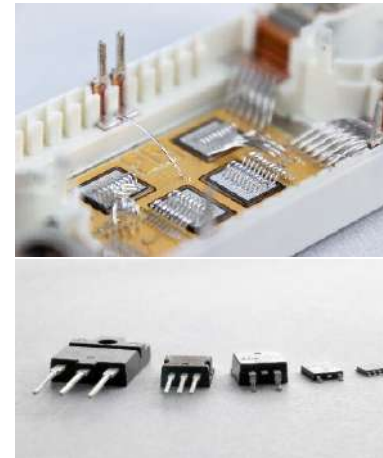


Lightweight transient thermal testing

Feasible samples | Electronic packages & modules |
| Thermoelectric systems | Custom thermal setups |

Output

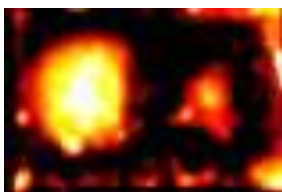
- » Thermal impedance curve
- » Thermal junction-to-case resistance
- » Time constant spectrum
- » Structure function
- » Thermal equivalent RC networks



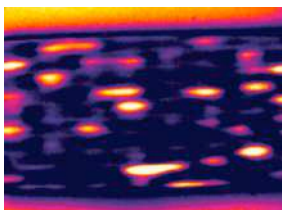
Contactless failure analysis in a nutshell

Features

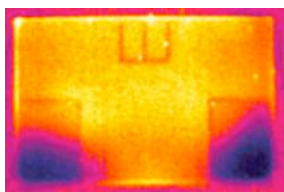
- » Complete infrared thermography-based failure analysis setup
- » Contactless and non-destructive
- » Short testing times, high throughput
- » Great variety of detectable defects
- » Comprehensive analysis software
- » Adaptable to special needs



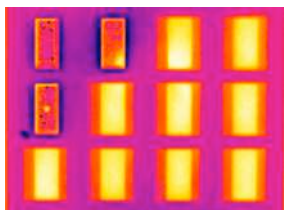
Voids in solder die attach layer



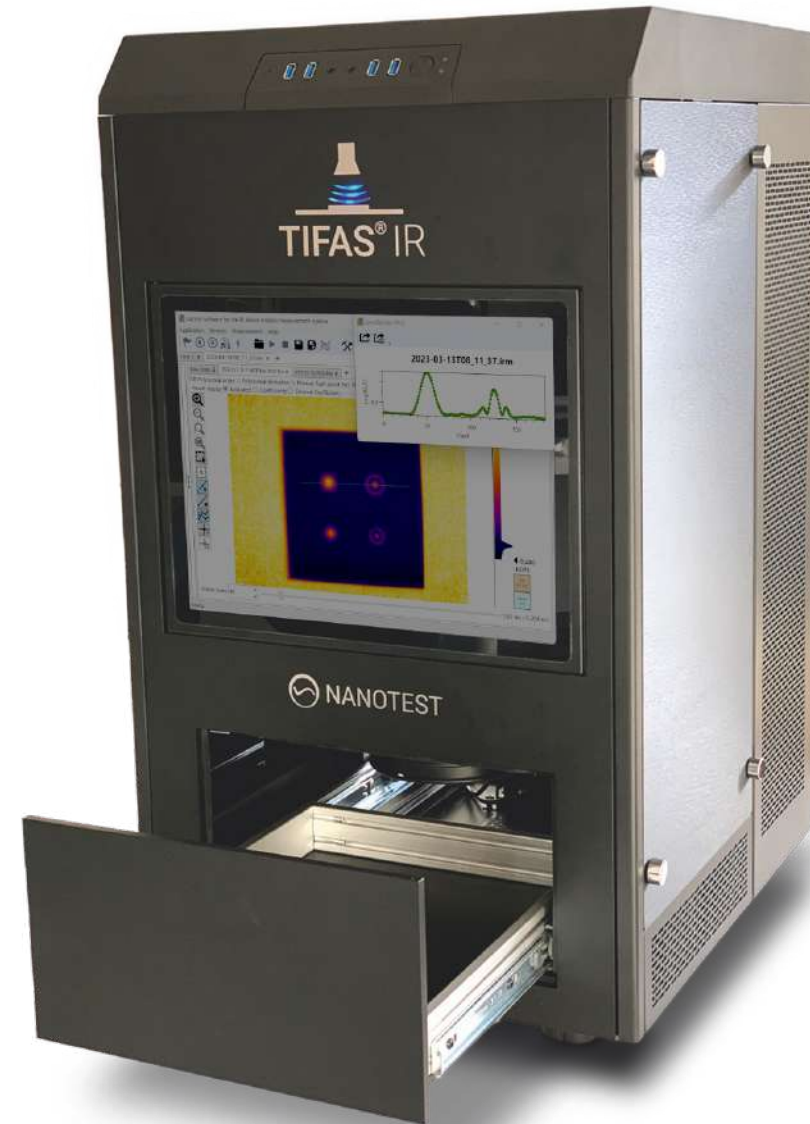
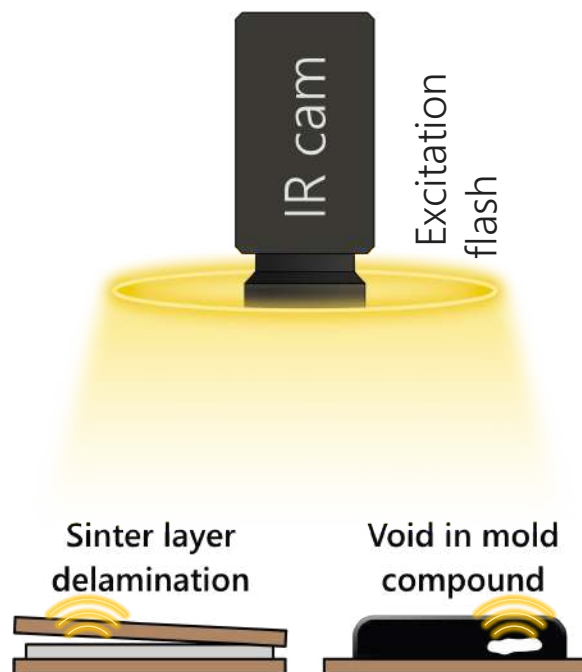
Voids in carbon fiber reinforced polymer



Delamination in sintered power module



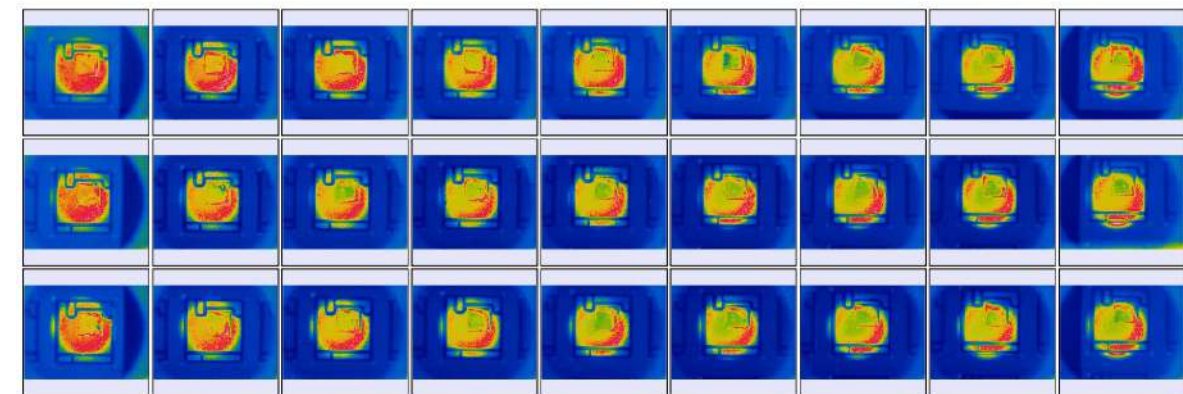
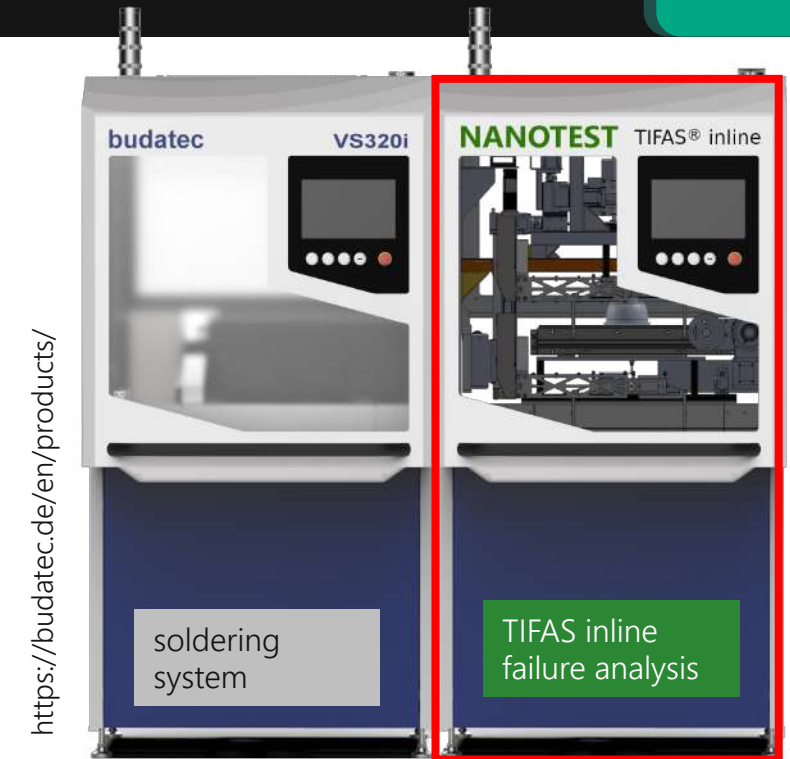
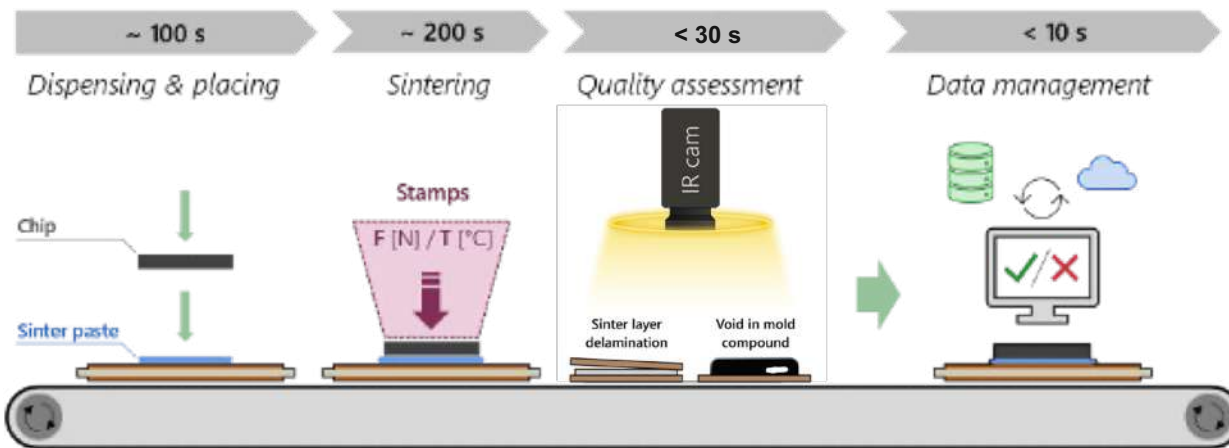
Voids in molding compound



Intelligent non-destructive 100% inline failure analysis

Features

- » 100% inspection in production lines, full automation
- » Short testing times, high throughput
- » Complete infrared thermography-based failure analysis setup
- » Contactless and non-destructive
- » Great variety of detectable defects



3x9 Measurements in a system tray

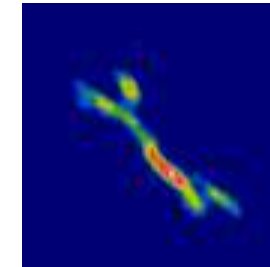
Contactless failure analysis in a nutshell for mobile applications

Features

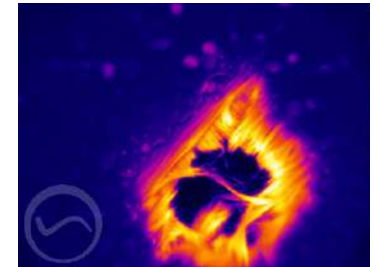
- » Mobile infrared thermography-based failure analysis setup
- » Contactless and non-destructive maintenance of components
- » Great variety of detectable defects
- » Comprehensive analysis software
- » Example: non-destructive testing of fiber composites and bonded joints



Impact defect



Lightning strike defect



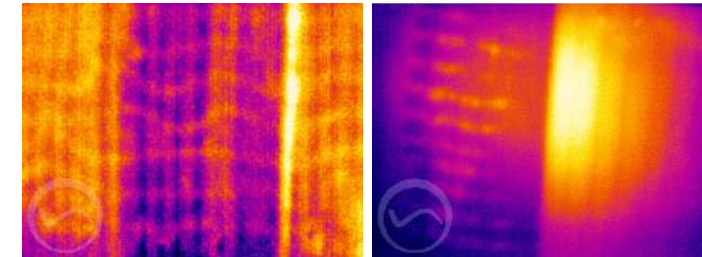
© Bladecare-academy.de



© Deutsche Bahn AG



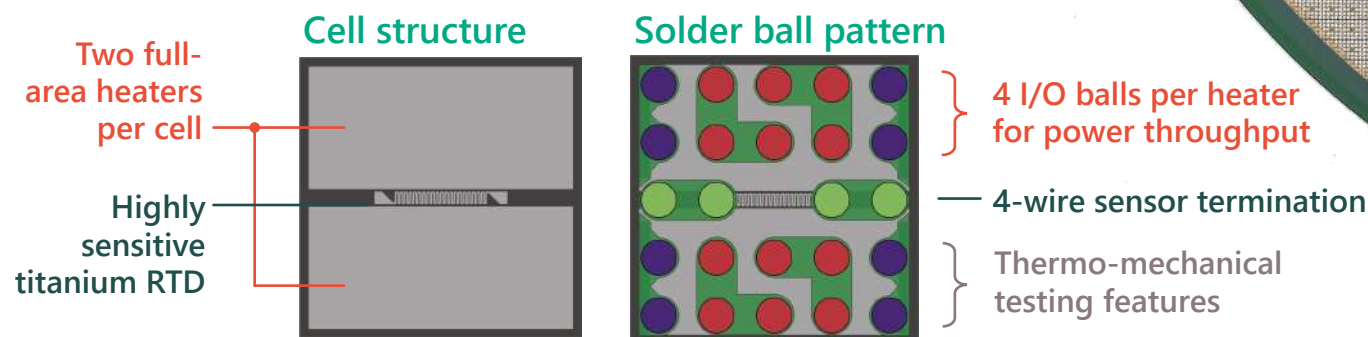
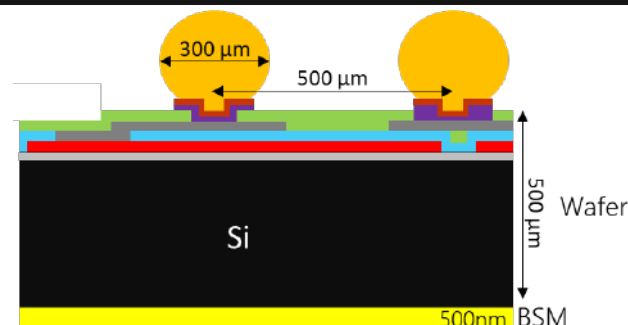
ZfP heute | Berlin 2020 p 54-55
M. Kaczmarek, M. Müller, Zerstörungsfreie
Bauteilprüfung von großflächigen, glasfaserverstärkten
Schienenfahrzeug-Komponenten



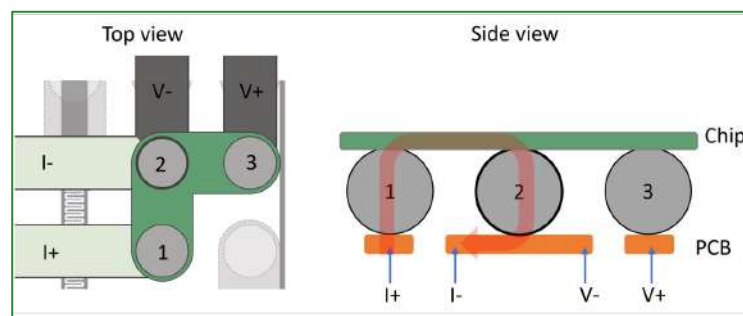
Inner structure of a wind turbine blade

NT20-3k thermal test chip

- » 200 mm (8") Si wafer
 - » Titanium thin-film structures
 - › 1 × 3.3 kΩ RTD
 - › 2 × 15 Ω heaters
 - › 4 x Monitoring Bumps
 - » Versatile & customizable
 - » Different BSM
 - » Up to
 - › 50 × 50 mm² die size
 - › 200°C chip temperature
 - › 10 W/mm²
- ➔ Ready for your custom TTV design

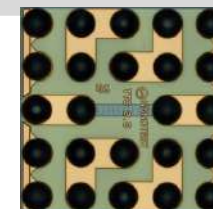


Resistive Bump Monitoring Structure



2.5×2.5 mm² unit cells

- » 10 W/mm² heating
- » 82% area coverage
- » 300 μm solder bumps
- » 500 μm pitch
- » 4000+ cells per wafer

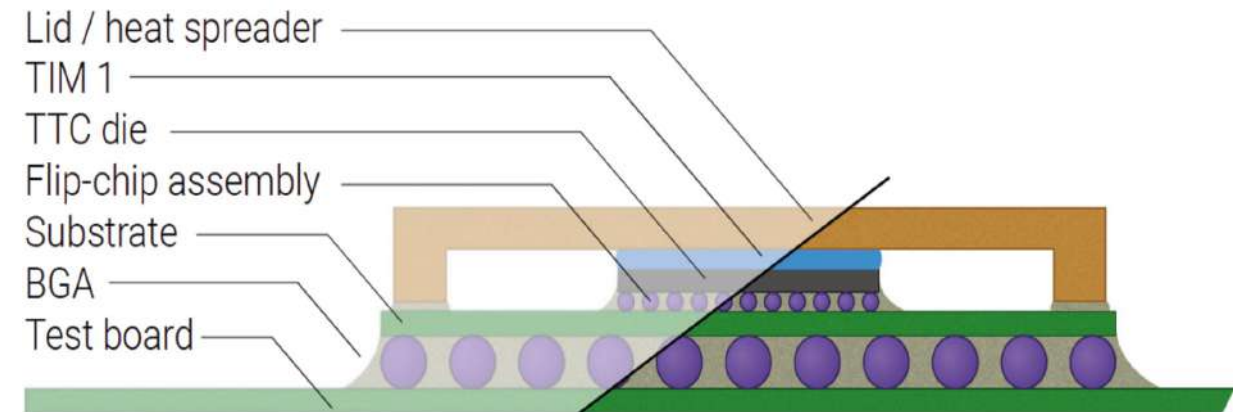


Design the TTV you need. No Compromise

We support our customers to verify their prospective package, TIMs and cooling solutions by offering TTV solution

We offer:

- » Thermal test chips wafer
- » Concept and feasibility
- » Interposer and test board
- » Assembly and quality assessment
- » Measurement hardware
- » Measurement and control software
- » Calibration and test



Thermal test
chip wafer

Chip
configuration

Substrate
design

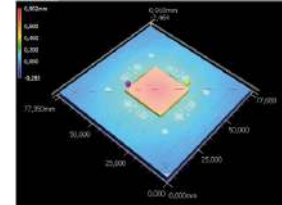
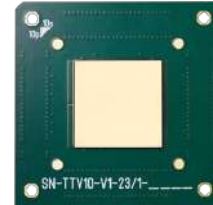
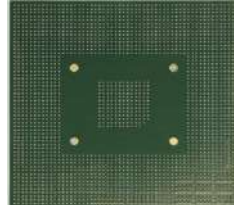
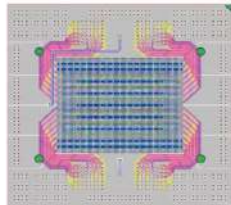
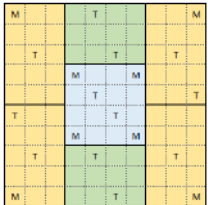
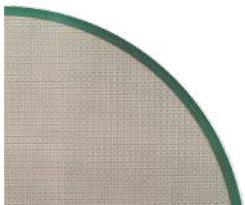
Substrate
manufacturing

Chip and Board
assembly

Quality control
and test

Measurement
hardware

Measurement
Software



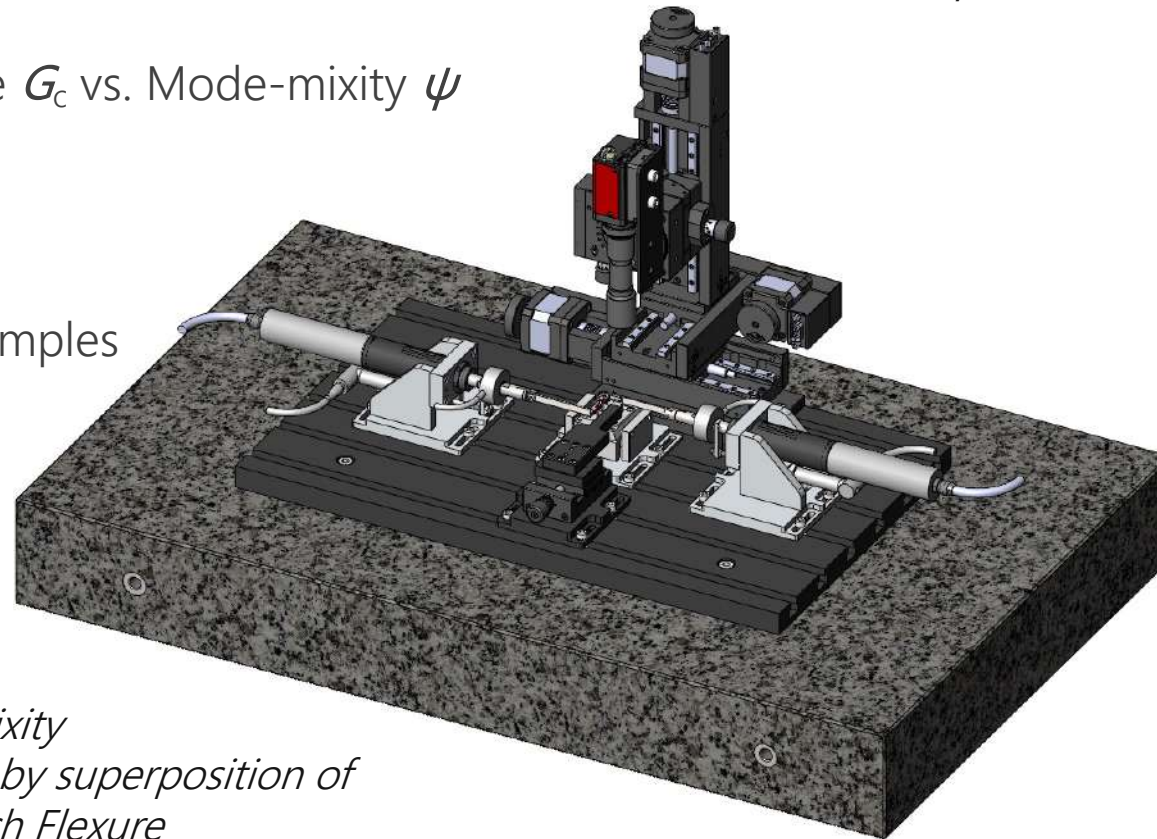
Rapid, inexpensive and effective interfacial adhesion strength characterization

Material parameters

- › Critical Energy Release Rate G_c vs. Mode-mixity ψ

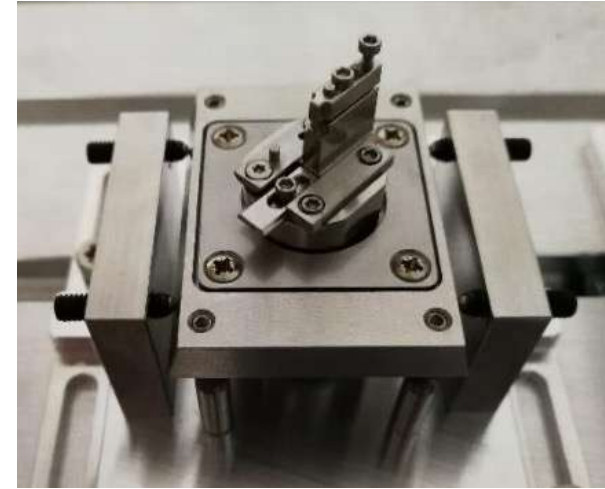
Feasible samples

- › Artificially manufactured samples
- › Bi- or multi-layered beams
- › Package origin cut-outs

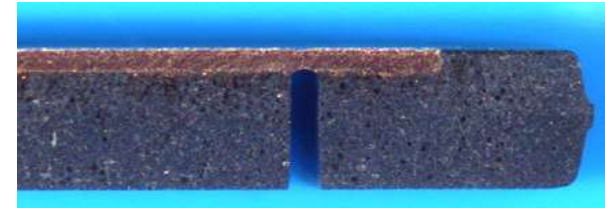


Mode-mixity variation by superposition of End Notch Flexure and Double Cantilever Beam tests

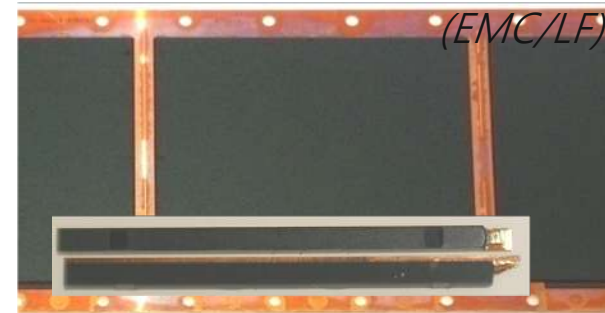
Specimen is simply fixated in the detachable sample holder.



Package origin cut-out (No chip)



Artificial manufactured (EMC/LF)



Our Offering

- » Thermal expertise
 - › 19 years of R&D experience
 - › 100+ scientific publications
 - › World-wide industrial network
- » Holistic lab services
 - › Material & package characterization
 - › Aging and reliability testing
 - › Failure detection and analysis
 - › TTV design, manufacturing and testing
 - › adhesion strength characterization
- » High-end laboratory products
 - › Focused on user-friendliness
 - › At maximum versatility
 - › Ensuring high scientific accuracy

Our Promise

- » Transparency
 - › About our measurement results
- » Fairness
 - › In pricing and conditions
- » Free technical and scientific services
 - › Zero-cost requirements analysis
 - › Zero-cost scientific discussion
 - › Zero-cost remote technical support
- » You learn - we learn.





NANOTEST

simply measured



Thank you

nanotest.eu

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