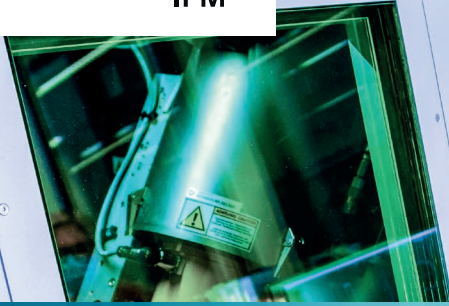




Fraunhofer
IPM

metrology|edition



3D CT

Material and component analysis

For electronic components and printed circuit boards

A look inside: 3D computed tomography makes it possible to identify defects inside components. Such hidden defects are often the cause of complete system failures, for example in electronics.

3D computed tomography offers new possibilities for the non-destructive analysis of components and materials. Using a 3D computer tomograph (3D CT), objects, components, materials and solder joints can be displayed two-dimensionally or three-dimensionally.

Simple and non-destructive

When developing and manufacturing electronics, there are many possible causes for defects in the technology and mounting of PC boards. Failure analysis is often impeded by compact, highly integrated structures and automated steps in the manufacturing process. Often, it is also necessary for the analysis that components or mounted PC boards are disassembled or undergo mechanical preparation of material cross sections. This sometimes leads to inadvertent changes to the original state of the sample, particularly when analyzing the quality of solder joints, such as those found in ball grid arrays.

For 3D CT analysis, it is generally not necessary to prepare the components. Analysis is even

possible for and with additional parts such as water coolers, Peltier devices or heat pipes. In addition to identifying defects, 3D computed tomography can also be used for product inspection when developing new manufacturing procedures, such as 3D printing. The components can be quickly compared to the target state using the 3D CT.

Combined analysis for electronics

We realize comprehensive, individually customized analytical chains by combining various analytical techniques with computed tomography. For instance, we perform functional tests on electronic components and use our 3D CT to troubleshoot defective components directly at the component and PCB level.

Measurement & Consulting Individual tomographic analyses

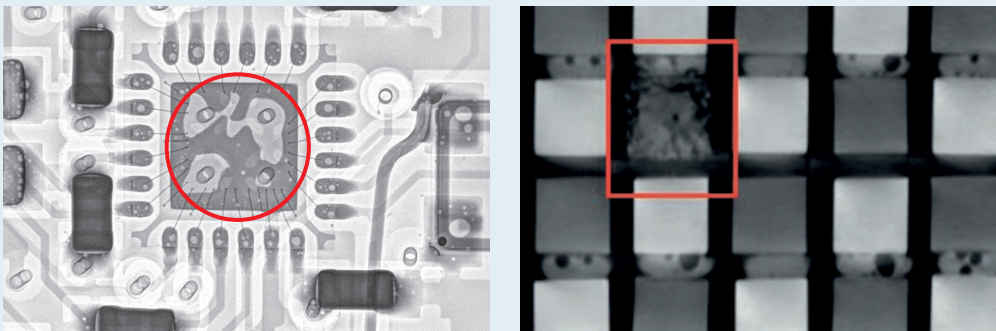
As a research institute, we have many years of experience in thermal engineering, Peltier coolers, heat pipes and sensor technology and also know the pitfalls of component analysis. Based on this foundation, we carry out 3D CT measurements for customers. We support you not only by carrying out the actual measurements but also in comprehensively analyzing the results.

Don't hesitate to get in touch!

Typical examples of materials and component analyses by means of a 3D CT

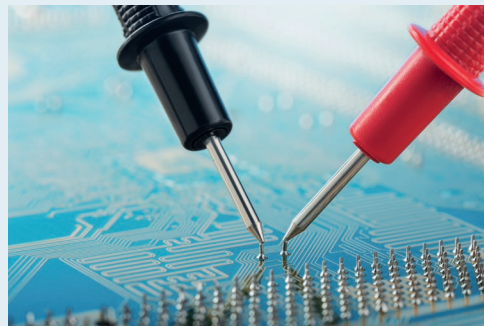


A faulty solder joint within a ball grid array (BGA) was identified as the cause behind the failure of a processor (marked in red).



Structural analysis / failure analysis of a faulty Peltier module using 3D CT. The faulty semiconductor element is marked in red.

Two-dimensional radiography image of a soldered component on a PC board. The spotty, nonhomogenous solder joint caused poor heat dissipation on the PC board and thermal issues in the component.



Our 3D CT is used to supplement the functional testing of electronic components and provides information on the causes of errors.

Live and in situ analysis

Using two-dimensional radiography, our tomograph is able to capture live images with a frame rate of up to five images per second. This allows components to be analyzed live and in situ under realistic conditions, including defined temperature, operating voltage, humidity, ambient gas composition and cooling liquids. In this way, defects that only occur under particular operating conditions can be identified.

Technical data

- 300 kV tube – for screening dense materials such as stainless steel and copper
- 180 kV nanofocus tube – for detail recognition of up to 200 nm under ideal conditions and resolutions of up to 1 μm
- 16 MP detector with a high dynamic – to capture fine structures and high contrasts
- Geometric measurements – with traceability for calibration standards according to VDI 2630 1.3
- In situ analysis of entire systems – for example, those connected to a power supply or with cooling liquids

Contact

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