

Measurement of 3D Thermal expansion
and Thermal strain of electronic
Components.

True Full-Field Measurement of Thermal Expansion on Electronic Components

3D-ESPI System Q-300 TCT

The 3D-ESPI System Q-300 TCT is designed for complete three dimensional and highly sensitive thermal expansion measurement and strain analysis of materials and components.

Quantitative full-field and 3D-Analysis

Q-300 TCT has successfully been used in development and testing of complex (anisotropic) materials, components and structures in electronic applications. It is ideal for the experimental verification of analytical and numerical calculations.

The 3D information enables fast determination of the thermal expansion coefficient of materials as well of the thermal stress of components such as printed circuits, BGA, Flip Chips, etc.

The measurement is performed non-contact, on the whole measuring area and on nearly any material. The field of view can be adjusted down to square millimetres.

The Q-300 TCT system is fully equipped with a heating device, control electronic and a 3D-ESPI sensor on an adjustable support.

Complete package for thermal investigations

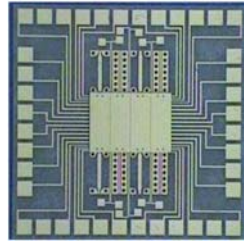
Different lenses are available to adjust the field of view. Areas from 40 mm x 50 mm down to 0,7 mm x 1 mm can be investigated. The measurement can be done fully automatic from room temperature up to 300 °C.

Due to the optional use of a contour module the Q-300

TCT could not only be applied to flat surfaces, but also to curved surfaces.

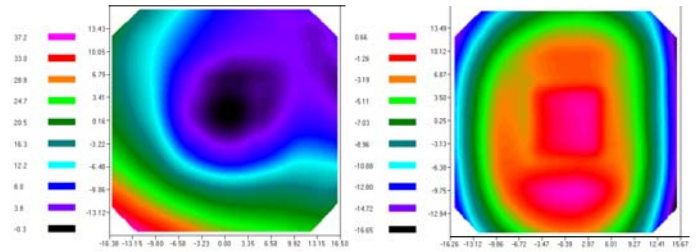
The sensor is driven by a robust electronic control system with the complete software package ISTRA. The temperature is acquired at each measuring step. It offers automatic or manual measurement, and quantitative data analysis of 3D displacement and thermal strain fields. Sub micrometer accuracy is achieved depending on the geometrical set-up.

The measuring sensor is attached to a vertical support and enables fast adjustment to the field of view.

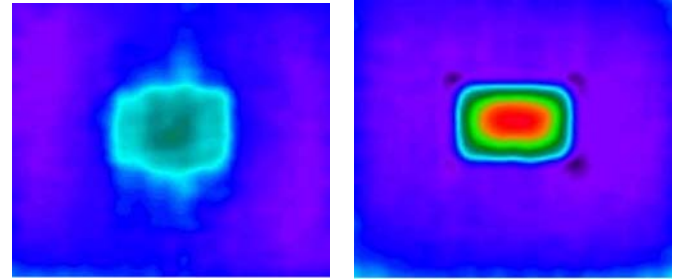


Flip Chip Assembly (1cm x 1cm)

Q-300 TCT System Set-up



Thermal bending of Ball Grid Array (BGA) Assembly with thermal stress of $\Delta T=110\text{ }^{\circ}\text{C}$. Left: normal bending behaviour; Right: BGA with detected de-bonding.



Thermal expansion of a Flipchip with perfect bonding (left) and defect bonding (right); $\Delta T=100\text{ }^{\circ}\text{C}$

The specifications in this document are subject to change without notice.

Technical Specifications		Q-300 TCT
Displacement resolution		0.01 - 0.1 μm adjustable depending on geometrical set-up and type of illumination arms.
CCD-resolution		1380 x 1035 pixels
Measuring range		Adjustable to any measurement range by variable number of measurement steps (10 - 100 μm per step depending on measuring direction)
Measuring area		40 mm x 50 mm down to 0.7 mm x 1 mm (depending on objective lens)
Working distance		Variable
Operation modes		Automatic, manual, 1D-, 2D-, 3D-operation
Data interface		TIFF, ASCII
Data acquisition speed		3.5 sec per measurement step for 3D measurements
Data analysis		Automatic serial analysis mode or manual at any measurement step
Dimensions of sensor head		80 mm x 130 mm x 120 mm (without illumination arms)
Dimension of heating device		200 mm x 200 mm x 70 mm
Laser (built in)		Laserdiode, 70 mW, 785 nm
Control and evaluation unit		Portable-PC with integrated electronics, heating control with timer
Operation system		Windows 2000, XP
Heating Specification		Max. temperature: 300°C. Heating rate: 30°C per minute. Heating power: 200 W
Mode of operation		Manual or ramp heating. Manual or automatic (timer controlled) measurement
Options	Different lenses for variable field of views	
	Contour measurement for thermal strain analysis on curved structures	
	Optical table	