



**Keynote speaker:**

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**Title of the Presentation:**

**Quality and Reliability Influences of SMD-Devices due to Warpage Behavior of SMD-Packages and Boards during Soldering**

**Biography:** Dr.-Ing. habil. Heinz Wohlrabe (born 1955) studied 1974-1978 electro techniques at Technische Universität Dresden (Dresden University of Technology). He has got the PHD in 1984 at the same university. The main important topic was the usage of statistical quality control in electronics technology. The focus of his scientific work over all this time was the application of mathematical-statistical methods (namely statistical process control, machine and process capability analysis, Design of Experiments) for the quality assurance in electronic production processes. The creation and execution of lectures in these fields belong also to his working field. Special measurement procedures for the quality assurance (placing and printing accuracy), the measurement of the warpage behavior during soldering and the numerical calculation of reliability data complete his research field. He habilitated in Dec. 2008. The focus of his research remained the quality assurance in the SMD-production.

**Abstract:** Printed circuit boards (PCB) and SMD-packages are built up of different materials with at least uneven but partly strong different thermal expansion coefficients. Under thermal load, e.g. board assembly or field conditions, a deformation and deviation from the initial state often occur as warpage. This warpage can cause defects such as open solder joints, like head in pillow, bridges of solder joints and pad cratering. There exist also influences on the reliability. The speech will show the principles to measure this behavior. Typical measurement and evaluation results of substrates and selected SMD-packages will be presented.

Quality and reliability experiments with special test boards were carried out, to find new limits for the maximum warpage of SMD-packages. The reliability evaluations will be completed by FEM-calculations. Finally the results were put in a "Warpage database".