APPLICATION FILE
COMPONENT TESTING

TDM

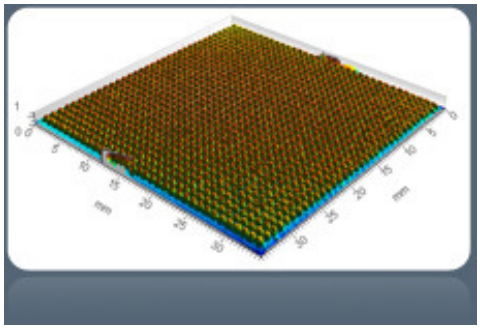
TOPOGRAPHY AND DEFORMATION MEASUREMENT

One of the most critical characteristics of components is their warpage behavior during the reflow solder process.

Component warpage is a consequence of internal stress accumulation. When components are undergoing the reflow cycle, important internal stress is generated by the fact that due to CTE differences the thermal expansion of the component materials under temperature variation differs for each material. E.g. the silicon die will expand quite little during heating up the component, while the mould compound will expand significantly more, leading to shear stress build up at the silicon – mould interface.

Consequences of component warpage include :

- *Delamination at one or more internal interfaces*
- *Damage of internal structures, like cavities in sensor MEMS*
- *Coplanarity failure of the connectors (solder balls, wire bonds, etc.)*
- *Reduced reliability due to permanent residual stress in the assembly*



Even by keeping identical electrical characteristics, the component warpage might be influenced by several factors, such as :

- *Material characteristics, e.g. composition of the mould compound*
- *Details of the component curing process*
- *Component humidity when starting the reflow process*
- *Heating / cooling gradient during reflow*
- *Component soldered or not to a PCB*

Careful design of the component and the processes will therefore significantly contribute to minimize failure risks, and to increase the overall component reliability expectation. A component warpage vs. temperature analysis will allow you to assess these issues, identify the key factors of influence on component warpage and failure risk, and systematically eliminate as far as possible the failure root causes.

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Integrated in the early component design phase, component warpage measurement by TDM will thus allow you to :

- *Optimize material choices to minimize internal stress build-up during component production*
- *Specify optimum reflow solder conditions for each component*
- *Minimize failure risks during assembly*
- *Optimize component reliability expectations*
- *Advance towards zero failure rate*

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