

13. Advanced Packaging for MEMS and Sensors

Course Leader: Horst Theuss – Infineon Technologies AG

Course Description:

Sensors are everywhere! They create data and provide the “food” for the Internet of Things. Which specific requirements distinguish MEMS and sensor packaging from standard assembly? How are these challenges being tackled? Do we need advanced packaging technologies for MEMS? These are just a few questions which are addressed in the course. From a general introduction into package platforms, MEMS-specific challenges will be derived – e. g. the need for low package induced stress and its impact to MEMS performance, the necessity to create cavities or the implementation of MEMS-specific package materials and processes. The course reviews the state of the art, but also explores some topics in more detail. These topics refer to case studies comprising pressure and impact sensors, microphones, mirrors, magnetic sensors, and Radar devices. A further section elaborates on robustness requirements and approaches for risk mitigation in harsh environments.

A discussion on advanced packaging contains developmental studies on integrating MEMS-microphones or RF-antennas into Fan-Out-Wafer-Level-Packages. The concluding chapter deals with systems and heterogeneous integration. Where is the overlap of the processor-driven world of advanced packaging and the MEMS/Sensor world? Where are differences, how can we overcome them and where will the future lead us?

Course Outline:

1. Packaging - What is different for MEMS and Sensors?
2. Cavity Packaging
3. Low Stress Packaging and Materials
4. Chemical Robustness
5. Case Studies
6. Heterogeneous Integration and Advanced Packaging

Who Should Attend:

The course is intended for engineers and technical managers working in the field of MEMS or sensors. It gives an overview on the MEMS packaging landscape but also elaborates more fundamentally into selected topics. It will as well welcome students and newcomers, who are interested in broadening their MEMS-specific knowledge.

Bio: Horst Theuss received his Ph.D. degree in Physics from the University of Stuttgart, Germany in 1993. His research was awarded an “Otto Hahn Medal for Young Scientists” by the Max Planck Society. As a research staff member at the Max Planck Institute for Metal Research he concentrated on magnetic properties of superconductors and amorphous materials. Within a post-doctoral assignment at the IBM Almaden Research Center in San Jose, CA, he worked on magneto-optical properties of exchange-coupled thin layers. In 1996, he started his industrial career at Vacuumschmelze GmbH, Hanau/Germany as a product marketing manager for alloys with special magnetic properties. Horst Theuss joined Infineon Technologies, Regensburg, Germany in 2000. Since then, he has been developing package concepts and processes in the fields of discrete semiconductors, wafer level packaging, cavity packaging, materials and system integration. As a Senior Principal he is today responsible for predevelopments with a focus on MEMS and sensors. Over the years, Horst has continuously contributed to a variety of conferences and magazines with presentations, papers and seminars. He holds more than 100 patents and is co-editor of the “Handbook of Silicon based MEMS Materials and Technologies”.