

16. Robust Electronics for Automotive Applications Including Autonomous Driving

Course Leaders: Matthias Petzold – Fraunhofer IZM, Mervi Paulasto-Kröckel – Aalto University, and Klaus-Juergen Wolter – TU Dresden

Course Objective:

The amount of electronics in vehicles has increased dramatically over the last years and will increase further in the future. Autonomous driving demands highly robust surround-sensing of the entire vehicle. The demand for alternative, more energy-efficient forms of mobility stimulates the application of electro mobility. Electronics modules integrated in sensors and actuators facing harsh environment and higher temperatures. Smaller packages and higher integration levels are needed through embedded systems in package, multi-die packages and finer pitch packages. New packaging technologies have to be qualified for the reliability and safety of automotive standards. E-mobility increases the today's life time requirements of automotive electronics. Additional to the driving time the charging operations have to be considered. To meet this new life time requirements the qualification of electronics module is changing from the detection of defects to the robustness validation. This approach to qualification is based on knowledge of physics of failure mechanisms relates to specific mission profiles. Based on broad practical experience along complete supply chain examples of robustness validation will be demonstrated. Finally, an overview of the methods of design for reliability with the focus on modeling and simulation of materials interactions will be given.

Course Outline:

- Electronics Packages for External Sensing and e-Drive
- Robustness Validation of Automotive Electronics
- Damage Mechanism in Automotive Electronics
- Design for Reliability of Automotive Electronics

Who Should Attend:

This PDC is dedicated to engineers and managers already involved in the field of reliability of electronics packaging especially for automotive electronics and for those who need fundamental understanding on robustness validation and design for reliability.

Bio:

Mervi Paulasto-Kröckel is a professor at Aalto University School of Electrical Engineering in Finland. She completed her D.Sc at Helsinki University of Technology in 1995. Prior to joining Aalto University end of 2008, she worked over 12 years in the semiconductor industry in various R&D and management positions. Her group Electronics Integration and Reliability focuses on advanced materials and interconnect technologies for MEMS/NEMS and power electronics, as well as multi-material assemblies behaviour under different loads and their characteristic failure mechanisms. She has over 100 international publications in fields of microelectronics packaging and interfacial compatibility of dissimilar materials. She is Distinguished Lecturer of IEEE EPS. Associate Professor, Department of Electrical Engineering and Automation, Aalto University

Matthias Petzold, Fraunhofer IMWS, graduated from Martin-Luther-University Halle-Wittenberg, Germany in Physics and received his PhD in 1987. After working at Halle University and for a ceramics company, he moved to the newly founded Fraunhofer institute Halle in 1991. Matthias Petzold is currently heading the institute's Center for Applied Microstructure Diagnostics (CAM) and is deputy director of the Fraunhofer Institute for Microstructure of Materials and Systems IMWS in Halle, Germany. His scientific activities include research on

physical failure analysis and material diagnostics in electronics components with particular focus on quality and reliability issues in automotive applications. He is member of the steering committee of the European Symposium on Reliability of Electron Devices, Failure Physics and Analysis.

Klaus Wolter, TU Dresden. His research interests have embraced many aspects of microelectronics packaging, including substrate technologies, assembly technologies, photonic packaging, MEMS, joining technologies, reliability of electronic packages, and non-destructive test methods. He is well known as co-author of six textbooks, co-editor of three book series with a total of 39 books, author and co-author of more than 200 papers. He is a senior member of IEEE-CPMT. Prof. Wolter was the Director of the Electronic Packaging Lab at TU Dresden from 2003 to 2014. From March 2015 to March 2017, he was a visiting professor at the 3D Systems Packaging Research Center of Georgia Tech Atlanta where he researched on system-integration for advanced automotive electronics. Currently he is a senior professor at TU Dresden.