Multi-chip semiconductor power module design and assembly: rethinking established packaging solutions for improved performance, robustness and reliability

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Abstract

This short-course analyses the typical structure and assembly process of commercial power modules. Based on real application examples, it goes on to illustrate key operational electro-thermal and thermo-mechanical effects which prevent the achievement of disruptive efficiency, power density, robustness and reliability. It then presents innovative concepts and design approaches enabling progress beyond state-of-the-art and discusses the transfer of technology to new and upcoming wide-band-gap semiconductor technologies. In closing, package bespoke design methodologies and tools are addressed, with a focus on future virtual prototyping needs to support competitive development of increasingly integrated solutions.

The course targets an audience with entry to intermediate level knowledge of power device packaging; the topic is treated in general at the survey level, with some punctual aspects only dealt more in depth.

Biography

Alberto Castellazzi is Associate Professor of Power Electronics at the University of Nottingham, Nottingham, UK. His research interests are characterization, modelling, application, packaging and cooling of power devices. He has been active in power electronics research and development for nearly 20 years and has had extensive collaborations with major European and international industrial research laboratories and groups. He is author or co-author of over 170 papers in peer reviewed specialist journals and conferences and has held over 10 tutorials and invited talks at specialist international conferences and workshops, as well as more than 10 PhD courses and seminars at Universities in Europe and Japan. Dr. Castellazzi is a member of the Technical Programme Committee of the ISPSD.