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"Revolutionizing the Electronics Ecosystems – Chiplet and Heterogeneous Integration"



Keynote speaker:

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Title of the presentation:

The Tiny Power Box - a bidirectional onboard charger with high power density

Short CV:

Alfred Binder is R&D manager and heads the Power Electronics Division at Silicon Austria Labs. He graduated in Mechatronics at Johannes Kepler University (Dipl.-Ing.) and Loughborough University (MSc). In 2000 he joined Carinthian Tech Research CTR in Villach and contributed to various fields in automated thin wafer handling, wireless SAW sensors, and harsh environment packaging. In 2015 he started the Heterogeneous Integration Technologies research unit at CTR developing applicative packaging solutions for MEMS, Flexible Electronics, Photonic Systems and Power Device Packaging. Since 02/2023 he is leading the Power Electronics Division at Silicon Austria Labs

Abstract:

The so called "Tiny Power Box" project was aiming for a power dense bi-directional on-board charger which serves as a good example demonstrating the needed design steps for achieving high power density. First a topology optimization was performed aiming for high efficiency and small volume, utilizing the latest semiconductor generation and newest passive components. Second a coupled electro-thermal co-simulation to identify the crosstalk between both domains was done and resulted in a proper positioning of electric and mechanical components already in the design phase. The last step is to do the actual hardware PCB and magnetics design ensuring small parasitics and safe operation and the control implementation for enabling highest efficiency in operation over the whole load and battery voltage range, avoiding partial overheating of components. Finally, a power density of approx. 4kW/L (without case) was achieved.