CIPS 2010 - a real success!

230 power electronics experts attended the CIPS 2010, the 6th International Conference on Integrated Power Electronics Systems. The conference topic was on power electronics systems, high and medium power modules and reliability. The programme included 71 technical papers: Two keynotes, 11 invited, 42 oral and 16 posters. The authorship was well balanced: 26 from industry, 28 from academia, 7 from both, and 13 from research institutes.

In the first keynote Prof. Johann Kolar/ ETH Zurich outlined a mathematical approach for a generic power electronics systems roadmap. The procedure relies on a multi-objective optimisation of converter systems. As a result efficiency and power density are presented in a map in which the pareto fronts are disclosing the state-of-the-art for individual topologies. The power electronics design engineer can easily read from the plan what can be achieved with today's (and tomorrow's) technologies. The third major parameter in the plan would be cost.

Prof. Dushan Boroyevich/ CPES, Virginia Tech., USA, summarised the results on system integration achieved by the CPES consortium in the last 4 years. Active device integration was done for SiC- JFETs and –MOSFETs into high-temperature power modules using wire bond as well as planar interconnect technologies. Passive power components were integrated like EMI filters and energy storage capacitors. Finally converter integration was shown and discussed. 85 references may give insight in details of integration.

Dr. Michel Mermet-Guyennet/ Alstom Transport, France, discussed railway traction reliability. He pointed out that present methods for life-time estimation of traction IGBT modules lead to high level of uncertainty related to observed failures in the field. A better link to the failure criteria of the power cycling test (VCEsat, Rthjc, leakage current) is necessary in the future.

Prof. Chris Bailey/ University of Greenwich, UK, explained the current status of prognostic techniques and application to power electronics. Three techniques are used: data driven, model driven and a combination of both – fusion approach.

Jens Goehre/ Fraunhofer IZM, Berlin, and Samuel Hartmann/ ABB Semiconductor, Switzerland, presented degradation data on Al wire bonds and chip solder respectively. For presenting their results they were rewarded with the “ECPE Young Engineer Award”. The best Poster Award was given to Christoph Marxgut/ ETH Zurich for “Design of a Multi-Cell, DCM PFC-Rectifier for a 1 mm Thick, 200 W Off-Line Power Supply”.

Another highlight has been presented by Dr. Dirk Siepe/ Infineon Technologies. In his paper “The future of Wire Bonding is? Wire Bonding!” he was able to demonstrate an increase of wire bond reliability by a factor of 20 using copper wires as well as a copper chip metallization. This high reliability is very much appreciated but one has to keep in mind that other failures might be dominant in copper bonded systems.

An own session with 5 papers dealt with silver sintering, a technology which is superior to the solders used today, mainly because of the high melting point of 960°C. The sintering technology is based on applying high pressure at moderate temperatures to the chips and substrates to be interconnected. Good progress was shown by Wolfgang Schmitt/ Heraeus, Hanau, Germany, regarding silver pastes which allow a sintering process with lower pressure.

The last session was dedicated to the future of power integration considering two very different aspects: requirements for more electrification in the societies, and device developments including new semiconductor materials.

Dr. Gerhard Miller/ Infineon Technologies demonstrated the close interaction of device developments (high power density, high temperature, fast switching) and improved hybrid integration technologies.

Prof. Ichiro Omura/ Kyushu Institute of Technology, Japan, discussed the “Future Role of Power Electronics”. Because of the strong intention of Japan to become a highly electrified society, roadmaps were presented at device, module and systems level.

The second keynote at the end of the conference entitled “Is it the End of the Road for Silicon in Power Conversion?” was presented by Dr. Alex Lidow, CEO of Efficient Power Conversion, El Segundo, USA. He demonstrated clearly the integration capability of GaN devices, like power switch and driver. His solution to get rid off parasitics in the package is surprising: “Use no package at all”. He showed also some promising reliability results. As in all new technologies, reliability has to be proven. The presented results are promising.

The CIPS 2010 was organised by VDE ETG/ VDE Conferences and the European ECPE Network. Technical co-sponsorship was provided by IEEE PELS and ZVEI.

The Proceedings are published by VDE- Verlag, ETG Fachbericht 121, ISBN 978-3-8007-3212-8. They will be available for downloading from IEEE Xplore digital library soon.

Prof. Eckhard Wolfgang/ ECPE e.V
Prof. Dieter Silber/ ECPE e.V.
Technical Chairs CIPS 2010