

Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

14 September 2021

Participation Fee:

Part I 21-22 Sept.	Part II 19-20 Oct.	Both Tutorials	
770,- €*	660,- €*	1.200,- €*	Industry
655,- €*	545,- €*	955,- €*	University
240,- €*	210,- €*	360,- €*	Students/ PhD stud.**

* plus VAT; **students seats are limited

- The regular participation fee includes dinner, lunches, coffee/soft drinks. The reduced (PhD) students fee includes all the above except for dinner (can be booked for an extra fee of € 50,-*).
- The presentations will be provided by email via a download link short before the event. A printed version of the tutorial handout is available on request (€ 50,-*).
- Upon receipt of registration confirmation via email you are signed-up for the event. The invoice will be sent by email.
- 25 % discount for participants from ECPE member companies.
- 10 % discount for participants from ECPE competence centres.
- Further information (hotel list and maps) will be provided after registration and can be found on the ECPE web page.
- Cancellation policy: Full amount will be refunded in case of cancellation up to 2 weeks prior to the event. After this date and in case of no-show 50 % of the fee is non-refundable (substitutes are accepted anytime).
- The number of participants is limited to 35 attendees.

05/08/21

Organisational Information

Organiser ECPE e.V.
90443 Nuremberg, Germany
www.ecpe.org

Chairman Prof. Dr. Uwe Scheuermann,
Semikron Elektronik

Organisation Ingrid Bollens, ECPE e.V.
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Venue Seminaris Hotel Nürnberg
Valznerweiherstraße 200
90480 Nuremberg, Germany

New Venue



Travel information (hotel list and maps) are available on the ECPE webpage under [Travel Information Nuremberg](#).

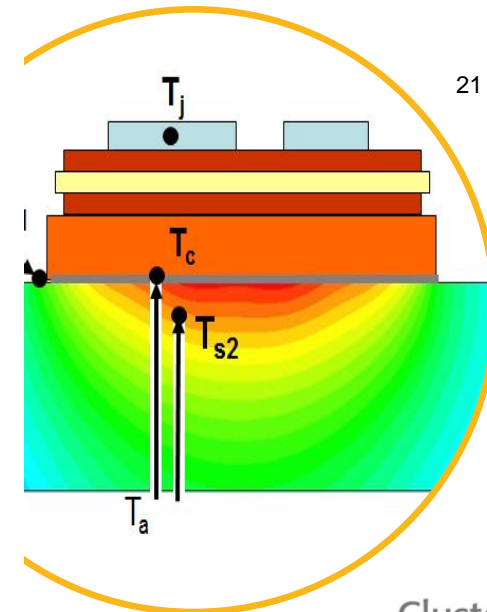


European Center for
Power Electronics e.V.

ECPE Tutorial

Thermal Engineering of Power Electronic Systems Part I: Thermal Design and Verification

21 – 22 September 2021
Seminaris Hotel
Nuremberg, Germany



Cluster
Leistungselektronik

Thermal Engineering of Power Electronic Systems Part I

21 – 22 September 2021
Nuremberg, Germany

Thermal engineering of power electronic systems is a key to achieve high performance and reliability. The focus of the tutorial is the thermal design and validation of a power electronic inverter exemplified by a 100 kW SEMIKUBE IGBT converter equipped with additional thermal sensors. The attendees should have basic knowledge on power semiconductor devices and power electronics systems.

Part 1: After a review of the basic theory of heat transfer, the calculation of losses in a voltage source inverter will be explained. For selected stationary operating conditions, the expected device temperatures of the sample converter will be calculated from datasheet values. Application of online tools to facilitate this process will be demonstrated. Participants can choose between FEM simulations and equivalent thermal network calculation with LTspice™ to simulate these operating conditions. The results are compared to thermal measurements using thermocouples and an IR camera. Furthermore, a 3rd practical training group will deal with modeling of a power board with 3D CFD thermal analysis.

Part 2: Following a brief summary of the results of the first part, failure mechanisms, both at semiconductor and package levels will be introduced. After that, thermo-/damage-sensitive parameters will be discussed, together with theoretical background of thermal impedance measurement. A practical experiment about measurement of thermal impedance with standard laboratory equipment will end the first day. The second day will start from concrete design for reliability concepts, then aim straight at lifetime estimation, based on both power cycling and mission-profile approaches. Advanced electro-thermal and thermo-mechanical simulation will follow, and an overview about cooling systems will conclude the 2-day tutorial.

All presentations and discussions will be in English.

Programme

Tuesday, 21 September 2021

09:30 Start of Registration

09:45 Welcome
ECPE e.V.

10:00 Heat: Basics, Examples, Heat-Exchange – I
Uwe Scheuermann

11:15 Coffee Break

11:30 Heat: Basics, Examples, Heat-Exchange – II
Uwe Scheuermann

12:45 Lunch

13:45 First Steps of a Converter Design
Arendt Wintrich

15:40 Coffee Break

16:00 Thermal Measurements I
- basic principles and techniques
Uwe Scheuermann

16:30 Thermal Network Simulation
Nils Jahn

17:25 Introduction to Finite Element Simulation
Martin Pfof

18:20 Wrap up 1st Day

18:30 End of 1st Day

19:30 Dinner

Programme

Wednesday, 22 September 2021

08:30 Start of 2nd Day

08:30 Thermal Measurements II
- measurement techniques
- practical tips and possible failures
- practical demonstration
Thomas Heckel

09:45 Coffee Break

10:00- Practical Training: Thermal Simulations
15:00 with three options:

Thermal Network Simulation (LTspice®)
Nils Jahn

CFD Thermal System Simulation with Finite Element Method -
Martin Pfof

Modeling a Power Board with 3D CFD Thermal Analysis (Simulation and Measurement)
Andreas Simon-Kajda, David Sulyok

For organisational reason each group is limited to 15 participants.

12:30-13:30 Lunch

Inbetween coffee during group activities

15:00 Wrap up 2nd Day, Final Discussion, Feedback

15:30 End of Tutorial

Course instructors:

- Dr. Thomas Heckel, Fraunhofer IISB
- Nils Jahn, TU Dortmund University
- Prof. Martin Pfof, TU Dortmund University
- Prof. Uwe Scheuermann, Semikron Elektronik
- Andreas Simon-Kajda & David Sulyok, Siemens Industry Software
- Dr. Arendt Wintrich, Semikron Elektronik