

Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:
27 June 2024

Participation Fee:

Part 1 2-3 July	Part 2 6-7 Nov.	Both Tutorials	
770,- €*	670,- €*	1.250,- €*	Industry
655,- €*	520,- €*	955,- €*	University
240,- €*	180,- €*	380,- €*	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.

17/04/24

Organisational Information

Organiser ECPE e.V.
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www.ecpe.org

Technical Chair Prof. Dr. Uwe Scheuermann,
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Venue Novotel Erlangen
Hofmannstr. 34
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Source: Novotel Erlangen
Source front page: Fraunhofer IISB.

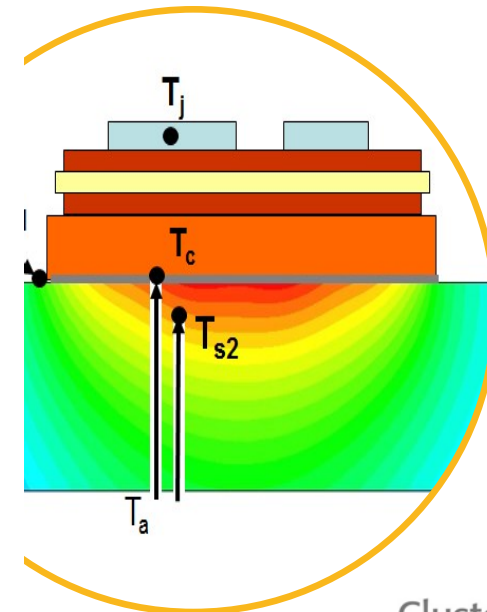


European Center for
Power Electronics e.V.

ECPE Tutorial

Thermal Engineering of Power Electronic Systems Part 1: Thermal Design and Verification

2 - 3 July 2024
Erlangen, Germany



Cluster
Leistungselektronik

Thermal Engineering of Power Electronic Systems Part 1

2 - 3 July 2024
Erlangen, Germany

Thermal engineering of power electronic systems is a key to achieve high performance and reliability. With a clear focus on power modules the tutorial addresses the thermal design and validation of power electronic components exemplified by a 100 kW 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 the comparison of a simulated power board with measurement and calibrate afterwards the simulation model.

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, 2 July 2024

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
- 5-minute break in between -

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, 3 July 2024

08:30 Start of 2nd Day

08:30 Thermal Measurements II
- measurement techniques
- practical tips and possible failures
- practical demonstration
Simon Quergfelder

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

Execute a Thermal Measurement of a Power Board and Compare with Simulation
A. Simon-Kajda,
S. Pauls, A. Voth

For organisational reasons each group is limited to 15 participants. Participation in working group 2 is subject to special modalities, please see attached description.

12:30-13:30 Lunch

Coffee Break during the group activities

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

15:30 End of Tutorial

Course instructors:

- Nils Jahn, TU Dortmund University
- Prof. Martin Pfof, TU Dortmund University
- Simon Quergfelder, Fraunhofer IISB
- Prof. Uwe Scheuermann, Friedrich-Alexander-Universität Erlangen-Nürnberg
- Andreas Simon-Kajda, Alexander Voth, Samuel Pauls, Siemens Industry Software
- Dr. Arendt Wintrich, Semikron Danfoss