Organisational Information

Sign up at: <u>www.ecpe.org/events</u>

Registration Deadline:

19 September 2023

Participation Fee:

€ 670,– *	for industry
€ 520,- *	for universities/institutes
€ 180,– *	for students/PhD student (limited spaces; copy of students required)
* plus VAT	

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- The participation includes dinner, lunches, coffee/soft drinks and digital proceedings. The reduced (PhD) students fee includes all except for dinner (can be booked for an extra fee of € 50,-*)
- Digital proceedings will be provided by download link latest one day before start of the event. A printed 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 via email.
- > 25 % discount for participants from ECPE member companies.
- > 10% discount on university/institute fee 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 upon to 2 weeks prior to the event. After this date 50 % of the fee is non-refundable (replacement is possible).
- > The number of participants is limited to 35 attendees.

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Organizational Information

Organiser	ECPE e.V. 90443 Nuremberg, Germany <u>www.ecpe.org</u>
Technical Chair	Prof. Eckart Hoene, Fraunhofer IZM
Technical Contact	Peter Rechberger ECPE e.V. +49 911 81 02 88 – 12 <u>peter.rechberger@ecpe.org</u>
Organisation	Marietta Di Dio, ECPE e.V. +49 911 81 02 88 – 13 <u>marietta.didio@ecpe.org</u>
Venue	Le Grand Hotel Strasbourg 12 Place de la Gare 67000 Strasbourg France



European Center for Power Electronics e.V.

ECPE Tutorial

Wide Bandgap User Training

26 – 27 September 2023 Strasbourg, France

Electric Field

(MV/cm)

Energy

gap (eV)

Electron velocity

(x107 cm/s)

GaN

Melting point

(x1000 °C)

Conductivity

(W/cm.*C)

Source photo: Le Grand Hotel Strasbourg Source graph front page: Pierric Gueguen, YOLE Développement

ECPE Tutorial

Wide Bandgap User Training

26 – 27 September 2023 Strasbourg, France

Wide bandgap (WBG) semiconductors are the next generation of power electronics. SiC and GaN based systems are the focus of an international cooperation between ECPE and Japanese partners that initially spurred the establishment of this tutorial. The wide spread programme is supposed to convey practical know-how to engineers working with SiC and GaN devices.

Efficient system integration is the key to exploiting the full potential of WBG semiconductors. Power electronics developers need to take into account that high switching speeds, high frequencies and high power densities place special demands on the system components.

This 2-day tutorial addresses all aspects of WBG system integration from the choice of semiconductor components and design options to how to cope with parasitics, EMC and inductance at high switching frequencies. Another topic is test methods – both for electric tests of new power semiconductor components as for the robustness and reliability of modules and systems.

Target Group

This tutorial is intended for engineers and technicians who work or plan to work with WBG devices. Efficient system integration and practical aspects are core components of this course.

Course Instructors:

Prof. Eckart Hoene, Fraunhofer IZM, Berlin Prof. Nando Kaminski, University of Bremen Andreas Schletz, SCHLETZ GmbH, Amberg Prof. Alexander Stadler, University of Applied Sciences Coburg

All presentations and discussions will be in English.

Programme

Tuesday, 26 September 2023

- 08:45 Registration & Welcome Coffee
- 09:15 Welcome, Opening Peter Rechberger, ECPE
- 09:30 Introduction & Motivation for WBG Electronics
 - Opportunities of WBG
 - What has been achieved?

Trends

Eckart Hoene

10:30 Coffee break

10:50 Wide Bandgap Power Semiconductor Devices

- General Considerations / Material Basics
 - SiC-Switches
 - SiC-Diodes
 - GaN-Devices

Nando Kaminski

12:45 Lunch break

13:45 Design of WBG Electronics

- Which Topologies are Suitable?
- Barriers to Overcome
- Design Rules for Low Inductance Modules
- Eckart Hoene

15:00 Coffee break

15:20 Integration Fast Switching Semiconductors: The Era of Designing Parasitics

- Parasitics
- Ultra Low Inductance Modules

• Low Inductance/Zero EMI Modules Eckart Hoene

16:15 Drivers & Control Circuitry for WBG Switches Eckart Hoene

16:45 Testing Wide Bandgap Devices I (Focus on Chip)

- General Considerations: What's Different
- Individual Robustness and Reliability Tests: Blocking, Gate, Operation
- Nando Kaminski
- 17:30 End of 1st Day

19:30 Dinner at "Le Baeckeoffe d'Alsace"

Programme

Wednesday, 27 September 2023

09:00 Start of 2nd Day

09:00 State of the Art Packaging

- Challenges for Highly Integrated Modules
- SiC Discretes
- SiC Power Modules
- GaN Discretes
- Andreas Schletz

10:15 Coffee break

10:45 Requirements for Inductive Components

- Effect of High di/dt
- Comparison of Different Winding Techniques
- Thermal Aspects
- Inductor Equivalent Circuit
- Effect of High du/dt
- High Frequency Resonances
- Alexander Stadler
- 12:30 Lunch break

13:30 Temperature Challenges for Integrated Systems Due to High Power Density

- Power Semiconductors
 - Passive Components: DC-link Capacitor
 - Electrical Insulation
- Die Attach
- Andreas Schletz

14:30 Testing of WBG-Components II (Focus on Construction and Connection Technic)

- Failure Mechanisms
- Test Strategies
- Power Cycling, further Reliability Tests
- Interpretation of Test Results Andreas Schletz
- 15:30 Final Discussion Feedback