Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

11 October 2023

Participation Fee:

€ 345,– *	for industry
€ 305,– *	for universities/institutes
€ 135,– *	for students/PhD student (limited spaces; copy of students ID required)

* plus VAT

- The online participation fee includes remote access via the meeting software Webex and digital proceedings.
- Digital proceedings will be provided by download link latest one day before start of the event.
- Upon receipt of registration confirmation via email you are signed-up for the event. The invoice will be sent via email.
- ECPE members are able to register 1 participant free of charge, 25% discount for further participants.
- 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).

30/06/23

Organisational Information

Organiser	ECPE e.V. 90443 Nuremberg, Germany www.ecpe.org
Technical Chair	Dr. Martin Rittner, Robert Bosch, Chairman of the AQG 324 Working Group Thomas Harder; ECOE e.V.
Organisation	Ingrid Bollens, ECPE e.V. +49 911 81 02 88 – 10 ingrid.bollens@ecpe.org

Dr. Martin Rittner, Chair of Tutorial
Robert Bosch

Peter Dietrich,
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Dr. Gábor Farkas
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Mathias Gebhardt,
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Frank Heidemann,
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Waldemar Jakobi,
Infineon Technologies

Stefan Schmitt,
Semikron Danfoss

Dr. Stefan Thieman
Valeo eAutomotive

Prof. Markus Thoben,
FH Dortmund

Marc Tüllmann,
Infineon Technologies

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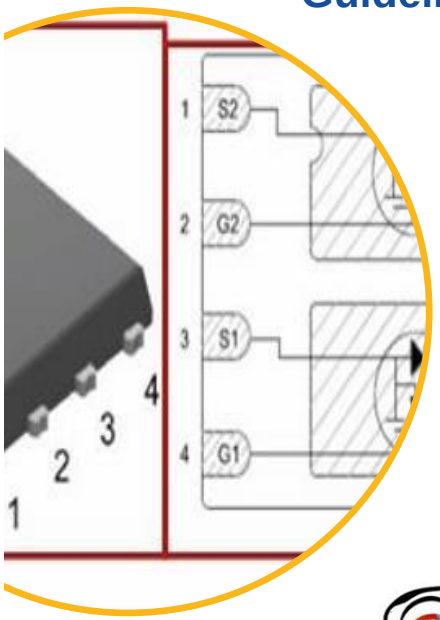
European Center for Power Electronics e.V.

Online Event

ECPE Tutorial

Testing Automotive Power Modules according to the ECPE Guideline AQG 324



18 – 19 October 2023

AQG324

ECPE Online Tutorial

Testing Automotive Power Modules according to the ECPE Guideline AQG 324

18 – 19 October 2023

SiC-based Power Modules included!

The ECPE Guideline AQG 324 is prepared and released by the ECPE Working Group ´Automotive Power Module Qualification´ comprising ECPE member companies from the automotive supply chain. The original version is based on the supply specification LV 324 which has been developed by German automotive OEMs together with representatives from the power electronics supplier industry.
The described tests concern the module design as well as the qualification of devices on module level (i.e. the assembly) but not the qualification of semiconductor chips or manufacturing processes. The requirements, test conditions and tests presented in the tutorial essentially refer to Release 03.1/2021 of the AQG 324 Guideline dated 31.05.2021 which addresses power modules based on Si power semiconductors in the main document and SiC-based modules in a specific annex.
The Tutorial with speakers from the AQG 324 Core Team will give practical information and advice how to test power modules according to the AQG 324 Guideline under comparable conditions. It aims at direct users from beginners to senior experts coming from power module suppliers, automotive tier 1 suppliers or test service and equipment providers.

The workshop is chaired by:

Peter Dietrich, Richardson RFPD Germany
Dr. Gábor Farkas, Siemens Digital Industries
Frank Heidemann, Mathias Gebhardt, SET
Waldemar Jakobi, Infineon Technologies
Dr. Martin Rittner, Robert Bosch
Stefan Schmitt, Semikron Danfoss
Dr. Stefan Thiemann, Valeo eAutomotive Germany
Prof. Dr. Markus Thoben, Fachhochschule Dortmund
Marc Tuellmann, Infineon Technologies

All presentations and discussions will be in English.

Programme

Wednesday, 18 October 2023

08:30 **Webex started**

09:00 **Welcome, Opening**
Thomas Harder, ECPE e.V.

09:10 **Introduction and Motivation**
Martin Rittner, Peter Dietrich
- Background of LV 324 and motivation
- Definition of terms
- Scope of AQG 324 and module definition

09:50 **SiC-Based Power Modules in AQG 324**
Marc Tuellmann
- SiC MOSFET characteristics
- Impact of SiC on qualification of power modules

10:30 Break

10:45 **Mapping of Relevant Standards**
Frank Heidemann
- Overview on relevant standards
- Different understandings (Europe, Asia, US)

11:15 **Characterizing Module Testing**
Part 1: Electrical Testing
Waldemar Jakobi
- Overview on chapters 6 and 7 of AQG 324

Part 2: Thermal Testing
Gábor Farkas

12:15 Lunch break

13:00 **Lifetime Testing: Power Cycling**
Markus Thoben, Marc Tuellmann
- Chapter 9.2: QL-01 Power cycling (PCsec)
- Chapter 9.3: QL-02 Power cycling (PCmin)
- Power cycling of SiC-based power modules

14:45 Break

15:00 **Lifetime Testing: Temperature Tests**
Stefan Schmitt
- Chapter 9.4: QL-03 High-temp. storage (HTS)
- Chapter 9.5: QL-04 Low-temp. storage (LTS)
- Chapter 8.2: QE-01 Thermal shock test (TST)

16:00 **Open Discussion on Lifetime Testing**

16:30 End of 1st Day

Programme

Thursday, 19 October 2023

08:30 **Webex started**

09:00 **Lifetime Testing: HTRB and HTGB**
Mathias Gebhardt
- Chapter 9.6: QL-05 High-Temperature Reverse Bias (HTRB) incl. HTRB for SiC modules
- Chapter 9.7: QL-06 High-Temperature Gate Bias (HTGB) incl. HTGB for SiC modules
- QL-05a Dynamic Reverse Bias (DRB) and QL-06a Dynamic Gate Stress (DGS)

10:45 Break

11:00 **Lifetime Testing: H3TRB**
Stefan Schmitt
Chapter 9.8: QL-07 High-Humidity, High-Temp. Reverse Bias incl. H3TRB for SiC modules
QL-07a Dynamic High-Humidity, High-Temp. Reverse Bias (dyn. H3TRB)

12:00 **Next Steps and Open Discussion**
High-Temp. Forward Bias (HTFB) and outlook on dynamic testing

12:30 Lunch Break

13:15 **Mechanical Tests**
Stefan Thiemann
- Chapter 8.4: QE-03 Vibration (V)
- Chapter 8.5: QE-04 Mechanical shock (MS)

13:45 **Test Documentation**
Stefan Schmitt
- Example of a documentation set
- Number of samples/modules for the tests

14:15 **Delta-Qualification of Power Modules**
Martin Rittner

14:30 **Outlook**
Peter Dietrich
- Further WBG challenges in AQG 324
- Adv. module packages e.g., PCB embedding

15:00 **Wrap up, Final Discussion**

15:30 End of Tutorial