

Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

12 October 2022

Participation Fee:

€ 620,- *	for industry
€ 490,- *	for universities/institutes
€ 165,- *	for students/PhD students
(limited spaces; copy of students ID required; dinner € 50,-* extra)	

- 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 via 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 50 % of the fee is non-refundable (substitutes are accepted anytime).

The number of participants is limited to 35 attendees.

02/09/22

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, ECPE
Organisation	Marietta Di Dio, ECPE e.V. +49 911 81 02 88 - 13 marietta.didio@ecpe.org
Venue	Erikson Hotel Hanns-Martin-Schleyer-Straße 8, 71063 Sindelfingen / near Stuttgart Germany



Source: ERIKSON Hotel Sindelfingen

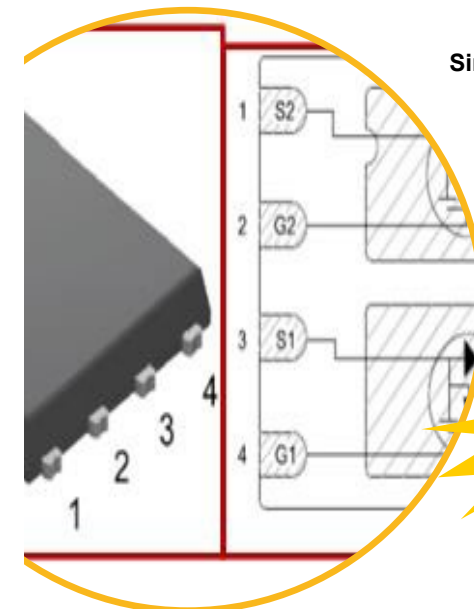


European Center for
Power Electronics e.V.

ECPE/Cluster Tutorial

Testing Automotive Power Modules according to the ECPE Guideline AQG 324

19 – 20 October 2022
Sindelfingen / Stuttgart,
Germany



**SiC-based Power
Modules included!**

ECPE/Cluster Tutorial

Testing Automotive Power Modules according to the ECPE Guideline AQG 324

19 – 20 October 2022
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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.

Course Instructors:

Dr. Martin Rittner, Robert Bosch
Peter Dietrich, Richardson RFPD Germany
Steffen Ewald, Fuji Electric Europe
Dr. Gábor Farkas, Siemens Digital Industries
Frank Heidemann, Mathias Gebhardt, SET
Stefan Schmitt, Semikron Elektronik
Marc Tuellmann, Infineon Technologies
Prof. Dr. Markus Thoben, Fachhochschule Dortmund

All presentations and discussions will be in English.

Programme

Wednesday, 19 October 2022

09:15 Start of registration

09:45 **Welcome, Opening**
Thomas Harder, ECPE e.V.

09:55 **Introduction and Motivation**
Martin Rittner, Peter Dietrich

- Background of LV 324 and motivation
- Definition of terms
- Scope of AQG 324 and module definition

10:35 **SiC-Based Power Modules in AQG 324**
Marc Tuellmann

- SiC MOSFET characteristics
- Impact of SiC on qualification of power modules

11:15 Break

11:30 **Mapping of Relevant Standards**
Frank Heidemann

- Overview on relevant standards
- Different understandings (Europe, Asia, US)

12:00 **Characterizing Module Testing**
Steffen Ewald (electrical testing),
Gábor Farkas (thermal testing)

- Overview on chapters 6 and 7 of AQG 324

12:45 Lunch

13:45 **Lifetime Testing: Power Cycling**
Markus Thoben, Marc Tuellmann

- Chapter 9.2: QL-01 Power cycling (PC_{sec})
- Chapter 9.3: QL-02 Power cycling (PC_{min})
- Power cycling of SiC-based power modules

15:30 Break

16:00 **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)

17:00 **Open Discussion on Lifetime Testing**

17:30 End of 1st Day

19:30 Dinner

Programme

Thursday, 20 October 2022

09:00 Start of Day 2

09:00 **Lifetime Testing: HTRB and HTGB**
Mathias Gebhardt

- Chapter 9.6: QL-05 High-Temperature Reverse Bias (HTRB) incl. HTRB and Dynamic Reverse Bias (DRB, QL-05a) for SiC modules
- Chapter 9.7: QL-06 High-Temperature Gate Bias (HTGB) incl. HTGB and Dynamic Gate Stress (DGS, QL-06a) for SiC modules

10:45 Break

11:15 **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)

12:15 **Next Steps and Open Discussion**
High-Temp. Forward Bias (HTFB) and further outlook on dynamic testing

12:45 Lunch

13:45 **Mechanical Tests**
Martin Rittner

- Chapter 8.4: QE-03 Vibration (V)
- Chapter 8.5: QE-04 Mechanical shock (MS)

14:15 **Test Documentation**
Stefan Schmitt

- Example of a documentation set
- Number of samples/modules for the tests

14:45 **Outlook**
Peter Dietrich

- Further WBG challenges in AQG 324
- Adv. module packages e.g. PCB embedding

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

15:45 End of Tutorial