Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

20 June 2024

Participation Fee:

Euro 345,– * for industry

Euro 305,– * for universities/institutes

Euro 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 Microsoft Teams 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. Payment by bank transfer or Paypal.
- ECPE members are able to register 1 participant free of charge, 25% discount for further participants.
- 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).

Source photo frontpage: STMicroelectronics

24/04/24

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,
Richardson RFPD

Dr. Gábor Farkas
Siemens Digital Industries

Mathias Gebhardt,
SET

Frank Heidemann,
SET

Waldemar Jakobi,
Infineon Technologies

Stefan Schmitt,
Semikron Danfoss

Dr. Stefan Thieman
Valeo eAutomotive

Prof. Markus Thoben,
FH Dortmund

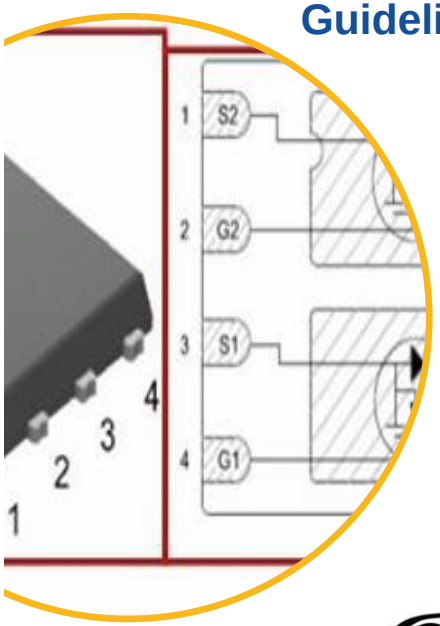
Marc Tüllmann,
Infineon Technologies

European Center for Power Electronics e.V.

Online Event – Special Edition adapted to Asian time zones

ECPE Tutorial

Testing Automotive Power Modules according to the ECPE Guideline AQG 324



25 – 27 June 2024

AQG324

ECPE Online Tutorial

Testing Automotive Power Modules according to the ECPE Guideline AQG 324

25 – 27 June 2024

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

Tuesday, 25 June 2024

13:30 h JST/KST | 12:30 h CNST | 06:30 h CEST
Microsoft Teams started

14:00 h JST/KST | 13:00 h CNST | 07:00 h CEST
Start of Tutorial

10 min. **Welcome, Opening**
Thomas Harder, ECPE e.V

40 min. **Introduction and Motivation**
Martin Rittner, Peter Dietrich
- Background of LV 324 and motivation
- Definition of terms
- Scope of AQG 324 and module definition

40 min **SiC-Based Power Modules in AQG 324**
Marc Tuellmann
- SiC MOSFET characteristics
- Impact of SiC on qualification of power modules

10 min Break

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

45 min. **Characterizing Module Testing**
Waldemar Jakobi (electrical testing) /
Gábor Farkas (thermal testing)
- Overview on chapters 6 and 7 of AQG 324

15 min Break

60 min **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)

20 min **Q & A 1st Day**

18:30 h JST/KST | 17:30 h CNST | 11:30 h End of 1st Day

Wednesday, 26 June 2024

13:30 h JST/KST | 12:30 h CNST | 06:30 h CEST
Microsoft Teams started

14:00 h JST/KST | 13:00 h CNST | 07:00 h CEST
Start of Tutorial

105 min **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

15 min Break

Programme

Continue Wednesday, 26 June 2024

105 min **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)

15 min Break

60 min **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)

20 min **Q & A 2nd Day**

19:20 h JST/KST | 18:20 h CNST | 12:20 h End of 2nd Day

Thursday 27 June 2024

13:30 h JST/KST | 12:30 h CNST | 06:30 h CEST
Microsoft Teams started

14:00 h JST/KST | 13:00 h CNST | 07:00 h CEST
Start of Tutorial

30 min **Next Steps and Open Discussion**
High-Temp. Forward Bias (HTFB) and outlook on dynamic testing

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

15 min Break

30 min **Test Documentation**
Stefan Schmitt
- Example of a documentation set
- Number of samples/modules for the tests

30 min **Delta-Qualification of Power Modules**
Martin Rittner

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

60 min **Q & A, Wrap up, Final Discussion**

17.45 h JST/KST | 16:45 h CNST | 10:45 h CEST