Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

  8 September 2021

Participation Fee:

  € 420,– *   for industry

  € 300,– *   for universities/institutes

  € 130,– *   for students/PhD students

       (limited spaces; copy of students ID required; dinner € 50,-* extra)

* plus VAT

- 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 and in case of no-show 50 % of the fee is non-refundable (substitutes are accepted anytime).

- The number of participants is limited to 15 attendees.

Organisational Information

Organiser	ECPE e.V. 90443 Nuremberg, Germany www.ecpe.org
Technical Contact	Chris Gould chris.gould@ecpe.org
Course Instructor	Dr. Peter Türkes, Consultant (DE)
Organisation	Lena Somschor, ECPE e.V. +49 911 81 02 88 – 18 lena.somschor@ecpe.org
Venue	Adina Apartment Hotel Dr.-Kurt-Schumacher-Str. 1-7 90402 Nuremberg Germany

Cluster Leistungselektronik
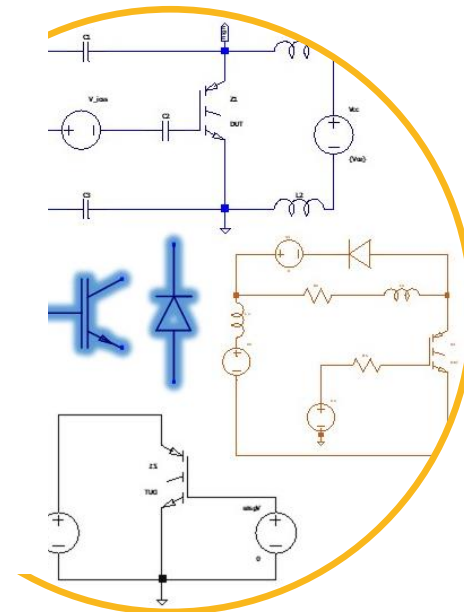
ECPE

European Center for Power Electronics e.V.

ECPE/Cluster Tutorial

Use and Assessment of Power Device Models in Power Electronic Simulation

15 September 2021

Nuremberg
Germany

ECPE/Cluster Tutorial

Use and Assessment of Power Device Models in Power Electronics Simulation

15 September 2021
Nuremberg, Germany

Some manufacturers of power devices are providing compact simulation models of their products. The intention of these compact models is supporting the customer who might use them for virtual prototyping purposes. Using 'Virtual Prototyping' in power electronics aims at the acceleration of the system development process. Therefore, the applied power device models have to have a high-level accuracy. This 'hands on training' shall enable you to evaluate and use compact power device models. It focuses onto IGBTs, Diodes and MOSFETs. It starts with a brief description of available power device models and the related data sheets. Both are available from the website of various vendors. Furthermore, a short introduction to the recommended simulation software LTSPICE (available from the 'Analog Devices' website for educational purposes https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html#) will follow.

During the course of this training, you will work through standard data sheet related simulation circuits and assess the used models in terms of correlation to the data sheet values. To evaluate the performance of power device models you will finally work through some application circuits. Simplifying the necessary drive and control circuits by controlled sources make this application circuits easy to handle.

Who should attend? Engineers, starting their career in power circuit design or simulation; device developers interested in power electronic system evaluation; students with a background in power electronics. The attendees should have LTSPICE on their notebook ready to use. Model libraries and test circuits needed for this tutorial will be distributed in advance.

Course Instructor:
Dr. Peter Türkes, Consultant (DE)

All presentations and discussions will be in English.

Content

1. **Introduction to 'Power Device Models'**
   The different implementation levels of power device models are briefly explained. These model levels range from pure behavioural to physics based implementations. All of these model levels have as well advantages as disadvantages.

2. **Becoming acquainted with LTSPICE by Simulating Data Sheet Characteristics**
   The most essential data sheet characteristics of IGBTs, MOSFETs and Diodes are compared to simulated curves in order to evaluate the device models performance:

   - DC output and transfer characteristics; dependent on temperature
   - Gate charge and capacitance curves
   - Transient switching characteristics like switching times and losses; dependent on temperature and the particular operating condition

   This task requires power device models from different manufacturers and the data sheet of the related devices.

3. **Applying Power Device Models to Typical Applications**
   Starting from the transient switching characterisation circuitry some easy to understand application circuits will be investigated to evaluate the benefits of simulating with power device models while starting the system design process.

   This part also includes the use of controlled current and voltage sources for the implementation of behavioural drive circuits.

   - PWM controlled one phase converter (extension of the transient switching test circuit)
   - PWM controlled BUCK – or BOOST converter

Programme

Wednesday, 15 September 2021
09:00   Registration & Welcome Coffee

09:15   Welcome, Opening
Chris Gould, ECPE e.V.

09:30   Introductory Remarks

10:00   Hands on Training: 'Power Device Models and the Data Sheet'
- DC characteristics of power devices (IGBT, MOSFET, Diode)
- Gate charge and capacitance evaluation circuits
- Transient characteristics

Coffee break in between the morning session

12:30   Lunch

13:30   Hands on Training: 'Power Device Models inside Application Circuits'
- Control schemes with controlled voltage / current sources
- Single ended resonant topology with two point current control (induction cooker)
- H-Bridge with PWM control

Coffee break in between the afternoon session

16:30   Feedback

17:00   End of Training