Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

12 November 2024

Participation Fee:

€ 670,– *	for industry
€ 520,– *	for universities/institutes
€ 180,– *	for students/PhD students (limited spaces; copy of students ID required; dinner € 50,-* extra)

* plus VAT

- 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.

17/04/24

Organisational Information

Organiser	ECPE e.V. Ostendstraße 181 90482 Nuremberg, Germany www.ecpe.org
Course Instructors:	Dr. Jan Sonsky, Innoscience Dr. Radoslava Mitova, Schneider Electric Thomas Ferianz, Infineon Technologies Austria Dr. Teng Long, University of Cambridge
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Organisation	Marietta Di Dio, ECPE e.V. +49 911 81 02 88 – 13 marietta.didio@ecpe.org
Venue	Downing College Howard Building Assembly Room Regent Street Cambridge CB2 1DQ United Kingdom

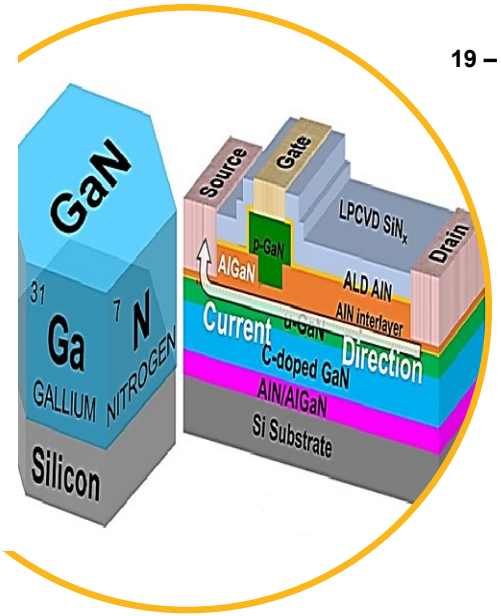
Source Photo: @TimRawle
Source Front Page: Jan Sonsky, Innoscience

European Center for Power Electronics e.V.

ECPE Tutorial

Wide Bandgap User Training – GaN-based Power Electronics

19 – 20 November 2024
Cambridge
United Kingdom



ECPE Tutorial

Wide Bandgap User Training – GaN-based Power Electronics

19 – 20 November 2024
Cambridge, United Kingdom

GaN has been a very promising wide bandgap semiconductor for a long time, outperforming both Si and SiC due to its high critical electrical field and very high electron mobility. The ability to grow GaN epitaxy on silicon wafers has been both virtue and vice. It opened the possibility of 8-inch manufacturing in low-cost silicon fabs. The complex epitaxy buffer structure required to accommodate lattice mismatch when growing on Si substrates has delayed the commercial use of GaN devices. These challenges have been largely overcome and we have seen market introduction of 40V to 650V GaN devices into low and medium power range applications recently. The key application advantages of GaN are the low input and output capacitances combined with zero reverse recovery charge. These characteristics help reduce power losses in many different applications and enable efficient switching at high frequencies up to 100s of MHz. Consequently, the designers can shrink magnetics for filter circuits and reduce power losses and thus increases power density and reduces material consumption. Application engineers and the research community continue to identify an increasing number of possible applications and explore the benefits and boundaries of GaN power devices. The GaN journey as a power semiconductor solution is just at its dawn with many improvements and innovations to be realized in coming decades.
This tutorial aims to introduce engineers to the basics of GaN power semiconductors and their application. We will guide you along the value chain from the basics of device physics to applications. Packaging solutions and special issues with GaN dies will be discussed. We will discuss different available driver solutions and necessary protection features and their realization to achieve the best possible operation of the different GaN devices. Testing and reliability are clearly key topics, which we will address throughout the lectures. Our team will also outline the ongoing development trends.

All presentations and discussions will be in English.

Programme

Tuesday, 19 November 2024

09:00 Registration & Welcome Coffee

09:30 Welcome, Opening
Gudrun Feix, ECPE e.V.

09:40 Basics of GaN Power Devices
Jan Sonsky
- GaN Material Properties and HEMT Essentials
- GaN Epitaxy Challenges
- Device Options: D-mode vs. E-mode
- Reliability and Key Application-specific tests
- GaN vs Si vs. SiC Benchmark

10:40 Coffee Break

11:00 Basics of GaN Power Devices – cont.
Jan Sonsky

12:00 Topologies and Applications 1
Radoslava Mitova
- Overview of different Converter Topologies enhanced by GaN Devices (Totem Pole, Flyback, LLC, DAB, ANPC, Flying Cap etc.)

13:00 Lunch

14:00 Basics of GaN Power Devices - Cont.
Jan Sonsky
- Reliability
- Short Circuit

15:00 Topologies and Applications 2
Radoslava Mitova

16:30 Coffee Break

16:45 GaN Packaging
Teng Long
- Basics of packaging
- Review of GaN device packaging from commercial and research

17:45 End of 1st Day

19:30 Dinner

Programme

Wednesday, 20 November 2024

08:30 Start of 2nd Day

08:30 GaN Packaging – Advanced Design Examples
Teng Long

09:30 Drivers and Protection Features
Thomas Ferianz
- Driving Basics
- Schottky Gate Driving
- GIT Driving
- Over Current Protection/ Current Sensing
- Over Temperature Protection
- Under Voltage Lockout
- Fault Reporting

10:30 Coffee Break

11:00 Drivers and Protection Features - Cont.
Thomas Ferianz

13:00 Lunch

14:00 Focus on GaN Devices Switching Performances
Radoslava Mitova
- Main GaN Device Technologies on the Market
- GaN Devices Parameters Impacting the Switching Performances

15:00 GaN Device Paralleling, Soft Switching
Teng Long
- Basics of zero voltage switching (ZVS)
- ZVS by using paralleled devices

16:00 Final Discussion

16:15 End of Tutorial

Course instructors:

Dr. Jan Sonsky, Innoscience (BE)
Dr. Radoslava Mitova, Schneider Electric (FR)
Thomas Ferianz, Infineon Technologies Austria (AUT)
Dr. Teng Long, University of Cambridge (UK)