Power Electronics: GaN and SiC contribution

Converter topologies and specifications, component selection

Mastering GaN and SiC technologies and their integration into the design of high-performance power converters—from component selection to sizing and implementation.

OBJECTIVES

- Learn to read and understand component datasheets; grasp the implications of using GaN and SiC components; explore key topologies, including buck, boost, and inverter circuits, as well as converters such as LLC DC/DC converters.
- Develop the ability to specify a power converter and determine the appropriate component requirements and system architecture.

TARGETED AUDIENCE

This training course is intended for application support, design office (BE), and/or R&D technicians and engineers responsible for specifying and designing boards that incorporate power electronics.

PREREQUISITE

Basic knowledge of electronics (use of capacitors and transistors). Complete the training course "Benefits of GaN and SiC Technologies."

TRAINER (S)

Industrial and power engineer (senior), 25 years of experience, trainer

TEACHING RESOURCES

Workshops / Course materials / Case studies / Post-training follow-up

MONITORING AND SANCTIONS

Attendance sheets / Certificate of attendance

ASSESSMENT METHODS

Assessment of knowledge via a questionnaire before and after the training. Satisfaction survey at the end of the training course and 3 months later

DATES

2027 March 30th-31st and April 1st AM

VENUE

In-person: 51 rue de l'Innovation - 31670 LABEGE, or remotely

DURATION

2.5d – 17.5h

FEES*

Base rate: €17500

Member rate: €1250 (Members of ASTEERICS consortium partner: Minalogic, Cap'tronic, Alpha RLH, Aktantis, Systematic Paris-Region, Smart Power, Images et Réseaux, CNFM)

** Free training for SMEs (as defined under European standards) and for public bodies that do not engage in economic activity.*

CONTACT

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TRAINING PROGRAM

DAY 1 – GaN and SiC: understanding the technologies and analyzing power converters

Round-table introductions

Module 1: "Reverse engineering" workshop – exploring power components

- PC power supply units
- DC/DC converters
- GaN buck converters
- Any devices brought in by participants will be analyzed

Module 2: Topologies

- Review of fundamental topologies (buck, boost, inverter, DAB, LLC, etc.)
- Transistor packages (miniature GaN, SiC, D2PAK, TO-247, modules, etc.) and thermal calculations
- Cutting-edge topologies based on SiC and GaN (e.g., automotive on-board chargers/OBCs)

DAY 2 – Design and Analysis of Power Architectures

Module 3: Workshop on Deciphering Power Component Datasheets

- Power transistor datasheets (MOSFET, GaN, SiC)
- Capacitor datasheets and understanding technologies based on switching frequencies (polypropylene, electrolytic, etc.)
- Inductor datasheets

Module 4: Specifics and Challenges in Power Electronics (PCB, EMC)

- Real-time embedded microcontroller programming (high-resolution PWM, interrupts, DMA, ADC, etc.)
- Power PCB design (high currents, high voltages, high-dielectric materials, clearance, creepage, heat extraction from small packages, EMC, etc.)
- Challenges associated with SiC and GaN technologies
- Comparison of "hard-switching" and "soft-switching" topologies
- EMC specifics in power electronics; case study of a multi-kW data center inverter incorporating three converters (AC/DC, DC/DC, DC/AC)
- Example of a GaN-based buck converter
- Brief introduction to standards applicable to power converters (safety, performance, EMC, environmental)

DAY 3 – Mastering the Specifics and Challenges of Power Electronics

Module 5: Comprehensive case study on the design of an LLC resonant DC-DC converter (isolated, soft-switching, high-frequency, efficiency >98%)

- Explanation of how this "modern" topology functions
- Sizing steps (inductors, transistors, capacitors, transformer)
- Switching frequency (capable of reaching up to 1 MHz!)
- Routing details
- The optimal switching cell; parasitic inductances at high frequencies (HF)

Round-table discussion