POWER WEBINAR

Sharpen Your Power Supply Design Acumen

2022 Power Webinars Abstracts

Silicon Carbide (SiC) – From Challenging Material to Robust Reliability

Date: Tuesday, October 18 at 10:00 a.m. CET and PST

Author: Catherine De Keukeleire

Silicon Carbide (SiC) can be considered one of the most promising semiconductor materials for manufacturing high-power electronic devices. Thanks to its excellent physical properties (high saturation electron drift velocity, high thermal conductivity, high breakdown electric field), systems with very low losses and faster switching speed can be designed. Smaller geometries compared to Silicon (Si) MOSFET transistors can be achieved. While **onsemi** made great use of knowledge and methodologies acquired for many years on silicon technologies, the specific challenges introduced by the SiC material have been and still are extensively assessed to tailor an appropriate qualification methodology and demonstrate robust reliability.

This session will introduce the audience to the **onsemi** Quality and Reliability methodology deployed from first design to mass production. This comprehensive approach is founded on the interaction between different fields, such as a rigorous design methodology, strict production monitoring, manufacturing control, adequate screening, and robust qualification plans. This methodology has shown its efficiency on silicon products applied to the automotive market for many decades and has been tailored to address the specific needs of SiC products. You will be guided through this evolution to SiC and, more specifically, on its successful deployment to address the integrity of the gate oxide of SiC MOSFET transistors.

Finally, the webinar will briefly present recent publications on Cryogenic Bias Temperature Instability, Body Diode degradation, and Dynamic stress requirements.

Lessons Learned from SiC-Based 25 kW DC Fast EV Charger Module Design

Date: Wednesday, October 19 at 10:00 a.m. CET and PST

Authors: Didier Balocco, Daniel Goldmann, Stefan Kosterec, Karol Rendek

In our eight-part how2power blog series, we described the development of a 25 kW DC charging module in detail. In this webinar, we will focus on Tips and Tricks from the HW and FW design perspective and debugging phase to share 25 kW DC charging module development and testing hints. We will explain how to test and fine-tune short circuit desaturation protection and what causes SiC MOSFET drain voltage ringing. We will show the impact of adding a snubber capacitor and how to test Device Under Test (DUT) with lower power equipment than the power of tested DUT in a loop-back test. Finally, we will touch on Phase Shifted Dual Active Bridge control algorithm design.

SiC Simulation for Application Evaluation

Date: Thursday, October 20 at 10:00 a.m. CET and PST

Author: Didier Balocco

In last year's sessions, we explained how **onsemi** Physical and Scalable SPICE Simulation Models are made and used to obtain data sheet values. In this session, however, we will focus on results that can be obtained only by simulation and how to use them in some high-power conversion topologies.

The session's first part will explain

- How to access internal node voltage or the die voltage
- How to use corner simulation models to study current sharing between MOSFETs in parallel
- How to use the thermal interface with a cauer network
- How package parasitics can influence switching losses
- How a half-bridge structure can also affect losses

The session's second part will focus on topologies simulations including

- Flying Capacitor Boost
- NPC and T-NPC cells
- 6-Pack Boost Active Front End with complete D-Q control and 3rd Harmonic Injection

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SiC-Based High-Density 3 kW Totem Pole PFC and LLC Power Supply

Date: Tuesday, October 25 at 10:00 a.m. CET and PST

Author: Jonathan Harper

Increasing the efficiency and power density of high-power single-phase input power supplies is a challenge for today's designers, especially considering the efficiency under medium load conditions (20% to 50%). Power supplies at this power level require power factor correction (PFC). Using bridgeless PFC to replace the input rectifier bridge increases efficiency. It is possible to achieve even higher power density and efficiency by using SiC MOSFETs in a totem pole PFC configuration because the switching frequency is much higher than other solutions at this power level. We present a solution using a SiC-based totem pole PFC followed by a secondary-side controlled LLC power supply.

How to Spin a BLDC Motor Using Motor Controller Development Tools

Date: Wednesday, October 26 at 10:00 a.m. CET and PST

Authors: Rogério R Ferreira

In this session we will discuss the accelerating trend toward energy efficiency improvement and how this impacts offline-powered application design. Highly efficient electrical motor technologies, such as BLDC motors, become more attractive as the industrial, automotive, and appliance market segments adjust their products to meet government agency energy efficiency targets and also lead the movement of environmentally sustainable products forward.

The ecoSpin 600 V ECS640A motor control device is presented as an "easy to use" solution to design an application that runs with a BLDC motor technology. The ecoSpin development platform enables a BLDC motor sample to spin even faster. The webinar will describe a step process of setting up the ECS640A evaluation board unit with an ecoSpin motor controller graphical user interface (ecoSpin DTFC* GUI) application and issuing BLDC motor movement commands.

*DTFC – Direct Torque and Flux Control is a motor vector control methodology

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Meet Ultra-High-Density Design Challenges with 300 W Totem Pole PFC and LLC Power Supply

Date: Thursday, October 27 at 10:00 a.m. CET and PST

Author: Roman Radvan

Energy-saving initiatives and customer expectations are driving the increase in efficiency and decrease in the size of power supplies—creating a challenge for designers of power supplies that require power factor correction (PFC). We present an ultra-high-density 300 W power supply solution that replaces the input diode bridge using a totem-pole PFC circuit. It uses an LLC converter with synchronous rectification and integrated driver GaN devices to enable 500 kHz switching on the LLC, dramatically reducing the inductor size.

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