Meet the GaN Experts in person at the Applied Power Electronics Conference (APEC) Booth #1302

March 20-24th, 2022

EPC's GaN Experts will be available during APEC to discuss the latest enhancement-mode gallium nitride-based FETs and ICs and demonstrating how GaN technology's superior performance is transforming power delivery across industries.

Schedule a meeting with our team of GaN Experts

Featured in Booth 1302

48 V DC-DC for High-Density Computing and Automotive

The high-density computing and automotive markets are coalescing on the 48 V bus and GaN is the ideal solution at this voltage node.

Stop by **Booth 1302** to see the state-of-the-art in power density with a 5000 W/in3 LLC design for high-density computing and how GaN enables 2 kW bidirectional converters to power the next generation of mild hybrid and electric vehicles.

eMobility

GaN-based motor drives are allowing a variety of applications such as warehouse autonomous robots, eMobility, and drones to reduce size and weight, extend range, and increase reliability. In **Booth 1302** we will have examples of GaN-based motors capable of driving everything from eScooters to server fans.

Fast Charging

GaN-based USB-C fast chargers can be up to 40% smaller and charge 2.5X faster than traditional silicon-based chargers. Stop by **Booth 1302** to see how GaN enables miniaturization, very high efficiency, and excellent thermal performance for this high-volume application.

GaN Integration

Meet with the EPC GaN Experts in **Booth 1302** to discuss the latest progress and roadmaps for GaN integration. Also take the opportunity to work live with the web-based design tools available in the GaN Power Bench to accelerate your design cycle.

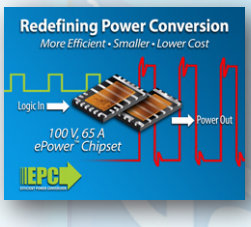
EPC Conference Schedule:

Professional Seminar – **The Surprising Benefits GaN Brings to BLDC Motor Drives – Design, Performance, Cooling and Reliability**

Presenters: *Michael de Rooij, Ph.D. - Vice President, Applications Engineering, Marco Palma – Director of Motor Drives Systems and Applications*

This seminar provides engineers the tools and understanding needed to fully utilize the potential of GaN FETs and ICs in BLDC motor drive applications.

The seminar begins with a review of GaN FET characteristics and how to design GaN converters. The seminar then gets into the details of GaN-based BLDC motor drives including the examination of two experimentally verified GaN IC BLDC motor drive designs.



Extending GaN Integration to Higher Power and Faster Speeds: An Examination of the Progress and Roadmaps for GaN Integration

Industry Session IS07.1

Presenter: *Alex Lidow, Ph.D., CEO and Co-founder*

GaN-based integrated circuits are in high-volume applications such as motor drives, DC-DC converters, and lidar systems. In motor drives and DC-DC converters the roadmaps need to point to higher power density. In lidar it is greater speed. In all of the above there needs to be strategic integration of functions and features. This talk will discuss the current state-of-the-art as well as the next few years' innovations in GaN integrated circuits.

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eGaN is a registered trademark of Efficient Power Conversion Corporation

2 kW Bi-Directional Automotive 48 V-12 V DC-DC Converters Using eGaN® FETs

Industry Session IS12.2

Presenter: *Yuanzhe Zhang, Director, Applications Engineering*

The conversion between 48 V and12 V is in high demand in data center, telecommunication, and automotive application, and the requirement includes high efficiency and small size. GaN transistors have small footprints, low switching losses that can result in a reduction in size, weight and material cost for such converters. This work focuses on evaluating the converter performance using automotive qualified, and various configurations of GaN FETs. Several 1.5 kW to 2 kW bi-directional systems are designed for 48 V/12 V conversion, with full load efficiency exceeding 95%.

PCB Layout for Chip-Scale Package GaN Fets Optimizes Both Electrical and Thermal Performance

Industry Session T18.8

Presenter: *John Glaser, Ph.D, Director of Applications Engineering*

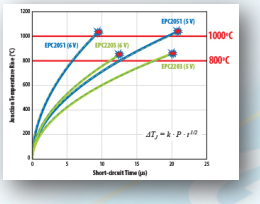
The half-bridge comprising two switches and a high frequency bypass capacitor forms the basic building block of the majority of power conversion applications. Prior work has shown how to design a printed circuit board layout for this building block using GaN in chip-scale packages, where the layout minimizes power loop inductance for best switching performance. However, this layout creates thermal bottlenecks that limit performance. A new layout is derived from basic principles with equal or superior electrical performance and greatly improved thermal performance with neither additional cost nor penalties. Initial experimental evidence shows a temperature rise reduction as high as 30%, allowing large gains in power density.

Thermal Tool for Quick Estimation of Thermal Performance of eGaN® FETs

Industry Session IS17.6

Presenter: *Assaad El Helou, Ph.D, Senior Thermal Mechanical Applications Engineer at Efficient Power Conversion*

The demand for high power-density converters has been pushing the adoption of eGaN devices due given their resultant higher efficiencies and high-power capabilities, but also require more advanced thermal management strategies and characterization. Full thermal simulations provide detailed analysis of developed electronic solutions, but remain computationally intensive while consuming a lot of time and thus are not feasible at the early stages of design tradeoffs. Early in the design process, a simpler approach is needed where reduced models are preferred to aid in the FET selection process and to assess the feasibility of various FETs options, PCB structures and layouts, and the effectiveness of different cooling solutions. In this presentation, the background and demonstration of a thermal characterization tool for GaN FETs is presented that predicts with a high degree of accuracy their thermal performance in conjunction with different PCB construction and for multiple cooling configurations.



Recent Advancements in the Understanding of Dynamic On-Resistance and Electromigration in Enhancement Mode GaN Devices

Industry Session IS21.4

Presenter: *Robert Strittmatter, Vice President of Reliability*

Using a test-to-fail methodology, coupled with novel experimental techniques and extensive theoretical analysis, physics-based models have been developed to characterize the key root causes of failure in lateral GaN power transistors. In part 1 of this discussion, we expand on the wide body of knowledge of charge trapping phenomena in eGaN devices that lead to dynamic on-resistance shifting ($dR_{DS(on)}$). Starting from a dynamical model of hot-electron scattering, we formulate an equation that combines the effects of current, voltage, and time during an arbitrary switching locus. The model is then put to the test against experimental results, including: (i) long-term $dR_{DS(on)}$ data for 5th generation 100 V and 200 V FETs operated well beyond datasheet limits; and (ii) a comparison of inductive versus resistive hard-switching. In part 2, we present reliability data on chip scale devices tested under high current/high temperature stress. The failure mode is found to be electromigration of the solder joints, and measured lifetimes are well fit with Black's equation. The results confirm that eGaN devices are robust against electromigration even under the most extreme operating conditions, such as DC-DC conversion in solar power.

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