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Tutorial Title

Gallium Nitride: Device Technologies and Applications

Instructor Team

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Abstract

Thanks to its superior switching performance, Gallium nitride is penetrating several power conversion markets, including mobile device chargers, power supplies, data centers, renewable energies, and automotive. In this tutorial, we'll review the key elements to understand GaN technologies and their applications. We will discuss the key parameters of power devices, including on-state resistance, breakdown voltage, parasitic capacitances, and their impact on conversion losses. We will review GaN material properties and appreciate where GaN is superior to silicon and silicon carbide. We'll dive into GaN transistors and discuss strategies to achieve normally-off operations, high current rating and high voltage rating (up to 1200V!). We will analyze switching transients and frequency response, discussing good practices to drive your GaN device fast and reliably. You will learn about industrial and automotive qualification standards, lifetime tests, transient reliability and short-circuit capability. The tutorial will end with a review of main GaN applications, including circuit topologies and design recommendations to make the most out of highly efficient, highly reliable GaN devices.

Instructor Biography

Dr. Davide Bisi

Dr. Davide Bisi received a PhD degree on GaN devices from the University of Padova, Italy, in 2015. He joined Transphorm in 2016. He's currently leading multiple R&D projects on advanced GaN materials and devices. Dr. Bisi has co-authored more than 50 peer-reviewed publications and has been awarded 4 Best Paper Awards and 4 Patents.