Universität Stuttgart

Institut für Robuste Leistungshalbleitersysteme

MA/BA/FA

Carry out your thesis in cutting edge field of GaN-based power electronics

Description:

- A gallium nitride (GaN) based monolithic integrated gate driver circuit and 600V GaN-on-Si transistor was recently developed by ILH and Fraunhofer IAF. Pulsed measurements up to 450V show ultra-fast switching transitions in the nanosecond range. This enables high efficiency and high power density power electronics. Side-by-side integration of low-power low-voltage logic transistors and large-area 600V power transistors raises questions about the heavily scaled transistors‘ characteristics and interaction. Due to the novelty of this GaN technology there are many open unanswered research questions which will be addressed by the student theses.

Examples of possible topics (will be individually tailored to a specific thesis):

- Gate driver and pre-driver design for high- and low-side transistors
- Assembly and packaging of power devices and modules
- Characterization, modelling and simulation of GaN power devices and circuits
- Measurement and evaluation of switching waveforms
- Control of half-bridge and gate driver circuits for MHz switching frequencies
- Development an analysis of efficient and compact dc/dc converters

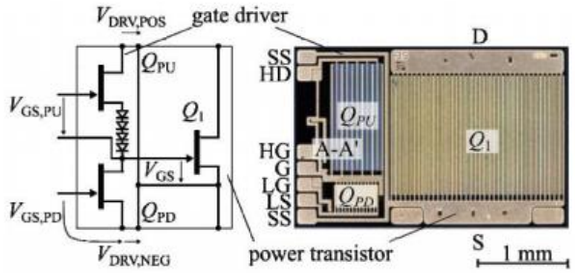
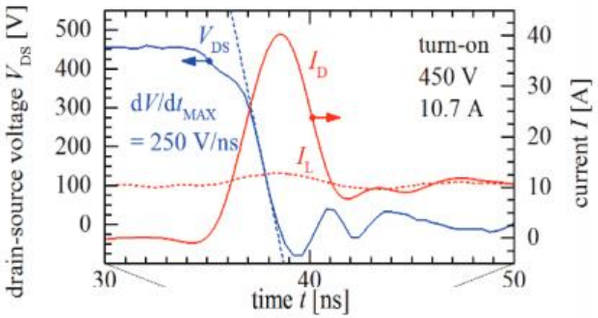


Fig. 1. Schematic of quasi-normally-off GaN gate driver (Q_{PU}, Q_{PD}) and d-mode power transistor Q_1 and photograph of the fabricated 2×3 mm² GaN-on-Si power device.



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