Active gate control for SiC MOSFETs

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Background

There is a trend in electric vehicle design to increase the DC voltage. At the same time, new wide-bandgap transistors are becoming more common in the inverter due to their superior on-state resistance, and fast switching speed which reduces the losses. However, the fast switch speed and high voltage result in a large voltage (dv/dt) and current (di/dt) slew rates, which have a negative impact on both EMI and the machine winding insulation.
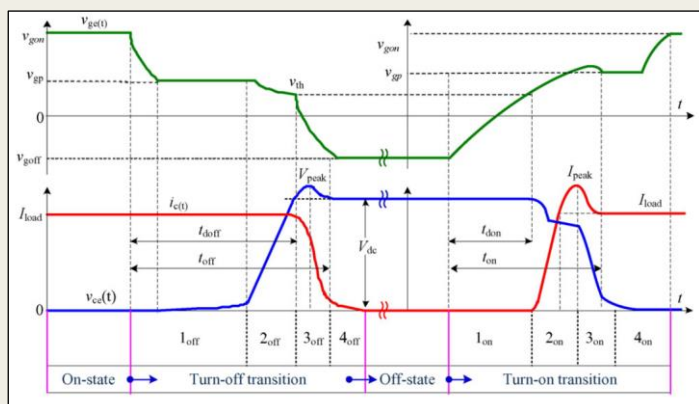
In the future, advanced gate driver methods could help to increase the lifetime of electric drives and reduce losses, helping to accelerate the electrification of the transport system.
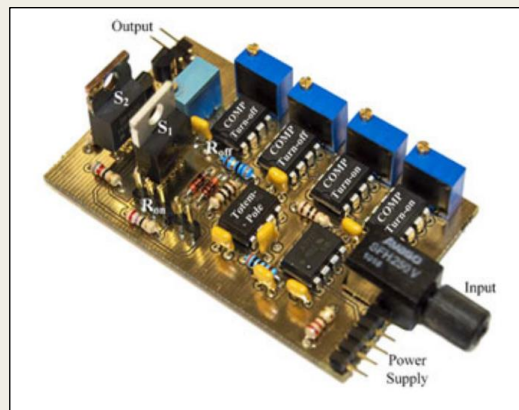
Goal

The goal is to identify promising techniques to control the dv/dt (and, if possible, the di/dt) of a medium voltage SiC MOSFET transistor under hard switching with inductive load. The method should be robust over a large current, voltage and temperature span.
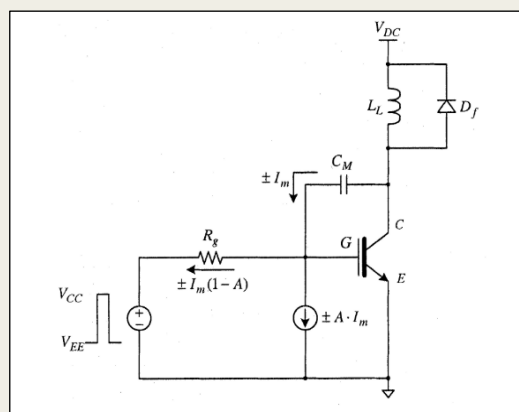
Outline

- Litterature study of the state of the art in active gate control.
- Selection of control method
- Analysis and simulation control method.
- Prototyping and experimental validation.

Luo et. al. 2016

Camacho et al 2017

Park, S., Jahns, T. 2003

Student profile

Interest in the topic is a key factor in the selection of student.

Useful skills include:

- Power electronics & semiconductors
- Circuit simulation
- Knowledge of amplifier circuits.
- Control theory & control stability
- Circuit board design and prototyping

The project is suitable for 1-2 students.

Contact

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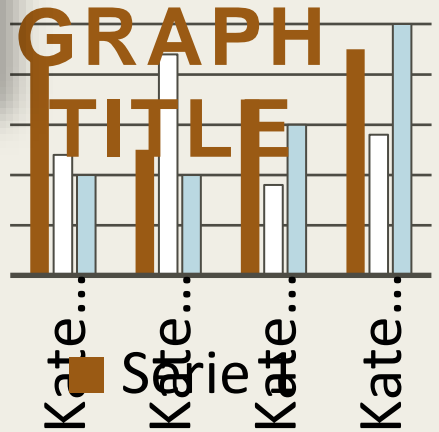
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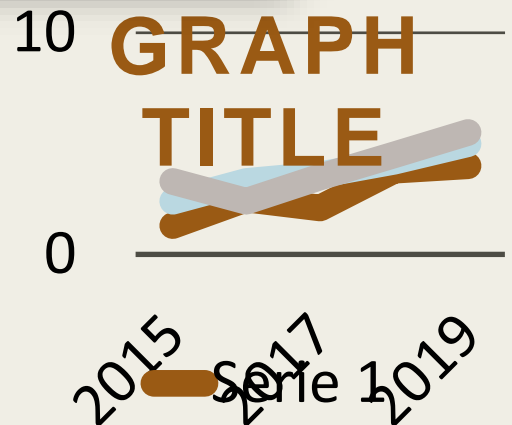
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