

University of Stuttgart



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Power Electronics

Modeling of intrinsic capacitance in Super-junction Power MOSFETs

Study Thesis / Master Thesis

Introduction:

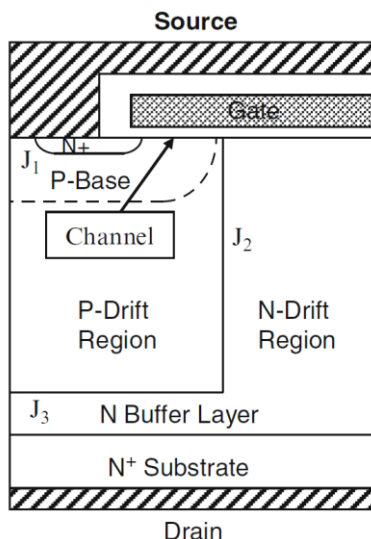
Super-junction structure is one of the approaches proposed to achieve the desired two-dimensional charge coupling within power MOSFET structures and it is well suited for the development of high performance Si power MOSFET structures with large blocking voltage capability.

Device structure of the modern Super-junction power MOSFETs is typically very different from conventional lateral MOSFETs. This causes the standard models defined for the lateral device models cannot be directly used for Super-junction structure power MOSFETs.

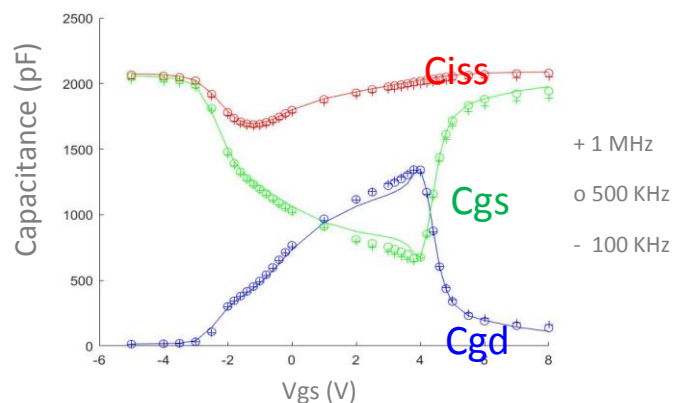
The switching capabilities of power transistors are determined by their intrinsic capacitances and resistances. A precise model for the capacitance of the transistor is therefore important to predict their switching behavior. However most of the capacitance model provided by the device manufacture are not accurate enough.

Tasks:

- Study structure and characteristics of Super-junction power MOSFETs.
- Study the capacitance structure and model definition in a power MOSFET.
- Understand different capacitance modeling approaches for MOSFETs.
- Contribute to the improvement and development of capacitance modeling in the field of Super-junction power transistors based on the standard model.



The SJ-MOSFET structure



The measured capacitance characteristics of a SJ-MOSFET