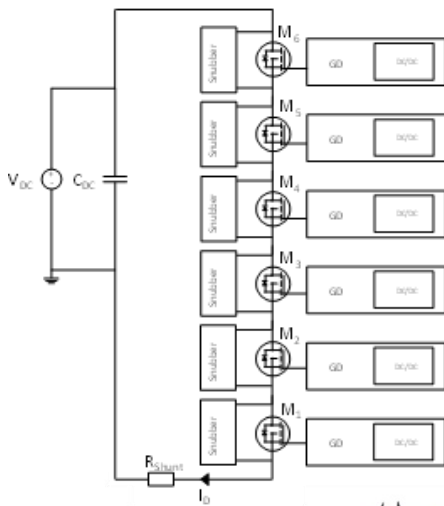




High Voltage Switch made by series connection of discrete SiC components

CONTEXT

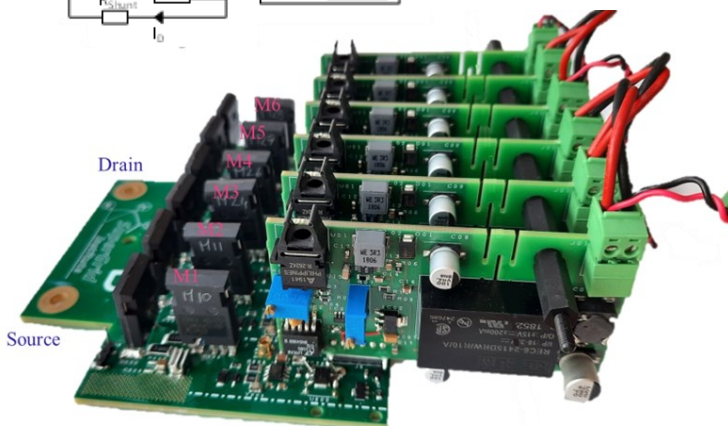
Silicon Carbide MOSFET components are suitable for low voltage kV applications because of their internal properties. In recent times SiC MOSFETs of rating 3.3 kV has arrived as a normally used market component, but for applications which need even higher voltages such as power distribution networks and railway systems components of higher voltage ratings are needed. In order to achieve these higher voltage levels with the available devices in the market, series connection of these devices seems an interesting option. Series connected SiC MOSFETs when applied can convert a low voltage rated power device for medium or high voltage applications.



Performances

→ 8 kV DC / 65A

→ Switching speed : up to 520 kV/μs



TECHNOLOGY DESCRIPTION

To reach a breakdown voltage over 10kV, six SiC-MOSFETs (1.7 kV 45mΩ from Wolfspeed) are connected in series. The freewheeling diode is a 10kV SiC PiN diode. The current rate can reach 70A. The prototype is made with PCB technology. Voltage balancing is achieved thanks to RCD snubber. Each SiC-MOSFET is driven by an insulated gate-driver supplied by insulated DC/DC converters.

APPLICATION DOMAIN

- MVDC Collection Network
- Photovoltaic, Wind Power
- Electrical vehicle charger

ADVANTAGES

Simplify the architecture of medium-voltage converter topologies by reducing the number of series-connected submodules

Avoid the voltage distribution between the submodules to be unequal and cause problems in both transient and steady state operations.

Reduce cost and complexity

TRL SCALE



DELIVERABLES

- Design methodology & associated report
- Simulation models
- Testing results on prototype
- Expertise on active/passive balancing solutions

SCIENTIFIC REFERENCE

PCIM 2021 : "Model parameter extraction tool for the analysis of series-connected SiC-Mosfests"

ECSCRM 2021 : "Experimental investigation of a 10 kV-70A switch with six SiC-MOSFETs in a series-connection"