CIRED 21-22 SEP 2022 SHANGHAI , CHINA

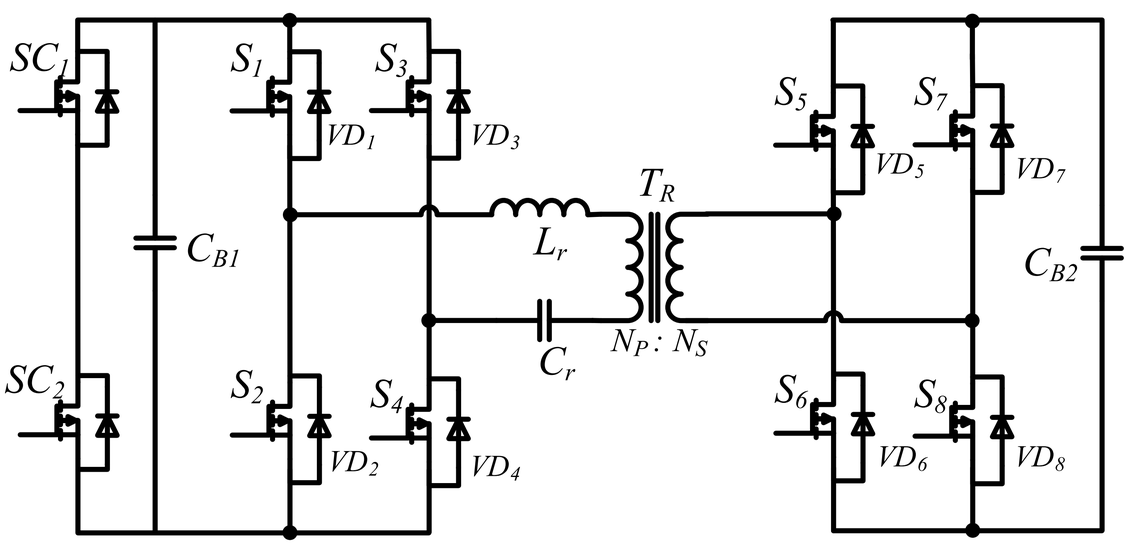
Research on Design of High Power DC Power Electronic Converter Based on SiC Devices

Yichu Li Feng Wang Fang Zhuo
State Key Laboratory of Electrical Insulation and Power Equipment Xi'an Jiaotong University, Xi'an, China

Introduction

As the voltage and power flow control fulcrum of the flexible DC distribution network, the DC power electronic transformer is an important development direction of the future intelligent distribution network. Based on the topology of high-power LC series resonant converter, the optimization calculation of component parameters is carried out in this paper. A half-bridge module driver of SiC MOS is designed, which meets the high-frequency application requirements of the device in a high-voltage and high-power environment. Finally, the driver board is tested to verify the correctness of circuit modeling and analysis conclusions.

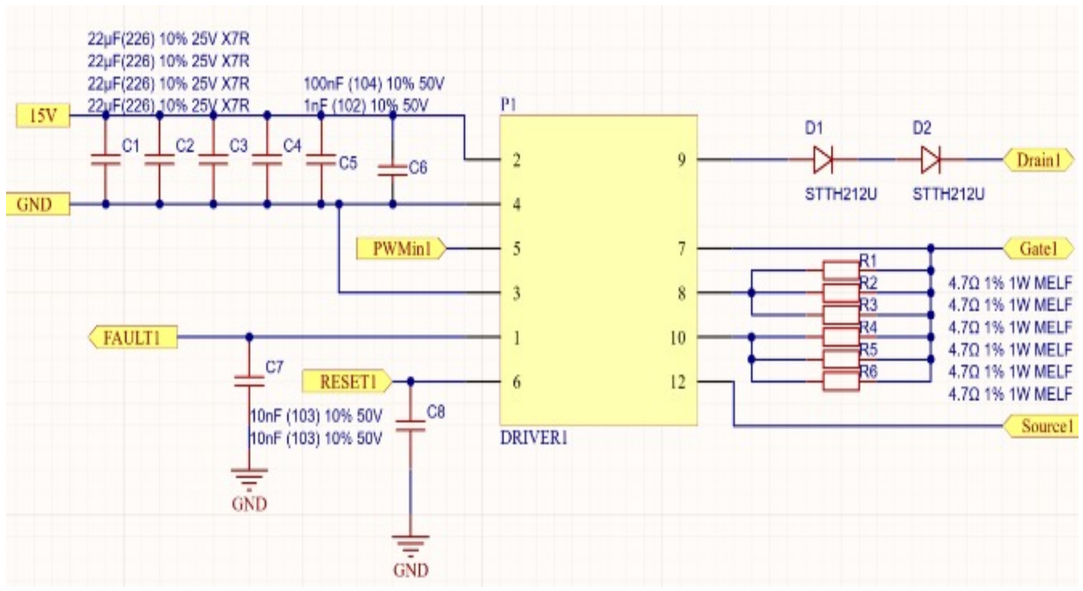
LC Resonant Converter



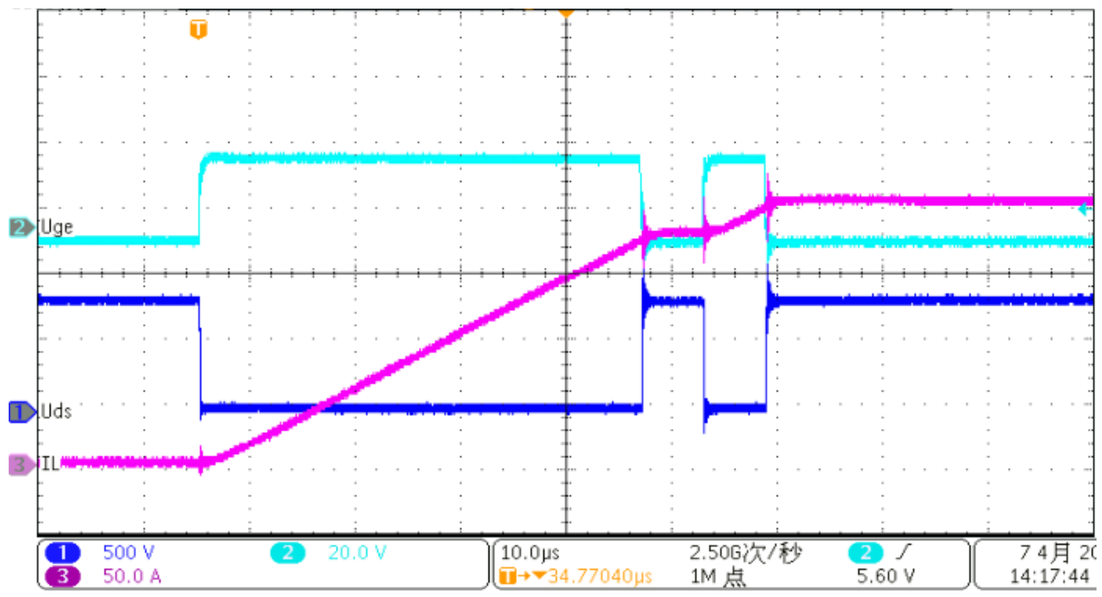
Application conditions: 100kW, 1kV/750V.
The main component parameters of the power module are designed:

Parameter	Value
Transformer ratio n	133：100
Resonant inductance L_r	72μH
Resonant capacitor C_r	1.5μF
Input filter capacitor C_{B1}	500μF
Ouput filter capacitor C_{B2}	800μF

Driver Design and Verification



Schematic diagram of driver board peripheral



Double pulse test waveform

above waveform that the obtained results meet the high-frequency operation requirements of the power module. The parasitic inductance of the busbar is small, and the driving resistance is properly designed.

Conclusions of your work

The topology parameters of the LC series resonant converter are designed according to the high-power operating conditions of the current mainstream power electronic transformers. The peripheral design of the driver board for the high-power SIC MOSFET half-bridge module is described in detail. Further, based on the above hardware, the double-pulse test is carried out, and the correctness of the design is proved.