
RUI WANG

Mobile: +45 50285950

Degree: Ph.D.

Gender: Male

Data of Birth: Jan. 1996

Address: Avenue du Tir-Fédérale 25, 1024 Ecublens VD, Lausanne, Switzerland

E-mail: ru.wang@epfl.ch

Research Field: Power Electronics

Place of Birth: Hubei, China

Nationality: Chinese



Research Focus

- Wide band-gap power semiconductor devices, their active gate drivers, series-connection technology, and medium voltage converter design.

Education and Working Background

- Postdoc (2023.7 ~ Now): **École Polytechnique Fédérale de Lausanne** (Lausanne, Switzerland)
Supervisor: Pro. Drazen Dujic Major: **Power Electronics**
- Doctoral Degree (2020.10 ~ 2023.7): **Aalborg University** (Aalborg, Denmark)
Supervisor: **Pro. Stig Munk-Nielsen** Major: **Power Electronics**
Thesis title: Series connection of medium voltage SiC MOSFETs with self-powered design
- Visiting scholar (2022.11 ~ 2023.1): **KTH Royal Institute of Technology** (Stockholm, Sweden)
Supervisor: **Pro. Hans-Peter Nee** Major: **Power Electronics**
- Master's degree (2017.9 ~ 2020.6): **Huazhong University of Science and Technology** (Wuhan, China)
Supervisor: **Pro. Lin Liang** Major: **Power Electronics** Academic Record: **90.7/100** (ranking: **35/246**)
- Bachelor's degree (2013.9 ~ 2017.6): **Hunan University** (Changsha, China)
Major: **Electrical Engineering and Automation** Academic Record: **GPA 4.15/4.5** (ranking: 13/263)
- Hardware Engineer (2020.06 ~ 2020.10): **Huawei Technologies Co., Ltd.** (Dongguan, China)

Selected Academic Activities

Core member of the competitions: Responsible for software coding (embedded C language) as well as the construction and debugging of two-wheel vehicle and four-rotor aircraft. Responsible for writing technical reports.

1. “NXP cup” smart car competition

Introduction: based on the provided chip, the control panel of the two-wheel car is designed, which realizes the upright of the two-wheel car with the principle of wind pendulum, and further makes the two-wheel car follow the electromagnetic track through the sensor detection.

2. “TI cup” electronic design competition

Introduction: in the early stage, the flight control board of the aircraft was designed on the basis of STM32 chip. The basic operations of the aircraft, such as suspension, forward and backward, etc. were realized through the communication between the remote-control board and the flight control board. According to the requirements of the competition, the flight control board is designed based on the provided chip to realize the automatic tracking flight of the aircraft.

Core member of the projects: In terms of hardware, responsible for the construction of press-pack IGBTs series-connection platform, IGBT module test platform, SiC MOSFETs series-connection platform and medium voltage converter; also, the schematic design of voltage balancing circuit and driving circuit, PCB designing and basic debugging. In terms of software, responsible for the writing of Verilog code based on Altera FPGA and the overall software debugging. In terms of writing, responsible for writing project reports, papers, patents and other documents.

3. Research of driving protection technology for high power IGBT module 2017.10-2018.12

Introduction: To study the driving protection scheme for IGBT module and then put forward a novel corresponding overshoot suppression scheme according to the voltage and current overshoots phenomenon of IGBT during the switching process. Afterwards, it should be integrated into the design of the driving protection circuit.

4. Key technology of customized high-power press-pack IGBT for HVDC 2017.09-2019.03

Introduction: a national key research and development program. The research group is responsible for the packaging of press-pack IGBT and the design of gate driver for series-connected IGBTs. The voltage unbalance of series-connected IGBT is studied, and a new voltage balancing scheme is put forward.

5. Research on application theory of silicon carbide high power devices 2019/01-2020/06

Introduction: a national key research and development program. The gate driver of 18 kV SiC IGBT needs to be designed reliably, and the expected target is to connect two 18 kV devices in series and put them into the 24 kV valve application.

6. Medium Voltage BASIC & Center of Digitalized Electronics (CoDE) 2020/10-2023/07

Introduction: Medium voltage BASIC project focuses on the converter design using 10 kV SiC MOSFET. CoDE project focuses on digital twin design, which includes the extraction of parasitic parameters of converter, etc. and optimization.

Selected Rewards

National encouragement scholarship	twice	2014/2015
Annual second-class scholarship of Hunan Univ.	once	2016
The first prize in south China competition of “NXP cup”	once	2016
The third prize in Hunan province of “TI cup”	once	2016
First-class scholarship for postgraduate students	third	2017/2018/2019
Merit Postgraduate of Huazhong Univ. of Sci. and Tech.	once	2019
First prize of Zhixing scholarship	once	2019
Outstanding Graduate of Huazhong Univ. of Sci. and Tech.	once	2019

Selected Publications as The First Author and Patent

Journal papers:

[1] **R. Wang**, A. B. Jørgensen, W. Liu, H. Zhao Z. Yan and S. Munk-Nielsen, “Voltage Balancing of Series Connected SiC MOSFETs with Adaptive-impedance Self-powered Gate Drivers,” in *IEEE transaction on Industrial Electronics*, vol. 70, no. 11, pp. 11401-11411, Nov. 2023.

[2] **R. Wang**, Y. Chen, J. Chen, L. Liang and L. Peng, “Plug-in Gate-loop Compensators for Series-connected IGBT Drivers in A Solid-state Fault Current Limiter,” in *CSEE Journal of Power and Energy Systems*, vol. 8, no. 1, pp. 165-174, Jan. 2022.

[3] **R. Wang**, A. B. Jørgensen, H. Zhao and S. Munk-Nielsen, “Short-Circuit Characteristic of Single Gate Driven SiC MOSFET Stack and Its Improvement With Strong Anti-short Circuit Fault Capabilities,” in *IEEE Transactions on Power Electronics*, vol. 37, no. 11, pp. 13577-13586, Nov. 2022.

[4] **R. Wang**, L. Liang, Y. Chen, Y. Pan, J. Li, L. Han and G. Tan, “Self-Adaptive Active Gate Driver for IGBT Switching Performance Optimization Based on Status Monitoring,” in *IEEE Transactions on Power Electronics*, vol. 35, no. 6, pp. 6362-6372, June 2020.

[5] **R. Wang**, A. B. Jørgensen, D. N. Dalal, S. Luan, H. Zhao and S. Munk-Nielsen, “Integrating 10-kV SiC MOSFET Into Battery Energy Storage System With a Scalable Converter-Based Self-Powered Gate Driver,” in *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 11, no. 1, pp. 351-360, Feb. 2023.

[6] **R. Wang**, L. Liang, Y. Chen and Y. Kang, “A Single Voltage-Balancing Gate Driver Combined With Limiting Snubber Circuits for Series-Connected SiC MOSFETs,” in *IEEE Journal of Emerging and Selected*

Topics in Power Electronics, vol. 8, no. 1, pp. 465-474, March 2020.

[7] **R. Wang**, A. B. Jørgensen, and S. Munk-Nielsen, "An Enhanced Single Gate Driven Voltage-balanced SiC MOSFET Stack Topology Suitable for High-voltage Low-power Applications," in *IET Power Electronics*, vol. 15, no. 3, pp. 251-262, Feb. 2022.

Conference papers:

[8] **R. Wang**, B. Zhang, S. Zhao, L. Liang and Y. Chen, "Design of an IGBT-series-based Solid-State Circuit Breaker for Battery Energy Storage System Terminal in Solid-State Transformer," *IECON 2019 - 45th Annual Conference of the IEEE Industrial Electronics Society*, Lisbon, Portugal, 2019, pp. 6677-6682.

[9] **R. Wang**, H. Zhao and S. Munk-Nielsen, "Comparison of Two Types of Single Gate Drivers for SiC MOSFET Stacks in Flyback Converters," 2021 IEEE Workshop on Wide Bandgap Power Devices and Applications in Asia (*WiPDA Asia*), Wuhan, China, 2021, pp. 36-40.

[10] **R. Wang**, A. B. Jørgensen, H. Zhao and S. Munk-Nielsen, "Design and analysis of a voltage clamping active delay control method for series connected SiC MOSFETs," 2022 24th European Conference on Power Electronics and Applications (*EPE'22 ECCE Europe*), Hanover, Germany, 2022, pp. 1-8.

Patent:

Lin Liang (Supervisor, 梁琳), **Rui Wang** (王锐). A single gate driver combined with limiting snubber circuits (一种基于双电压控制型器件的单驱动串联均压电路), 201910570943.0. (Public)

Personal Skills

- Proficient in Office, MATLAB, Altium Designer, Quartus, Saber, LTspice and other relevant software.
- National computer rank examination: level 2 (C language), level 3 (embedded).
- English examination: CET4, CET6. Proficient in English speaking and writing.

Self-evaluation

- Earnest attitude towards scientific research, in-depth excavation of problems encountered, diligent in thinking.
- Professional and a good teamwork player.