

Zhou Dong

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Work Experience

Scientist - Power Electronics ABB Inc. (U.S. Corporate Research Center), Raleigh, NC	2022-present
Graduate Research Assistant The University of Tennessee, Knoxville, TN	2017-2022

EDUCATION

The University of Tennessee, Knoxville, USA Ph.D. in Electrical Engineering, GPA: 3.89/4.0, Advisor: Prof. Fred Wang (FIEEE)	2017-2022
Nanjing University of Aeronautics and Astronautics, Nanjing, China M.S. in Electrical Engineering, GPA: 88/100, Advisor: Prof. Zhi-liang Zhang (SMIEEE)	2014-2017
Nanjing University of Aeronautics and Astronautics, Nanjing, China B.S. in Electrical Engineering and Automation, GPA: 85/100	2010-2014

RESEARCH AND PROJECTS

Multiple Research Projects in ABB Inc. Confidential	Jul. 2022- Present
Ultra-Light Tightly-Integrated Modular Aviation Transportation Enabling Solid-State Circuit Breaker (ULTIMATE SSCB) · Objective: develop and test a 10 kV and 100 A SSCB in a simulated flying environment. · Modular structure and suitable for cryogenic cooling. · Responsible for the project management, SSCB electrical design, and TVS characterization at cryogenic temperatures.	Jun. 2021- Jul. 2022
High Power Density Solid-state Power Controller (SSPC) · Developed a liquid-cooled 1 kV 500 A SSPC with an efficiency of 99.51% and a specific power density of 112.4 kW/kg (state-of-the-art: 82 kW/kg). · Designed and implemented everything about the project except the UI. · Analyzed and proposed solutions for the parallel instability issue of multi-die paralleled SiC power module and high clamping ratio of high power TVS diodes . · Help the team apply a \$1.4M project (ARPA-E CABLES ULTIMATE SSCB) about a similar topic leveraging the project experiences.	Feb. 2019- Aug. 2020
Automatic Design Tool for Three-phase Motor Drives · Developed a comprehensive and automated design tool integrating state-of-the-art design algorithms and models for the three-phase motor drive design. · Software development: the switch selection, DC capacitor selection, and cold plate selection. · Proposed an ANN based model to predict leakage inductance and the error is reduced from >20% using state-of-the-art models to <10%.	Oct. 2020- Jun. 2021 & Jan. 2018- Jan. 2019

- Proposed an improved **single Fourier analysis approach** to consider non-linear carrier ratios.
- Proposed an **automatic layout tool** for three-phase two-level converters to optimize the switching cell layout and extract the parasitic of interest.

Cryogenic Cooled 40 kW 3L ANPC Converter

Aug. 2017-

- Hardware implementation and test of a 40 kW 3L ANPC converter.

Dec. 2017

30 MHz Resonant Synchronous Rectification (SR) Flyback Converter

Jul. 2015-

- Proposed a **digital adaptive driving scheme** to solve the timing mismatch problem of the eGaN control and SR HEMTs under various input voltage and improved the efficiency by 2.2% compared to the conventional one.
- Features: 18-24 V input, 5 V/2 A output, 30 MHz switching frequency, air-core transformer, digital control (ARM), high power density: **96 W/in³** (more than 4 times of state-of-the-art products), efficiency: 80.0% (full load).

May 2016

Driving Circuits for eGaN HEMTs in Multi-MHz Resonant Converters

Jul. 2014-

- Proposed a **three-level driving circuit** to reduce the reverse conduction voltage of eGaN HEMTs and improved the efficiency by 0.7% compared to the conventional one.
- Proposed an **SR self-driving circuit** to compensate for the driving IC propagation delay and improved the efficiency by 4.8% compared to the conventional one.

Jun. 2015

AWARDS AND HONORS

IEEE PELS Ph.D. Thesis Talk Winner, 2023, 5 elected worldwide.
 Transactions on Power Electronics Second Prize Paper Award, 2020
 National Scholarship for Graduate Students, 2015-2016, Top 1%
 Hella Scholarship, NUAA, 2014-2015, Top 2%
 First-class National Academic Scholarship for Graduate Students, 2014-2017
 Second Prize in National Undergraduate Electronic Design Contest, 2013
 Second Prize in Undergraduate Electronic Design Contest in Jiangsu Province, 2012

PROFESSIONAL SKILLS

Solid-state protections
 Si and WBG device application including switching transient analysis and DPT test
 Design automation tool development for power electronics
 Magnetic components design and modeling using FEM software and PEEC tool
 Cryogenic power electronics
 Digital control using DSP
 Basic converter and filter design and troubleshooting skills
 Tools: Altium, Solidworks, MATLAB, LTSPICE, Saber, office...

JOURNAL PUBLICATIONS

- **Zhou Dong** et al., "A Current Limiting Strategy for WBG-Based Solid-State Circuit Breakers With Series-Connected Switching Cells," in *IEEE Transactions on Power Electronics*, vol. 37, no. 12, pp. 14062-14066, Dec. 2022.
- **Zhou Dong**, R. Ren, and F. Wang, "Development of High-power Bidirectional DC Solid-state Power Controller for Aircraft Applications," in *IEEE J. Emerg. Sel. Topics Power Electron.*, vol. 10, no. 5, pp. 5498-5508, Oct. 2022.

- **Zhou Dong**, R. Ren, W. Zhang, F. F. Wang, and L. M. Tolbert, “Instability Issue of Paralleled Dies in a SiC Power Module in Solid-State Circuit Breaker Applications,” *IEEE Trans. Power Electron.*, vol. 36, no. 10, pp. 11763-11773, 2021.
- Z. Zhang, **Zhou Dong**, X. W. Zou, and X. Ren, “A Digital Adaptive Driving Scheme for eGaN HEMTs in VHF Converters,” *IEEE Trans. Power Electron.*, vol. 32, no. 8, pp. 6197-6205, 2017. (**The advisor is the first author**)
- Z. Zhang, **Zhou Dong**, D. Hu, X. W. Zou, and X. Ren, “Three-level Gate Drivers for eGaN HEMTs in Resonant Converters,” *IEEE Trans. Power Electron.*, vol. 32, no. 7, pp. 5527-5538, 2017. (**The advisor is the first author**)
- F. F. Wang, R. Chen, and **Zhou Dong**, "Power Electronics: A critical enabler of future hydrogen–electric systems for aviation," in *IEEE Electrification Magazine*, vol. 10, no. 2, pp. 57-68, June 2022.
- H. Gui, Z. Zhang, R. Chen, R. Ren, J. Niu, H. Li, **Zhou Dong**, C. Timms, F. Wang, L. M. Tolbert, B. Blalock, D. Costinett, and B. Choi, “Development of High Power High Switching Frequency Cryogenically-Cooled Inverter for Aircraft Applications,” *IEEE Trans. Power Electron.*, vol. 35, no. 6, pp. 5670-5682, 2020. (**2nd paper award 2020**)

CONFERENCE PROCEEDINGS

- **Zhou Dong** et al., "High Current Turn-off of GaN HEMT for Solid-state Circuit Breaker at Cryogenic Temperatures," 2023 IEEE Applied Power Electronics Conference and Exposition (APEC), Orlando, FL, USA, 2023, pp. 656-660, doi: 10.1109/APEC43580.2023.10131468.
- **Zhou Dong**, R. Ren, F. Wang, and R. Chen, “An automated design tool for three-phase motor drives,” in *IEEE design methodologies for power electronics conference*, July 2021.
- **Zhou Dong**, R. Ren, and F. Wang, “Evaluate I²t Capability of SiC MOSFETs in Solid State Circuit Breaker Applications,” in *IEEE Energy Conversion Congress and Exposition (ECCE)*, pp. 6043-6048, 2020.
- **Zhou Dong**, R. Ren, B. Liu, and F. Wang, “Data-driven Leakage Inductance Modeling of Common Mode Chokes,” in *IEEE Energy Conversion Congress and Exposition (ECCE)*, pp. 6641-6646, 2019.
- **Zhou Dong**, Z. Zhang, X. Ren, X. Ruan, and Y. F. Liu, “A Gate Drive Circuit with Mid-level Voltage for GaN Transistors in a 7-MHz Isolated Resonant Converter,” *IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 731-736.

PATENTS

- B. Kevin, R. Chen, **Zhou Dong**, F. Wang, and Z. Yang, “Ultra-light tightly-integrated modular solid-state circuit breaker,” Patent Pending.
- R. Chen, **Zhou Dong**, R. Ren, and F. Wang, “Design Tool for Three-phase Power Electronics Converters,” Patent Pending.
- **Zhou Dong**, Y Zhou, Z Zhang, X Ren, and F. Yu, “Driving method of gallium nitride transistor, driving circuit thereof, and fly-back converter using the circuit” Patent Pending.
- Z. Zhang, **Zhou Dong**, Z. Xu, K. Xu, and X. Ren, “The hyperfrequency gate-drive and control method of gallium nitride device,” granted 03/30/2018, No. CN105896992B.
- X. W. Zou, Z. Zhang, **Zhou Dong**, X. Ren, and F. Yu, “Control method of very high frequency (VHF) circuit, VHF circuit and power supply expansion framework of VHF circuit,” granted 07/10/2018, No. CN105186880B.
- Z. Zhang, X. Zou, **Zhou Dong**, X. Ren, and F. Yu, “Ultra high-frequency isolating resonant converter” granted 02/15/2017, No. CN104124874B.