Zhou Dong

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PROFESSIONAL EXPERIENCE

Senior Scientist - Power Electronics — Jul 2024-present
ABB U.S. Corporate Research Center — Raleigh, NC

· Managing two cutting-edge R&D projects for ABB Electrification Smart Power.
· Assessing new technologies, creating proposals, and securing funding from business units for solid-state switching, power converters, and motor drives.
· Mentoring junior scientists, engineers, and interns.

Scientist - Power Electronics — Jul 2022-Jun 2024
ABB U.S. Corporate Research Center — Raleigh, NC

· Created a proposal and successfully secured funding for a project.
· Contributed to three cutting-edge R&D projects focused on solid-state switching and high power density power converters.
· Delivered all work packages to business units on time.
· Generated more than ten invention disclosures.

Research Assistant — Aug 2017-May 2022
The University of Tennessee, Knoxville — Knoxville, TN

· Assisted the team in creating proposals and securing fundings.
· Led two project and contributed to other research initiatives.
· Conducted researched on solid-state switching and development tools for power converters.
· Published high quality scientific papers.

Research Assistant — Sep 2014-Apr 2017
Nanjing University of Aeronautics and Astronautics — Nanjing, China

· Conducted researched on very high frequency power converters.
· Published high quality scientific papers.

EDUCATION

The University of Tennessee, Knoxville — Aug 2017-May 2022
· Ph.D. in Electrical Engineering, Advisor: Prof. Fred Wang (FIEEE) — Knoxville, TN

Nanjing University of Aeronautics and Astronautics — Sep 2014-Apr 2017
· M.S. in Electrical Engineering, Advisor: Prof. Zhi-liang Zhang (SMIEEE) — Nanjing, China

Nanjing University of Aeronautics and Astronautics — Sep 2010-Jun 2014
· B.S. in Electrical Engineering and Automation — Nanjing, China

RESEARCH PROJECTS

Development of Solid-state Switching and Power Conversion Products — Jul 2022-Present
ABB U.S. Corporate Research Center — Raleigh, NC

- Developing a scalable and ultra-fast SiC-based static transfer switch to reduce the transfer time and improve the reliability in mission-critical systems.
- Developed a SiC-based solid-state circuit breaker (SSCB) with the advanced current limiting function to coordinate the protection in future dc grids.
- Developed an ultra-thin and high-power-density bidirectional dc/dc converter for emerging energy storage applications.

Ultra-Light Tightly-Integrated Modular Aviation Transportation Enabling Solid-State Circuit Breaker (ULTIMATE SSCB) — Jun 2021-Jul 2022
The University of Tennessee, Knoxville — Knoxville, TN

- Led Phase I of the project in collaboration with two other universities and one company.
- Designed a 10 kV and 100 A SSCB with modular structure for aviation environment.
- Characterized GaN devices and TVS diode at cryogenic temperatures.

High Power Density Solid-state Power Controller (SSPC) — Feb 2019-Aug 2020
The University of Tennessee, Knoxville — Knoxville, TN

- Designed and developed a liquid-cooled 1 kV 500 A SSPC with an efficiency of 99.51% and a specific power of 112.4 kW/kg (state-of-the-art: 82 kW/kg).
- Performed analysis and proposed solutions for the parallel instability issue of multi-die paralleled SiC power module.
- Addressed the high clamping ratio of high power TVS diodes.
- Assisted the team in applying and getting funded for a $1.4M project (ARPA-E ULTIMATE SSCB) on a similar topic leveraging the project experiences.

Automatic Design Tool for Three-phase Motor Drives — Oct 2020-Jun 2021
The University of Tennessee, Knoxville — Jan 2018-Jan 2019
Knoxville, TN

- Developed a comprehensive and automated design tool integrating state-of-the-art design algorithms and models for the three-phase motor drive design.
- Proposed an ANN based model to predict leakage inductance and the error is reduced from >20% using state-of-the-art models to <10%.
- Improved a single Fourier analysis approach to consider nonintegral carrier ratios.
- Designed an automatic layout method for three-phase two-level converters to optimize the parasitic of the switching cell.

30 MHz Resonant Synchronous Rectification (SR) Flyback Converter — Jul 2015-May 2016
Nanjing University of Aeronautics and Astronautics — Nanjing, China

- 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.

· Developed an isolated 30 MHz switching frequency converter with a power density of 96 W/in^3 (more than 4 times of state-of-the-art products).

Driving Circuits for eGaN HEMTs in Multi-MHz Resonant Converters Jul 2014-Jun 2015
Nanjing University of Aeronautics and Astronautics Nanjing, China

· Invented 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.

TEACHING & MENTORING EXPERIENCE

Mentoring ABB Intern and LEAD engineer Jan 2024-present
ABB U.S. Corporate Research Center Raleigh, NC

· Mentoring an intern and a LEAD (ABB early talent program) engineer to do electrical circuit design, PCB layout, and electrical test.

Teaching Assistant (ECE683: Drive System Control and Converter Design) Aug 2020-Dec 2020
The University of Tennessee, Knoxville Knoxville, TN

· Assisted the instructor with materials preparation and assignment grading.
· Provided support to students including assistance with assignments, clarification of concepts, and individualized tutoring sessions.

Mentored Junior Students for the National Undergraduate Electronic Design Contest Jun 2014-Aug 2015
Nanjing University of Aeronautics and Astronautics Nanjing, China

· Guided two groups of junior students (six students in total) in preparation for the contest
· One group was awarded First Prize, and the other received the Second Prize.

PROFESSIONAL SERVICE

· Reviewed 60+ papers of top transactions and journals related to power electronics: 2017-2024
  – IEEE Transactions on Power Electronics
  – IEEE Transactions on Industrial Electronics
  – IEEE Journal of Emerging and Selected Topics in Power Electronics
  – IEEE Transactions on Transportation Electrification
  – IEEE Open Journal of Power Electronics
  – IEEE Transactions on Industry Applications
  – IEEE Open Journal of the Industrial Electronics Society
· Served as a session chair of IEEE Applied Power Electronics Conference and Exposition (APEC). 2023

AWARDS & HONORS

· Publisher of the Year 2023 at ABB (Top 1 among 40+ scientists)	2024
· IEEE PELS Ph.D. Thesis Talk Winner (5 elected worldwide)	2023
· Transactions on Power Electronics Second Prize Paper Award	2020
· National Scholarship for Graduate Students (Top 1%)	2015-2016
· Hella Scholarship (Top 2%)	2014-2015
· 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 protection design and application
· Silicon and wide bandgap (WBG) device application
· Design automation tool development for power electronics converters
· Magnetic components design and modeling using FEM software and PEEC tool
· Cryogenic power electronics
· Digital control of power electronics converters
· Power 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 Trans. Power Electron.,* 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, Oct. 2021.
- S. K. Dam, **Zhou Dong**, *et al*., "Module Development for a High Specific Power Density High-Efficiency Cryogenic Solid-State Circuit Breaker for Electrified Aircraft Propulsion," in *IEEE Trans. Power Electron.*, early access.
- S. Zhao, C. Xu, L. Ravi, **Zhou Dong**, and P. Cairoli, "Review and Analysis of Voltage Clamping Circuits With Low Overvoltage Ratios for DC Circuit Breakers," in *IEEE Open J. Ind. Electron. Soc.*, vol. 5, pp. 651-662, 2024
- A. K. R. Siddavatam, **Zhou Dong**, et al., "Fault-Tolerant Architectures With Enhanced Bus Protection for Electric/Hybrid Aircraft Systems," in *IEEE Trans. Transp. Electrif.*, vol. 9, no. 3, pp. 3564-3578, Sept. 2023.

- F. F. Wang, R. Chen, and **Zhou Dong**, "Power Electronics: A critical enabler of future hydrogen–electric systems for aviation," in *IEEE Electrific. Mag.*, vol. 10, no. 2, pp. 57-68, June 2022.
- H. Gui, **Zhou Dong**, et al., "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)
- 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.
- 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.
- Z. Zhang, X. W. Zou, **Zhou Dong**, Y. Zhou and X. Ren, "A 10-MHz eGaN Isolated Class-Φ2 DCX," in *IEEE Trans. Power Electron.*, vol. 32, no. 3, pp. 2029-2040, March 2017.

CONFERENCE PROCEEDINGS

- **Zhou Dong** and F. Wang, "Automatic Layout Design and Implementation for Three Phase Voltage Source Converters," 2023 *IEEE Design Methodologies Conference (DMC)*, Miami, FL, USA, 2023, pp. 1-6.
- **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.
- **Zhou Dong**, R. Ren, F. Wang, and R. Chen, "An automated design tool for three-phase motor drives," in 2021 *IEEE design methodologies for power electronics conference*, Bath, United Kingdom, 2021, pp. 1-6.
- **Zhou Dong**, R. Ren, and F. Wang, "Evaluate I^2t Capability of SiC MOSFETs in Solid State Circuit Breaker Applications," in 2020 *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2020, pp. 6043-6048.
- **Zhou Dong**, R. Ren, B. Liu, and F. Wang, "Data-driven Leakage Inductance Modeling of Common Mode Chokes," in 2019 *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 6641-6646.
- **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," 2015 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 731-736.
- D. Qin, **Zhou Dong**, et al., "Towards System-Friendly Solid-State Circuit Breaker for Electrified Aircraft Propulsion," 2024 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Long Beach, CA, USA, 2024, pp. 3108-3114.
- D. Qin, **Zhou Dong**, et al., "Intelligent Gate Drive for Cryogenic Solid-state Circuit Breaker with Current Limitation Capability for Aviation Application," 2023 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Orlando, FL, USA, 2023, pp. 318-323.
- S. K. Dam, **Zhou Dong**, et al., "Experimental Evaluation of Cryogenic Performances of Electronic Components for Signal Isolation in Medium Voltage Power Converters," 2023 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Orlando, FL, USA, 2023, pp. 3196-3200.
- C. -H. Yang, **Zhou Dong**, et al., "Paralleling 650 V/150 A GaN HEMTs for Cryogenically Cooled Solid-State Circuit Breaker Applications," 2023 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Orlando, FL, USA, 2023, pp. 2520-2525.

- R. Ren, **Zhou Dong**, B. Liu and F. Wang, "Leakage Inductance Estimation of Toroidal Common-mode Choke from Perspective of Analogy between Reluctances and Capacitances," 2020 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, New Orleans, LA, USA, 2020, pp. 2822-2828.
- R. Ren, **Zhou Dong**, B. Liu and F. Wang, "Impedance-based Common-mode Inductor Design Approach Considering Frequency-dependent and Imaginary Permeability," 2020 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, New Orleans, LA, USA, 2020, pp. 2680-2686.
- R. Ren, **Zhou Dong**, and F. Wang, "Bridging Gaps in Paper Design Considering Impacts of Switching Speed and Power-loop Layout," 2020 *IEEE Energy Conversion Congress and Exposition (ECCE)*, Detroit, MI, USA, 2020, pp. 1992-1999.
- R. Ren, B. Liu, **Zhou Dong**, and F. Wang, "Current-bias Dependent Permeability of Powder and Amorphous Core Induced Unbalanced DM Impedance and Mixed-mode Noise," 2019 *IEEE Energy Conversion Congress and Exposition (ECCE)*, Baltimore, MD, USA, 2019, pp. 2873-2880.
- H. Gui, **Zhou Dong**, *et al*., "A Simple Control to Reduce Device Over-Voltage Caused by Non-Active Switch Loop in Three-Level ANPC Converters," *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, Anaheim, CA, USA, 2019, pp. 1337-1343.
- R. Chen, **Zhou Dong**, *et al*., "Core Characterization and Inductor Design Investigation at Low Temperature," *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, Portland, OR, USA, 2018, pp. 4218-4225.
- J. Xu, Z. Zhang, X. Chen, K. Xu, **Zhou Dong**, and X. Ren, "A helical air-core transformer with even current distribution for VHF converters," 2018 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, San Antonio, TX, USA, 2018, pp. 2249-2255.
- Z. Xu, Z. Zhang, K. Xu, **Zhou Dong**, and X. Ren, "2-MHz GaN PWM isolated SEPIC converters," 2017 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Tampa, FL, USA, 2017, pp. 149-156.
- X. Zou, Z. Zhang, **Zhou Dong**, Y. Zhou, X. Ren and Q. Chen, "A 10-MHz eGaN FETs based isolated class-Φ2 DCX," 2016 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Long Beach, CA, USA, 2016, pp. 2518-2524.
- Y. Zhou, Z. Zhang, X. Zou, **Zhou Dong**, and X. Ren, "A 10-MHz isolated class-Φ2 synchronous resonant dc-dc converter," 2016 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Long Beach, CA, USA, 2016, pp. 73-78.

PATENTS & PATENT PENDING

- S. Zhao, **Zhou Dong**, C. Xu, and L. Ravi, “Modular DC SSCB topology with capacitive voltage clamping circuits in cascaded submodules” Patent Pending.
- **Zhou Dong**, G. Chavan, C. Xu, A. Patni, and P. Cairoli, “Coordination between SSCBs using band-to-band current limiting control” Patent Pending.
- A. Patni, G. Chavan, **Zhou Dong**, and C. Xu, “Multipurpose intelligent gate driver for short-circuit and fault-current-limiting applications” Patent Pending.
- G. Chavan, **Zhou Dong**, C. Xu, T. Strassel, and P. Cairoli, “Fault current limiting SSCB using series-connected semiconductor switches” Patent Pending.
- G. Chavan, **Zhou Dong**, C. Xu, and P. Cairoli, “di-dt sensor for fast detection of short circuit faults with solid-state circuit breaker” Patent Pending.
- B. Kevin, F. Wang, **Zhou Dong**, S. Dam, and J. Yang, “Ultra-light tightly-integrated modular solid-state circuit breaker” Patent Pending.

- **Zhou Dong** and F. Wang, “Method & apparatus for controlling a current,” Patent Pending.
- **Zhou Dong**, Y. Zhou, Z. Zhang, X. Ren, and F. Yu, “Driving method of gallium nitride transistor, driving circuit thereof, and flyback 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. 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.