

Fei Song

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RESEARCH INTERESTS

My research interests lie in **power electronics (PE)** and **power management (PM)**. I mainly focuses on the design and improvement of monolithic hybrid switched-capacitor topologies, power delivery systems with large conversion ratios, gate drivers, RF envelope tracking, and energy harvesting power supplies.

WORK EXPERIENCE

Tsinghua University

Full-time Research Assistant

Beijing, P.R.China

June 2025 – Now

EDUCATION EXPERIENCE

University of Macau

Master of Philosophy (M.Phil.) of Microelectronics, GPA: 3.56/4.0

Macau SAR, P.R.China

Aug. 2022 – June 2025

University of Electronic Science and Technology of China

Bachelor of Optoelectronic Information Science and Engineering, GPA: 3.67/4.0

Chengdu, Sichuan, P.R.China

Sep. 2018 – June 2022

PUBLICATIONS

- [1] **F. Song**, S. Han, R. P. Martins, and Y. Lu, “A 1.52-w capacitor-drop sigma-floating-sc ac/dc converter for grid power to iot devices,” *IEEE Journal of Solid-State Circuits*, pp. 1–11, 2025.
- [2] S. Han, **F. Song**, Z. Zhu, X. Wu, H. Jiang, T. Ren, and Y. Lu, “A lego-like easy-stacking step-up sc converter with ultra-high and wide vcr using all input-stress-only devices,” in *2025 IEEE Custom Integrated Circuits Conference (CICC)*, 2025, pp. 1–3, doi: 10.1109/CICC63670.2025.10983382.
- [3] **F. Song**, S. Han, R. P. Martins, and Y. Lu, “An 85-to-230vac to 3.3-to-4.6vdc 1.52w capacitor-drop sigma-floating-sc ac-dc converter with 81.3% peak efficiency,” in *2025 IEEE International Solid-State Circuits Conference (ISSCC)*, vol. 68, 2025, pp. 1–3, doi: 10.1109/ISSCC49661.2025.10904504.
- [4] **F. Song**, Y. Zhang, and J. Zhang, “Optimization of cnn-based garbage classification model,” in *Proceedings of the 4th International Conference on Computer Science and Application Engineering*, ser. CSAE '20. New York, NY, USA: Association for Computing Machinery, 2020, doi: 10.1145/3424978.3425089.

PROJECT EXPERIENCE

A segment-quantity-match minimized-ripple SITO converter

May 2025 - Now

- Wait for the next 180nm BCD MPW.

A non-cross-regulation fast-transient SIMO converter

Oct. 2024 - Now

- Fabricated in a 180nmBCD process and under measurement.

A slope-fitting SITO converter for AMOLED displays

Oct. 2024 - Now

- Fabricated in a 180nmBCD process and under measurement.

An 85-230VAC input and 3.3-4.6VDC output AC-DC converter

Oct. 2023 - Oct. 2024

- A Sigma-Floating-SC topology is proposed to achieve 81.3% peak efficiency and 1.52W maximum output power.
- Up to 10% increased efficiency over a large load current range, compared with prior works.
- The design is fabricated in a 180nmBCD process and the manuscript has been accepted by ISSCC 2025.

Ultra-light-weight multi-chip easy-stacking step-up SC DC-DC converter

Oct. 2023 - Oct. 2024

- The design is proposed to convert 5V voltage to 30V, 70V, and 150V to drive electrostatic and piezoelectric (PZT) actuators.
- The proposed topology combines local drivers and level-shifters together without bootstrap capacitors to reduce the driver loss.
- The design is fabricated in a 180nmBCD process and the manuscript has been accepted by CICC 2025.

- A fast-transient response single-input-multiple-output DC-DC converter** *Sep. 2022 - Oct. 2023*
- The design utilize an auxiliary capacitor stacked with the input power source to increase the inductor charging speed and thereby improve the transient response.
 - Collaborated with 3Peak INCORPORATED.
- Low-power, high transient response LDO design without off-chip capacitors** *Nov. 2020 - Aug. 2021*
- Developed a bandgap with 1.2V voltage reference and 50nA current reference, whose power consumption was less than 200nW, in the temprature variation range of -40 to 125 degrees celsius.
 - Developed a circuit of super positive feedback and self-bias amplifier, with static power consumption of 3-7uA and high bandwidth of 80M-160MHz.
 - Won the first prize of National University Student Integrated Circuit Innovation and Entrepreneurship Competition in Southwest Devision (2021).
- Smartphone-based Analysis of Non-destructive Apple Brix Measurement** *Apr. 2021 - Aug. 2021*
- Designed an optical system using Zemax OpticStudio to achieve Czerny-Turner Spectroscope structure using a positive (converging) lens, two spherical mirrors, a blazed grating and a linear CCD.
 - Designed a CCD driver board including a Xilinx FPGA, a Toshiba linear CCD, a high-speed and high-precision ADC and so on to capture light spectra and transmit digital spectra data to smart phones.
 - Programmed verilog HDL codes on Xilinx FPGA to drive CCD and ADC, besides communicating with smart phones by USB protocol.
 - Won the second prize of National University Student's Opt-Sci-Tech Competition (2021).
- Intelligent Biological Microscope** *Apr. 2020 - July. 2020*
- Designed a multi-method of resizing and merging limited images under microscope to make up a full cell image.
 - Migrated M2Det algorithm to suit the blood cell recognizing, segmentation and counting.
 - Developed a dataset of blood cells with five classification including neutrophils, lymphocytes, monocytes, eosinophils and basophils.
 - Won the first prize of National University Student's Opt-Sci-Tech Competition (2020) and the first prize of China-U.S. Young Maker Competition in Chengdu Division (2020).
- Intelligent Device to Protect Children left in Cars** *Apr. 2019 - July. 2019*
- Designed a multi-model network merged by AgeNet and Yolo-v2 to detect children left in cars.
 - Used sensors such as temperature and humidity sensor, Oxygen sensor and AIoT to send data to private servers.
 - Programmed a mobile app to receive warnings sent by servers to remind children's guardians of the states in cars about their children.
 - Won the third prize of National University Student's Opt-Sci-Tech Competition (2019).

HONORS & AWARDS

- First Prize of National University Student Integrated Circuit Innovation and Entrepreneurship Competition in Southwest Devision, 2021.
- Second Prize of National University Student's Opt-Sci-Tech Competition, 2021.
- First Prize of National University Student's Opt-Sci-Tech Competition, 2020.
- First Prize of China-U.S. Young Maker Competition in Chengdu Division, 2020.
- Third Prize of National University Student's Opt-Sci-Tech Competition, 2019.
- Third Prize of National Undergraduate Engineering Training Integration Ability Competition in Sichuan Province Division, 2019.

LEADERSHIP EXPERIENCE

- Excellent President of Application Electronics Association** *Sep. 2019 – Sep. 2021*
Organized lectures and competitions about electronic design and program.
- Member of UESTC Linux User Group** *July 2020 – July 2021*

TECHNICAL SKILLS

Circuit Design: Mixed-Signal Integrated Circuit Design, Printed Circuit Design
Programming Languages: Verilog HDL, Verilog-AMS, C for Embedded System, Python, Matlab
Developer Tools: Cadence (eg. Virtuoso, Innovus), FPGA IDE (eg. Vivado, Diamond, Quartus.), MDK-ARM, STM32CubeIDE