

Haoquan (Tony) Zhang

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Summary

I am a Senior Hardware Engineer at Google working on Wireless Charging for Pixel phones after receiving my PhD from MIT, focusing on power electronics. I have a proven track record prototyping, developing and testing high performance dc-dc and dc-ac converters from on-chip energy harvesters to Qi wireless receivers to rf plasma generators. My work has landed in mass-produced phones, two US patents, and seven first-authored publications at top conferences and journals.

Education

Massachusetts Institute of Technology

Cambridge, MA

Ph.D. in Electrical Engineering and Computer Science (GPA: 5.0/5.0)

Sep. 2022

M.S. in Electrical Engineering and Computer Science (GPA: 5.0/5.0)

Feb. 2019

Advisor: Prof. David J. Perreault

The University of Hong Kong

Hong Kong

B.Eng. in Electrical Engineering (GPA: 4.03/4.3)

Jun. 2016

Skills

- Circuit Design and Simulation (LTSpice, Simplis, Cadence Virtuoso), FEM Simulation (Maxwell, FEMM), PCB Design, MATLAB, Python, Bash, EE Lab Equipment (Oscilloscope, Network Analyzer, Signal Generator, DC Load/Source)

Work Experience

Senior Hardware Engineer, Power Specialist

Google LLC

Manager: Dr. Liang Jia (liangjia@google.com)

Aug. 2022 - Present

- Directly responsible individual for Pixel 9 wireless charging to be launched in 2024. Promoted in H1 2024.
- Worked with vendors and internal cross-functional teams over product development cycles to ensure on-time delivery, reliable charging functions, and stellar user experience.
- Example daily responsibilities include charging coil design, IC vendor downselection, prototype system bring-up, IC firmware and software driver development and validation, performance issue root-causing, layout and system integration improvements, charging speed and thermal performance optimizations etc.

Analog Design Engineer Intern

Texas Instruments - Kilby Labs

Manager: Dr. Yogesh Ramadass (yogesh.ramadass@ti.com)

May 2019 - Aug. 2019

- Completed design of a fully functional, capacitively-isolated dc-dc converter IC test-chip ready for layout.
- Performed theoretical analysis in MATLAB, system-level simulations in Simplis, and transistor-level simulations in Cadence Virtuoso. Designed analog blocks including LDOs, DLLs, Bandgap References, Oscillators, Power MOSFETs and Drivers, Power-on Reset circuitry, etc., with extensive Monte-Carlo and PVT verification.
- Co-authored US patent (11/817,779).

Selected Research Experience

On-Chip DC-DC Energy Harvester for Advanced Solar Cells

U.S. Department of Energy ARPA-E

Advisor: Prof. David J. Perreault (djperrea@mit.edu)

Sep. 16 - May 19

- Designed, laid-out, taped-out, and tested a chip, functioning as a multi-input single-output dc-dc converter with MPPT control for photovoltaic applications, in TSMC 130-nm CMOS technology.
- Worked cross-functionally with optical design and cell-fabrication teams on system optimization.
- Designed transistor-level analog function blocks, including Op-Amps, Oscillators, Bandgap References, Comparators, Power MOSFETs and Drivers, Control Logic, etc.

DC-to-RF Power Amplifiers for Plasma Generation

MKS Instruments Inc.

Funding Director: Dr. Aaron Radomski (Aaron.Radomski@mksinst.com)

Sep. 19 - Sep. 22

- Designed, prototyped and tested a 5 kW dc-to-rf power generation system at 13.56 MHz.
- Proposed and implemented a novel system architecture with high efficiency, fast dynamic responses, and very wide power range for industrial plasma generation in semiconductor processing.
- Designed compact form-factor rf power combiner network with high efficiency and controlled impedance variations critical to achieving the target power ranges.
- Co-authored US patent (11/667,773).

- **Wireless Power Transfer System with Position Sensing Capabilities** The University of Hong Kong
Advisor: Prof. Ron S. Y. Hui (ron.hui@ntu.edu.sg) May 2015 - May 2016
 - Designed and tested a multi-receiver WPT system, with positioning technique by current sensing and triangulation.
 - Performed FEM and circuit simulations, designed and tested inverters and coils with tuning capacitors.
 - Awarded 1st-place in departmental capstone project presentation.

Selected Publications and Patents

- **Modeling of Duty Cycle Mode Voltage Ringings in Wireless Power Transfer Systems**
Haoquan Zhang, Liang Jia, Yanchao Li, Srikanth Lakshmikanthan
IEEE Applied Power Electronics Conference and Exposition (APEC), Feb. 2024 (**Best Presentation Award**)
- **A High-Power Non-Isolating RF Power Combining Network based on Transmission Lines**
Haoquan Zhang, Grace Cassidy, Alexander S. Jurkov, Ky Luu, Aaron Radomski and David J. Perreault
IEEE Journal of Emerging and Selected Topics in Industrial Electronics (JESTIE), Nov. 2023
- **Modeling and Design of High-Power RF Power Combiners Based on Transmission Lines**
Haoquan Zhang, Grace Cassidy, Ky Luu, Alexander S. Jurkov, Aaron Radomski and David J. Perreault
IEEE Applied Power Electronics Conference and Exposition (APEC), Mar. 2022 (**Best Presentation Award**)
- **Multi-Inverter Discrete Backoff: A High-Efficiency, Wide-Range RF Power Generation Architecture**
Haoquan Zhang, Anas Al Bastami, Alexander S. Jurkov, Aaron Radomski and David J. Perreault
21st IEEE Workshop on Control and Modeling for Power Electronics (COMPEL), Nov. 2020
- **Comparison of Radio-Frequency Power Architectures for Plasma Generation**
A. Al Bastami, Haoquan Zhang, Alexander S. Jurkov, Aaron Radomski and David J. Perreault
21st IEEE Workshop on Control and Modeling for Power Electronics (COMPEL), Nov. 2020
- **A CMOS-Based Energy Harvesting Approach for Laterally-Arrayed Multi-Bandgap Concentrated Photovoltaic Systems**
Haoquan Zhang, Konstantin Martynov, and David J. Perreault
IEEE Transactions on Power Electronics (TPEL), Jan. 2020
- **A CMOS-Based Energy Harvesting Approach for Laterally-Arrayed Multi-Bandgap Concentrated Photovoltaic Systems**
Haoquan Zhang, Konstantin Martynov, Duanhui Li, and David J. Perreault
IEEE Energy Conversion Congress and Exposition (ECCE), Sep. 2019
- **A Power Management Approach for Laterally-Arrayed Multi-Bandgap Concentrated Photovoltaic Systems**
Haoquan Zhang, Konstantin Martynov, Duanhui Li, Ruitao Wen, Jurgen Michel, and David J. Perreault
IEEE Photovoltaic Specialists Conference (PVSC), Jun. 2019 (**Best Student Presentation Award**)
- **Radio-Frequency Power Generator and Control Method**
Haoquan Zhang with David J. Perreault, Anas Al Bastami
U.S. Utility Patent 11/667,773, May. 2023
- **Power Transfer Over an Isolated Capacitive Barrier with Controlled Current**
Haoquan Zhang with Ashish Kumar, Yogesh Ramadass
U.S. Utility Patent 11/463,000, Oct. 2022

Selected Awards and Achievements

- Best Presentation Awards: IEEE PVSC, 2x at IEEE APEC 2019, 2022, 2024
- Analog Devices Inc. Outstanding Student Designer Award 2018
- Williamson Prize (Top Engineering Graduate, 1/1500), The University of Hong Kong 2016
- HKU Foundation Scholarships for Outstanding International Students, The University of Hong Kong 2012-2016

Volunteer and Services

- Peer Reviewer (TPEL, TIE, JESTPE, JESTIE, TMTT, APEC, PVSC etc.) 2019 - Present
- MIT Microsystems Annual Research Conference - Platform Chair Jan. 2020
- HKU Beyond the Pivot Inner Mongolia Program - Volunteer Teacher Jun. 2013