# **Alex Hanson**

ajhanson@utexas.edu

EDUCATION	Massachusetts Institute of Technology (MIT), Cambridge, MA	
	<ul> <li>Doctor of Philosophy (Ph.D.) in Electrical Engineering</li> <li>Thesis: Enabling Miniaturized Grid-Interface Power Conversion</li> <li>Advisor: Professor David Perreault</li> <li>Cumulative GPA: 5.0/5.0</li> </ul>	Sep 2016 – Jun 2019
	<ul> <li>Master of Science (S.M.) in Electrical Engineering</li> <li>Thesis: Enabling HF Power Conversion: Magnetic Components and a Wide Voltage Range Converter</li> <li>Cumulative GPA: 5.0 / 5.0</li> </ul>	Sep 2014 – Jun 2016
	Dartmouth College, Hanover, NH	
	<ul> <li>Bachelor of Engineering (B.E.) in Electrical Engineering</li> <li>Thesis: Fabricating On-Chip Magnetics for Power Conversion</li> <li>Advisor: Professor Charles Sullivan</li> <li>Highest Honors, Tau Beta Pi</li> <li>Engineering GPA: 3.92 / 4.00</li> </ul>	Sep 2010 – Jun 2014
	<ul> <li>Dual Bachelor of Arts (B.A.) in Engineering Sciences and Physics</li> <li>Phi Beta Kappa, John S. Tamagni 1956 Scholarship</li> <li>Cumulative GPA: 3.89/4.00</li> </ul>	Sep 2010 – Jun 2014
INDUSTRY EXPERIENCE	FINsix, Menlo Park, CA - Design Engineering Intern	Jun 2016 – Aug 2016
	<ul> <li>Designed high-bandwidth current transformer for IC characterization</li> <li>Designed components for lifetime test setup for 20 kW of installed power</li> <li>Implemented setup and procedure for other tests</li> </ul>	
	Linear Technology, North Chelmsford, MA - Design Engineering Intern	Jul 2014 – Sep 2014
	<ul><li>Designed discrete-level realization of novel wireless power control scheme</li><li>Experimentally characterized and improved the system</li></ul>	
	Domain Surgical, Salt Lake City, UT - Design Engineering Intern	Dec 2011 – Mar 2012
	<ul><li>Benchmark, validation, and QC testing for novel electrocautery system</li><li>Helped design and prototype a cleaning tool for electrocautery tips</li></ul>	

PUBLICATIONS JOURNAL

(\* = SUPERVISOR)

- [J6] S. Lim, A.J. Hanson, J.A. Santiago, D.J. Perreault, "Bus Converter Using Isolation Capacitance for ZVS and Invariant Operation" in *IEEE Journal on Emerging and Selected Topics in Power Electronics (JESTPE)* (Accepted)
- \*[J5] **A.J. Hanson**, A.F. Martin (Co-First Author), D.J. Perreault, "Energy and Size Reduction of Grid-Interfaced Energy Buffers Through Line Waveform Control" in *IEEE Transactions on Power Electronics (TPEL)* (Accepted)
- \*[J4] R.S. Yang, A.J. Hanson, B.A. Reese, C.R. Sullivan, D.J. Perreault, "A Low-Loss Inductor Structure and Design Guidelines for High-Frequency Applications" in *IEEE Transactions on Power Electronics (TPEL)* (Accepted)
- [J3] D.V. Harburg, A.J. Hanson, J. Qiu, B.A. Reese, J.D. Ranson, D. Otten, C.G. Levey, C.R. Sullivan, "Micro-Fabricated Racetrack Inductors with Thin-Film Magnetic Cores for On-Chip Power Conversion" in *IEEE Journal of Emerging and Selected Topics in Power Electronics* (*JESTPE*), vol. 6, no. 3, pp. 1280-1294, Sept. 2018
- [J2] **A.J. Hanson**, J.A. Belk, S. Lim, C.R. Sullivan and D.J. Perreault, "Measurements and Performance Factor Comparisons of Magnetic Materials at High Frequency," in *IEEE Transactions on Power Electronics*, vol. 31, no. 11, pp. 7909-7925, Nov. 2016

[J1] A.J. Hanson, C.A. Deline, S.M. MacAlpine, J.T. Stauth and C.R. Sullivan, "Partial-Shading Assessment of Photovoltaic Installations via Module-Level Monitoring," in *IEEE Journal of Photovoltaics*, vol. 4, no. 6, pp. 1618-1624, Nov. 2014

## **CONFERENCE (PEER REVIEWED)**

- \*[C11] A.F. Martin, A.J. Hanson, D.J. Perreault, "Energy and Size Reduction of Grid-Interfaced Energy Buffers Through Line Waveform Control," 2018 IEEE Workshop on Control and Modeling of Power Electronics (COMPEL), Padova, Italy, 2018, pp. 1-8
- \*[C10] B. Galapon, A.J. Hanson, D.J. Perreault, "Measuring Dynamic On Resistance in GaN Transistors at MHz Freuqencies," 2018 IEEE Workshop on Control and Modeling of Power Electronics (COMPEL), Padova, Italy, 2018, pp. 1-8
  - [C9] A.J. Hanson, D.J. Perreault, "A High Frequency Power Factor Correction Converter with Soft Switching," 2018 IEEE Applied Power Electronics Conference (APEC), San Antonio, TX, 2018, pp. 2027-2034
- \*[C8] R.S. Yang, A.J. Hanson, C.R. Sullivan, D.J. Perreault, "Design Guidelines for Low-Loss High-Frequency AC Inductors," 2018 IEEE Applied Power Electronics Conference (APEC), San Antonio, TX, 2018, pp. 579-586
- [C7] A.J. Hanson, P. Lindahl, S.D. Strasser, A.F. Takemura, D.R. Englund, J. Goldstein, "Technical Communication Instruction for Graduate Students: The Communication Lab vs a Course," *American Society for Engineering Education Annual Conference (ASEE)*, Columbus, OH, 2017
- [C6] A.J. Hanson, R.S. Yang, S. Lim, D.J. Perreault, "A Soft-Switched High Frequency Converter for Wide Voltage and Power Ranges," 2016 IEEE International Telecommunications Energy Conference (INTELEC), Austin, TX, 2016, pp. 1-8
- [C5] S. Lim, A.J. Hanson, J.A. Santiago-González and D.J. Perreault, "Capacitively-aided switching technique for high-frequency isolated bus converters," 2016 IEEE Applied Power Electronics Conference and Exposition (APEC), Long Beach, CA, 2016, pp. 98-105
- [C4] A.J. Hanson, J.A. Belk, S.Lim, D.J. Perreault and C.R. Sullivan, "Measurements and performance factor comparisons of magnetic materials at high frequency," 2015 IEEE Energy Conversion Congress and Exposition (ECCE), Montreal, QC, 2015, pp. 5657-5666
- [C3] A.J. Hanson, C.A. Deline, S.M. MacAlpine, J.T. Stauth and C.R. Sullivan, "Partial-Shading Assessment of Photovoltaic Installations via Module-Level Monitoring," 2014 IEEE Photovoltaic Specialist Conference (PVSC), Denver, CO, 2014
- [C2] D.V. Harburg, A.J. Hanson, Y. Song, J. Qiu, R. Tian, C.G. Levey, C.R. Sullivan, D. Otten, "Measured performance and micro-fabrication of racetrack power inductors," 2013 IEEE Energy Conversion Congress and Exposition (ECCE), Denver, CO, 2013, pp. 614-620
- [C1] J.Qiu, A.J. Hanson, C.R. Sullivan, "Design of toroidal inductors with multiple parallel foil windings," *Control and Modeling for Power Electronics (COMPEL)*, 2013 IEEE 14th Workshop on, Salt Lake City, UT, 2013, pp. 1-6

## PATENTS

[P1] D. J. Perreault, A.J. Hanson, S. Lim, and R.S. Yang. "Wide-Operating-Range Resonant-Transition Soft-Switched Converter" U.S. Patent Pending

## Microsystems Annual Research Conference (MARC), MIT

TEACHING/

MENTORING

- One of two co-chairs in charge of MARC, under the direction of the MTL director
- Normal duties include orchestrating abstract submissions, creating proceedings, securing keynote speakers, venue and finances, and website development with a  $\sim$ 20-student committee and MTL staff

 Discovered a departmental split among attendees/non-attendees and organized inclusion efforts for non-EECS groups

• Improved communication training in conjunction with the Communication Lab

## EECS Communication Advisor, MIT Communication Lab

 Mentored EECS graduate students to improve their communication skills for upcoming publications, presentations, etc.: 250+ appointments

- Designed and delivered multiple workshops on proposal writing and other tasks
- Helped design and implement a graduate-level course on professional communication,
- including academic papers, oral presentations, funding proposals, elevator pitches, etc.
- Authored a paper [C7] for the American Society for Engineering Education (ASEE) conference demonstrating the effectiveness of the Communication Lab
- Helped organize and develop curriculum for a one-week seminar for academics
- looking to adapt the Communication Lab model to their institutions: both 2017 and 2018
- Began partnerships with organizations within MIT, including the Center for Integrated Circuits and Systems and the MTL Annual Research Conference
- Served as Seminar Chair for the MTL Annual Research Conference (MARC 2018).
- Organized a pitch/poster workshop and liased with the Communication Lab

## Mentor to Undergraduate Researchers, MIT

- MIT 2018 Outstanding UROP Graduate Student Mentor Award
- Benjamin Cary, enabling large-scale HF core loss measurements through automation
- Noah Moroze, designing very high bandwidth current sensors

 Rod Bayliss, expanding characterization of HF magnetic materials and developing high-performance, high-power RF inductors

- Dayna Erdmann, in collaboration with the Buonassisi solar research group, developing high-efficiency circuits for innovative applications of solar energy
- Anna Song, expanding characterization of HF magnetic materials
- Andreea Martin, examining the purposeful use of harmonic input currents to reduce energy buffer requirements in power factor correction [C11],[J6]
- Bryson Galapon, measuring dynamic on-state resistance in GaN [C10]

• Rachel Yang, developing a wide-range high frequency converter, developing HF magnetic structures [C6],[C8],[J5]

Julia Belk, characterizing HF magnetic materials [C4],[J2]

## Laureates and Leaders Program, MIT

- Mentored undergraduates who are underrepresented in STEM and interested in pursuing graduate school
- Helped mentees navigate the decision to go to graduate school, preparing and applying, and difficult professional settings like unhealthy environments

## Teaching Assistant, Power Electronics (Graduate), MIT

- Developed curriculum and delivered two weeks of class sessions
- Normal duties included grading, office hours, in-class demos
- Student Evaluations: Median 7.0/7.0, Avg 6.8/7.0

## Summer Course Instructor, MIT High School Studies Program

- Designed and taught an introduction to calculus
- Designed and taught a lab-based introduction to digital electronics

May 2018 - Present

May 2015 - Present

#### Dec 2014 – Present

Jul 2015 - Aug 2017

Sep 2016 - Present

Feb 2018 - Jun 2018

	<ul> <li>Formal Teacher Training, MIT Teaching and Learning Lab</li> <li>Kaufmann Teaching Certificate Program</li> <li>Ed-Tech Teaching Certificate Program</li> <li>Introduction to Evidence-Based Undergraduate STEM Teacoupled with MIT-based learning community</li> </ul>	Jun 2015 – Dec 2016 Paching – Coursera course	
	<ul> <li>Teaching College-Level Science and Engineering – gradua</li> <li>Teaching Assistant, Introduction to Circuits, Dartmouth College</li> <li>Led laboratory sections, advised on final project work</li> </ul>	te course at MIT Jan 2014 – Mar 2014	
	<ul><li>Teaching Assistant, Digital Electronics, Dartmouth College</li><li>Led laboratory sections, advised on final project work</li></ul>	Jun 2013 – Aug 2013	
	<ul><li>Recitation Section Leader, Intro E&amp;M, Dartmouth College</li><li>Inaugural group to lead course material reviews on behalf</li></ul>	Jan 2013 – Jun 2013 of engineering department	
AWARDS	MIT Outstanding UROP Graduate Student Mentor	May 2018	
	<ul> <li>For exceptional guidance and teaching in a research setting</li> <li>Awarded to one individual across all of MIT</li> <li>Undergraduates nominate faculty, instructors, lecturers, graduate students and other research affiliates</li> </ul>		
	<ul> <li>Paul L. Penfield Student Service Award</li> <li>For exceptional service to the disciplinary community, the and the institute</li> <li>One student out of EECS department</li> </ul>	May 2016 department,	
	<ul> <li>William M. Portnoy First Place Prize Paper Award</li> <li>For [C4] at ECCE 2015</li> <li>One paper is chosen by the IEEE Industrial Applications S Power Electronic Devices and Components Committee</li> </ul>	Sep 2016 ociety (IAS)	
	<ul><li>Best Student Paper Finalist</li><li>For [C3] at PVSC 2014</li></ul>	Jun 2014	
INVITED TALKS	Power Ferrites: Evolving Needs in Materials and Manufacturing <ul> <li>International Conference on Ferrites (ICF 12)</li> </ul>	9 Oct 2019	
	Power Electronics - A New Landscape and its Impact on Research and Applications		
	<ul> <li>University of Illinois, Urbana-Champaign</li> <li>University of California, Los Angeles</li> <li>University of California, San Diego</li> <li>University of California, Berkeley</li> <li>Utah State University</li> <li>University of Texas at Austin</li> <li>Northeastern University</li> </ul>	Mar 2019 Feb 2019 Feb 2019 Feb 2019 Feb 2019 Feb 2019 Feb 2019 Feb 2019 Feb 2019	
	Advances and Impacts of Dower Magnetics Stanford University	Nov 2010	
	<ul> <li>On the magnetics bottleneck and recent efforts to address i</li> </ul>	100V 2018	
	Device Conversion of a System University of Device de	- I.1 2040	
	<ul> <li>On leveraging multi-level (component, circuit, architecture) and cross-level observations to improve power converter size and efficiency.</li> </ul>		