Renke (Richard) Han | PhD

Personal Webpage – https://renke-richard-han.github.io

Profile

More than Ten years cutting-edge experiences in power electronics design with both software and hardware. Profound understanding about global OBC/DCDC market trends at different regions. Experience with driving crossing function collaboration with multi-culture background. Strong business oriented mindset with good system understanding:

- Working and leading multi culture teams (Asian, European, African) for 10 years
- As OBC/DCDC/X-in-1 application owner reporting directly to head of product line with above 1B revenue
- Clear view about OEM/Tier 1s development trends and requirements for xEV, and being strongly involved in customer RFIs for OBC/DCDC, E/E architecture
- Familiar with power converter topologies: components selection, PCB design including both power and control circuitry, control algorithm
- Embedded firmware development: Digital controller design/implementation/validation with AURIX, STM32@STMicroelectronics, XMC@Infineon, C8051F352@Silicon lab
- CAD and simulation tools: Altium, LTspice, PLECS, SIMULINK/Matlab

Professional Experiences

Staff -> Senior Staff -> Principal Engineer - AURIX Product Definition and System Architect **2023.06 – present**
Automotive(ATV) ·Infineon Technologies AG ·Germany

Senior -> Staff System Engineer **2021.08 – 2023.05**
Green Industrial Power (GIP) ·Infineon Technologies AG ·Germany

Postdoctoral Research Associate **2018.11 – 2021.07**
Department of Engineering Science ·University of Oxford ·United Kingdom

Departmental Tutorship for Semiconductor Devices **2020.10 – 2021.07**
Department of Engineering Science ·University of Oxford ·United Kingdom

Visiting Scholar **2017.02 – 2017.08**
Automatic Control Laboratory ·École Polytechnique Fédérale de Lausanne ·Switzerland

Education

Ph.D. in Power Electronics Systems **2015.11 – 2018.10**
Department of Energy Technology ·Aalborg University ·Denmark

MA.Sc in Control Theory &Control Engineering **2013.09 – 2015.07**
GPA: 90/100, Ranking: 1/134
School of Information Science &Engineering ·Northeastern University ·China

B.Eng in Automation **2009.09 – 2013.07**
GPA: 88.8/100, Ranking: 14/270
School of Information Science &Engineering ·Northeastern University ·China

Experiences

System architect reporting directly to Head of AURIX Product Line above 1B revenue
xEV application: On-board charger + HV/LV DCDC, traction inverter *2023.06 – present*

- Next generation automotive MCU definition
  - Peripheral KPI definition including PWM resolution and special driving signal (eg: synchronous rectifier, single stage OBC driving signal for bidirectional switches), ADC sampling rate and accuracy, fast comparator and DAC (peak current mode control), bus architecture, core performance for real-time application
  - Competitor products features comparison (TI, Renesas, NXP) and fighting guides generation
- Strongly customer engagement in EMEA and GC (on-site technical promotion, tech-day, RFI response)
  - Success G2M strategies (theoretical/simulation proof) for AURIX as solid enough product with system benefit
  - System level BOM cost optimization for customers (different scenarios comparison)
- As a technical stakeholder and project manager leading innovation projects (20 people projects)
  - Real time junction temperature estimation for traction inverter using AURIX TC4xx parallel process unit
  - New OBC + DCDC architecture by using one MCU, validation through hardware-in-loop setup
  - Firmware development for 3.7kW single stage OBC
  - White paper generation

Industrial Reference Design and Digital Service
Industrial application *2021.08 – 2023.05*

- 22kW General Purpose Motor Drive
  - https://www.infineon.com/cms/en/product/evaluation-boards/ref-22k-gpd-inv-easy3b/
- IGBT power module real-time status monitor
  - Thermal impedance fitting, digitization, uC implementation on XMC and associated tool suite development on Matlab
  - Firmware development for power loss calculation with Junction temperature calculation embedded with motor control
- Flyback auxiliary power supply design (100 W, input DC link voltage 650V, output voltage: 15V and 24V)
- Signal chain design print circuit board design for several applications: T-sense module, Vce saturation measurement

Project: Robust Extra Low Cost Nano-Grids for developing world
Funded by UK Engineering and Physical Sciences Research Council (EPSRC) *2018.08 – 2021.07*

- Develop scalable 12-200V, 300W multi-port isolated DC-DC power converters for PV-battery system
  - Topology and passive components selection, high frequency magnetic components design;
  - Embedded coding including communication(UART/I2C/SPI), measurement(ADC, Op-amp), digital control, Li-ion battery charge/discharge, cells balancing and protection strategies on STM32;
  - Construct Nanogrid prototype demonstration with converters, ten 240Wh li-ion batteries, 7.2kWh lead-acid batteries;
  - Design qualification control tests including measurement accuracy, safety, reliability;
- Coordinate and communicate with industrial (Tropical Power Cooperation) and academic (Cardiff University) partners
- On-the-ground experience deploying 10 designed converters to one village in Africa providing normal life electricity

Project: Pure software solution for power line communication (UK patent)
Funded by University of Oxford and Oxford Innovation Institute *2020.06 – 2021.03*

- Amplitude modulation achieving 2 kbps communication with only 8 kHz sampling frequency using the frequency band above control bandwidth but below sampling frequency
- Pure software modulation and demodulation with Manchester Encoding

Consultant Project: 5kW inductive Charger for Electrical Vehicle
Funded by University of Oxford *2020.09 – 2020.11*

- Analysis and simulation for weak coupling transformer and its equivalent circuit
- Characteristics analysis about tuned LCL circuit including LCL load resonant converter and secondary pickup circuit
- Calculation about max current through transformer winding and max power transfer capacity providing guideline for practical design

Awards and Prizes

Representative (1/7) of University of Oxford, Global Young Scientist Summit ·Singapore *2021.01*
IEEE ECCE Travel Grants ·Cincinnati ·US *2017.10*
Best Oral Presentation at IEEE 42nd IECON ·Florence ·Italy *2016.11*
Outstanding Master Thesis at Provincial-level ·China *2015.06*
Outstanding National Scholarship ·China *2014.06*

Other Experiences

Member of the IEEE Power Electron., and Ind. Electron. Societies *2015.11–*
President of Chinese Students and Scholars Association, Denmark *2016.02 - 2017.08*

Skills

Proficient: Altium Designer, PLECS, C language, AURIX, TI C2000, STM32F103, LTspice, Eagle
Language: Chinese (Native), English (Business Level), German (B1)

Selected Top Publications

1 UK patent, 15 Journal Papers (5 as first author in IEEE Transactions on Power Electronics, Power Systems, Industry Application), 9 Conference Papers (oral presentations)
Google Scholar Citations: 2058, **H-index:** 16 **i10-index:** 20

1 **R. Han** and D. J. Rogers, "Zero-additional-hardware power line communication for dc–dc converters," *IEEE Transactions on Power Electronics*, vol. 37, no. 11, pp. 13 107–13 118, 2022.

2 **R. Han**, L. Meng, J. M. Guerrero, and etc, "Distributed nonlinear control with event-triggered communication to achieve current-sharing and voltage regulation in dc microgrids," *IEEE Transactions on Power Electronics*, vol. 33, no. 7, pp. 6416–6433, 2018.

3 E. Shelton, **R. Han**, D. Rogers, J. Carter, L. Louco, M. Beadman, and P. Palmer, "Comparison of fast switching high current power devices," in *PCIM Europe digital days 2021; International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management*, 2021, pp. 1–8.