

sierra@ilovepowerelectronics.com



Sierra Rae

SKILLS

Switching power supply design in systems delivering up to 2000A and 99% efficiency. Control loop design including DSP/digital loop compensation and deadbeat control. Hysteretic voltage and current control loop design. Full bridge, Half bridge, Quasi-resonant, ZVS, ZCS, LLC, Flyback, Buck, and Boost topologies. Soft switching, resonant, and forced commutation SMPS design for very high efficiency. Extensive knowledge of Si, SiC, and GaN semiconductors and gate drivers. Photovoltaic (solar power) system and power conversion design. Battery charging and battery management system design. Maximum power point tracking (MPPT) for PV arrays. Shade tolerant solar power systems. Ultra low power system design for mobile and wearable electronics. Expert knowledge of LTSpice and experience with QSpice, Tina, and PSpice. PCB Layout Expert.

RF and microwave circuit design up to 24GHz. PCB layout in 8+ layers for digital and RF circuits. RF cascade/signal chain analysis and design. Class-E RF power amplifier design up to 100W.

EMC compliance including conducted and radiated emissions in RF systems and switching power supplies. "Spur Hunting". FCC Class A and B compliance.

Basic knowledge of C, C#, Java, and Python. Android experience including Bluetooth communication. Embedded systems and microcontroller design experience. FPGA and CPLD gateware synthesis including timing analysis. Altera and Lattice.

Named inventor on two pending patents. Extensive knowledge of Electronic Test equipment - Oscilloscopes, VNAs, loads, Spectrum Analyzers, DMMs etc.

SOFTWARE

KiCAD, Altium Designer, Sonnet EM simulation, FEMM, LTSpice, TI Tina, QSpice, FreeCAD, Android studio, MPLab, FreeCAD, Git. Linux and Windows.

EXPERIENCE

Company Name On Request, Bay Area – *Principal Power Electronics Engineer*

March 2022 - Present

- Designed switching power supplies for solar power conversion (SEPIC, Fullbridge, Buck, Boost, LLC).
- Designed PCBs for compact high efficiency switching power supplies with planar magnetics including digital control and wireless communication.
- Owned the design of a 450W LLC converter with >97% peak efficiency.
- Worked alongside engineering team to innovate new topologies to solve shading problems in solar applications.
- Custom magnetics design including simulation of Litz and ferrite structures in FEMM.

Company Name On Request – RF Engineer

June 2010 – June 2020

- Designed microwave circuits up to 24GHz for receivers and downconverters.
- Designed printed circuit boards of up to 8 layers with Rogers/fiberglass hybrid stackups.
- Complete redesign of a 6GHz spectrum analyser including parts selection, signal chain analysis, LO design, and PCB layout. R04350B material.
- Troubleshooting of circuits and systems including EMC compliance issues.
- Complete design of a 12GHz down-converter including LO.
- Designed RF sniffer probes, antennas, and accessories for spectrum analysers. Transimpedance amplifier design for high speed optical receivers. Filter and antenna characterization including open air testing of printed antennas.

Consulting Work and Research Projects

Circa 2000 – Present

- Fully functional Micro TIG Welder with Android tablet interface. This project consists of a 2000A arbitrary current sink and all required DSP logic to control it. The power stage is a polyphasic interleaved buck converter with current mode control. Also designed a fast mechanical fail-safe shutter system for use with a microscope for user safety.
- Artificial mains AC source including arbitrary waveform generation. 400V peak output at 10A. Touch screen user interface. DSP control loop for output. <1% THD delivered into highly nonlinear loads. Topology is PFC -> ZVS full-bridge -> interleaved buck (current mode).
- Hysteretic current mode control Forced commutation DC to AC inverter for 3kW continuous power. Very low harmonic distortion. FPGA digital control logic implementation.
- Various power electronic circuit designs for Tesla coils including resonant full bridges and hysteric voltage control for buck converters.
- Various electromagnetic levitation devices including a repulsive levitator. Complete electrical and mechanical design including PC USB interface for real-time control.
- Electrical impedance tomography AC current source and data acquisition system design for medical research. USB interface.
- Designed and built a complete CNC gantry milling machine capable of reaching 0.001 inch repeatability. Ball screws and linear guideways throughout. The base is a slab of granite and the gantry is welded steel.
- 100W Class-E plasma excitation system for toroid generation in Xenon.

EDUCATION

School Name On Request – BS EE

July 2009 – May 2014

Earned a BS in Electrical Engineering with a concentration in control systems.

Minor in mathematics. GPA 3.79.