



Tim Williams

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Objective

Consultation and Contract work. Analog, digital or power electronics. Design, review, layout, electromagnetic compliance (EMC) testing, and more.

Experience and Talent

- Expert in circuit design; analog, digital and power electronics; electromagnetic compatibility; and more.
- Quick learning, analytical problem solving, communication, teaching
- Numerous personal projects exemplify an understanding of control systems, power electronics, wideband and RF circuitry, etc.
- More information available at:
Seven Transistor Labs: <https://www.seventransistorlabs.com>
Upwork profile: <https://www.upwork.com/freelancers/~01b09763cc3fd93b81>

Projects

Via Consultation—Highlights

- Jun Innovations (Sept 2021), dual buck module: design updates.
- Precisionary Instruments (Aug 2021), review and improvement of automatic microtome machine.
- IoTank (Apr 2021), analog capacitance sensor.
- Dematic (Feb-Oct 2020), MCC conveyor system. Hardware design of industrial networking and control systems for automated warehouse control, using proprietary SoC. Ethernet, RS-485 and CAN interfaces.
- Eaton (Mar-May 2019), Form 7 Recloser control. EMC assistance. Comprehensive review of system EMC response, culminating in minor schematic changes and a complete rip-up and re-layout of the power supply PCBs, dropping emissions by over 20dB. Identified simple fixes, improving ESD immunity from under 500V to over 10kV.
- Jun Innovations (Jan-Mar 2019), dual buck module. High efficiency converter, CC/CV analog control, digitally programmable.

- Liquid Controls LLC (2018), fuel-metering register, IO expansion board. Received existing customer design, reviewed and optimized. New PCB layout. Wide-common-mode-range 24-bit ADC channels show noise floor comparable to datasheet. Meets automotive standards.
- Rite-Hite Products Corp. (2014, 2017, etc.). Migration of old designs from PADS to Altium. Maintenance updates. New design of IO/network interface board.
- Google Inc. (2017-2018), [AI Quantum](#). Design of 250W capacity, multi-output converter, with emphasis on low noise. Integration into backplane. Created two new standards, and the necessary test fixtures to execute them.
- Eaton (2017), fault circuit indicator. Redesign of test stand. Review of existing IP, application of EM field theory.
- Sullair LLC (2016). Prototypes supporting software design; control and IO boards. Meets industrial standards.
- Fluid Management, HEA project (primarily for the [Accutinter 8000 Elite](#) line) (2015-2016). Comprehensive review of existing IP; schematic and PCB design. Close coordination with mechanical and software design teams. First try passed EMC.
- Natus Medical, [neoBLUE compact](#) (2014). ISO 13485 controlled project. Power supply design and PCB layout. First try passed EMC.
- TotalTrax, [Sky-Trax Project](#) development (2014). Design of CPU unit, IO modules and power supply. Meets rigorous automotive (environmental and EMC) standards.
- Bumblebee Batteries, LLC (2014). Design of Prolong Intelligent Discharger.
- Bumblebee Batteries, LLC (2013). Battery testing power supply, phase interleaved SMPS, 0-20V $\pm 60A$, dual channel. Novel analog control with selectable CC/CV operating modes.

Personal Projects

- Reverb Effect Box (Apr-Oct 2020). 12-bit, 25kS/s DSP effects system, designed around Atmel/Microchip XMEGA MCU (8-bit, 32MHz). Written primarily in C, assembler optimizations yielded approximately triple performance.
- Induction Heater Power Supplies (2019). Redesign of original 1kW model; high frequency and higher power models in development.
- Active Load (2018). Electronic load, 400V 5A range, digitally programmable.
- Current-Limiting Fuse (2017). 30V 20A rating, bidirectional. Two-terminal series or three-terminal buck mode operation, 150ms fault withstanding.
- Electronic Fuse (2014). 30V 8A rating, response as fast as $3\mu s$.

Early Studies

- Theremin. Synth instrument, designed from scratch (2013). Project page: <https://www.seventransistorlabs.com/Theremin/index.html>
- Electrolysis power supply. 5V 100A capacity, digital control, LCD interface. MSOE capstone project (2012).
- Induction heater power supplies. Design, construction and sale of 1kW model, as kits and finished units; complete design of 10kW unit (2008-2010).

Equipment and Capabilities

- Altium Designer® schematic capture, SPICE simulation, PCB design
- Tektronix TDS 460, DSO, four channels, 350MHz bandwidth, 15kPt memory
- Hewlett-Packard HP8590A Spectrum Analyzer, 1.5GHz, 80dB dynamic range, 1kHz-3MHz RBW, digital controls, sweep, averaging, peak, etc.
- Wavetek 193 20MHz Sweep/Modulation/Generator: 1mHz to 22MHz, 9 ranges; auxiliary 1Hz to 300kHz, four ranges; sine, triangle, square, adjustable duty cycle; FM, sweep, AM and DSB-SC; 15V output, 0-70dB attenuator
- EMC tools: wideband LNAs and power amplifiers, FCC Part 15-compliant LISN, CISPR 22-compliant ISN, 6-channel 20MHz 30A LISN, TEM horn antenna, ground plane.

Computer Skills

Programming Languages

- JavaScript
- Java
- C
- BASIC
- MATLAB

Assemblers

- x86 (MASM)
- AVR
- Z80

Schematic Capture and PCB Design

- Altium
- Multisim / Ultiboard

Documentation

- HTML / CSS
- L^AT_EX
- Doxygen
- JavaDoc
- Word, Excel

Education

- Bachelor of Science Electrical Engineering, Milwaukee School of Engineering, 2008-2011, GPA 3.6
- Bachelor of Art Physics, Beloit College, major in Physics, 2005-2008, GPA 3.2

Work History

- Seven Transistor Laboratories LLC, Cudahy, WI. Founder, 2015-. Contract design services.
- Creation Technologies, Oak Creek, WI. Electrical Engineer (on contract), December 2013-. Various tasks, including schematic capture, PCB layout and EMC work.
- Radyne Corporation, Milwaukee, WI. Power Electronics Engineer, December 2010 to August 2013. Design of cutting-edge induction heating power supplies: power electronics, control systems, mixed signal interfaces, high speed data systems.
- Woodward Governor Company, Rockford, Ill. Summer internship, 2006 and 2007. Equipment Services: repair of electronic and electromechanical equipment.