Elliot Brooks

Prosper, TX
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Work Experience

Senior Principal Electrical Engineer

Raytheon Technologies - Dallas, TX
December 2018 to Present

Vehicle based power system: Designed and implemented 1.2kW distributed power system drawn from vehicle power (MIL-STD-1275D/E). Design included buck boost converter and controls. Did schematic capture, placement, build and test.
Satellite power system architect: Architecture and trade studies for a multi-kilowatt satellite power system.
DC-DC Converters: Designed and analyzed board-level DC-DC converters in support of Xilinx SOCs and microcontrollers, including power sequencing and layout issues.
Generator Modelling and Control: Modelled a 7kW 3-phase generator with all parasitics and controls in Spice and Saber. Designed a matching control board, including a 270VDC bus full bridge driver. Specified the software control algorithm using a type 3 digital compensator and DSP methods.
Subject Matter Expert: Served as subject matter expert for the department overseeing design teams on several projects in the areas of analog circuits, power electronics, and electronics for space applications.

Lead Electrical Engineer

Terran Orbital - Irvine, CA
September 2016 to November 2018

Developed the main processor board for space-based applications. All new design based on a dual-ARM core Zynq SOC, includes DDR3 SDRAM, GigE transceiver and switch, USB 2.0, I2C, SPI, LVDS, FRAM, eMMC, SD Card, multiple UART channels. Includes custom DC-DC conversion for multiple supply rails from a 12V bus.
UART Transceiver: Converted multiple UART channels between CMOS levels and RS-422 for space application.
Lithium Battery Controller. Controls charging and discharging of Lithium battery packs. Protection of over charge and over discharge, current limiting. Cell-by-cell telemetry and balancing. MSP430 for communications. Remote boot load over UART circuit. Core control system had to run on 50uA maximum supply current.
Maximum Power Point Tracker (MPPT), 4 Versions: Designed space-based MPPT DC-DC converters to interface between a 9-60V solar panel and 12V (2 versions), 33V, and 66V lithium battery busses, up to 400W. Each type uses an MSP430FR controlling a full custom buck-boost converter. Detailed simulation of constant-current control of inputs and outputs under steady-state and transient conditions. Thermal modelling and simulation.

Liaison

Quantum Technologies - Lake Forest, CA
January 2015 to September 2016

Lake Forest, CA

Senior Control Systems Engineer
January 2015 to September 2016
150kVA Inverter. Developed the gate driver board for one of the most powerful commercially available electric motor drives. Designed on Altium, including 3D mechanical models.
Automotive Hydrogen Fuel Dispenser System. Lead development engineer for a hydrogen car fueling station. Main control modules programmed in Matlab/Simulink. Developed a stand-alone IrDA / SAE J2799 parser module using embedded C running on an MSP430F5529 processor. Developed modules interconnecting analog, CAN, and serial controls.

Senior Development Engineer

SureFire LLC - Fountain Valley, CA
May 2004 to January 2015

Lithium Battery Chargers. Designed complete 3,4, and 6 cell lithium battery chargers for automotive and line voltage applications, including all required safety circuits. Thermal protection. Controlled by PIC micro controllers and mixed signal control circuits.
LED Lighting. Worked on a wide variety of LED lighting ballasts.
HID Arc Light Ballasts. Designed the power, control, and high voltage ignition circuits for a series of 100W portable arc lights. Interfaced to automotive power. Designed hardware, laid out PCBs, wrote all firmware in C for PIC18F.
RF Control Systems. RF remote control and communications system for military applications. Transmitter module, and several receiver modules for various applications. 900MHz and 2.4GHz versions. Used nRF2401 RF transceiver and MSP430F1232. Very low power battery operated system. Designed original patch and PCB antennas. Managed a small development team of direct reports for this project.
Digital and Analog I/O System. This system was used for controlling a variety of boards and subsystems. A/D and D/A conversion and digital I/O controlled by a PIC18F, mostly via I2C bus. Several different versions were developed.
Thermal Analysis. Developed sophisticated thermal models for heat transfer and cooling for PCB mounted power LEDs in aluminum enclosures. Model included heat flow model through PCB vias and laterally through the multi-layer PCB, with convection and radiation cooling of the aluminum case. Implemented in MathCad and Spice.

Development Engineer

Cardiac Science Inc - Lake Forest, CA
October 2003 to May 2004

Responder 2000. Designed the ECG section of this defibrillator system, a joint venture with GE Medical. Low noise analog amplifiers, filters, slew detectors, A/D converters; digital circuits and Motorola MCore processor, isolated DC/DC power converter. Design was completed successfully in the first PCB version.

Senior Development Specialist

LIEBERT EMERSON NETWORK POWER - Irvine, CA
August 1996 to October 2003

Emerson Network Power / Liebert Corporation Irvine, CA

Senior Development Specialist
August 1996 to October 2003
STS2 Static Transfer Switch Family. A complete family of Static Transfer Switches, 200 to 600V, 100 to 1000A per phase, 3-phase. A completely new design. I conceived the product, wrote the initial specifications, developed all of the control algorithms, filed a large patent to cover many new DSP

algorithms for high-speed AC power detection and control, sold it to management, built the team, and delivered the product successfully. The design emphasized ease of manufacturability, minimum cable harnesses. No single points of failure, exceeds 2+ million hours MTBF. Used a triple redundant control logic set, implemented in redundant FPGAs, designed and implemented using the VHDL design language. Developed in close consultation with key clients to make sure that the unit met expectations for ease of installation and use. An extremely successful product, with total sales so far approaching $1 Billion.
30/40/50kVA S3 Series Uninterruptible Power Supply family. All high-frequency PWM, PFC, with front panel display.
Desktop Static Switch Family. Developed a family of small very low cost transfer switches for HP/Compaq OEM sales. Patented a new algorithm for the rapid <2mSec detection of single-phase AC signal levels. Low cost of $60 to $200 each. Met aggressive 6-month development schedule.
Also managed cross-functional teams of 8-15 direct reports for these programs.

Education

BS in Electrical Engineering
CalTech - Pasadena, CA