Scott Homan

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CompletePCB.com | PCB Design Engineer

Altium Designer license holder

As a professional printed circuit board designer since 2009, I specialize in using Altium Designer to deliver manufacturable and reliable PCB fabrication and assembly files as a contractor and at times as a W2 employee.. I thrive in a team environment with ambitious collaborative goals, while pushing the latest technology to the limits. With input from many engineers and informed by many industries, I've developed a robust checklist system to catch issues early and to efficiently and accurately design rapid prototype PCBs as well as mission critical production hardware. I am known for doing a significant amount of the engineering.

Clients & Contracts

2009-Current

- RelativitySpace.com 3D printed reusable rocket for small to medium satellite launches ***2025***
  - Primary engine controller & power flight electronics design
- Kernel.com (HI - Human Intelligence) (neuroscience full-head coverage neuroscience) ***2019–2025***
  - **FLUX - OP-MEG** - (Optically Pumped Magnetometer - Magnetoencephalography)
    - Full head coverage, to read EMF emanating from neural activity, outside of the skull, in real time, at the quality of MRI, fMRI technology in a real world setting for scientific research, not medical. Multiple patents with my contributions
    - Wearable system electronics, magnetically sensitive copper
    - Johnson-Nyquist noise sensitive
    - Close collaboration with ME and physics leads for thermal conduction, weight, elaborate rigid-flex design,
    - Gas chamber thermal heater design
    - FPGA analog to digital sensor data processing, rack mount, full-system hardware design in cylinder package for earth magnetic field shielding
    - Real-time, room sized, Earth magnetic field rejecting coil ceiling & walls
    - Physics tool creation
    - Backplane system architecture, lots of timing considerations
    - https://thehealthhorizon.com/showcases/innovations/e3a58a47-16ed-444a-9ee9-a4ec0a91994f
  - **FLOW - TDfNIRS** https://www.kernel.com/technology
    - Quality Assurance of gen 1 hardware
    - Gen 2 - I lead a team to redesign our flagship helmet, fixing all identified gen 1 problems with a complete ground up redesign of physical and electrical hardware for: weight, comfort, data accuracy, optical & laser sensor position,

EEG functionality, aesthetics, rigid-flex circuit protection, lightweight coil position for unique head shape sensor position validation
        - ASIC wafer substrate for BGA and wire-bond attachment & encapsulation

- **Little Squiggle** *(dissolvable FR4 equivalent substrate)* ***2024***
    - *Full EE design ownership and artwork*
    - *UNO arduino clone*
    - *Sustainable toy company, full lifecycle consideration - manufacturing to landfill*
- **Barber Nichols Inc.** ***2015-2019***

(ISS cooling pump, rocket 3 phase controller, airforce, navy, aerospace, automotive, HC & HV power, FPGA control)

    - United Launch Alliance (ULA - Boeing & Lockheed Martin)
        - Redundant 3-phase motor controller for new rocket
    - ARL (Applied Research Laboratories) *(DoD)*
    - Dynetics
    - Space Micro
    - Ford
        - hybrid 3-phase charging
    - US Navy
        - Torpedo power supply generator vintage replacement for 80s hardware
    - Zodiac Aerospace (France)
        - flight HV 3-phase motor controller
- **Liqid**
    - *Data center server hardware - high speed data 8-16Ghz*
- **Colorado Power Electronics** *(satellite)*
    - NASA
        - HV trigger
- **Blue Canyon Technologies** *(satellite)*
    - *Solar array deployment*
        -

- Leader Technologies *modular rapid prototyping hardware designs, FPGA*
    - Western Digital
        - USB 3.0 prototyping 2009
    - RadioMetrix
    - Canadian Royal Air Force
    - Digital Mosaic Inc
    - Fresenius
        - Mission critical state machine control for blood cleansing (kidney service)
    - Radio Metrix
- Rough Country Consulting LLC *(consulting PCB designer)*
    - Phase3 Technologies
    - Data911
- Golden Gate Graphics *consulting PCB designer*
    - Ingenium Care
        - hospital communications StarTrek communicator installation

Skills

- PCB design
  - Industries:
    - Neuroscience, ECO friendly, IPC Class 3 for aerospace, MIL-STD specifications required for DoD, temperature and shock & vibe standards for automotive industry, mission critical for medical industries, scientific instrumentation
  - Experience with:
    - HV clearances (to 1400V), differential pairs, impedance control for data integrity and high speed (8-16Ghz) data, communication protocols: I2C, CAN, RS232 and similar, matched length pairs and high-speed buses, FPGA fine-pitch BGA fanout and capacitance, clock pairs, transmission lines, tightly controlled return paths, custom footprints, footprint checking, rule driven design, rigid-flex folding boards, multi-board stacking designs, op-amps, RF design, Bluetooth, Boolean algebra, individual gates (NAND), state machines
  - Power:
    - GaN 30Kw 3-phase 400V design, Silicon Carbide (SiC MOSFET) 40A 270V design, Silicon FET 40A 28V design, snubber networks, IGBT, HV & HC, power conversion: AC>DC, DC>AC, balanced gate-drive signal pairs, up to 270kHz SiC switching frequency, conductive thermal management for spacecraft, fluid & conductive thermal management for Earth-craft
- Schematic capture
  - error checking, following company standards and industry best practice, symbol library setup for clean error-free migration to .PCBdoc file, compile settings for error detection, blankets for PCB rule use, hierarchy structure, schematic sheet re-use, parameter manager for BOM completion, ECO use for accurate changes
- Database library creation and management
  - schematic symbols, PCB footprints with 3D models for accuracy, obsolescence
- Placement & routing feasibility trade-off/studies
  - mockups including polygons for current, suggestions and solutions for fitment, part re-select, beating the unknown out of the internet
- Layer stackup
  - 2-16+ layers, split planes, polygon fills/cut-outs, data buses with appropriate reference return paths, high weight copper for top and bottom high-current paths, trenching for high-voltage and standard clearances following IPC standards, high speed data using minimal drills per trace and back drilling, EMF protection, Faraday cage, minimized impedance and impedance control, thermal conductive solutions
- Writing design rules
  - creating rule classes, setting up rule standards, blanket and .RUL use, batch and online rule setup for one time placement and routing
- Component package selection
  - rad hard, communication, power density to size, single event effects, saturation, high voltage, switching speeds, corner frequency, mixed technologies, ADC, DAC, current sense, MUX, discretes, planar and toroidal inductors, thousands of package types, SMD, through hole, N0G, X7R, X8R, Q ratings, reliability data, obsolescence, etc.

- Component placement
    - "Ideal component placement" method, using Altium "Union" blocks to move groups of pre-routed components, "rooms" for reuse,, playing Tetris
    - Working closely with mechanical & electrical teams to quickly find creative packaging solutions to achieve any number of requirements
    - DRAM, CPU, FPGA and required bypass caps, power supplies, mixed analog and digital groups
- Release documentation for fabrication and assembly
    - NC Drill/Slot, Gerber, Pick and Place, BOM, Assembly drawings
- Collaboration to continually improve process
    - CONDR/PRD/CDR, concept to product process flow, ECO standards, release method
- Rapid prototyping test fixtures for new technologies
- Following manufacture datasheets for best practice and optimal copper routing/cutouts for each component and placement
- Maintaining and evaluating latest offerings from Altium and related software, Mentor Graphics
- Training and education
    - teaching team members, sharing methodology, teaching tool features, creating how-to videos for efficient design methods/tricks-of-the-trade

Companies & Products

Barber Nichols Inc. **2015-2019**

Arvada, CO

- 3-phase blower for International Space Station (ISS) 28VDC 40A silicon
- Military underwater vehicle - 3-phase motor controller, 270 VDC, 40A, 1.2KV AC
- United Launch Alliance (spacecraft) - 3-Phase HV GaN transistor motor controller 30KW, 1KW plus 4 low power motors (6 board system with A:B unit redundancy for space flight)
- US Navy - Virginia Class submarine torpedo relay redesign of 1980s tech (10 boards)
- Zodiac Aerospace (France) - motor controller (3 boards) 270V, 30A
- Ford automotive - motor controller (4 boards) 270V, 30A

Blue Canyon Technologies **2014-2017**

Boulder, CO

- Communication Satellites - Solar Array deployment power boards (3 Boards)

Liqid **2015**

Lafayette, CO

- Altium Library management
- Kingston Solid State, Half Height, Half Length PCI card (HHHL) - Fastest IOPS in the industry
- 16Ghz+ Circuit design - Composable Infrastructure Flagship Datacenter system

Rough Country Consulting, LLC **2014-2016**

Loveland, CO

- Rigid Flex design - (4 boards, 3 polyimide ribbons) - Wearable tech for industry
- 3Phase Technologies - Design Rework for Revision
- Data911 - Design Rework for Revision

Colorado Power Electronics **2012**

Fort Collins, CO

- NASA - Gen 3 Ignition Switch - arc prevention - footprint and copper pour updates to eliminate stress concentrators/arc points
- Database Altium Library management

Leader Technologies **2009-2011**

Louisville, CO

- Western Digital DDR3 test fixture for, then future, USB3.0 HDD (1 Rogers board)
- Fresenius - prototype board set (17 boards) PMOD modular technology, I2C

Education

MSU Metropolitan State University **2010-2012**

Electrical Engineering
Denver, CO

MCTC **2004-2006**

Digital Imaging + Analog & Digital Photography
Minneapolis, MN

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