



fidus
innovate • design • deliver



Redesign to get around your component shortage issue. **Fast. Fix. Fidus.**

COMPONENT SHORTAGE DESIGN SERVICES BOOKLET

With the chip and component shortage crisis wreaking havoc on supply chains in all sectors, engineering and operations teams have options: look for alternative design elements or parts that can work just as good or better.

But your teams are already overloaded, let us help: we can provide a turnkey or staffing solution to seamlessly extend your team.

COMPONENT SHORTAGE ISSUES: THE REALITY IS NOW

There has been much discussion and speculation of how this worldwide pandemic would affect businesses globally, and in particular, the electronics product and manufacturing industries. Now, over a year later, with almost all supply chains being affected, electronic component shortages are impacting research and development cycles as well as product shipments:

- Longer lead times in PCB fabrication shops
- ICs (fixed function) — shortages on capacitors
- FPGA, CPU, MCU shortages
- Hardware issues due to last minute design adjustments
- Migration tasks for part swap outs
- Firmware and software patch application and verification

DON'T WAIT.

Keep your product shipping

- Scrub your BOM and identify the quickest, lowest-risk path to redesign
- Identify suitable, low-risk substitutes for your component shortages
- Optimize your design to target a new stack-up
- Analyze potential alternatives to minimize design impacts
- Eliminate your dependence on high-risk single-sourced chips and ICs
- Fit-form-function replacements: search, qualify, and test
- Port or re-target your design with a different speed, capacity, package or device
- Improve supply chain robustness with a new selection of creative alternates

Redesign to get around your component shortage issue. **Fast. Fix. Fidus.**

HARDWARE DESIGN SERVICES

SIGNAL INTEGRITY DESIGN SERVICES

PCB LAYOUT DESIGN SERVICES

FPGA DESIGN SERVICES

WE ARE SPECIALISTS IN CREATIVE ENGINEERING DESIGN SOLUTIONS.

Fidus offers turnkey design and staffing services to help you:

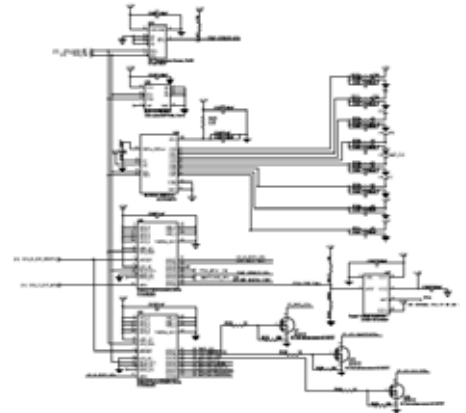
FPGA | PCB Layout and IC Packaging | Hardware | Signal and Power Integrity
Embedded Software | Wireless | Mechanical and Thermal | UVM Verification | ASIC



Hardware Design

TAKE ADVANTAGE OF OUR HARDWARE DESIGN

EXPERTISE — analog, digital, optical — we invest in and train on the world's best hardware design tools. And for design bring-up and proving, our labs are outfitted with leading edge equipment to get your design done right, the first time.



Your teams are facing unique challenges, and we understand — too many projects and too few engineering resources. And that's not all. Designing for your complex prototype or product requires deep technical knowledge as well as thoughtful consideration and planning. Bottom line, you need to meet your roadmap schedule, and with Fidus as an extension of your team, you will get there, and get it right the first time.

HOW WE HELP

Delivering solutions at the speed of your business.

After more than 20 years, 3,000 projects and 400 customers, we've learned how to transform your idea, vision or concept into the product you've imagined. That's because we know how to take complex problems, and design and deliver them against dynamic environments and tight deadlines.

Your project needs the right team and the right toolset with a rigorous process to deliver on your capability and capacity challenges. At Fidus, we become a seamless extension of your team, with a clear focus and commitment to getting your design or prototype to market faster.

Our hardware design teams are equipped with an impressive breadth of knowledge paired with hands on experience — this ranges from simple, cost effective projects to high performance embedded systems with high reliability requirements. We deliver designs that frequently utilize the world's largest FPGAs, complex microprocessors, 100Gbps ASSPs, high-end data converters, multiple high-speed memory interfaces and complex power sub-systems.

That's not all! Our hardware design teams' skills are well complemented by our PCB layout, FPGA/DSP, signal integrity, embedded software, and mechanical design expertise.

Extend your team — you choose how we work together.

Design projects have many elements, all of which are in your control when

you work with Fidus. Do you want to hand off the whole project or just find a few people to supplement your staff? Looking for project management to keep you informed and the project on track? Our breadth of expertise, creative team structures, and flexible payment options allow a customized service that works for you:

- **Turnkey design services:** Plan and execute with our team for an end-to-end development solution, or choose anything in between to suit your requirements.
- **Staffing services:** Utilize a design expert at your virtual or physical location, for the length of your project, or for a targeted engagement.

DESIGN EXPERTISE

- Entire design cycle from system architecture to low-level design
- Complex designs combining analog, digital, RF, power
- 32Gbps+ designs built with robust signal integrity strategies
- FPGAs (CPLD, SoC, MPSoC, RFSoc), DSPs, microprocessors, discrete designs
- Low-power/battery applications, power sequencing
- High current, high voltage isolation from low voltage logic
- Embedded system design and development
- Simulation, optimization, and verification
- Timing budget calculations and analysis
- Component obsolescence and cost reduction analysis
- EMI, EMC, ESD, RoHS compliance
- Regulatory approval identification and design strategies

TOOLS FOR HIGH-END DEVELOPMENT

Design and Simulation: Cadence®, Mentor Graphics®, Altium®, Agilent ADS, ANSYS HFSS™, MATLAB® and Simulink®, LTSPICE®

Verification: Network Analyzers, Vector Signal Generator, Signal Analyzer, RF Signal Generators, Spectrum Analyzers, Electronic Loads, Four-channel high-speed oscilloscopes, Thermal Chamber, Logic Analyzer, Soldering Stations, Programming Pods, etc.

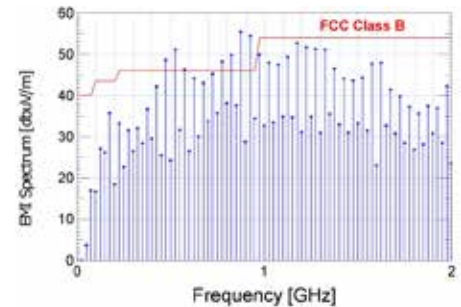
EXAMPLES OF OUR WORK





Signal Integrity

TAP INTO THE EXPERIENCE OF OUR SIGNAL INTEGRITY (SI) AND POWER INTEGRITY (PI) TEAMS — ensuring your high-speed project is properly modeled and constrained to achieve the maximum performance to cost ratio. The right tools, systems models, and interpretation of results and verification are all part of the rigorous process you can expect from us, ensuring your project is done right, the first time.



Your teams are facing unique challenges, and we understand — too many projects and too few engineering resources. And that’s not all. Designing for your complex prototype or product requires deep technical knowledge as well as thoughtful consideration and planning. Bottom line, you need to meet your roadmap schedule, and with Fidus as an extension of your team, you will get there, and get it right the first time.

HOW WE HELP

Delivering solutions at the speed of your business.

After more than 20 years, 3,000 projects and 400 customers, we’ve learned how to transform your idea, vision or concept into the product you’ve imagined. That’s because we know how to take complex problems, and design and deliver them against dynamic environments and tight deadlines.

Your project needs the right team and the right toolset with a rigorous process to deliver on your capability and capacity challenges. At Fidus, we become a seamless extension of your team, with a clear focus and commitment to getting your design or prototype to market faster.

Help up the performance of your product with our signal and power integrity teams. And they will dig in and advise you on optimum topologies for emerging memory technologies, interconnects within complex computing platforms (PCIe Gen 4), Interlaken systems (12.5Gbps links), FPGA transceivers (58G and 112G PAM4), and complex layer stacks using next generation laminates with buried capacitance to support the latest FPGA’s and ASIC’s.

That’s not all! Our signal integrity design teams’ skills are well complemented by our PCB layout, FPGA/DSP, hardware, embedded software, and mechanical design expertise.

Extend your team — you choose how we work together.

Design projects have many elements, all of which are in your control when you work with Fidus. Do you want to hand off the whole project or just find a few people to supplement your staff? Looking for project management to keep you informed and the project on track? Our breadth of expertise, creative team structures, and flexible payment options allow a customized service that works for you:

- **Turnkey design services:** Plan and execute with our team for an end-to-end development solution, or choose anything in between to suit your requirements.
- **Staffing services:** Utilize a design expert at your virtual or physical location, for the length of your project, or for a targeted engagement.

DESIGN EXPERTISE

- Fidus delivers SI, PI, and EMC analysis for on-chip IC design, package design, PCB-level, and system design
- Layer stack-up, hybrid technologies, via, and net topology design
- Capabilities and experience 32.75Gbps (NRZ) to 56 Gbps (PAM4)
- IBIS, IBIS-AMI model simulations, including Power Aware IBIS v5.0
- Pre-layout, during layout, and post-route, high-speed signal integrity analysis and simulation for verifying signal quality, reducing signal reflections, increasing timing margins, reducing crosstalk, enhancing power integrity through cost effective decoupling design, simultaneous switching noise (SSN) reduction and reducing conducted and radiated emissions
- Expertise in high-speed memory interfaces (DDR4 and DDR5)
- Shield designs for both compliance and sensitive signal preservation

TOOLS FOR HIGH-END DEVELOPMENT

Fidus maintains licenses for:

Agilent® ADS, ANSYS® HFSS™, Cadence® Sigrity, Mentor Graphics® HyperLynx®, Cadence PSpice®, Synopsys® HSPICE®

RF laboratory equipment: Agilent® Network Analyzer, Agilent Vector RF/Signal Generator, Agilent PXA Signal Analyzer, Agilent Electronic Loads, Spectrum Analyzers, multi-channel oscilloscopes to 40 GS/S

EXAMPLES OF OUR WORK

Power integrity

- Design for meeting target impedance or noise level
- Optimize PCB stackup for power distribution
- Optimize number and location of decoupling capacitors
- SSO noise reduction

High-speed memory interfaces

- DDR4, DDR5, GDDR6 memories and modules

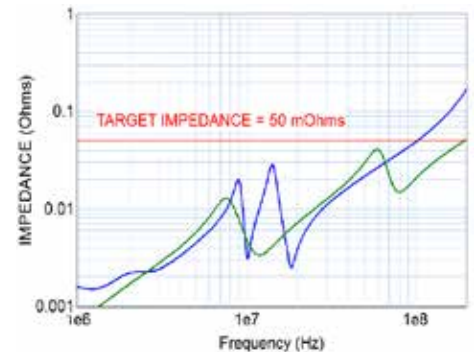
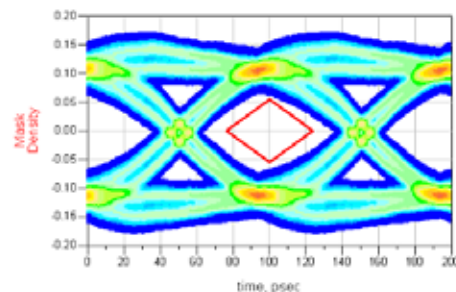
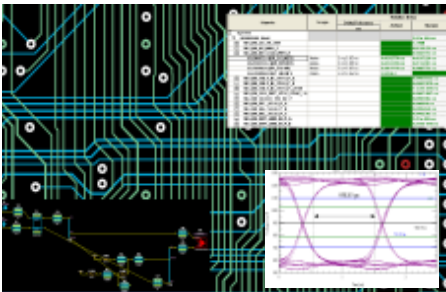
- Cross talk reduction
- Topology templates and routing guidelines
- Pre- and post-route simulation
- Dynamic timing verification

SerDes design and optimization

- Experience with 56Gbps PAM4 designs
- Link budgets
- Interconnect optimization
- Pad compensation
- s-parameter and eye diagram simulation
- Pre-emphasis and equalization

System design

- Power, grounding, decoupling and filtering analysis
- 28Gbps SFP+ and QSFP+ Cable adapter modules
- High-speed backplanes
- Multi-gigabit serial links
- 3D heat sink and enclosure modeling for EMI

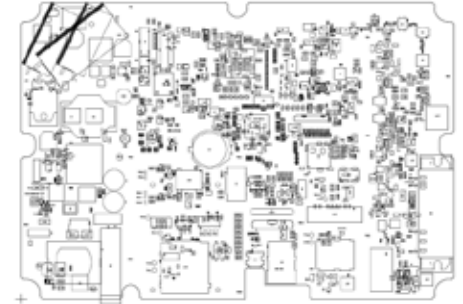




PCB Layout

OUR PCB LAYOUT TEAM HITS THE HIGHS:

High-speed, high frequency, high complexity, high layer counts, and high performance dielectrics! From simple standalone boards to very thick, high-speed, mixed technology, back drilled backplanes — we will find a creative solution to make it work.



Your teams are facing unique challenges, and we understand — too many projects and too few engineering resources. And that's not all. Designing for your complex prototype or product requires deep technical knowledge as well as thoughtful consideration and planning. Bottom line, you need to meet your roadmap schedule, and with Fidus as an extension of your team, you will get there, and get it right the first time.

HOW WE HELP

Delivering solutions at the speed of your business.

After more than 20 years, 3,000 projects and 400 customers, we've learned how to transform your idea, vision or concept into the product you've imagined. That's because we know how to take complex problems, and design and deliver them against dynamic environments and tight deadlines.

Your project needs the right team and the right toolset with a rigorous process to deliver on your capability and capacity challenges. At Fidus, we become a seamless extension of your team, with a clear focus and commitment to getting your design or prototype to market faster.

Working with our PCB Layout team means not having to worry about DFM/DFA rules, high-speed routing, high-current routing, and layer stack-ups. We'll take care of it all to ensure a high-yield and CM agnostic design. From 2 layer consumer products to 40+ layer multi-gigabit backplanes with complex laminates and stack-ups, you're in good hands with our IPC recognized layout designers (CID/CID+). And since Fidus attracts a variety of industries and customers, our teams have cultivated creative problem solving expertise, ensuring projects are efficiently planned and cost effective.

That's not all! Our PCB layout design teams' skills are well complemented by our hardware, FPGA/DSP, signal integrity, embedded software, and mechanical design expertise.

Extend your team — you choose how we work together.

Design projects have many elements, all of which are in your control when you work with Fidus. Do you want to hand off the whole project or just find a few people to supplement your staff? Looking for project management to keep you informed and the project on track? Our breadth of expertise, creative team structures, and flexible payment options allow a customized service that works for you:

- **Turnkey design services:** Plan and execute with our team for an end-to-end development solution, or choose anything in between to suit your requirements.
- **Staffing services:** Utilize a design expert at your virtual or physical location, for the length of your project, or for a targeted engagement.

DESIGN EXPERTISE

Designations: Our designers have CID/CID+ accreditation

High Density Interconnect (HDI):

Microvia/stacked microvia, blind and buried, via-in-pad, fine-line, buried capacitance

High-speed: 28Gbps+ serdes, DDR3/4/5 memory interfaces

RF/wireless/analog: 24GHz+, including, 2.4GHz and 5GHz, printed antennas, other printed elements, sensitive signal handling

Impedance control: Single ended, differential

PCB types: Rigid, Flex, Rigid-Flex

PCB materials: FR4, Polyimide, high speed/low loss dielectrics, (Megtron 6/7), hybrid constructions (e.g. FR4/Rogers), RoHS

Layer counts: 2 to 40+ layers

Layer stacks: Custom layer stacks for signal integrity

Constraint driven placement and routing: Net topology and scheduling, absolute and relative propagation delay matching, limiting parallelism to avoid crosstalk, package pin delays, phase matching and back drilling, etc.

Signal Integrity: Pre and post-route analysis and simulations to increase timing margins, reduce reflections, and reduce EMI, fiber weave effect mitigation

Power Integrity: Capacitor placement, plane assignment, dielectric thickness, and simultaneous switching noise (SSN) optimizations, current carrying and thermal analysis/strategies

Layout/Mechanical integration: Component interference checking

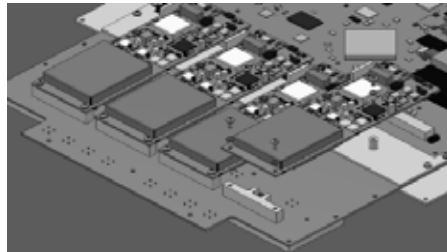
DFx: Balancing cost, yield, and DFM/DFA/DFT

TOOLS FOR HIGH-END DEVELOPMENT

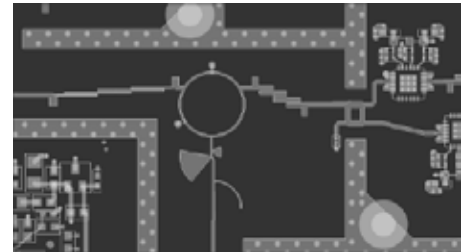
PCB Layout: Cadence®, Altium®, Mentor® (Expedition and PADS)

PCB Signal Integrity: Agilent ADS, ANSYS HFSS™, Cadence® Allegro PCB SI SPECCTRAQuest), Cadence PSPICE®, Synopsys HSPICE®, Mentor Graphics HyperLynx®

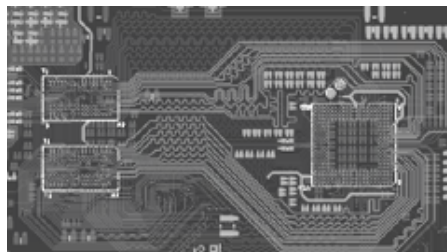
EXAMPLES OF OUR WORK



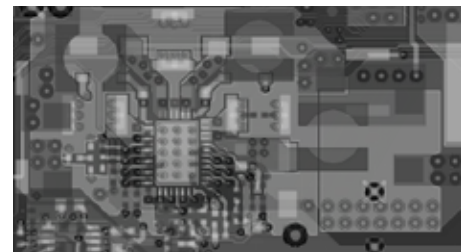
Full CCA and mechanical integration



RF/Wireless design and routing



High-speed memory layout DDR3/4/5, EMI etc.



Conscientious power placement, fan-out, and routing



FPGA Design

UTILIZE OUR EXTENSIVE EXPERIENCE IN FPGA DESIGN FROM LOW-COST CPLDS RIGHT UP TO THE LARGEST FPGAS IN THE WORLD.

Your teams are facing unique challenges, and we understand — too many projects and too few engineering resources. And that's not all. Designing for your complex prototype or product requires deep technical knowledge as well as thoughtful consideration and planning. Bottom line, you need to meet your roadmap schedule, and with Fidus as an extension of your team, you will get there, and get it right the first time.

HOW WE HELP

Delivering solutions at the speed of your business.

After more than 20 years, 3,000 projects and 400 customers, we've learned how to transform your idea, vision or concept into the product you've imagined. That's because we know how to take complex problems, and design and deliver them against dynamic environments and tight deadlines.

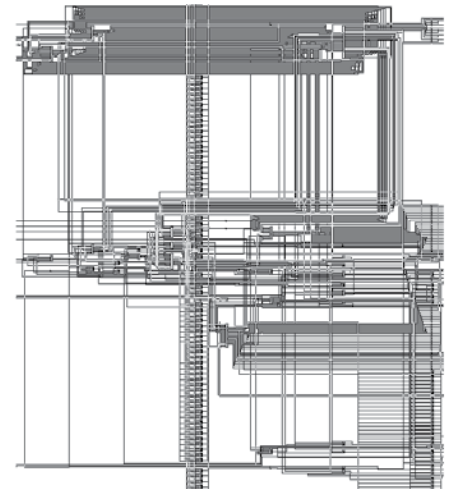
Your project needs the right team and the right toolset with a rigorous process to deliver on your capability and capacity challenges. At Fidus, we become a seamless extension of your team, with a clear focus and commitment to getting your design or prototype to market faster.

Being a Xilinx® Premier Design Services member means that we are trained and adept at selecting and implementing the most advanced Xilinx devices and tool flows. And since Fidus attracts a variety of industries and customers, our teams have cultivated creative problem solving, ensuring projects are efficiently planned and cost effective.

That's not all! Our FPGA design teams' skills are well complemented by our hardware, PCB layout, signal integrity, embedded software, and mechanical design expertise.

Extend your team — you choose how we work together.

Design projects have many elements, all of which are in your control when you work with Fidus. Do you want to hand off the whole project or just find a few people to supplement your



staff? Looking for project management to keep you informed and the project on track? Our breadth of expertise, creative team structures, and flexible payment options allow a customized service that works for you:

- **Turnkey design services:** Plan and execute with our team for an end-to-end development solution, or choose anything in between to suit your requirements.
- **Staffing services:** Utilize a design expert at your virtual or physical location, for the length of your project, or for a targeted engagement.

DESIGN EXPERTISE

Turnkey: FPGA design, verification, and documentation solutions

Device selection: Identifying the best device to get the job done

Device retarget: Helping you migrate from one FPGA to another

Languages: Verilog®, VHDL, SystemVerilog, HLS

Xilinx advanced tool flows: Vitis®, SDNet™, Partial Reconfiguration, HLS, IDF, AMP, SDSoC™, MatLab®, Simulink®, System Generator for DSP™

Intel® advanced tool flows: SoC Embedded Development Suite

ASIC-to-FPGA Conversion: Replacing low-volume or discontinued ASICs with low cost FPGAs

ASIC prototyping in FPGAs: De-risking ASIC developments by first implementing the design in one or multiple FPGAs

High performance computing: Tensor Processing Unit, ML, AR/VR

Multi-Gigabit Serial Links: PCIe® Gen4, JESD204, Aurora

Memory Interfaces: NVMe, HBM, DDR4, SRAM, LPDDR, etc.

Communication Protocols: OTN, CPRI™, TCP/IP, Ethernet, SONET/SDH, ATM.

Digital Signal Processing (DSP): Software Defined Radio (SDR), filters, echo-cancellation, 802.11 a/b/g wireless LAN, etc.

Video: 12G-SDI, DP, MIPI, HDMI, HDCP, image enhancement, scaling, overlay, PiP, soft-core processor engine with DMA interfaces, etc.

Experience with: Xilinx (UltraScale+™, UltraScale™, Kintex®, Virtex®, Zynq®, Artix®, Spartan®), Intel® (Stratix®, Arria®, Cyclone®), Lattice

TOOLS FOR HIGH-END DEVELOPMENT

Xilinx: Vitis, Vivado®, ISE®, PetaLinux

Intel: Quartus Prime

Embedded: Xilinx (MPSoC, ARM®, PowerPC®, MicroBlaze™, Linux on MicroBlaze, PicoBlaze™, Zynq, bare metal, EDK/SDK), Intel (SoC, NIOS)

Simulation/Code Coverage: Questa®, ModelSim® SE, NC-Sim

Synthesis: Synplify Pro®, Synopsys Design Compiler®

Lab tools: Programming pods, Vivado® Logic Analyzer, ChipScope™

EXAMPLES OF OUR WORK

- Video aggregation of 10 video streams into a single custom fiber link.
Technologies: Xilinx Kintex UltraScale, Xilinx Vivado, GTY, DP, 12G-SDI, DVI
- HDCP IP Core Development – Designed, tested, and integrated, Xilinx-targeted HDCP IP.
Technologies: HDCP 1.3 for DisplayPort: HDCP encryption/decryption for SST, HDCP 1.4 for HDMI: HDCP encryption/decryption for HDMI 1.4b

- Video MIPI DSI input to MIPI DSI with low latency processing unit for VR application.
Technologies: Xilinx Virtex, ASIC emulation, HLS
- Video protocol conversation from and to SDI, DP, HDMI, MIPI.
Technologies: Xilinx, HLS
- High Bandwidth NVMe Storage Systems.
Technologies: Xilinx Zynq UltraScale+, NVMe, SSD, PCIe
- 100G Ethernet Switch/Protocol analyzer and tester.
Technologies: Xilinx Virtex UltraScale+
- Our FPGA, SI, and layout expertise with Xilinx high-speed transceivers makes us a one-stop shop for high-speed serial.
Technologies: Xilinx GTX/GTH/GTZ/GTY
- EPON ONU development.
Technologies: Xilinx Virtex UltraScale+, SDNet
- Semiconductor Test System
Technologies: Intel Cyclone V SoC, RTOS
- VME SDR airborne search and rescue radar system. The center-piece of the system is a custom FPGA-based software defined radio DSP engine. The DSP algorithms were designed in MATLAB and then moved into VHDL.
Technologies: AIS, SDR (software defined radio), Xilinx FPGA, PowerPC® hardcore, VHF, AGC, programmable attenuators, power amplifier, VME, VITA, DO-160E, ITU M1371, NMEA0813
- Encryption algorithms on Xilinx Zynq using Asymmetric Multi Processing, HLS, IDF, and Partial Reconfiguration.
Technologies: Xilinx Zynq, Avnet® Zedboard, AMP, HLS, IDF, PR, AES, SHA2, SHA3

DESIGN SOLUTIONS WITH FIDUS

Need prototype and product design help?

We'll work with you to understand what you're looking for, and we'll dedicate the necessary resources to make sure it's a success the first time. Come to us with just an idea or specific challenges that are keeping you up at night, and we'll help you solve them.

Fueled by 20+ years' experience, our expertise, and creativity, along with our collaborative and process driven approach, turns complex challenges into well-designed solutions, and we keep customers like you coming back, again and again:

1. We are committed to "first time right."

2. Experience has taught us how to solve problems on any scale.

3. Faster time to market means faster time to benefit.

4. You choose how we work together.

5. Unique projects are our obsession.

6. We believe transparency builds trust.

7. Customer focus is our calling card.

20+
years experience

Collaborating with smart teams is what fuels us every day.

3,000+
successful projects

Your unique challenges are our obsession.

400+
customers

Extending your team with our expertise brings designs to market faster.

82%
repeat customers

Customers love to work with us, again and again.



ABOUT FIDUS

Fidus Systems, founded in 2001, specializes in leading-edge electronic product development with offices in Ottawa and Waterloo, Ontario, and San Jose, California. Our hardware, software, FPGA, verification, wireless, mechanical and signal integrity teams work to innovate, design and deliver next-generation products for customers in emerging technology markets. Fueled by 20+ years' experience and creativity, along with our collaborative and process driven approach, we turn complex challenges into well-designed solutions. And with over 400 customers and 3000+ completed projects, we have the expertise to be a seamless extension of your team, providing a clear focus and commitment to getting designs and prototypes to market faster. Once you start working with us, you'll trust us like one of your own. Our hallmark is transparency. Our guiding principle is first time right.

fidus
innovate • design • deliver

fidus.com

The Fidus name and the Fidus logo are trademarks of Fidus Systems Inc.
Other registered and unregistered trademarks are the property of their respective owners.

©Copyright 2021 Fidus Systems Incorporated. All rights reserved. Information subject to change without notice.