



**powersoft**  
n i n e t e e n

# HARDWARE ENGINEERING SERVICES

*After all, it is all about People*

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## Sustainable Market Leadership

In today's dynamic technology business environment, it is not adequate to just have a more advanced product, a lower-priced product, or a ground-breaking product. Rather, balancing all of these attributes in each product is critical to win business. To succeed, a product company must continuously innovate while maintaining competitive quality, price, and service.

Powersoft19's hardware engineering team turns visions into winning products by embedding future trends in each design. We are among the very few design service provider companies where electrical and mechanical engineers do the actual layout designing. That's why we have a reputation of creating designs for which rev A is released into production.

We partner with our clients in their pursuit of achieving a sustainable market leadership. We may perform as your company's virtual hardware design team or as a helping hand for your design department during the peak periods. Look inside for our services profile and hardware design strategy that has been making our clients' businesses successful.

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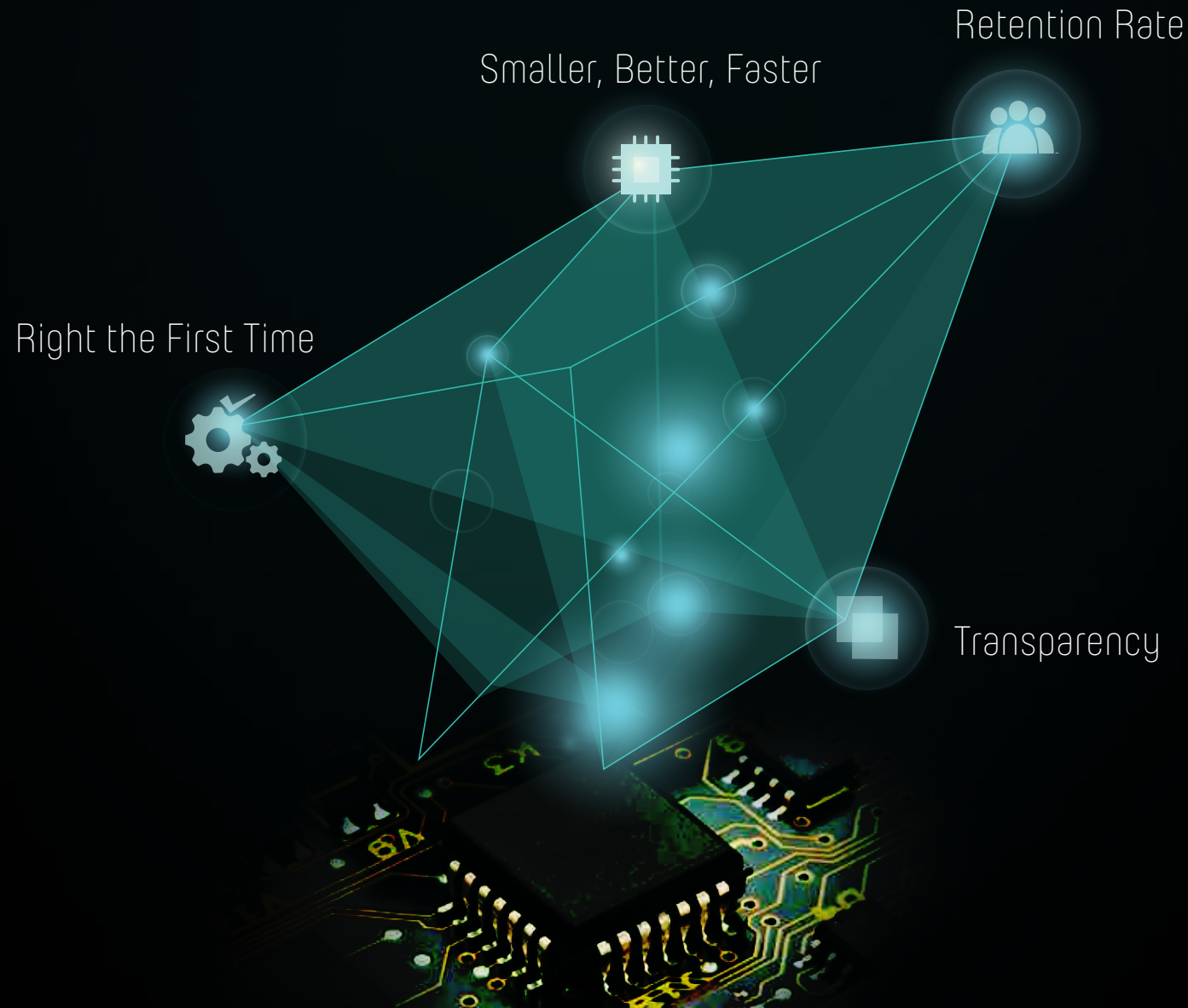
ハードウェア工学

硬件工程

HARDWARE ENGINEERING

Hardware-Entwicklung

# Our Commitment to Excellence



## Right the First Time

Converting your imagination into a useful hardware product feels good; but building a good, standard compliant hardware design in the first go is just remarkable - and rare. The secrets behind this feat are the good old experience, attention to detail, a specialized process, the best tools, and careful planning. The most efficient hardware is designed in environments where there is due diligence in refining the hardware engineering processes, visionary investment in cutting-edge design tools, specialized engineering project management, and above all, a continuous improvement culture.

*Powersoft19* hardware engineering division is among the very few electronics design service centers where all these conditions are met. Here electrical and mechanical engineers do the actual Printed Circuit Board layout and Electronic Packaging designing. That's why our hardware engineering team has a reputation of creating designs for which most of the time the first or the second revision is released into production.

## Smaller, Better, Faster

The electronics industry's unceasing demand of reducing the size and energy consumption while maximizing features and efficiency has led us to be innovative in our design approach. We use concurrent and integrated engineering processes along with specialized tools for electronic packaging, multi-board designs and energy optimization. We push the limits on the conventional designs while meeting the industrial standards for quality and reliability.

With a blend of the latest technologies and creative design techniques, we get the best of both worlds, i.e. high quality products that meet the size-feature ratio challenges of today and tomorrow.

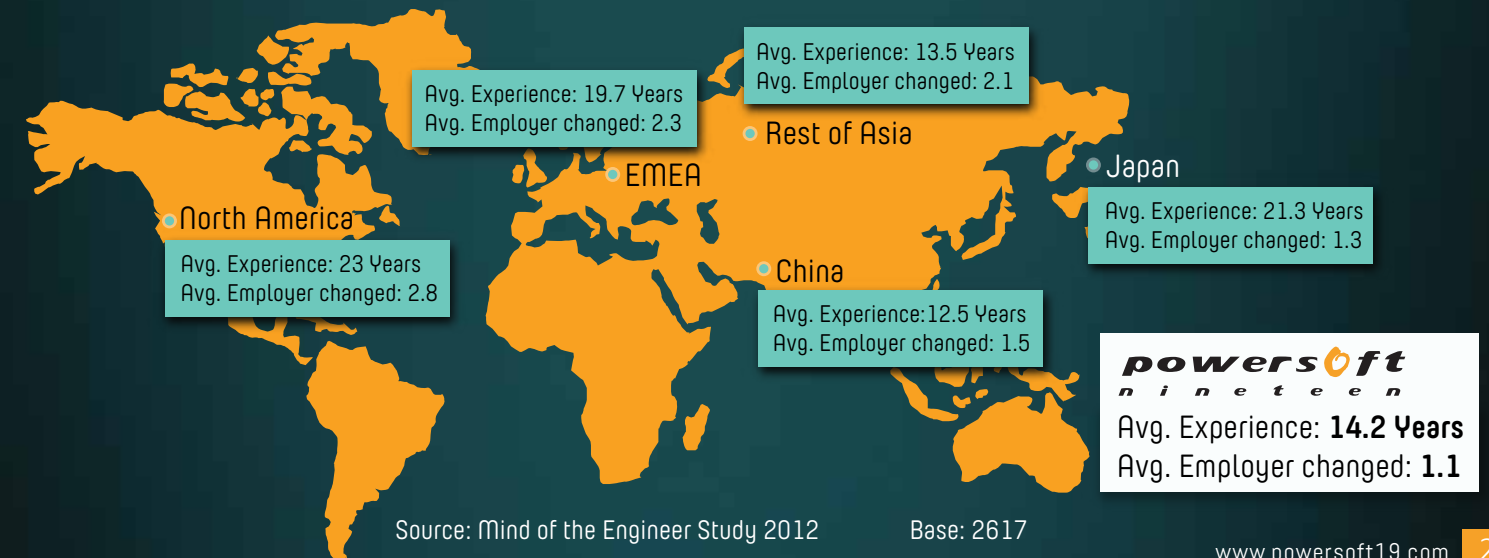
## Lean Processing and Transparency

In order to meet the ever shortening time-to-market goals, our teams have made it a habit of preventing unnecessary delays in processes, communication, or just about anything. That is, we ensure lean processes, not only in manufacturing or development, but also in communication and management.

We, at *Powersoft19*, work with teams coming together from multiple time zones and diverse cultures. That's why we take special care in keeping our communication alive all the time, but we do it without increasing the budget. High-speed data links, phones, and video conferencing are our go-to solutions. In this way we eliminate travel costs while ensuring that all transactions and engagements are completely transparent and as lean as possible.

## Highest Employee Retention Rate in the Industry

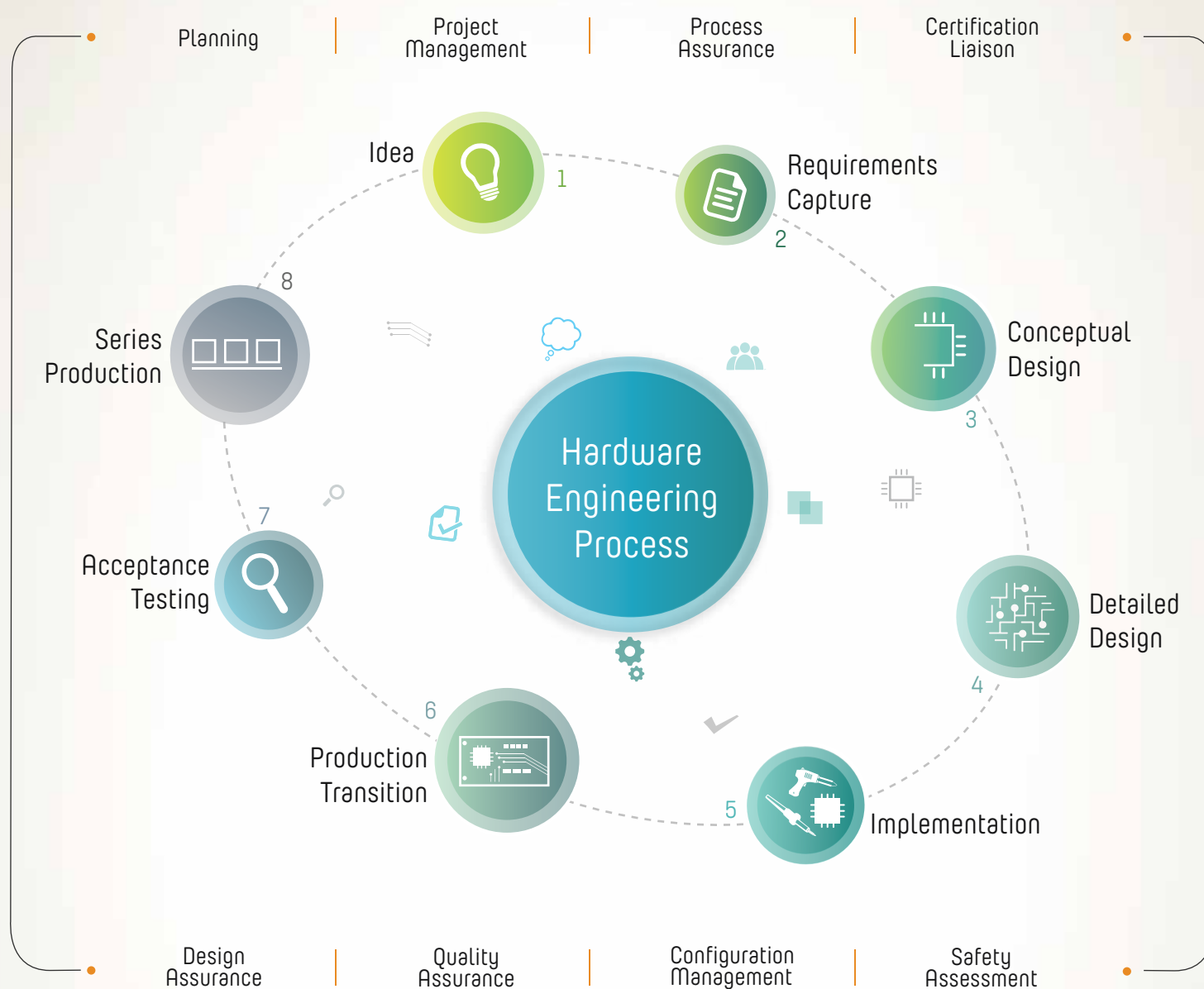
Our teams love working at *Powersoft19* as we have an amazing work environment where creativity thrives. For us, this means 95.5% team retention since last 10 years which is way higher than the industry norms. For our clients, working with the same teams brings a peace of mind as they don't have to train new resources every other day (as is the case with most outsourcing companies). Another advantage is the accelerated performance: due to a long-term working relationship, our teams retain knowledge about client requirements, design processes, and industry standards.



Source: Mind of the Engineer Study 2012

Base: 2617

## Our Way



### Mature Process

In more than 20 years of industrial work experience, our design processes have matured to reflect the best practices and practical knowledge applicable across industries.

We have successfully completed projects with diverse requirements such as shorter time to market for consumer electronics, highly complex safety-critical systems for locomotives I/O controls, intrinsically safe portable gas monitors, and ultra-low power smart wrist bands, to name a few.

We continuously learn while fulfilling such diverse requirements. Our core team members discuss and implement possible improvements in our hardware designing process after the completion of each project. We are proud of this tradition as this has been our savior in this cutthroat competition.

### International Standards Compliance

Our hardware engineering process complies with the guidelines of safety standards like EN 61508 (Functional Safety) and DO 254 (Design Assurance Guidelines for Airborne Electronics).

This helps us execute certification-oriented development and minimize the time needed for adapting any product to a standard – since all of the documentation and the development complies with the requirements of the certification agency from the start of a project.

### Scalable Process

One of the most useful features of our hardware engineering process is its scalability. It can be tailored to meet specific demands of a project, depending upon the technical and financial risks involved. The spectrum of our processes covers the whole life cycle of new product development – from concept development and design implementation to mass production.

### On-Demand and Flexible Engagements

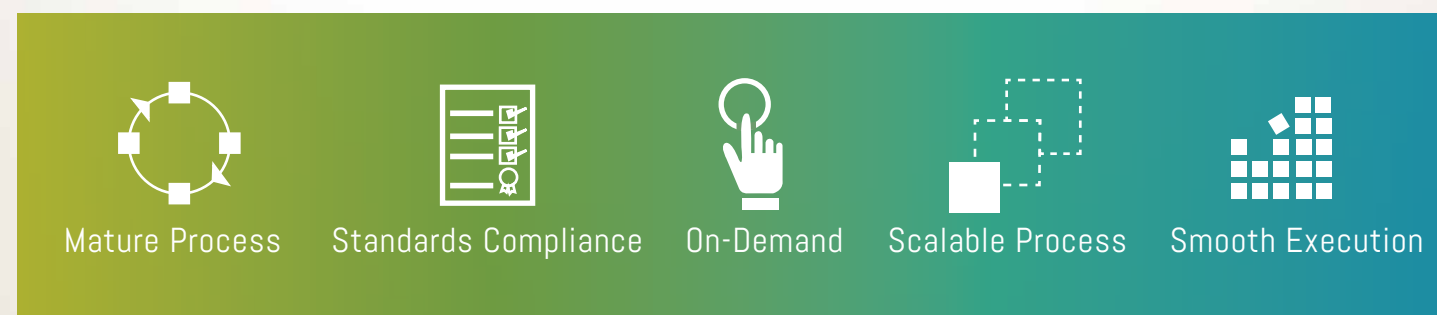
Customization is the one word that best describes us as a team. We not only produce custom-tailored solutions, but also give our clients multiple options of selecting a business model through which they may engage us.

We can perform as an extension of your hardware engineering team, as a turn-key solution provider, or somewhere in between to best fit your needs. We believe in zeroing-in on the business challenges of our clients and then offering them the most suitable business model to meet those challenges.

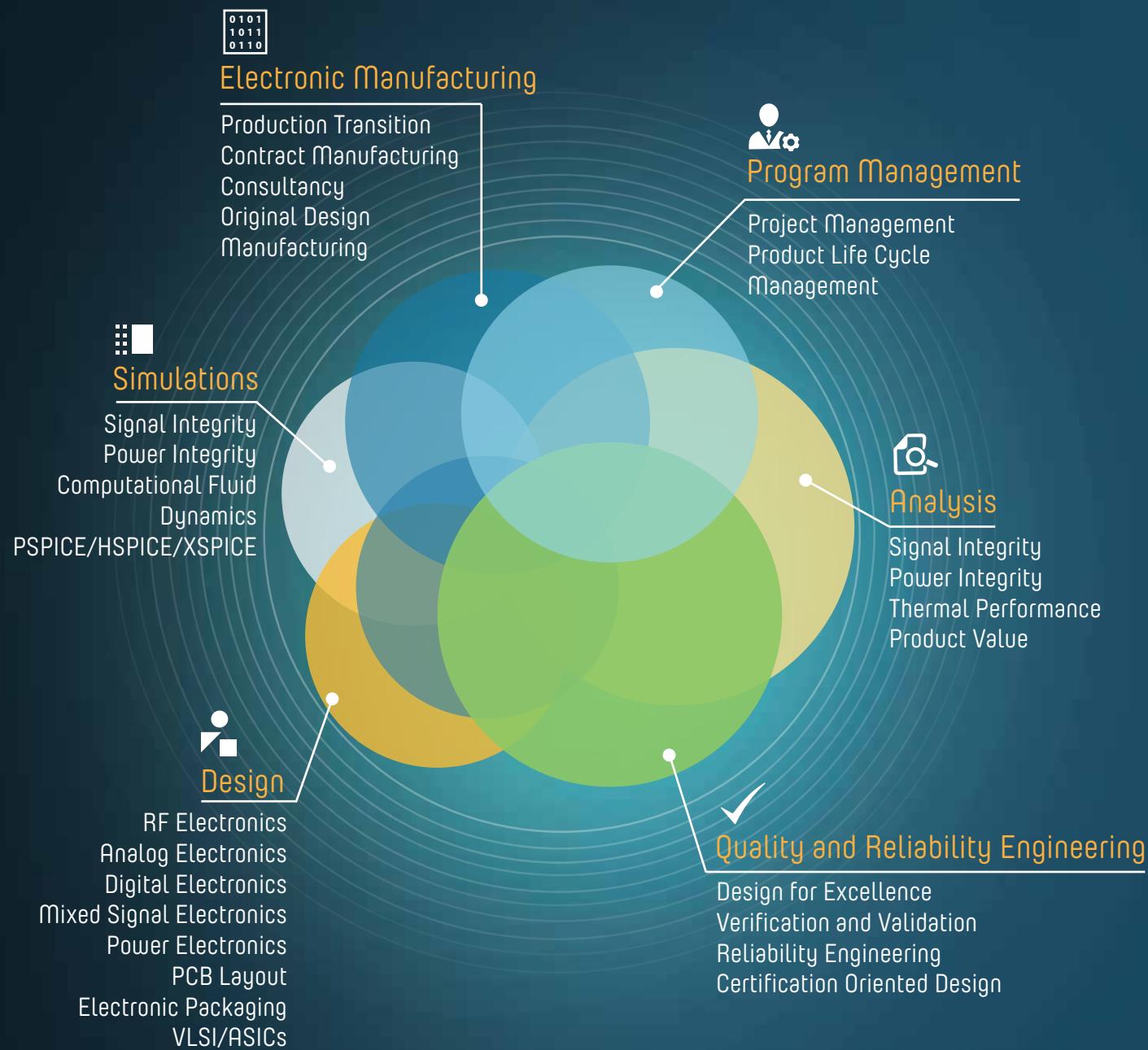
### Smooth Execution

When it comes to hardware design, no one likes surprises – especially near the closing of a project. To keep the project execution as smooth as possible, our hardware engineering process is augmented with support processes like independent quality assurance, safety assessment, certification liaison, process assurance, project management, design assurance, and configuration management.

These services make sure that the seemingly benign issues, which may become ugly surprises down the road, are not overlooked or taken for granted. With a glitch-free execution, we support a pleasant relationship with our clients throughout a project.



# Our Services



## “Either find a way or make one!”

*Powersoft19* hardware engineering services turn ideas into winning products. Our specialized design processes are based on ‘V-model’ to limit the number of re-spins, while guaranteeing time and cost efficiency. Clients from diverse fields like consumer electronics and safety-critical systems trust us because of our efficient all-round hardware engineering services.

Explore our hardware design services and let’s discuss your needs and business challenges.

## Design

World’s top innovative products are enabled by VLSI and ASICs. We have a host of VLSI/ASIC designing services for domain-specific and globally accepted hardware design. In board designing, we have expertise in RF, Analog, Digital, Mixed Signal, and Power Electronics along with High Speed/High Density PCB Layout and Electronic Packaging.

## Simulations and Analysis

In the pursuit of designing robust and reliable products, we refine our designs through a range of simulations and analyses. We specially focus on Signal Integrity, Power Integrity, Thermal Performance and Value Engineering/Value Analysis.

## Quality and Reliability Engineering

Whenever a new product design is planned, along comes the quality consideration. *Powersoft19* offers a large array of quality and reliability engineering services. These services include: DfX (Design for Excellence), Verification and Validation Testing, Quality Functional Deployment, Physics of Failure, Warranty Predictions, Reliability Growth Analysis, Certification Oriented Development, etc.

## Electronic Manufacturing Services

With the right hardware engineering partner firm you can tap unlimited possibilities. We offer you this experience with the help of our network of global manufacturing partners and original design manufacturing agreements. We offer Production Transition, Component Sourcing, Contract Manufacturing, and Consultancy for teaming up with Asian or global manufacturing partners.

## Hardware Engineering Program Management

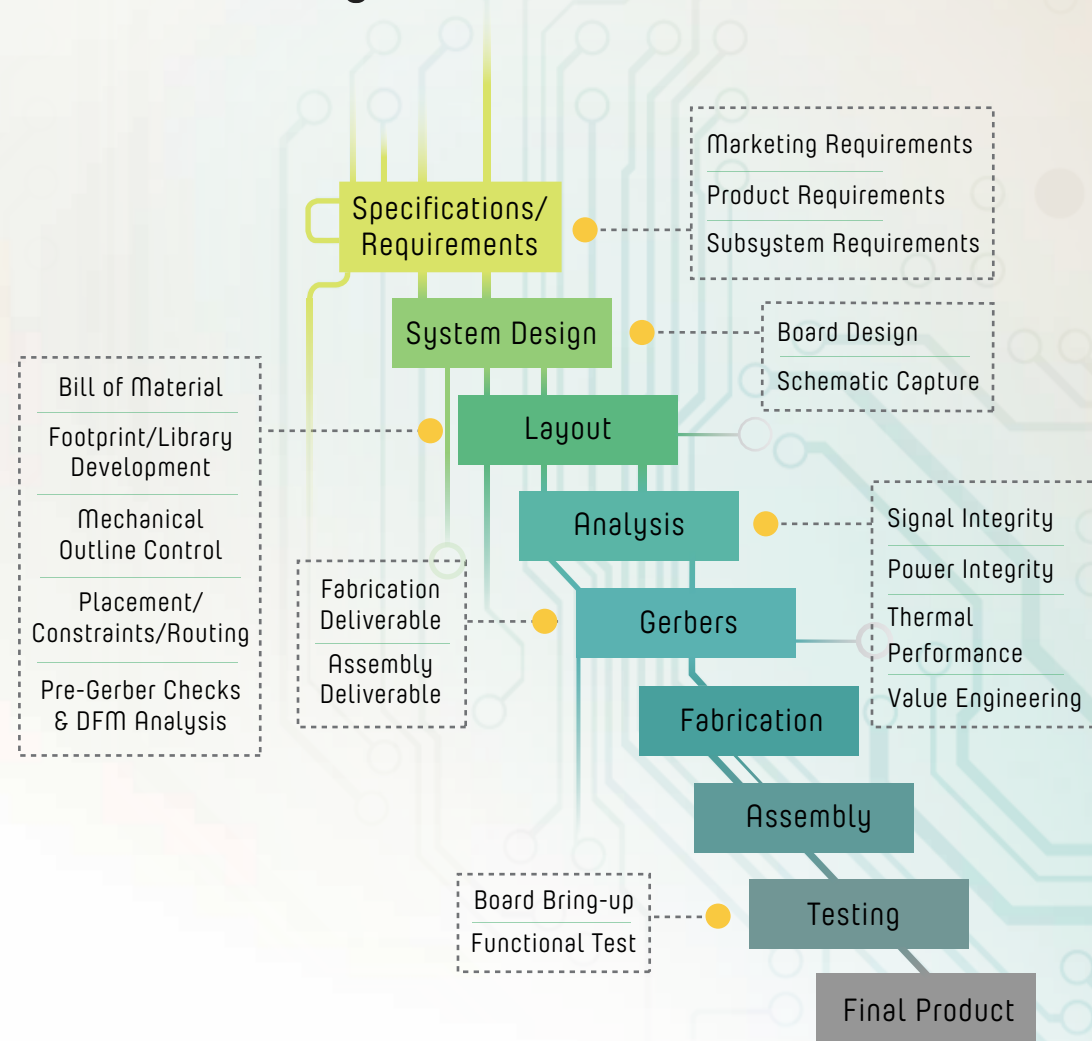
As a global hardware engineering services team, our motto is: “Either find a way or make one!” Our certified project managers, with more than 20,000 hours of hardware engineering experience, have the proven skills of minimizing time, cost, and risks of a design project.

Working with *Powersoft19* will make you realize how easy a hardware engineering project can be!

# Industries

- Rail**
- Gas Detection**
- Material Handling**
- Smart Grid**
- Consumer Electronics**
- Semiconductors**
- Satellite Navigation**
- Health Care**

## Board Design Services



## Power Electronics

*Powersoft19* hardware engineering team architects a diverse array of power control and conversion designs to realize the optimum balance among reliability, cost, and time-to-market requirements. We have been successfully delivering board level power supplies capable of delivering few hundred watts as well as hybrid renewable energy power converters handling several hundred kilowatts.

### Power Electronics Capabilities

- Power supply and analog conversion circuit topologies
- Ruggedized indoor and outdoor enclosures
- Grid-tied, off-grid, and backup battery management
- Structural, thermal, and EMC design
- Energy metering and remote monitoring
- Digital control and digital power conversion
- Wireless power supplies and chargers
- Multi-chemistry battery charger and fuel gauge circuits



**BRETT RICKARD**  
Staff Applications Engineer  
**Integrated Device Technology**

"I worked with *Powersoft19* on a fairly complicated PMIC evaluation board. I was very happy with the results. They catch all the small details that go into a successful board design: Z height restrictions, component parameter double checking, design for manufacturing, etc. They would send me the design in the afternoon, I would mark it up and send it back, and I would have my new design first thing in the morning. *Powersoft19* was quick to respond to any concerns I had. Also the layout engineer I worked with was very knowledgeable regarding power layout design. The board was a success and I was 100% satisfied with the work. The cost was very reasonable also. I would not hesitate to work with them on any other future design."



## Analog Electronics

Precision of the design can make or break analog electronics. On the other hand, analog designs are inherently complex. To balance functionality and efficiency amid this complexity is the work of an imaginative engineer. Our engineers build precise analog electronic designs that are employed in power supplies, audio signal processing systems, sensor interfaces, and data acquisition systems. We combine our design services with prototyping and simulation services to deliver a complete solution to our clients.

### Analog Electronics Design Capabilities

- Low noise circuit design
- TDMA noise suppression in audio circuits
- Audio system design
- SPICE circuit modeling and analysis
- Sensors and interfacing
- A2D and D2A conversion
- Class D power amplifier circuit designs
- Ultra low power and wideband designs
- Data acquisition



## Featured Project - Wired Gas

### Design Challenge

*Powersoft19* develops safety-critical hardware and firmware of portable gas detection instruments. This requires thorough testing and quality assurance for verification of hardware and firmware functionality. The challenge is to carry out quality tests on Haz-Mat gas detection devices in strict budget constraints.

### Solution

*Powersoft19* hardware and firmware team has designed a multiple-channel precision current source simulator device within about half of the price of an off-the-shelf single-channel precision current source simulator.

### Key Accomplishments

- No dependency on actual gas
- Ability to execute special test scenarios
- Extreme economy during thorough testing
- Speedy testing accelerates the time to market
- Uncompromised workplace safety



## RF Electronics

Now a days, every business has innovative RF systems to boost their essential operations like supply chain management, asset identification, and personnel management. *Powersoft19* offers RF engineering consultancy for all stages of your product development life cycle and turnkey solutions. We work with wireless technology and, if the project demands, suggest the right technology to fit specific requirements.

### RF Design Capabilities

- Short range wireless transceiver designs
- Bluetooth, Bluetooth Low Energy and ZigBee
- Broad band and narrow band receiver design

### Digital Electronics

The creation of a standard compliant product requires accuracy in each development phase and seamless integration from one phase to another. Starting from product and subsystem requirements, our hardware engineering team adds value to each subsequent phase until a successful production transition. Some of the major industries that use our designed equipment are: health care, instrumentation, gas detection, oil & gas, material handling, and rail.

### Digital Board Design Capabilities

- 8051, PIC, ARM9, ARM Cortex, and Cold Fire designs
- FPGA and CPLD based designs
- Digital signal processor based designs
- FRAM, SDRAM, DDR, DDR2, DDR3, and QDR interfaces
- NOR flash and NAND flash interfaces
- Fiber channel and Gigabit Ethernet interfaces
- High speed and 10GHz+ signals
- PCI, PCIe, and PCI-x interfaces
- ModelSim simulation
- LVTTLL, LVDS, and CML
- Ultra low power design and energy optimization
- Application specific customized designs
- Certification oriented development
- International design standards compliance



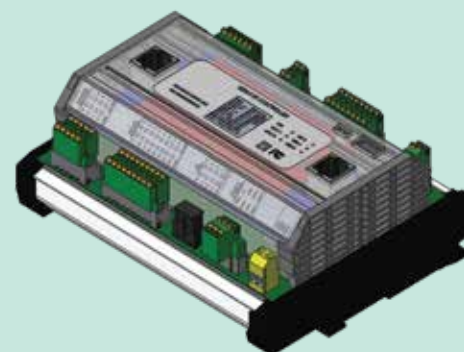
## Featured Project - Industrial I/O Controller

### Design Challenge

In this project we replaced a fleet of legacy I/O controllers deployed in the rail industry of the North and South America. The challenge was to add 10 years to product life while maintaining high availability and fault-tolerant design.

### Solution

Powersoft19 designed a complete I/O controller with fault-tolerant inputs/outputs and expandable platform to meet future needs. We carried out hardware development from concept to production transition.



## PCB Layout Design

From wearable electronics to on-board electronics of locomotives and spacecrafts, Printed Circuit Boards (PCB) are the backbone of every electronic system. To design PCBs that fulfill such diverse systems' requirements, our designers adopt a scalable and systematic approach. At Powersoft19, we design PCBs by using the latest tools and technologies to guarantee compliance with the international quality standards.

### PCB Design Capabilities

- PTH/SMT and HDI layout designs up to 32 layers with layout densities above 200 pins per sq. inch
- 100% manual routing and design partitioning among multiple teams
- Radial layouts, flex/rigid and non-standard geometries
- High speed and high density digital, analog, RF, power, and mixed signal designs
- Complex high-speed systems for low power and noise sensitive devices
- Intrinsically safe PCB designs
- EMI protection
- Single ended and differential impedance control
- Fine pitch BGA layout (0.4 mm and below)

## Featured Project - Satellite Navigation Field Controller

### Design Challenge

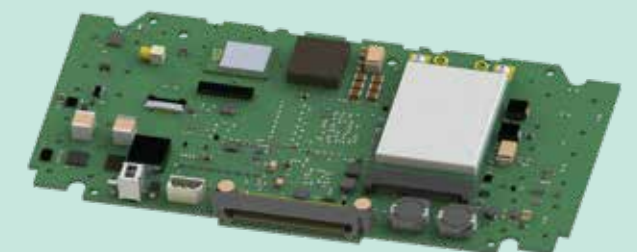
We had to design a product that required a dense board with multiple 0.4 mm BGAs. There were more than 1000 components in a form factor of 6.2" x 3" that meant a design complexity of more than 200 pins per sq. inch. We needed to keep the trace widths and spacing above 4 mils while minimizing the number of blind/buried plating processes.

### Solution

We used Design for Volume (DFV) methodology and minimized the use of High Density Interconnect (HDI) technology. We 100% hand-routed the design and carried out several iterations of component placement to achieve optimum production cost.

#### Design Project Metrics

|                       |                     |
|-----------------------|---------------------|
| Form Factor           | 155.2 mm X 78 mm    |
| Number of Components  | 1023                |
| Number of Connections | 2770                |
| Design Pin Density    | 229.612 pins/sq. in |
| Number of Layers      | 12                  |
| Duration of Project   | 1 Month             |



# Electronic Packaging

The hallmarks of today's electronic systems are their high density, complexity, and miniaturized size. To support such competitive list of features in a system, the packaging designs have to meet all technical challenges arising as a result of these requirements. In fact, high quality packaging assists the system performance by facilitating thermal management, signal distribution, serviceability, manufacturing, and power distribution.

Powersoft19 hardware engineering team includes SolidWorks and Autodesk certified engineers dedicated to oversee the electronic packaging aspects of the projects. Our electronic packaging services incorporate reliability engineering and industrial design best practices to deliver the best quality packaging. Our expertise includes sheet metal and plastic enclosures, tooling, 3D printing, thermal management, and design. The successful track record of our team in electronic packaging ranges from space constrained wearable electronics design to thermally critical power electronics modules and everything in-between.

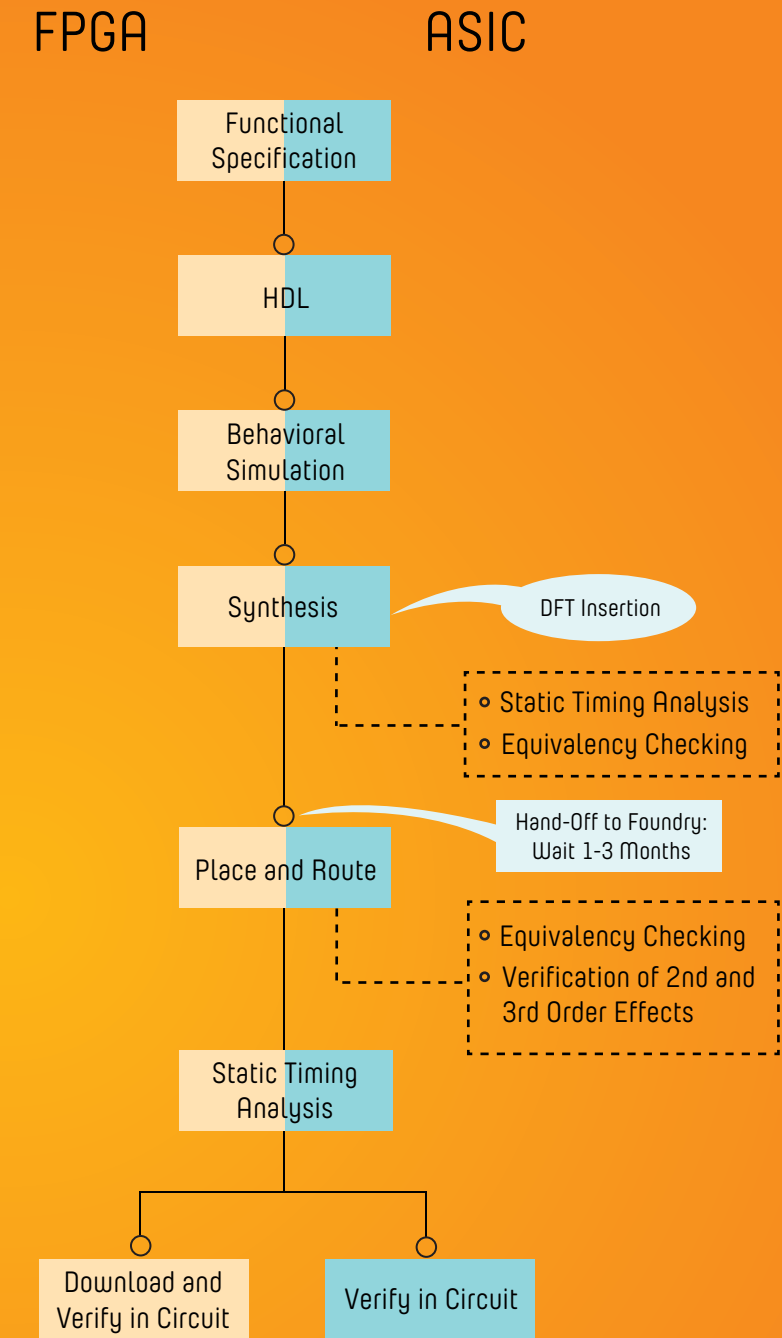


# VLSI/ASICs Design

The persistent requirement of packing more features in less space is best described as: "yesterday's PCB is tomorrow's Integrated Circuit." Keeping such market needs in view, Powersoft19 has launched its ASIC design services. We provide FPGA and ASICs design and development in collaboration with leading semiconductor foundries.

The hallmark of our ASIC designs is their practical value for our clients. Before taking up a project, we analyze the client's needs and provide them consultancy to figure out whether ASIC is the right solution for them. Our teams minimize the time spent in design and synthesis phases. In order to save time without compromising the quality, we fix the bugs (that could be countless for complex designs) by using state of the art CAD systems.

Powersoft19 covers the entire ASIC development life cycle from specifications to actual tape-out. We support our clients throughout architectural design, HDL, simulations/verification, synthesis, and layout stages. We also offer consultancy to our customers in selecting the right ASIC vendor for their designs after analyzing their needs on the basis of factors like gate count, IC package, unit price, performance, power consumption, NRE costs, CAD tools availability, development time, and vendor's track record.



**MORE FEATURES**  
LESS SPACE

**PRACTICAL VALUE**  
UNMATCHED QUALITY  
MINIMIZED TIME

**CONSULTANCY**

**DESIGN**  
SIMULATIONS  
VERIFICATION



## Simulations and Analysis

### Signal Integrity

The challenge of high speed designs is to maintain the quality of the signals over long distances on printed circuit boards and wire-harnesses. We employ signal integrity simulation to check the effectiveness of the steps taken to ensure signal integrity. Simulation of the routed board verifies the standard compliance of design and saves the manufacturing costs in the long run.

#### Signal Integrity Simulation Capabilities

- 10 Gigabit XFP (small form factor pluggable) Interface
- 10 Gigabit Ethernet (GigE) and XAUI Interface
- Fiber Channel/SAS/SATA Interface
- DDR, DDR2, and QDR2 Interfaces
- DDR3 Memory @ 1600 MHz
- PCI Express (PCIe) Generation III & PCIe
- HDMI, SGMII, and Ethernet PHY
- Virtex 5 MGT SERDES @ 65GHz

## Featured Project - Signal Integrity of DDR Interface

### Design Challenge

This project required us to sort out a malfunction in "Internet of Things" gateway that resulted from die shrinking of microprocessor and DDR (Dual Data Rate) memory chips.

Although the manufacturers claimed that no timing spec was changed but the DDR interface continued to trouble, endangering product continuity as the inventory of older parts started depleting.

### Solution

*Powersoft19* team ran a detailed signal integrity simulation and analysis to get an insight into the problem. The analysis revealed signal integrity issues and loose constraints on propagation delay of the signals in the original design. In the light of the signal integrity analysis report, which spanned over 116 pages, we did re-floor planning of the entire board. The post-layout signal integrity report gave the design a clean bill of health.



### Circuit Behavior

At *Powersoft19*, PSPICE (LTSPICE, PSPICE, HSPICE, and XSPICE) is the de-facto standard simulation for a system design. Our engineers have expertise in simulating all complex mixed-signal designs containing both analog and digital circuitries.

#### Circuit Simulation Capabilities

- Temperature and stress simulation
- Worst-case scenarios
- Curve-fit optimization
- Electro-mechanical simulation
- Monte-Carlo simulations
- Component stress/smoke simulations

### Power Integrity

Power integrity is a critical issue in high speed designs due to their higher switching rate. To maintain the power integrity of high speed designs, we keep the common-impedance coupling and common-mode switching noise at the minimum level. This also helps in eliminating or minimizing signal integrity problems related to power supply drop. We use state of the art software packages from Cadence and Mentor Graphics to predict potential design problems earlier in the design phase by simulating various load conditions on the power distribution network of product designs.

#### Power Integrity Analysis Capabilities

- Board design database set-up for analysis
- AC and transient analysis
- Single node analysis for optimization of capacitor placement
- DC and steady-state analysis
- Target impedance definition for reduced I<sup>2</sup>R losses
- Multi-node analysis to refine overall placement of the components

### Thermal Performance

While designing any real-world electrical, electronic, mechanical, and electro-mechanical system, thermal analysis plays an important role in determining the system's thermal performance. We offer thorough thermal analysis services featuring the simulation of air/fluid flow and heat transfers as a regular part of our design process. This approach reduces the cost of prototypes, eliminates rework, and saves time and development costs.

#### Thermal Analysis Capabilities

- Heat sink junction temperature analysis
- Component and enclosure temperature analysis
- 3D airflow modeling and analysis
- 3D temperature distribution patterns

## Value Analysis and Value Engineering

*Powersoft19* offers a full array of Value Analysis and Value Engineering (VAVE) services aimed at balancing the design features, functionality, and cost of the hardware design. We view VAVE as a continuous process spanning over the whole product management life cycle. That's why we focus on all aspects of VAVE from component engineering to product teardown.

### Value Analysis and Value Engineering Capabilities

- Cost reduction
- Component engineering
- Product teardown

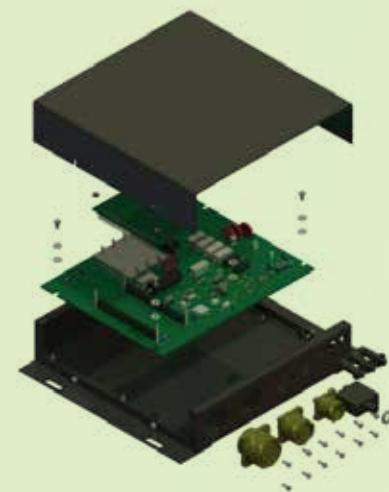
## Featured Project - VAVE of Passive RFID System

### Design Challenge

This project required replicating an RFID product that was discontinued by the original manufacturer (leaving us with no design documentation).

### Solution

We value engineered a completely new hardware product with enhanced features and backward compatibility with the original system. *Powersoft19* delivered the turnkey solution and manufactured a limited number of units to support the operations and sales for a year until the production was successfully transitioned to client's end.



### Value Engineering Achievements

- 66% reduction in transponder cost
- 57% reduction in antenna cost
- 70% reduction in reader cost
- 50% reduction in reader size
- 10 years added to product's life
- 87% reduction in product lead time



**Jennifer P Nguyen**  
President and CEO  
CPS Tech

I work with *Powersoft19* almost on a daily basis. The engineers I work with are highly reliable, experienced, and always available to me regardless of what the hour. I find it hard to believe that they ever stop working as I am in California but receive instant responses no matter what hour I have a question. I highly recommend *Powersoft19* and welcome any questions anyone may have."



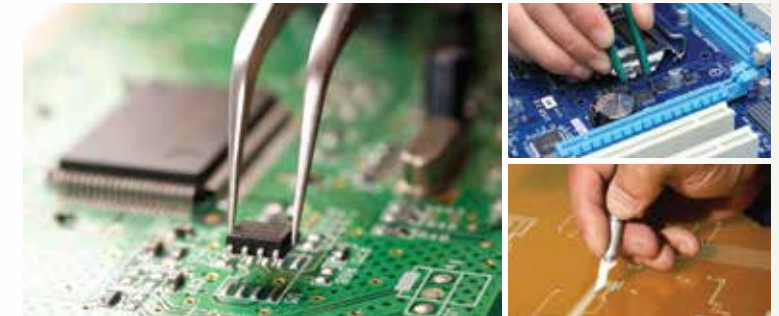
## Hardware Quality and Reliability Engineering

### Design for Excellence (DFX)

As client-specific products are *Powersoft19* hardware engineering team's distinguishing proposition; we adopt a unique approach for each design. We embed each client's specific requirements into the design right from the planning phase and select the design approach that best suits these requirements. Our DFX services ensure that the final product is as close to our clients' expectations as possible. You'll find excellence in our each design, regardless of the approach.

### Design for Excellence (DFX) Capabilities

- Design for Manufacturability (DFM)
- Design for Assembly (DFA)
- Design for Serviceability (DFS)
- Design for Testability (DFT)
- Design for Volume (DFV)
- Design for Profitability (DFP)



### Engineering Verification & Validation

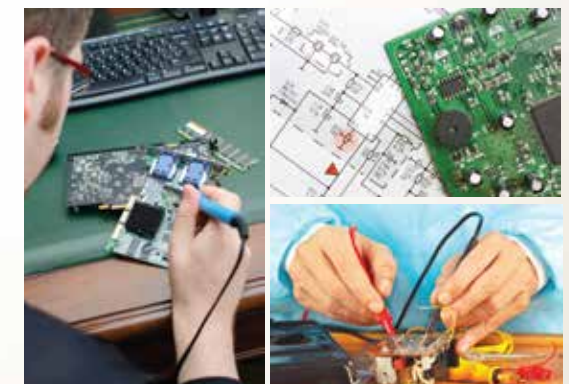
The guarantee of the best quality in each project is a promise that we make and keep with our clients. In order to be true to our word, we carry out thorough verification and validation testing during all project phases.

The verification testing ensures that the project progresses according to the approved requirements. Also, all technical requirements and sub-systems quality are ensured during verification testing. In this manner, the maturation of the project goes hand in hand with quality assurance.

The validation testing seals the final quality of the product in its entirety. Done in a realistic environment, the validation of complete product ensures the product quality from the client's perspective. Our test labs are equipped with sophisticated test instrumentation where certified test professionals carry out verification and validation testing.

### Engineering Verification and Validation Capabilities

- First Article Inspection Testing (FAIT)
- Electrical Verification (ETP – Electrical Test Procedures)
- Functional Testing (FTP)
- Hyper Accelerated Life Testing (HALT)
- Hyper Accelerated Stress Screening (HASS)
- Temperature Testing
- Vibration and Drop Testing
- Ingress Protection Testing (IP)
- Electromagnetic Compatibility (EMC)
- Factory Acceptance Testing (Go/No GO)



## Reliability Engineering

Reliability is, after all, engineering in its most practical form. At *Powersoft19*, we view reliability as an effective parameter to assess the success of an engineering system. The integrated nature of reliability requires: identifying and resolving the design weaknesses, stress protection, tolerance assessment, and risk reduction. Another important aspect of reliability is the economic sustainability of the system. In order to achieve the optimum balance of quality and cost, we keep a laser-sharp focus on the costs of failure caused by the factors such as downtime, spares, repair equipment, personnel time, and warranty claims. Our reliability specialist engineers instill reliability in product design with the help of design evaluation, product safety assessment, statistical tools application, modeling, and reliability testing.

### Reliability Engineering Capabilities

- Requirements Flow-Down
- Quality Functional Deployment (QFD)
- Failure Mode Effects Analysis (FMEA)
- Fault Tree Analysis (FTA)
- Design of Experiments (DOE)
- Physics of Failure and Warranty Predications
- Regression and Automated Testing
- Sensitivity and Stacked Tolerance Analysis
- Mean Time Between Failure (MTBF) Analysis
- Reliability, Availability, Maintainability, and Safety Planning (RAMS)



## Featured Project - Manufacturing Yield and Reliability Growth

### Design Challenge

*Powersoft19* was tasked to perform a design review and investigation into the root cause of a 17.5% failure in manufacturing of dual Ethernet feature on a previously designed industrial I/O controller for railway applications. The objective was to improve the yield and lower the failure rate to 0.1%.

### Solution

*Powersoft19* performed a detailed investigation by studying the data-sheets, application notes, and errata sheets. We also took signal integrity measurements on all nodes of the signal chains related to Ethernet functionality. Several undocumented deviations were found in the signal integrity measurements. A simple fix of terminations and reliability testing in a temperature chamber ensured that 99.9% manufacturing yield was achieved.

## Certification Oriented Development

We, at *Powersoft19*, specialize in certification oriented development of complex systems. Our lead engineers have expertise in a variety of international standards related to safety and reliability of systems. Our approach towards developing standard-compliant products is to incorporate certification process from the day 1 in the product life cycle - that's why it is termed as "Certification Oriented Development". Our engineers excel in working on legacy product designs and making them compliant to the industry standards. We have experience of working with FCC, UL, TUV, DOT, DOE, FDA, CE, MSHA, ATEX, SIRA, and HART foundation.

### Certification Oriented Development Capabilities

- FCC Part 15 – Non Intentional Radiators
- Electromagnetically Compatible Electronics (EN61000)
- Intrinsically Safe Electronics (EN60079)
- Functionally Safe Electronics (EN61508)
- Design Assurance for Airborne Electronics (DO254)
- Remote Control Locomotive Safety (49 CFR Part 229-15)



## Featured Project - HART Transplant

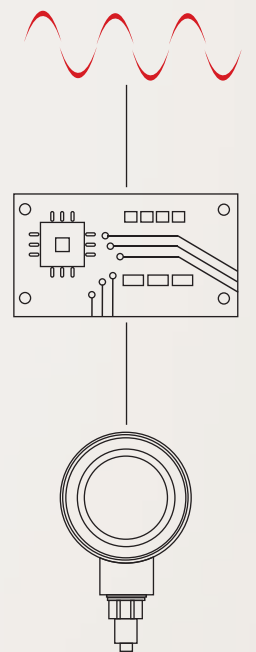
### Design Challenge

*Powersoft19* was asked to add the HART communication capability in a very successful fixed gas-detection transmitter to increase the sales opportunities for the product – thus named HART Transplant. The challenge was to design a drop-in/add-on board without making any changes to the primary hardware design which was already certified by UL, ATEX, and CSA.

### Solution

*Powersoft19* designed an add-on board and packaged it in a way that new features were added to the product without making any hardware changes to the primary hardware design. The HART functionality was then tested thoroughly and *Powersoft19* spearheaded the effort to get the product approved from HART foundation for compliance to the HART standard and interoperability with other HART devices.

The biggest success story was that the introduction of the enhanced product acted as a catalyst for an acquisition/merger worth \$21 million of the fixed gas detection business with another industry leader.



# Electronic Manufacturing Services

## PCB Fabrication

*Powersoft19's* global partnership network of high quality PCB fabrication houses systematically meets our client's hardware project needs. From few prototyping boards to high volume manufacturing, no job is too small or too big for us. We work with materials such as High Frequency – Microwave, Halogen-free, Lead Free, Mix-Material, Metal Based – Core, and High Tg. The surface finish options include: OSP, Immersion Gold, Selective Gold Plating, Fingers Gold, Immersion Tin, HAL, Lead Free HAL, Immersion Silver, and Power-link.

| Specification                   | Capability  |
|---------------------------------|---|
| Layer Count                     | Up to 42 Layers   |
| Line Width/Line Spacing         | Inner Layer<br>4 mils/4 mils<br>Outer Layer<br>4 mils/4 mils              |
| Min. Mechanical Drilling        | 0.1 mm  |
| Aspect Ratio                    | 12:1  |
| Copper Thickness                | 10 Oz.  |
| Impedance Control               | +/-5%   |
| High Density Interconnect (HDI) | 2 + 1 + 2   |
| Rigid Flex                      | 14 Layers   |
| Printed Electronics             | Buried Resistor/Capacitor<br>Buried Magnetic Core<br>Buried Fiber Optical |

"We are the first choice of our clients when it comes to speeding-up product development as we specialize in development of customized tools for hardware, firmware, software, and web application domains that accelerate the new product development."



**Abe Lee**  
Overseas Sales Manager  
**Shenzhen King Brother Technology Limited**

We have been working with *Powersoft19* as their Electronic Manufacturing partner for 5 years and I honestly commend *Powersoft19* for their commitment to excellence and quality. Shenzhen King Brother Technology Limited processes and delivers several thousand orders every day. The PCB and PCBA orders that *Powersoft19* places with us are really "Right the First Time" in manufacturability, assembly, testability, impedance requirements, and power distribution network design. *Powersoft19's* quality, delivery, and customer services speak of a "Best in Class" company. We take them as a benchmark for our own PCB Design Services. I highly recommend *Powersoft19* to anyone who needs Hardware Design Services.



## PCB Assembly

*Powersoft19* has an ESDA Standards and EN61340 compliant facility for in-house assembly of low volume PCBA orders for few prototypes. For high-volumes, we have a global network of quality contract manufacturers. All PCBA adhere to world-class quality and acceptance standards for electronic assemblies (IPC-610E). We offer a transparent and seamless interface to our clients by helping them in answering engineering questions and providing manufacturing consultancy.

| Specification          | Capability      |
|------------------------|-----------------|
| Component Height       | 0.2-25 mm       |
| Minimum Component Size | 0201            |
| Pin Pitch              | 0.2-2.54 mm     |
| BGA Ball Pitch         | 0.25-2.0 mm     |
| BGA Ball Diameter      | 0.1-0.63 mm     |
| Minimum Board Size     | 50 mm x 30 mm   |
| Maximum Board Size     | 510 mm x 460 mm |

## Component Sourcing

With *Powersoft19* as your global component sourcing partner, you will never have to worry about completing a project in time or fret over the varying quality of components from shipment to shipment. Our dedicated component sourcing team plans your inventory supply with the future requirements in sight. This future oriented planning ensures that your project lead time is minimized while the quality and cost are optimized for the most competitive markets. Our working relationships with component suppliers from across the globe guarantee that you never run out of quality components during any phase of your hardware project. So, whether you require materials for a few prototypes or a supply chain for high-volume manufacturing operations, we are prepared to support you.



## Hardware Engineering Program Management

### Hardware Engineering Project Management

Our accomplished hardware project engineering managers have more than 20,000 hours of experience in managing time, cost, quality, cross functional teams, and technical risks of design projects. Powersoft19 guarantees you a transparent interface that maximizes the benefits of off-shore hardware development economics. Our effective relationship management leverages long distances, multiple time-zones, and diverse cultures to enrich the client experience beyond expectations.

Our mature hardware engineering process equips us to meet the unique demands of diverse industries from Consumer Electronics to Safety-Critical Systems in sectors such as Rail, Mining, Gas Detection, Infotainment, Material Handling, Telecommunications, Smart Grids, etc.

### Product Life Cycle Management

During the last 20 years, Powersoft19 has accumulated valuable experience in product management while working with clients from numerous geographical areas and diverse market segments. We share this experience with our clients who need assistance in managing their products. We accomplish this by offering consultancy regarding foreseeing component life, coordinating with suppliers, and achieving economies of scale by collaborating with the right manufacturing partners.

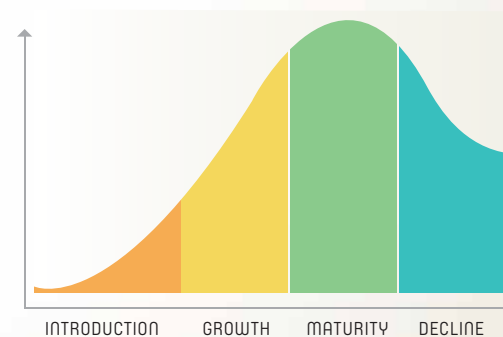
#### Product Life Cycle Management Capabilities

- Integrated product requirements and implementation
- MCAD and ECAD Design tools and processes integration
- Enterprise level management of ECAD and MCAD design data and parts libraries
- Coordination of life cycle activities with suppliers
- Implementation and maintenance of standard compliance
- Digital prototyping
- Incorporation of structured change processes
- Management of electronics projects in tandem with the rest of the product life cycle

“Going solo is not how engineering is done. We link teams, talents, and knowledge to create a sum much greater than its parts.”



“The magic touch of an expert who knows all the pitfalls and how to dodge them to complete the home run.”



## Upcoming Smart Hardware for IoT Era

### Powering up the Game Changers

The game changing technology of future will be as good as its power efficiency. The interconnected devices, smart assets, and remotely controlled machines – all need power, and lots of it. No one would risk relying on a device if its battery lasts only 6 hours.

Powersoft19 hardware team is meeting the power challenge in Internet of Things era head-on. The precision energy measurement (PrEM) is a revolutionary device that correlates the firmware with the battery usage. This allows for immense economy in the battery usage of the smart devices. This technology will be a key in increasing the battery run time, and consequently, the reliability of smart devices by making energy optimization of the firmware easier for the developers. The added advantage of efficient battery performance will be smaller and lightweight batteries that are prerequisite for wearable electronics.

### Wearables Enabling a Personalized and Immersive Fun Experience

Visiting a theme park for a fun-filled holiday will now become even more exciting as Powersoft19 hardware team's upcoming wearable technology will automate the logistics for such experiences. This active-RFID and NFC based wrist band will help visitors of a theme park to enjoy the rides, games, food, and other activities without having to worry about long queues for purchasing tickets or passes. The users can register for their customized wrist band through website, social media accounts, or onsite admin portal. The wrist band would need to be swiped against a terminal for each activity and the participants will be good to go and enjoy their activity.

Taking this fun experience one step further, the user profile will be linked to the automatic video and photograph capturing devices. The participants will enjoy their activities and get high definition recording of each moment of their experience without stopping in the middle for taking a selfie. The users may choose to sync their profile with their social media account for instant sharing of this immersive experience with their social circles.



## Is Hardware Engineering Partnership Right for You?

Entrusting your product design ideas to others brings up insecurities like IP violations and quality compromises. But, this approach may hinder your progress and growth that you can achieve in collaboration with the right hardware design partner. If global contributions can build the largest knowledge base “Wikipedia”, then why not use the same concept to build upon each other’s creativity and R&D to achieve ground-breaking product designs? The basic concern of the companies in this regard is whether the risk inherent in such partnerships worth the effort in the long run? To answer this question, here is a checklist of the most important items that a company should know when considering a partnership in hardware designing.

- 01- Our primary business is product innovation/product development and marketing
- 02- Our engineering resources are best deployed on innovation
- 03- We are trying to grow the business with the minimum outside investment
- 04- We are under pressure to rapidly develop product and get to the market
- 05- It is always a challenge to stay one step ahead of our competition
- 06- We need to minimize our financial exposure and inventory risk
- 07- We want to reduce the capital costs
- 08- We have access to established hardware engineering service providers
- 09- We are ready to start a relationship and gradually develop it into a trusted partnership
- 10- We have low volume component purchases and have difficulty achieving economies of scale and component lead times when purchasing

### Score Interpretation

2-5 checked boxes imply that hardware engineering partnership should be carefully evaluated. 6 or more than 6 checked boxes imply that partnering with an established hardware engineering services provider is necessary for you in order to structure a viable and thriving business. If your score is in the second group, you can assess a prospective partner on the bases of the critical factors listed in the following table.

### Selecting the Right Hardware Engineering Partner

| The right size   | Technical expertise  | Track record  | Reliability  |
|--|--|---|--|
| <ul style="list-style-type: none"> <li>◦ Are they agile enough to complete the project timely?</li> <li>◦ Are they big enough to solve a complex engineering problem?</li> </ul> | <ul style="list-style-type: none"> <li>◦ Do their technical expertise match your needs?</li> <li>◦ Are they sharp enough to learn new technologies?</li> </ul> | <ul style="list-style-type: none"> <li>◦ Are their clients happy with their services?</li> <li>◦ Do they have any impressive work to show?</li> </ul> | <ul style="list-style-type: none"> <li>◦ Do they guarantee Intellectual Property protection?</li> <li>◦ Do they know and follow the industry standards?</li> </ul> |

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ENDLESS POSSIBILITIES  
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✉ [hde@powersoft19.com](mailto:hde@powersoft19.com)

🌐 [www.powersoft19.com/hardware](http://www.powersoft19.com/hardware)

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