

# Automotive Electronics Solution

## Systems to Silicon

### Overview

Electronics continue to infiltrate all aspects of automotive design as consumer demand for safety, performance, fuel efficiency, and reliability continues to grow. Automotive companies face pressure not only for advanced functions and performance, but also from the rising cost of warranty issues, supply-chain management, intense competition, and compressed market windows.

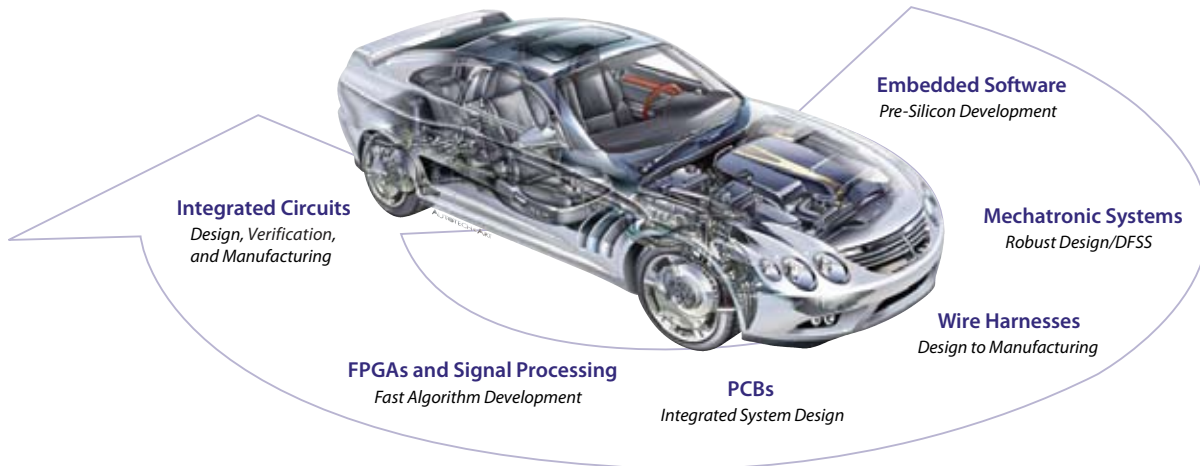
Electronic vehicle design incorporates semiconductor, FPGA, PCB, mechatronic, and embedded software design to create cost-effective and reliable systems. Integrating all aspects of electronics requires careful attention to component design and system interactions to reduce warranty costs, meet performance specifications, and enhance reliability under constantly changing environmental and operational conditions.

### Key Benefits

Electronic components, embedded software, and mechatronic systems greatly enhance vehicle performance and flexibility, but can be a source of significant reliability issues as new functions are added at an accelerated pace. This dramatic increase in electronic complexity makes design tools indispensable for today's automotive systems. Synopsys has the tools and methodologies necessary for today's complex automotive designs from systems to silicon.

- Reduce warranty costs by increasing component, software, and system reliability
- Respond to changing consumer requirements in safety, infotainment, fuel efficiency, and performance
- Decrease design cycle time with virtual prototyping and verification tools that speed time-to-market
- Verify electronic function at the IC, FPGA, PCB, mechatronic system, and embedded software level
- Design and verify electronic/mechatronic automotive systems – powertrain, safety, body/engine controls, fuel and emissions management, navigation, infotainment, etc.
- Develop and verify embedded software before silicon is available using virtual platforms and FPGA prototyping
- Verify component and system interaction across multiple physical domains (electrical, mechanical, hydraulic, magnetic, thermal)
- Address mechatronic complexity using Robust Design/DFSS methodologies
- Develop high-performance, technology-independent FPGAs and prototype ASICs to optimize speed, cost, and area
- Create and validate mixed-signal, full-custom and standard cell ICs for automotive applications
- Develop IC designs requiring specialized device types and design rules for power and reliability in harsh environments
- Decrease IC manufacturing costs and improve production and yield predictability
- Exchange model information across the supply chain to ensure accuracy and reduce development time





**Embedded Software Development and Verification**

Embedded systems and algorithm development allows automotive companies to quickly adopt new electronic functions while lowering costs and development time. However, software can be the source of reliability issues that are difficult to diagnose prior to hardware implementation. Synopsys' System Studio provides high-performance simulation to explore, verify and optimize digital signal processing (DSP) algorithms used in automotive functions. Synopsys' Innovator facilitates a virtual platform to develop, test, and verify hardware/software interaction prior to silicon availability to ensure vehicle performance.

**Mechatronic Systems – Robust Design Methodologies**

Mechatronic systems combine mechanical, electrical, hydraulic, and software disciplines to efficiently drive and control complex vehicle operations. Reliable mechatronic performance requires that systems be immune to the effects of operational, environmental, and manufacturing variations through such methodologies as Robust Design or DFSS. The Saber® Simulator incorporates Robust Design/DFSS methodologies to model, analyze, and optimize system-level interactions for performance, reliability, and cost. Saber Harness provides proven design and verification capabilities to efficiently create and characterize wire harnesses from design to manufacturing.

**PCB Design and Verification**

PCB design integrates various electrical functions into more advanced systems and is crucial in the supply chain. Synopsys partners with leading multi-layer and high-speed PCB design tool providers to incorporate chips and FPGAs into PCB systems. Synopsys also provides industry-recognized simulation and analysis for PCB verification using Saber.

**FPGA Design for Flexibility and Fast Algorithms**

FPGAs provide the flexibility to quickly support new electrical functions without committing to the cost and cycle time of traditional

ASICs or ASSPs. Synopsys has a full-range of FPGA design and verification tools such as Synplify™ DSP to synthesize DSP algorithms into an FPGA for validation, and Confirma™ to prototype and test automotive systems in FPGA-based hardware.

**IC Design and Verification – World Leader**

Automotive semiconductors have revolutionized vehicle design, making operations more efficient with ICs and ECUs networked together to provide critical functions for safety, communication, and controls. Synopsys offers a complete suite of digital and analog/mixed-signal IC tools with the Galaxy™ Design Platform and Galaxy Custom Designer™, including place and route tools tuned for reliability, specialized device types, etc. Verification tools within the Discovery™ Verification Platform are used by leading automotive companies to analyze and verify designs from high-level functional equivalence, high-power behavior at the transistor level, and special rules for cost, production, and reliability.

**IC Manufacturing Solutions – DFM, Yield, and TCAD**

Evaluating IC manufacturing impact early in the design phase ensures cost-effective production and reliable long-term operation. Synopsys offers leading-edge design for manufacturing (DFM) solutions such as Proteus™, to isolate proximity effects for sensitive analog and power structures, and Odyssey™, to predict yield for faster production with less risk. To determine the most appropriate circuit device types and technology, Synopsys provides technology exploration (TCAD) tools to match the demands of specific automotive applications.

**Synopsys for Complete Automotive Electronics Design**

Synopsys provides comprehensive tools and methodologies enabling automotive teams to design, analyze, and verify complex electronic designs in today's demanding environment. Find out more about Synopsys' proven automotive design tools and services by visiting us on the web at [www.synopsys.com](http://www.synopsys.com), or calling 650.584.5000.



Synopsys, Inc.  
700 East Middlefield Road  
Mountain View, CA 94043  
[www.synopsys.com](http://www.synopsys.com)