

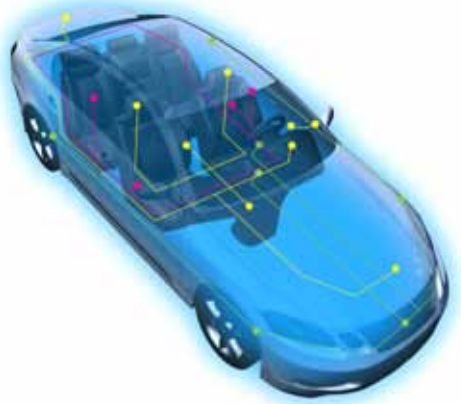
# Innovative Insights

AUTOMOTIVE

## ‘Connected’ Vehicle Engineering Incorporates Feature-Rich Consumer Electronics >

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Today’s digital-savvy drivers are accustomed to 24/7 connectivity to the internet and 24/7 communication with colleagues, employers, family, and social networks. Whether shopping economy or luxury class vehicles, they want the total driving package price, safety, performance, reliability, comfort and the ‘Wow’ factor. Enhanced driver and passenger features can help build automotive brand identity and differentiate a manufacturer’s offerings.



*A high-speed connection system for embedded vehicle design, the HSAutoLink™ assembly includes options for USB 2.0, LVDS, 1394Auto, FlexRay, MOST and Ethernet. The packaged assembly deploys an economical five-pin shielded connector system ruggedized for automotive mechanical requirements.*

By leveraging connector designs and expertise, automotive manufacturers are breaking down barriers to delivering the total package in ‘connected’ vehicles. From standard sealed connector systems to high-speed, in-vehicle, digital communication products, top-tier automotive manufacturers are leveraging advanced electronics for vehicle efficiencies, while responding to demand for ‘connected’ vehicles that economically incorporate feature-rich consumer electronics.

### Complexities of High Speed In-Vehicle Wiring Integration

As seen in the migration of robust safety equipment from luxury to economy class vehicles, more automotive makers are offering consumer-appealing electronics in all vehicle classes. Automotive systems increasingly incorporate the latest in-vehicle audio and video infotainment, GPS navigation, driver assist, back-up cameras, and other content-rich mobile consumer products. Electronic manufacturers are seeing a commensurate boost in demand for much higher speed in-vehicle connectors, wiring, cable assemblies, switches and other electronic technologies that enable these comfort and convenience features.

However, while demand is rising, not all OEMs and designers are experts in high speed electrical connectivity. Designing the ‘connected’ vehicle presents unique engineering challenges, including cost, complexity, signal integrity, vehicle integration constraints and environmental demands. Automotive electronic platforms must meet stringent design specifications and performance requirements for these high speed links.

The sub-system that a link services is a primary influencer in component selection, in addition to the module or device location within a vehicle, and connector performance requirements. Unlike a PC or other portable consumer device, a car’s serviceable life can span upward of 15 or more years, so product integrity and longevity are other important considerations.

To address these issues, leading electronics companies and engineers are increasingly leveraging expertise from other industries and adapting the latest technologies for use in automotive applications. Advanced interconnect and high-speed technologies are helping automotive manufacturers bridge engineering challenges. Powerful cross-technologies provide invaluable tools for designers tasked with developing scalable, flexible, and economical platforms for smarter, more connected vehicles. In some cases, the most cost-effective and advisable approach is to migrate or modify existing consumer electronic products to meet automotive requirements. Demand for better designs has also spurred development of new electrical and electronic products for the ‘connected vehicle’ segment.

### ‘Connected’ Vehicle Design Engineering Essentials

An array of user access ports, point-to-point connector assemblies, and other driver and passenger networking solutions have been tested and validated in demanding automotive applications, including:

- Driver interface Customer Convenience Port (CCP) modules optimize the power supply and connectivity to high-speed audio, video displays, CD players, DVD players and navigation devices. For improved engineering design flexibility, CCP options include total I/O integration with USB, SD memory cards, HDMI, IEEE 1394, EtherNet, Bluetooth and auxiliary jack media ports.
- Membrane switches provide durable, lightweight and low-profile options for integrating in-vehicle user interfaces and electronic components. Standard membrane switches are thin micro-motion assemblies, with one or more layers of silver or carbon conductors printed on polyester substrate layers. Non-tactile membrane switches, poly-domes, silicone rubber keypads, and tactile metal domes can be selected to provide the “snap” feedback or audible sound when the switch is actuated.

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- Using solid state circuitry to detect touch, customized capacitive switches are designed to be resistant to harsh chemical exposures, contaminants, and EMI, which makes this user interface robust and durable in automotive applications.
- Stac64™ single, multi-pocket and hybrid systems reduce engineering and time-to-market by offering modular housing connectors which can be used to easily gang headers together in telematics, navigation, instrumentation and other vehicle electronics applications. This versatile and stackable connection system supports low-level signal requirements, as well as power applications upwards of 30 amps.
- Standard and custom light-emitting diode (LED) printed circuit assemblies support low power consumption in high-current applications, including indicator panels, interior lighting and navigation, mirrors, side markers, head lamps, emergency lights, brake lights and stop lights.

In terms of technology trends, three primary digital links are emerging in the connected vehicle segment consumer access ports, video (port-to-port) and in-vehicle networking (peer-to-peer). Both optical and copper connectivity solutions, with multiple options, are being used to support high speed digital links entering vehicles. Many are based on SerDes (Serializer/Deserializer) and networking standards which help to reduce weight and open up endless possibilities for in-vehicle architecture changes, but not without initial challenges.

### **HSAutoLink™ Interconnect System Delivers Ultimate Integration Flexibility**

An emerging high-speed connection system for embedded vehicle design, the HSAutoLink™ assembly encompasses technology options, such as Universal Serial Bus (USB 2.0), Low Voltage Differential Signaling (LVDS), 1394Auto, FlexRay, MOST and Ethernet, is gaining traction across the automotive industry. The packaged assembly deploys an economical five-pin shielded connector system from the consumer market that has been ruggedized to meet automakers’ mechanical requirements and to bring USB and other technologies to vehicle information and entertainment systems.

The economical HSAutoLink connection system represents a significant step toward streamlining connectivity in the consumer automotive market. Addressing one of the most significant design challenges of blending consumer and automotive electronics, the HSAutoLink assembly delivers on the requirement for reliable EMI and EMC performance in the space-constrained packaging requirements commonly found in vehicle communications, telematic devices, driver assist cameras, infotainment, and other potential high speed embedded link applications.

Engineered for longer product life, HSAutoLink interconnect cable assemblies are in compliance with USCAR-30 and offer a ruggedized interface durable up to 5,000 cycles, which far exceeds optimal automotive life requirements for an embedded link. The full-length cable shielding provides the superior signal performance and reduced EMI with the HSAutoLink assembly. In USB 2.0 applications, the standard A receptacles feature shrouded and positive bezel-latching capabilities to provide in-vehicle mounting for connecting media devices such as portable navigation systems, flash drives and MP3 players where vibration is always present.

Expanded cable exit offerings deliver even greater design flexibility in compact vehicle packaging requirements. The angled exits or short profile, right angle exit (RAE) options allow the assembled cable to exit the device at various angles, providing alternative routing options in tightly confined areas. The RAE version features an extremely compact connector footprint, allowing cable connections in areas with obstructions directly behind the interface.

### **Automotive Engineering to Meet Demand and the ‘Wow’ Factor**

The automotive industry has seen important shifts in the way automotive buyers evaluate their purchases. Next-generation car buyers know the conveniences they want in their day-to-day driving experience. Some consumers place as much emphasis on the technology and connectivity of a vehicle as on the brand and model. As demand for user navigation, safety, comfort, and infotainment content increases, so too does the need for solutions that simplify electrical distribution systems and enable a feature-rich environment today’s drivers have come to expect.

Automotive OEMs gain a competitive advantage by tapping into high performance and reliable electronic content and customization. For those exploring new strategies to simplify engineering, improve performance, and economically reduce weight and space, HSAutoLink and other electronic advances can readily be integrated into a total package that delivers a high bandwidth ‘Wow’ factor.

A global electronics supplier to top-tier automotive markets, Molex offers vehicle manufacturers and their suppliers a wide range of products, as well as extensive research and development capabilities that include rapid prototyping and high volume production support by applying proven expertise and breakthrough technologies from other markets and industries to infotainment, telematic and in-vehicle network development engineers.

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