

# Innovative Insights

TRANSPORTATION

## ADVANCED ELECTRONICS FOR 'CONNECTED' COMMERCIAL VEHICLE ENGINEERING >

HSAutoLink™ PRODUCT SPOTLIGHT

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A decade ago, electrical components represented about 10 percent of the overall cost for commercial vehicles. Today, electronics represent approximately 35 percent of vehicle component cost. Transportation engineers have a broad range of innovative and proven electronics solutions at their disposal, ranging from standard sealed connector systems to high speed in-vehicle digital communication products. Top-tier manufacturers are leveraging advanced electronics for vehicle efficiencies, while concurrently responding to demand for 'connected' commercial vehicles that economically and efficiently incorporate feature-rich consumer electronics.

On-highway and off-road applications require the ability to communicate with the back office to help track and regulate vehicle behavior. Fleet owners face federal mandates limiting hours of service, which is placing the onus on drivers to regulate themselves, and putting the corporations at risk. Telematics integration tools such as GPS locators, tracking software, and other communication devices help business owners run their operations under strict parameters while better understanding real time issues in the field.

For vehicle OEMs focused on offering value to their fleet owners through driver retention, integrated connected vehicles add a competitive edge for both the OEM and fleet owners. This is particularly important as intense competition for experienced drivers has raised the bar for comfort and connectivity in long and short haul trucks. Many commercial drivers are accustomed to 24/7 connectivity to the internet and communication with family, friends and their employers. The industry is starting to see a trend whereby features and conveniences commonly found in personal vehicles are steadily migrating into commercial vehicles, including audio and video infotainment, security and safety cameras, smartphones, and power and data connectivity for mobile laptops, netbooks and smartphones.

While demand is on the rise, not all commercial OEMs and designers are experts in high speed electrical content. Designing the 'connected' commercial vehicle presents unique engineering challenges, including signal integrity, in-vehicle data management, space constraints and electrical voltage regulation. To address these issues, leading electronics companies and OEM design engineers are increasingly leveraging expertise from other industries and adapting the latest technologies developed for use in commercial transportation applications.

### Convergence of Commercial and Consumer Electronics

Commercial vehicle engineering increasingly requires electronic technologies enabling the latest in-vehicle content-rich mobile

applications. As seen in the migration of robust safety equipment from luxury automobiles to economy class and commercial vehicles, OEMs are strategically incorporating electronics as business tools and for user functionality and appeal. Electronic manufacturers have seen a commensurate boost in demand for connectors, cable assemblies, switches and other electronic technologies to enable these features.

The integration of new electronic content and connectivity options presents unique power management and engineering design challenges. Commercial electronic platforms must meet stringent design specifications and performance requirements. Cost, compatibility, electrical voltage spikes and in-vehicle or cab signal integrity are important considerations.

The need for better technologies has spurred the development of Molex product offerings addressing the electrical and electronic demands of the 'connected commercial vehicle' segment. Powerful cross-technologies provide invaluable tools for designers tasked with developing scalable, flexible and economical platforms for smarter, connected commercial vehicles.

### 'Connected' Commercial Vehicle Electronic Toolkit Essentials

An array of user access ports, point-to-point connector assemblies, and in-cab networking solutions have been tested and validated in demanding commercial transportation 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, in addition to Molex HSAutoLink.
- Membrane switches provide durable, lightweight and low-profile options for integrating user interfaces and electronic components into a variety of transportation applications. 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.
- Using solid state circuitry to detect touch, customized capacitive switches are designed to be resistant to harsh chemical exposures,

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contaminants, and EMI, which makes this user interface robust and durable in vehicle applications.

- Stac64™ single, multi-pocket and hybrid systems that 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 30.0A.
- 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.

### Technology Spotlight: HSAutoLink™ Interconnect System Delivers Ultimate Design Flexibility



The HSAutoLink™ portfolio is the emerging high-speed data bus for commercial vehicles and other heavy equipment, encompassing technologies such as Universal Serial Bus (USB 2.0), Low Voltage Differential Signaling (LVDS), 1394, FlexRay, eMOST and Ethernet. Molex has packaged an economical and widely deployed five-pin shielded connection system from the consumer market into a more robust connector system to meet mechanical requirements and bring USB and other consumer technologies to commercial transportation. The release of the HSAutoLink™ High-Speed Databus represented a significant step toward streamlining electronics in 'connected' commercial vehicles.

Addressing one of the most significant design challenges of blending consumer and industrial electronic components, the HSAutoLink assembly delivers on the requirement for reliable EMI and EMC performance in space-constrained packaging requirements commonly found in vehicle communications, telematic devices, safety cameras, infotainment and other potential in-cab applications. The full-length cable shielding provides the superior signal performance and reduced EMI with the HSAutoLink. The USB 2.0 standard A receptacles feature shrouded and positive bezel-latching capabilities to provide in-cab mounting for connecting media devices such as portable navigation devices, flash drives and MP3 players where high vibration is always present.

The HSAutoLink packaged assembly deploys an economical five-pin shielded connector system from the consumer market that has been ruggedized for harsher commercial mechanical requirements. Molex recently introduced expanded cable exit offerings for even greater flexibility in compact design 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.

Engineered for longer product life, the HSAutoLink portfolio blends proprietary shielding and volume assembly manufacturing processes leveraged with breakthrough technologies from other markets. HSAutoLink interconnect cable assemblies offer a durable interface up to 5,000 cycles. In compliance with USCAR-30, the HSAutoLink connectors and cables are configured to deliver the latest in 'connectivity' to drivers and operators.

As demand for user navigation, safety, comfort, and infotainment content increases, so too has the need for solutions that simplify electrical distribution systems and enable a feature-rich environment. Commercial vehicle OEMs can gain competitive advantages tapping into high performance and reliable electronic content and customization. As a major supplier to global commercial transportation markets, Molex offers a wide range of products and 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 in-cab and vehicle electronics.

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