

ADAS Interconnect Design: Selecting the Right Connector for Every Link



Advanced driver assistance systems are pushing vehicle electronics into a new class of complexity. Cameras, radar, LiDAR, domain controllers, and central compute platforms all depend on interconnects that can transmit more data, withstand harsher environments, fit into tighter spaces, and remain manufacturable at automotive scale. In ADAS, the connector is no longer just a passive link. It directly influences signal integrity, packaging efficiency, reliability, manufacturability, and long-term serviceability.

ADAS uses many different types of connections, and each one has its own design needs. A sensor link, a board-to-board interface inside a compute module, and a compact 48 V signal connection do not face the same challenges. Connector selection in ADAS therefore depends on where the interface resides within the system and the requirements it must support.

High-Speed Links at the Sensor Edge

One of the most visible ADAS pressures is data movement. Sensor-rich architectures must transport increasing volumes of information between edge devices and compute nodes, often across multiple protocol layers. Inside compute modules, PCIe remains attractive for high-bandwidth, low-latency communication between processors, accelerators, storage devices, and peripheral subsystems over relatively short distances, while Ethernet is better suited to longer-reach networking and aligns well with software-defined vehicle architectures.



This is where connector selection becomes application-specific. Amphenol's [Ve-NET™ Automotive Multi-Gigabit Differential Connector System](#) addresses automotive Ethernet needs with sealed and unsealed options, board and cable variants, hybrid versions, and packaging-efficient right-angle geometries. Features such as compact 90-degree cable connectors and reversed interfaces help reduce module height in tightly packaged control units.

[HSD \(High Speed Data\) Connector System](#) remains relevant as a widely adopted high-speed platform for camera, USB, Ethernet, and LVDS-style links, with multiple form factors for edge devices and legacy architectures.

For ADAS engineers, the real question is not simply bandwidth. It is how bandwidth, shielding, reach, and packaging all interact in the same link.

Inside The ECU: Vibration, Tolerance, And Board-to-Board Performance

Once data reaches the controller, the interconnect requirements change. Inside ADAS ECUs, board-to-board interfaces must carry high-speed signals while also tolerating vibration, assembly variation, and solder-joint stress. A connector that performs electrically but transfers mechanical strain into the PCB is not enough.



Amphenol's [Floating Board-to-Board Connector](#) approach is designed for that environment. By absorbing stress away from board-fixed regions, it helps protect solder joints under vibration while accommodating PCB misalignment. At the same time, it supports the signal integrity requirements of modern high-speed board-to-board interconnects and can be configured for both signal and power distribution.

[DensiStak™ 1034 pin Open-Pin-Field Board-to-Board Connector](#)

addresses a different use case: high-density board-to-board paths where alignment is tightly controlled and space efficiency is the priority. With shielding options, keying, and PCIe-capable performance, it is better suited to designs where density and stack height matter more than float.

There is an important distinction here in the level of tolerance each connection is designed to manage. In ADAS compute modules, board-to-board selection depends not only on signal performance but also on how much misalignment and mechanical stress the interface needs to absorb.

Reducing Connector Complexity in Zonal Architectures

ADAS growth also increases interface count. More sensors and more distributed electronics can quickly lead to connector sprawl, consuming PCB area, increasing mating operations, and adding sealing and coding complexity.

This is where Amphenol's connectors, like the [ComboNET™ Automotive Modular Connector](#), which combines multiple different connectors, become particularly useful. Instead of treating signal, data, and power as separate connector problems, combo architectures consolidate multiple interfaces



into a single modular system. That can reduce PCB footprint, lower assembly effort, simplify coding, improve serviceability, and make sealed implementation more manageable. In zonal designs, where multiple functions converge at aggregation points, such consolidation can be more valuable than simply choosing a denser discrete connector.

The flexibility of the concept also matters. Standard modules support repeatable building blocks, while hybrid or customized modules can improve contact density and reduce wasted space for application-specific pinouts. For engineers trying to reduce wiring complexity without giving up functional diversity, a modular hybrid approach offers a more system-level solution.

Flex Connectors For Compact, Lightweight ADAS Modules



As ADAS electronics become denser, internal routing becomes a packaging problem as much as an electrical one. Designers need to reduce bulk and weight while preserving retention, contact reliability, and assembly robustness.

Amphenol's flex connector families address that problem from several angles. [FlexLock™ Flex-to-Board/Wire Connectors](#) provide a more traditional flex-based solution for flex-to-board and wire-to-flex interfaces, including larger-pitch designs that support more

demanding automotive conditions. [FlexFast™](#) reduces mass, simplifies termination, and provides lower mating force. Features such as flex position assurance help maintain proper alignment and reduce operator-handling risk during assembly.

[FlexFast™ Mini Flex-to-Board](#) extends that concept into tighter spaces, while ZIF, Auto Lock, and [FlexFast™ ZIF](#) offer different approaches to low-force mating and controlled electrical engagement. In compact ADAS modules, these are not simply lightweight alternatives to round cable. They are ways to improve routing freedom, reduce package bulk, and make flex interconnects more production-ready.

Compact Signal and Power Still Matter

Not every ADAS interconnect challenge is a multi-gigabit challenge. Sensor and compute platforms still depend on large numbers of compact signal and local power interfaces, each with its own constraints around pitch, current, sealing, and voltage capability

[MicroSpace™ and MicroSpaceXS™](#) fit where engineers need compact wire-to-board or wire-to-wire connectivity with strong space efficiency. Their staggered geometry helps reduce PCB footprint, and sealed and unsealed variants support different module environments. [WireLock®](#) extends that compact philosophy across wire-to-board, wire-to-flex, and wire-to-wire implementations for dense low-voltage connectivity.



As architectures move toward 48 V, connector design becomes more critical. Ve-Tera™ Automotive Power 48 V Connector System addresses these requirements with a compact, space-efficient design, creepage and clearance performance exceeding PD2 requirements, support for EWCAP 6.3, 9.5, and 12.0 interfaces, CPA and TPA features for secure mating, and sealed or hybrid options to support a wide range of automotive power distribution applications.

The takeaway is that signal and power connectors remain central to ADAS design. They simply have to do more within less space.

Qualification, Manufacturability, And the Value of a Portfolio Approach

ADAS connector selection is not complete until the interface can be validated, assembled repeatably, and integrated into a real production environment. Interoperability, qualification, automation readiness, and repairability all shape whether a connector architecture can succeed in a vehicle program.

That is why details such as automated crimping and insertion support and separable internal interfaces matter so much. They affect how easily the vehicle wiring system can be built, how modules are assembled, how the design is validated, and what it ultimately costs. As ECUs become more expensive and more modular, repairability and serviceability also become more important design considerations rather than afterthoughts.

This is also why ADAS requires a portfolio approach. High-speed sensor links, internal board-to-board compute paths, zonal aggregation points, flex-based internal routes, and compact signal and power connections all operate under different constraint sets. Those needs span high-speed data transport, board-to-board links inside ECUs, modular interfaces that reduce connector count in zonal architectures, flex-based connections for lightweight internal routing, and compact signal and power links that support dense packaging.

As vehicles become increasingly connected, autonomous, and software-defined, interconnect selection plays a critical role in overall system performance. Amphenol's automotive connector portfolio provides the flexibility, reliability, and scalability needed to support every link in the ADAS signal chain.

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