The Evolution of ADAS Design

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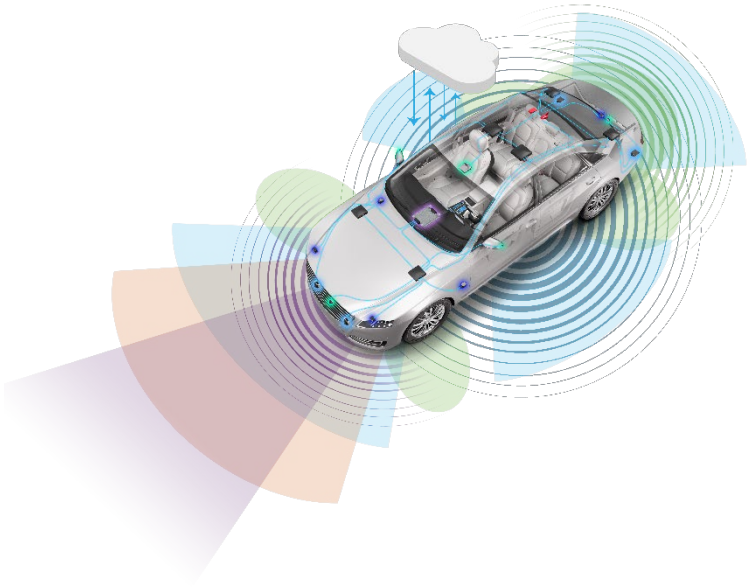

Advanced driver-assistance systems (ADAS), which aim to increase car and road safety, started out as antilock braking and traction control but have evolved in including advanced capabilities that are viewed as precursors to fully autonomous vehicles. Applications with ADAS, such as seamless integration of mobile devices, collision and obstacle avoidance, lane departure warnings, adaptive cruise control, and more, rely on LiDAR, radar and cameras, as well as advanced positioning technologies.

These solutions are becoming more common and capable—in fact, a recent Molex survey found that 94% of automotive manufacturers think cars in the future will include autonomous driving features. These trends are already being included in many newer models, while engineers and designers continue to work to make the components smaller and more reliable, rugged, and capable.

ADAS Design Challenges

Today's vehicles require advanced overall connectivity—integrated systems that can seamlessly and reliably communicate and adapt to the complex systems that are driving an increase in modularization, engine compartment systems, human-machine interfaces, and integrated, connected sensors. Saving space is critical, as ADAS require multiple printed circuit board (PCB) and flex assemblies for an increasing number of components expected to deliver quality, reliability and ruggedness in a sleek package.

Miniaturization drives the need for finer-pitch and higher-density interconnects between components. Designers are turning to interconnect technologies that have not been typical in automotive designs, such as fine-pitch board-to-board (B2B) and FFC/FPC connectors, which enable denser board architectures and replace larger interior connectors that are traditionally used in the vehicle space. These smaller connectors must still meet demanding temperature, shock and vibration extremes with high signal integrity and security.

As the approach to ADAS components evolves, automotive original equipment manufacturers (OEMs) and their suppliers require a certain level of electronic component excellence, including wide temperature ratings and shock and vibration validation, along with adherence to the automotive Production Part Approval Process (PPAP). The ADAS space continues to rapidly evolve, while the learning process of designing, assembling and validating any new components requires a longer timeline.

Affordability also plays into design considerations—as ADAS capabilities become more commonplace, the costs associated with the features need to remain balanced so that consumers can afford a vehicle with multiple driver-assist systems, especially if the systems become part of standard regulations.

Connected Solutions

Molex supports the development of ADAS car cameras, radar and LiDAR with solutions tailored to the connected vehicle environment. Floating B2B connectors ease the robotic assembly process and are resilient to the effects of high-vibration and shock environments, while many connectors are designed with high retention and dual contacts to ensure reliability. Molex offers tested and rated components and has a proven track record of performance for ADAS and automotive solutions.

SlimStack floating B2B connectors. These flexible and reliable connectors are used in vehicle modules and systems to connect PCBs and can be robotically assembled due to their exceptionally wide floating ranges. The connectors float even when mated, which helps compensate for tolerance stacking and withstand vibration for the lifespan of the connection.

The SlimStack floating B2B connectors have been tested to demanding automotive-grade requirements and are used in multiple applications, such as interconnecting PCBs in applications from miniature external vision systems. Molex offers custom options in compact sizes with pitches as small as 0.635 and 0.40mm to meet space constraint requirements.

Easy-On FFC/FPC connectors. These reliable and robust connectors are used for ADAS applications and in-vehicle infotainment due to their high operating temperatures, contact reliability, robustness and small profile.

A subset of Easy-On connectors has been tested to demanding automotive-grade requirements and is used in multiple applications, such as LiDAR, radar, electronic systems and automotive display systems. The unique front-flip actuator design and built-in retention features allow the connectors to withstand high shock and vibration and can operate under harsh outside conditions.

HSAutoLink. This interconnect system addresses the ever-increasing requirements of ADAS applications by providing high-speed and robust capabilities that can support advanced infotainment, cameras, high-resolution displays and telematics. Molex's high-speed cable technology is automotive-grade, rugged and guarantees signal integrity.

Antennas. To enable vehicle Wi-Fi, Bluetooth, keyless entry systems and dedicated short-range communications (DSRC) systems as well as LTE and 5G antennas, Molex offers a variety of PCB, internal and external antennas. A variety of manufacturing technologies allows the antennas to be used for a variety of ADAS applications.

Use Automotive-Grade Connectors in ADAS Design

As ADAS applications continue to expand, Molex offers a variety of cutting-edge solutions to enable reliable and cost-effective capabilities. Visit TTI's website for more information on Molex's SlimStack and Easy-On connectors, as well as HSAutolink and Molex antennas.