ElectronicDesign

TOP TIPS

# ADAS: The Tech That's Changing the Auto Forever

## 1 What is ADAS?

Advanced Driver Assistance System (ADAS) designs leverage sensor technology to determine the operational state of vehicles and provide essential information for a safer and easier driving experience. ADAS systems take the guesswork out of driving, replacing it with accurate real-time knowledge that give drivers greater control over their vehicles.

Most cars today come with some ADAS functionality, such as forward collision warning or advanced parking assist. According to AAA, at least one ADAS feature was available in 92.7% of new vehicle models in the United States in 2018. Drivers are increasingly counting on these systems to improve their driving, reduce distraction, and help them to focus on the road, enhancing road safety. The demand for increasingly automated driving is also impacting other systems, as seen in the stick shift's ongoing demise as an option across all car makes and models.

## 2 IoT and V2X is driving it all.

IoT technologies already support ADAS functionalities, in-vehicle infotainment systems, navigation and telematics applications, and serve as the foundation for all emerging V2X technologies—and there are many: vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), vehicle-to-network (V2N), vehicle-to-pedestrian (V2P), vehicle-to-device (V2D), and vehicle-to-grid (V2G).

In the long term, all V2X technologies combined will turn the autonomous vehicle vision into a reality. Even now, V2X strategies are accelerating system-of-system, system, and module-level autonomous solution design—while ensuring that today's ADAS functionalities are being innovated for the V2X vision.

## 3 AEB: Automatic Emergency Braking

Automatic Emergency Braking (AEB) is among the most widely adopted ADAS functionalities. Many drivers can now rely on it to detect impending forward crashes. If the driver's response is not sufficient to avoid the crash, the brakes are automatically applied to help prevent or lessen the severity of a collision.

4

## FCW: Forward Collision Warning

Forward Collision Warning (FCW) notifies the driver when a forward collision with another vehicle or any object in the roadway is imminent. These systems work with radar, laser and camera systems to measure the distance, angular direction and relative speed between the equipped vehicle and any object directly ahead. Visual, audible, and/or tactical alerts are generated so the driver can take evasive action if needed. Some forward collision warning systems are integrated with the adaptive cruise control system to reduce speed when another vehicle or object is detected.

5

## ACC: Adaptive Cruise Control

Adaptive Cruise Control (ACC) is an intelligent system that allows drivers to maintain an optimum distance between other vehicles by automatically adjusting speed. A control unit manipulates the accelerator and brake based on the information from a radar or laser sensor on the vehicle exterior. The system is integrated with the engine as well as the brakes, automatically decelerating the vehicle to maintain optimum distance. The vehicle then re-accelerates to the set speed when the path is clear.

6

## LDW: Lane Departure Warning

Lane Departure Warning (LDW) systems use a small camera mounted near the rearview mirror to determine the position of the vehicle and recognize the striped and solid lane road markings. When the vehicle starts deviating from the lane without an appropriate turn signal, this system warns the driver by vibrating the steering wheel or sounding an alarm. Some systems also employ Lane Keeping Assist (LKA), which uses automatic corrective steering input for continuously active steering, or braking to return the vehicle to its intended lane of travel.

7

## APA: Advanced Parking Assist

Advanced Parking Assist (APA) detects the lane marking and sets the target parking position of the vehicle to guide parallel parking. Sensors monitor the sizes of potential parking spaces as you drive by, alerting you when a good fit has been located (often via an arrow on the dashboard). Once the right spot has been found, all the driver has to do is pull up next to it, bring the vehicle to a stop, and shift into reverse gear. Shifting to reverse automatically activates the backup camera system, and the car's rear view appears on the dashboard navigation or camera display.

The system also causes a grid with colored lines—usually green or red—to appear, a symbol representing the corner of the parking spot, and adjustment arrows. This eliminates guesswork and ensures a perfect parallel parking job with no risk of damage to the vehicle or other vehicles.

8

## BSW: Blind Spot Warning

Blind Spot Warning (BSW) systems use cameras or radar to monitor vehicles approaching from the side drivers can't see. The sensors are next to or behind the car, positioned in the driver's blind spot to facilitate safe lane changes. Drivers get a visual warning when a vehicle is detected, often in the outboard mirrors.

## 9 Glass Cockpits: Why they're needed for ADAS to advance

As the last remnants of the analog dashboard go extinct, tomorrow's instrument clusters require digital displays in varying combinations that are designed for precise and fast driver responses. Glass cockpits often consist of multiple touchscreen displays positioned over liquid crystal panels allowing immediate user input and function display. The main touch screen technologies include resistive, surface capacitive, projected capacitive, surface acoustic wave and infrared. Today's display systems consist of a sensing mechanism, a control circuit and an interface to the control circuit. When a finger approaches the surface, electrostatic capacity among multiple electrodes changes simultaneously, and the position where contact occurs can be identified precisely.

## 10 Open Standards: A must for the glass cockpit

The broad range of display technologies, resolutions, and interfaces poses challenges for automotive suppliers. Among them: delivering the real-time processing performance that is ideal for vision-based applications (which requires a throughput minimum of 30 frames per second); and providing the LCD/TFT interfacing capabilities required for automotive infotainment, driver information, and driver assistance applications. This includes the ability to control optional heads-up displays.

Going forward, digital display hardware and their capabilities must be usable across multiple car models with different feature offerings. The glass cockpit also must be able to adapt as connectivity is added or updated as networking standards change over time.