VEHICLE electronics

The monthly magazine for automotive electronics engineers

# Adas could end backseat drivers

According to a recent study from Ford and sociologist Jess Carbino, more than two-thirds of drivers believe backseat driving behaviour will decrease because of driver-assist technology.

And Carbino believes by reducing chirps from backseat drivers, driver-assist technology can help reduce relationship tensions in the car for a more harmonious ride.

Available driver-assist technologies – such as blind spot information system with cross-traffic alert and pre-collision assist with automatic emergency braking – can help reduce the risk of collisions and build confidence in certain driving situations, while always allowing the driver to remain in control.

For the study, Ford teamed with sociologist Carbino, best known for her work with dating app Bumble, and confirmed that backseat drivers could cause more harm than good for the well-being of those inside the vehicle.

"For a lot of drivers, constantly getting advice from passengers is more than just annoying, it's stressful," Carbino said.

The study's findings contradict a growing belief that technology inhibits human connection. Insights from the study show that while backseat driving can cause in-vehicle relationships to suffer, driver-assist technology can help avoid unnecessary backseat banter.

Since the technology can help with some of the burdensome navigation tasks, drivers and passengers can focus on more enjoyable aspects of the ride, namely each other.

The data also suggest that since respondents have confidence in the technology, it can help eliminate the perceived need for their backseat driving input.

Ford is using the study to plug its Co-Pilot 360 driver-assist technology.

"Certainly the intent of Ford Co-Pilot 360 technology was not to eliminate backseat driving," said Chris Billman, Ford Co-Pilot 360 engineering manager, with a laugh. "But hey, if we can help in that way too, that's great."



Driver assist technology can harmonise journeys

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# Elektrobit software powers Baidu Apollo project

Elektrobit is to provide automotive infrastructure software for the Apollo computing unit (ACU), Baidu's in-vehicle computing platform for autonomous driving.

The ACU, an autonomous driving in-vehicle computing platform for mass production, is one of the most important products of Baidu Apollo, which is being developed with 156 industry partners including Chinese car makers.

EB is providing its Tresos automotive basic software products to the ACU-advanced automated valet parking project. Tresos enables the development of Autosar standard-compliant software for automotive ECUs with functional safety up to ISO 26262 Asil D.

The software will let car manufacturers and suppliers using ACU expedite the market introduction of safe systems for automated valet parking.

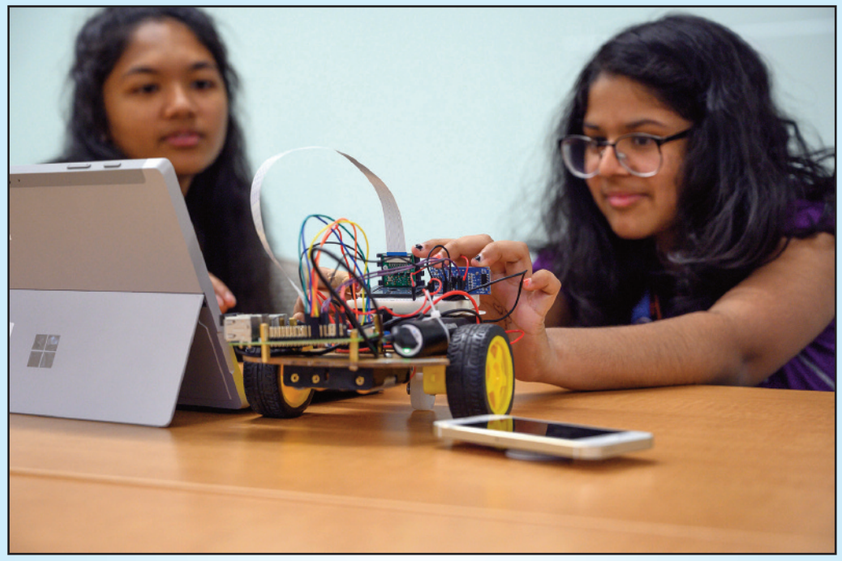
EB says it is playing an integral role in Baidu's efforts to accelerate the intelligent transformation of the automotive industry.

"Baidu Apollo has made tremendous strides in just two years since its launch, with support from leaders in the automotive industry, in China and around the world," said Alexander Kocher, president and managing director of Continental subsidiary Elektrobit. "China is an important and strategic market for EB, therefore we are glad to bring our products and experience into the ACU. We are extremely proud to be a partner and look forward to working with Baidu as well as the whole industry to accelerate the development of automated driving based on Apollo."

Elektrobit is also working with Baidu Apollo in further areas and just published a joint whitepaper on reliable and safe maps for automated driving.

EB's software powers over one billion devices in more than 100 million vehicles. Baidu is the leading Chinese language internet search provider.

# Intel girls take self-driving lessons



Girls aged 12 to 15 received training in autonomous vehicles and other technologies during a weeklong camp run by Intel to mark Women's Equality Day in the USA.

The Women in Science Girls' Steam (science, technology, engineering, arts and maths) Camp in Oregon saw 54 girls from underserved communities and a bunch of Intel employee-mentors learn about robotics, drones, coding, artificial intelligence and more.

This was the first camp of its kind in the USA, following similar camps this summer in Estonia and Kosovo, and previous camps in Rwanda, Peru, Malawi and Georgia.

In classrooms and labs at Oregon State University's Cascades campus, the girls received hands-on experience writing Python code to control drones; learned to use sensors and other technologies that support robotics and autonomous vehicles; and broke into small groups to discuss how they could improve their lives.

# Juniper becomes Aston Martin network partner

AI-driven networking firm Juniper has become an official partner of Aston Martin Lagonda. The companies will work together to deploy a network to support the car maker's business through growth and expansion of its vehicle ranges.

Aston Martin is already a Juniper customer, with deployments across its multiple manufacturing, administration and customer-facing sites. Going forward, the company's secure networking infrastructure will be underpinned end-to-end by Juniper technology.

Aston Martin Racing, the company's motorsport arm, will also use Juniper's technology trackside to enable its competitive and R&D communications for events globally.

In the world of endurance sports car racing, Juniper branding will appear on the Aston Martin Vantage GTE race cars for the FIA World Endurance Championship flagship race at Le Mans in 2020, as well as several other races globally in the 2019-20 season and beyond. The first outing for the new livery was at last month's Four Hours of Silverstone season starter.



Juniper branding on Aston Martin race car

"It is vital to a company like Aston Martin that our networks work seamlessly," said Sebastien Delmaire, Aston Martin partnerships director. "Juniper strives to be the best in its field and that is demonstrated with everything they do."

Mike Marcellin, chief marketing officer for Juniper Networks, added: "Our two companies, although producing uniquely different products, share many common values, including the pursuit of engineering excellence and creating simplicity as the highest form of innovation."

# JLR and Cambridge University partner on HUD research

Jaguar Land Rover is working with researchers at Cambridge University to develop head-up display technology that could beam real-time safety information in front of the driver, and allow passengers to stream 3D movies direct from their seats.

Engineers are working on a 3D head-up display to project safety alerts, such as lane departure, hazard detection and satnav directions, and to reduce the effect of poor visibility in poor weather or light conditions. Augmented reality would add the perception of depth to the image by mapping the messages directly onto the road ahead.


Passengers can watch 3D movies

The technology could be used by passengers to watch 3D movies. Head and eye tracking technology would follow the user's position to ensure they see 3D pictures without individual screens or special glasses.

In a fully autonomous vehicle, the 3D displays could provide a personalised experience and allow ride-sharers to select their own infotainment independently.

Several passengers sharing a journey would be able to enjoy their own choice of media including journey details, points of interest or movies, optimised for where they are seated.

The research is being undertaken with the Centre for Advanced Photonics & Electronic at Cambridge University.





# AGL working group to tackle instrument clusters

Automotive Grade Linux (AGL), an open source shared software project for in-vehicle technology, has set up a working group focused on instrument clusters and the latest code release of AGL platform, the UCB 8.0.

The group wants to reduce the footprint of AGL and optimise the platform for lower performance processors and low-cost vehicles that do not require an entire infotainment software stack. The group plans to release design specifications this year with an initial code release in early 2020.

"AGL is supported by nine major automotive manufacturers, including the top three producers by worldwide volume, and is being used in production for a range of economy and luxury vehicles," said Dan Cauchy, executive director of Automotive Grade Linux. "The instrument cluster expert group, supported by several of these automakers, will expand the use cases for AGL by letting the UCB platform support lower-cost vehicles, including motorcycles."

UCB 8.0 was developed through a joint effort by AGL members. It is an open source software platform that can serve as the de facto standard for infotainment, telematics and instrument clusters.

UCB 8.0, nicknamed Happy Halibut, includes an operating system, middleware and application framework.

Updates include: device profiles for telematics and instrument cluster; telematics profile and demo; web app manager enhancements; upgrade to Yocto 2.6; speech integration with Alexa Voice Agent; multi-user security rules for the AGL application framework; Waltham transmitter and receiver fully available in IVI and instrument cluster profiles; window manager and home screen services; audio policy manager; pipewire as default audio build option; writing to Can bus supported and secured; board support packages for major automotive reference hardware boards; and task manager application available as an installable widget.




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# Nissan adopts Renesas SoC and MCU in ProPilot 2.0

Nissan Motor has adopted Renesas technology for the ProPilot 2.0 featured in the Nissan Skyline unveiled in July.

The driver assistance system combines navigated highway driving with hands-off, single-lane driving capabilities, using Renesas' R-Car automotive SoC and RH850 MCU to implement core functionality in the ECUs that handle driving judgment and control.

For on-ramp to off-ramp highway driving, ProPilot 2.0 engages with the vehicle's navigation system to help manoeuvre the car according to a predefined route on designated roadways. The system also enables hands-off driving while cruising in a single lane.

The R-Car SoC first creates detailed environment maps of the vehicle surroundings by combining information on nearby vehicles and other objects from the cameras and front radar with the high-precision 3D map data preloaded for navigation.

The SoC determines the vehicle's own position from the map data and lane information and determines the vehicle's action plan. The RH850 receives the resulting data and sends control commands to the ECUs such as in the steering wheel, accelerator and brakes.



Nissan picks Renesas R-Car SoC and RH850 MCU for ProPilot 2.0

"Realising ProPilot 2.0 on the Skyline required the technological innovation of achieving performance that can handle real-time processing of several times more sensor data than ever before while maintaining reliability," said Takashi Yoshizawa, vice president at Nissan Motor.

Shingo Yamamoto, executive vice president for Renesas, added: "Nissan's confidence in the processing performance and quality of our semiconductors and in Renesas as a partner in the overall project of advanced driver assistance system ECUs made it possible to combine our technological expertise for development."

## Nvidia picks Macronix for secure memory

Macronix's ArmorFlash memory is being used on the Nvidia Drive AGX Xavier and AGX Pegasus autonomous vehicle computing platforms.

ArmorFlash is said to bring security, quality and longevity of supply data storage to AI-based level two to five adas and autonomous driving.

"Our efforts with Nvidia are focused on elevating the security of data in AI-based autonomous driving and, ultimately, to enhance the safety of drivers," said Anthony Le, vice president of Macronix.

ArmorFlash combines mature security technologies, including unique ID, authentication and encryption features. These features enable security in a high-density memory device to prevent data from being compromised.

On the Nvidia Drive platforms, the ArmorFlash device provides trusted NVM storage of encrypted and integrity-protected assets. It supports secure communications channels and protocol with the Xavier SoC via cryptographic operations, integrity checks and additional measures against certain security protocol attacks.

"The ArmorFlash memory on the Drive AGX Xavier and Pegasus platforms can provide trusted identification, authentication and encryption features for customers' levels two-plus through five autonomous driving security requirements," said Gary Hicok, senior vice president at Nvidia. "This will help provide the building blocks for customers to create higher levels of safety in the next generation of connected and automated vehicles."



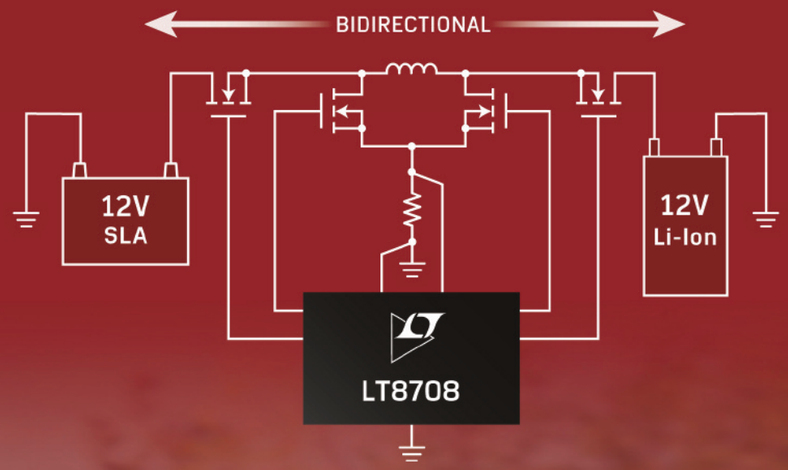
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# LG 3D technology emits light in five directions

LG Innotek has developed flexible three-dimensional lighting for cars that emits bright and uniform light from five directions.

The Nexlide-HD module was made by attaching a number of LED packages to a thin substrate. It is a hexahedron that gently curves like a rubber and mounted on the exterior lamps, such as daytime running lights (DRLs) and tail lights.



**Nexlide-HD emits bright and uniform light from five directions**

Claimed to be an industry first, it emits uniform light from five directions except the substrate contact surface.

The company applied the LED packages, which spreads light around 180˚, and a proprietary optical design technology to the product.

Former products use ordinary LED packages, emitting light at a limited angle of 100˚ above. In addition, they need separate components to produce a uniform light.

This development enables the production of lightings with various designs such as straight lines, curved lines, waves and three-dimensional figures. The module can also be cut into thin pieces and combined into blocks to create floral patterns and more. The flexibility of the module is doubled so it can be formed into different shapes by using silicon. And it also produces smooth, seamless light from various angles and shapes.

This product can be applied to the tail lights as well as DRLs on the front of the vehicle. DRLs require brightness of 400 candela so they can be recognised even in daytime. LG has raised the module's brightness by applying the five-sided stereoscopic lighting technology.

In addition, it can be used to produce slim lighting and reduce the thickness of automobile lamps by up to 70%. This is possible because there is no need for extra components in the module, such as an inner lens to make the light uniform.

The company holds 30 domestic and overseas technical patents related to this product, and already has a production base as well as a quality control base.

"Nexlide-HD is an innovative product that has evolved the vehicle lights one step further," said a representative from LG Innotek. "We will continue to show products that can enhance the design, quality and stability of vehicle lights."

# Magna opens factory to focus on adas

Magna has opened an electronics manufacturing factory in Michigan, consolidating three nearby locations into a single facility that can focus on components for adas and autonomous driving.

The 21,000-square-metre facility represents an investment of $50m.

Magna ships adas components to more than 330 different locations in North and South America, Europe and Asia. The firm started making automotive-grade cameras in 2005 and has steadily increased its annual output as driver assistance systems have grown through regulatory measures and consumer demand.

The company now combines cameras with other sensors such as radar and lidar for adaptive cruise control to maintain a safe following distance and speed, lane-keeping assist to centre the vehicle, and blind-spot detection.

"We provide features to improve the daily commute and add a layer of safety," said Magna CTO Swamy Kotagiri. "With the excitement surrounding autonomous vehicles and their potential to eliminate car crashes, it can be easy to forget the path to full autonomy lies in the safety and driver assistance systems we have today."





# Porsche invests in sensor start-up TriEye

Porsche has acquired a minority stake in Israeli start-up TriEye, which has developed a sensor technology for short-wave infra-red (SWIR).

This can enhance safety in vehicles fitted with assistance systems or autonomous driving functions by improving the ability to see in weather conditions where visibility is poor, such as dust, fog, murky conditions or rain.

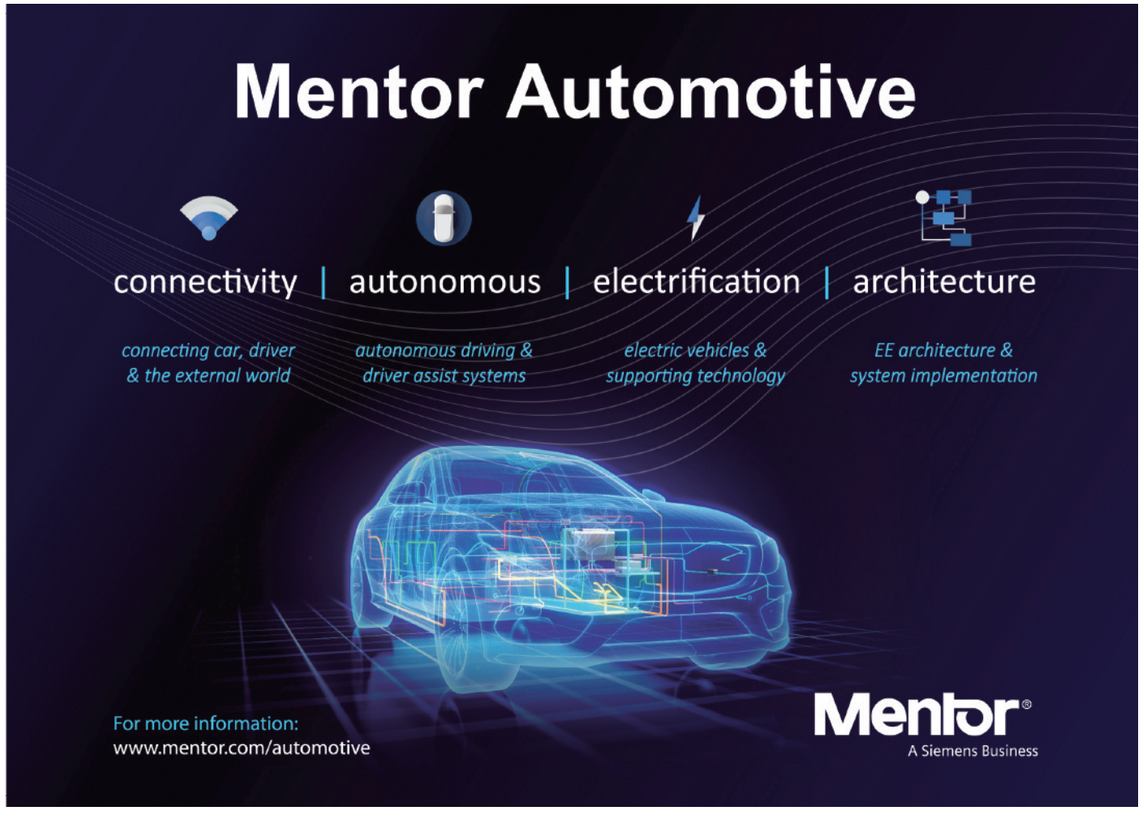
The company's semiconductor design uses patent-pending technology that makes it possible to manufacture SWIR HD cameras at a fraction of their current cost.

"TriEye is a promising technology company led by an exceptionally strong team with experience in the areas of nano-photonics, deep learning and the development of semiconductor components," said Michael Steiner, board member at Porsche. "We see great potential in this sensor technology that paves the way for the next generation of driver assistance systems and autonomous driving functions. SWIR can be a key element; it offers enhanced safety at a competitive price."

Avi Bakal, Omer Kapach and Uriel Levy founded TriEye in 2017. The firm's technology is based on almost a decade of advanced research in nano-photonics performed by Levy, TriEye's CTO, at the Hebrew University of Jerusalem.

Porsche Ventures has invested in TriEye as part of the current series A financing round. Intel Capital led the round with Israeli venture capital fund Grove Ventures, in which Porsche has also held shares since 2017, increasing its existing investment in TriEye.

"Our mission is to save lives and reduce risks of accidents in all weather and lighting conditions," said Bakal, TriEye CEO. "The expansion of our series A round and the addition of Porsche as an investor serves as a further proof that SWIR is a critical component in the necessary sensor fusion to enable safer and better advanced driver assistance systems and autonomous vehicles."



## Synopsys buys QTronic

Synopsys is to acquire Germany-based QTronic, a specialist in simulation, test tools and services for automotive software and systems development.

The acquisition should broaden Synopsys' portfolio of automotive products for tier-ones and OEM s and add a team of experienced engineers to accelerate technology development and customer deployment.

The transaction is expected to close before the end of this year. The terms of the deal were not disclosed.

QTronic's simulation and test tools should accelerate Synopsys' delivery of virtual prototyping for system and software development throughout the automotive electronic supply chain.

Manoj Gandhi, general manager of the Synopsys verification group, said: "With the acquisition of QTronic, we are strengthening our position as the leader in virtual prototyping and will continue to deliver powerful virtual development and test solutions that enable automotive companies to develop vehicle software earlier, faster and better."

QTronic, established in 2006, provides tools for virtual validation of automotive software.



5G put to the test at Korea International Circuit

# Samsung and SK put 5G to work in race cars

Samsung and SK Telecom have demonstrated how 5G technology can improve the motor racing experiences for fans.

The demonstration, held at the Korea International Circuit racetrack, was made possible by Samsung Networks' end-to-end 5G mm-wave technology, including 5G New Radio base stations. The same equipment has been in commercial operation in the USA since the first half of this year.

While the racing car moved at about 210km/hr on the track, the trial verified the stable performance of live downloads, uploads and handovers between 5G cell sites on the racetrack. Download speeds reached 1Gbit/s, showing the capacity for multi-gigabit downloads on a 5G device inside a racing car, using 200MHz bandwidth of 28GHz spectrum.

High speeds, instantaneous communications and seamless handovers in 5G allow for a more effective and safer way to transfer video to and from cars accelerating up to 200 to 370km/hr. The firms were able to use this live video streaming capability to broadcast multiple views of the race in real time over SK's live 5G broadcasting.

"This trial is a great example of taking a user experience and the racing industry to new heights," said Jaeho Jeon, executive vice president at Samsung Electronics.

The test showed that the mm-wave technology can unlock the potential of 5G, for delivering uses cases and business models, such as entertainment experiences in motor sport events. For example, cameras built into the cars' cockpits will be able to stream real-time video data from each car over 5G wireless links, allowing viewers to enjoy vivid scenes of the race from the driver's point of view.

Through VR, AR and 360° video streams, racing fans will be able to enjoy the immersive experience of feeling as if they are inside an actual moving car.

"5G is a vital engine in transforming digital landscapes to bring enhanced and new business models that had only lived in our imagination," said Park Jin-hyo, chief technology officer at SK Telecom.

In 2017, Samsung achieved the world's first 5G handover at 190km/hr and 1Gbit/s speed download in a vehicle moving at 205km/hr in Korea.





# GTAT and GWC partner on SiC supply

GT Advanced Technologies (GTAT) and GlobalWafers (GWC) have entered a long-term deal to forge a source of supply of silicon carbide wafers for the electric vehicle market.

GWC, a producer of semiconductor wafers, will add 150mm SiC to its offering, manufactured from bulk SiC crystal produced by GTAT.

As the EV and power electronics industries shift from silicon to SiC, the two companies are bringing their capabilities together to increase supply while lowering costs for this substrate material.

"The fundamental advantages of SiC are well known and demand for it is high, but it's a difficult material to make," said Greg Knight, GTAT's president. "Because of our crystal-growth know-how and ability to master this complex process, we can positively shape and influence the SiC wafer industry by diversifying the supply chain, enabling higher wafer volumes and lowering costs significantly."

For GTAT, the agreement marks the completion of an 18-month move from selling equipment to providing advanced materials. GWC, using this incoming supply of SiC material from GTAT, can apply years of wafer process development in its bid to become a top-tier SiC wafer supplier to complement its other substrate offerings.

"The power electronics industry needs supply agreements such as the one we've entered into with GWC, and we're very pleased to make it a reality," said Knight.

Doris Hsu, CEO of GWC, sees this long-term agreement with GTAT similarly.

"Bringing our companies' respective technical strengths together will benefit high-growth industries such as EV because we will increase the global supply of SiC wafers," she said. "Pairing our expertise in wafers with GTAT's premiere quality SiC crystal will enable important, high-growth industries like EV to reach key adoption milestones sooner and at lower cost."



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# Zenuity and Cern develop machine learning for cars

Swedish autonomous driving software company Zenuity has become the first automotive company to team up with Cern, the European organisation for nuclear research, in the development of fast machine learning for autonomous cars.

A challenge in the development of autonomous drive (AD) cars is the interpretation of the huge quantities of data generated by normal driving conditions, such as identifying pedestrians and vehicles with the sensors on the car, including cameras, lidar and radar.

Addressing these issues is crucial for the development of safe AD cars. It is hoped this collaboration with Cern will help Zenuity develop AD cars that can reach decisions and make predictions more quickly, thus avoiding accidents.

One of the main quests at Cern is to study the standard model of particle physics by collecting large quantities of data originating from particle collisions produced by a large hadron collider. Both particle physics and autonomous vehicles require fast decisions to be made.

Cern has approached this by using FPGAs that can execute complex decision-taking algorithms in microseconds. The synergy between Zenuity and Cern aims to use FPGAs for fast machine-learning applications, to be used in the AD industry and in particle physics experiments.



**Dennis Nobelius: "This kind of cross-disciplinary collaboration is needed."**

Dennis Nobelius, Zenuity's chief executive, said: "I think it says something important about the collaborative nature of science that an organisation like Cern that conducts high-energy particle collisions can work with a company that is dedicated to completely eliminating collisions in traffic."

The research to be conducted under the collaboration concerns deep learning, which is a class of machine learning algorithms. In recent years such algorithms, commonly referred to as AI, have been applied to a multitude of fields successfully, exceeding human performance on certain tasks.

Zenuity hopes the collaboration will push the frontiers of this technology by reducing the runtime and memory footprint of the relevant deep learning algorithms without reducing accuracy, while simultaneously reducing energy consumption and cost.

"I personally view this collaboration as a manifestation of the fact that this rapidly developing technology not only spans across different industries but also across the boundary between scientific research and industry, and this kind of cross-disciplinary collaboration is needed to reach ambitious goals," said Nobelius.

The collaboration forms part of Cern's knowledge transfer activities to engage with experts in technology and industry.

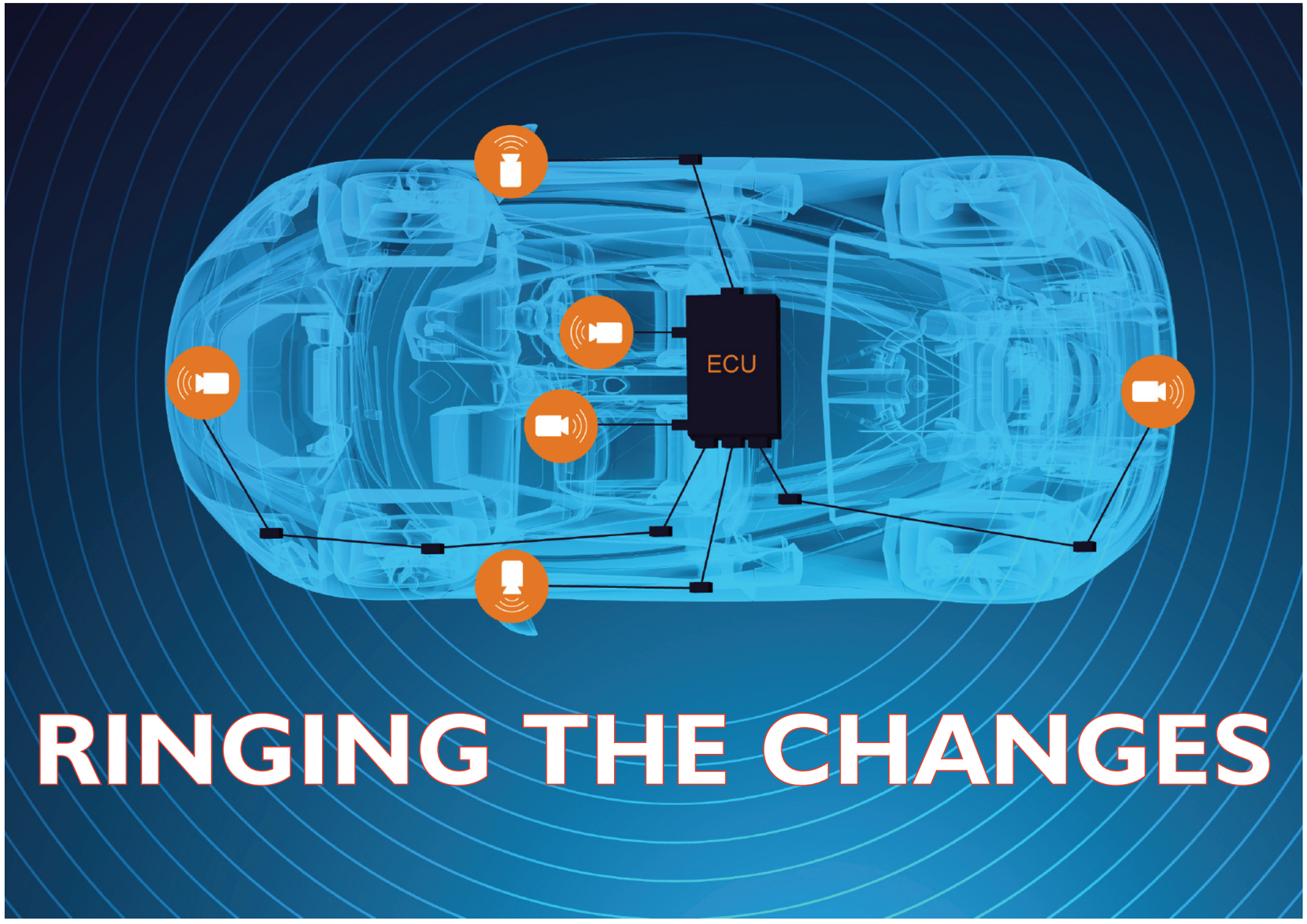
## Commsignia $11m funding round

Californian V2X start-up Commsignia has closed an $11m fundraising round led by Karma Ventures and Samsung. The company will use the money to add more than 100 engineers and open local offices in the USA, Asia and Europe.

Commsignia develops automotive OEM integrated software that supports functions related to V2X connectivity, security and applications, as well as aftermarket onboard and roadside units for smart city use cases.

Jozsef Kovacs, CEO of Commsignia, said: "With this investment, we aim at strengthening our leading position at the forefront of V2X and create innovative products that set standards for connected and autonomous driving."

VEHICLE NETWORKS




# RINGING THE CHANGES

## Fionn Hurley discusses a car camera link for automotive applications

As we hurtle towards the widespread use of autonomous vehicles, the need for more automotive sensors becomes increasingly apparent. Cameras are one of the key sensors required to aid the evolution of the autonomous vehicle.

The number of cameras in automobiles is rapidly increasing with applications continuing to emerge. In addition to this, the take rate for camera applications continues to increase with camera-based applications moving from the preserve of lower volume premium vehicles to the larger volume standard vehicles market. Fig. 1 shows the rapidly growing automotive camera market.

This growth is expected to continue beyond 2025 with vehicles supporting up to 20 cameras becoming a reality in the not too distant future.

Along with the number of cameras increasing, the need for higher camera resolutions continues at pace. This resolution increase is driven by two main factors. The first is the need to support more adas features, as these features require higher resolution to achieve greater and more accurate functionality. The second factor is the need to display higher quality images as consumers now demand excellent visual quality comparable with their smartphones' high-resolution displays.

The problem here is that the lifetime of a smartphone is significantly shorter than that of a car and therefore automobile manufacturers need to ensure they implement the latest display technology at the start of production so their displays stay relevant for as long as possible.

OEMs continue to increase the size and resolution of the displays they use. As a result, when displaying a camera image on these larger and higher resolution displays, higher resolution cameras are required because using existing standard-definition (SD) cameras results in a very poor user experience. A low-resolution camera results in poor video quality. Additionally, many unwanted visual artefacts such as dot crawl and colour leakage are clearly visible on these displays, therefore using SD cameras to drive these displays is no longer acceptable. To provide a better experience, high-definition (HD) cameras are required.

The addition of these cameras comes at a cost. This cost is not just limited to increased sensor and image processing costs, but also the transfer of the video data from the camera to the processing units over copper wiring in the vehicle harness. Additional copper wiring for the car camera link may not seem like a big issue, but with the vehicle harness being the third most expensive component in a car behind engine and chassis, wiring and connector selection is of critical importance to car OEMs.

Harnesses are built one at a time and consume up to half of the cost of labour for the entire car. The wiring harness is also the third heaviest component in the car behind the chassis and engine.

Inserting these wire harnesses into the vehicle proves increasingly problematic on vehicle production lines, with any additional manufacturing steps driving costs even further. Adding weight to the vehicle must be avoided as we move towards greater electric vehicle use, where weight directly impacts vehicle range.

With the continued introduction of many sensors and with forecasts showing up to 22 billion automotive sensors in 2020, this problem is only worsening. Any technology that can reduce the weight and cost of the cable harness is to be welcomed and offers significant appeal to automotive OEMs.

To address this, a car camera link technology called Car Camera Bus ($C^2B$) has been developed solely for the car camera link. $C^2B$ encompasses three main criteria:

- Offering an easy upgrade path to HD by reusing existing SD unshielded twisted pair (UTP) cable and connector infrastructure;
- Supporting high-definition video with high visual quality; and
- Meeting all automotive EMI and EMC requirements.

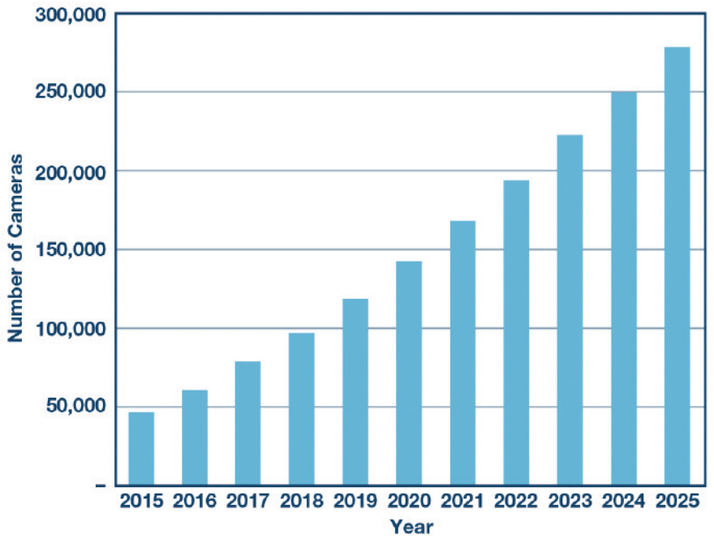



**Fig. 1: Automotive camera market in thousands of units, according to Strategy Analytics**

Cameras are one of the highest data bandwidth sensors in the car. With the move to these higher resolution cameras, bandwidths continue to increase. Existing SD car camera links use lower bandwidth capable infrastructures such as UTP cables and unshielded connectors.

This is possible as the bandwidth requirements for SD cameras are lower than HD, and SD transmission standards such as NTSC use a multilevel transmission scheme to reduce further the bandwidths that the cables and connectors need to support.

Options such as serdes – also known as LVDS – mandate a move to cables and connectors such as coaxial or shielded twisted pair (STP) that are capable of supporting much higher bandwidths than UTP. This is because present serdes products use non-return to zero (NRZ) signalling and do not use multilevel signalling, and therefore have much higher cable and connector bandwidth requirements. These higher performance, high bandwidth capable cables and connectors increase the cost and weight of the cable harness.

C²B enables sending HD resolution video over this existing SD UTP cable and connector infrastructure. To achieve this, it uses multilevel signalling to reduce the bandwidth requirements for high definition video transfer. C²B thus provides the easiest upgrade path from SD cameras to HD cameras without the need to change the existing cable and connector infrastructure, which can be valuable, cost-effective and resourceful for OEMs.

Another advantage of reusing the UTP cabling is that it allows for a connection to the free pins of the multipurpose block connectors already available on head units and camera ECUs. This avoids having to use the dedicated individual connectors that serdes technologies require, and that add cost to the system while taking up valuable area on the already space constrained head unit and camera ECU modules.

The C²B transmission format was chosen to provide robustness for automotive use. The signalling scheme provides a tenfold reduction in cable bandwidth requirements over other options. Reusing the existing infrastructure greatly eases the upgrade to HD cameras without the need to qualify a new infrastructure, since the existing one has already been

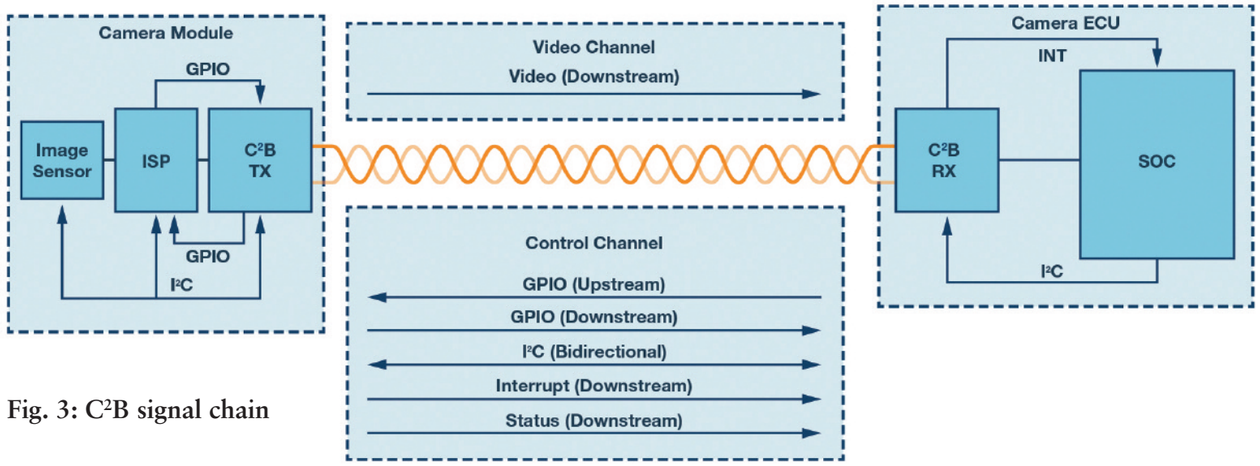



**Fig. 3: C²B signal chain**





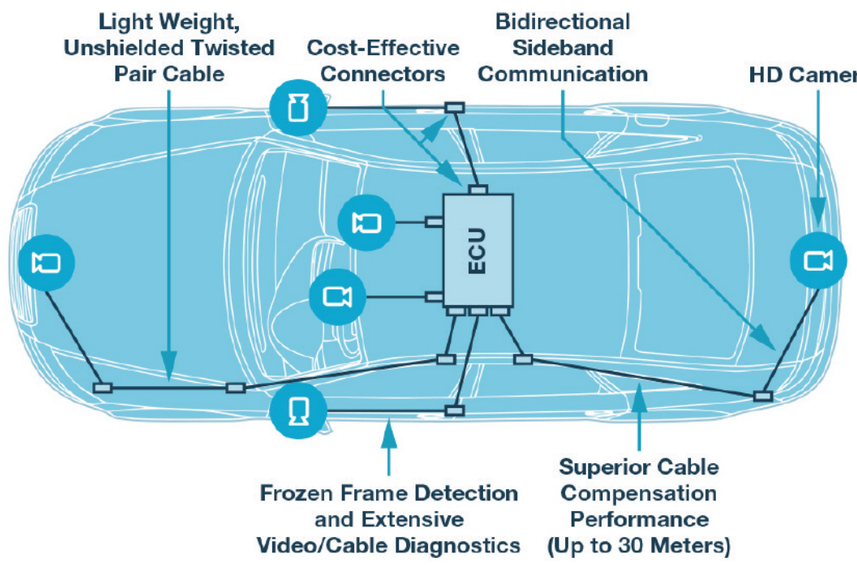



**Fig. 2: C²B provides many advantages to camera systems**

proven in the field over many years.

Additionally, because of the optimised transmission scheme used by the C²B technology, it supports cable lengths up to 30m, which lets OEMs have free reign in their infrastructure design and removes limitations imposed by other technologies.

The selection of the data format for C²B transmission was chosen to improve video quality and EMI and EMC performance over the existing cable and connector infrastructure. HD video quality is maintained over the lower bandwidth capable infrastructure with particular focus given to maintaining all high frequency visual quality detail. The video quality has been verified by significant testing carried out to the latest standard.

While multilevel signalling offers the opportunity to support high-resolution cameras over low cost cables and connectors, it does not come without challenges. With the infrastructure not having shielding to offer protection from aggressors or provide attenuation of emissions, the transceiver design is critical to ensure a low emissions profile and high immunity performance to meet stringent automotive EMI and EMC requirements. C²B, being defined and designed for the automotive industry, addressed this requirement from the beginning and has proven robust to meet all automotive EMI and EMC requirements.

C²B supports many other features, including sideband control communications over the same UTP cable, which in turn enables remote configuration of the camera module to simplify the camera design. C²B also provides frozen frame detection, which is a key requirement for many OEMs.

C²B eases the upgrade from NTSC to HD cameras over the existing infrastructure while providing video quality and robust EMI and EMC performance. This technology offers advantages to ease the ever-increasing problem of connecting multiple cameras within a car.

**Fionn Hurley is marketing manager with the automotive cabin electronics group at Analog Devices**



SAFETY & SECURITY



# Intruder ALERT

**Holger Hilmer asks why data protection and security are crucial in networked cars**

Cars are increasingly becoming mobile living spaces. That's why the subject of security is so important for OEMs and suppliers. When a car becomes a personal mobile device that the owner uses for communications and personalises with apps, it offers a lot of opportunities for manipulation by attackers.

Hacker attacks on smart cars and connected cars have already made the headlines.

For example, a wireless connection was used to access the Can bus that networks many control units in the vehicle.

This allowed the hackers to control the car remotely and switch off the engine while it was driving.

Other criminals have managed to gain control over brakes, door locks, air conditioners and windshield wipers.

This is hardly surprising, since more and more vehicles have interfaces for exchanging data with the outside world. The trend to networked cars that communicate with other smart vehicles in the IoT world will lead to even more of these interfaces, and thus to a higher risk of hacker attacks.

## Cat and mouse

The car industry wants to protect itself and its customers against attacks. It is therefore looking for ways to limit the options for hacker attacks on vehicles. One approach is to seal off all wireless interfaces. However, this is not in the interest of customers, since a connection for data exchange is needed – particularly for innovative V2V or V2I services and autonomous driving.

Furthermore, with the traditional method of recalls and shop upgrades, it will not be possible to protect vehicles reliably against digital attacks. A recall campaign incurs high costs and damages the reputation of the car manufacturer. It also takes too long until all vulnerable vehicles have been patched.

In the meantime, it's open



**Fig. 1: Software updates over the air maintain security**

season for hackers. A vulnerable vehicle poses an enormous risk to the driver and their surroundings, so this time frame is not acceptable. In addition, it is often possible to identify additional weaknesses in the vehicle software during this interval. This makes the update obsolete when it is installed.

An alternative can be found in the world of apps and smartphone operating systems. Regular updates and patches are commonplace there. The software and firmware are updated over the air, which means via the mobile network interface.

Once the update has been transferred to the device, it is automatically unpacked and installed. There is also a similar method in the automotive industry: firmware over-the-air (FOTA) can help with supplying updates to a large number of devices in a short time.

This method could be used to correct weaknesses quickly and continuously by means of patches, integrate new functions, and modernise the cryptographic algorithms used to safeguard control devices.

A large number of devices can be updated using the FOTA method. A control unit equipped with a mobile network interface acts as an intermediary between the backend and the devices to be updated in the vehicle. It receives all the software packages via the OTA interface and distributes them to the target devices over Can bus systems or high-performance communications channels such as Ethernet. As the master device, the electronic control unit (gateway ECU) also monitors and coordinates the entire update process.

## FOTA challenges

FOTA poses major technical challenges. For example, it is necessary to ensure that the process can be reliably executed and does not bring any additional vulnerabilities.

If FOTA could be used to load manipulated software into a unit, the consequences for data security and functional safety would be immeasurable. This means the over-the-air interface must be cryptographically protected, for example by encryption with the TLS protocol.

The keys and certificates needed for this must be entered in the devices in a secret and tamper-proof manner, and they must be stored in a secure memory area in the devices. A dedicated hardware security module (HSM) is important to implement secure memory and enable secure execution of cryptographic algorithms.

Protection against unauthorised installation of manipulated software could be achieved by using a secure installation process (secure flashing) and a security check when the device software starts up (secure boot). Digital signatures for validation of software authenticity are used in both methods.

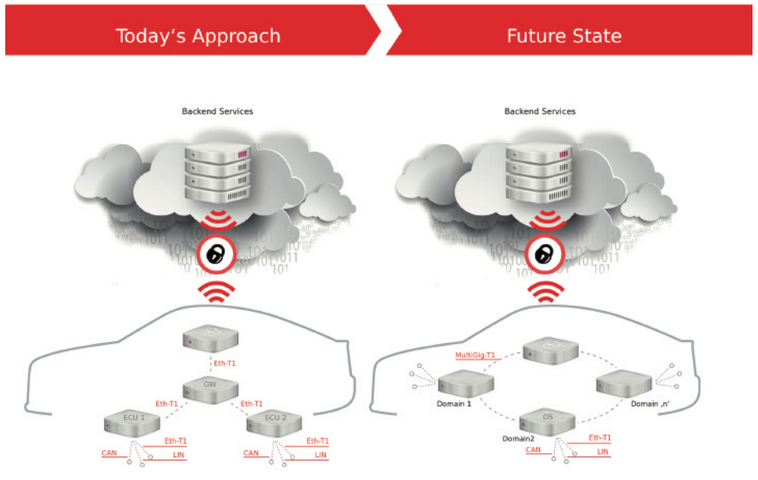



**Fig. 3: A paradigm change – evolution of the FOTA process from today's traditional architecture to multi-zonal**





Development interfaces such as uart, USB or JTag must either be disabled in series-production units or protected by cryptographic methods to prevent device penetration. Attackers could use these paths to try to read out or manipulate the software or confidential data.

## Adaptations

Along with technical aspects, organisational and development aspects must be adapted to the new circumstances. For example, end-to-end risk analyses are not standard practice, but they should be included in the requirements that manufacturers set for their suppliers.

These analyses examine possible attack scenarios on all components of the chain and their impact on data security and functional safety.

Based on the results, suitable protective measures can be defined.

This procedure can only yield the desired result if the OEM, the supplier of the backend and the manufacturer of the control units work together starting with the early development phase.

This approach requires switching from black-box development of control units to an integrated approach with regard to security.

In addition, measures to achieve and maintain security must persist after the start of production. Security analyses, security testing and elimination of security gaps by FOTA must be carried out continuously during the entire product lifetime.

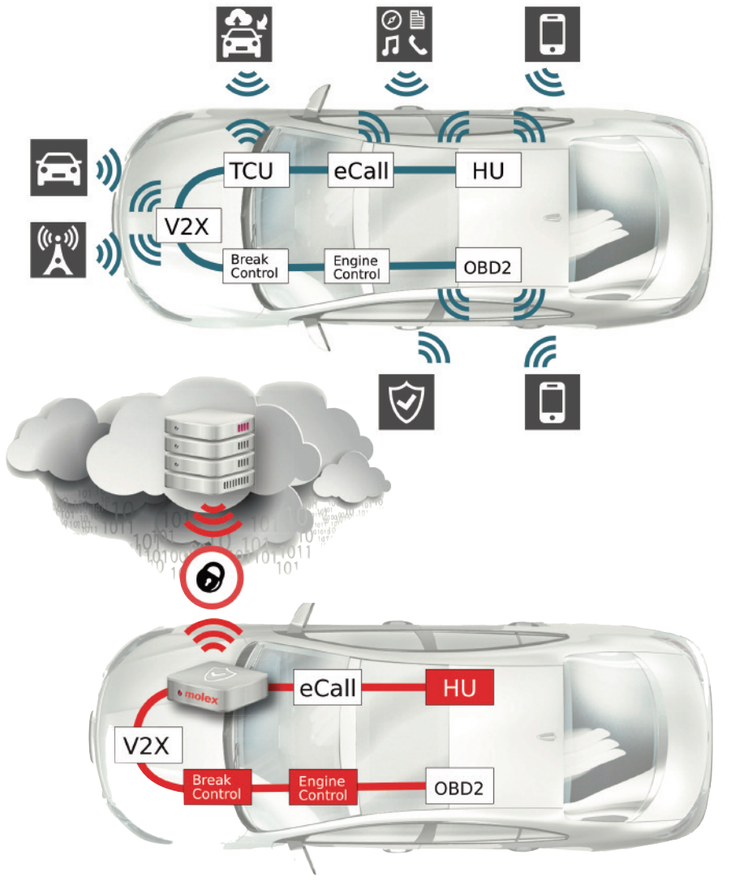



**Fig. 2: A gateway acts as an intermediary between the backend and the control units to be updated – top: wireless interfaces in the car, and bottom: the FOTA gateway approach (source: Laird)**

## More than security

FOTA offers more than just security benefits for OEMs. In the future, expensive recalls will no longer be necessary in the event of software problems. Many of them can be resolved without active customer involvement, since patches can be sent wirelessly to the vehicle.

FOTA can also play a role in establishing new business models and customer relationships. This opens perspectives for OEMs. Presently, the value of a new car usually drops by half when it leaves the dealer's lot. Subsequently the value continues to decline. In the future, with new functions loaded into vehicles via FOTA, cars might not lose value over time, but instead retain or even increase their value.

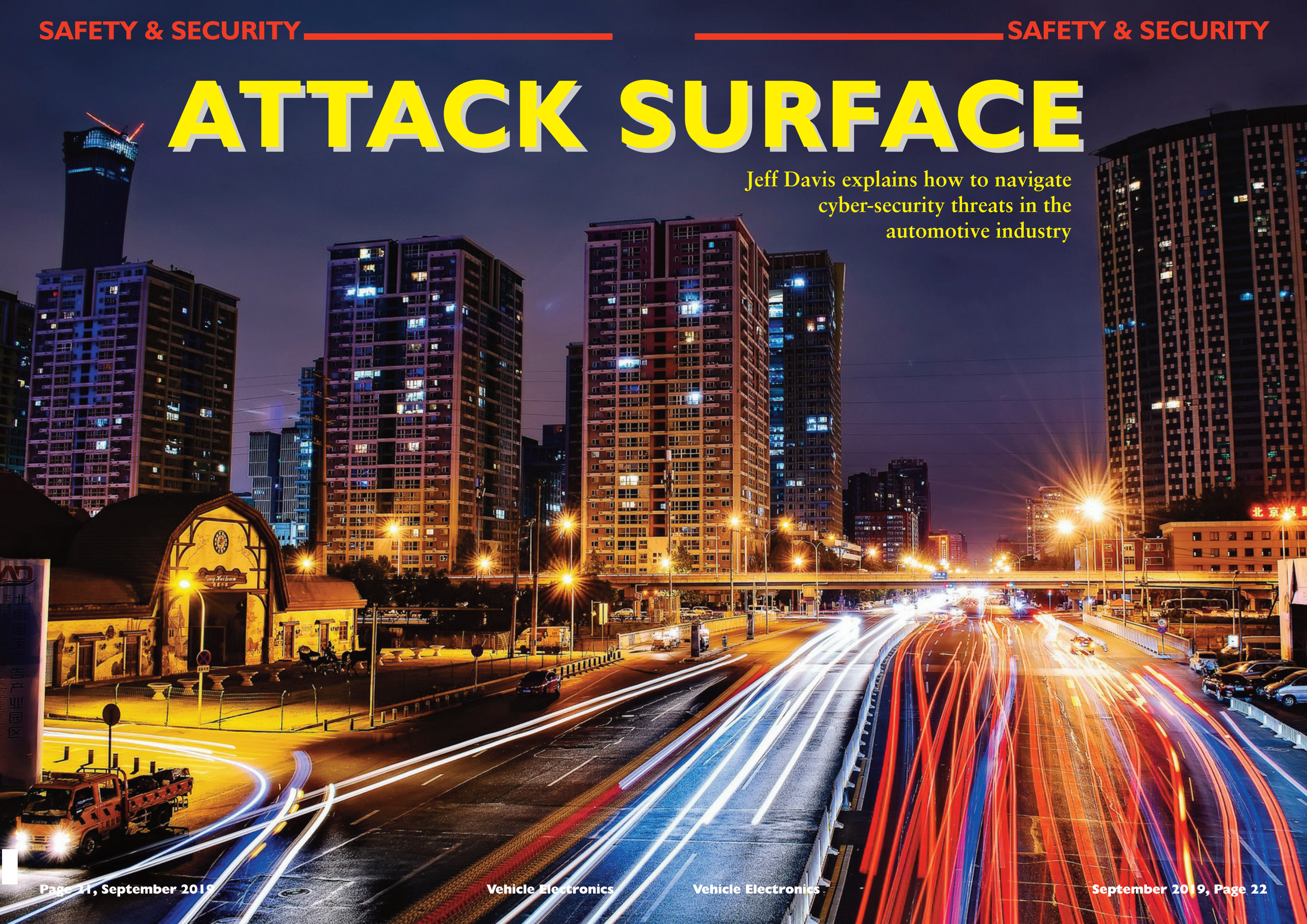


**Holger Hilmer is a senior staff engineer at Molex**

SAFETY & SECURITY

# ATTACK SURFACE

Jeff Davis explains how to navigate cyber-security threats in the automotive industry




Vehicle Electronics

All connected devices are potential targets for hackers. Often, when cyber security is discussed, people think about personal devices such as mobile phones and laptops, or corporate systems and databases.

In recent years, however, a vector has been added to that list: the humble car. As connected technology has increasingly been introduced into automotive design, the issue of cyber security has become a key concern for manufacturers.

The increasing connectivity of cars is a good thing. Connected and autonomous cars can save lives, money and energy. Advancements in automotive technology will let people enjoy their commutes and make their drives safer.

However, despite all the potential benefits, advancements in automotive technology and connectivity carry the same risks associated with laptops and phones, all of which are a cause of significant concern for car manufacturers. The threats to privacy, safety and theft are real and at the centre of concern for the transportation industry writ large. So how can the industry use its collective resources better to meet this threat?

Cyber criminals are quick to exploit new technologies, and, as more valuable personal data and financial transactions take place on a vehicle, the more valuable the target becomes. With value comes innovation, and criminals can be very innovative. They will exploit every weakness in the system, including the most insecure: the humans operating the system. A specific incident involving GPS tracking apps serves as a reminder of the potential consumer challenges that come with sophisticated technology.

However, the consumer cannot be expected to take steps for security, especially when it does not directly affect them. This is not the first time we have seen this. The 2016 DDoS attack, using bots created through a series of IoT devices, effectively paralysed the internet. This too was done using default passwords and the attack itself did not affect the overall function of the devices. This is important because it shows the true flexibility of IoT cyber attacks.



Security concerns are a cloud hanging over the industry

Another example of criminal innovation is exploiting personalised technology. Keyless ignitions are on the rise and now come standard in more than half of the 17 million vehicles sold annually. However, a recent report found that 230 of 237 keyless models tested could be opened using a relay attack, which uses a device that wirelessly transmits signals from one location to another, like from near the front door of someone's home – where many car keys may be – to the vehicle. This tricks the vehicle into unlocking its doors and allowing the cyber criminal to take off in the car.

A survey of car makers from Synopsys and SAE found that 62% of respondents thought it was likely that malicious attacks on their software, automotive components and/or technology would happen within the next 12 months.

Even though connected cars are becoming more common, there still isn't enough data to understand the automotive industry's ability to address the software security risks of connected vehicles. And with the move towards autonomous vehicles powered by artificial intelligence, machine learning and connectivity, the importance of automotive cyber security is even greater to prevent new entry points for malicious actors.

Today's vehicles are equipped







Car makers and their supplies need to navigate the complexities of security

with hundreds of processors that control everything from a car's safety systems to steering, acceleration and more. This means vulnerabilities in the software of a car can put the physical safety of the vehicle's occupants and others at risk. And a majority of the industry is reacting to this.

The creation of the Automotive Information Sharing & Analysis Center (Auto-Isac), development of key cyber-security roles within manufacturers and suppliers, and the widespread adoption of the National Institute of Standards & Technology (Nist) cyber-security framework and consensus on best practices to follow are all positive steps from an industry determined to protect its customers.

The question is how to do this better? It begins with a culture of understanding cyber security from design to production, much the same way that the industry understands safety. This requires a great deal more work than most really understand.

It requires agreements that do not penalise anyone in the supply chain for identifying vulnerabilities. It means that everyone in the value chain from suppliers to assembly plants understand the risks, how to identify them, protect against them, detect problems, respond to incidents and, most importantly, how best to recover. It means creating an understanding that a secure system – a train, a city's infrastructure or a car – starts with secure parts and consistent security practices. Security should be a part of every buying decision, and that each decision either mitigates risk or increases it.

Those that understand cyber security can identify from the paragraph above the five elements of the Nist framework, but how many within the value chain can? Do product managers realise that the operating systems they purchase create a base level of security? Or that the supply chain practices of their chip provider have the potential to reduce or increase the risk and liability of their organisation?

Making security into a primary part of practice creates efficiency. It must be a part of every level of the supply chain, the back-office practices and the actions of every employee of an organisation, and across the entire transportation network. As said earlier, there is only so much that can be expected from the consumer, therefore the products, software and people that make up the actual system need to ensure that it is prepared and can react to human error.

As the industry pushes into connected and autonomous car technology, it's increasingly important to focus on building consumer trust to match. There is a justifiable level of concern in public debate about the level of security and safety that comes with connected cars. People need to be able to trust that the technologies embedded in their cars are safe and reliable, and will act in their interests. It's up to the industry to meet those expectations – cyber security must now be an imperative for manufacturers.



**Jeff Davis is senior director for connected transportation at Blackberry**



# MYTH BUSTERS

## Bill Leisenring lists four myths that could derail connected data initiatives

People have been talking about the connected car for years, but the reality is far from the hype. Consultancy McKinsey estimates the broader car data-enabled services market could become a $450bn to $750bn market by 2030, representing a dramatic proliferation of features and services that are relatively nascent today.

To get there requires OEMs to think about the opportunity with a fresh perspective, starting with debunking four common vehicle connectivity myths that plague the market.

### Myth one: The data OEMs already have are all they need

Given that car makers have been collecting data from cars for 20 years, many believe they already have all the data they need or can handle, but this is far from the truth. When it comes to tapping into the much larger revenue and cost-saving opportunities that connected car data offer, data users not only lack the right data at the right time, they're missing the most effective data strategy to help them find them.

Engineering-grade data help OEMs combine the right data and data strategy, starting with what problem needs to be solved and then to architecting the best possible data, at the lowest cost. With the right architecture in place, OEMs can monitor vehicle components down to the most detailed vehicle subsystem level at frequency rates up to 50 times what they're currently doing.

This richer, faster, more high-fidelity data translate into deeper mobility insights such as transmission shift metrics and energy consumption, behavioural insights such as seatbelt usage and driving styles, and prognostics insights such as driving emissions and battery health.

### Myth two: Getting to valuable insights requires capturing all the data

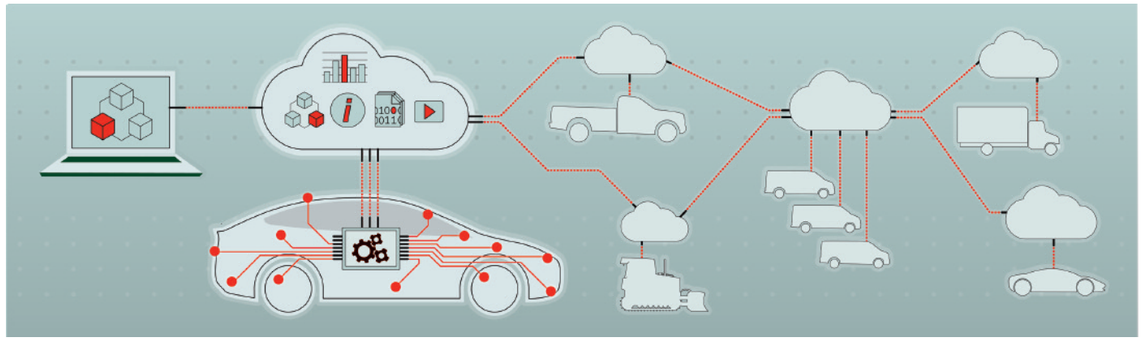
One of the biggest misconceptions in the connected data world is that we don't know what we don't know, so we must capture everything. But, why collect all those data, and incurring the cost to do so, if they don't provide the right information to answer the question?

To analyse and process vehicle data in real time requires moving only the specific data needed to solve the problem at hand up to the cloud, not all the data.

For example, if an OEM is trying to monitor brake pad use in a vehicle, it doesn't also need full data insights into the vehicle's infotainment system. Edge computing allows users to do exactly this by establishing edge algorithms and triggering rich data capture for anomaly or single status events for standard operations. This allows OEMs to move a targeted amount of data through their system and obtain answers in a fraction of the time and at a fraction of the cost.

### Myth three: Which data to collect must be defined up front

Technology exists today to configure and reconfigure what data get collected to avoid being locked into upfront parameters. Auto manufacturers' data collection strategies can be based on their current business priorities but then refined, optimised and revamped as their strategies



Debunking the myths of automotive data

change over time.

By updating the data strategy in real time, users can dramatically reduce the amount of time it takes to resolve an issue. In some cases, OEMs have reduced the time it takes to fix an issue by up to 50%, and that kind of reduction translates into some big time savings. This configurability supports not only today's problem solving but also provides flexibility to update the data strategy to enable future services in the nascent but evolving connected vehicle marketplace.

### Myth four: Connectivity must wait for a new vehicle launch

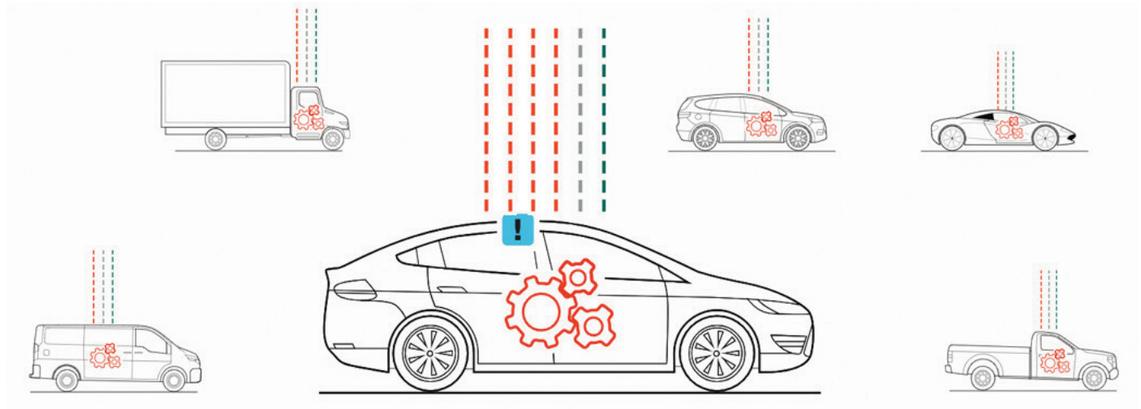
For the most part, auto manufacturers wait until each model goes through its scheduled major refresh to incorporate any noteworthy new technology. However, taking this approach with connected vehicles could be a costly mistake. If manufacturers add embedded connectivity to one car model per year over the next five years, about a quarter of the cumulative total of vehicles will have connectivity capabilities. But, unfortunately, the flipside is also true, that three-quarters of all the vehicles made over the next five years will not have connectivity capabilities.

Luckily, there is an affordable option today for achieving connectivity – engineering-grade devices that auto manufacturers can plug or wire into late-model vehicles as well as into new vehicles. These devices provide features that drivers want, for example wifi hotspots, the ability to unlock remotely via a smartphone and vehicle diagnostics – all while capturing one-time and recurring revenue opportunities for the OEMs.

So what's next? Successful car makers will be those that are able to differentiate with new technologies. Having the right data strategy and the supporting technology in place will provide a path to this future.



Bill Leisenring is CTO for Aptiv Connected Services



How much vehicle data are needed?



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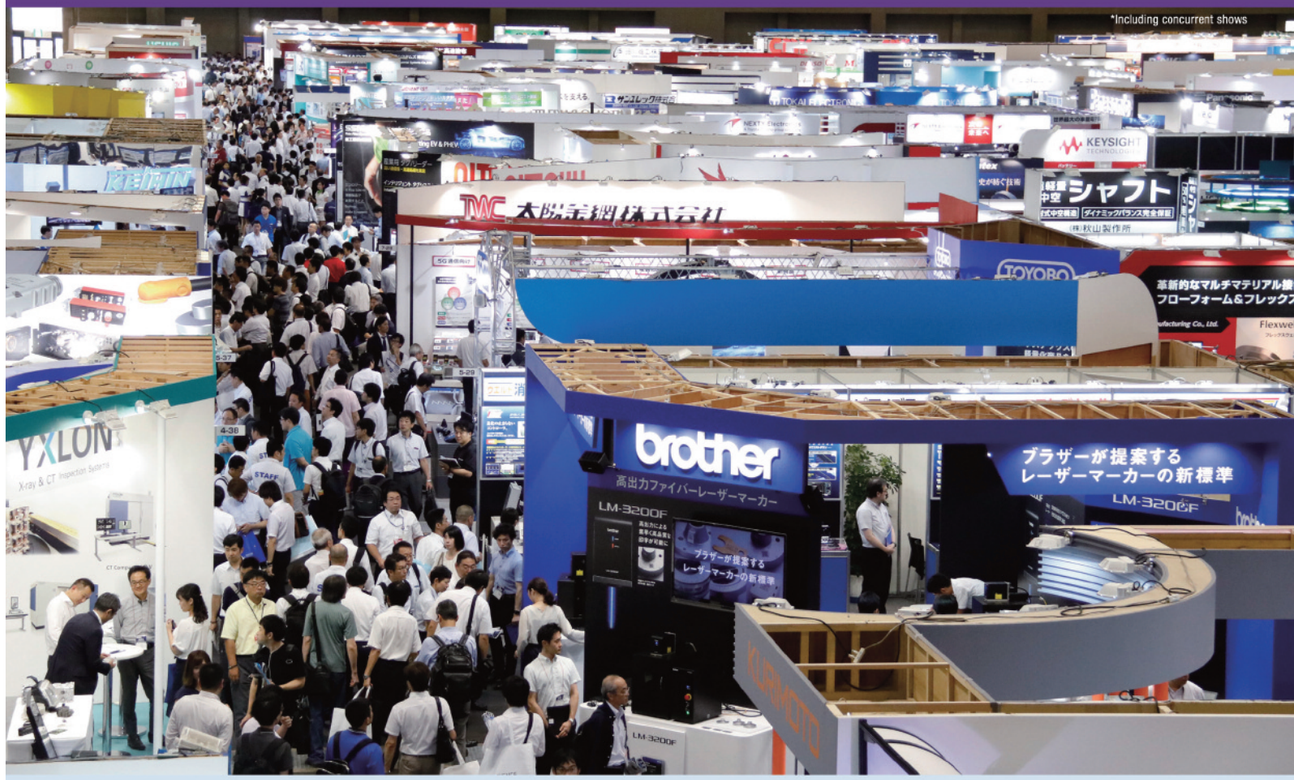
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ON THE ROAD

# e by gum




A look at the infotainment and connectivity option on the Honda e electric vehicle



Vehicle Electronics

ON THE ROAD

The latest Honda e features intuitive connectivity in a contemporary passenger cabin that is claimed to set a benchmark in the compact EV segment. Complementing its simple and clean exterior, the interior of the urban electric vehicle uses subtle, contemporary materials, presenting a relaxing and modern space once inside.

The car is equipped with a high-power electric motor delivering up to approximately 150PS (110kW) and torque in excess of 300Nm. The 35.5kWh battery is one of the most compact in its class, contributing to a balance of low weight, charging capability of 80% in 30 minutes, and a range of over 200km, suitable for every day urban commuting.

Connected infotainment helps the car seamlessly integrate with the owner's urban lifestyle through easy-to-use technology. As a result, the driver and passengers – whether the car is driving, parked or charging – can enjoy the same connectivity and comfort with connected services accessed through a full-width digital dashboard.

"Our objective for the Honda e was that the simple exterior style continues inside," said Kohei Hitomi, large project leader for the Honda e. "The overall interior atmosphere combined with exceptional comfort, by using familiar materials such as wood grain and textured fabric, is reminiscent of a modern living room. In this modern, relaxing environment, occupants can effortlessly engage with advanced connected technology such as the camera mirror system and dual touchscreen display that is highly sophisticated, but incredibly easy to use."

### Digital dashboard

The full-width digital dashboard, comprised of five neatly integrated high-resolution colour screens, is designed for effortless usability of the on-board connected apps and services.

The side camera mirror screens are ergonomically placed at either end of the dashboard to ensure a natural feel and vision for the driver, while the centre camera mirror display relays the image from a central rear-facing camera, further increasing the driver's field of vision.

A 22.3cm TFT meter instrument display in front of the driver presents key vehicle information including power and charge status, drive mode selected, and safety feature details.

Dual screens display connected services side by side.

The largest area of the Honda e's full-width digital dashboard is occupied by dual 31.2cm LCD touchscreens. These are the primary infotainment displays, presenting a range of intelligent applications and services.

This interface is intuitive and customisable, and has been designed for usability to elevate the car beyond being a means of transportation to become fully integrated into the owner's modern connected life.

The interface has a familiar smartphone-style usability, with swipe controls to browse recently used applications. Content can be swapped across the two screens, enabling the driver to use both screens with simplicity and ease.

This function allows the passenger to swipe content such as navigation instructions into the driver's eye line. And, because the dual screen set-up allows two applications to be displayed side by side, the driver and front passenger can independently select and view separate apps. For example, the driver can follow navigation instructions while the front passenger searches for a music playlist.




**Primary infotainment displays present intelligent applications and services**

### Personal assistant

Connected services and applications can also be accessed using voice commands via the Honda Personal Assistant. The intuitive system is a smart artificial intelligence (AI) service that uses contextual understanding to create natural conversations and provide access to a range of online services.

The Personal Assistant is activated by saying, "OK Honda", followed by the question or instruction. Machine learning lets the technology develop a greater understanding of an individual's voice over time, helping it to deliver more accurate responses.

### Apps

The suite of in-built apps can be supplemented by seamless smartphone mirroring, via Apple CarPlay or Android Auto. These systems let users view social media, music and other internet services on the dual touchscreens. When the vehicle is parked – including when charging – occupants can also watch video content and access the internet on their own mobile devices using the vehicle's wifi hotspot.

### Remote access

Away from the car, owners can enjoy the peace of mind of being able to stay connected to their vehicle remotely through a smartphone application.

The service has been redeveloped for a greater focus on the user journey, with easy navigation to access charging functions, detailed vehicle status, climate control, security and location monitoring. Additional connectivity and EV-specific functions include battery charge control and range monitor, while charging station and navigation search results can be sent to the car from a mobile device.

The car is also accessible using a digital key, allowing the car to be locked and unlocked via the app. Safety alerts can notify owners if the vehicle is moved outside of a set geofence zone.

The compact electric vehicle is a key part of the brand's latest commitment to feature electrified technology in all of its European sales by 2025. Presented in prototype form at the 2019 Geneva Motor Show, the first production battery electric vehicle for the European market will make its mass production debut later this year.

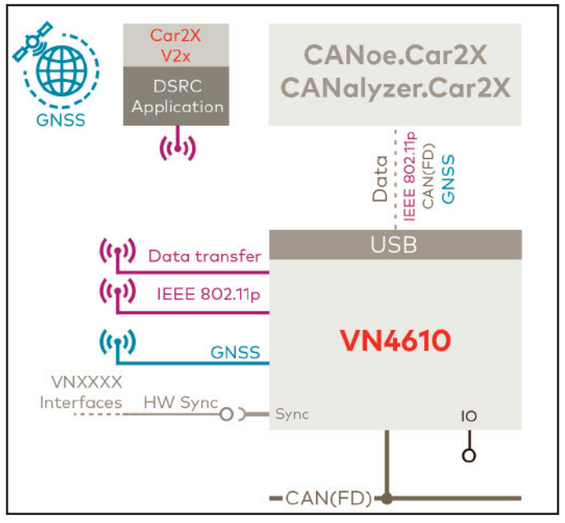
# Network interface for V2X communications

A network interface from Vector is for IEEE-802.11p and Can-FD applications. As an interface to the Canoe.Car2x test tool, the VN4610 interface should help advance 802.11p-based ECUs to production readiness.

Users can benefit from the ease of receiving and sending IEEE-802.11p messages in implementing V2X applications. The received IEEE-802.11p messages are transferred to the application time-synchronous to the Can-FD messages. A built-in GNSS receiver provides the GNSS time and current position.

The interface meets technical hardware requirements for safely testing DSRC dedicated short-range communications applications over IEEE-802.11p radio channels. It routes all received messages from the two radio channels, unfiltered, to a test tool such as Canoe.Car2x for analysis.

The advantage for the developer is that messages can be analysed that would have previously been rejected by an ECU due to timing, geographic information or Car2x and V2X protocol errors. In addition, latency measurements can be performed because the time stamps of messages are synchronised to the bus channels.

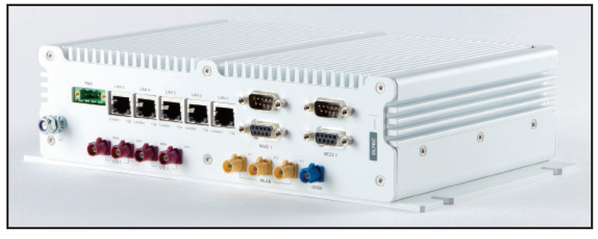



With the Canoe.Car2x test tool, the interface is tuned for creating a simulation environment for testing Car2x and V2X applications. It sends the transmitted messages and configures the communication parameters for the various tests individually.

# Dual LTE and wifi router for buses and lorries

A dual LTE and wifi router for automotive applications is available from Eltec Elektronik.

The CyBox RT 2-A combines a wireless router, access point and integrated switch to allow unlimited internet surfing and data exchange. It acts as a control centre for mobile applications in buses, trams and lorries.



In addition to the 1GbE interface, other interfaces enable the connection of vehicle-internal bus systems such as Can, Ibis, OBD-2, RS232 and RS485.

With the integrated wifi access point (up to two 802.11 ac with 1300-Mbit/s and three-by-three mimo each) and two LTE interfaces (Cat 6/2 x 300Mbit/s download and two 50bit/s upload), the box can also be used as a head station for mobile wifi compatible devices in a bus or tram.

There, it provides communication with the internet or access to local data such as timetable information and videos. The integrated configurable firewall with client isolation prevents users from accessing other clients in the network.

The router supports wifi and GSM, UMTS and LTE modems and has two LTE modules. Two sim slots per LTE module enable operation with several mobile phone operators for better network coverage.

The IP40 housing requires no active cooling and is resistant to shock and vibration.

Several Ethernet devices can be connecte via RJ45. There is a USB interface and optionally an internal SSD for storing local data. Geographical position can be tracked by an integrated GPS and Glonass receiver.

The router meets the requirements for E1 approval. It operates from -40 to +75˚C.

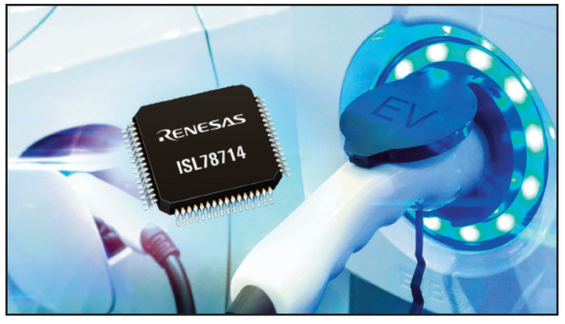




# IC increases battery cell life

A 14-cell Li-ion battery management IC from Renesas Electronics can increase battery cell life and driving range for hybrid and electric vehicles.

The automotive-grade ISL78714 provides accurate cell voltage measurements and safety features for Asil D systems.




Its cell voltage and temperature monitoring, along with cell balancing and system diagnostics, protect 14-cell Li-ion battery packs.

The device monitors and balances up to 14 series-connected cells with ±2mV accuracy across automotive temperature ranges. It includes a 14bit analogue-to-digital converter and associated data acquisition circuitry. The device also has up to six external temperature inputs – two available from GPIOs – and includes fault detection and diagnostics for all key internal functions.

It meets the reliability and performance requirements of battery pack systems for all EV variants including HEV and PHEV, with safety features enabling ISO 26262 Asil D.

In addition, it monitors and reads back over and under voltage, temperature, open wire conditions, and fault status for 112 cells in less than 10ms, or 70 cells in 6.5ms.

Multiple devices can be connected via a proprietary daisy chain that supports up to 420 cells (30 ICs) that provide transient and EMC and EMI immunity, exceeding automotive requirements. The daisy-chain architecture uses low-cost capacitive or transformer isolation, or a combination of both, with twisted pair wiring to stack multiple battery packs together while protecting against hot plug and high-voltage transients.

A watchdog timer automatically shuts down a daisy-chained IC if communications are lost with the master MCU.

A battery management system reference design includes five ISL78714 ICs and a RH850/P1M MCU to form a 70-cell evaluation platform for external balancing.

The ICs come in 64-lead TQFPs.

# Programme CMIC for multiple uses

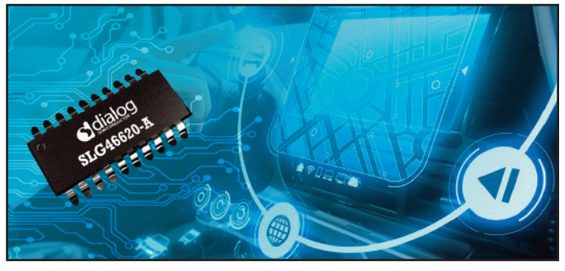
A configurable mixed-signal IC (CMIC) is available from Dialog Semiconductor for the automotive industry.

The SLG46620-A brings the company's GreenPak platform to the automotive space. It is said to provide lower project costs, an accelerated time to market and unified development flows. This CMIC, along with others in the GreenPak family, can replace dozens of components in automotive applications to optimise flexibility, footprint and cost.

Each automotive grade base die part can be programmed to implement multiple AEC-Q100 qualified ICs, with functionality including power sequencing, voltage monitoring, system reset, LED control, frequency detection and sensor interfacing. Every custom, factory-programmed IC gets a unique part number, top marking, automotive grade datasheet and PPAP production part approval process.

In production, the user's configuration will be factory programmed and tested to ensure it meets its functional specification to automotive reliability levels.

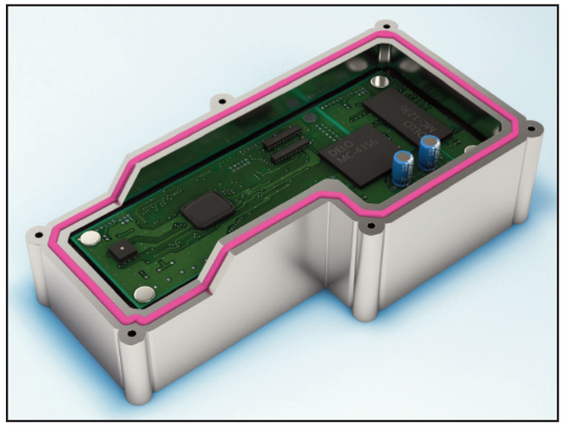
The CMICs give OEMs the ability to create flexible base platforms that can be customised at no additional cost to the designer. The scalable nature of the portfolio lets users choose the CMIC that best fits their needs and budget.



# Sealant suits all shapes

A silicone-free liquid sealant from Delo is for the automotive, electronics and white goods industries. Curing by light, the Photobond SL4165 protects from dust, air and water.

The flow-resistant viscous liquid sealant can be applied in the desired height and any geometric shape. The product cures by UV or visible light in a matter of seconds without thermal influence, and thus enables the cured-in-place gasket process, which means the liquid sealant cures in the desired position so fast that the entire assembly can be further processed directly.



It has a compression set of 15% and thus shows elastic recovery in that the flexible material springs back after being compressed. These properties ensure reliable sealing and help manufacturers meet the tightness requirements according to IP67.

Liquid sealants are suitable for complex geometries. Compared with O-rings or moulded gaskets, they involve fewer process steps and reduce machine setup times. Other benefits are fewer rejects and reduced storage costs.

In addition, the production process can be automated, allowing any shape to be produced on one system. And the product is suitable for inline quality control through fluorescent detection of potential leaks.

Free of solvents as well as paint-wetting impairment substances, it can be used in power electronics in cars, for example in high-voltage accumulators or electronic transmission control components.

## Laser qualification

TriLumina's VCSEL vertical-cavity surface-emitting laser technology for automotive time of flight (ToF) and 3D sensing has completed all tests for AEC-Q102 grade-one, which means it can operate from -40 to +125˚C.

This, the firm claims, marks the first time any semiconductor laser product has qualified for AEC-Q102 grade one.

The VCSEL arrays have optional integrated microlenses and are used in solid-state direct flash lidar, ToF lidar, scanning lidar and automotive in-cabin systems without the need for active cooling.

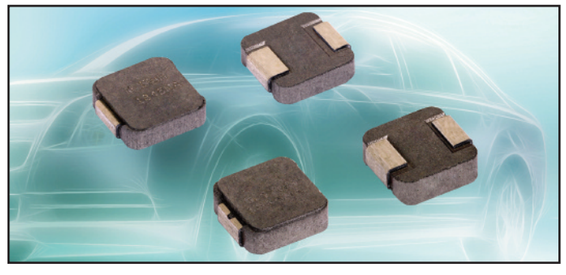
# Low profile inductors go under bonnet

Vishay has introduced its smallest automotive-grade IHLP low profile, high current inductors to date.

Offered in the 3.3 by 3.3mm 1212 case size for adas and sensor applications, the Dale IHLP-1212AZ-A1 and IHLP-1212AB-A1 combine operating temperatures of +125˚C with profiles down to 1.0mm, while the IHLP-1212AB-5A has an operating temperature up to +155˚C and a profile of 1.2mm.

The AEC-Q200 qualified devices are optimised for energy storage in DC-DC converters up to 5MHz.

They attenuate noise in high-current filtering applications up to the SRF of the inductor.

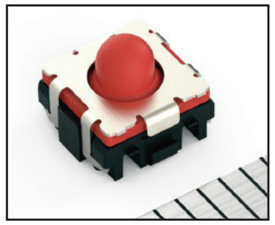


For under the bonnet applications, they are for filtering and DC-DC conversion in adas, sensor, entertainment and navigation systems, in addition to noise suppression for medium current filter applications.

Packaged in a 100% lead (Pb)-free shielded, composite construction that reduces buzz to low levels, they resist thermal shock, moisture and mechanical shock, and handle high transient current spikes without saturation.







# Tact switch

A model with 0.9mm travel has been added to Alps Alpine's SKSU series of compact, middle-stroke tact switches. The SKSUBCE010 has push clarity along with quiet operation and a distinct click, suitable for automotive use.

While retaining the quiet sound and distinct click feel made possible by combining rubber and metal for an original contact structure, the latest model delivers a clearer push sensation, enhancing the clarity of operation and satisfying demand for a better operating feel.

It also incorporates a pre-stroke design helping prevent rattling when integrated into the end product.

Because the SKSU series has mounting compatibility with SKTQ devices, those with an existing product can choose the best operating feel for their vehicle brand without having to modify the board design.

Applications include steering wheel switches, centre console panels, car audio and navigation.

# Tuners enhanced with SDR

Hybrid software-defined radio (SDR) tuners from Silicon Labs can support all global digital radio standards, including the DRM digital radio mondiale, with a common platform.

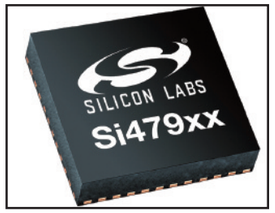
The Si479x7 tuners are an extension of the company's Global Eagle and Dual Eagle AM and FM receivers and digital radio tuners, providing the same field performance, pin and package compatibility between single and dual tuners.

The firm is also enhancing its Si4790x, 1x, 2x, 5x and 6x automotive tuners with SDR-friendly technology, transforming these devices into hybrid SDR tuners.

The hybrid SDR technology includes DSP-based automotive features such as maximal ratio combining, digital automatic gain control, digital radio fast detect and dynamic zero-IF I/Q. These features let automotive radio manufacturers support global digital radio standards with a common radio hardware and software design.

The portfolio supports all broadcast radio bands including AM, FM, long wave, short wave, Weather Band, HD Radio, Dab band III and DRM.

Single DRM hybrid SDR tuners are available in a 48-pin, 7 by 7mm QFN package fitting a board area of less than 55mm². Dual DRM tuners are offered in a 56-pin, 8 by 8mm QFN package on a board area of less than 79mm².

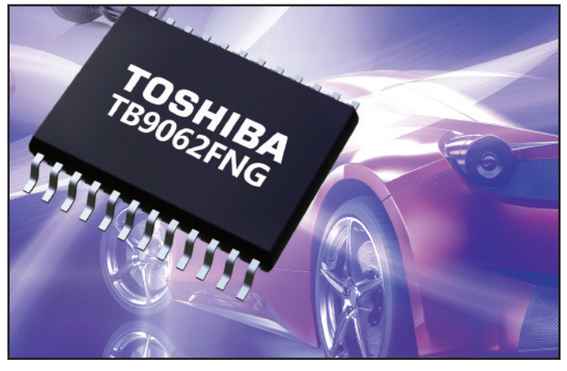



# IC controls brushless DC motors

A sensorless control predriver IC from Toshiba Electronics is for brushless DC (BLDC) motors in industrial and automotive applications. The main applications will include electric pumps for water, oil and fuel as well as electric fans.

The TB9062FNG predriver can control BLDC motors using a pulse-width modulation (PWM) input, without the need for any high-performance microcontrollers and software.

An automatic duty generation function adjusts the output PWM duty cycle to suit the battery voltage (Vbat) at start-up, and a soft speed changing function prevents stalls by suppressing sudden changes in the output PWM duty cycle. These functions contribute to stable motor control.




The IC does not require any software development as it is controlled by a hard-wired logic circuit. Vbat over voltage detection, Vbat under voltage detection, over current protection and thermal shutdown circuits are implemented to ensure safe operation.

Operating temperature is -40 to +125˚C and the device comes in a 7.8 by 7.6mm ssop24 package.

# ICs drive bright LEDs

Designers of automotive lighting can use LED drivers from Maxim for high-brightness LEDs (HBLEDs).

The Max 25610A and 25610B synchronous buck, buck-boost LED drivers and DC-DC converters are said to achieve EMI performance without compromising efficiency and size.

These ICs drive up to eight HBLEDs directly from the automotive battery and integrate many external components to save on costs and space.

Traditionally, designers employed multiple components to pass EMI specifications. To achieve performance gains, they would often have to compromise on space and system efficiency while addressing thermal issues and high costs.

These drivers address these concerns by combining size, efficiency and EMI performance into one package. They meet a wide range of voltage requirements and can decrease design complexity, lower costs and improve power efficiency.

Input voltage is from 5 to 36V in buck-boost LED driver applications with up to 90 per cent efficiency in buck-boost mode. An internal current sense option and integrated high- and low-side switching mosfets reduce space and cost in the 5 by 5mm TQFN.

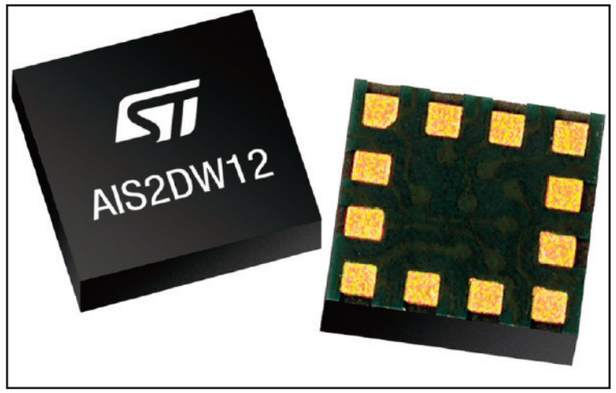
Programmable on-chip PWM dimming allows for fine dimming control without having to use a separate microcontroller. Additionally, the 25610B has a 2.2MHz switching frequency option.

They can help designers pass Cispr 25 EMI specs.

They enable configuration of buck, buck-boost and boost modes to support a wide variety of LEDs and topologies in exterior and front lighting

Also available is the Max 25600, a 60V, synchronous, high-voltage, four-switch buck-boost LED controller that shifts seamlessly between buck, buck-boost and boost modes. This IC is for driving changing LED loads in high-power automotive, commercial and industrial lighting.




# Accelerometer toughens PKE fobs

An automotive accelerometer from ST Microelectronics is said to be able to make passive keyless entry (PKE) radio fobs tough enough to survive inevitable drops and scrapes.

The accelerometer adds motion awareness to help prevent theft.

Ordinary PKE radio fobs listen continuously for an unlock request coming from the vehicle when it is touched. They then send a command to unlock the vehicle.

Thieves can force a fob that is out of range – it could be placed on a table in the owner's house – to send an unlock command by relaying the request via an intermediate transmitter, and hence gain access and steal the vehicle.

Enhanced with an accelerometer, fobs can ignore malicious relayed transmissions by powering down the receiver when not moving and out of range.

The radio wakes only when movement is detected at close range as the owner approaches the vehicle. In addition, deactivating the receiver during idle periods helps extend battery life.

The AIS2DW12 has passed severe industry shock testing. Hence vehicle owners can enjoy more security without taking extra care of a fragile fob.

Operating current is 380nA at 1.6Hz. It operates from 1.8V DC and can be powered from a single lithium cell, producing a digital output with full-scale range up to 4g.

The device is AEC-Q100 certified and compliant with automotive PPAP level three. It is available in a 2 by 2 by 1mm 12-pad LGA package.





# LED drivers streamline lighting

Two automotive LED drivers from Diodes combine robust performance, simplified design and flexibility to address internal and external lighting applications, such as fog, position, rear and door lamps.

The AL8860Q and AL8861Q have an operating voltage from 4.5 to 40V to withstand load-dump events and operate correctly at low-cranking voltages in stop-start applications.

Hysteretic-mode buck control simplifies the design of the feedback loop, enabling inherent stability with only four external components. Designers can save space and reduce costs due to the integrated, main power mosfet and a programmable switching frequency up to 1MHz that allows a small output inductor.

The devices can source 1.5A for powering loads up to 40W depending on supply voltage and external components. In addition, both drivers support 0.3 to 2.5V analogue dimming as well as PWM dimming from 1 to 100% to allow various automatic or user-adjustable brightness controls.

This flexibility enables use in various applications inside and outside the vehicle, permitting designers to create multiple lamp types efficiently using the same driver and streamline inventory management for manufacturing.

Built-in protection features ensure reliability and safety, including short-circuit and open-LED protection as well as over-temperature shutdown. The AL8861Q also has current-sense resistor, short-circuit protection.

Both drivers are packaged in an msop-8EP with support for analogue and PWM dimming via one control pin. This pin can be used for soft-start of the LED current with only one capacitor.

They are automotive-compliant and support PPAP documents, and are qualified to AEC-Q100 grade one.




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