VEHICLE electronics

The monthly magazine for automotive electronics engineers

Oxbotica AI tests AVs in metaverse

Oxbotica is using artificial intelligence (AI) in the metaverse to accelerate the deployment of autonomous vehicle (AV) technology.

The goal is to reduce the carbon emissions generated by test vehicles.

Oxbotica MetaDriver is a suite of tools that includes virtual world simulation, automated discovery of difficult scenarios and real-time data expansion. It is designed to help AVs answer three core questions: "Do I see it right?", "Am I doing it right?" and "Can I trust myself right now?".

MetaDriver generates a vast bank of scenarios that are used to test and refine AV operations and behaviour without needing to drive physically in them. It also provides the ability to build a digital-twin representation from real-world gathered data.

The AIs have learnt to seek out rare, unusual and unseen scenarios, known as edge cases, automatically, which allows the testing of autonomy systems against corner cases and for the systems to learn to handle them.

MetaDriver offers edge-case discovery rates at an average of 1000 times faster than traditional testing methods, and up to 35,000 times faster in some situations.

Using MetaDriver's data expansion, each meta-kilometre can be tested in all conditions, including rain, snow, fog, and at night or in the day, eliminating the need to wait for various weather conditions.

The capabilities of MetaDriver should give AV operators confidence their vehicles can operate safely, accurately and effectively in specialised environments, whether a city, mine, wind farm, solar park or airport.

"Oxbotica MetaDriver is a suite of tools that offers so much more than straight forward simulation," said Paul Newman, CTO at Oxbotica. "Using the metaverse in this way provides us and our customers with practically unlimited test challenges, revolutionising how we are accelerating AV commercial deployment to make the Earth move."



Helping AVs operate safely in odd environments

Issue 103
July 2022

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Blackberry and NXP prepare for quantum cyber attacks

Blackberry is to support quantum-resistant secure boot signatures for NXP's crypto-agile S32G vehicle networking processors in a demonstration to illustrate how to mitigate the risk of potential quantum computing attacks on in-vehicle software.

The integration will allow software to be digitally signed using the Nist recently endorsed Crystals Dilithium digital signature scheme that will be quantum resistant, providing peace of mind to those relying on and delivering long lifecycle assets such as in transportation infrastructure and connected cars.

The collaboration is set to guard against an increasing risk of quantum computers being able to break easily traditional code signing schemes.

While quantum computing promises to deliver leaps forward in processing power, it can also render public key cryptography useless. In recent months, Nato, the US government and Nist have all taken steps to prepare for a scenario in which quantum computers become weaponised by threat actors.

The Blackberry Certicom code signing and key management server leverages the S32G chip's secure boot flow to achieve fast and agile quantum protection. Using quantum-resistant signature schemes such as Dilithium for low-level device firmware, over-the-air software updates and software bills of material mitigates the risk of quantum computing attacks on critical software updates.

"As quantum computers continue to advance in development, it's increasingly important to work to secure systems against these future threats," said Joppe Bos, NXP senior cryptographer.

Blackberry VP Jim Alfred added: "NXP shares our vision of mitigating the risk of quantum computing concerns and, thanks to their support for hash-based signatures, together we can provide cyber-security teams with the tools they need now."

Apple announces CarPlay updates



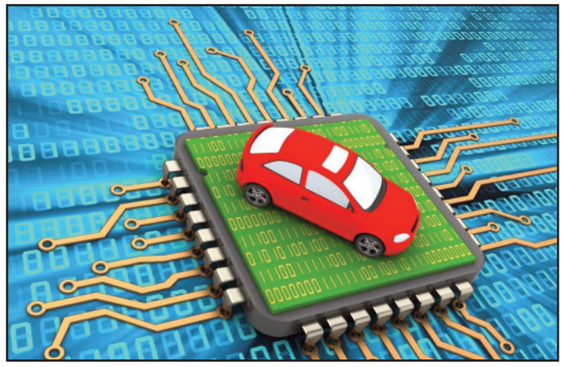
Apple's CarPlay has changed the way people interact with their vehicles, and an upcoming version is said to go even further by deeply integrating with a car's hardware.

CarPlay will be able to provide content for multiple screens within the vehicle, creating an experience that is unified and consistent. Deeper integration with the vehicle will allow users to do things such as control the radio or change the climate directly through CarPlay and, using the vehicle data, it will seamlessly render the speed, fuel level, temperature and more on the instrument cluster.

Users will be able to personalise their driving experience by choosing different gauge cluster designs and, with added support for widgets, users will have at-a-glance information from Weather and Music right on their car's dashboard.

Apple says it will share more information about the update to CarPlay in the future, and vehicles will start to be announced late next year.

Nsitexe turns to Imperas to verify Risc-V designs



Nsitexe picks ImperasDV for Risc-V verification

Denso subsidiary Nsitexe has selected the ImperasDV Risc-V processor hardware design verification technology for AI (artificial intelligence) automotive applications to achieve ISO 26262 Asil-D.

Risc-V is an open standard instruction set architecture (ISA) that allows processor developers to optimise the configuration with standard extensions and custom instructions. The recently ratified Risc-V Vector Extensions support the compute requirements for hardware accelerators for applications involving linear algebra, which is suitable for the emerging AI algorithms and workloads in automotive applications.

ImperasDV provides an adaptable framework based on the Risc-V verification interface that supports the core RTL verification with the Imperas reference model in a lock-step-compare methodology in addition to test suites and other verification IP.

It covers the verification tasks for implementations that range from basic controllers to designs featuring vector extensions, privileged mode security protections, multi-hart and custom extensions.

Developers are exploring techniques such as superscalar, out-of-order execution, multi-threading, heterogeneous multi-core and processor arrays plus other approaches for domain specific devices.

"The flexibility of the Risc-V ISA coupled with the performance of vector extensions is an ideal starting point for AI accelerators for automotive applications," said Hideki Sugimoto, CTO of Nsitexe.

Simon Davidmann, CEO at Imperas Software, added: "The open standard ISA of Risc-V is enabling a fundamental shift in processor development, with developers able to explore and innovate with optimisations for targeted applications. The flexibility of Risc-V on the design side has a direct impact on the verification task and, since the value-added features are central to the development, we developed ImperasDV to be adaptable for all implementations to allows our customers and users to verify state-of-the-art designs independently."

Synopsys and ADI collaborate on EV simulation

Synopsys and Analog Devices are collaborating to provide model libraries for DC-DC ICs and μModule micromodule regulators.

These will use Synopsys' Saber simulation tool, part of its virtual prototyping offering.

With this library in Saber system-level simulation, powertrain designers for products such as electric vehicles can perform accurate multi-domain simulations with precision and speed, accelerating the design process and time to market.

"With robust and reliable Saber modelling for our power ICs and μModule devices, system designers can confidently rely on our services, focusing their attention on the rest of their complex designs involving FPGA, processors, memory, sensors and data converters," said Afshin Odabaee, business development director at ADI. "Collaborating with Synopsys enables us to deliver powerful simulation based on Saber's integrated environment for simulation and modelling, allowing our customers to accelerate their time to market."

For developing an electric vehicle's powertrain or charging system, accurate models and simulation are key to meeting competitive design targets. The availability of Analog Devices' library of component models in Saber enables design teams to perform simulations at various levels of abstraction, with multi-domain physical modelling and analysis capabilities to explore, measure and optimise performance.

Joint venture expands brake-to-steer technology

Nexteer and Continental's CNX Motion joint venture has expanded its brake-to-steer (BtS) technology with two software functions that provide backup safety layers for all variants of electric power steering (EPS) and steer-by-wire (SbW) systems and across SAE levels one to five.

"These new BtS software functions further enable safety redundancies across all EPS applications and SAE driving levels without the cost and complexity of additional hardware," said Greg Katch, general manager of CNX Motion. "Our advanced BtS technology can help ensure the safety net is always on through driver effort support and SbW support, as well as automated driving support."

EPS systems are designed with multiple protective layers to ensure the steering safety net is always on. When paired with a traditional EPS, BtS driver effort support adds another safety layer and can provide up to 25% reduction in torque.

While steering traditionally manages the lateral control of a vehicle, BtS enables the braking and powertrain systems to contribute to lateral control to reduce steering efforts when necessary.

SbW replaces the mechanical steering connection between the hand wheel and road wheels with algorithms, electronics and actuators. In these steering systems, the BtS SbW support function adds another safety layer by translating the driver's steering inputs into brake system control of the vehicle's lateral motion.

"BtS's expanded software functions highlight how collaboration through our CNX Motion joint venture with Continental leads to innovation in motion control and further enhances the steering safety net for all assisted and automated driving levels," said Robin Milavec, president of Nexteer Automotive.

Lutz Kuehnke from Continental in North America added: "As the industry progresses towards highly automated and autonomous vehicles, BtS's advanced functions allow for critical safety features across all levels, enabling increased safety for all road users."



Volvo goes Epic for photorealistic visualisation

Epic Games and Qualcomm are bringing real-time photorealistic visualisation into Volvo cars.

They are combining Epic's Unreal Engine and Qualcomm's Snapdragon cockpit platforms to bring photorealistic visualisation technology to Volvo electric vehicles. As a result, Volvo's next infotainment system will be more than twice as fast as its predecessor, while graphics generation and processing inside the cabin will be up to ten times faster.



Volvo wants real-time photorealistic visualisation in its cars

Unreal Engine should bring more advanced gaming technology inside Volvo cars. The engine is also said to be the most advanced real-time 3D creation tool used in industries beyond games. This will mean the elevation of in-cabin screen technology including sharper renderings, richer colours and new 3D animations.

Epic Games is an interactive entertainment and software company probably best known for Fortnite, one of the world's largest games.

Volvo is the first European car maker to use the Unreal Engine for developing its HMI. It will initially focus on the driver information module, one of the displays inside the cabin that provide the driver with relevant information and infotainment features.

"To offer our customers the best possible user experience and contribute to a safe and personal drive, we need rich, immersive and responsive visualisation inside our cars," said Henrik Green, chief product officer at Volvo. "Running Unreal Engine in our cars enables this and makes it even more enjoyable to spend time inside a Volvo."

By coupling the Unreal Engine with the computing power of the Snapdragon cockpit platforms, Volvo aims to set a new standard in graphics and infotainment system performance.

"When you bring interactive, high-resolution graphics running in real time into the car, you open the door to a vast range of new ways to inform and entertain everyone inside," said Heiko Wenczel, Epic Games' director of automotive. "Volvo's deeply talented design and product development teams have grasped this opportunity to do something fresh that will keep evolving with exciting new features that take advantage of the capabilities of Unreal Engine."

The first car to contain the graphics is an all-electric flagship model that Volvo will reveal later this year. Volvo aims to sell only pure electric cars by 2030.

Further into the future, the company sees additional opportunities for Unreal Engine to advance other areas of technology within its cars for different software-driven platforms.

Volvo aims to develop half of all the software inside its cars in-house by mid-decade and is recruiting within software development.

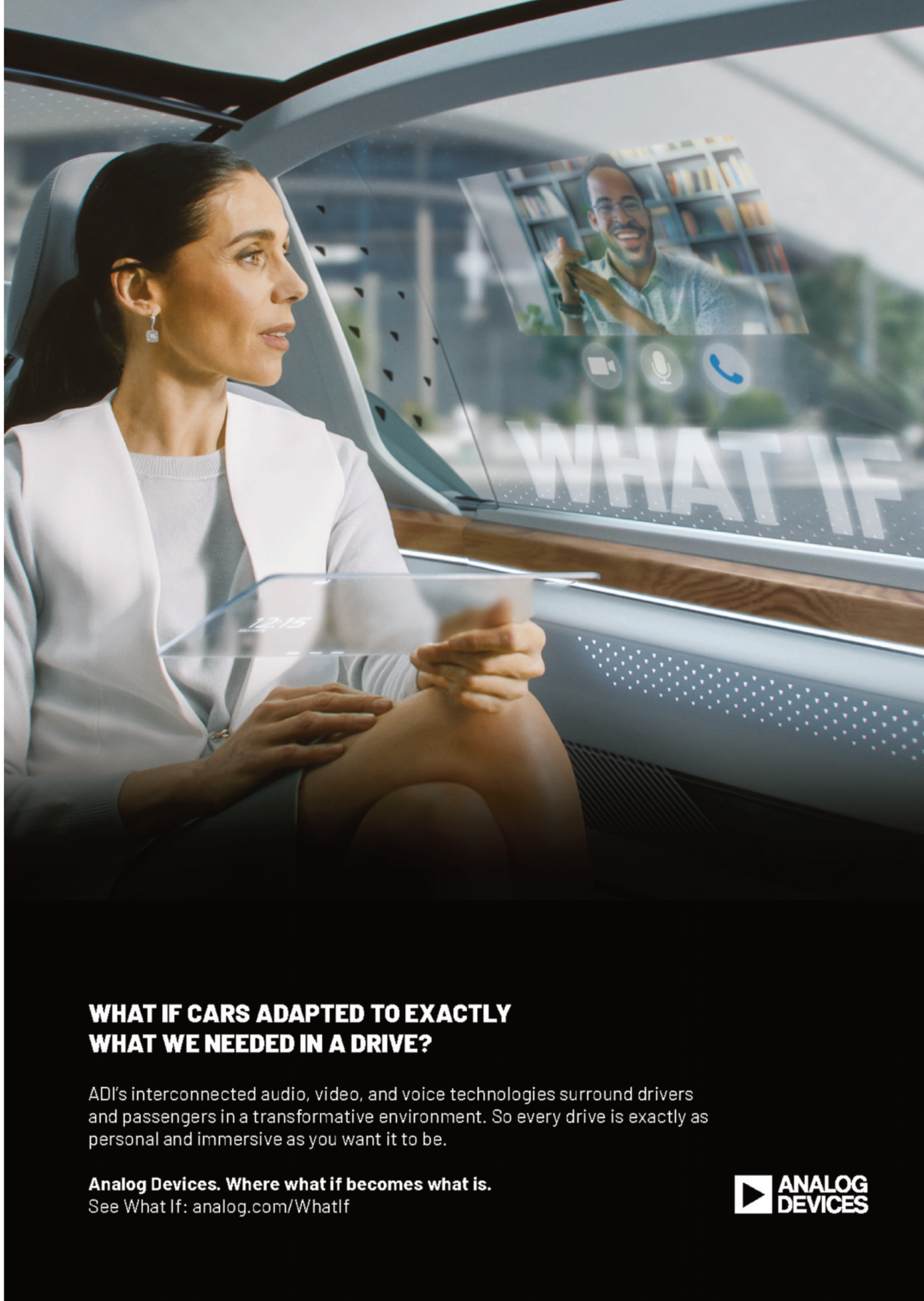
Wejo creates AV operating system

Wejo has created a smart autonomous vehicle operating system.

AV-OS could accelerate the development of AVs for car makers and fleet developers by opening up and democratising access to connected vehicle data.

Announced at June's Move show in London, the platform can leverage billions of daily data points from millions of connected vehicles.

The platform can unlock insights for developers supporting the rapid acceleration of testing in a virtual environment.



VW pays out £193m to vehicle emissions claimants

Volkswagen will pay out £193m in an out-of-court settlement to UK claimants in NOx emissions group litigation.

This follows the group installing software in certain vehicles that detected when the cars were undergoing emissions testing and temporarily reducing the amount of harmful exhaust gas.

The group has already paid out more than £25bn worldwide following the 2015 dieselgate scandal.

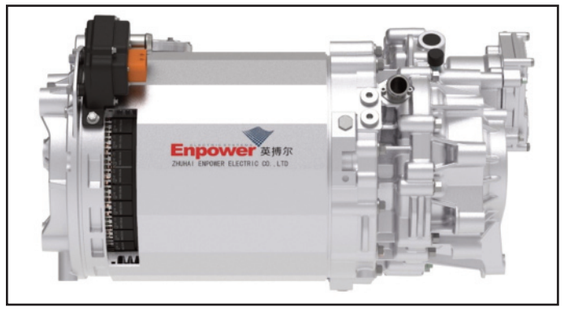
A separate contribution is being made by Volkswagen towards the claimants' legal costs and other fees.

Slater & Gordon represented around 70,000 vehicle owners, the majority of the 90,000 claimants in this group action.

"At Slater & Gordon, we are passionate about securing the best possible outcome for our clients, and I am immensely proud of this excellent result for around 70,000 Slater & Gordon claimants," said David Whitmore, Slater & Gordon CEO. "Over the last five years, Slater & Gordon has rightly dedicated a significant and unwavering commitment to this case, providing an expert voice to consumers."

Slater & Gordon represented claimants in relation to 71,000 of the 91,000 vehicle claims.

"Leading on this ground-breaking collective action has been a privilege," said Slater & Gordon principal lawyer Alicia Thompson." I am delighted to have secured this settlement for our clients and am grateful to them for their patience in what has been a lengthy process."



Infineon IGBTs are used in Enpower inverters

Enpower picks Infineon IGBTs for inverters

Zhuhai Enpower Electric, a Chinese supplier of automotive inverters, is the first to integrate the latest 750V automotive-grade IGBTs from Infineon.

The AIKQ-120N75CP2 and 200N75CP2 discrete IGBT EDT2 devices in TO-247Plus packages enable performance boosts and cost savings in inverter applications and DC link discharge switches for electric vehicles. Additionally, they offer design freedom for system integration.

"With the high current density, ultra-low saturation voltage drop and very good parallel performance, power density of our products has increased by more than twenty per cent, further improving competitiveness of our products," said Liu Hongxin, Enpower's R&D director.

The benchmark EDT2 technology is optimised for automotive discrete traction inverters

Rheinmetall and Dermalog venture to monitor drivers

Rheinmetall and biometrics company Dermalog have formed a joint venture to develop a driver monitoring system.

The SensorTec venture aims to supply the biometric technologies to vehicle manufacturers.

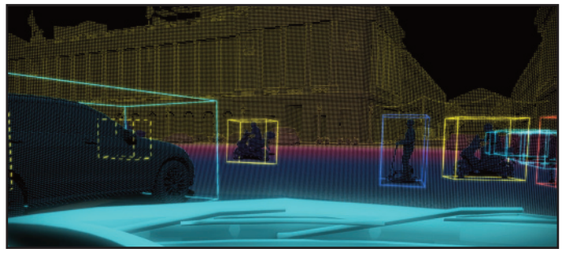
Driver monitoring involves the continuous, computer-assisted observation of the driver. Using various cameras and sensors, the system detects any causes of distraction such as checking a smartphone or fatigue and then warns the driver or, when fitted in vehicles with autonomous control, intervenes independently in emergencies.

The companies will combine their expertise in biometrics, artificial intelligence and radar. As well as keeping an eye on the driver, it will also monitor the entire cabin to detect other risks, such as when a baby or small child is left behind in the vehicle.

Car-sharing services can be informed quickly via an app if objects have been left in the car.

"The technology can offer real added value for vehicle safety and even has the potential to save lives when applied to effective driver monitoring," said Günther Mull, CEO of Dermalog.

Rene Gansauge, CEO of Rheinmetall's sensors and actuators division, added: "This joint venture is an important step forward in our transformation strategy that will allow us to offer cutting-edge technology in the fields of monitoring, authentication and safety."



Stellantis picks Valeo lidar

Stellantis has chosen Valeo's third-generation lidar to equip multiple models of its automotive brands from 2024.

The Valeo Scala 3 lidar will let these vehicles be certified for level-three automation, allowing drivers to take their hands off the steering wheel and their eyes off the road.

"What sets cars apart from others today is the driving experience they offer," said Yves Bonnefont, chief software officer at Stellantis. "Thanks to our L3 autonomous driving solution leveraging Valeo's latest generation lidar, we will offer a more enjoyable driving experience and give back time to the driver during their journeys."

Valeo's lidar sees when an object is far ahead and invisible to the human eye. It can identify objects more than 150m ahead that neither the human eye, cameras nor radars can, such as a small object with very low reflectivity or a tyre lying in the road.

It recreates a 3D image of the vehicle's surroundings using a point cloud, with a claimed unparalleled resolution for an automotive system. It can map the ground topology and detect road markings.

"A new chapter in driving assistance systems is being written with our partners at Stellantis," said Marc Vrecko, president of Valeo's driving assistance group. "L3 vehicle automation can only be achieved with lidar. Without it, some objects cannot be detected. Yet at this level of autonomy, the system's perception capabilities must be extremely precise."

He said the lidar had a resolution nearly fifty times that of the second-generation device.

"The technology comes with data collection features, allowing Stellantis to pave the way for new experiences," he said.

Embedded AI software algorithms let it steer the vehicle's trajectory, anticipating obstacle-free zones ahead.

It can self-diagnose and triggers a cleaning system when its field of vision is obstructed.

Marelli builds wireless battery management

Marelli has expanded its technologies for EVs with a wireless distributed battery management system (WBMS).

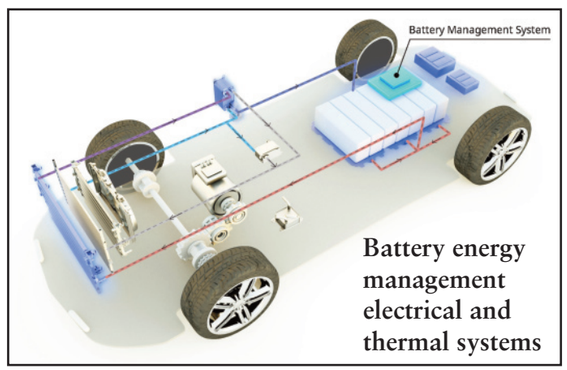
This technology eliminates the wired physical connections typically needed in other BMS architectures, allowing for flexibility, increased efficiency, improved reliability and reduced costs. Marelli is making this available now to support car launches in 2024.

It eliminates the need for daisy-chain communications and wiring by using wireless technology to enable the communications between batteries and control unit. This can reduce the wiring harness by 90% and simplify the battery cell construction and installation.

This opens up room in the battery pack to fit larger batteries.

"Wireless BMS is a real game-changer for the automotive industry, eliminating the need for the battery harness, wires and connectors associated with the standard wired BMS systems," said Razvan Panati, head of power electronics at Marelli. "Marelli designed both the WBMS and the wired BMS with identical base architectures, supported by two different ways of communication and interfaces. In that way our technology can be applied across multiple vehicle platforms with minimal change. This flexibility guarantees significant reduction in engineering costs and allows Marelli to make this high-end technology affordable for the mass market."

The WBMS can be delivered with a software application layer that uses algorithms based on a proprietary technique for so-called sensor fusion. The algorithms estimate several parameters of each battery cell, including states of charge, health and power.



Battery energy management electrical and thermal systems



Inca Jay digital cockpit uses Integrity and Snapdragon

Mitsubishi protects digital cockpit with Integrity

Mitsubishi is using the Green Hills Integrity rtos to run and protect its Inca Jay digital cockpit's software, while harnessing Qualcomm's Snapdragon cockpit platform.

The Inca Jay cockpit adds a suite of integrated technologies featuring adas, cabin safety and augmented reality (AR).

"The Inca Jay relies on the Integrity rtos' trusted execution platform and our developers have achieved higher performance and productivity using the Multi integrated development environment," said Mark Rakoski, vice president of engineering at Mitsubishi Electric.

The Asil-certified rtos is the platform that Inca Jay applications rely on for real-time resources, fail-safe timing, and protection from malicious or errant software. Integrity's Multivisor virtualisation safely and securely runs Android infotainment functions on the same processor in a separate and protected software partition alongside safety- and security-critical functions.

Consolidating software in this way lowers certification costs and reduces complexity. Building, testing and optimising software with Multi has helped Mitsubishi developers find and fix difficult software bugs faster, thus reducing development time and cost while raising code quality.

The cockpit's driver monitoring system leverages an onboard near-infra-red camera to detect driver drowsiness or sudden sickness based on facial expressions and other body information, including pulse and respiration rates.

Face-tracking and image-processing technologies detect slight variations in skin tone due to changes in heartbeat, even in the presence of vehicle vibrations and changes in ambient light. If abnormal physical conditions are detected, the system suggests the driver stop to rest, or can notify another system to commence an automated emergency-parking function.

If children are left in a vehicle unattended, a cabin sensor detects their presence in the camera's blind spots, such as wrapped in a blanket or down in the footwell, and alerts the driver and others nearby.

A high-definition locator provides adaptive directional headlights for safer night-time driving. It is also paired with augmented reality to power location and payment services on the centre display and show bookmarks for parking spots and other landmarks. In addition, it scans and saves credit-card information for easy payment.

The AR graphics overlays on the Asil-B certifiable instrument cluster and centre console show intuitive navigation guidance and location-based services, all powered by a custom version of TomTom Navigation.

"The trusted execution of system-critical functions with high-performance AR graphics and cabin safety functions are key requirements for the cockpit," said Dan Mender, vice president at Green Hills Software. "Global automotive customers can now realise these enhanced features while reducing the cost and time-to-deployment of their next-generation safety-critical digital cockpits."

Mitsubishi is demonstrating the Inca Jay cockpit in a production vehicle.

KPit acquires diagnostics specialist Somit

Software-defined vehicle company KPit Technologies has acquired cloud-based vehicle diagnostics specialist Somit.

Somit enables after-sales operations of high-tech luxury and new age OEMs through a cloud-based vehicle diagnostics platform and consulting services.

Somit's cloud-based platform features intelligent and intuitive diagnostics to enhance a service technician's user experience and improve service quality by increasing the ratio of first-time-right repairs.

"Somit has created a niche for themselves in the challenger EV OEM segment," said Kishor Patil, chief executive officer of KPit Technologies. "Their cloud-based platform complements KPit's existing after-sales platform to offer more integration for the benefit of our T25 clients."

Julian Soanes, CEO of Somit, added: "Our vision to build cloud-based, scalable diagnostics and after-sales that offer comprehensive coverage will be strengthened by KPit."

Cadence improves aerodynamics for McLaren

Cadence Design Systems has become an official technology partner of the McLaren F1 team.

Through the multi-year partnership, McLaren has access to Cadence Fidelity CFD software, which provides aerodynamic prediction tools.

In racing, shaving off a fraction of a second per lap can make all the difference when it comes to a podium finish. McLaren will use the suite of computational fluid dynamics (CFD) software to investigate airflow. The team will also leverage Cadence's computational software expertise to tackle design projects that require advanced compute power and precision.

"Cadence is a technology leader that prioritises innovation," said Matt Dennington, director at McLaren Racing. "Its CFD and advanced electronic technologies will be crucial assets for our design operations. We look forward to a fast-paced collaboration that supports our constant drive to boost our on-track performance."

The partnership was launched at the Monaco Grand Prix in which McLaren's Lando Norris finished sixth.

"As part of the McLaren racing family, we're bringing our Fidelity CFD software to the team and supporting the team in its ongoing pursuit of boosting performance," said KT Moore, Cadence vice president.

- The Cadence EMX Planar 3D simulation technology has been integrated into the X-Fab RFIC workflow for RF designs targeting automotive applications.

X-Fab is an analogue, mixed-signal and specialty foundry.

The validation activities carried out via the EMX on X-Fab RF reference designs for low-noise amplifiers, RF switches, filters and passives elements all delivered high-accuracy results within short timeframes.

By leveraging Cadence's EMX, X-Fab design engineers can develop RF technology for the latest communication standards including sub-6GHz 5G, mm-wave and UWB, which are enabling technologies for EV wireless applications.



Lando Norris came sixth at the Monaco Grand Prix

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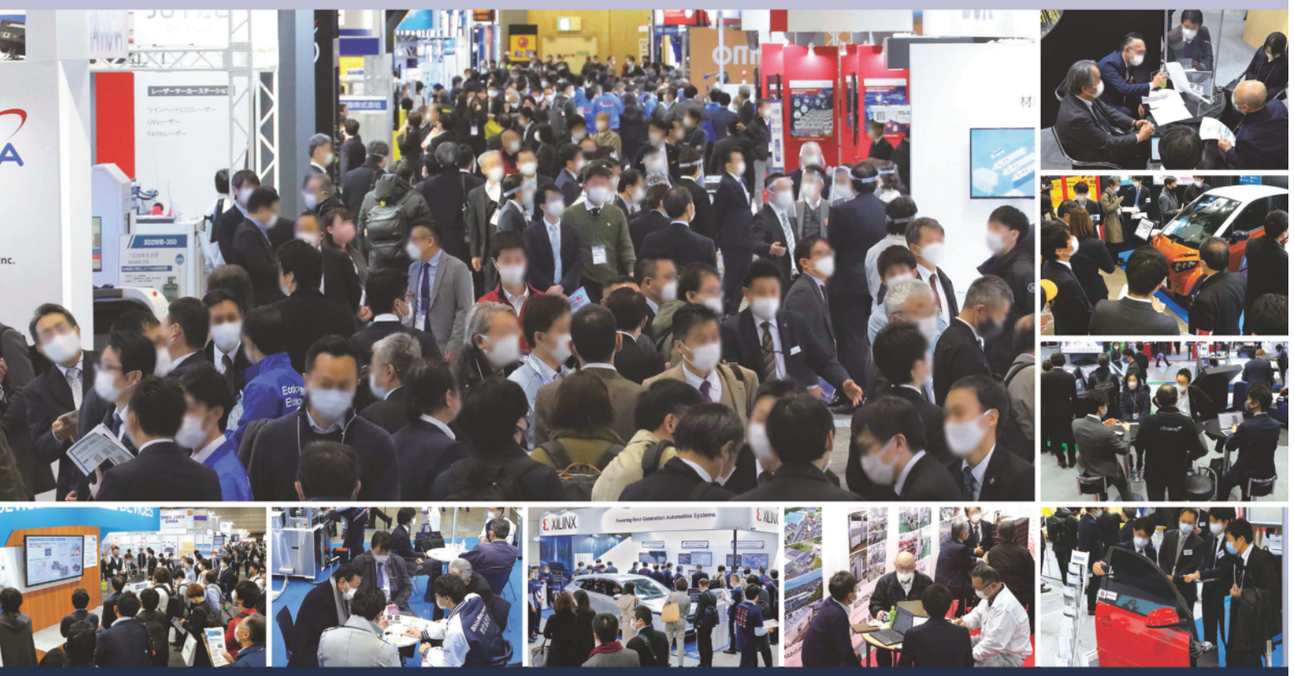
Nagoya Show
Dates: Oct. 26 (Wed) – 28 (Fri), 2022
Venue: Portmesse Nagoya, Japan

Digital Show
Dates: Nov. 30 (Wed) – Dec. 2 (Fri), 2022
Venue: Online

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Dekra partners VicOne on security compliance

Dekra and Trend Micro subsidiary VicOne are working together to help automotive suppliers comply with the latest international regulations and standards in vehicle security.

With their technical know-how and certification services, they can assist suppliers in the automotive supply chain who are eager to enter the electric vehicle industry, implementing and complying with international security standards.

Daniel Lee, general manager of Dekra's product testing operations, stressed that as the technology of 5G and low-earth-orbit satellites have become mature, high-speed transmission and low latency have facilitated the rapid development of the applications for the internet of vehicles (IoV).

He said smart in-vehicle auxiliary technologies and software had changed the landscape of automotive industry. Since the era of software-defined vehicles is approaching, industries in Taiwan are looking to bring their capabilities to the supply chain of smart vehicles and the IoV.

"Whether it is the design and hardware and software, deployment, or the production of associated parts and computers of the network, cyber security is inevitably a key challenge," he said. "Only when automotive players within the supply chain pay proactive attention to and intensify security-related regulations can the requirements from major international car brands be satisfied."

ISO/SAE 21434 and UN ECE Regulation 155 have been regarded as the mainstream standards for automotive cyber security by European and American car manufacturers. However, suppliers are often uncertain about how they can incorporate these regulations into their development process or meet the legal requirements for security in ISO 21434 and UN155.



Dekra and VicOne collaborate on cyber security

VicOne offers counselling and cyber security. A one-stop integration has been devised, coupled with Dekra's vehicle security certification services, to assist suppliers in implementing and complying with international security standards more efficiently, while lowering the cost of development and production.

"We've seen news of car companies experiencing cyber attacks to electric vehicles in recent years and it becomes the emerging challenge for the automotive industry," said Edward Tsai, vice president at VicOne. "Combining VicOne's expertise in automotive cyber security and Dekra's abundant experiences in inspection and certification, makes us the best security partner of choice for automotive companies and suppliers."

AI finds faults in 10% of Israeli bus fleet

One in ten buses in an Israeli public transport fleet were found to have major malfunctions when tested by Questar Auto Technologies' VHM vehicle health management platform.

Questar identified that 10% of tested buses in the Kavim Public Transportation fleet had two malfunctions that required repair; repairing before scheduled maintenance saves money and improves passenger safety.

The platform combines artificial intelligence with automotive expertise.

Questar ran its AI-based analytics software on a heterogeneous Kavim fleet to monitor the health of its urban and intercity buses and determined that 90% of the tested buses were functioning properly while 10% had two major malfunctions that were not observable through any vehicles' error codes.

The first malfunction was an issue with the vehicles' exhaust systems due to an engine oil leak – a serious issue that was not reported by the engine controllers. The second was an issue with the exhaust systems' particulate filters, which disrupted the pollutant burning cycle process that assures proper emission filtration.

Questar's technology is deployed in over 350,000 vehicles across more than 20 countries.

UK Garage & Bodyshop Event
Presented by automechanika BIRMINGHAM

TIME TO UPGRADE

Steve Rogerson reports from the recent Garage & Bodyshop Event in Birmingham, UK



Mark Banks: "Some of the diagnostic features are locked."

While the industry in general welcomes the advances towards autonomous vehicles, car repairers are already beginning to become worried, especially those working in the independent garage sector. They do not have the advantages of large OEMs backing them yet they still have to grapple with the difficulties of fixing vehicles with ever-more advanced electronics.

That is if they can get into the vehicle diagnostics systems in the first place. Fears of connected cars being hacked have forced OEMs to add more security and, with each car maker going their own way with this, the headaches for the independent repairers are increasing.

This was a major discussion topic at the recent Garage & Bodyshop Event in Birmingham, UK, where repairers flocked to find out how they can survive in a world of adas and increasing vehicle autonomy.

Mark Banks, diagnostics development engineer at Bosch, said the catalyst was the now famous 2017 hack of a Jeep where the steering was taken over externally. This led to vehicle owners installing secure gateways to act as a diagnostic firewall.

"This means some of the diagnostic features are locked," he said. "This means normal diagnostic testing will not work. You need to pay to unlock them so you can complete the job."

He was plugging Bosch's secure diagnostics access (SDA) feature as a way round this as this provides a single gateway for the repairer into systems from multiple car makers.

"Without SDA, you have to have separate accounts with each car manufacturer," he said. "With SDA, Bosch will do that for you. Once logged in, you are ready to go on all vehicles. The car is now unlocked."

Levels

Sean Brookes, technical innovations manager at vehicle glass repair group Belron, explained where the industry had reached in autonomous driving, and for most that is still only at SAE levels one and two though the Honda Legend now allowed on public roads in Japan is level three and there are many trials of higher levels taking place.

Such cars, he said, have radar, lidar and multiple cameras working together in what has become known as sensor fusion.

"So, in certain circumstances, the driver can be hands and eyes off in, say, slow-moving traffic," he said. "There is a complexity in a level-three system because the environment can change and the traffic speed up beyond what is allowed. It has to alert the driver to take over."

That, he said, was why some car makers were going for an intermediate step, known as level two-plus, that only allows some hands-free functionality. The Mercedes Drive Pilot is an example.

"We are also seeing the camera technology improve with multiple lenses so they can have different fields of view to detect distances," he said. "Infra-red can be critical in dark tunnels where the normal adas cameras can't see."

On top of this, artificial intelligence (AI) is being used to distinguish between types of objects and even types of pedestrians classifying people say on age to help predict likely behaviour.

The Euro NCap regulations are listing more adas features and if that was not bad enough, he said the Chinese NCap was more stringent and so he warned repairers to expect even more challenges with Chinese vehicles.

Adas is also stretching to systems that turn on headlights and windscreen wipers automatically in poor light or weather and even the air conditioning to stop windscreens steaming up, as all these can affect the way the systems work.



Sean Brookes: "We are seeing the camera technology improve."

Glass

Brookes naturally was more focussed on what this means for windscreen repair. The windscreen is now being used as part of adas with augmented reality working with the navigation system to project real directions onto the front view. There are also various head-up elements being projected onto the screen.

For these to work properly it is critical that the glass is fitted correctly.

"For example, if you get it wrong you can have a double image or no image at all," he said. "Fitting the glass is increasing in complexity. The tolerances are a lot tighter on a head-up display."

Tyres

Tyre pressure monitoring systems (TPMS) have been around for some time but many garages are still not dealing with them in the most efficient way, according to Prashant Chopra, managing director of Autogem Invicta.

"About sixty per cent of vehicles have tyre pressure sensors and these will eventually need to be replaced or new batteries fitted," he said. "Rubber valves on the sensors degrade, metal valves corrode or shear."

The first stage he said was to make sure that the vehicle inspection system was up to date and ready for all types of TPMS. Data direct from the manufacturers should be imported into these systems.



Prashant Chopra: "An informed customer is a happy customer."

He also stressed how important it was to explain what needed to be done with a TPMS to the customer without using jargon or gobbledygook.

"An informed customer is a happy customer," he said. "Take the opportunity to educate the car owner about TPMS."

Conclusion

There are no easy answers to the problems facing car repairers as vehicle become increasingly complex. However, what they cannot do and still survive is ignore the difficulties. As Brookes said: "Adas technology is increasing; it is not going away."

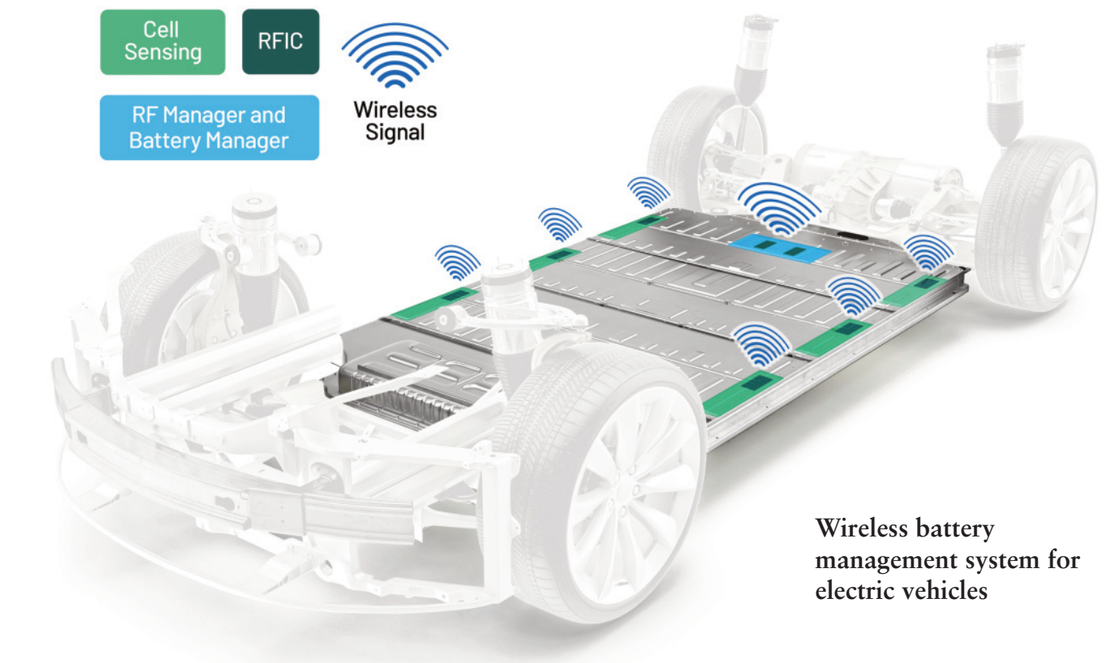
Thankfully, as was seen at the show, the industry is stepping up to the task with multiple systems on display to help garages. Time to upgrade.

WIRELESS

BATTERY REVOLUTION



Shane O’Mahony says the electric vehicle wireless battery management revolution has begun and the RoI potential is huge



Wireless battery management system for electric vehicles

OEMs have an opportunity to increase profits on next-generation electric vehicles by leveraging wireless battery management systems (WBMS).

The electric vehicle (EV) industry's evolution to WBMS was in many ways inevitable. The benefits of wireless versus wired BMS are crystal clear to anyone who's grappled with the complexity, costs, space and labour penalties inherent to wired systems, no matter the application.

WBMS, in contrast, has showed promise in saving up to 90% of the wiring and up to 15% of the volume in battery packs for EVs. This is achieved by eliminating the communication wiring harness and connectors, leveraging instead an intelligent battery module with fully integrated electronics; the only exposed connectors are the positive and negative terminals.

But the benefits achievable with WBMS technology can only be realised with massive investments in the design, validation and manufacturing infrastructure needed to accommodate it. What's more, the security and safety requirements unique to wireless systems invite a top-to-bottom reassessment at every stage of the battery pack life cycle, from manufacturing to reuse.

At first, the scale of this effort is a seemingly impossible barrier to OEM adoption. OEMs eyeing WBMS as a quick cost savings opportunity should reset their expectations. To unlock the cost benefits of WBMS fully, OEMs must first regard battery packs as assets to be managed over time – through the first life on board the vehicle, and on to the second life – to achieve a high return on investment. Only then will the cost savings fully manifest.

There are additional opportunities for design and cost efficiencies that will smooth the road ahead for OEMs that recognise WBMS as the clear path forward. Based on early OEM feedback, WBMS is projected to be much more cost-effective and otherwise advantageous to implement industry wide for EVs in the long run.

Efficiency

To commit to the technology is to re-imagine how the EV factory is designed. But the merits of going fully wireless from production to product become hard to ignore when all the moving parts, some literally, are considered.

There's a big difference between almost robotic and fully robotic manufacturing. Put simply, as soon as humans are introduced to the factory floor environment populated with high-speed robotics, significant safeguards must also be put in place to protect them, and this inherently reduces the production efficiency that could otherwise be achieved with full end-to-end automation.

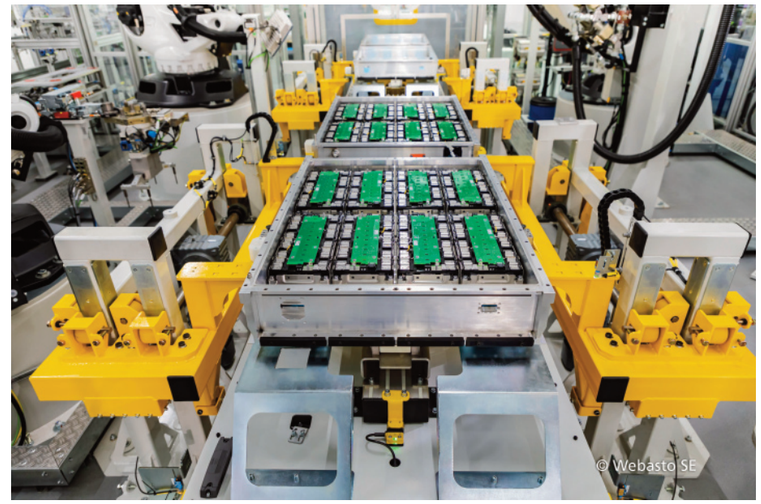
Using wireless communications throughout the factory floor for WBMS production opens the door to touchless, fully robotic EV battery pack manufacturing. In addition to leveraging the benefits of WBMS at the vehicle level, OEMs can reduce capex and opex by eliminating the need for personnel to spend time manually wiring battery packs to harnesses and/or testing modules and connections with the ongoing safety training this activity entails.

This aspect provides new and established OEMS alike the opportunity to bypass legacy wired production in favour of wireless, robotic manufacturing. In turn, they can realise efficiencies and flexibility that make the most of their limited budgets, keeping them nimble and competitive with deep-pocketed, established players.

By bypassing the need for robotics devoted to the time and cost-intensive tasks of manipulating wired battery pack harnesses, OEMs can achieve the full promise of high speed, high efficiency robotic production.

Scalability

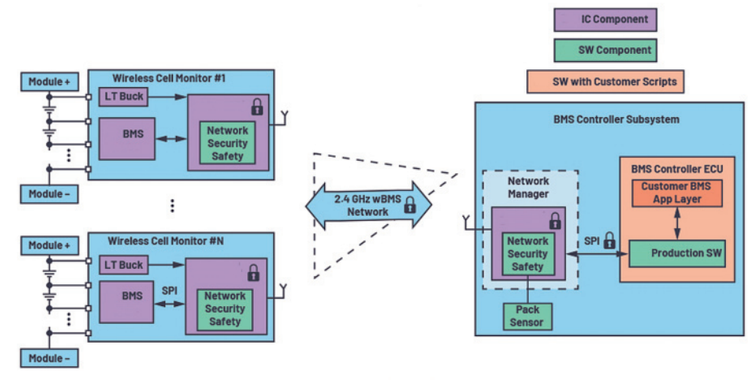
With WBMS, OEMs and battery suppliers are liberated to design and produce as many battery pack variants as they like without ever designing a harness. They can leverage a common WBMS platform that's software configurable for individual vehicle models, at lower overall development costs. This remains the heart of the WBMS value proposition: OEMs gain increased flexibility to scale their EV fleets into volume production across a wide range of vehicle classes to meet evolving consumer demand.



No touch, fully automatic manufacturing is a strongly growing trend in the EV industry

For example, by adopting WBMS to underpin its Ultium battery platform, GM can scale the platform across its brands and vehicle segments, from work trucks to performance vehicles. And GM credits WBMS for enabling the more widespread electrification of its fleet.

But there's much more that can be done to lower the carbon footprint of a battery pack over its usable lifetime, while extending the associated revenue potential. This is achieved through a reduce, repair and reuse strategy whereby WBMS can help reduce costly vehicle recalls, streamline repairs, and promote battery reusage as a preferred alternative to scrapping and recycling.



The architecture of the world's first WBMS production system with cell pack monitoring hardware and production network, safety and security software

WIRELESS

WBMS makes it considerably easier to maintain a stock of spare modules, and they are a lot easier to swap in and out of battery packs during vehicle service. There's no time loss or frustration associated with tracking and locating inventory, or attempting to remove the battery harness without breaking it during a service call. Modules are scanned in and out as they migrate through the supply chain, and finally from stock shelf to vehicle, with installation ease that traditional wired BMS could never match.

This impacts more than just service at the EV development phase. Pack designers no longer need to spend precious time and space to accommodate how the harness will be removed and replaced, resulting in faster design and more energy dense packs.

WBMS also lets batteries measure and report their own performance, increasing early failure detection and helping avoid costly vehicle recalls, while optimising battery pack assembly. The data can be monitored remotely throughout the battery life cycle, from assembly to warehouse and transport, through installation and maintenance.

For OEMs interested in increasing the usable life and revenue potential of their battery packs, WBMS makes second-life battery repurposing more efficient. Minus the harness, battery packs are easier to repair and reuse to ensure a longer lifetime and a more environmentally friendly carbon footprint overall. OEMs can readily resell their used batteries for applications such as solar or wind energy storage once they reach a determined state of health.

OEMs pursuing this reduce, repair and reuse strategy can eliminate seven tons of carbon emissions per battery pack if it's repaired and not recycled. In terms of cost savings, OEMs typically earmark approximately $1000 to recycle each individual EV's battery pack. This can exceed the profit the OEM made on the original vehicle sale, so it makes good business sense to explore ways to resell their used EV batteries as quickly as possible so as to get the most value out of them.

Security

As the life cycle of the EV battery pack is extended, it becomes increasingly necessary to maintain tight security protocols accompanying each and every module on its journey from manufacturing to servicing to decommissioning. OEMs must maintain the integrity of the battery modules at all times, or risk negating the value of the module for reuse in second life applications if its secure status can't be independently verified.

This holds important implications for serviceability as well. Modules can be designed to authenticate themselves, and battery packs can be designed to reject bad modules automatically. This makes it easier to ensure only genuine spare parts are going into the battery pack, installed by approved agents where warranted.

Here again, implementing these measures can be cost prohibitive and/or perceived as a major barrier for OEMs attempting to exploit the full benefits of WBMS. The prospect of designing a brand-new security architecture for a new communications platform extending across the full life cycle of the battery or module is hardly palatable to the OEM.

Secure module tracing capabilities unburden OEMs of the significant time and expense of implementing secure locations across their supply chains and/or babysitting systems that do not benefit from the convenience of public key-based certificate schemes. OEMs won't need to hire a devoted and expensive team of top-flight cyber-security specialists if this hard work is already done for them upfront.

This underscores the need for a comprehensive design strategy that helps OEMs increase the full value of their investments in the technology without worrying that any one misstep can upend the projected overall cost savings.



Hummer has been transformed into an all-electric poster child

Battery pack simulation technology can go a long way towards helping OEMs achieve first pass design success by predicting their WBMS system performance via a thorough assessment of the pack's simulated digital twin long before the CAD drawing stage.

This will help establish a comfortable design margin for OEM battery packs developed for WBMS, while helping to confirm interoperability with the surrounding ecosystem of components. This is a critical point that can't be overlooked: a WBMS must be designed to be really robust to be truly low cost from a development point of view.

Marginally good enough designs may save some system cost here and there, but these upfront savings can be utterly wiped out by the associated development costs that can arise as system deficiencies begin to surface in later design stages. A well architected, flexible design can preclude the cost overruns and frustrations associated with tweaking individual battery packs for individual vehicle models, enabling greater overall scalability for OEMs' battery pack platforms.

Future

When accounting for the simplified manufacturing processes and lowered capex and opex outlay relative to legacy wired BMS, OEM feedback on maturing wireless BMS technology suggests a possible achievable cost savings as high as $250 per passenger EV.

Factoring in the attendant vehicle and battery service and inventory monitoring efficiencies, and the added opportunity to increase overall profit via second life battery pack reclamation and repurposing, it's easy to envision a profitable and sustainable future for the technology in EV designs.

GM is the first of many OEMs to embrace WBMS, and it's striking that it elected to debut the benefits in, of all vehicles, a very large SUV, a vehicle class perhaps best remembered for its outsized environmental footprint.

If the Hummer can be transformed into an all-electric poster child for green transportation, the last remaining barriers to mainstream EV adoption are surely crumbling before our eyes, and WBMS technology will play a pivotal role in this transformation.

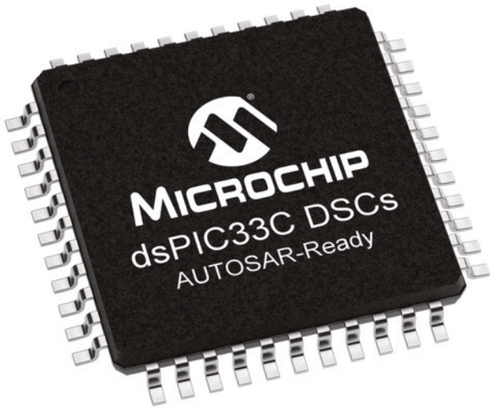


Shane O'Mahony is product marketing lead for wireless BMS at Analog Devices

DESIGN & DEVELOPMENT

COMING together

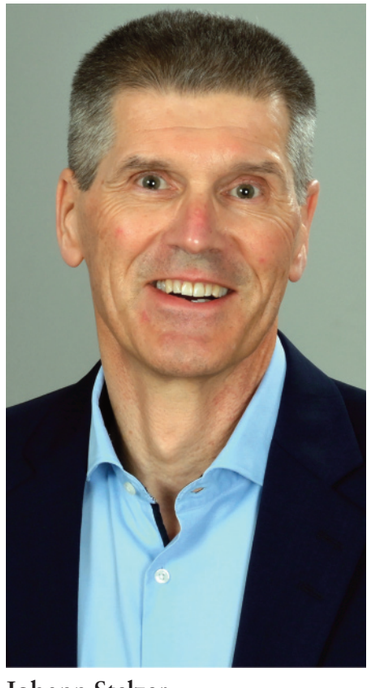






Steve Rogerson talks with Johann Stelzer from Microchip about how the company is working with others to change the automotive design market

The growth of electronics and software in vehicles, while bringing major benefits, has caused numerous headaches for designers. Car makers are experiencing increasing application complexity and the need for Autosar, ISO 26262 functional safety and security increase hand-in-hand with the market for electric and autonomous vehicles.



Johann Stelzer

For automotive developers looking to design scalable applications for future technologies while also meeting the latest automotive requirements, Microchip Technology is building an ecosystem of players around its Autosar-ready DSPic33C digital signal controllers (DSCs) to accelerate development and reduce costs.

This ecosystem includes Microsar Classic from Vector, the KSar operating system from KPit Technologies, Elektrobit EB Tresos Studio MCAL configurator and ASpice- and Asil-B-compliant MCAL drivers from Microchip. Third-party hardware tools include the Trace 32 debugger from Lauterbach.

"We have had this family for several years, but what we didn't have was the ecosystem for automotive," said Johann Stelzer, product manager of Microchip's automotive products group. "The devices have all the peripherals for typical automotive applications, but we wanted everything around it that are not directly silicon related."

After the hardware has been created, there is the software that runs on it.

"They need to take the peripherals of the microcontrollers and they need drivers for the peripherals and these have to be compatible with Autosar," said Stelzer. "In the past few years, the requirements for security have grown. You need to make your applications safe, so you have ISO 26262 for automotive that defines certain things that the application must meet to satisfy Asil B, C or D. If the steering doesn't work, you can be off the street in milliseconds."

People, he said, needed to know the systems were safe, and if it did go wrong that it would stop in a safe way.

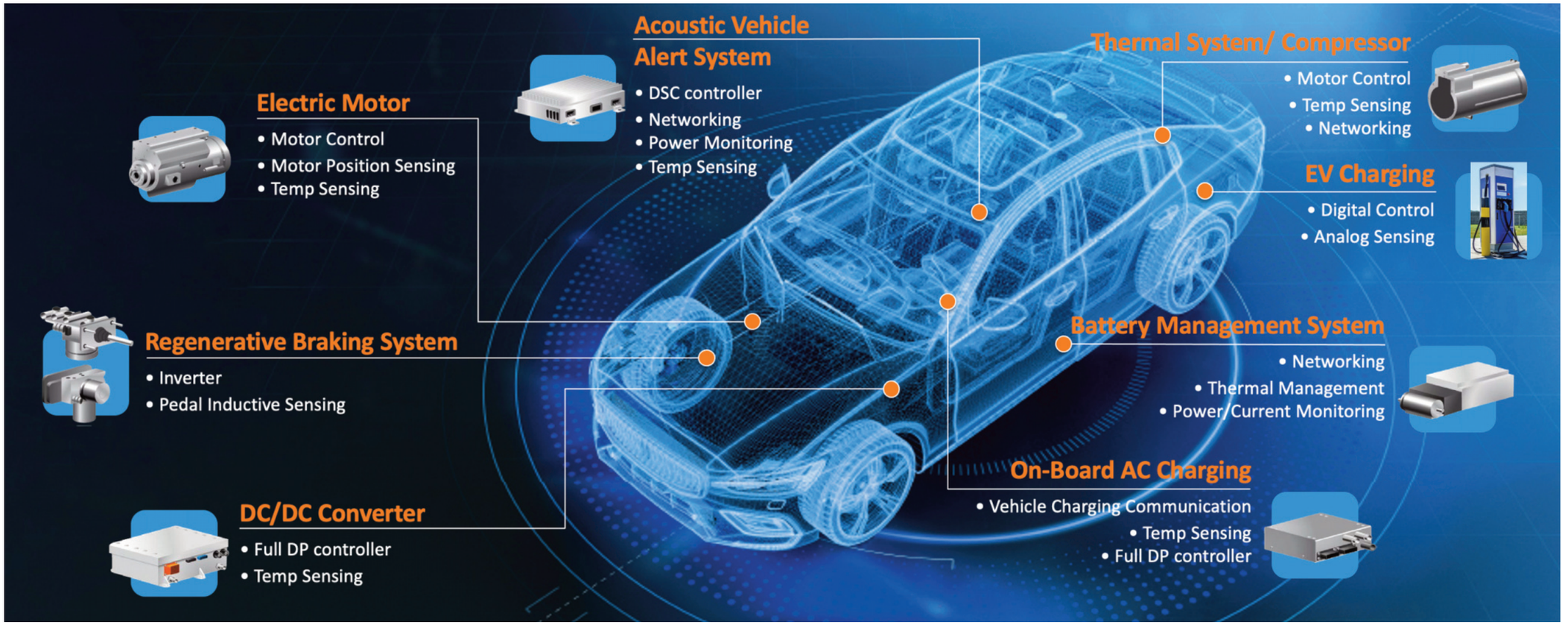
"But what engineers don't have is time," he said. "They need to know if our DSPic is good enough for their application, so we are making it easier for them to evaluate that quickly."

Microchip is expanding its portfolio of DSPic33C DSCs to cover the large memory segment with the ISO 26262-compliant DSPic33 CK1024MP7xx family. This family with 1Mbyte flash enables applications running automotive software such as Autosar, OS, MCAL drivers, ISO 26262 functional safety diagnostics and security libraries. The AEC-Q100 grade 0 DSCs also include a central processing unit (CPU) with deterministic response and specialised peripherals for general automotive, advanced sensing and control, digital power, and motor control applications.

The 1Mbyte of flash is important because to be Autosar ready it need at least 256kbyte. Some of the firm's earlier devices had 128kbyte or less.

"These have everything for a full-blown Autosar application," said Stelzer. "We are providing our customers with all the thing they need in an Autosar environment. We are looking towards software-defined cars as more is defined by software rather

DESIGN & DEVELOPMENT



Where the DSCs are used in a vehicle

than hardware. That is driving demand. That is what our customers are asking for."

The Autosar-ready DSCs help designers achieve higher levels of system optimisation by implementing Autosar-based applications, functional safety goals and security use cases in a single MCU while meeting automotive application requirements.

This opens up opportunities for designers looking to work with Microchip while expanding into e-mobility, sensing and control applications.

The benefit of adopting Autosar-ready devices such as these is that engineers can improve their risk and complexity management while decreasing development time through reusability.

Those who have previously designed bare metal or non-Autosar automotive applications and are now adopting Autosar can scale up by staying within the DSPic33C ecosystem.

Microchip has worked with partners to offer an integrated way to simplify development for automotive OEMs and tier-one suppliers. This is simplifying evaluation of an ECU project using Autosar 4.3.x and helping users become familiar with the systems quickly.

Microchip has expanded its functional safety packages that include FMEDA reports, safety manuals and diagnostic libraries to cover the ISO 26262-compliant DSCs. These, used together with the company's TA100 CryptoAutomotive security ICs, enable the implementation of security in automotive designs.

"People want to do over-the-air updates to improve software and add more features," said Stelzer. "So security needs to be there as well."

The reason, he said, Microchip was building the ecosystem was to make it easier for users so they did not have to deal with multiple vendors and patch everything together.

"Development times are shorter so we wanted to reduce the risk with this family," he said. "We can answer their questions quickly. They can see the family is suitable. They know the integration works and they can very quickly get started."

For ISO 26262 there are three packages to ease engineers into the ecosystem. They can start with a basic package and move up to the full-blown safety package. On security, they can reduce the amount of effort to build applications.

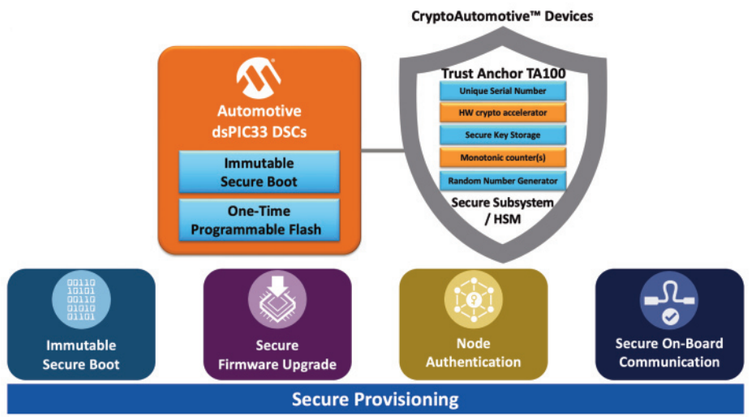
Though the company's products have been used in vehicles for years, the increase in electrification has given it more opportunities. A good example is noise creation, so pedestrians can hear a vehicle approaching. They can also be used in EV charging and battery management systems, and as e-fuses to disconnect the battery quickly if something goes wrong.

For autonomous vehicles, applications can include hands-on detection for the steering wheel, driver-assist camera control, and LED and adaptive lighting.

As well as the third-party tools from ecosystem partners, software and tools from Microchip include certified MPLab XC16 compiler functional safety licences, MPLab X integrated development environment (IDE), MPLab code configurator (MCC), programming and debugging tools for the DSCs, ISO 26262- and ASpice-compliant MCAL drivers, ISO 26262 functional safety packages, and software libraries and reference code for security use cases.

Microchip has been working for the past year with the ecosystem partners to bring this package together.

"We were constantly working with the third parties during this period," said Stelzer. "And it is available now. We have had early adopters, and they like it. The feedback has been positive."



DSC automotive security features

SENSORS



Continental adds sensors for electromobility to support road safety and electrification

Continental is widening its portfolio by launching two sensors for electrified vehicles: the CSM current sensor module and BID battery impact detection system. Both focus on protecting the battery and/or on battery parameter retention.

This year, Continental will begin manufacturing the high-voltage CSM. This compact modular sensor measures the current and simultaneously detects temperature. Both values are relevant as inputs for battery management.

Another element of battery protection will be brought into the market by Continental; the BID is a light-weight alternative to heavy underfloor armouring against damage.

"Vehicle electrification brings new use cases and thus opens up more opportunities to our sensor activities, because an electric car has all the sensor needs a conventional car has, and more," said Laurent Fabre, head of passive safety at Continental. "Protecting the battery and retaining its performance, for instance, are two additional tasks in electrified vehicles. The CSM and BID serve both purposes."

Considering the battery is the single most expensive component in an electric car, the CSM was not just developed to protect the battery from over currents, but

will also help retain the battery parameters by limiting ageing effects. Integrated either in the battery disconnect unit or in the battery itself, the CSM will provide the two decisive bits of information for battery protection as well as reliable driving range monitoring.

To support functional safety requirements, it is available as a two-channel sensor, measuring current independently by integrating shunt technology and Hall technology in a compact, single unit.

The BID combined with a lightweight structure detects underfloor impacts and alerts the driver if a stop at a garage is necessary as a result. This relieves the driver of the decision whether an impact at high speed or a low-speed ground contact may have damaged the battery. Compared with current metal underfloor protection, the BID can save up to fifty per cent of weight.

Monitoring

Lithium-ion batteries store a great amount of energy to provide an attractive driving range. Particularly during charging, high current flows into the battery.

Owing to inevitable physical effects, charging and discharging a battery will heat it up, especially high-power fast charging or sportive driving. To prevent the car battery from overstress, the current has to be controlled to limit the temperature gradient.

"A lithium-ion battery has an optimum temperature span in which it is very safe and ages very slowly," said Horst Gering, programme manager at Continental. "However, fast charging the battery is a trade-off between keeping the battery safe and healthy and limiting the duration of charging. This is best done on an exact data basis."

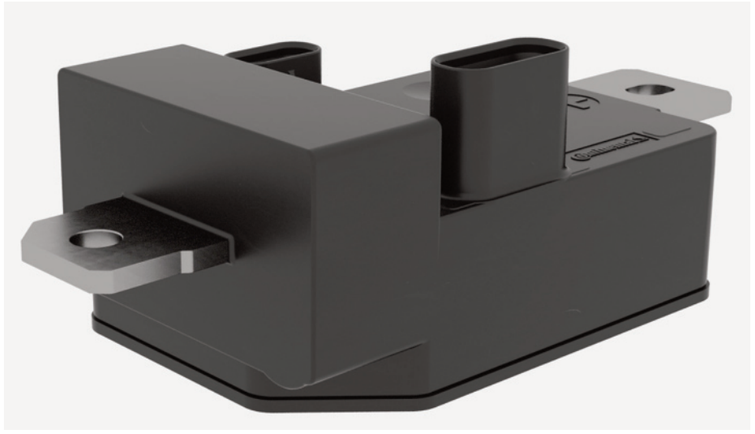
Also, the CSM helps calculate the precise remaining range by monitoring current consumption.

The measured current can be calibrated up to 2kA with better than ±1% accuracy on the shunt channel and ±3% accuracy on the Hall channel, plus temperature in the range between -40 and +125°C.

Both current measurement technologies provide full galvanic separation. This input is then provided via the Can interface to the battery management system.

In addition to optimising the efficiency of charging while protecting the battery, the CSM will also help detect mechanical malfunctions, which could lead to a fire if undetected.

The CSM supports Asil D on the system level. The production of the CSM will start this year for a global automaker's electric vehicle. The first product is part of a modular sensing platform that is scalable for additional features such as voltage measurement and number of measurement channels.



The CSM supports Asil D on system level

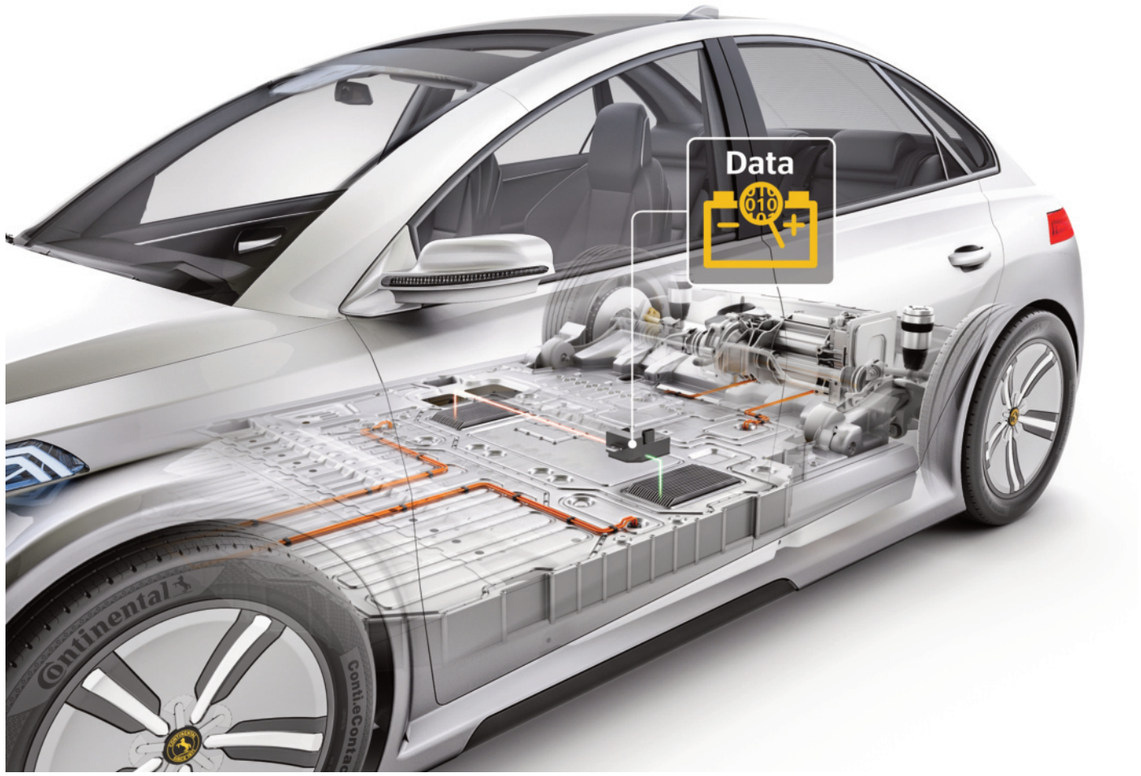
Protection

Typically, the lithium-ion battery of an electric car is integrated in an underfloor position where its weight contributes to a low centre of gravity and where it is protected by the vehicle structure, with two potential exceptions.

At high speeds, objects, such as lashing straps, can be swirled up and damage the underfloor. At low speeds, ground contact during a parking manoeuvre can also cause damage. Therefore, electric vehicles are fitted with a large and often heavy cover to protect the battery compartment from the underside.

However, if an impact occurs, it will be up to the driver to judge whether the car needs to be checked at a garage.

"This is not a satisfying situation as there is poor visibility underneath a car, plus it takes a trained eye to assess the true damage," said Johannes Clemm, managing director of Continental's safety engineering division in Alzenau.



The high-voltage CSM provides current and temperature information to keep the battery safe

To help the situation and make a lightweight underfloor protection feasible, Continental has developed the pressure-sensor based BID.

This detects and classifies underfloor impact events to alert the driver if the battery integrity may have been breached. This way the car owner can take precaution before a punctured battery could ignite later.

"In addition, the BID identifies the area of the damage so the battery management can empty the cells in that area to prevent any risk of fire," Clemm said.

The BID covers two typical impact risks. One is low-speed ground contact, for example during parking manoeuvres when the vehicle slowly rolls over a kerb and hits the ground. During this type of event, the BID signal could also be used to trigger a fast-acting active suspension system to increase temporarily the underfloor clearance to mitigate the damage.

The other use case is high-speed intrusion, which can be caused by swirled up heavy objects such as rocks or lashing straps on the road. Given the speed and impact, these types of objects can damage the underfloor and potentially even penetrate the battery structure.

Compared with current technology, the sensor-based underfloor protection can save up to half of the weight of battery shielding. The pressure sensor satellites used in the BID derived from the proven pSat pedestrian protection system, which has been in serial production and applied in millions of vehicles for more than ten years.

Any impact is detected via a resulting pressure signal in an air-filled silicone tube that is integrated in serpentines at the bottom of the battery compartment. The time difference between the signal's arrival at the two pressure satellites at both ends of the tube makes it possible to calculate the area of the impact.

The severity of the impact can be classified via signal thresholds that serve to trigger cascaded alarms to the driver.

IMU uses machine learning

An inertial measurement unit (IMU) from ST Microelectronics can move smart driving a step closer to high levels of automation with its machine-learning (ML) core.

Leveraging mems technology, the automotive-qualified ASM330LHHX houses a three-axis accelerometer and three-axis gyroscope in a 2.5 by 3 by 0.83mm outline. The six-axis module provides movement and attitude sensing for functions including vehicle positioning and digital stabilisation.

The ML core, a hard-wired processing engine, runs AI algorithms directly on the sensor, reducing latency between sensing an event and the vehicle's response. This enables real-time performance that demands lower system energy and computing power than being embedded on an application processor or cloud-based AI.

Demonstration boards and free software example libraries are available to simplify application development. Functions available include vehicle-stationary detection, attitude and heading reference, altitude estimation, car-tow detection, and crash detection.



There are two operating modes. Low-power mode is for running always-on applications such as telematics, anti-theft systems, motion-activated functions, and vibration monitoring and compensation. When operated in low-power mode, the current is less than 800μA with both the accelerometer and gyroscope running.

There is also a mode for applications that demand higher accuracy and lower latency, including precise positioning, V2X communication, and impact detection and crash reconstruction.

The module maintains consistent accuracy over the operating range -40 to +105°C.

It is AEC-Q100 qualified and is in production housed in a 14-lead land-grid array (LGA-14L) package.

The company has also released the TSB622 general-purpose low-power dual operational amplifier (opamp) to enhance ruggedness and flexibility in industrial and automotive applications.

The unity-gain stable device operates over the temperature range -40 to +125°C, and is automotive-qualified. The supply voltage from 2.7 to 36V lets designers use the same device for multiple applications with different voltage domains.

The rail-to-rail output increases dynamic range while the input offset voltage of 1mV ensures competitive precision for a low-power device.

With a gain-bandwidth (GBW) product of 1.7MHz and maximum operating current of 375µA per channel at 36V supply, it delivers high speed relative to power consumption.

The low supply current allows use in applications that demand low-power operation and extends the runtime of battery-operated equipment.

In addition, 4kV ESD tolerance and enhanced resistance to electromagnetic interference ensure it withstands the technically demanding industrial and automotive environments.

The dual opamp is now packaged in SO8 and MiniSO8 styles that save board space and can help reduce the overall cost of the PCB.

The 3 by 3mm DFN8 package will come with wettable flanks that boost mechanical strength.



3D antenna

Huber+Suhner claims to have made the first long-range 3D metallised plastic radar antenna for adas, offering low losses for more accurate object detection while meeting automotive standards.

Based on injection moulding, the antenna creates an air-filled waveguide to achieve lower insertion loss and a higher performance than PCB antennas.

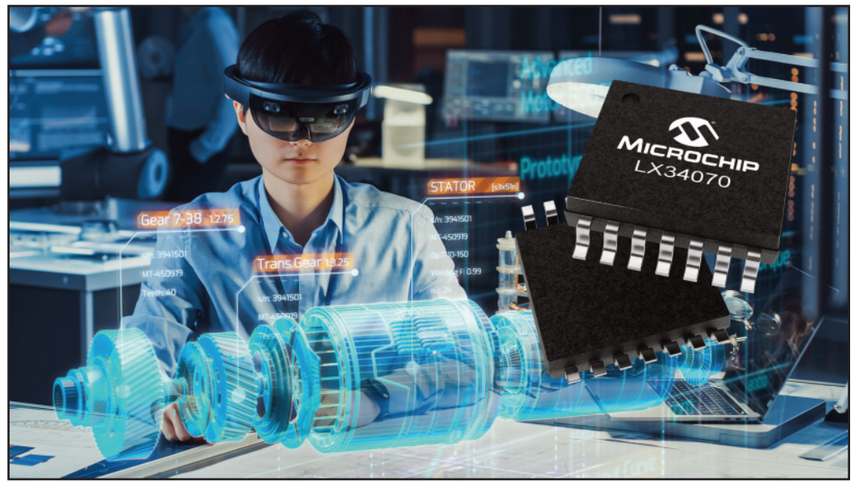
Its increased size allows the antenna to read objects from over 300m away, offering broad bandwidth and improved signal-to-noise ratio.

OEMs are requesting sensors containing 3D antenna components for heightened performance. The use of waveguide antennas has become an attractive alternative to classical PCB technology as it improves efficiency, pattern stability and impedance bandwidth.

Exploiting a third dimension facilitates the ability to distribute arrays quite freely over a large antenna aperture to obtain high angular resolution and increased virtual array possibilities.

Sensor aids EV motor control to ISO 26262

A family of inductive position sensors from Microchip includes a device for ISO 26262-compliant electric-vehicle motor control applications.



The LX34070 IC can help accelerate the move away from expensive and less accurate magnet-based technology for safety-critical EV motor position monitoring.

Developers of motor control systems are rapidly replacing Hall Effect position sensors and older magnetic resolvers with inductive alternatives that eliminate expensive magnets and other heavy transformer-based structures so they can be integrated onto simple, compact PCBs.

This device has been purpose-built for EV motor control applications. It includes differential outputs, fast sample rates and features that make it functional-safety-ready for ISO 26262 compliance to Asil C.

Designers can use it to streamline EV motor control designs by pairing it with other functional-safety-ready devices including the firm's 8bit AVR and Pic microcontrollers, 32bit microcontrollers, and DSPic digital signal controllers.

The inductive position sensor uses PCB traces rather than transformer-based magnetic windings and coil structures.

Accuracy is improved since it does not depend on magnet strength, and the device increases robustness by rejecting stray magnetic fields. These give designers flexibility over where they can place the PCB-based device.

A primary coil generates an AC magnetic field that couples with two secondary coils. A small metal target object disturbs the magnetic field so each secondary coil receives a different voltage whose ratio is used to calculate absolute position.

TVS surge capability to 3kW

Surface-mount Transzorb bidirectional TVS transient voltage suppressors from Vishay come in an SMC DO-214AB package for automotive, industrial and telecom applications.

Offering surge capability of 3kW at 10/1000μs to meet ISO 16750-2 pulse b, the SMC3Kxxx CAHM3_A devices provide leakage current down to 1μA from 22 to 120V and high temperature operation to +175°C.

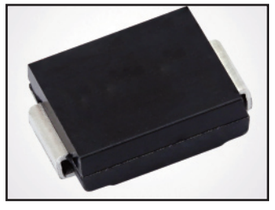
Suitable for high reliability applications, the devices are AEC-Q101 qualified and offer stable breakdown voltage from 11.1 to 133V across their entire operating temperature range of -55 to +175°C.

Designed to protect sensitive electronic equipment against voltage transients induced by inductive load switching and lightning, the devices are for automotive load dump protection and signal line protection in industrial and telecom systems.

The series consists of 33 TVS part numbers with stand-off voltages from 10 to 120V.

The devices offer fast response times, low incremental surge resistance and clamping capability, with a maximum clamping voltage from 17 to 193V at 10/1000μs.

The devices are RoHS-compliant and halogen-free, and offer a moisture sensitivity level (MSL) of one in accordance with J-STD-020, LF maximum peak of +260°C.



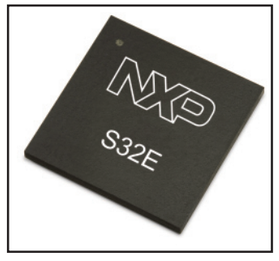
Real-time processors enable software-defined vehicles

NXP is extending its S32 automotive family with real-time processors for software-defined vehicles. The class of processors has the critical deterministic behaviour of safe MCUs, but with a combination of gigahertz speed, multi-application isolation and memory expansion capabilities.

They are suitable for the safe integration of cross-domain vehicle functions for software-defined vehicles.

And the scalable 16nm S32Z and S32E processors come with a roadmap to 5nm devices.

Being launched at Embedded World in Nuremberg, the processor families are said to extend the benefits of the firm's S32 automotive platform with safe, real-time processing. They can help the automotive industry accelerate the integration of diverse real-time applications for domain and zonal control, safety processing, and vehicle electrification.



The S32Z processors are suitable for safety processing and domain and zonal control, while the S32E processors are for electric vehicle (EV) control and smart actuation. The software-compatible S32Z and S32E help enable software-defined vehicles, reduce software integration complexity, and enhance security and safety.

The automotive industry's evolution to domain and zonal architectures is attractive to car makers, enabling them to optimise wiring harnesses, reduce cost and weight and implement a more scalable and cost-effective, software-centric approach for developing and updating intelligent vehicles. This transformation requires processors that offer higher performance, application isolation and memory expansion capabilities to support software-defined vehicles and future innovations.

These processors come with eight Arm Cortex-R52 processors cores with split-lock support that operate at up to 1GHz to address safely integrating deterministic, high-performance real-time applications. The processors isolate independent real-time applications with core-to-pin hardware virtualisation and resource firewalls for freedom of interference.

The processors are available with up to 64Mbyte of integrated flash memory for large, zero-downtime over-the-air (OTA) updates and support LPDDR4 dram and flash expansion memory with execute-in-place (XiP) mode for large applications and Autosar Adaptive applications.

A communications accelerator supporting 24 Can interfaces and a Gigabit Ethernet switch supporting time-sensitive networking provide vehicle data seamlessly to virtual ECUs to improve efficiency and streamline software development.

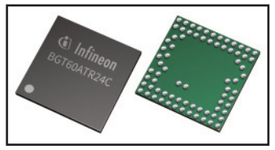
A hardware security engine supports secure boot, accelerated security services and key management. The processors are certified to ISO/SAE 21434 for cyber security and ISO 26262 for Asil-D functional safety.

The S32E processors add smart actuation capabilities, specifically in the form of timers and high-resolution analogue-to-digital converters and 5V analogue and IOs, for EV integration applications with direct-drive motor control.

System support for the processors can accelerate user designs including the co-developed FS86 Asil-D safety system basis chip and PF5030 PMIC with safety features and in-vehicle networking support with Ethernet switches and phys and Can transceivers, along with other analogue companion chips such as the GD3160 IGBT, SiC high-voltage inverter gate driver and MC3377x battery cell controllers.

The first two devices are sampling to lead customers. Silicon evaluation, software development and rapid prototyping can be accelerated using the GreenVIP vehicle integration software with the GreenBox 3 development platform.





Radar sensor

Equipped with the Xensiv 60GHz automotive radar sensor (BGT-60ATR24C) from Infineon, in-cabin monitoring systems can detect micro-movements as well as signs of left-behind infants and animals and sound the alarm.

The chipset also addresses front-end radar for gesture sensing, high-resolution frequency modulated continuous wave (FMCW) radars for distance measurement, short range sensing operations, and hidden sensing applications in the radome.

It enables 4GHz ultra-wide bandwidth FMCW operation in an eWLB package. Configuration of the sensors and data collection are done with a digital interface.

The integrated state machine enables independent data acquisition with power mode optimisation to reduce power consumption.

There are two transmit channels as well as four receive channels and the device provides thermal management.

The sensor also enables functions such as seat belt reminder, and is qualified to AEC-Q100 and 101.

Secure Ethernet switch uses lockstep dual-core redundancy

The latest Marvell Brightlane Ethernet secure managed switch uses lockstep dual-core Arm processing redundancy to improve reliability for mission-critical applications that support vehicle safety and performance.

The switch also includes a suite of security and networking features, along with increased bandwidth and port counts compared with the previous version.

The integrated design incorporates IEEE 802.1AE-2018-compliant mac security protocols and an embedded hardware security module for software authentication and data encryption. It also integrates 10baseT1S capabilities into an automotive Ethernet switch, along with 100/1000-baseT1 phys, 2.5G and 10G serdes and PCIe generation-three ports.

In addition, it supports the latest TSN time-sensitive networking standards to reduce latency and ensure quality of service for essential vehicular connectivity, including the IEEE 802.1CB standard for data redundancy.

The switch meets ISO 26262 Asil-B safety standards and comes in two versions: The 88Q5152-/51 version is a nine-port design, while the 88Q-5192 is a 16-port design.

The switch is sampling with volume production scheduled for later this year.

Lin pre-driver assists mechatronics

A single chip Lin pre-driver from Melexis for up to 2kW enables motor control miniaturisation and silent drive with field-oriented control.

The MLX81346 addresses automotive mechatronic applications including oil pumps, engine cooling fans and BLDC positioning actuators. The device can also be used in robotic systems and e-bikes and e-scooters.

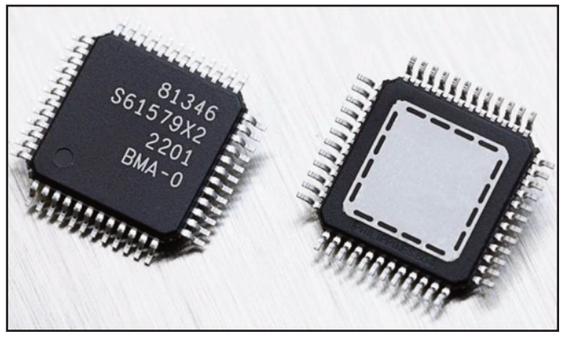
As well as being able to support operation up to 1kW from a 12V supply, it can reach 2kW from a 48V supply. Its high-voltage capabilities come from silicon-on-insulator (SoI) technology.

The device includes a 16bit embedded MCU and 64kbyte flash memory, plus a Lin software stack and Lin interface for connecting to in-vehicle networking infrastructure.

It has 12 GPIOs including three high-voltage IOs, two uarts, SPI and I²C. Rapid end-of-line programming via the Lin pin can be carried out by users with the support of recommended third parties.

It can be supplied in either a 32-pin 5 by 5mm QFN or a 48-pin 7 by 7mm TQFP48 package.

This pre-driver was developed as a SEooC with Asil-B capability. Operational temperature range is -40 to +150°C. Essential circuit protection functions are incorporated.



Driver software eases battery management

An Autosar-compliant complex device driver (CDD) software module from Renesas is for designers of automotive battery management systems (BMS) in electric vehicles.

The software pairs with the company's ISL78714 Li-ion battery management IC to speed design and optimise performance.

The CDD software is designed to work with Renesas' BMS reference design hardware kit, which includes the ISL78714 IC and the RH850/P1M MCU.

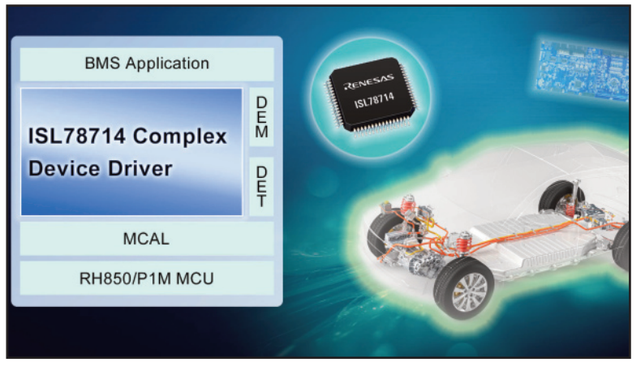
The CDD includes configuration and integration of required microcontroller abstraction layer (MCAL) modules provided for the RH850 MCU. It provides entire low-level software for collecting battery cell voltage and temperature measurements and controlling cell balancing functions of the ISL78714.

Configurable parameters determine the number of cells in the BMS and the desired rate of battery cell data collection.

A simple but full-featured API allows the end-user's application software to receive battery cell measurements in real time.

Software interfaces and protocol management needed to operate the ISL78714 are built into the CDD software and operate on top of existing lower-level SPI, GPIO, and general-purpose timer drivers included in the MCAL modules. The CDD software provides a practical architecture for simplifying software design.

The software follows ISO 26262 Asil-D development processes. The RH850/P1M MCU and MCAL modules also achieve Asil D.





LDO regulators stable at nanoscale

Automotive LDO regulator ICs from Rohm have stable operation at nanoscale output capacitance.

The BD9xxN1 series is optimised for primary direct connection to 12V power supplies in a range of applications, including powertrain, body, adas and car infotainment.

The firm's Nano Cap stable control technology for power supply ICs lets designers develop LDO regulators with stable operation even at nanoscale output capacitances.

This enables the support of an output capacitance of 100nF. Output voltage variation within 100mV condition is 1mA, 50mA/1μs load current variation even when the input voltage and load current fluctuate.

Furthermore, in addition to common μF-order MLCCs and large capacitance electrolytic capacitors, the regulators can handle output capacitances down to 1μF in the 0603/0402 size.

Going forward, the firm is expanding the LDO regulator series with built-in Nano Cap technology to 22 models in different output voltages and packages by the end of this year. Next year, another 24 models will be added to support 500mA output current, for a total of 46 products by the end of 2023.

Nano Cap combines analogue expertise covering circuit design, processes and layout using a vertically integrated production system. Stable control eliminates the problem of unstable operation related to capacitors in analogue circuits.

The LDOs meet the basic requirements of automotive products, such as operation above +125°C, qualification to AEC-Q100 and input voltages greater than 40V for the primary power supply.

Datalogger records multiple signals simultaneously

The X2E Xoraya Z7 automotive datalogger from Saelig can record data from multiple automotive bus systems simultaneously.

All data are logged with a precise, central timestamp with 100ns resolution and either saved on the internal SSD or transferred to an external computer via Ethernet. Optionally, the logged data can be stored on an external storage unit.

Logging is implemented for LS-Can, HS-Can, Can-FD, Flexray, RS232, Lin, Most 25, Most 150, Ethernet, BroadR-Reach (OABR), PSI5 and analogue signals, with additional bus systems in development.

Harman-Becker's GNLog protocol and the DLT protocol can also be recorded via Ethernet, OABR and RS232.

A built-in supercapacitor unit bridges power fluctuations and shuts the datalogger down safely in case of power failures. The operational interfaces are on the front panel including connectors, buttons, SD card slot and LED bus activity indicators.

A four-port Gigabit Ethernet switch is used for configuration and to download the logged traces at speeds of up to 800Mbit/s. The recording interfaces are at the rear.

Each has 20 HS-Can channels upgradable to Can-FD, eight RS232 channels, one dual-Flexray card and four Gigabit Ethernet ports. Three extra slots for plug-in cards allow flexible interface configurations to suit requirements.



An add-on board is available to provide 12 OABR ports.

The unit's modular construction allows the logger to be adapted to varying test conditions and project needs.

It can simultaneously collect signals such as OBD, Can, analogue and GPS. Designed for vehicle test and OEM engineering data acquisition, it captures real-time data from multiple sources including temperatures, RPM, brake and accelerator settings, GPS data, and speed, without requiring extra instrumentation or user interaction for long periods of time.

Measuring 25 by 20.5 by 5.6cm, it works from -40 to +65°C, operating from a 6 to 36V source.

In automatic sleep mode, it can wake up by Can, Flexray, RS232, Lin, Most, PSI5, wakeline or trigger.

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