VEHICLE electronics

The monthly magazine for automotive electronics engineers

# VW and Rivian joint venture to develop EV architecture

Volkswagen has set up a joint venture with Rivian Automotive to create an electrical architecture and software for both companies' electric vehicles, covering all relevant vehicle segments, including subcompact cars.

The JV will be headed by Wassym Bensaid from Rivian and Carsten Helbing from VW. Developers and software engineers from both will join the venture.

Volkswagen plans to invest up to $5.8bn in Rivian and the joint venture by 2027 and take a 50% equity stake.

Teams will be based in Palo Alto, California, and three other sites are in development in North America and Europe.

By combining their expertise, the companies plan to reduce development costs and scale new technologies more quickly. The goal is to offer customers the best technology as early as possible.



From the left, Oliver Blume, Carsten Helbing, Wassym Bensaid and RJ Scaringe

"The partnership with Rivian is the next logical step in our software strategy," said Oliver Blume, CEO of Volkswagen. "With its implementation, we will strengthen our global competitive and technological position."

The JV will aim to use the existing Rivian electrical architecture and software technology stack, enabling the launch of Rivian's R2 in the first half of 2026 and support the expected launch of the first models from Volkswagen as early as 2027.

Rivian CEO RJ Scaringe said: "We're thrilled to see our technology integrated in vehicles outside of Rivian, and we're excited for the future. Rivian will continue to stay focused on creating best-in-class products and services that benefit our customers, helping to drive EV adoption."

The JV will evolve Rivian's modular and flexible electrical architecture, and scale the technology across a wide range of price points and international markets.

Issue 132
December 2024

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# Demo shows how 5G can power C-V2X

The 5G Automotive Association (5GAA) has demonstrated innovations in cellular vehicle-to-everything (C-V2X) to illustrate the potential of 5G for enabling use cases integrated across multiple automakers, service providers and mobile network operators.

The 5G-V2X technology was integrated in Audi and BMW vehicles with the support of 5GAA members Autotalks, Bosch, Commsignia and Fraunhofer Fokus.

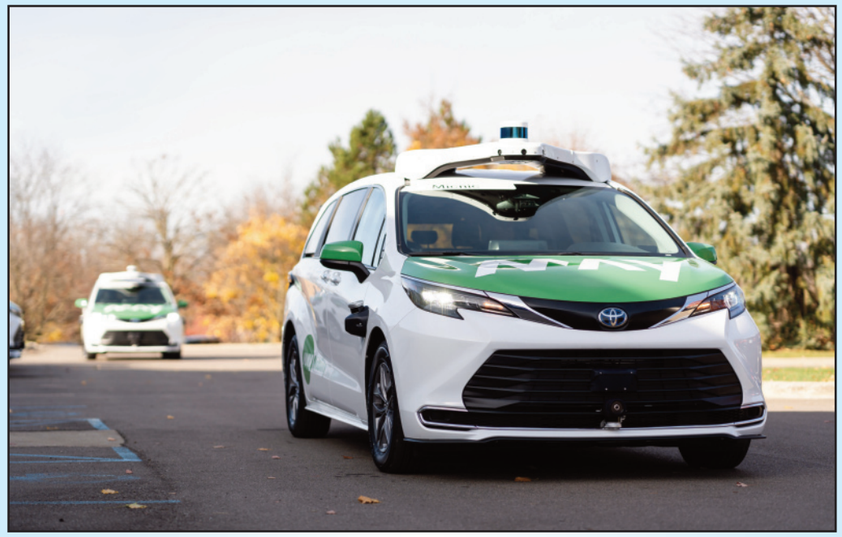
This demonstration illustrated how technology can alert drivers about pedestrians and cyclists even before they can see them, leveraging sensors and a camera feed from other vehicles. The demonstrations showed the high bandwidth and low latency performance characteristics of 5G-V2X Direct using Etsi release-two messages.

Bosch, Commsignia, Deutsche Telekom, Ericsson, Keysight, LG, Mercedes-Benz, Vodafone and the Coalition for Cyclist Safety showed ready-to-deploy, interoperable applications to increase awareness of vulnerable road users and emergency vehicles on public roads in Berlin.

Safety awareness alerts were delivered via 4G and 5G networks with low latency thanks to multi-access-edge computing and precise positioning, as verified by Anritsu's performance measurements.

Autotalks, Bosch and Commsignia demonstrated the benefits of collective perception related to vulnerable road users. Ettifos, Keysight, Rohde & Schwarz and SEA Datentechnik also exhibited 5G-V2X Direct interoperability and conformity options and radio performance verification.

## May goes driverless in Ann Arbor



May Mobility has announced its second driverless operation in the USA, in Ann Arbor, Michigan, following its driver-out operation in Sun City, Arizona, launched less than a year ago.

This is the next step towards expanding autonomous driver-out vehicle services commercially across the USA and Japan alongside partners Toyota, NTT and Lyft.

The driver-out testing in Ann Arbor involves complexity of traffic, weather patterns and pedestrian density, and operates in and around approximately five square kilometres of Ann Arbor streets.

May Mobility showcased its driver-out capabilities with 30-minute autonomous vehicle rides on public roads during its Technology Day in Ann Arbor.

"Starting driver-out operations in our second city in under a year shows the scalability of our technology while expanding our capabilities to challenging weather, higher speeds and busy traffic," said Edwin Olson, CEO of May Mobility.

May Mobility is also working with Peachtree Corners in Georgia to bring driverless operations to the smart city in 2025 and recently announced a partnership with Lyft to transition future deployments to driver-out over time.

# Lola Cars invests in software and data company PaceTeq

Racing car maker Lola Cars has become a major stakeholder in data technology and software company PaceTeq.

The investment sees Lola gain access to knowledge and expertise critical to the brand's ambitions to re-establish itself as a world leader in sustainable engineering and motorsport.

The fields of data technology and software will play a pivotal role not only in Lola's motorsport activities, but also in the company's wider focus areas of electrification, hydrogen, and sustainable fuels and materials.

PaceTeq has a track record of innovation and growth in motorsport, including Formula One, WEC and Formula E, as well as the recently launched A2RL autonomous racing championship.

The backing of Lola should amplify PaceTeq's reputation for motorsport software and data, while exposing the PaceTeq team to technologies at the frontier of mobility and sustainable motorsport.

"I am delighted to confirm Lola's return to motorsport will be supported by one of the world's foremost racing data and software providers," said Till Bechtolsheimer, chair of Lola Cars. "Our investment in Paceteq is an essential element of our strategy, not only to return to the forefront of modern motorsport as a leader in design and engineering, but to take strides in the field of software-enabled vehicles. As we focus on alternative powertrains and sustainable materials, we need machine-learning software and AI-powered data options that are equally forward-looking."



PaceTeq has a reputation for motorsport software and data

He said though PaceTeq had experienced significant growth, it had remained agile and innovative, taking an intelligent approach to solving customer problems.

"Gaining immediate access to its in-house expertise provides Lola with a compelling competitive advantage, without the need to start from square one," he said. "We are excited to see how the company evolves over the coming years and are proud to drive that journey as investors."

Alexander Bodo, CEO of PaceTeq, added: "We are thrilled that Lola Cars has decided to invest in PaceTeq and our shared vision. We very much look forward to supporting Lola's ambition to become a world leader in racing. The brand is a motorsport icon and one of the world's oldest racing car manufacturers. Its return as a herald for more sustainable motorsport is an exciting prospect. We look forward to the technical challenges that this partnership will bring."

## Einfochips signs Infineon software distribution deal

Arrow subsidiary Einfochips has signed a multi-year software distribution agreement with Infineon, which will supply software for Aurix, Traveo and PSoC automotive microcontrollers.

The offering will include Autosar-compliant software and non-Autosar drivers, as well as safety-critical software.

"Einfochips is already an Infineon preferred design house and we are thrilled to further enhance our collaboration," said Murdoch Fitzgerald, vice president at Arrow.

Einfochips will provide software support and maintenance, including cyber security for those purchasing the software.

"With the signing of the agreement, we're taking a step forward in our mission to enhance our software offering for our distribution customers, particularly those we serve through Arrow," said Patrick Will, head of software marketing at Infineon. "By combining our industry-leading, microcontroller software with Einfochips' software integration support, we're empowering our customers to simplify their development processes and accelerate time to market."





# AGL expert group to promote open source for SDVs

Automotive Grade Linux (AGL) has set up a group led by Toyota to help automakers manage open-source activities.

AGL is a collaborative cross-industry effort developing an open-source platform for software-defined vehicles (SDVs). It has created the open-source programme office (OSPO) group to promote the establishment of OSPOs within the automotive industry and encourage the sharing of information and best practices between them.

Open-source software has become more prevalent across the industry as automakers invest more time and resources into software development. Car makers such as Toyota and Subaru are using open-source software for infotainment and instrument cluster applications.

Other open-source applications include R&D, testing, vehicle-to-cloud and fleet management.

"Historically, there has been little code contributed back to the open-source community," said Dan Cauchy, AGL executive director. "Often, this was because the internal procedures or IT infrastructure weren't in place to support open-source contributions. The rise of SDVs has led to a growing trend of automakers not just using, but contributing, to open-source software. Many organisations are also establishing OSPOs to streamline and organise open-source activities."

Toyota, Honda and Volvo have already established OSPOs. The AGL expert group provides a neutral space for them to share pain points and collaborate, exchange information and develop best practices that can help other automakers build their own OSPOs.

"Toyota has been participating in AGL and the broader open-source community for a decade," said Masato Endo from Toyota Motor. "We established an OSPO earlier this year to promote the use of open-source software internally and to help guide how and where we contribute."

The group is led by Toyota with support from Panasonic and Aisin.




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# Subaru picks OnSemi for image capture

OnSemi will be the primary supplier of image sensors for Subaru's EyeSight stereo-camera front sensing system in future vehicle models.

The Hyperlux AR0823AT image sensor will serve as the eyes of the system, tailored to capture critical visual data required to feed into Subaru's stereo-camera enabled artificial intelligence (AI) algorithm that will allow the car to make more accurate driving decisions and improve overall vehicle safety.



OnSemi sensor aids vision for Subaru

"Capturing precise and reliable visual data is paramount to the success of AI-enabled driver assistance systems and significantly improves overall vehicle safety," said Hassane El-Khoury, CEO of OnSemi. "The combination of high-performance imaging and compliance with key safety standards in OnSemi's Hyperlux image sensors will ensure Subaru's next-generation system can interpret the driving environment and make accurate driving decisions."

The AR0823AT has a whole pixel design, capturing clear images regardless of lighting conditions, and includes controls to ensure the two sensors of the EyeSight stereo-camera capture images synchronously.

This is essential for stereo vision that mimics human vision and lets the system discern depth as well as the relative size and distance of objects in the vehicle's path.

Additionally, the sensor's high dynamic range (HDR) allows for brightly lit and shadowed areas of a scene to be captured in detail to ensure the AI-enabled system can make accurate decisions.

"Subaru is committed to achieving the goal of zero fatal road accidents in 2030," said Eiji Shibata, executive officer at Subaru. "We regard OnSemi, a market leader in automotive image sensing technology, as a partner who shares our vision and dedication in pursuing safety, and we look forward to accelerating our collaborative efforts while leveraging our respective strengths."

The sensor also has functional safety features that meet Asil C, to uphold the safety and reliability of the driver assistance system.

These actively monitor the sensor's functionality, and, if an issue is detected that could compromise accuracy, they can enable actions such as resetting the camera or alerting the driver.

# Nexperia partners Kostal on wide bandgap

Nexperia is working with supplier Kostal to produce wide bandgap (WBG) devices that more closely match the needs in automotive.

Nexperia will supply, develop and manufacture WBG power electronics devices which will be designed-in and validated by Kostal.

The collaboration will initially focus on the development of SiC mosfets in topside cooled (TSC) QDPak packaging for onboard chargers (OBCs) in electric vehicles (EVs).

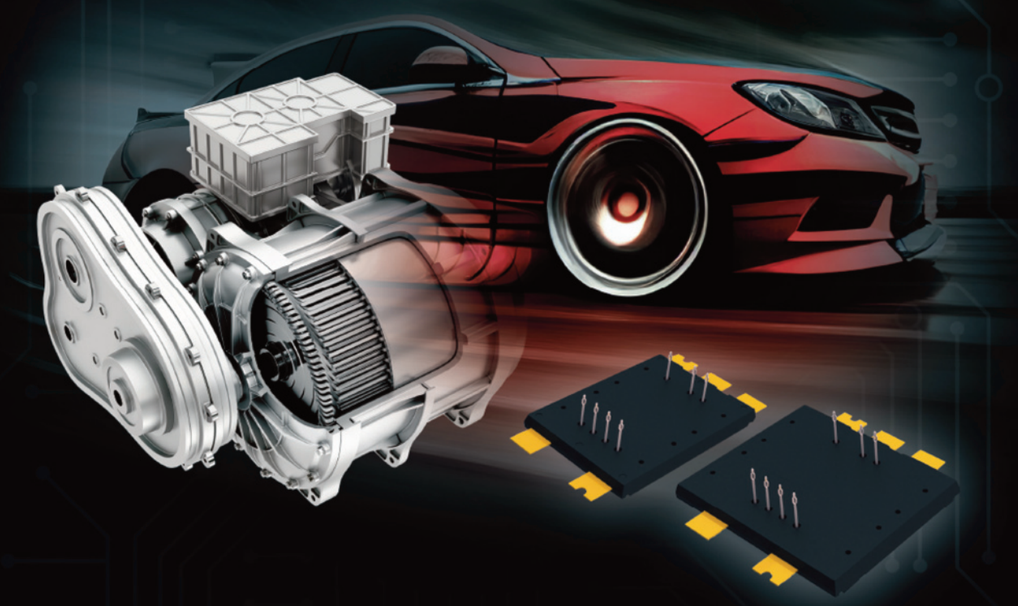
Nearly one in every two cars worldwide is equipped with Kostal's products, including more than 4.5 million OBCs.

"Nexperia has been a trusted supplier of silicon components to Kostal for many years and is delighted to enter this partnership that will now extend to wide bandgap devices," said Katrin Feurle, Nexperia director. "Kostal will assist in validating our devices in its charging applications, thereby providing us with the type of invaluable real-world data that will allow us to further enhance their performance."

Georg Mohr, EVP at Kostal, added: "Kostal is extending its SiC supply portfolio to support our growth path towards 2030 with a special dedication on e-mobility applications for onroad and offroad applications. Kostal will leverage Nexperia's expertise in wide bandgap technology, particularly their SiC mosfets, which we believe are among the best in the market. By sharing our insights from real-world EV charging applications, we aim to contribute to the development of even more optimised and tailored SiC devices."



EcoSiC
ROHM SEMICONDUCTOR



ROHM's TRCDRIVE pack™
for significantly smaller xEV inverters

The improved efficiency of more compact and lighter electric drives plays a crucial role to increase the range and reduce the size of the on-board battery in xEV vehicles. With its new packaging technology and press fit pins ROHM's TRCDRIVE pack™ supports up to 300 kW and features high power density. With their characteristics the SiC modules help to solve the key challenges of traction inverters in terms of miniaturization, higher efficiency and lower system costs.

| Part No. | Absolute Max. Ratings (Tj=25°C) | | | | Heat Sink Assembly | A type Modules |
|---|---|---|---|---|---|---|
| | VDSS [V] | RDS(on) [mΩ] | DC Current [A]*1 | AC Current [A]*2 | | |
| BST500D08P4A104 | 750 | 2.0 | 506 | 417 | TIM: heat dissipation sheet | 41.6 x 52.5 mm |
| BST400D12P4A101 | 1,200 | 2.8 | 394 | 326 | TIM: heat dissipation sheet | 41.6 x 52.5 mm |
| BST740D08P4A154 | 750 | 1.4 | 738 | 634 | TIM: heat dissipation sheet | 58.6 x 52.6 mm |
| BST580D12P4A151 | 1,200 | 1.9 | 575 | 475 | TIM: heat dissipation sheet | 58.6 x 52.6 mm |

*1: Tc=60°C, Vgs=18V *2: Tf=65°C, Voc=800V/500V, fsw=10kHz, Modulation=0.9, Power factor=0.9

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Sensors behind the display capture vital parameters

# Continental to show biometrics sensing display at CES

Continental will present at January's Consumer Electronics Show (CES) in Las Vegas an invisible biometrics sensing display that tracks vital parameters of persons inside the vehicle using a camera and a laser projector behind the dashboard.

The technology has won a CES Innovation Award Honoree and could support a wide range of safety and comfort functions. It detects passengers inside the car through a high-resolution OLED screen and is completely invisible to the naked eye.

Other features include 3D distance mapping to optimise the deployment of airbags and restraint devices and check the correct fastening of seat belts.

Developed with BASF subsidiary Trinamix, a provider of biometric technology, it enables contactless monitoring of vital parameters such as heart rate to identify stressful situations or an impending medical emergency in the driver's seat.

A corresponding safety feature installed in the vehicle can be triggered if needed to protect the occupants as well as other road users.

"Our expertise allows us to seamlessly integrate pioneering technologies into our displays and thus enhance the range of functions offered and create added value," said Pavel Prouza from Continental. "By installing the camera and laser dot projector invisibly behind the display, we will unlock completely new creative possibilities for designers of car interiors and boost acceptance among users."

The display captures data points relevant for interpreting driver monitoring systems.

A 1.5MP near infra-red camera and an eye-safe laser dot projector are embedded behind the high-resolution OLED screen to monitor vital parameters. The underlying biometric imaging technology was developed by Trinamix.

The process captures the reflections of the light points emitted by the laser dot projector in the invisible light spectrum to derive results with the help of algorithms based on artificial intelligence. It also provides other relevant information, including the distance of the driver to the cockpit or the classification of textile materials, which are needed to identify whether the seat belt has been fastened correctly.

"The ability to monitor vital signs and other relevant passenger data without physical interaction and using just a single hardware module is unique on the market," said Wilfried Hermes, director at Trinamix.





# Mipi Alliance releases camera security framework

The Mipi Alliance has released a camera security framework that defines a flexible approach to add end-to-end security to automotive applications that use the CSI-2 camera serial interface.

Because of the safety-critical role of image sensors in adas and autonomous driving, protecting image-sensor data against cyber-security risks is paramount to the security of the overall vehicle.

Image sensor-enabled systems must be secured from cyber-security risks such as installation of illegitimate or substandard image sensor components, malicious manipulation of sensor data, and privacy violations from unauthorised access to images and image-related metadata.

Effective in implementation and operational flexibility, the framework enables authentication of system components, data integrity protection and data encryption.

It provides implementers with a choice of security protocols, cipher suites, data integrity tag modes and security controls, which provide flexibility to balance required security levels against processing efficiency, implementation complexity, thermal regulation and power consumption.

While other embedded interface security methods protect only the link layer, this framework delivers application-level protection from silicon to silicon; the security transcends all link-layer components to provide end-to-end CSI-2 protection from the source of sensor data in sensor silicon to the ultimate sink of those data in SoC silicon.

In this way, end-to-end CSI-2 protection is guaranteed, irrespective of the underlying communication network topology, providing flexibility for developers to leverage any combination of bridges, aggregators, forwarding elements and other underlying network components.

The framework also allows highly granular security control over the different segments of the CSI-2 image frame to enable a sliding scale of security levels.

At the highest security level, full data integrity and encryption are applied to the whole image frame; whereas, at partial integrity levels, integrity protection is applied to a subset of data within an image frame. At the lowest security level, no data integrity is applied to the image data.

# GCF validates Anritsu for LTE and 5G ecall tests

Anritsu has achieved GCF validation for ecall test cases on LTE and 5G on its ME7834NR 5G NR mobile device tester.

The European ecall initiative is designed to provide rapid assistance to motorists involved in accidents. It uses an in-vehicle system equipped with sensors that, when triggered such as by airbag deployment, automatically place an emergency call to the pan-European emergency number 112.

Along with the voice call, essential data such as location, passenger count and vehicle direction are sent.

The conformance tests are defined by 3GPP in TS 34.229-5 for 5G and TS 34.229-1 for LTE, aligned with the core requirements in TS 24.229. These tests have been submitted by Anritsu to 3GPP's radio access network working group and validated by GCF.

The test platform supports 3GPP-based protocol conformance tests and carrier acceptance testing of mobile devices incorporating multiple radio access technologies. It covers 5G NR in both standalone and non-standalone modes, along with LTE, LTE-Advanced, LTE-A Pro, W-CDMA and now NTN.

When paired with Anritsu's MA8171A OTA RF chamber and RF converters, the ME7834NR supports testing in sub-6GHz and mm-wave 5G NR frequency bands.

The Global Certification Forum (GCF) is a non-profit, membership driven organisation offering mobile and IoT certification programmes based on conformity to agreed standards.




Enabling ecall for LTE and 5G

# Autel and Revv provide adas calibration for repair shops

Diagnostic tool maker Autel is working with AI software firm Revv to bring adas identification and a repair and service workflow to mechanical vehicle repair shops.

The partnership aims to address the growing need and opportunity to empower mechanical repairers with the information, technology and equipment to calibrate adas components affected by everyday mechanical vehicle repairs and services.

This collaboration should empower automotive mechanical repair shops by integrating Revv's adas research platform with the Autel Maxisys IA900 wheel alignment and adas calibration equipment.

Shop owners will be able to provide more comprehensive repairs and service to the increasing number of vehicles entering their shops with these safety and convenience systems.

"Autel has a history of discovering revenue opportunities for its users and providing them with options to capitalise on them," said Autel CEO Chloe Hung. "Adas identification and calibrations are essential to the mechanical repair and service space to ensure the safe repair of customer vehicles. By pairing Revv with the IA900, our users can identify and efficiently complete every needed service to ensure the safest repair."



**Autel IA900 all-in-one diagnostic, alignment and adas calibration system**

Integrating Revv's adas research platform with the Autel IA900 all-in-one diagnostic, alignment and adas calibration system lets repair shops offer comprehensive adas diagnostics within standard repair packages, adding value for customers and boosting revenue.

Automated adas research powered by Revv's platform will now sync directly with Autel's vehicle and adas software coverage, guided alignment, and adas calibration instructions, ensuring real-time access to critical calibration data to reduce service time and missteps.

As the automotive industry focuses on ensuring vehicle safety, this collaboration equips shops with the tools and information to perform safe and reliable adas calibrations on every repair.

## Sparq turns vehicles into self-diagnosing AI

Sparq Diagnostics has produced a device that can turn most North American vehicles, model year 2014 and beyond, on the road today into four-wheel AI, allowing drivers to talk directly with their cars to find and solve problems months before they happen.

Appearing at the Los Angeles Auto Show, the device tracks 50,000 vehicle codes and is personalised to every driver based on their behaviour and vehicle.



**Sparq diagnostic device**

The device connects with drivers' iPhones, offering the vehicle's health score and proactively identifying maintenance or service in simple, everyday language.

Selling for $500, it offers the depth and quality of vehicle data comparable with $10,000-plus commercial-grade onboard diagnostics (OBD II) scanners, and sells without the annual or monthly service fees of other consumer OBD II devices that can, over the average length of car ownership, reach more than $1000.

Sparq was giving the device for free to attendees of the LA Auto Show.

"Car design and functionality has advanced dramatically over time, but the way we maintain and service our cars is stuck in the past," said Daniel Nieh, co-founder of Sparq. "There is no need for drivers to spend their time Googling why a check engine light is on, or what it will cost to repair an issue. Sparq allows us to talk with and learn about our cars, so we don't have to rely on translators who profit from telling us what's wrong and how to fix it."

It works by plugging into a car's OBD II port. After downloading the Sparq app for iOS and answering some basic questions, drivers will have on-demand insight into their car's health.





# Rohm and Valeo collaborate on inverter power modules

Valeo and Rohm are collaborating to optimise power modules for electric motor inverters. As a first step, Rohm will provide its TRC Drive Pack two-in-one silicon carbide (SiC) moulded module to Valeo.

Valeo is broadening access to efficient, electrified mobility across various vehicle types and markets from the smallest e-bikes through mainstream passenger cars to e-trucks.

By combining Valeo's expertise in mechatronics, thermal management and software development with Rohm's power modules, Valeo hopes to drive power electronics forward, contributing to the performance, efficiency and decarbonisation of automotive systems worldwide.

Valeo and Rohm have been working together since 2022, initially focusing on technical exchanges aimed at improving the performance and efficiency of the motor inverter, a key component in the propulsion systems of EVs and plug-in hybrids (PHEVs).

By refining power electronics, both companies aim to optimise cost to performance by delivering higher energy efficiency, reducing heat generation thanks to cooling and mechatronic integration, and increasing reliability with SiC.

"We are pleased to support Valeo with our power semiconductors," said Wolfram Harnack, president of Rohm.

These evolutions are essential to supporting the growing demand for longer range, faster charging capabilities and high performance, and an affordable inverter for BEVs and PHEVs.

Valeo will start supplying a first series project in early 2026. Valeo and Rohm will contribute to the improvement of efficiency and downsizing of Valeo's xEV inverters.

Because SiC enables low-loss power conversion under high-voltage conditions, combining Valeo's component technology, casing design and thermal management expertise with Rohm's power module creates a synergistic effect.

Both companies hope to contribute to achieving a decarbonised society by enhancing the performance and efficiency of the motor inverter.



**From the left, Wolfram Harnack with Valeo vice president Christophe Chevalier and director Nicolas Gelez**

## TÜV certifies Perforce version control platform

TÜV SÜD has certified Perforce Software's Helix Core version control platform to ISO 26262.

With this certification, Perforce ensures its platform meets the safety and reliability standards required for developing automotive systems.

The version control platform is used by OEMs and suppliers as well as semiconductor firms, embedded systems developers, and gaming and media studios for limitless scalability, fine-grained security and rapid file access from anywhere in the world.

"Helix Core offers a modern alternative to legacy tools that can no longer meet the demands of today's fast-paced software- and design-driven automotive development," said Brad Hart, Perforce CTO. "For large, cross-functional, globally distributed teams, Helix Core is the only version controller that can deliver the speed, scale and security necessary to manage all digital assets, including binary code and large game engine 3D files."

Half the respondents to a Perforce survey are using game engines outside traditional game development, such as in creating digital twins of vehicles that can enhance vehicle safety from virtual crash tests to using simulated driving scenarios to train adas.

Helix Core is a foundation to leverage this technology, achieving ISO 26262 certification.

# Melexis improves lighting for Geely

Geely is to use Melexis devices and Melibu technology for the daytime running lights (DRLs) and RGB LED taillight with full-colour lighting in its latest Z10 model.

Looking to push the limits of vehicle lighting design, the group selected Melexis' MLX81116 smart RGB LED driver due to its dynamic lighting control and communication interface.

With automotive lighting becoming a key visual distinction in modern vehicle design, Geely was looking for a distinctive DRL and RGB taillight with full-colour lighting arrangement for the first EV to be launched by its Lynk subsidiary brand.

To achieve reliable colour-changing dynamic lighting in safety-critical elements such as the front DRL and full-colour taillight, a multitude of technical requirements had to be met.

As a proven technology, the IC provided a mature option that, when combined with Melexis application support, allowed the automotive manufacturer to implement a standout feature for its inaugural EV.

The MLX81116 offers self-synchronisation and provides a high-speed, robust communication system for applications with numerous LEDs and a high degree of animation, complexity and dynamic range.

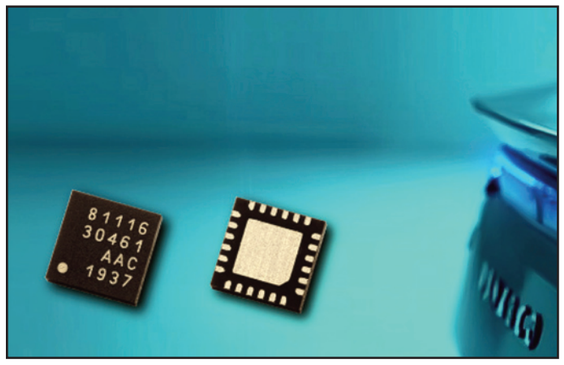
With the inclusion of an integrated MCU, it enables enhanced LED control algorithms, precise colour mixing and thorough diagnostic functionalities.

It achieves a colour mixing accuracy of 1% delta UV, while compensating for temperature fluctuations in red-green and blue LEDs without requiring external components.

The Melibu high-speed communication technology enables the smart animated automotive lighting required by the car maker.

Melibu uses the Can-FD physical layer and uart communication. For Geely, it served as a crucial differentiating factor in Melexis' offering and facilitated a smooth integration with the car's EE architecture.

"This model represents an exciting moment for this automotive brand, not only because it is their first EV but also because of the bold lighting design choices," said Linhong Song, regional marketing manager at Melexis. "The key for automotive OEMs is to discover innovative approaches for their cars to connect with their audience, and that is exactly what they have accomplished with the dynamic DRLs and RGB taillight, supported by Melibu."



Melexis devices boost lighting in Z10 model

# Dacia picks Here to navigate Duster SUV

Renault brand Dacia has selected Here Navigation to power its Duster sport utility vehicle (SUV) and New Spring, electric car.

Here Navigation is a cloud-based application for connected vehicles. With it, Duster and New Spring drivers will benefit from automotive-grade maps, online and offline search, real-time traffic information, and turn-by-turn voice guidance in an easy-to-use interface.

The application's over-the-air update capabilities deliver drivers the freshest map content and latest service updates.

With its simple interface, clear design and connectivity, it delivers the ease-of-use of smartphone applications while providing a seamless experience through its integration into the car's digital cockpit. It is optimised to meet a vast array of hardware needs and enables a comparatively low data footprint with its option to cache maps.

"Thanks to Here Navigation, Dacia customers benefit from online navigation with an always up-to-date map and traffic information," said Damien Laplane from Dacia.

Gino Ferru, senior vice president at Here, added: "We are proud that the Renault Group has chosen Here Navigation for its Dacia all-new Duster flagship model and New Spring electric car, so that drivers will get to enjoy an all-inclusive navigation experience that stays up to date."






AV Elevate provides user-friendly way to set up and execute test scenarios

# RFPro simulator elevates route to autonomous cars

A simulator from RFPro aims to accelerate development of autonomous vehicles by enabling the tuning of sensors, the training of perception and control algorithms, and the testing of the full AV technology stack.

Called AV Elevate, it provides closed-loop perception testing and the creation of engineering-grade synthetic training data.

"For the first time, AV developers can confidently reduce their reliance on real-world testing, instead subjecting systems to AV Elevate's highly-accurate synthetic data," said Matt Daley, technical director at RFPro. "Now, testing and development can be massively and cost-effectively scaled like never before, removing the biggest barrier to the advancement of AVs."

To create AV Elevate, RFPro integrated several technologies to its existing platform including lidar, radar and camera models, a simulation manager to define the full vehicle sensor suite and create base test scenarios with thousands of iterations, and compatibility with high performance computing (HPC) in the cloud to conduct and scale the testing rapidly.

It integrates high-fidelity sensor models for all major AV sensor types and enables installation choices and configurations to be tuned and optimised. The platform's synchronous architecture allows for hundreds of sensors to be tested, enabling sensor fusion testing to a level of accuracy not previously possible.

Included within the simulation is a library of standard sensor models alongside digital twins of commercially available sensors. This allows development to progress before a physical sensor exists or enables OEMs to benchmark technologies against their competition.

Typically, AV developers manually annotate each frame of video, lidar point or radar return to identify objects to create training data. This approach generally takes 20 minutes per frame and has a 10% error rate. AV Elevate automates this using engineering-grade synthetic training data, meaning it is 100 times faster and 150 times more cost-effective than manual annotation, and is error-free.

The simulation manager provides a user-friendly way to set up and execute test scenarios simply and automatically. This allows large-scale simulations with multiple sensor systems to be created with ease.

Due to its synchronous architecture, the time to complete tests is directly linked to the available computing power. As the platform is cloud and HPC compatible, it lets users scale testing flexibly and rapidly without significant investment in internal computing.

At the core of AV Elevate is RFPro's physically modelled virtual environments and ray tracing rendering technology. Its library of more than 180 real-world digital twins provides an accurate and diverse virtual proving ground with every element in the scene physically modelled with realistic material characteristics and a road surface accurate to 1mm.

Its ray tracing rendering replicates the nuances of how a sensor system perceives the world. The multi-path technique simulates the many light and electromagnetic sources and reflections that happen around a sensor. It generates high-fidelity data for sensors and includes phenomena such as motion blur and rolling shutter effects.

electronica 2024

# SHOW TIME

Steve Rogerson reports from last month's Electronica in Munich, Germany

# Renesas goes to 3nm for multi-domain SoCs

Renesas launched automotive fusion systems-on-chip (SoCs) serving multiple automotive domains including adas, in-vehicle infotainment (IVI) and gateway applications on one chip.

Built using 3nm process technology, the R-Car X5H SoC, which is the first device in the X5 series, helps OEMs and tier-one suppliers shift to centralised ECUs for streamlined development and future-proof systems.

Offering integrated, secure processing for multiple automotive domains, thanks to its hardware-based isolation technology, it provides the option to expand AI and graphics processing performance using chiplet technology.

It directly addresses the growing complexity of software-defined vehicle (SDV) development by optimising compute performance, power consumption, cost, hardware and software integration, while ensuring vehicle safety.

"We see a rapid evolution of vehicle architecture to central compute with domains," said Vivek Bhan, senior vice president at Renesas. "We see that as part of the move to SDVs."

By coupling application processing, real-time processing, GPU and AI compute, large display capabilities, and sensor connectivity on one chip, these devices can enable automated driving, IVI and gateway applications.



Vivek Bhan: "It is an open platform."

The SoC enables AI acceleration of up to 400Tops and GPU processing of up to 4TFlops. It incorporates 32 Arm Cortex-A720AE CPU cores for application processing, delivering over 1000k DMips; and six Arm Cortex-R52 dual lockstep CPU cores delivering over 60k DMips with support for Asil-D capabilities without external MCUs.

Made using TSMC's process nodes, the SoC series achieves top-end CPU performance and a 30 to 35 per cent reduction in power consumption compared with devices designed for a 5nm process node.

"The 3nm technology gives us best-in-class power efficiency," said Bhan.

This eliminates the need for additional cooling while extending vehicle driving range.

While the SoCs come with native NPU and GPU processing engines, Renesas is offering the ability for users to scale up their performance through chiplet extensions.

When combining a 400Tops on-chip NPU with an external NPU via a chiplet extension; for example, it is possible to scale AI processing performance by three to four times or more.

For seamless chiplet integration, there is the standard UCIe die-to-die interconnect and APIs, facilitating interoperability with other components in a multi-die system, even if they are non-Renesas chips.

"It is an open platform where different OEMs and tier-one suppliers can mix and match to meet their needs," said Bhan.

Hardware-based freedom-from-interference technology securely isolates safety-critical functions, such as brake-by-wire, from non-critical functions. Functions deemed safety critical can be assigned their own separate, redundant domains, each having its own independent CPU core, memory and interfaces, thus preventing potentially catastrophic vehicle failures in the event of a hardware or software fault from a different domain.

Quality of service management determines workload priorities and assigns processing resources in real time.

"Our customers are looking for end-to-end automotive-grade systems that cover everything from hardware optimisation, safety compliance to flexible and scalable architecture selection and seamless tools and software integration," said Bhan. "Our R-Car gen-five family meets these demands and we are committed to helping the industry accelerate SDV development and shift-left innovations for the next era of automotive technology."

The range supports the processing requirements from zonal ECUs to high-end central compute, serving from entry-level vehicles to luxury-class models.

Thanks to a unified hardware architecture based on Arm CPU cores, developers can reuse the same software and tools and applications from Renesas' 64bit SoCs and future products including crossover 32bit MCUs and automotive 32bit MCUs.

Renesas is extending its vehicle control portfolio with an MCU also powered by Arm.

It plans to sample the 32bit unit with enhanced security for body and chassis applications early next year.



Renesas stand at Electronica

The R-Car Rox open-access SDV platform integrates all essential hardware, operating systems, software and tools needed to develop vehicles with secure and continuous software updates. Rox provides OEMs and tier-one suppliers the flexibility to design a broad range of scalable compute options virtually for adas, IVI, gateway and cross-domain fusion systems as well as body control, domain and zone control systems.

The R-Car X5H will be sampling to select automotive users in the first half of next year, with production scheduled for later in 2027.

# LEM protects EV users from electric shock

As EVs become providers of electricity, they are having to adopt the same safety standards associated with the electricity supply in homes and offices, including residual current devices that can cut off power if there is a problem.

As such, LEM has developed an Asil-B automotive grade residual current monitoring (RCM) type B sensor for bi-directional on-board chargers (OBCs). The CDT sensor ensures performance and safety compliance with ISO 5474 part two for AC power transfer.

In recent years there has been significant growth in the use of bi-directional OBCs because they allow the use of the battery pack in the car to feed another vehicle, an electrical appliance or even a house.

However, because they are bi-directional, the OBCs present safety problems. Designers have to consider high-voltage safety, specifically leakage monitoring and compensation, while also looking to reduce weight, improve efficiency and cut costs.

"When the car becomes the energy supply, you have to make sure there is no leakage that can damage the user," said Clément Amilien, LEM's global product manager.



Clément Amilien: "It is a very sensitive topic."

LEM's answer is the CDT RCM type B automotive sensor that complies with all the relevant safety standards.

The sensor takes away the worries of designing in constrained automotive environments while speeding up architecture by being ISO 26262 Asil-B ready. More importantly, the RCM type B sensor helps designers react quickly to the ISO 5474 part-two standard for AC power transfer.

The standard focuses on electrically propelled road vehicles and outlines the functional and safety requirements for power transfer between the vehicle and an external electric circuit using AC.

The sensor detects differences in current between two points, identifying such faults as short circuits and enabling rapid isolation of faulty sections to prevent damage. It has been designed to represent a match for RCM type B for bi-directional OBCs, where residual currents are detected and monitored, including AC and DC leakage currents.

"It measures both AC and DC leakage," said Amilien. "We also prevent DC leakage going to the AC grid and into any load that will be plugged into the vehicle."

This type of RCM is for complex electrical systems, especially those found in EVs with DC components, and can detect potentially hazardous leakage currents. With a bi-directional OBC, if the DC fault current is greater than 6mA, there is the potential to compromise the detection and tripping capabilities of a type A RCD, which could increase the risk of electric shock.

Only a type B RCM can measure and detect AC and smooth DC. The CDT sensor has been designed to meet this demand with accuracy of ±0.5mA at 5mA using fluxgate technology.

Fluxgate is where precise magnetic field measurements are required, with fluxgate sensors sensitive and capable of detecting very small magnetic fields. They also offer accurate measurements of DC and low-frequency AC magnetic fields and ensure stable measurements over a range of temperatures and environmental conditions.

Functions on the secured SPI bus include dynamic fault selection, temperature monitoring, leakage value and supply monitoring; a secured bus ensures encrypted and authenticated data transmission between devices.

Additional features include diagnostic functions and the ability to work equally effectively with single- and three-phase supplies.

"Mass production starts early next year and we have samples now," said Amilien. "It will be bought by people who make OBCs. We are talking directly to the OEMs as well as they need to make sure no users of their cars will get electrified. It is a very sensitive topic."

## Was this the coolest display?



**Sven Möser, sales manager at Delta Electronics, demonstrated how to keep modern vehicles cool. Pictured at the show with a demonstration of the different technologies Delta has for cooling vehicle electronic systems, he said there was a lot of focus on autonomous driving.**

**"There are a lot of systems with big computer units," he said. "These take a lot of power and need to be cooled. This can be active cooling such as fans or passive cooling like heat plates."**

**Modern vehicles also have large displays, sometimes pillar to pillar, which need cooling, as do the batteries. And, as Möser pointed out, it is not just the electronics that get too hot, but the occupants too.**

**"Air can come out of the seat and cool down the driver," he said.**

## Crunching the numbers at Electronica

The eighteen halls of Electronica housed 3480 exhibitors showing their wares to about 80,000 visitors to celebrate the show's 60th anniversary.

"For 60 years, Electronica has been the central meeting place for the global electronics industry," said Reinhard Pfeiffer, CEO of show organiser Messe München. "In the halls, visitors were able to see first hand how future technologies are already taking shape – from intelligent energy to smart mobility – and the vital role the electronics industry plays in making this happen."

The exhibitors travelled from 59 countries and regions, with 76 per cent of them from abroad. The visitors came from around 100 countries and regions.

The share of international visitors totalled 54 per cent. After Germany, the top ten visitor countries were Italy, China, France, Austria, UK, Switzerland, USA, Spain, Netherlands and Poland.

Electronica will be back in November 2026.

# Siemens turns to AI for electronics design software

Siemens announced the latest advancement in its electronic systems design portfolio.

The release takes an integrated and multidisciplinary approach, bringing together Xpedition, Hyperlynx and Pads Professional software into a unified user experience that delivers cloud connectivity and AI capabilities to push boundaries of innovation in electronic systems design.

"Twice a year, we release updates but major ones such as this come every ten years," said Ed Goldman, senior director at Siemens. "This was four years in the making and has gone through beta testing."

The problems of engineering talent shortages, supply chain uncertainties and the increasing complexity of designs in the electronic systems design industry have impacted engineers and the development ecosystem, hindering their ability to meet the demands of modern electronics development.

"There are not enough engineers coming into the work pool," said Goldman. "There are not enough engineers studying at university. There is a lot of competition for talent."

Siemens aims to address these head-on by delivering an intuitive, AI-enhanced, cloud-connected, integrated and secure product.

"AI is in the beginning," said Goldman. "AI is going to be part of our lives. It needs to be there to close the gap between the engineering teams and the demands on the teams."




Ed Goldman: "Security is a big challenge."

Focused on providing intuitive tools to overcome talent shortages and enable engineers to adapt quickly with short learning curves, the toolset adds predictive engineering and support assistance using AI.

"Everything is a software-developed product," said Goldman. "Everything has software in it, so everything needs silicon and PCBs, and that is putting a lot of pressure on engineers. This will boost productivity with a modern experience. People want the most capable tool but they want it easy to use."

Cloud connectivity will facilitate collaboration across the value chain and provide access to services and resources, helping engineers rapidly adapt to changing requirements, supply chain insights and easier collaboration with stakeholders, regardless of location.

This should facilitate the seamless flow of data and information throughout the product lifecycle using digital threads.

The software also brings enhanced integration with Teamcenter software for product lifecycle management and NX for product engineering, allowing for multi-BoM support and tighter collaboration between e-cad and m-cad domains.

"You have electrical, mechanical and thermal challenges just in the power modules in a car," said Goldman. "This requires integration."

To prioritise security, it offers rigid data access restrictions that can be configured and geo-located, while adhering to industry protocols.

"Security is a big challenge," said Goldman. "Engineers might have different access control depending on which countries they are in."

Siemens maintains partnerships with cloud providers to ensure security measures. It also includes design and verification requirements management for model-based systems engineering support.

The electronic design system, including Xpedition and HyperLynx NG software are available, and Pads Pro NG will be available in the second quarter of 2025.







Lars Klapproth: "We can be more flexible."

# Heilind predicts future of farming

In a few years, a farmer will be able to see something remotely happening in a field and send a tractor or other agricultural vehicle to fix it without a human being involved.

That is the view of Lars Klapproth, a territory manager for Heilind Electronics in Europe.

"Today, we are developing stuff for this market," he said. "We can help with farming for the future."

The company has a good customer base in automotive but Klapproth said the main focus was on agricultural vehicles and transportation, including railways.

"There are clear trends in terms of connectivity for electrification and harnesses," he said. "New ECUs have been developed for every big agricultural vehicle. These are going to drive autonomy, so we also need sensors and camera systems."

He said because this industry didn't move as fast as automotive, it gave him more time to influence the design for future agricultural vehicles.

Heilind is a privately owned distributor, which Klapproth believes gives it an advantage.

"There are no investors that put pressure on us," he said. "We can be more flexible."

Though the company is fifty years old, it is relatively young on the global market.

"We built up something from scratch," he said. "We invest in buildings and we invest in people."

# TI MCUs provide integrity to Asil D

Texas Instruments unveiled 64bit MCUs that will more than double the real-time control performance of existing products and have an integrity level up to Asil D.

The F29H85x series is built on TI's 64bit C29 digital signal processor core and offers an architecture with integrated safety and security.

Featuring diagnostics and error-checking mechanisms, the F29H85x series was engineered for compliance with ISO 26262 and IEC 61508 automotive and industrial safety standards.

These MCUs also provide cyber security, with a fully isolated hardware security module that protects systems from unauthorised access and cyber threats.

"Our focus area is the powertrain," said Na Kong, TI's product line manager for automotive. "There is a trend for more integration in the powertrain. That is why we designed this platform."

Additionally, TI provides runtime safety and security without a performance penalty using a context-aware memory protection unit for hardware isolation of CPU tasks, with freedom from interference and self-test processes.

"Our customers are looking for higher efficiency and lower costs," said Kong. "We can put core control functions into one device."

The F29H859TU-Q1 automotive C2000 64bit MCU has C29x 200MHz tri-core, lockstep, functional safety compliance.

Kong said pre-production samples were already available and that production would start in the third quarter of next year.



Na Kong: "We put more control in one device."

# STM unjumbles move to zonal architecture



Julia Riedel with the skeleton car

ST Microelectronics had a skeleton Audi Q6 E-Tron car to show the jumble of wires in a typical vehicle with a zonal architecture.

It may look complex with more than 1500 cables measuring 3.6km and weighing nearly 59kg, but in the past, those figures were even higher!

"This is the state of the art now," said Julia Riedel, marketing communications manager in STM's automotive group. "Most people don't think of that when they get in the car. The car makers want to move to a zonal architecture."

Zonal car architectures represent an innovative approach to vehicle design, organising electrical and electronic components into distinct zones. Each zone is responsible for managing specific functions and communicates with other zones through a central network.

The vehicle is divided into several zones, typically based on physical location and function.

A high-speed central network, often based on Ethernet, connects all zones. Each zone is equipped with a zonal controller, a specialised MCU that manages the functions within its zone. This approach enables new services to be offered to the user and facilitates the development of the software-defined vehicle (SDV).

"It makes the car more efficient, it reduces the amount of cable, and it makes it lighter," said Riedel. "And it helps the car maker offer new business models such as video conferencing or subscription services like people are familiar with on their smartphones."

Intelligent fuses are part of the underlying technology for a zonal architecture. These enable precise fault detection and resolution by quickly identifying electrical faults such as short circuits or overloads and immediately shutting down the affected circuits.

This not only protects vehicle components from damage but also increases the safety of the occupants. Additionally, they allow for quick fault diagnosis, facilitating maintenance and increasing operational safety.

"The devices have to be fast so if there is a failure it doesn't affect the voltage on the rest of the vehicle," said Luigi Guarrasi, senior advisor at STM.

Another demo explained the diagnostics capability known as electrochemical impedance spectroscopy (EIS), which provides insights into battery health, state of charge and state of health.

The full BMS building blocks, built with STM's L9965 chipset family, were demonstrated. Additionally, the demo incorporated an on-board charger (OBC), which also acts as a source of excitation for EIS, and a battery module with STM's L9965A cell monitoring and balancing IC integrated into a flexible cell contact system.

"This is not yet in a vehicle," said Kaushik Salver, STM technical marketing engineer. "We are doing the certification phase so customers can start using EIS for measurements to a certain level. It may be in a vehicle by the next Electronica."

The EIS diagnostic capability provides accurate state estimation, including precise measurements of battery pack inner temperature, state of charge and state of health.

This method offers a non-destructive way to characterise batteries, ensuring they remain intact and undamaged during diagnostics.

Furthermore, the EIS capability is suitable for real-time, online operability, and critical measurements in dynamic environments.





# NXP adopts UWB for battery management

NXP unveiled an ultra-wideband (UWB) wireless battery management system (BMS) that it says simplifies EV assembly, enables increased battery energy density, and decouples mechanical and electrical development.

UWB provides higher resistance to reflections and frequency selective fading within the battery pack than existing narrow-band technologies for more robust and reliable data transfer.

"We had UWB technology already," said NXP vice president Naomi Smit. "We had to make some adjustments, but it is a proven technology that is nice to be able to rely on."

The product is part of NXP's FlexCom chipset that supports wired and wireless BMS configurations using common software architecture and safety libraries.

Wireless communication within battery packs enables robust and reliable transfer of battery cell information such as voltage and temperature measurements from one module to the battery management unit without the need for wiring. It helps ensure performance and prevent conditions that lead to premature failure or safety hazards.

UWB wireless BMS technology decouples mechanical and electrical development, offering EV manufacturers increased flexibility, faster time to market and reduced development costs, while maintaining scalability of the system across different platforms.

Leveraging wireless reduces the use of complex wiring harnesses in the battery pack, and the need for error-prone manual effort during production, which makes the assembly of EVs more efficient and cheaper. The elimination of connectors and wiring between battery cells allows for increased energy density, which is a key parameter in EV design and performance to enable longer range.

"Our wireless battery management system is the industry's first to include UWB technology, offering EV manufacturers the most advanced technology to power tomorrow's electric vehicles," said Smit.

Realising wireless technology within the reflective enclosure of a battery pack can be difficult. UWB uses high bandwidth pulses instead of a modulated carrier frequency (sinusoidal signal) as used in 2.4GHz narrowband, such as Bluetooth Low Energy based technologies. This provides higher resistance to reflections and frequency selective fading for more robust and reliable data transfer.

"With UWB, you can use reflections to strengthen the signal," said Smit. "With narrowband, they will disrupt the signal."

NXP's UWB wireless battery management system will be available for OEMs to start evaluation and development in spring 2025.

"We have several proofs of concept running with customers, but we are still finalising the software, which is why it will be available Q2 2025," said Smit.

It is part of NXP's FlexCom chipset, which supports wired and wireless technologies, providing OEMs and tier-one suppliers with flexibility in vehicle architecture and technology choices. Its common software architecture and safety libraries for both BMS configurations allow reuse of software across platforms, reducing development efforts.

The FlexCom BMS chipset also includes the recently announced MC-33777 battery junction box (BJB) IC, serving high-voltage systems with accurate voltage, chassis isolation and current measurements. The BJB is part of a turnkey BMS and can be used with wired and wireless battery management.




Naomi Smit: "It is a proven technology."

# Allegro sensors control EV torque

Allegro Microsystems introduced inductive position sensors and a series of micropower magnetic switches and latches.

These sensing products can lower costs, extend battery life and offer reliable performance across automotive, industrial and consumer applications.

The APS11753 and APS12753 switches and latches are for medical, consumer and industrial markets, whereas the A17802 and A17803 inductive contactless angle and motor position sensors enable dynamic speed and torque control for smoother motion, reduced vibration and energy savings.

"We are excited to announce our latest inductive position sensors as we continue to drive innovation in sensing technology," said Ram Sathappan, senior director at Allegro Microsystems. "Our inductive sensors deliver high accuracy, advanced diagnostics and connectivity options essential for safety-critical traction motors in electric vehicles, while the magnetic switches and latches enable designers to achieve reliable and energy-efficient position sensing in a variety of applications."

The sensors maintain consistent performance and stability in extreme temperatures, ensuring reliability in harsh conditions.

Integrated digital compensation and programmable linearity enhances accuracy and resolution while offering design flexibility.

Earlier this year, Allegro introduced the ACS37030 and ACS-37032 high bandwidth current sensors for rapid response and minimal power loss in high-power density SiC and GaN systems. These are widely used in electric vehicles, clean energy equipment and data centres.

Allegro also introduced ACS37220 and ACS-37041 shunt replacement current sensors that reduce energy loss and component count.

## How EVs benefit from mram



Senior director Peter Schubert (left) and CEO Sanjeev Aggarwal from Everspin Technologies attended Electronica to explain how their magneto-resistive ram (mram) technology can benefit the automotive industry.

Founded in 2008 as a spin off after NXP acquired Freescale, the company now has $65m revenue and around 100 employees. It is based in Arizona, and has more than 2000 customers and 650 patents.

"The technology is interesting for various markets, including automotive," said Schubert.

It can be found in the high-end EV segment in the engine controls on each wheel, and in the powertrain. And it is used by more than one Formula One team, though Schubert wouldn't say which.

Aggarwal said it was the only memory technology fast enough to monitor battery functions when the accelerator was pressed.








Will Donnelly: "We deliver premium audio."

# Jaguar roars with ADI sound quality

Analog Devices (ADI) had a Jaguar Land Rover vehicle on its stand to demonstrate the in-cabin audio features that its technologies were enabling.

"We use the ADI technology to deliver premium audio," said Will Donnelly, audio lead at JLR.

The car had 29 internal speakers plus one external to alert pedestrians of an approaching hybrid electric vehicle.

"We can tag the external speaker onto any car that needs it," said Donnelly.

The car uses ABI's A²B (automotive audio bus) technology to daisy-chain speakers and microphones together rather than using a star architecture that would involve individual cables for each microphone.

The microphones can be powered by the A²B so there is no need to add power cables. A²B devices can supply 50W of power.

The vehicle uses road-noise cancellation, which requires low latency and a deterministic data flow to support the audio algorithms running in the DSP core. A²B supports active road noise cancellation algorithms, which means the noise reduction can be tailored to the road conditions as the occupants are driving.

Also on display was the latest in wide-screen displays for either rear-seat entertainment or as a pillar-to-pillar front display capable of 8k by 2k pixel high resolution over a single GMSL (gigabit multimedia serial link).

"When it comes to carrying data from cameras to displays, we are the market leader," said Rajiv Somisetty, marketing director at ADI.

It can have a GMSL-connected occupant monitoring system using a high-resolution 12MP camera.

"This is not in vehicles yet but we are talking with OEMs for the next-generation systems," said Somisetty.




Rajiv Somisetty: "We are talking with OEMs."

# Murata white paper targets engineers

Murata is hoping an electrification white paper it is due to release will raise its profile among engineers in the automotive sector.

The white paper will look at how to power tomorrow's sustainability with today's technology.

"We want to gain momentum to get engineers to look at us and get the earlier samples," said Christian Felsensteiner, application marketing engineer. "We are looking at engineers in the tier-one suppliers and at new companies and start-ups, and also at the OEMs. The diversity of customers is getting wider so we have to sell to a wider audience. The ecosystem is getting more diverse."

He said more OEMs were doing the design work themselves.

"They are taking the initiative," he said. "We see a lot of OEMs moving to in-house design."

He also said the increasing use of mobility was stretching into the likes of e-helicopters and delivery robots, and it was important for Murata to address those markets.

"That is for the future," he said. "The business we are dealing with now is automotive."

He said at the PCIM show in Nuremberg in June, the company recognised that this type of face-to-face event was important for talking with engineers.

"We saw a clear interest for all sectors, and they wanted to interview us about our products," he said. "The white paper aims to increase this audience. We can't have a conversation with 1000 engineers at an OEM at one time, so this will give us easier access to them. Our products are highlighted in the white paper and we want them to be designed into products that are under development."




**Christian Felsensteiner: "The ecosystem is getting more diverse."**

# Toshiba aims for sustainable future

Toshiba showcased the synergies of its semiconductor, battery, data storage and ceramic substrate products.

Either as individual components or working together as part of a system, they can improve the performance and sustainability of designs across multiple sectors.

This year's focus was on e-mobility, energy, infrastructure and industrial applications, which form the backbone of a future all-electric society.

Toshiba's power semiconductors, materials and battery products are designed to offer flexibility and efficiency in e-mobility. The company's semiconductors reduce energy loss, while high-power SCiB batteries power transportation, such as trucks, buses and trains.

In addition, its ceramic substrates insulate heat dissipation for power control units in electric and hybrid cars.

SiC products are integral to e-mobility traction systems in cars and high robustness applications such as trains and buses. Their power density, temperature resilience and energy efficiency make them suitable.

A highlight was the integrated Smart MCD motor control driver IC with a built-in microcontroller and gate driver. The first product in the series is for sensorless control of three-phase brushless DC (BLDC) motors in automotive applications, including water and oil pumps, fans, and blowers





# PI welcomes smaller battery packs

Power Integrations believes the low profiles of its Innoswitch SiC devices makes them suitable for battery pack applications in automotive.

"The driver in automotive is always smaller and increased density," said Peter Vaughan, director of automotive business development at PI. "They want to minimise the height of the battery pack, so they are looking for low-profile devices. They want to cram as much electronics as they can into smaller spaces."

He said PI's devices fitted the bill as did not become the limiting factor in terms of profile.

"They are also looking to improve the efficiency of the vehicle when it is charging," said Vaughan. "We can help them save on the charging losses."

The firm's 1.7kV SiC flyback switchers also have a safety role to play.

"If you are driving down the road and a lead comes off the battery, you need to bring the vehicle to a safe stop," said Doug Bailey, VP of marketing. "It monitors the control system for failures."



**Doug Bailey**



**Peter Vaughan**

Bailey said though PI's automotive business was small, it was the fastest growing as the EV market blossomed.

"We have been in automotive for four years," he said. "For revenue, it is relatively small, but from an activity point of view it is big. It takes a few years for the automotive guys to get from prototype to production."



TEST & MEASUREMENT

# TYRE PRESSURE

Complex paper-based systems used by car dealerships lead to mistakes, but an AI-supported app can collect and process tyre data precisely and in seconds



Vehicle Electronics December 2024, 28

Hand scanners, callipers and even the naked eye are still the main tools many car dealerships and fleet managers use to assess the quality of tyres. But these approaches take too much time and create a greater risk for errors in measurement and transmission.

These data points are often written down by hand before being entered manually into a digital ERP system, all making room for more mistakes to creep in.

To reduce the workload and ease the time pressure on staff, the Karl + Co car dealership in Mainz, Germany, has been using the TireScanMobile app from GL Technology for a year now. With the help of the menu-guided application and AI-based object recognition, it records the tyre model quickly and accurately and automatically stores all relevant information digitally.

BMW dealer Karl + Co consists of three car dealerships in Mainz, Rüsselsheim and Wiesbaden and is part of the owner-managed Enders car dealership group. With over 900 employees, the group comprises 21 dealerships in 16 cities and sells brands such as Mini, Renault, Dacia, Kia, Opel, Mazda and Ferrari in addition to BMW. It also sells used vehicles while offering services.

The extended condition documentation from using the app can also be used to document other important details, such as existing tyre or rim damage. In addition, automated licence plate and vehicle identification number recognition is available to the user for simplified recording of vehicle data.

The data from the app, which is already available as a stand-alone version, are then processed further by one of GL Technology's profile measurement offerings. Karl + Co also uses the StackedTireProfiler from the same developer with the mobile app to measure the tread of the entire stack of tyres in just a few seconds.

"Until now, we had been collecting tyre data manually using a hand scanner," said Klaus Kleinfeller, service manager at Karl + Co. "But the data collection and assessment of the current condition easily took three to four minutes per tyre."



Tyre filters scan the tyre to be inspected and AI does the rest

Like many car dealerships and tyre dealers, Karl + Co was previously concerned that newer technologies that could partially automate this process would require lengthy employee training due to their complexity and therefore be more of a hassle. Last year, however, the Mainz-based BMW dealer decided no longer to accept the relatively high risk of measurement inaccuracies and transmission errors that the manual procedure inevitably entails. After all, the resulting extra work puts a strain on the entire company as well as the individual employees.

## Independently

"At the time, we were looking for innovations that could help us improve our internal workflow," said Kleinfeller. "Since we were already using tread measurement from GL Technology, we decided to also use the TireScanMobile app as an extension and to make our daily work even easier."

Just a few days passed between ordering and setting up the technology.

"Our staff got comfortable with the app after very little training thanks to its user-friendly functions," Kleinfeller added.

GL Technology is a relatively new company, only founded in 2022 as a subsidiary of GL Messtechnik. Based ion Hargesheim, it has12 employees. Its customers decide whether the app is installed on existing devices or supplied with suitable








The TireScanMobile app is compatible with the StackedTireProfiler

mobile equipment. Tyre recognition is conducted mostly automatically via the app, which reduces the staff's workload.

"The tyre fitters simply take a photo of the tyre to be inspected using the mobile device, and the app does the rest," said Steffen Klein, managing director of GL Technology.

Using AI-based object recognition, the system independently determines all relevant tyre information such as the manufacturer, model, tyre dimension and other important information such as an existing OEM code or any run-flat properties of the tyre. All data and photos are then digitally saved as an overview report, entirely without paperwork.

"The recorded measurement sizes are then seamlessly transferred via wifi into our document management system," said Kleinfeller.

The app also has a QR code scanner that can record all order and vehicle data at once so they never again have to be entered manually.

"Our TireScanMobile app is also able to run completely independent of all tread measurement tools and be able to transfer data directly to our ERP system," Klein said.

## Combination

Through continuous use, the AI is automatically trained and learns to recognise and evaluate new and external tyre data even more effectively.

"The more we use the system, the faster and more reliably it recognises the different models and information to be recorded," said Klein. "This will help us design the AI for further promising areas of use."

So far, the app has primarily been designed for car tyres, but is also being trained to record truck tyres. Companies that specialise in larger vehicles or fleet management could also use the app in the near future to make daily documentation work easier.

The app is customisable in terms of its compatibility with other GL Technology products.

"In our work, we also use, for example, the StackedTireProfiler tyre tread measurement tool from GL Technology along with the mobile TireScanMobile app," said Kleinfeller.

This measurement system is designed for the precise tread measurement of an entire stack of tyres in just a few seconds. The car owner can thus be informed immediately on site about the condition of the entire set of tyres and advised of any need for new tyres.

"With our specially developed measurement for complete wheels and tyres, we want to make day-to-day work easier for companies in the automotive aftermarket," Klein said. "With the TireScanMobile app as an independent app or expansion to existing systems, we are finally bringing tyre documentation into the digital age."



Steffen Klein: "We want to make day-to-day work easier."

RADAR

# MOVE TO 140GHz

Ilja Ocket explains how 140GHz radar is bringing smarter, safer cars within everyone's reach


Vehicle Electronics



Lidar beams are easily scattered in heavy rain

Automotive radar, a key component of adas, is playing an increasingly vital role in improving road safety, especially as other sensing technologies such as cameras and lidar face important limitations. One of the most promising advancements is the development of 140GHz radar, which is to complement the 60GHz in-cabin and 77GHz environmental perception radar systems currently in use.

With its high resolution and compact design, 140GHz radar promises to offer robust sensing – both inside and outside the vehicle – at a fraction of the cost of lidar.

This new radar flavour could be integrated into the automotive sensor suite by the early 2030s, unlocking exciting use cases such as automated valet parking and advanced driver monitoring. But several technical and regulatory challenges must be addressed before the technology can reach full commercial potential.

This article outlines the necessary steps for bringing 140GHz radar to market and examines how its development could act as a catalyst for rethinking the overall design of automotive sensing systems.

## Marvel

Nearly 150 years after Carl Benz first hit the road with his Benz Patent-Motorwagen, cars continue to be technological marvels. They come equipped with arrays of up to one hundred sensors, and high-end models can feature even twice that number.

On the one hand, this automotive sensor suite plays a critical role in optimising engine performance by continuously monitoring key parameters in the engine control unit (ECU) such as air flow, fuel injection and ignition timing. In addition, it includes camera, lidar, radar and ultrasonic technologies to enhance road safety and driving comfort.

Image sensors such as cameras are invaluable to car manufacturers. They act as a powerful extension of the human eye, recognising traffic signs, and enabling rear-view and surround-view functions to assist with parking and manoeuvring.

Lidar sensors generate high-resolution maps of a vehicle's surroundings, allowing for accurate perception and response. They are crucial for applications such as pedestrian detection, monitoring complex overtaking manoeuvres, and detecting obstacles ahead of the vehicle.

Ultrasonic sensors are particularly useful at low speeds and in close-range scenarios, aiding in safe parking and blind-spot detection.

Yet, while each of these technologies enhances a car's perceptive capabilities, they also come with limitations. Cameras struggle in low light or excessive brightness and require extensive, costly processing to convert video pixels into usable data. Lidar's laser beams are easily scattered or absorbed in adverse weather conditions, such as heavy rain, fog or snow. Moreover, lidar systems are expensive to build, acquire and maintain. And, finally, ultrasonic sensors offer limited value over longer distances.

This is where radar technology steps in, offering robust, reliable and long-range sensing, even in harsh weather conditions, and at a fraction of the cost of lidar.

Modern cars already have multiple radar sensors, often working with camera technology to support adas features such as adaptive cruise control, collision warning and lane keeping assist. But radar is also set to become an increasingly interesting technology for in-cabin sensing applications.

Think of driver monitoring and detecting the presence of children or pets in a parked vehicle, even if they are hidden under a blanket in the backseat.

## Advantages

Current automotive radar systems operate in two frequency bands: 60GHz for first-generation in-cabin applications and 77GHz for out-of-cabin use cases. This separation helps reduce interference, as radar systems using the same frequency can disrupt each other's signals.

In parallel, however, the automotive industry has also started to explore the 140GHz band. One factor driving this exercise is that the 60GHz band is also used for wireless local area networking and point-to-point communications, hindering automotive radar's performance.

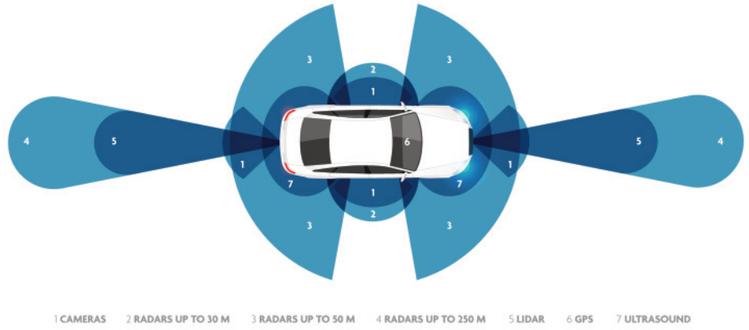
And tapping into the 140GHz frequency offers even more advantages, including higher resolution to detect smaller objects and improve the detection of objects at various distances and angles, such as distinguishing between multiple passengers in a vehicle.

And it uses smaller antennas, particularly beneficial for automotive design, where compactness and maintaining a sleek appearance are critical.

Each of these capabilities will be essential for enabling new use-cases, including automated valet parking and driver monitoring, which are features consumers are willing to pay a premium for in a competitive, high-pressure market.

## UWB

Ultra-wideband (UWB), a short-range 8GHz wireless technology, is already used in premium



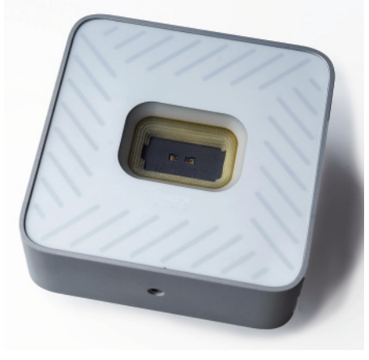

**Example configuration of an automotive sensor suite supporting advanced driver assistance**

automotive features such as secure keyless entry. But its potential goes much further. UWB's fine-range capabilities also make it particularly suitable for in-cabin sensing applications.

The main difference between 140GHz radar and UWB lies in signal properties. The longer wavelength of a UWB signal makes it more difficult to achieve consistent coverage throughout a car's interior, often requiring the installation of multiple anchors. In contrast, the higher frequency of 140GHz radar offers greater resolution and accuracy, making it suitable for complex use cases using just a single sensor.

Does this mean 140GHz radar will eventually replace UWB in the automotive market? Not quite. Both technologies will coexist, addressing different needs, but complementing each other to enhance vehicle safety and comfort.

UWB comes with the benefit that OEMs are already familiar with the technology. Moreover, it can build on existing keyless entry infrastructure, thus offering an important cost advantage. In contrast, 140GHz radar, with its higher resolution, could become the preferred technology for monitoring tasks where precise measurements of both the angle and distance between multiple occupants or objects are crucial.



**140GHz radar demo platform**

The industry is far from reaching a point where automotive sensor suites are fully saturated.

The real challenge is adding new sensor modalities without significantly increasing the sensor suite's overall price tag. This is why, for both radar and UWB implementations, the automotive industry will continue to require sensors to be fabricated using cmos-based technologies that leverage standard, cost-effective chipmaking processes.

## Commercialisation

Commercialisation of 140GHz automotive radar is expected by the early 2030s. While the technology has great potential, several hurdles must be overcome before it can be integrated into commercial vehicles.

Importantly, the main technological challenge isn't related to semiconductor limitations as 140GHz radar systems can still leverage standard cmos technology as opposed to even higher-frequency options that require the use of more expensive, exotic technologies such as indium phosphide. This allows the industry to benefit from advanced system-on-chip integration, nanometre-scale design and improved power efficiency, all while keeping production costs low, which is essential for mass-market adoption.

The bigger challenge lies in the realm of physics. As radar systems transition from 60 and 77GHz to 140GHz, the same amount of transmitted power covers a shorter distance. In other words, achieving the same sensing range at higher frequencies requires more power, which is technically difficult to realise. Hence, depending on the range desired by OEMs for 140GHz sensors, the state-of-the-art will need to advance towards co-packaged or integrated III-V front ends combined with cmos technology.

This challenge is further compounded by the integration of radar systems into the vehicle, which causes a significant signal loss. Although transparent materials are used already to allow radar signals to pass through more easily, this issue worsens at higher frequencies. New materials are thus required that are not only transparent to 140GHz, but are also strong, durable and visually appealing.

## Regulations

Beyond technical challenges, the lack of unified spectrum regulation is another obstacle to the commercial adoption of 140GHz automotive radar.

Spectrum regulations for the currently used 76-81GHz frequency band vary from country to country. This hinders the global commercial introduction of automotive radar, as OEMs need consistent standards to sell their cars worldwide.

As such, to avoid repeating this problem with 140GHz automotive radar systems, achieving global standardisation is key.

While advisory groups are already working on regulatory recommendations, particularly for in-cabin applications, this process needs to be accelerated.

As we move towards permitting the use of 140GHz for in-cabin applications, this momentum should be leveraged to secure spectrum regulation for higher energy levels, enabling valuable applications for external sensing too.

Improved road safety depends on the availability of affordable, smart cars, and 140GHz automotive radar is crucial to this. However, this vision can only be realised if regulation steps up its game.

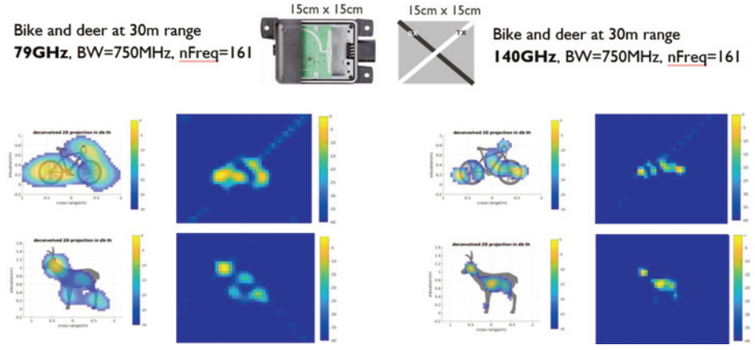
## Research

Although commercial 140GHz automotive radar products are not yet available, semiconductor companies such as TSMC and GlobalFoundries are already deeply engaged in their development. In parallel, research efforts continue to advance as well, focusing on areas such as interference management, technology benchmarking and new radar design principles.

Interference management includes one major area of research. The research community strongly advocates for a standard modulation scheme within the 140GHz band to mitigate interference from the outset.

Another crucial focus domain is the neutral benchmarking and evaluation of semiconductor technology platforms, including the 22nm FD-SoI and 16nm finfet flavours, which are considered good candidates to support the development of 140GHz automotive radar systems.

Finally, a third important research challenge is the development of distributed and coherent radar architectures, where radar units operate coherently – sharing data and being centrally coordinated – rather than functioning in isolation. This approach could result in smaller, more efficient and cost-effective radar systems with lidar-like angular resolution.




**Comparing the resolution of 79 and 140GHz radar at a 30m range with a radar aperture of 15 by 15cm**

## Shift

The rise of software-defined vehicles calls for a fundamental shift in how cars are developed. Simply adding hardware and layering new software is no longer sufficient. Instead, car manufacturers must design and build safety-critical products that are increasingly electronic, with systems built from the ground up to support complex and safety-critical applications.

However, the automotive industry lacks experience in this type of comprehensive overhaul.

Developing 140GHz automotive radar systems should be a part of this transformation. It presents an ideal test case for the accelerated development of a new sensing modality, and its integration with – or even within – camera modules.

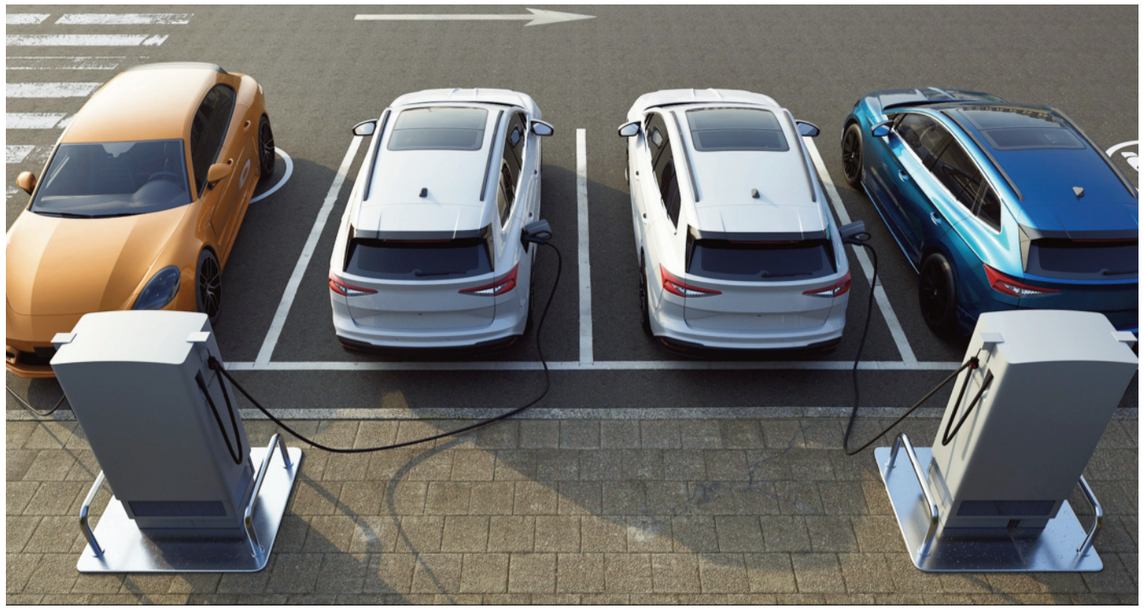
## Conclusion

The 140GHz automotive radar has the potential to transform the driving experience by offering high-resolution sensing at an affordable price, enabling services such as automated valet parking and advanced driver and passenger monitoring.

While this technology will be pivotal in making vehicles smarter, safer and more efficient, ongoing research into key technological advancements is essential. Additionally, proper spectrum regulation will be crucial to democratising the technology and ensuring its widespread adoption.



**Ilja Ocket is portfolio manager for automotive at Imec**



# ALLEVIATING ANXIETY

## Mike Torbitt shares why he remains hopeful for the future of the EV industry

Major car manufacturing giants Toyota and Volvo are the latest in a long list of car manufacturers to put the brakes on electric car production targets. Electric vehicles (EVs) present a number of environmental and performance benefits, but recent concerns about consumer demand have left car manufacturers uneasy.

Over the past five years, the EV market has been flourishing. Globally, there are more than 40 million electric cars in use, compared with just 26 million in 2022. In support of worldwide environmental goals, many car manufacturers adopted targets to increase their EV production or, in the case of Volvo, to manufacture EVs solely in the near future.

However, this year has seen manufacturers go back on their targets due to the increasingly unstable EV market.

### Concerns

Though global interest in purchasing EVs has increased from 44 to 51 per cent in the past year, regional disparity remains strong. China, Europe and the USA made up nearly 95 per cent of new electric car registrations in 2023, with sales still low in Japan and India, despite the major car markets in these countries.

The current state of international trade for EVs is also contributing to both consumer and manufacturer concerns. This year, America, Canada and the EU all announced tariffs on imported EVs from China, raising concerns that this could boost the price of EVs for consumers in these markets.

EV performance also worries drivers, with 57 per cent of potential buyers expressing anxiety about the range afforded by a single charge, found a recent Simpson Carpenter study. Range anxiety has been exacerbated by a perceived lack of charging infrastructure.

However, a rapid rollout of charging infrastructure around the world is predicted over the next few years.

Globally, Statista projects that over three million public EV charging stations will be in operation by 2028, while there were only 1.7 million recorded in 2022. If it becomes easier to charge EVs during journeys, car manufacturers can expect consumers' range anxiety to ease.

### Braking

To address consumer concerns regarding range and battery capacity, regenerative braking offers a highly efficient option. This technology harnesses the kinetic energy generated during vehicle deceleration to recharge the battery, effectively extending the vehicle's range.

However, when the battery reaches full capacity, the regenerative system must divert this excess energy to prevent overcharging and potential system overload.

In such scenarios, the integration of a dynamic braking resistor (DBR) is critical. The DBR safely dissipates the surplus electrical energy by converting it into thermal energy. This heat can be repurposed for auxiliary uses, such as warming the vehicle's cabin, optimising efficiency and ensuring no waste of recovered energy.

Liquid cooling further enhances efficiency by enabling compact systems. Water-cooled resistors take up ten per cent of the space and 15 per cent of the weight of equivalent air-cooled resistors that require additional cooling fans.

Lightweight water-cooled EV resistors retain high levels of excess energy generated during braking for a more efficient, safer electric driving experience. Manufacturers have the choice of a heavy-duty resistor for large vehicles and a smaller resistor for passenger vehicles.

### Conclusion

The EV market continues to face challenges as consumers and manufacturers alike reserve hesitations. However, with increased charging availability and innovative technologies to make EVs more commercially viable, car manufacturers can feel confident that the future is electric.

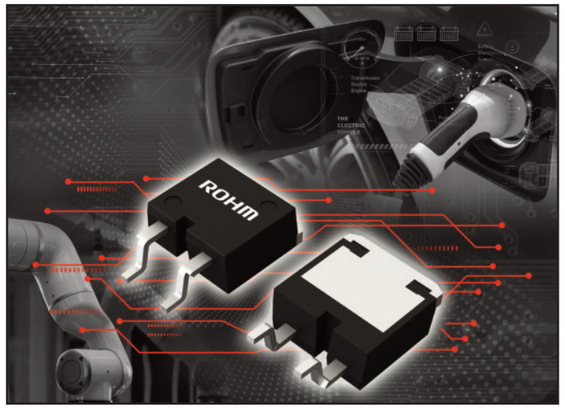


**Mike Torbitt is managing director of Cressall**



A rapid rollout of charging infrastructure is predicted

# Schottky diodes improve insulation




Surface mount SiC Schottky barrier diodes (SBDs) from Rohm improve insulation resistance by increasing the creepage distance between terminals.

The initial line includes eight models – SCS2xxxNHR – for automotive applications such as onboard chargers (OBCs) and DC-DC converters.

The rapidly expanding xEV market is driving the demand for power semiconductors, among them SiC SBDs that provide low heat generation along with high-speed switching and high-voltage capabilities in applications such as OBCs.

The SBDs offer breakdown voltages suitable for high-voltage applications with ease of mounting.

The products use a design that removes the centre pin previously located at the bottom of the package, extending the creepage distance to a minimum of around 5.1mm, 1.3 times greater than standard products.

This reduces the possibility of tracking (creepage discharge) between terminals, eliminating the need for insulation treatment through resin potting when surface mounting the device on circuit boards in high-voltage applications.

Additionally, the devices can be mounted on the same land pattern as standard and conventional TO-263 package products, allowing an easy replacement on existing circuit boards.

Two voltage ratings are offered, 650 and 1200V, supporting 400V systems commonly used in xEVs as well as higher voltage systems expected to gain wider adoption in the future.

They are AEC-Q101 qualified.

# Tools simplify AI development

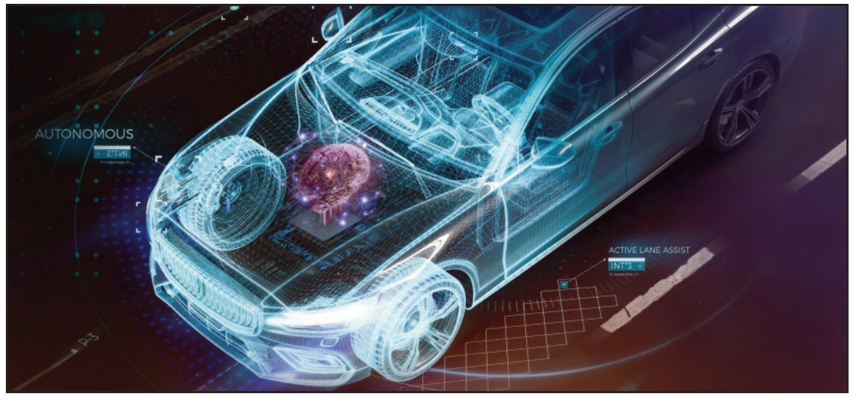
Tasking hopes to simplify the development of AI-based applications in the automotive sector with the latest version of its SmartCode development environment for the Infineon TriCore Aurix TC4x family.

The v10.3r1 release includes the parallel processing unit (PPU) runtime environment library, which provides a bidirectional data exchange mechanism for offloading the TriCore or allowing the TriCore to take advantage of the PPU's compute power for matrix and vector intensive calculations.

BlueBox debuggers support development in the virtual and ECU environment, and allow developers debug access to all cores including the PPU. The complete set of hardware and software provides the necessary development tools for implementing AI-based applications.

SmartCode is based on the Eclipse IDE and can be used with Windows and Linux hosts. A safety and security manual for TriCore and the PPU is included for tool qualification.

The included compilers comply with ISO 26262 for functional safety and ISO 21434 for cyber security; they have been certified by TÜV.








# Sensor detects brake pedal position

A brake pedal position sensor from Melexis comes complete with a wake-up function.

For functional safety purposes, the MLX90424 integrates two position-sensing ICs and a wake-up switch isolated in one package. It can be powered directly from 12V and handles precise measurements of linear displacement up to 30mm.

Redundancy comes through its dual linear position sensing, while the integrated magnetic switch allows the implementation of a power-saving mode.

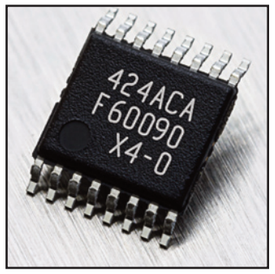
When compared with a current brake pedal module including separated position sensors and switches, the integrated device ensures both the position sensing and switching element are placed together at the best location. This reduces design and packaging considerations, simplifying assemblies and reducing component count.

Additionally, it provides supply flexibility, allowing it to be powered directly from the 12V battery without a regulator.

The device measures linear displacement up to 30mm, and uses the firm's Triaxis Hall technology to provide stray field robustness.

The combined sensor is AEC-Q100 qualified, with the position sensing function offering up to Asil-D system integration, and the switch function supporting up to Asil-B in accordance with ISO 26262.

It is robust against magnetic stray fields up to 5mT (4kA/m) in accordance with ISO 11452-8.






## Switches connect via Lin bus

EAO has extended its family of universal switches for interior applications in cars, electric vehicles, buses, lorries and special vehicles.

The Series 09 now includes variants with the Lin-bus interface to provide reliable and robust communication between automotive control units to ease and speed integration of interior HMI units and subassemblies in modern vehicles. They can also help optimise efficiency and performance.

They can be connected with a network of up to 16 participants via the integrated Lin-bus controller, and integrated into an existing communication system with various control devices or combined with other universal switches to form a separate network.

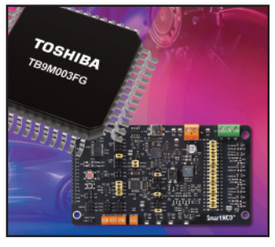
Designed to be modular and ergonomic, the switches are manufactured in accordance with IATF 16949 and are available in a range of variants and application-specific configurations.

Devices with ISO 7000 conforming illuminated graphical symbols are available, or switches can be marked according to user requirements.

## Board streamlines prototyping

Toshiba has integrated its SmartMCD motor control driver IC into Mikroe's TB9M003FG board to streamline prototyping.

With a focus on performance, flexibility and ease of integration, the AEC-Q100 Grade 0 qualified SmartMCD has a 32bit Arm Cortex-M0 CPU and a vector engine co-processor as well as gate-drivers to control external n-channel mosfets for driving three-phase brushless DC (BLDC) motors and permanent magnet synchronous motors more efficiently.




Now a central component on the TB9M003FG board, this IC can be designed into automotive applications such as electric pumps, fans, body control and thermal management systems.

The board includes an integrated inverter comprising six small-package, AEC-Q101-qualified mosfets for efficient power management.

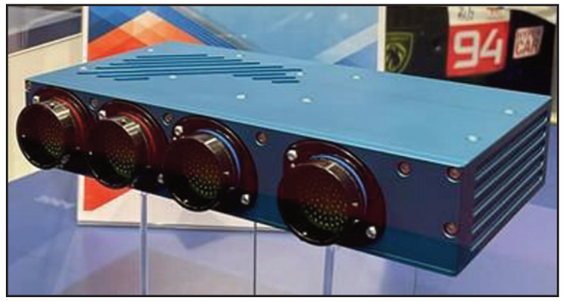
The board can be optionally connected to external inverter boards for driving higher power BLDC motors consuming several hundred watts.

It measures 130 by 73mm, includes all circuitry required for motor control, switches and potentiometers for operational testing.

# ECU uses AI to control racing cars

An AI-based ECU from Marelli is for engine and vehicle control in motorsport applications, and is designed for all types of vehicle propulsion, from traditional to electric.

The VEC480 is compatible with the rising trend of real-time AI computation onboard, and was presented at November's Professional MotorSport World Expo in Cologne, Germany.



Compared with previous vehicle control units (VCUs) for motorsports, its real-time computing performance is 2.5 times higher. The inter-processor bandwidth is increased ten times and ram bandwidth improved, enabling more reliability in reiterating crucial vehicle operations.

VCUs integrate different functions into one device: engine and chassis control and actuation, data logging and gateway to telemetry and cloud, and in-car networking.

It is engineered to manage the increasing complexity of neural-based algorithms in real time (milliseconds). This is achieved through the adoption of an AI accelerator (NPU), available with a capacity up to 26Tops. This provides potential for internal vehicle networking and engine or vehicle management.

The AI accelerator embedded in the device supports real-time AI inference with low latency and high efficiency, paving the way to neural virtual sensors, data inference with AI, real-time video processing (track detection, object detection and more), localisation and positioning, performance analysis, predictive analysis, and voice recognition.

The technology is also compatible and supports AI frameworks such as TensorFlow, TensorFlow Lite, Keras, PyTorch and Onnx.

## IC drives high- and low-side n-channel mosfets

A gate driver ICs from Nexperia is for driving high- and low-side n-channel mosfets in a synchronous buck or half-bridge configuration.

The automotive-qualified NGD4300-Q100 is for electronic power steering and power converters and the NGD4300 for use with DC-DC converters in consumer devices, servers and telecommunications.

The floating high-side driver in these ICs can operate from bus voltages up to 120V and use a bootstrap supply with an integrated diode, features which simplify overall system design and help reduce PCB size.

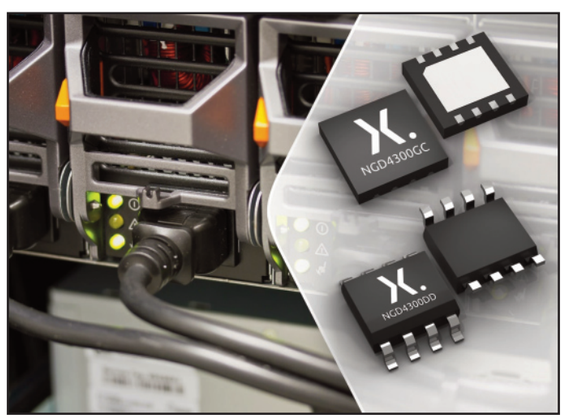
They can deliver up to 4A peak source and 5A of sink current to guarantee short rise and fall times even for heavy loads.

The gate driver has a 13ns delay and offers channel-to-channel delay matching of 1ns. These delays help reduce deadtime by increasing switching duty-cycle. The 4ns rise and 3.5ns typical fall times help deliver higher efficiency and support high frequency and fast system control.

These gate drivers accept input control signals complying with TTL and cmos logic levels.

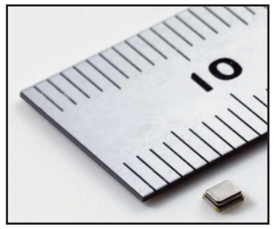
For robustness in power conversion and motor driving applications, they are fabricated using a silicon-on-insulator process. This allows the negative voltage tolerance of the HS pin to extend to -5V, reducing the risk of damage caused by system parasitic component and unexpected spikes.

They come in DFN-8, SO-8 and HSO-8 packs.







# Timing

A -40 to +125°C automotive timing device from Murata has a frequency tolerance of ±40ppm.

It can enhance the design and deployment of in-vehicle networks (IVNs), wireless communication and adas.

Th automotive crystal (HCR), or XRCGE_M_F series, helps automotive engineers achieve stable and accurate timing without the need for system calibration or temperature compensation measures, reducing development efforts and costs.

Through the optimisation of artificial crystal growth, assembly and inspection, the resin-sealed package technology, along with the optimisation of crystal design, allows HCR to achieve high-temperature operation and accuracy.

This combination suits the latest vehicle communication and safety functions such as Can and Ethernet IVNs, adas components such as cameras, lidar and radar, and wireless technologies such as RF, NFC, BLE, Zigbee and UWB.

# Rectifiers balance reverse recovery charge with forward voltage drop

Vishay has expanded its seventh-generation platform of 1.2kV Fred Pt Hyperfast rectifiers with four automotive grade devices in the eSMP series SMF (DO-219AB) package.

For industrial and automotive applications, the 1 and 2A rectifiers are said to offer the best trade-off between reverse recovery charge (Qrr) and forward voltage drop for devices in their class and provide the lowest junction capacitance and recovery time.

The rectifiers are the VS-E7FX0112-M3 and VS-E7FX0212-M3, and AEC-Q101-qualified VS-E7FX0112HM3 and VS-E7FX0212HM3.

To reduce switching losses and increase efficiency, the devices combine recovery times down to 45ns with Qrr down to 105nC typical, forward voltage drop down to 1.45V, and junction capacitance down to 3.0pF.

The rectifiers offer non-repetitive peak surge current up to 21A in a package measuring 4.2 by 1.4mm, with a 1.08mm profile and minimum 2.2mm creepage distance.

The devices can serve as clamp, snubber and freewheeling diodes in flyback auxiliary power supplies and high-frequency rectifiers for bootstrap driver functionality while providing desaturation protection for the latest fast switching IGBTs and high voltage Si and SiC mosfets.

Typical applications include industrial drives and tools, on-board chargers and motors for electric vehicles (EVs), energy generation and storage systems, and Ćuk converters and industrial LED sepic circuitry.

They have a planar structure and platinum doped lifetime control that guarantee system reliability and robustness without compromising on performance, while their optimised stored charge and low recovery current reduce switching losses and power dissipation.

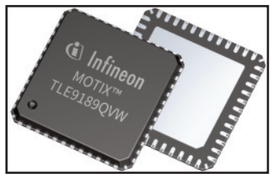
RoHS-compliant and halogen-free, the devices have a moisture sensitivity level of one in accordance with J-STD-020 and provide high temperature operation up to +175°C.



# Gate driver IC targets BLDC motors

A gate driver IC from Infineon is for safety-critical applications for 12V brushless DC (BLDC) motors.

This Motix TLE9189 three-phase gate driver IC is for motor control ICs required for by-wire installations. It is qualified to AEC Q100 grade 0 and ISO 26262 Asil D.




This makes the device suitable for brake-by-wire and steer-by-wire systems, where conventional mechanical connections will be eliminated in the future.

The IC will be available in two packages, the TQFP-48 9 by 9mm and the VQFN-48 7 by 7mm.

Supply voltage range is from 4.2 to 36V and it is optimised for 12V battery systems.

A conventional motor control concept consists of PWM input and integrated current sense amplifiers for accurate current sensing.

# Sensors ensure precise current measurements

Automotive-grade integrated high-bandwidth, high-isolation current sensors from Novosense ensure precise current measurement and eliminate the need for external isolation components.

The NSM211x series targets applications including OBC, DC-DC converters, PTCs, automotive motor control, charging station current detection, and fuel cells.

Certified to AEC-Q100 grade 0, they operate stably from -40 to +150˚C and address AC or DC current detection in automotive applications with a high isolation voltage, strong current handling capability and reliability.

With a -3dB bandwidth of up to 1MHz and a response time of 400ns, they help control systems achieve rapid loop control and overcurrent protection. The series also features a creepage distance of up to 8.2mm and isolation voltage withstand of 5kV RMS per UL standards, with a maximum working isolation voltage of 1.618kV peak.

The three packaging options of SOP8, SOW16 and SOW10, respectively, have a primary side impedance of 1.2, 0.85-1 and 0.27mΩ, with a continuous current handling capability of up to 100A. Multiple models come with each package.

The current sensors integrate internal temperature compensation algorithms and offline calibration to enable a measurement accuracy of less than ±2% sensitivity error and less than ±10mV offset error across the full temperature range, with no need for secondary programming.

The series supports 3.3 and 5V power supply voltage as well as DC or AC measurement with a current of 5 to 200A with options for reference voltage output, overcurrent protection output and configurable overcurrent protection thresholds.






# ECUs support various powertrain technologies

Cosworth introduced the Antares 4 and Antares 6 ECUs at November's Professional MotorSport World Expo in Cologne, Germany.

Engineered with a balance of cost-efficiency and performance, the models bring the capabilities of the Antares 8 to a wider array of motorsport applications.

Designed and developed to empower OEMs, motorsport teams and individuals, they can function as a complete vehicle controller and data logger, supported by Cosworth's software toolchain.

Both ECUs have been designed to support a range of powertrain technologies, including internal combustion engines, hybrids, plug-in hybrids and battery electric vehicles.

They offer high-rate synchronised data logging for precision and reliability. Both come with out-of-the-box control features such as multi-pulse and stratified GDI control, active torque management, and FIA-compliant real-time PPU and BOP control.

For teams seeking customisation, the firm's real-time embedded software generation platform enables the development of bespoke control algorithms within the Matlab Simulink environment. This allows teams to deploy complex powertrain and chassis control algorithms, signal processing routines, dynamic models, and high-speed data processing within the development toolchain.

Teams can develop strategies using Simulink neural network blocks to create machine learning for driven traction control.

Also featured at PMW Expo, Cosworth's Toolbox 13 software for engineers, coaches and analysts delivers detailed live telemetry, customised performance metrics and interactive circuit maps.





# SSD receives AEC-Q100 certification

Exascend has received AEC-Q100 certification for its AS500 automotive-grade heat-sink BGA solid state drive (SSD).

It supports operation at the automotive grade-two temperatures from -40 to +105˚C.

Features include virtualisation capabilities, security, reliability, and resilience to shock and vibration.

Housed in a 16 by 20mm BGA form factor and providing up to 1Tbyte of storage capacity, it addresses space and capacity constraints in automotive, aerospace and embedded designs.

The series has PCIe Gen 4x4 interface and NVMe 1.4 support, delivering read and write speeds up to 5 and 1.6Gbyte/s, respectively. This performance is for seamless handling of data-intensive requirements in modern automotive applications and edge AI workloads.

Single root IO virtualisation (SR-IOV) enables one physical device to appear as multiple separate logical devices that can be directly assigned to virtual machines (VMs), reducing latency and overhead typical of software-based virtualisation.

It supports up to four concurrent VMs, facilitating scalability and resource allocation. SR-IOV reduces CPU overhead and enhances real-time data processing, accelerating throughput and reducing latency for adas and AI workloads.

Adaptive thermal control (ATC) dynamically monitors changes in temperature and regulates performance to prevent overheating, thereby extending device lifespan.

The AS500 with TCG Opal 2.0 strengthens data security by providing hardware-based encryption and access control for sensitive data such as sensor readings, event logs and control algorithms, safeguarding sensitive information against unauthorised access and intrusion.

An optimised low-power design is achieved through careful component selection, consuming less than 2.5W at full performance. Its energy efficiency suits space-constrained and thermally difficult environments, achieving power savings without sacrificing performance.

A built-in heat sink enhances thermal dissipation and manages heat build-up, coupled with the ATC algorithm to ensure reliability and stability even in high thermal stress conditions.

Firmware customisation can meet needs. Write protection and data purge can be tailored for the application, while performance and power tuning provide flexibility.

Available in BGA, M.2 2230 and 2280 form factors, it provides shock and vibration resistance.




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© 2024 Vehicle Electronics
ISSN 2055-1177

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