VEHICLE electronics

The monthly magazine for automotive electronics engineers

Microsoft accelerates AI momentum at Stellantis

Stellantis and Microsoft have agreed a five-year collaboration to co-develop AI, cyber security and engineering.

Building on a long-standing alliance, this collaboration will bring together Stellantis' automotive engineering expertise with Microsoft's cloud, AI and security capabilities.

"Through our collaboration with Microsoft, we are accelerating our AI momentum across the enterprise, giving our teams the tools to innovate faster and deliver the products, services and experiences customers expect from us," said Ned Curic, Stellantis chief engineering officer.

As part of the collaboration, Stellantis and Microsoft are co-developing more than 100 AI initiatives including AI-powered product development and validation, predictive maintenance and testing, and faster deployment of digital features and services.

"Our work with Stellantis reflects a shared ambition to drive AI responsibly and securely across the automotive value chain," said Judson Althoff from Microsoft's commercial business.

By leveraging AI-driven insights from secure, encrypted data, Stellantis says it is reaffirming its commitment to put customers at the centre of everything it does. For example, drivers may receive intelligent recommendations for more energy efficient driving in urban environments, along with proactive vehicle-health insights and feature updates designed to improve everyday usability.

Stellantis will deploy and operate an AI-driven global cyber defence centre spanning its IT systems, connected vehicles, manufacturing sites and digital products. This unified approach should let Stellantis anticipate and detect cyber threats faster with AI-driven analytics.

With an end-to-end approach, cyber security will be embedded into every digital vehicle experience, safeguarding interactions across mobile apps and in-vehicle services. Drivers should benefit from reliable connectivity and protected data access even in remote areas.



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Vector expands NXP collaboration for SDVs

Vector is expanding its collaboration with NXP by contributing embedded software and system integration expertise to the NXP CoreRide platform, a scalable foundation for software-defined vehicles (SDVs).

The collaboration focuses on accelerating the industrialisation of SDVs, reducing time to market through pre-integrated and optimised software stacks.

The joint activities concentrate on software-centric system integration, measurable performance optimisation, and secure boot and update architectures.

The latest outcome of this collaboration is the recently released CoreRide Z248 zonal reference system. This provides OEMs with a ready-to-adopt, real-time compute platform for series production.

NXP provides a pre-integrated and pre-configured hardware and software platform based on Microsar embedded software products, tightly aligned with NXP hardware. This close coupling of hardware and software reduces system bring-up complexity and lowers integration effort for OEMs.

As a result, development teams can begin application development earlier in the programme lifecycle.

The joint approach shortens evaluation, reduces engineering risk and accelerates vehicle programme ramp-up. Developers use Vector products such as Microsar Classic as the software stack, DaVinci Configurator for the stack configuration and Preevision for the system design within the package.

Vector's base layer directly contributes to enhancing CoreRide's critical system-level performance indicators. This includes optimising boot and start-up behaviour to ensure fast and deterministic ECU availability.

Update, wake-up and sleep mechanisms are designed to meet performance and energy-efficiency requirements of modern zonal architecture. In addition, Vector enhances communication and gateway performance across Can and Ethernet while reducing overall memory footprint.

Vector collaborates closely with hardware suppliers to reduce integration complexity, optimise system performance and deliver a scalable foundation for future vehicle architectures.



ThunderSoft unveils architecture at Beijing Auto Show

At April's Beijing Auto Show, ThunderSoft unveiled AquaDrive AIOS 2.1, a unified experience architecture consolidating cockpit, autonomous driving, adas, navigation and AI agents, marking a shift from software- to AI-defined vehicles.

Built on a full-stack AI-native four-layer architecture (data-model-system-application), version 2.1 addresses complex problems in central computing, including data governance and heterogeneous compatibility.

Cockpit-driving fusion eliminates boundaries between traditional domains, laying the foundation for a centralised AI agent architecture.

End-to-end AI integration sees a shift from rule-driven to cognition-driven intelligence, providing a springboard for L3 to L5 autonomy and resolving long-tail corner cases.

A unified real-time interface merging map, surround reality (SR) and video streams reduce cognitive load for drivers through seamless, touchless interaction.

The upgraded Kanzi 4 3D HMI engine now supports multi-screen fusion; Kanzi was deployed in over 14 million vehicles in 2025 alone.



ThunderSoft stand at Beijing Auto Show

Starlight-level night vision provides clear visual enhancement in low-light conditions, less than one lux, for round-the-clock awareness.

"The intelligent vehicle is evolving from a transportation tool to a mobile intelligent agent," said Larry Geng, executive president of ThunderSoft. "This AI-powered transformation of the physical world has just begun."

For OEMs, the platform shortens development cycles and enables unique brand visual styles. For consumers, it standardises luxury-level AI interactions, creating a perception-anticipation-service experience.

ThunderSoft's expertise is backed by mass-production experience in more than 50 million vehicles globally, including brands such as Volkswagen, Porsche, Toyota and Geely.

Nissan lays out vision for AI in vehicles

Nissan has unveiled a long-term vision that integrates mobility intelligence into everyday life through a focus on AI-defined vehicles (AIDV), offering a choice of electrification technologies to meet diverse customer and market needs.



Ivan Espinosa

"Our vision defines where Nissan is headed, with customer experience as our guiding priority," said Ivan Espinosa, Nissan CEO. "By advancing mobility intelligence, we will deliver products and technologies that are safer, more intuitive and more accessible with outstanding value and a more rewarding experience."

Nissan's long-term direction is designed to drive sustainable competitive advantage across future technologies, a streamlined product portfolio, redefined global market approach and an industrial model organised around clearly defined vehicle families.

AI is central to this approach, enabling AIDV, which will combine Nissan's AI Drive and AI Partner technologies to enhance mobility and optimise time spent in transit.

Building on real-world deployment of adas technologies, the car maker is integrating AI with vehicle control and safety systems. It aims to deploy AI Drive technology across 90 per cent of its line over the long term.

The Nissan Elgrand scheduled for launch this year will adopt ProPilot with end-to-end autonomous capability by the end of 2027.

LG partners Applied to speed sensor deployment

Applied Intuition and LG Innotek are working together on autonomous vehicle development.

The aim is to provide OEMs with a faster path to production-ready autonomy using camera sensors, real-world testing and simulation.

The partnership will optimise Applied Intuition's self-driving system to work seamlessly with LG Innotek's camera, lidar and radar sensors, helping automakers build safe and scalable autonomous vehicles.

By combining real-world testing with simulation-based validation optimised for LG Innotek's sensors, Applied Intuition is offering OEMs an expedited path to develop production-ready autonomy systems using the latest hardware.

LG Innotek's sensors will be deployed on Applied Intuition's autonomous development vehicles operating across the company's global test fleet. These vehicles operate in multiple regions, providing perception system feedback and reference data for evaluating and improving sensor performance.

LG Innotek will integrate digital versions of its sensors into Applied Intuition's simulation environment. This will allow automakers to evaluate sensor performance in virtual scenarios during development, enabling faster iteration and reducing the engineering complexity associated with integrating sensors and autonomy software from multiple vendors.

By leveraging Applied Intuition's software and global operational experience in autonomy testing, LG plans to operate its own autonomous test vehicles in South Korea, which is expected to shorten the development timeline for its sensors.

By pairing sensors and autonomy software early in the development process, the collaboration simplifies how automakers design and validate autonomous systems. This should reduce engineering overhead, shorten development timelines and help OEMs bring autonomous vehicles to market more quickly.



Power Automotive Displays With First Grade 2 SIP
Cuts PCB Complexity and BOM Costs for Digital Clusters

The market's first Automotive Grade 2 SiP, the SAM9X75D5M, drives automotive innovation with a reliable, cost-effective solution. Combining a high-performance MPU and DDR2 SDRAM, it simplifies PCB design and reduces BOM risk. Designed specifically for automotive applications, including digital cockpit clusters, smart clusters for two-and three-wheelers, HVAC control systems, EV chargers and more, it provides OEMs and Tier 1 suppliers with a versatile solution. AEC-Q100 Grade 2 certified, it ensures dependable performance for digital clusters, HMI, EV chargers, diagnostics and asset tracking.

Discover how the SiP streamlines design and cuts costs.

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AB Dynamics opens facility near Munich

Automotive test equipment supplier AB Dynamics has opened a technical facility near Munich to improve equipment uptime and test efficiency for its local customers.

The building is close to major vehicle makers and tier-one suppliers.

The site complements AB Dynamics' existing German headquarters in Giessen, near Frankfurt, increasing the company's capacity to provide high-level technical support and equipment servicing within the region.

The new facility has a dedicated training centre where customers can receive instruction on the maintenance of AB Dynamics' products. The site also houses a specialist repair and maintenance department.

For automotive OEMs, the proximity of the site is expected to be an advantage. By offering in-person support and rapid on-site repair services, the company aims to support its customers in reducing equipment downtime and improving test efficiency.

"As vehicle development cycles continue to shorten, emphasis is on test teams to maximise uptime and operate with greater efficiency," said Holger Hildsberg, managing director of AB Dynamics. "Fast access to technical expertise, training and repair capability is becoming essential. The new Bavaria facility is designed to support that reality, helping customers reduce disruption, maintain momentum in their test programmes and enable us to respond more quickly when issues arise."

The facility has been constructed according to the latest energy efficiency standards and features integrated rooftop solar panels.

The facility has capacity for future expansion.



AB Dynamics facility near Munich



Toyota Rav 4 infotainment system

Toyota adopts Panasonic IVI

Toyota is using Panasonic's in-vehicle infotainment (IVI) system in this year's Rav 4 to keep drivers connected, informed and entertained with speed, personalisation and future-ready technology.

In developing this product, Panasonic established a large-scale framework for IVI software that integrates with Arene, Toyota's software for development and deployment, created by its group company Woven.

The company is continuing this collaboration with Toyota to support the development of software platforms that enable SDV adoption across Toyota's vehicles.

Integration with Arene software lets the IVI serve as a hub for over-the-air updates, which are essential for SDV adoption for multimedia and adas features.

The product builds on existing capabilities, including smartphone connectivity via Apple CarPlay and Android Auto with wireless connectivity, digital radio support and Bluetooth audio, and user authentication and voice UI enabled through smartphone and cloud integration.

Beyond personalised experiences enabled by a customisable home screen, the system supports vehicle comfort and usability through connected features such as temperature control, cloud-based navigation and faster, more enhanced voice recognition.

In addition, safety is enhanced through adas-integrated camera recording.

A high-definition display measuring up to 32.7cm integrates navigation and temperature control into a single user interface.

Hyundai Mobis validation cuts SDV test times

Hyundai Mobis is using data-driven validation to cut testing times for software-defined vehicles (SDVs).

The system collects real-world driving data and replicates driving scenarios in the lab using simulators directly connected to ECUs.

It performs large-scale validation more quickly and efficiently by automating data management and integrating it with simulators.

As automotive software becomes more sophisticated, extensive evaluation and validation to ensure the safety and performance of related products have emerged as critical processes, alongside global R&D competition in autonomous driving and adas technologies. Automakers are requiring suppliers to provide data-based validation results spanning tens of thousands of hours before adopting core auto components for SDVs.

Meeting such demands typically requires test vehicles to undergo years of test driving in real-world conditions. However, Hyundai Mobis has developed a way to shorten this process.

The evaluation and validation system can repeatedly test ECUs for SDVs and autonomous driving by linking data obtained from actual road tests with data management and simulators to replicate driving scenarios.

This can drastically reduce evaluation and validation time through a platform that connects multiple simulators in parallel, reflecting various validation scenarios.

Hyundai Mobis plans to expand this platform to connect up to 60 such simulators. This will enable the company to perform 10,000 hours of evaluation and validation in one week.

In particular, the system is based on data collected under various conditions in real-world driving and parking environments via sensors mounted on test vehicles.

AI aids Mercedes in Miami



The Mercedes-AMG Petronas F1 team upgraded from TeamViewer Tensor to TeamViewer One ahead of May's Miami Grand Prix.

The platform for autonomous endpoint management gives the team real-time visibility and control across thousands of IT and OT endpoints, from the Brackley factory to the trackside garage. TeamViewer One leverages AI to detect and resolve issues before they affect operations, critical in an environment where even minor IT problems can change a race outcome.

"During a race, I rely on dozens of streams of data from telemetry to weather to radio, and the technology behind it has to work without fail," said team principal Toto Wolff. "In Formula One, every vendor has to earn their place. There are no free passes. TeamViewer delivers on the two things we never compromise on: reliability and performance. Moving to TeamViewer One is a deliberate step up, and a signal that our partnership is built for where this sport is heading, not just where it is today."

Oliver Steil, CEO of TeamViewer, said Formula One was exactly the environment TeamViewer One was built for.

"If it holds up there, it holds up anywhere," he said.

Rohm optimises SiC mosfet tech

Rohm has improved its SiC mosfet technology for automotive electric powertrains, such as in traction inverters for electric vehicles.

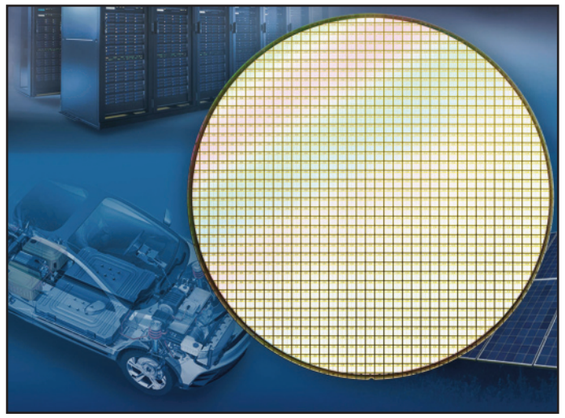
The fifth generation of its EcoSiC series is optimised for high-efficiency power applications and can also be used in power supplies for AI servers and data centres.

In the automotive sector, electric vehicles require extended cruising range and faster charging, creating demand for lower-loss inverters and higher performance onboard chargers.

Against this backdrop, the adoption of SiC devices capable of low loss and high efficiency is increasing in high-power applications ranging from a few kilowatts to hundreds of kilowatts.

Rohm was the first to begin mass production of SiC mosfets in 2010, contributing to reducing energy losses by implementing SiC devices over a wide range of high-power applications, including offering an early line of products compliant with automotive standards such as AEC-Q101.

Its fourth-generation SiC mosfets, for which sample provision began in 2020, have been adopted globally in automotive and industrial sectors. They are available across a broad portfolio, including discrete devices and modules.



EcoSiC fifth-generation wafer

The fifth-generation SiC mosfets are said to achieve lower loss.

Through structural enhancements and manufacturing process optimisation, the on resistance is reduced by approximately 30% during high temperature operation (Tj = 175˚C) compared with fourth-generation products under the same breakdown voltage and chip size conditions.

This improvement contributes to making units smaller while increasing output power in high temperature applications such as EV traction inverters.

Rohm began supporting the bare dies business with fifth-generation SiC mosfets last year and completed development in March this year. Starting from July, the company plans to provide samples of discrete devices and modules incorporating fifth-generation SiC mosfets.

Going forward, it plans to expand the line with additional breakdown voltage and package options.

It will also continue to enhance its design tools and strengthen application support.

Collaboration focuses on exterior mirrors

Robotic cell maker Q5D has joined a collaborative project with Samvardhana Motherson Reflectec (SMR) and Cranfield University to develop exterior automotive mirrors.

The collaboration is focused on creating a Mirror 2.0 concept that integrates an automatic wiring harness into an increasingly complex mirror assembly while improving efficiency, manufacturability and robustness.

This is part of the UK government's £4bn Drive35 programme, delivered by the Department for Business & Trade in partnership with the Advanced Propulsion Centre and Innovate UK.

Q5D will contribute its wiring automation technology and design expertise to help SMR integrate wiring directly into the mirror's structure.

The partners will run a series of joint design workshops in which SMR iteratively refines the mirror design and Q5D proposes options for routing and securing the wiring to suit automated production.

This phase will culminate in a demonstrator mirror manufactured that embodies the electrical and electronic content alongside Q5D's automated wiring approach.

SMR will carry out environmental and functional testing of the prototype mirrors using its in-house facilities, while Q5D will manufacture the automated wiring harness components and support integration.

Infineon mems mirror enables Valeo ground projection kit

Infineon and Valeo are collaborating on a short-distance ground projection module integrating laser beam scanning.

Their first collaborative innovation was on show at April's Beijing Auto Show.

Achieving daytime visibility for ground projections necessitates high-performance systems. Incorporating Infineon's 2D mems mirror and controller into Valeo's high-definition ground projection module improves brightness, contrast and resolution.

While the first-generation delivers impactful bi-colour output, the product roadmap is already planned for future iterations to include full-colour capabilities.

"We believe sensors are at the heart of every meaningful electronic application," said Thomas Schafbauer, executive vice president at Infineon. "Our collaboration with Valeo demonstrates how we go beyond a single device."

Maurizio Martinelli, CEO of Valeo's light division, added: "Thanks to our joint development, our new ground projection module meets the demands of customers in China and Europe for a more personalised experience, as well as the automotive industry's stringent standards for quality, reliability and performance."

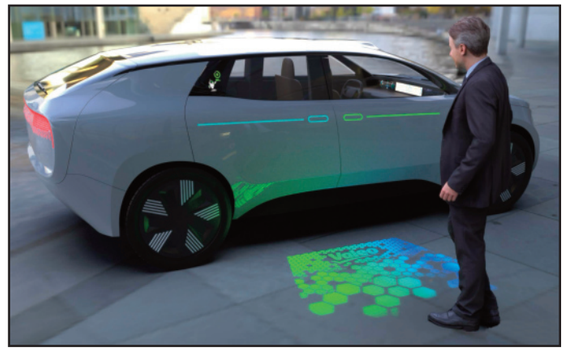
As vehicles evolve to offer deeply personal experiences and more security, communication and entertainment features are expected both outside and inside the vehicle. For example, the car can communicate as the user approaches it, using features integrated into the car body or via projections onto the ground.

The ground projection module provides another layer of personalisation, allowing OEMs to deliver branded welcome and goodbye light signatures, or display tailored messages and graphics directly next to the vehicle.

This capability can transform the simple act of approaching or leaving a car into a distinctive and memorable brand experience, enriching the emotional connection between the user and their vehicle.

V2X communication, when integrated with exterior lighting systems, is poised to enhance road safety. By projecting dynamic, context-aware information onto the ground, vehicles can communicate critical data, such as immediate braking warnings, pedestrian crossings or lane-change intentions, not just to other vehicles, but directly to nearby pedestrians, cyclists and drivers of non-connected cars.

Subject to regulatory approval, this non-verbal, visually impactful communication system bridges the gap between digital V2X data and the physical environment, creating an intuitive layer of safety that complements existing warning systems and helps reduce cognitive load for road users.



Infineon's 2D mems mirror and controller enable Valeo's high-definition ground projection module

Mips picks Arteris IP to accelerate physical AI

Arteris, a provider of semiconductor technology for accelerating innovation in the AI era, is working with Mips, a provider of processor IP, tools and software, to accelerate building physical AI computing platforms.

Mips has selected Arteris FlexGen smart NoC IP and Magillem SoC integration automation software to accelerate the development of scalable SoC platforms targeting high-growth markets adopting physical AI, including automotive MCUs and adas.

Mips will integrate Arteris system IP into its platform offerings, enabling users to accelerate development of optimised SoCs built on Mips Risc-V processors.

Arteris enables the underlying AI data movement in chiplets, SoCs and MCUs based on Arm, Risc-V and x86.

A²B 2.0 boosts bandwidth while keeping latency low

Version 2.0 of Analog Devices' Automotive Audio Bus (A²B) is designed to help automotive OEMs and tier-one suppliers deliver richer in-cabin audio experiences through more bandwidth and Ethernet integration.

It does this while preserving the low-latency, simple architecture that has defined A²B for years.

Over the past decade, A²B has been broadly adopted in the automotive industry, with hundreds of millions of nodes on the road from over 35 automotive manufacturers, establishing a foundation for the next evolution of the technology.

Built for applications where low and deterministic latency is a key requirement, A²B was designed to support demanding use cases such as road-noise cancellation and in-car communications through a flexible and cost-effective approach to audio connectivity.

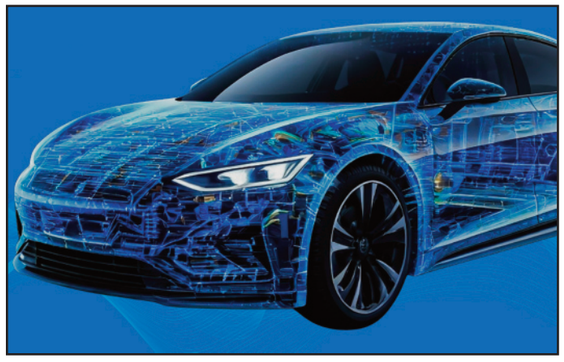
Its single main, multiple sub-node daisy-chain architecture reduces wiring complexity and associated costs by up to 75%.

The straightforward architecture with zero software overhead also lowers overall development time and investment for OEMs and tier-one suppliers.

The ecosystem spans OEMs, silicon partners and ODMs, supported by development and test tools.

As vehicles transition to software-defined architectures, in-cabin features are increasingly delivered and improved through software, raising the bar for deterministic, high-bandwidth connectivity that can integrate cleanly with modern in-vehicle networks. As in-cabin technology becomes a key differentiator for automakers, expectations for premium audio and infotainment continue to rise, driving demand for higher bandwidth, advanced connectivity and seamless integration with today's vehicle networks.

"Audio is central to how drivers perceive refinement, safety and responsiveness inside the vehicle, especially as cabins become more software defined," said Yasmine King, corporate vice president at Analog Devices. "In this new era, engineers need audio connectivity that integrates cleanly with the broader vehicle network. A²B 2.0 delivers higher bandwidth, low latency and Ethernet tunnelling without adding architectural complexity."



A²B 2.0 delivers higher bandwidth

The fourfold bandwidth increase to 98.3Mbit/s, full duplex, supports more advanced in-vehicle audio architectures. There is support for up to 119 upstream and 119 downstream audio channels for automotive audio system configurations.

Ethernet data tunnelling is via the Open Alliance SPI (OASPI) interface for enhanced connectivity and flexibility.

Up to 30% system cost reduction is enabled through increased functional integration and reduced external circuitry and components.

Low and deterministic latency includes a noted 62μs low latency and an architecture for straightforward integration.

It is compatible with existing A²B 1.0 cabling and connector infrastructure, supporting a simple upgrade. Additionally, the ADAA245x devices can easily branch to A²B 1.0 networks, increasing reuse of existing modules.

Lauterbach supports Neusar OS

Lauterbach has expanded its support for Autosar by also supporting Neusar from Neusoft Reach.

Autosar-based safety-critical systems require analysis techniques to verify functional safety.

Trace32 now enables the analysis of both the Autosar Classic operating system Neusar cCore and the Autosar Adaptive Neusar aCore, as well as the applications running on them.

This is realised by adding a menu extension to Trace32 PowerView software that gives developers access to Neusar resources such as tasks, alarms and stack coverage.

HighTec helps Novelic radar detect children in vehicles

Novelic's Acam automotive in-cabin radar monitoring system was developed using HighTec's development platform.

The automotive radar technology monitors the vehicle cabin and detects the presence and movement of occupants, including children.

The system's in-cabin sensing capabilities help car makers meet safety standards such as Euro NCap's child presence detection (CPD) protocols, which aim to prevent tragic incidents involving children left unattended in vehicles.

The protocol makes CPD mandatory for vehicles seeking top safety ratings. It requires the use of direct sensing technologies such as radar or cameras to detect the presence of children up to six years old within 15s after the vehicle is locked.

If a child is detected, the system must trigger exterior alerts such as horn or light activation followed by escalating warnings, including smartphone notifications or haptic feedback, if the child remains inside the vehicle.

Novelic's Acam provides CPD in a compact, power-efficient module, while providing additional functionality, such as seat occupancy detection and intrusion and proximity alerts.

Novelic used HighTec's development platform, including an automotive-grade C/C++ compiler optimised for the Infineon Aurix TC3x microcontroller architecture, to develop and optimise the embedded software powering its radar-based monitoring capabilities.



Novelic's radar detects children left in vehicle

HighTec's technical support team worked closely with Novelic engineers throughout the development process, helping resolve technical problems and ensuring development milestones could be achieved on schedule.

Because HighTec compilers are based on widely adopted open-source technologies, development teams benefit from a shorter learning curve and reduced vendor lock-in, enabling engineers familiar with open-source toolchains to become productive quickly and integrate the tools easily into existing development environments.

HighTec provides native support for modern C++ standards, giving engineering teams the ability to leverage the latest language features while building scalable and maintainable software architectures for future vehicle platforms.

For applications such as in-cabin radar monitoring, systems must process complex signals and detect extremely small movements, such as the breathing of a sleeping infant in real time under strict power and performance constraints.

HighTec compilers are certified to ISO 26262 up to Asil D, giving Novelic confidence the generated code is trusted, and providing a clear path towards future safety certification.

The company works closely with semiconductor manufacturers to ensure early tool support for new silicon platforms and automotive processors.

ESol and Quintauris partner on Risc-V integration

Embedded software developer ESol is working with Quintauris to expand software integration in Risc-V platforms.

The collaboration will focus on integrating ESol's real-time operating system into Quintauris' Risc-V platforms, enabling automotive systems that demand determinism, safety and software portability.

The partnership aims to accelerate the availability of production-ready Risc-V products for the automotive industry, where demand for scalable, energy-efficient compute platforms continues to grow. The goal is to provide OEMs and tier-one suppliers with a consistent foundation for developing applications such as adas, vehicle control and zonal architectures.

Quintauris and ESol intend to support future interoperability, optimise software integration workflows and provide a clear migration path for automotive developers.

Anritsu validates LG IVS Hybrid eCall

Anritsu has validated LG's in vehicle system (IVS) for Hybrid eCall operation, demonstrating conformance with the latest European EN 18052: 2025 standard.

The validated Hybrid eCall setup was demonstrated at the 5G Automotive Association (5GAA) event in Gothenburg last month.

This joint validation confirmed correct end-to-end operation of the eCall service chain across coexisting circuit-switched (2G and 3G) and packet-switched (4G and LTE IMS) networks, as specified for Hybrid eCall deployments. The results demonstrate that LG's IVS meets the functional and interoperability requirements defined for Hybrid eCall, supporting continuity of emergency services during network transitions.

Hybrid eCall is designed to ensure backwards compatibility with legacy circuit switched networks while enabling NG eCall over IP multimedia subsystem (IMS) in packet-switched networks.

As European regulations evolve to mandate NG eCall compatibility for new vehicle type approvals, verification of Hybrid eCall behaviour under mixed network conditions has become a necessary step to demonstrate readiness for regulatory compliance.

"Hybrid eCall places stringent requirements on end-to-end interoperability across heterogeneous network technologies," said Shinji Hoshino, general manager at Anritsu. "This validation with LG confirms the correct implementation of Hybrid eCall behaviour and supports conformance with the latest European eCall standards."

Kim Hong-doc, vice president at LG, added: "This validation demonstrates that LG's in-vehicle system is capable of supporting Hybrid eCall requirements as Europe transitions towards NG eCall. Collaborating with Anritsu enables us to verify end-to-end eCall performance in line with current European conformance expectations."

Anritsu has developed one-button test automation of complex standard-compliant tests, achieving reduced test times. In addition, even novice operators can test reliably and repeatably under identical conditions to achieve consistent test quality.

By improving overall operational efficiency, this supports all stages of in-vehicle system development through to verification and certification.

The European Union made NG eCall mandatory from this year, requiring compliance by automotive manufacturers. However, conventional eCall remains necessary in regions where 4G networks are not fully available.

As a result, Hybrid eCall, which switches between NG eCall and conventional eCall depending on network availability, has attracted increasing attention.



Demonstration at 5GAA event in Gothenburg

WeRide and Geely pick RoboSense lidar

RoboSense's EM4 thousand-beam-level and E1 solid-state digital lidars have been selected for the Robotaxi GXR, co-developed by WeRide and Geely subsidiary Farizon.

The fleet of robotaxis is scheduled to begin rolling off the production line later this year, with a planned delivery of 2000 units for domestic and international markets.

The GXR is equipped with the firm's eighth-generation autonomous driving suite, with at its core WeRide's self-developed Sensor Suite 8.0 (SS8.0), which includes RoboSense's EM4 as the main lidar, and the E1 blind-spot lidar to improve safety and reliability during operation.

Launched in early 2025, the EM4 is customisable with up to 2160 beams. With a detection range up to 600m, it helps the GXR identify hazards earlier, gaining over 70% more reaction time for decision-making in high-speed driving.

With a 120˚ by 90˚ field of view, the E1 is said to be the only mass-produced, automotive-grade solid-state digital lidar designed to eliminate near-field blind spots.

The EM4 and E1 setup provides a seamless blend of long-range precision and 360˚ near-field coverage.



Pony AI announced domain controller at Beijing Auto Show

Nvidia enables Pony AI L4 domain controller

Pony AI has announced its latest autonomous driving domain controller for its L4 autonomous driving platform and a broader set of applications across autonomous mobility.

Developed with Nvidia, the controller is built on the Nvidia Drive Hyperion platform and powered by Drive AGX Thor with NVLink, supporting Pony AI's next phase of commercialisation in robotaxis and its growing domain controller business.

The system is designed to deliver gains in AI computing performance and energy efficiency, and support for the latest AI models, while meeting core L4 requirements such as multi-sensor fusion, full-scenario perception and high-complexity scenario understanding.

It is also engineered to enhance safety redundancy, robustness and deployment flexibility.

Pony expects the platform to support a portfolio spanning multiple compute tiers and cooling, enabling deployment across a wide range of autonomous applications.

With flexible single-chip and multi-chip configurations, the platform is expected to incorporate Nvidia NVLink to enable high-speed, low-latency communication between the two Drive Thor SoCs, achieving a combined maximum computing performance of 4000 FP4 Tflops.

The platform builds on a long-standing collaboration between Pony and Nvidia that began in 2017. In 2022, Pony launched its in-house developed automotive-grade computing unit powered by single or multiple Drive AGX Orin SoC, which was deployed in its sixth-generation robotaxis. In 2025, the company began mass production of its L4 robotaxi domain controller equipped with four Drive AGX Orin SoCs. That controller now powers Pony's seventh-generation robotaxis and provides a foundation for scalable, fully driverless operations.

"Autonomous driving systems are rapidly increasing in complexity, driving the need for scalable, high-performance compute platforms," said Rishi Dhall, vice president at Nvidia.

As one of the few L4 autonomous driving companies globally with full-stack, in-house capabilities across software and hardware, Pony brings expertise in domain controller design. Its software-hardware co-design approach enables system-level optimisation across performance, safety and cost.

Over the past year, Pony has seen growing demand for its automotive-grade domain controllers across low-speed delivery, robo-sweeping, logistics, mining, autonomous shuttles and other robotics and mobility applications.

Shipments of its Fangzai domain controller in 2025 surged by more than 500% year over year.

The company aims to expand its robotaxi fleet to more than 3000 vehicles and its geographic footprint to more than 20 cities globally by the end of 2026.

TAIPEI AMPA
E-MOBILITY TAIWAN
AUTOTRONICS TAIPEI

TAIPEI TIME

Steve Rogerson reports from April's Autotronics show in Taiwan

Wanting vehicles to do so much more

Today's travellers expect mobility to be much smarter, more connected, more efficient and more responsive to their needs, according to James Huang, chairman of show organiser Taitra, as he opened the event.

"We want vehicles to do more than simply take us from here to there," he said. "We expect them to interact with drivers, connect with infrastructure, support sustainability and fit seamlessly into our daily lives."

He said mobility was being reshaped by electrification, digital transformation, connectivity and intelligence.

"Vehicles have become a platform for technology, data, energy management, entertainment and user experience," he said. "This is a revolution of industry; the entire supply chain is being rewritten. Business models are changing. And that is why mobility is being redefined; we are the ones defining it."



Cynthia Kiang: "We are promoting AI digital transformation."



Jerry Hsu: "Transitioning into a new era."

Taitra is the Taiwan External Trade Development Council and it said the show was expected to generate US$338m in follow-on business opportunities.

Huang was joined at the opening ceremony by Jerry Hsu, vice chairman of Teema, the Taiwan Electrical & Electronic Manufacturers' Association. He said the global automotive industry was undergoing the most profound transformation in a century.

"Artificial intelligence is moving from the cloud into the vehicle cabin, and from software into the chassis," he said. "Vehicles are no longer just means of transportation, but are evolving into intelligent mobile computing platforms integrating AI, communications and energy management."

The industry, he said, was also transitioning from the traditional CASE framework – connected, autonomous, shared and electric – into a new era driven by AI.

"Future competition will no longer be defined by horsepower, but by computing power, software capabilities, data and governance," said Hsu. "Software-defined vehicles, autonomous driving, automotive semiconductors, 6G communications and AI regulations are collectively reshaping the global supply chain landscape."

He said Taiwan possessed one of the world's most comprehensive ecosystems in semiconductors, ICT and automotive electronics integration, from chip manufacturing, communication modules and sensors, to power management, thermal, PCBs and further to complete vehicle platforms and smart cockpits.

"Taiwan is no longer just a component supplier, but is steadily becoming a key technology provider in the AI-driven automotive ecosystem," he said. "Looking ahead, our challenge is to build on our hardware strengths by strengthening software development, system integration and AI governance capabilities, ensuring sustained global competitiveness."

Cynthia Kiang, deputy minister at Taiwan's Ministry of Economic Affairs, said Taiwan's ability to respond quickly to needs was why the country was demonstrating strong growth at a time of international uncertainty.

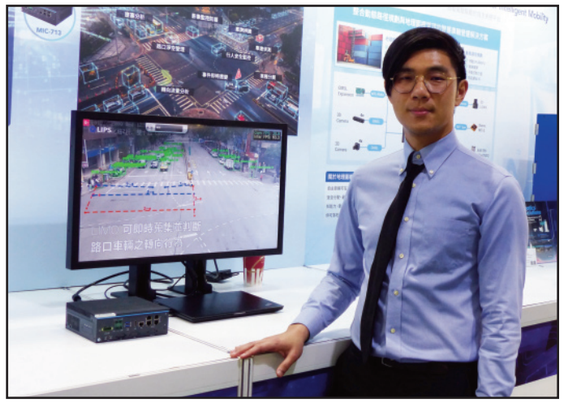
"This is why we maintain our position in the global supply chain," she said. "We have a firm foothold in the global smart mobility market."

She added that the government continued to stand with industry with a focus on AI initiatives.

"We are promoting AI digital transformation and transforming cars into intelligent mobility platforms," she said. "We want to enable more Taiwanese companies to grow internationally."



James Huang: "This is a revolution of industry."



Marco Shay: "Everything is based in IoT"

Advantech focuses on public transport

Advantech showed smart transportation and green commercial fleet products developed with the global mobility ecosystem.

At the core is its rugged in-vehicle edge AI platform, integrated with an Nvidia Jetson processor, lidar, camera sensing and AI software.

These products support commercial fleet scenarios, helping improve driving safety and operational efficiency.

"We try to help each industry with digitisation," said Marco Shay, senior sales engineer at Advantech. "We hep with factory automation and transportation, and we have a focus on public transport."

Shay said this was part of the company's mission to build an IoT infrastructure that controls sensors, temperature monitors, cameras, lidar and so on.

The second element of this infrastructure is the communications through routers, wifi and telematics. And the third part is the computing power.

"All these data have to be computed to be useful," he said. "Everything is based in the IoT world."

An example is a passenger information system for buses. This uses GPS to show where the bus is and is going. Telematics transmits those data and then processors calculate wait times for the screens at the bus stops.

Advantech says it draws from its industrial expertise to address various problems in public transportation with products for control centres, parking facilities, buses, bus stations and roadside infrastructure.

Mindtronic AI keeps driver focus on road

Mindtronic AI wants to make sure drivers stay focused on the road ahead and as such produced the Horusee Copilot that unifies driver attention and road perception into one system.

It analyses where the driver is looking and how alert they are. At the same time, it looks at objects around the car, including other vehicles, so the system can spot unseen risks and respond accordingly.

It is integrated into a rear-view mirror with hidden under-glass camera and infra-red illumination.

"It can track the driver and know what they are looking at," said Sharon Jiang, CEO of Mindtronic AI. "It can see if there is a problem."

The mirror form factor enables plug-and-play installation across different vehicle platforms.

Automatic software calibration is independent of mirror position adjustment.

Driver monitoring, occupant monitoring, gaze tracking and road-facing adas inputs are combined on a shared ECU to see what the driver is looking at and provide alerts if necessary.

Jiang said the company was working with OEMs in Europe and India.

"We do all the cybersecurity and functional safety work," she added.

The automotive-grade product can operate in temperatures from -40 to +85°C, and handle secure over-the-air updates.



Sharon Jiang: "It can see if there is a problem."



Kevin Lee demonstrates forklift system

Chimei catches bus with AI vision

Chimei Motor Electronics was showing an AI vision system for electric buses, covering blind-spot information, moving off information, camera monitoring, intelligent video analytics and driver monitoring, effectively addressing blind spots caused by the inner wheel path of large buses.

"This works as part of an adas for detecting around the vehicle," said Kevin Lee, Chimei Motor commercial director. "There are no traditional mirrors. It uses cameras."

An electric commercial truck system developed with Kudo integrates L2+ adas, blind-spot information, mini LED camera monitoring and front intelligent video analytics to enhance energy efficiency and driving safety for logistics fleets.

The third major product on show was the ICam270 for forklifts. This is said to be the market's first industrial AI detection system, capable of achieving 270° wide-angle image recognition and foreign object alerts with a single camera.

With a simple design architecture and IP69K waterproof rating, it can improve warehouse operation safety.

"We are redefining safety with AI," said Lee.

He said the truck system was not yet available but the ones for buses and forklifts were.

Founded in 2013, Chimei has in-house capabilities in AI algorithm development, optical design and automotive-grade hardware engineering. Its products have entered Europe, USA, Japan and Taiwan.

It fine-tunes its AI recognition models based on local road conditions.

Taiwan well placed to handle mobility shift

Mobility is more than moving people and goods from one place to another, according to Joe Chou, executive vice president at Taitra.

"Today, it is about intelligence," he said as he opened the show's 360° Mobility Forum.

Success, he said, was not just about technology but having a long-term perspective.

"Here, Taiwan has a strong foundation to support the next generation of electric and automated mobility," he said.

Bobby McCurdy, vice president of the Intelligent Transportation Society of America, agreed.

"We have to look at how technology improves overall performance," he said. "Taiwanese companies are well positioned to help with this."

He said Taiwanese firms were essential for the global supply of semiconductors and connectivity modules, and they were major contributors in helping transportation networks function.

However, he warned those exporting to the USA that this was not a simple market but a highly decentralised one. While the US Department of Transport sets directions and allocates funding, the individual states have flexibility in how the funds are spent and how much of that money goes on technology.

"Conversations happen at the state level on how much is spent on technology," he said.

He said overseas companies often misunderstood this aspect. Instead of focussing on the technology itself, it is best to focus on outcomes.

"They want to see measurable improvements," he said. "When local agencies invest in technology, they need to show it affects outcomes."

Here, he said, AI was playing a pivotal role in showing where technology could have an operational impact.

The other issue was the growing emphasis led by the current government on not trusting technology that was not made in America.

"There is concern not just about the technology but where it comes from," he said. "The main business models should thus include American companies. There are also restrictions on high-risk suppliers in connected systems."

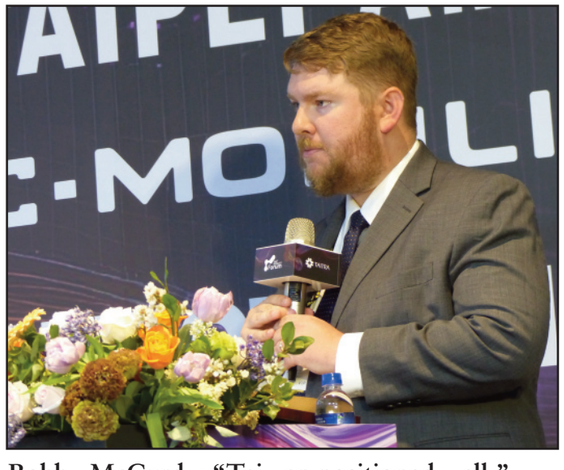
He emphasised though that Taiwan was not the target of these restrictions.

"Taiwanese firms are positioned well in this environment," he said, "but they have to show cybersecurity compliance. Taiwan is already doing this and is well positioned to take advantage of this policy shift. Taiwan has strengths in the technology that transportation systems rely on."



Joe Chou: "Taiwan has a strong foundation."

Raed Kadri, head of the Ontario Vehicle Innovation Network, added: "Technology has become central for making transportation safer and more efficient, and driving profitability."



Bobby McCurdy: "Taiwan positioned well."



Raed Kadri: "Technology has become central."

Bringing value to EV charging

Fortune Electric Value was the first major heavy electrical equipment company in Taiwan to enter successfully the EV charging equipment supply chain.

This showed how a traditional power equipment company could leverage its core strengths in electrical infrastructure and system integration to support the fast-growing electric mobility market.

In 2015, the company launched its EValue brand, through which the company integrated internal group resources related to electric vehicles and began offering a full range of EV charging products and services.

"We now have 720 charging stations across Taiwan," said Esther Wang, EValue team leader. "We have more than 150,000 members."

On top of this, the company works with partners such as Seven-Eleven and Ikea, which sell its products.

"We make the products ourselves and work closely with car manufacturers," said Wang. "These include Kia, BMW, Mercedes-Benz and Rolls Royce, and Luxgen in Taiwan."

Its portfolio includes charging stations for electric cars and electric scooters, high-efficiency charging equipment, charging and battery-swapping systems for electric buses, and an intelligent cloud-based charging station management platform.



Esther Wang: "We position ourselves as the gas station for the future."

These demonstrate the company's ability not only to provide hardware, but also to offer integrated systems for different mobility applications.

In 2016, the company established a dedicated vehicle service centre to address the needs of EV owners. It also introduced home charger site survey and installation services, providing professional support in charger installation, electrical route planning and construction work across Taiwan.

This means the company is not just selling equipment, but also building a complete service ecosystem for EV users.

"Electric vehicles is the trend for the future," said Wang. "We position ourselves as the gas station for the future."

The company works with real-estate agents and government bodies to spread its charging network and says its EV charging app is the most used in Taiwan. It also produces a 640kW hypercharger for electric buses, highway rest areas, parking lots and business fleets.

Tier-ones test Actron power modules

Actron Technology has automotive grade power modules going through validation testing by Taiwanese tier-one suppliers.

The firm was showing its ATS SiC mosfets and AEP SiC and IGBT units.

"These are not in vehicles yet," said Roger Huang, business development manager at Actron Technology. "It is hard to say when that will change."

He said the market was moving towards smaller modules and that the firm's production line was ready for when that happened.

"That will probably be the first half of next year when we complete validation," he said.



Roger Huang: "These are not in vehicles yet."

Mini LEDs make displays easier to read

Springteq is focussing on mini-LED technology to make head-up displays (HUDs) easier to read.

"Traditionally, in high brightness you can't see the display," said Ted Pan, general manager at the 18-year-old company. "But with our technology, you can turn different areas on and off."

The technology makes dark areas darker and light areas brighter to improve contrast and make the images clearer even in bright sunlight.

This also works on conventional backlit displays where it can the turn the backlight on and off in different areas.

"You turn off the backlight on the areas you want you see," said Pan. "With local dimming, you can highlight the areas you need. You input the video stream and it calculates which of the small zones across the screens it needs to work on. It detects which areas need to be turned on or dimmed, and it does this very fast."

This he said meant you could have a very strong panel with good contrast, suitable for motorcycles, one of the firm's target markets.

"It can be used for in-car displays or any display under heavy sunlight," he said. "It is very important for HUDs to improve the contrast on the windscreen."

The company sells the displays both to OEMs and the aftermarket. Customers include Isuzu and Nissan.

"For the aftermarket, we sell to end users and dealers," said Pan. "They can install it themselves."



Ted Pan

Old outside, new inside



To demonstrate how modern electric vehicle technology is not limited by the vehicle shape, Clientron has built a replica of a 1932 Ford and fitted it with the latest technologies

"We have shown how we can take an old car and bring it up to date," said Jansen Chang (pictured), manager of Clientron's automotive sales division.

And the car is no slouch, with a top speed of 120km/h. It has a 70kW motor, maximum torque of 160N-m, battery capacity of 42.3kWh and 354.2V battery voltage.

The body itself was built by a partner but Clientron fitted it with an electric motor, batteries, electronic control unit, display and other technologies to make it a modern vehicle under the bonnet.

The car was initially built for a project in Indonesia and Chang expects it to be exported to a customer soon.

For the future, the company is planning on entering the drone market.

Foxconn pushes made and designed in Taiwan philosophy

Few companies can illustrate more the made and designed in Taiwan philosophy than electronics giant Hon-Hai Technology, better known as Foxconn.



James Wu

The massive and sometimes controversial electronics manufacturer is now making a name for itself in vehicle manufacturing.

Its open platform model means Foxconn itself does not act as a car brand but allows other makers to make their own vehicles using the Foxconn platform.

"We don't do our own brand," said James Wu, Foxconn vice president. "We help our customers make their cars. We have nine different models that use our vertical integration capability."

In Taiwan, for example is Foxtron, a joint venture between Foxconn and Yulon Group, founded in 2020. This marked Foxconn's move from being a component maker to becoming a car manufacturer.

Others using the Foxconn platform include Mitsubishi, which will be launching a model based on the platform in New Zealand and Australia later this year.

Japanese commercial car company Fuso, these days owned by Archion, is also using Foxconn models.

"Most of our cars are designed in Taiwan," said Wu. "And most of the components also come from Taiwan. Taiwanese companies are very good at making components for electric vehicles. We can leverage our capabilities with electric devices. One hundred per cent of the major components are designed in Taiwan."

The Foxconn stand highlighted the company's vertical integration capabilities in electric vehicles, from key components, batteries, electric drive systems and automotive semiconductors to vehicle platforms and in-vehicle applications.

Foxconn's strengths lie in in-house R&D, system integration, local supply chain development and mass-production.

Highlights included Bria and the North American version of Model C, both developed by Foxtron.

The pavilion also featured self-developed LFP battery cells, battery packs and energy storage systems, along with technologies such as integrated e-powertrains, SiC and IGBT power modules, mosfets, and in-vehicle infotainment.

Chinese companies denied entry permits

The increasing tensions between China and Taiwan were unmissably visible at the show as rows and rows of stands due to be occupied by Chinese companies stood empty.

This followed the Taiwanese government denying entry permits to representatives from the Chinese firms in the days before the show.

Around 100 stands still bore the names of the Chinese companies that were meant to have been there. Some even had boxes of packaged good with nobody to open them.

The delegates mostly expected to arrive the day before the show but hit a snag with visa arrangements and were thus blocked from entering.

Show organiser Taitra was understandably trying to stay neutral and merely said that some of the Chinese companies were unable to get entry permits in time.

The handful of Chinese stands that were occupied were staffed with people from Taiwan or other countries.



Empty Chinese stands at the exhibition



Wayne Chen: "It provides a third eye for the vehicle."

E-Lead drone checks vehicle surroundings

E-Lead Electronic has developed a vehicle-mounted drone for large commercial vehicles, where blind spots remain a major safety problem during reversing, turning and docking.

The drone uses a smart rooftop docking station, allowing it to take off with one-touch operation from inside the vehicle. Once airborne, it provides a real-time aerial bird's-eye view of the vehicle's surroundings.

"It provides a third eye for the vehicle," said Wayne Chen, sales account manager at E-Lead.

This is particularly valuable for lorries and other large vehicles, where conventional mirrors and cameras may still leave critical blind zones. By adding an aerial perspective, it helps drivers understand the surrounding environment quickly and clearly, improving driving safety and operational efficiency.

"Cars can have various cameras that can be merged into one image," said Chen. "For trucks, that would mean a lot of cameras. This drone solves that. And the weight of the drone is so small it can be flown anywhere, meeting regulations in the USA and Europe. And when it is tethered, the drone becomes part of the vehicle so it doesn't need a separate licence."

Its tethered design helps ensure stable operation and safe recovery of the drone.

AI guides the drone into the right position for whatever view the driver wants.

"The drone will fly to the right position and height with just one button push from the driver," said Chen. "It can also be used to see what is happening in the road ahead in, say, a traffic jam."

The drone's AI camera can detect objects around the vehicle.

The drone, however, is not yet in production.

"It was going to be this year, but it will take longer," admitted Chen. "We have to work with car makers as it attaches to the vehicle. Maybe 2028."

The firm has built ten to twenty drones for internal testing.

Applications include logistics fleets, port operations and off-road vehicles, where drivers often need to navigate complex and high-risk environments. In these scenarios, the ability to obtain an instant overhead view can reduce accident risk and support faster decision-making.

Founded in 1983, E-Lead has built expertise in head-up displays, driver safety systems, rear-seat infotainment and charging-related automotive accessories.

Velox shows smart motorbike dashboard

Velox Smart was showing its intelligent dashboard for motorcycles.

It enables navigation through Google Maps by connecting to the rider's mobile phone.

Via mm-wave radar, it can detect vehicles around the bike and behind. And it can act as a digital video recorder.

If it gets lost or is stolen, it can be tracked using Apple and SmartThings find-my-device features.

Bluetooth connectivity allows for tyre pressure monitoring and for displaying phone messages on the sunlight-readable display. The user can also use a mobile phone to change the look of the interface.

The dashboard can be updated over the air via wifi.

"AI is getting popular so we are also planning an AI feature for the dashboard," said James Lin, general manager at Velox Smart. "The goal is to have a voice interface for activities such as route planning. You could ask it to find a restaurant and it could ask you what type of food you want, and then suggest and guide you to nearby options."

For cellular connection, it is using 4G.

"With 5G, it has to be higher power consumption, so we are sticking with 4G," said Lin.

The company has manufacturing facilities in Kaohsiung in Taiwan and Zhejiang in China.



James Lin: "AI is getting popular."



Innolux sets vision following Pioneer acquisition

Following its acquisition of Pioneer in December 2025, Innolux through its CarUX brand presented a unified vision for the future of the in-scar user experience.

CarUX has a fully integrated in-cabin simulation, demonstrating how audio and visual systems can work together seamlessly for every seat in the vehicle. This setup is built on an automotive hardware and software platform designed to deliver fast and scalable integration for OEMs of any size.

The simulation highlights how meaningful information can be surfaced clearly and intuitively, despite the limited surfaces available in modern vehicle interiors.

Innolux CEO Jin-Yang (Jim) Hung said this represented the firm's vision for the future in-car user experience, where drivers and passengers received the information they needed through the smart, efficient use of space.

"We acquired Pioneer for the talent pool," said Hung. "They have software engineers. They have people who can create the whole ecosystem."

Acquiring Pioneer gave Innolux a strong manufacturing and R&D base in Japan.

By bringing together CarUX's display and interface expertise with Pioneer's audio and sensing capabilities, the companies say they have unlocked a new level of integration between sound and vision. Their joint platform connects actuators, sensors, shared processing power and software into one cohesive system.

Hung admitted that Innolux was in a very bad place a few years ago when a $2bn profit in 2018 turned into a $17bn loss in 2019.

This led to a range of cost-cutting measures including the selling and closing down of fabs.

"There is only one goal," said Hung, "and that is to increase RoE for the shareholders. We are looking for the most optimal product mix."

The company, he said, was moving from being a tier-two supplier to a tier-one.

"This is very different," he said. "Tier-twos get just the specification and complete on price. As a tier-one, you are in discussions about all that goes on in the cockpit. Things like how to handle complex situations."

He said the company now saw itself as a global smart cockpit provider.



Jim Hung

ON THE RADAR



Rogerio Almeida and Gerold Dhanabalan explain how to achieve 4D radar imaging with a single-chip, eight-by-eight cascadable transceiver

A single-chip, eight-by-eight radar transceiver can enable 4D imaging radar for autonomous vehicles. Such radar adds vertical angle measurement to detect object height, improving accuracy in adas.

These devices also support satellite radar architectures where distributed sensors stream raw data to a central processor for simplified system design and more comprehensive radar coverage of the vehicle.

Unlocking the potential of autonomous driving features requires that adas can reliably gather highly detailed, streaming environmental data, including proximity to other objects, the types of objects (other cars, people, obstacles) around and in front of the car, and how fast the car is moving.

Radar continues to be a foundational technology that enables adas to perceive and react better to a vehicle's surroundings, especially in adverse weather conditions that limit both a driver's visual acuity as well as the accuracy of vision- and light-based sensors.

Innovations in radar technology such as 4D imaging radar, which enables high-resolution sensing while adding vertical angle measurement, along with satellite radar configurations, are accelerating industry progress to higher levels of vehicle autonomy.

These innovations and the single-chip radar transceivers that enable them are simplifying implementations of comprehensive, high-resolution radar sensing for better accuracy when tracking and discerning nearby or approaching objects.

4D radar

Automotive radar systems typically use short- and medium-range radar sensors at the front and rear corners of a vehicle for blind-spot detection, lane-keeping assistance, and front and rear cross-traffic alerts. Long-range radar sensors at the front of the vehicle handle autonomous emergency braking and adaptive cruise control. 4D imaging radar extends the capabilities of 3D radar (shown in Table 1) by adding vertical angle measurements, allowing vehicles to detect the height of structures such as bridges and tunnels.

When combined with distance, horizontal location and velocity data, adas features can detect objects and distinguish between road debris, obstacles, vehicles, road surface, pedestrians or even a person crouched next to a vehicle changing a tyre. These sensing capabilities create a high-resolution visualisation of objects around a vehicle.

Along with extending the range of object detection, 4D imaging radar also improves accuracy. Unlike lidar or cameras, 4D imaging radar relies on echolocation, which uses radio waves to determine the location, speed and shape of objects to monitor environmental and vehicle conditions. Because radio waves have longer wavelengths that can penetrate through particles such as rain, fog and dust, 4D imaging radar has better performance than lidar or cameras in adverse conditions with poor visibility.

4D imaging radar obtains data from a multiple-input, multiple-output (mimo) antenna array that facilitates high-resolution mapping. With many antennas transmitting signals to targets within the surrounding

environment and receiving signals reflected by those targets, the antenna array generates point-cloud data that translate to improved environmental modelling and object classification.

Design

Implementing 4D imaging radar presents significant challenges for automotive OEMs. Traditional radar systems often require cascading multiple chips to achieve the necessary antenna array size and channel count for high-resolution imaging, increasing system complexity, power consumption and cost. This integration also requires more thermal management and larger PCB footprints, complicating vehicle design and manufacturing.

For example, implementing an eight-by-eight configuration with four-by-four transceivers would require two cascaded four-by-four transceivers along with PMICs, additional peripherals and a larger board to route the two ICs. This increases overall complexity, power consumption and cost.

A single-chip transceiver can enable this configuration by itself while also allowing for scalability up to 32-by-32 with only four eight-by-eight devices cascaded together, significantly reducing system complexity.

Table 1: Core functions of traditional automotive radar systems

Function	Description
Distance measurement	Enables safe following distances through range measurements
Velocity detection	Uses the Doppler shift to track the relative speed of moving objects
Angular resolution	Determines the relative location of objects
Multiobject tracking	Supports the simultaneous tracking of vehicles, pedestrians and cyclists

Fig. 1 shows how such transceivers can be cascaded from an eight-by-eight configuration to 16-by-16, 24-by-24 and 32-by-32 configurations. This high level of scalability enables tier-one automotive suppliers and OEMs to meet consumer demand for improved functionality and greater autonomy.

Cascading these devices helps designers achieve even higher performance and more accurate long-range object detection at more than 350m (as shown in Fig. 2), while also providing a scalable development path, from cost-effective stand-alone implementations to premium radar systems.

Architectures

To support sophisticated adas features, automotive radar is evolving from traditional edge radar architecture, where data are processed at each sensor, to satellite radar architecture, where radar transceivers around the vehicle provide raw data for processing by a central ECU.

Through the distributed configuration of satellite architecture, the central ECU can more easily build a comprehensive environmental view, reducing coverage gaps rather than processing those data at the edge, as in a traditional edge radar configuration.

In a satellite architecture, the central ECU reduces latency through its high use of computing resources, allowing the vehicle to respond faster to sensor data.

Modern sensor integration is increasingly using AI and machine-learning frameworks to combine data from multiple input sources such as imaging systems and radar sensors to enhance system performance through minimally processed or raw sensor inputs. Transmitting unfiltered data streams to the CPU creates opportunities for software-based product differentiation across vehicle fleets and operational adaptability that is unattainable with traditional architectures.

The transceiver discussed here supports both architectures and was designed to integrate with an ecosystem of leading processors,

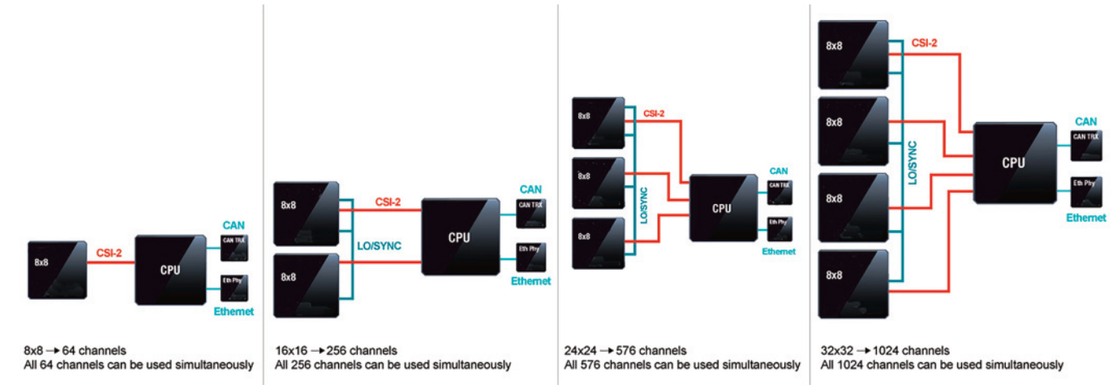


Fig. 1: Cascadable configurations from eight-by-eight to 32-by-32 with 4D radar transceivers

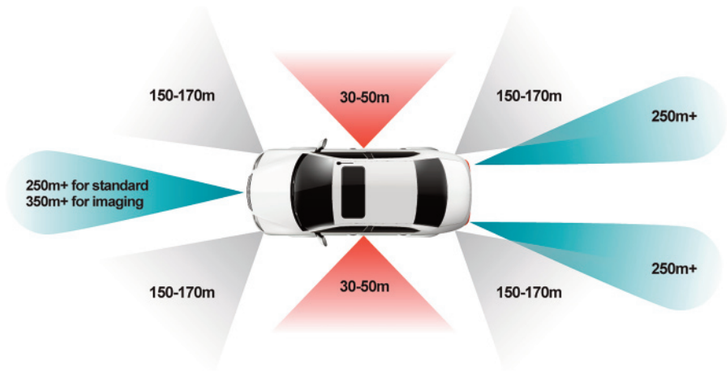


Fig. 2: 4D imaging radar improves coverage

helping designers more easily adopt satellite radar as they design for higher levels of autonomy.

Fig. 3 is a block diagram of a satellite architecture using these sensors.

Conclusion

By enhancing the view of the world around the vehicle, it is possible to take another step towards a future of more responsive, safer and autonomous driving experiences. To understand surroundings better, modern vehicles use a combination of sensing modalities to empower adas features.

4D imaging radar transceivers provide the RF performance, channel count and cascadability needed to support the evolution from edge to satellite radar applications.

Rogerio Almeida and Gerold Dhanabalan work for Texas Instruments

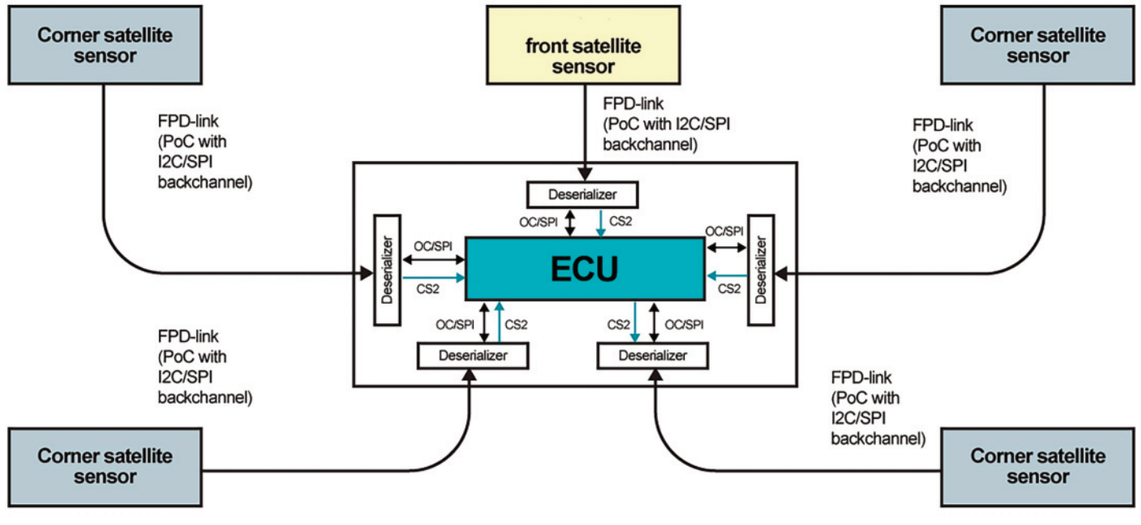


Fig. 3: Block diagram of satellite radar architecture

RESEARCH

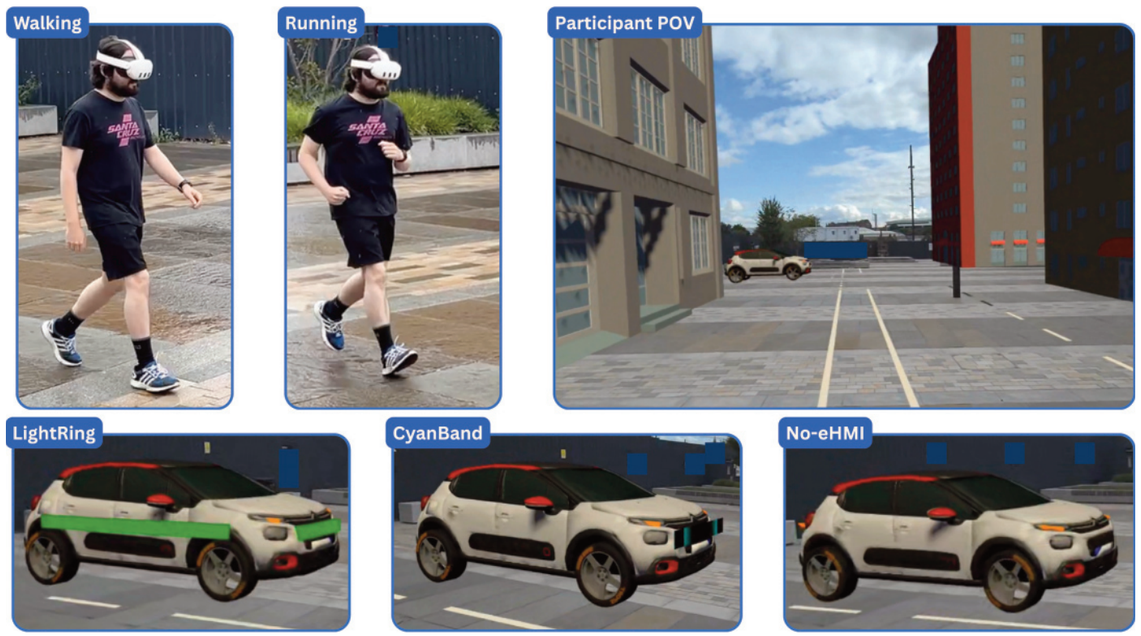
RUNNING INTO TROUBLE



Researchers have found runners behave differently than walkers when interacting with autonomous vehicles

Image by Mircea Iancu from Pixabay

Vehicle Electronics



Types of bands considered by the study

A study on how runners may choose to interact with self-driving cars is challenging assumptions on how automated vehicles will navigate safely on the roads of the future.

Researchers at the University of Glasgow and the Korea Advanced Institute of Science & Technology (Kaist) in South Korea led the study, which used augmented reality technology to explore for the first time how runners' behaviour differs from walkers when they are crossing roads and junctions.

Their research revealed that runners are much more likely to take risks when negotiating traffic than walkers. During the study, the runners often took less time to process the road conditions around them and sometimes chose to run ahead of oncoming cars to maintain their target pace. On several occasions, they were struck by virtual vehicles in the team's simulated road tests.

The team's findings could help develop better safety systems for automated vehicles, or AVs, which have largely been trained to expect the people around them to behave much more cautiously while walking.

Suggestion

The team suggests that displays of lights on the exteriors of cars called external human-machine interfaces, or eHMIs, could enable them to communicate their intentions more quickly and effectively.

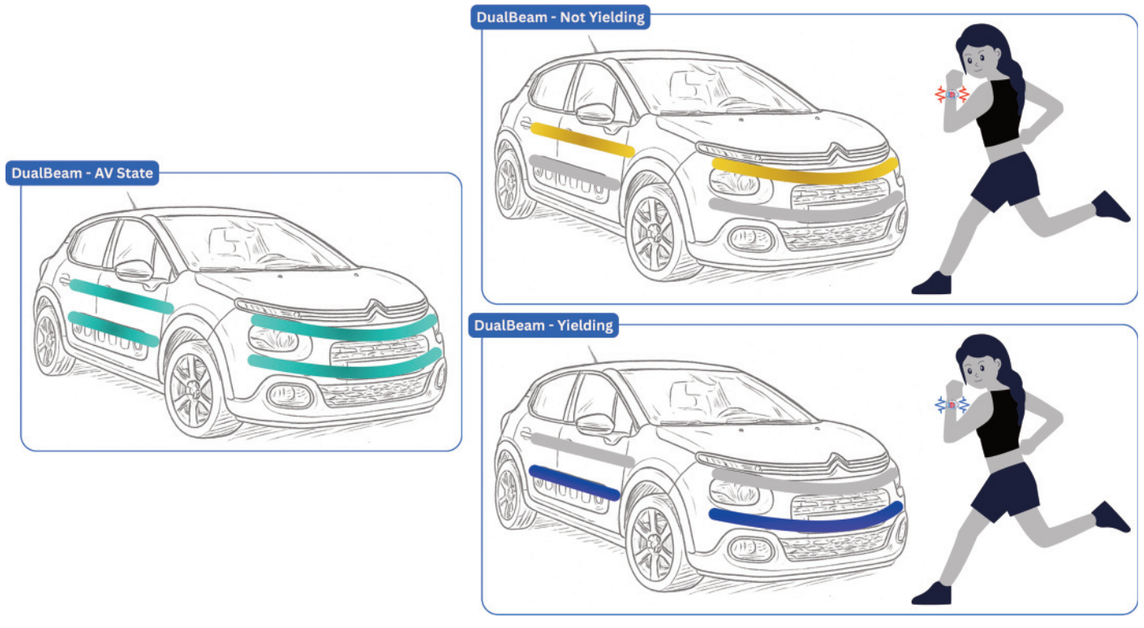
Well-designed eHMIs could replace the usual non-verbal cues such as waves, eye movements and deceleration, which human drivers currently use to show people around them how they intend to proceed. Based on their research, the team suggest an eHMI design called dual beam, which uses new types of lights on the vehicle to help runners make swift but well-informed crossing decisions.



Runner and simulated points of view

Professor

"In our research group, we've been working for several years now on developing eHMIs which could help self-driving cars share the roads safely with vulnerable road users such as cyclists," said Stephen Brewster, a professor at the University of Glasgow's School of Computing Science. "In doing so, we realised that there's been very little research into how runners might expect to interact with driverless cars. That's surprising on a couple of levels. One is that running is the most popular physical activity in the world, with more than 600 million



Proposed states for dual beam system



Proposed states for light ring and cyan band systems

people estimated to run recreationally. The other is that self-driving car journeys are booming, with a million AV trips a month in the USA alone. Clearly, it will be increasingly important to ensure that runners and AVs can share the roads safely in the years to come. We were keen to explore how self-driving cars could use eHMIs to speak the language of runners as well as bike riders to help maximise road safety."

Interaction

To test how walkers and runners might interact and communicate with self-driving cars, the team used an augmented-reality headset to mix real-world conditions with a life-size simulated AV. The virtual environment enabled them to test safely how self-driving cars might behave around runners and walkers in the future.

The study's 24 participants went outdoors wearing the headset, which showed them a virtual urban environment overlaid on the real world. The participants either walked or ran towards a junction with a simulated AV approaching.

The simulated car had either no safety features displayed on its exterior, or one of two eHMIs. One eHMI, a ring of lights around the car the team called a light ring, showed green to indicate it was safe for the participant to continue or red to help them decide to stop. The other, a strip of animated cyan lights called cyan band, swept the lights inward to show it was slowing and in the opposite direction to display acceleration. Sometimes the car stopped for the participants, and sometimes it did not.

Although both runners and walkers reported they found it easier to determine the car's intentions if it used an eHMI, the differences between their behaviour in all cases was striking.

When walking, participants had time to slow down or stop and verify the eHMI signals with the vehicle's driving or braking behaviour. This increased their trust in the AV's intentions and allowed them to make safe and informed crossing decisions.

In contrast, when running, participants felt more motivated to cross to maintain exercise. They were unlikely to slow down or stop when approaching the crossing.

This gave them less time to make informed decisions, resulting in an overreliance on the display, riskier crossing decisions and a lack of trust on the AV's intentions.

Struggle

The runners struggled to process the animation of the cyan band lights in the limited time they had to focus on them while approaching the junction, while walkers found it useful. The light ring display's simple red-and-green colour scheme, on the other hand, was much more immediately legible to both groups.

Runners also collided with the vehicle three times during the study, while walkers avoided any contact with the cars. In two of the collisions, the runners saw a red light but chose to run ahead anyway, misjudging the vehicle's pace and causing a simulated collision.

Crossing

Ammar Al-Taie is one of the paper's corresponding authors. He worked on the research at the University of Glasgow before moving to Kaist in South Korea, where he is now based.

"I'm a runner myself," he said, "and I've noticed that crossing roads while running feels different than when I'm walking. I'm much more motivated to keep moving because slowing to let a car pass and accelerating again takes a real physical effort. Paired with that is an increased mental effort of trying to process what's around me as I'm running, and judging whether it's safe for me to keep going at my current pace."

In this study, he found evidence to suggest these were common feelings for runners.

"They do seem more tolerant of risk if it helps them keep moving," he said. "That makes them a riskier class of road user for self-driving cars to deal with, and suggests that more needs to be done to test self-driving cars with runners as well as walkers, and to find new ways to facilitate communication between cars and people."

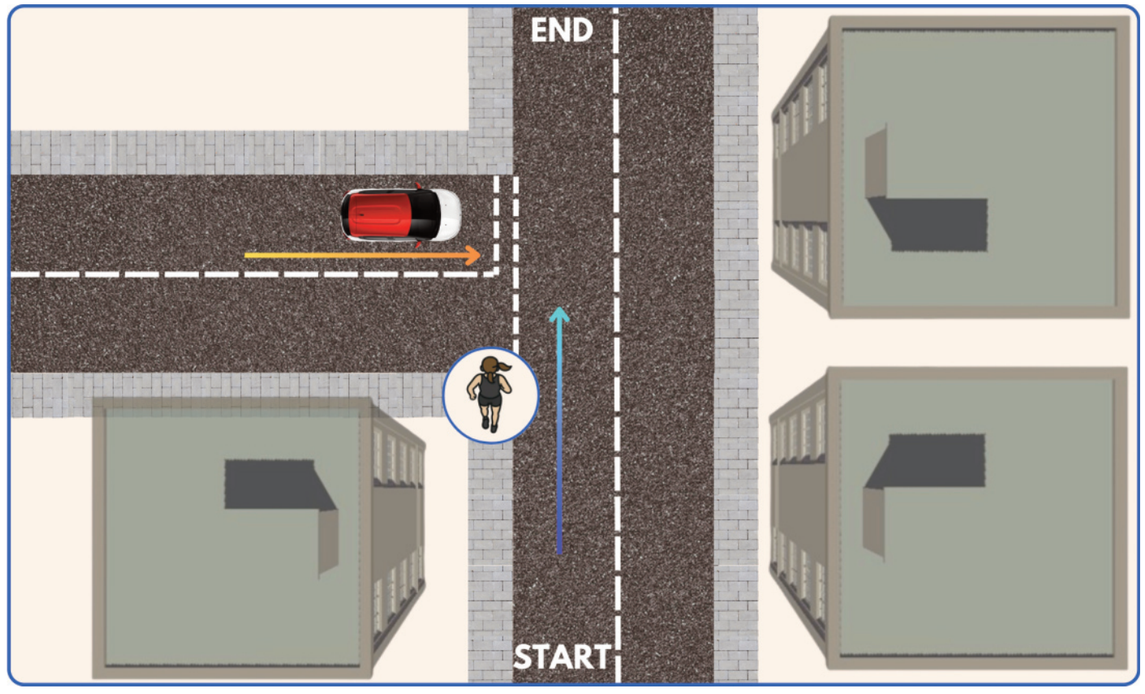
Proposal

In the paper, the team propose adapting their findings into a new eHMI called dual beam, which places two rows of lights around each side of the car with colours chosen to be quickly understandable but avoiding the over-familiarity of red and green. Instead, an amber ring would signify the car does not intend to yield, while a purple one would show that the car intends to let the runner pass safely.

Warning

The team also propose that dual beam could integrate an early-warning system which would send vibration or sound alerts to runners' smart watches or earbuds to highlight an approaching AV, enabling them to better assess risk without breaking stride.

The team's paper, titled "Running into traffic: Investigating external human-machine interfaces for automated vehicle-runner interaction", was presented at the CHI conference in Barcelona in April.



Typical scene of runner approaching junction

SPI boost controller meets headlight requirements

An automotive-compliant multi-phase SPI boost controller from Diodes is designed to meet the power density, efficiency, EMI and functional safety requirements of headlight control units.

The AL8859Q serves as the primary constant-voltage pre-stage for adaptive front lighting, including high beams, low beams, daytime running lights, turn indicators, fog lights and cornering lights, as one integrated module.



The device integrates a current-mode multi-phase boost architecture with a 4.5 to 60V input voltage, enabling operation across standard 5, 12, 24 and 48V supply rails. It also improves output voltage tolerance under load dump and transient conditions through programmable registers.

One device supports two phases; scaling to three or four phases requires synchronising devices. This makes it suitable for 100 to 400W output power with a balanced thermal distribution, low ripple current and system efficiency of around 95%, while reducing external component stress by using the firm's automotive-compliant discrete components, including mosfets, SBRs and TVS diodes.

The SPI digital interface programmes the register map to control output voltage, switching frequency, current limits and protection thresholds. Such software programming, flexibility and reconfiguration allow for a single hardware platform design to be adapted across multiple vehicle applications.

Integrated one-time programmable memory enables production line configuration and fail-safe or stand-alone operation, reducing MCU dependency and making system operation more robust.

Diagnostics include thermal warning and shutdown, over- and under-voltage protection, current limiting, SPI error detection, and VDrive monitoring. This enables continuous system status reporting and facilitates functional safety-capable compliance.

Spread-spectrum frequency modulation eases compliance with Cispr 25 class-five EMI requirements, reducing the need for bulky external filtering and lowering costs.

Voltage accuracy is ±0.5% at 50V typical, ensuring a stable supply for downstream LED drivers with high current accuracy. This improves light consistency and reliability across operating conditions.

Housed in a wettable flank V-QFN4040-24/-SWP package measuring 4 by 4mm, the device optimises PCB space while enabling automated optical inspection.

Boards evaluate GaN inverter architectures

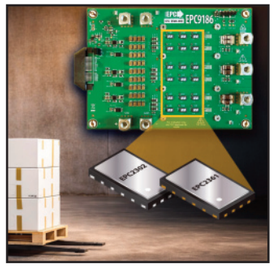
Two three-phase BLDC motor drive inverter platforms from EPC are for use in light electric vehicles, electric scooters, forklifts and battery-powered mobility systems as well as other industrial applications.

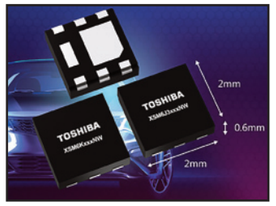
Supporting motor drive systems up to 5kW, the 9186HC2 and 9186HC3 evaluation boards let engineers evaluate compact, high-efficiency inverter architectures based on 100V EPC2361 eGaN fet technology.

They are based on the EPC9186 platform and have the same hardware architecture.

The power stage is made up of EPC2361 GaN devices that improve conduction performance and allow for higher-current and lower cost operation in motion-control environments.

The 9186HC2 integrates two eGaN fets in parallel per switch position, while the 9186HC3 uses three devices in parallel, reducing equivalent on-resistance and improving efficiency at higher load currents.





Five mosfets

Five AEC-Q101 automotive mosfets from Toshiba combine space-saving with easy mounting.

The n-channel XSM6-K361NW, K519NW, K376NW and K336NW and p-channel J372NW are housed in the DFN2020B package with a wettable flank structure.

This improves the visibility of the solder fillet, enabling confirmation of joint quality using automated optical inspection.

In solder joint mounting shear strength tests, the package demonstrates 23% more strength than Toshiba's existing sot23F.

With a typical size of 2.0 by 2.0 by 0.6mm, the package reduces mounting area by 43% and package height 25% compared with the sot23F's 2.4 by 2.9 by 0.8mm.

The K361NW has a maximum power dissipation of 1.84W, which is about 1.5 times higher than the 1.2W of the existing SSM3K361R with a sot23F package.

This supports compact equipment with high-power mosfets, such as DC-DC converters for ECUs and load switches for LED headlamps.

Sensor checks three axes in one device

Combining sensing for three axes in a single digital device, a wide-bandwidth vibration sensor from ST Microelectronics can cut bill-of-materials costs in industrial and automotive condition-monitoring applications.

The IIS3DWBG1 is suitable for use where sensor placement and mounting govern measurement accuracy. Its dimensions and operating-temperature range of -40C to +125°C enhance flexibility to place small, externally attached sensors at optimal diagnostic locations regardless of how difficult they are.

Featuring stable sensitivity over the operating-temperature range, it requires no calibration in the final application. Combining flat frequency response from DC to above 6kHz (-3dB point), and noise density of 75μg/√Hz in three-axis mode, the sensor detects extremely small vibrations and thus provides early warning to prevent equipment failures. The sensor is resistant to mechanical shocks and integrates digital features including configurable low-pass or high-pass filter with selectable cutoff frequency, embedded fifo, interrupts, temperature sensor and self-test capability.

It is housed in a 2.5 by 3mm LGA-14L package.

This compact footprint also facilitates integration inside smart motors and smart gearboxes, while the low power consumption helps designers ensure long-lasting operation in battery-powered applications.

The sensor's bandwidth and resolution simplify capturing patterns associated with defects or wear, as well as equipment setup issues such as looseness and misalignment, to assist with installation, maintenance and repairs.

In addition to general monitoring of motors and equipment, it can detect electromechanical vibrations in coils, transformers, snubber capacitors, busbars, connectors and in general vibrations originating in a power electronics module such as a traction inverter.

Automotive brands can thus extend remote diagnostics to cover power modules, as well as traction inverters of electric vehicles to enhance support through predictive maintenance. It can also monitor circuits and mechanisms in very harsh environments such as in hybrid motors.



AI transforms CFD data for aerodynamic design

A physics-informed AI platform from Flexcompute transforms existing computational fluid dynamics (CFD) data into real-time aerodynamic intelligence for automotive.

Called AutoInsight, it helps engineering teams evaluate aerodynamic trade-offs as vehicle shapes evolve, bringing insight directly into the design process.

The platform is built as an open ecosystem that can ingest simulation and experimental data from existing workflows, including datasets from CFD tools and wind tunnel measurements.

It can be trained with ten to twenty simulation samples while maintaining predictive accuracy.

The platform also enables a closed-loop workflow with high-fidelity simulation, where candidate designs can be evaluated using the firm's Flow360 solver to generate training samples that feed directly back into AutoInsight.

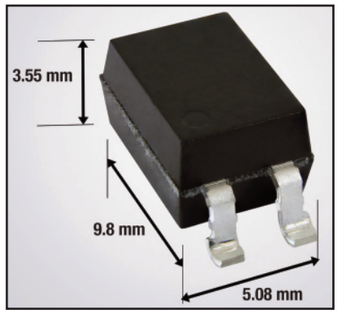
Photovoltaic mosfet driver simplifies HV systems

An automotive-grade photovoltaic mosfet driver from Vishay Intertechnology comes in the compact SMD-4 package to provide a creepage distance of 8mm and mould compound with a comparative tracking index (CTI) of 600.

Designed to increase safety and reliability in high-voltage automotive applications while simplifying designs and reducing costs, the Voda1275 is said to have the industry's fastest turn-on times and the highest open circuit voltage and short circuit current in its class.

For providing reinforced isolation, the device delivers an open-circuit voltage of 20V typical, short circuit current of 20μA and turn-on time of 80μs.

These characteristics enable quicker and more reliable driving of mosfets and IGBTs in high-voltage systems. In addition, the device's working isolation voltage of 1.26kV peak and isolation test voltage of 5.3kV RMS make it suitable for 800V+ battery systems.



AEC-Q102 qualified, the device is for use in pre-charge circuits, wall chargers and battery management systems for electric and hybrid electric vehicles.

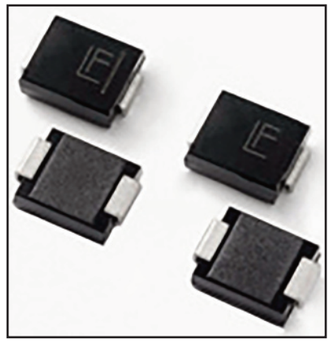
While designers previously had to use two mosfet drivers in series to generate the higher voltages required in these applications, the device's high open-circuit output voltage allows them to use just one, saving space and lowering costs. In addition, the driver enables the creation of custom solid-state relays to replace legacy electromechanical relays.

The optically isolated device draws all the current required to drive its internal circuitry from an infra-red emitter on the low voltage side of the isolation barrier. This construction simplifies designs and lowers costs by eliminating the need for an external power supply.

The mosfet driver is RoHS-compliant, halogen-free and Vishay Green.

Samples and production quantities are available now, with lead times of eight weeks.

TVS diodes protect GaN and SiC devices



High-voltage transient voltage suppression (TVS) diodes from Littelfuse are for automotive high-voltage power electronics including battery disconnect units, hvac systems and positive temperature coefficient heaters.

As EV architectures migrate towards higher voltages and wide-bandgap semiconductors, power devices such as GaN and SiC mosfets and IGBTs are increasingly exposed to severe voltage transients from load dumps, inductive switching and other high-energy events.

Traditional low- and mid-voltage TVS products often require multiple devices in series to achieve sufficient protection, thereby increasing PCB area, complexity and costs.

The TPSMC, TPSMD and TP5.0SMDJ high-voltage TVS diodes address this by delivering higher standoff voltages, up to 400V, and high peak pulse power in a single automotive-grade device, helping engineers simplify protection schemes while improving system efficiency and robustness.

Peak surge current up to 300A and peak pulse power up to 5kW support harsh transient conditions.

Response time is typically less than 1ps for effective transient clamping.

The devices are AEC-Q101 qualified and PPAP capable for automotive reliability requirements. IEC-61000-4-2 ESD compliance up to 30kV enables robust system-level protection.

The DO-214AB surface-mount package reduces PCB footprint and simplifies layout.

They are purpose-built for emerging high-voltage automotive subsystems.

Applications include battery disconnect units, high-voltage hvac compressors, PTC cabin and battery heaters, and high-voltage DC power distribution.

The TPSMC supports 1.5kW, the TPSMD 3kW and the TP5.0SMDJ 5kW peak pulse power.

They are available in tape and reel format in quantities of 3000.

Gateway joins Can-FD and Ethernet

A Can-FD-to-Ethernet gateway from HMS Networks is for scalable automotive and industrial networking.

Modern applications increasingly require seamless communication between distributed Cans and Ethernet-based systems. However, engineers often face a trade-off between performance, latency and cost. Existing products tend to be either over-engineered with unnecessary features or too limited to handle real-world Can-FD requirements.

The Ixxat Can@net Basic addresses these by focusing on efficient data exchange, low latency and affordability.

In many Can-to-Ethernet systems, transmitting Ethernet frames for every Can message creates excessive interrupts, leading to high jitter and unstable system performance.

Conversely, aggregating data reduces jitter but increases delay.

The gateway uses UDP/IP communication, reducing protocol overhead and interrupt load. This enables a balanced approach with low latency and controlled jitter, making it suitable for time-sensitive applications.

In applications where many devices such as test setups or distributed machines must exchange Can-FD data, physical Can bus limitations become a bottleneck, especially regarding bus length and node count. The gateway enables flexible network expansion via Ethernet, allowing engineers to connect distributed systems without being constrained by classical Can topology limits.



Many users only require a subset of gateway functionality but are forced to pay for full-featured products. This gateway is designed as a cost-optimised alternative, delivering essential functionality while maintaining industrial-grade performance and quality.

Specifications include Can data rates up to 8Mbit/s, Ascii interface mode, USB type C interface, USB 2.0 480-Mbit/s interface, removable push-in connectors, and galvanic isolation for Can 2.5kV for one minute and Ethernet 1.5kV for one minute.

Operating temperature is from -25 to +85°C. Ingress protection is to IP20.

It comes in a Din rail housing measuring 108 by 149 by 27mm.

Expansion module combines Can-FD and Lin

An expansion module for Göpel Electronic's Scanflex II provides interface tests for serial buses.

The cost-effective Lin bus with master-slave architecture and the fast multi-host Can-FD have become established in automotive. But the advantage and efficiency lie in the combination of both.



The extension for the Scanflex 9305 multi-port bus IO module for these interfaces makes the functional diversity of Scanflex available for automotive interfaces in production testing.

With the BAC (bus access cable) module for Can-FD and Lin, these interfaces can be tested for functionality during production. The BAC is connected to one of the five slots of the IO module and thus connected to the Scanflex system. This enables access to the complex test functions of the boundary scan controller.

Scanflex is a modular JTag and boundary scan controller.

Based on multi-core processors and FPGAs, it allows users to execute test and programming technologies from embedded JTag options.

Its multifunctional architecture enables these technologies to be combined flexibly and with high performance on a single platform.

AI software boost for critical applications

The latest release of TrustInSoft Analyzer introduces enhancements to improve productivity for mission-critical and safety-critical software development.

This release adds AI powered test driver and stub generation, enhanced MC/DC coverage analysis based on formal methods, and expanded Rust support through an improved gui, supporting broader adoption of rigorous formal verification across development teams and platforms.

By combining the efficiency of AI with the measurability and accuracy of formal methods, development teams in IoT, automotive, aeronautics and defence can scale C, C++ and Rust code assurance while maintaining the confidence required for mission and safety-critical software.

AI assisted verification helps teams reduce manual effort while preserving determinism, measurability and compliance with industry standards.

This approach is already delivering value for organisations integrating AI in complex embedded software environments.

Context-aware test drivers and stubs can now be generated automatically using AI, reducing analysis setup effort while preserving the rigour required for mission and safety-critical certification verification.

Rust analysis workflows from project setup to root cause investigation and reporting are fully integrated into the gui, supporting production grade Rust verification using formal methods.

The release enables MC/DC coverage compliance through formal methods-based input generalisation, reducing verification effort for standards such as ISO 26262.





Seven MLCCs support stability

Murata has started mass production of seven AEC-Q200-qualified multilayer ceramic capacitors (MLCCs) that support stable operation of in-vehicle systems and design flexibility.

Five parts in the GCM series are rated at 2.5 to 4V DC, targeting IC peripheral circuits in adas and autonomous driving applications. The other two are rated at 25V DC for in-vehicle power line applications.

For low-rated voltage MLCCs, Murata has expanded its line of products with a capacitance of 100μF or higher, achieving 100μF in the 3.2 by 1.6mm size, which was previously available only in the larger 3.2 by 2.5mm size. This reduces PCB mounting area by approximately 36%.

In addition, in the smallest automotive MLCC size of 0.6 by 0.3mm, capacitance has been increased from the typical 1μF to 2.2μF.

For medium-rated voltages, the devices have a capacitance of 1μF in the 1.0 by 0.5mm size, which was previously realised in the larger 1.6 by 0.8mm, reducing PCB mounting area by about 61%.

In the low-voltage line, the 2.5V DC rated unit is available in 0.6 by 0.3mm, and offers a capacitance of 2.2μF. The 13.2 by 1.6mm device is rated at 2.5V DC and provides 100μF.

A 4V DC unit is available in the 0.6 by 0.3mm size, and delivers 2.2μF. Another 4V DC device is available in the 3.2 by 1.6mm size and offers 100μF. And a 4V DC device in the 13.2 by 2.5mm size provides 220μF.

The medium-rated voltage line has two parts for power line applications. A 25V DC part is available in the 1.0 by 0.5mm size and provides 1μF. The other 25V DC part is available in the 3.2 by 1.6mm size and provides 22μF.

Ultrasonic chipset uses raw data to improve detail

At the Beijing Auto Show, Bosch presented an ultrasonic chipset for close-range perception in vehicles.

The TB193 and TB293 chipset enables more precise detection of objects such as parked vehicles or kerbs and allows for accurate measurement of the distance to them. For the first time, these process the raw signals directly from the ultrasonic sensors. This provides a significantly larger and more detailed data set.

Raw data contain more detail than pre-processed information. This allows AI-based parking assistants to assess the surroundings, beneficial in tight parking garages with many pillars and walls, or when vehicles are parked close together.

Road conditions such as wet or varying surfaces can also be detected for smarter braking.

The chipsets capture and process ultrasonic data directly at the source. One chip controls and processes the data, while the other captures the actual sensor signals.

Together, they deliver the information AI-based parking or brake assistance systems need. In addition, the chipset architecture provides the necessary data transmission speed and bandwidth to handle and transport these large volumes of raw data in real time.

The TB293 sensor chip is installed directly at the ultrasonic transducer and captures the raw signals without intermediate steps. The TB193 controller chip coordinates multiple sensor chips and prepares the collected data for processing.

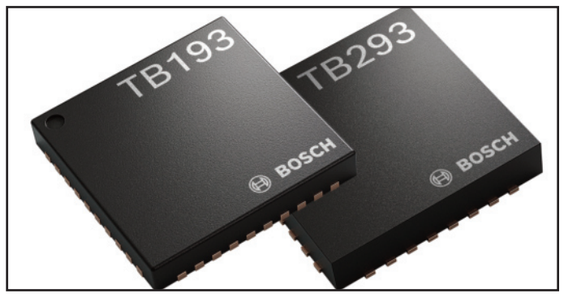
This modular design lets car makers scale the number of sensors according to vehicle class and functional scope.

The separation of tasks supports scalable design, reduces complexity at vehicle level, and creates a smooth transition towards more centralised, software-defined vehicles.

The chipsets use up to 50 per cent less energy than comparable products. This preserves battery power especially in situations where the engine is not running, such as low speeds in start-stop mode or in the electric mode of hybrid vehicles.

The chips also require fewer peripherals and less pins, while the Vasi bus transmits data and power. These features reduce cabling, simplify wiring and save up to half of the component's weight.

The temperature rating up to +150°C ensures operation even under demanding conditions, for example in engine-adjacent installations.



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