VEHICLE electronics

The monthly magazine for automotive electronics engineers

Stradvision and AMD to unveil collaboration at CES

At next month's CES in Las Vegas, Stradvision will announce a multi-year collaboration with AMD to redefine the future of perception in autonomous driving.

At the show, the companies will reveal Stradvision's MultiVision software running on the AMD Versal AI Edge Gen 2 VEK385 evaluation kit, demonstrating real-time, multi-camera perception capabilities.

The live demo will highlight how Stradvision's latest deep learning-based software stack leverages AMD automotive-grade AI compute to deliver breakthrough performance, scalability and energy efficiency.

This collaboration brings together Stradvision's SVNet and MultiVision perception software with AMD automotive SoCs, creating a production-ready platform for automakers and tier-one suppliers worldwide.

By tightly integrating the perception stack with AMD's AI-optimised compute architecture, the collaboration should accelerate the deployment of perception systems, setting standards for safety, efficiency and intelligence on the road.

"This represents a pivotal step to realising the future of intelligent mobility," said Philip Vidal, chief business officer at Stradvision. "We're setting a benchmark for real-time, high-performance perception that empowers automakers to accelerate the path to safer autonomous vehicles."

Stradvision and AMD are co-optimising perception features, such as object and pedestrian detection, lane and free-space recognition, and environmental understanding, to enhance performance and thermal efficiency in autonomous driving systems up to L4.

Paul Zoratti, chief automotive system architect at AMD, said: "Our collaboration with Stradvision demonstrates how optimised software and hardware integration can unlock safer, smarter and more adaptive vehicles."



Issue 144
December 2025

IN THIS ISSUE

2: LG and Mercedes partner meeting

3. Foxconn, Nvidia, Uber and Stellantis

6: Marelli opens Indian R&D centre

7: Saicec builds Siemens digital twin

8: Arm support lifts eSync standard push

10: Spinoff sees return of VDO

11: Nissan and Monolith AI deal

13: EV growth for power electronics

17: Precision timing critical in SDVs

21: Architectures for DC charging

27: EV fleet role for telematics

31: Product news

36: Contact details

LG and Mercedes meet to extend partnerships

Executives from LG and Mercedes-Benz met in Seoul last month to discuss expanding their collaboration.

Discussions centred on strengthening cooperation to support Mercedes' vision for the future of mobility, including the transition to electric vehicles and the establishment of a flexible, sustainable global production network driven by digitalisation and automation.

LG Electronics, LG Display, LG Energy and LG Innotek presented their planned developments in EV components, batteries, displays and autonomous driving sensors, seeking ways to strengthen integration under the One LG framework.

The four LG affiliates already work closely with Mercedes across multiple core areas of mobility technology. For example, LG Electronics and Mercedes-Benz have long worked together on core systems for software-defined vehicles (SDVs), including in-vehicle infotainment (IVI) and adas.

A notable example is the co-developed OLED-based IVI system for the Mercedes-Benz EQS, featuring a curved panoramic display that spans the entire dashboard, reflecting the growing trend towards immersive, large-format in-vehicle screens.

LG Display has been supplying plastic OLED (P-OLED) panels to Mercedes since 2020. Built on flexible plastic substrates, the panels deliver better image quality and enable elegant, curved designs, including those in Mercedes' MBux Hyperscreen infotainment.

LG Energy continues its partnership with Mercedes in electric vehicle batteries. And LG Innotek is in discussions to expand cooperation in autonomous driving sensor technologies, including vehicle camera modules, lidar and radar.

"Together with LG, we share a vision built on innovation, quality and sustainability," said, Ola Källenius, CEO of Mercedes-Benz. "By combining our strengths, we're creating vehicles that will set global standards."

William Cho, LG CEO, added: "We will further solidify our partnership with Mercedes by leveraging core competencies in the vehicle components business, from our user experience-centric value proposition to our integrated SDV portfolio and globally proven technology and reliability."



Foxconn, Nvidia, Stellantis and Uber plan level-four robotaxis

Stellantis, Nvidia, Uber and Foxconn are exploring the joint development and future deployment of level-four driverless autonomous vehicles for robotaxi services worldwide.

This follows Stellantis' recently announced agreement (*Vehicle Electronics*, November 2025) with Pony.ai to test autonomous vehicles in Europe.

Together, the companies intend to combine their strengths – Stellantis' global vehicle engineering and manufacturing expertise, Nvidia's autonomous driving software and AI computing, Foxconn's electronics and system integration capabilities, and Uber's ride-hailing operations – to explore future level-four autonomous vehicles.



Work builds on Stellantis' AV-Ready platforms

The collaboration will build on Stellantis' AV-Ready platforms – specifically the K0 medium-size van and STLA Small – powered by the Nvidia Drive AGX Hyperion 10 autonomous vehicle architecture, which includes the safety-certified Nvidia DriveOS operating system and full-stack Drive AV software purpose-built for level-four autonomy.

"Autonomous mobility opens the door to new, more affordable transportation choices for customers," said Antonio Filosa, CEO of Stellantis.

Uber plans to deploy Stellantis autonomous vehicles in select cities worldwide, starting with 5000 units, with initial operations beginning in the USA. Pilot programmes and testing are expected to ramp up over the coming years, with the start of production targeted for 2028.

"Nvidia is the backbone of the AI era and is now fully harnessing that innovation to unleash level-four autonomy at enormous scale, with Stellantis among the first to integrate Nvidia's technology for deployment on Uber," said Dara Khosrowshahi, CEO of Uber.

Foxconn will collaborate with Stellantis on hardware and systems integration.

"Autonomous mobility is a priority within Foxconn's EV programme," said Young Liu, chairman of Foxconn. "The partnerships and strengths across Nvidia, Stellantis and Uber accelerate the deployment of level-four robotaxi technology, with Foxconn delivering HPC, sensor integration to enable a global rollout."

The non-binding memorandum of understanding (MoU) establishes the framework for future agreements covering technology development, licensing, production and vehicle procurement. Each company retains the flexibility to pursue additional collaborations in the autonomous driving space.

"Level-four autonomy isn't just a milestone for the auto industry, it's a leap in AI capability," said Jensen Huang, CEO of Nvidia. "The vehicle becomes a robot, one that sees, perceives, plans and drives with superhuman precision. By combining Stellantis' global scale with Nvidia Drive and Foxconn's system integration, we're creating a new class of purpose-built robotaxi fleets, making transportation safer, more accessible and more affordable for everyone."

DSpace partners Omnivision on sensor simulation

DSpace and Omnivision, a developer of cmos image sensors, are working together to advance the development of adas and autonomous driving (AD) systems.

As part of the collaboration, the realistic simulation of Omnivision image sensors will be integrated into Aurelion, the physics-based simulation platform from DSpace.

Cameras are an essential component of adas and AD systems, as they enable precise detection of the surroundings. They provide data for object detection, lane tracking and obstacle avoidance, which are essential for the safety and efficiency of these systems.

The realistic sensor simulations in Aurelion make it possible to reproduce driving scenarios and conditions as they occur in the real world. Simulations enable developers to ensure that adas or AD systems are reliable and robust long before they hit the road.

Quintauris establishes Risc-V foundation

Quintauris hopes to establish a standard foundation for building and integrating Risc-V processors with the expected performance for real-time applications, enabling the automotive industry to secure development from prototype to production.

Its RT-Europa platform, labelled as a gold standard reference for Risc-V automotive real-time processors, supports a profile released by Quintauris back in February and expands the offering to a shared foundation for SoC design, system performance and interfacing, virtualisation, and ecosystem integration.

This lets the automotive industry leverage the value of Risc-V processors with secure platform compatible IPs, competitive use-case based performance, software interoperability, and formal validation and benchmarking based on Quintauris' test automation framework.

The platform introduces a system-level standardisation layer, ensuring interoperability across diverse IPs and software configurations.

The platform and test automation framework let OEMs and tier-one suppliers evaluate and optimise different Risc-V IPs and software stack implementations.

RT-Europa is said to make Risc-V interoperability a reality in real-time processors, establishing a shared reference point for hardware and software vendors in the automotive industry.

Quintauris will unveil the architectures at CES in Las Vegas in January, demonstrating how the platform enables the automotive industry to transition effectively to Risc-V.

The firm will also show an early release of its test automation framework.

• HighTec EDV-Systeme, a provider of automotive compilers, is bringing together its expertise in open-source technologies with Quintauris' focus on interoperable Risc-V platforms for automotive applications. HighTec develops safety-qualified C/C++ and Rust compiler suites for microcontroller families and embedded microprocessors.



Lauterbach supports Tenstorrent SoCs with development tools

Lauterbach's Trace 32 development tools will be used to support Tenstorrent's systems-on-chip (SoCs) and chiplets for Risc-V and AI powered workloads in the automotive, client and server spaces.

Tenstorrent's automotive and robotics base-die SoC is for automotive applications in software-defined vehicles (SDVs). The SoC implements at least eight 64bit superscalar, out-of-order TT-Ascalon Risc-V cores with Vector and Hypervisor ISA extensions as well as dozens of Risc-V-based AI-accelerators and further Risc-V cores for system and communication management.

The Trace 32 development tools enable simultaneous debugging of the various TT-Ascalon Risc-V processors and other cores that are implemented on the chip. The tools cover the entire product lifecycle from pre-silicon development on virtual targets to prototyping on silicon to in-field debugging on ECUs.

The universal PowerView debugging and tracing software can be complemented with debug and trace accelerator modules for analysing real chips, while Lauterbach's intelligent PowerDebug modules provide high download speeds and small response times for debugging and test automation including CI and CD support.



Lauterbach accelerates development on Risc-V

PowerTrace real-time trace modules provide full insights of what the processors and other cores of the system are doing without affecting its real-time performance.

Lauterbach's hypervisor, Autosar and OS awarenesses enable developers to analyse the complete automotive software stack. Trace analysis, including code coverage measurements, can support bringing embedded designs to market in faster, safer and more reliable ways.

"Tenstorrent's automotive and robotics SoC combines excellent computing performance with massive AI acceleration, which makes it highly attractive for modern cars," said Alexandre Schaefer, sales director at Lauterbach.

Eric Rentschler, senior principal engineer at Tenstorrent, added: "The advanced debugging capabilities and insights provided by Lauterbach's Trace 32 development tools complement our efforts, helping developers boost productivity and accelerate time to market for Risc-V CPUs and AI accelerators."

The Trace 32 development tools enable developers of automotive domain-based as well as SDV architectures to evolve their applications based on Tenstorrent SoCs faster and easier.

Ceva and United Micro collaborate on 5G Redcap SoC

United Micro Technology and Ceva have collaborated on a 5G Redcap SoC to accelerate connected vehicle adoption.

United Micro has integrated the Ceva-Pentag Lite 5G platform IP in the Redcap SoC, delivering secure and scalable connectivity for vehicles

As automakers expand connected vehicle offerings, 5G Redcap is emerging as a cost-efficient complement to traditional 5G, enabling mass-market adoption of vehicle connectivity without compromising reliability or security.

Ceva, a licensor of silicon and software IP, and United Micro, a developer of smart cellular communication IoT, have launched the HyperMotion 5G Redcap automotive IoT platform. Built on United Micro's 5G Redcap SoC integrated with Ceva's Pentag Lite scalable 5G modem IP and DSP technology, it delivers a complete 5G Redcap connectivity platform for automotive telematics control units and C-V2X applications.

While many OEMs will continue to deploy full 5G NR for premium platforms, Redcap lowers cost and complexity, making it suitable for telematics, L2 adas, fleet management and C-V2X applications at scale.

Marelli opens R&D centre in Bangalore

Marelli officially opened last month an R&D centre in Bangalore, southern India, to expand the company's engineering capabilities in automotive technologies.

The facility is set to employ 350 people and is in Bangalore's Embassy Manyata Tech Park, which already hosts Marelli's other technical R&D centre in the city. It opened in 2022.

This adds to the company's engineering centre in Gurugram and, with this opening, Marelli's R&D capacity in India will reach 1200 people.

The R&D site includes infrastructure for labs supporting optics, hardware and automotive validation labs, as well as facilities for training and collaborative spaces to foster innovation, teamwork and development.

The centre will support electronics, automotive lighting and both internal combustion and electric propulsion. Together with the two existing R&D facilities, the site will focus on end-to-end development for infotainment, clusters, displays, body control modules, engine management systems, headlamps and rear lamps for Indian customers.

It will also work closely with other Marelli global engineering teams as well as with customers to co-develop technologies for software-defined vehicles, zonal architecture, automated manual transmissions, engine and battery management, and lighting features.

Marelli is also focusing on expanding in-house test infrastructures to carry out most of the design and process validation of products and components internally, allowing for rigorous validation and robust, reliable product design

College honoured by king



The UK's North Warwickshire & South Leicestershire College (NWSLC) has won a Queen Elizabeth Prize for Education for equipping thousands of students and professional engineers with specialist skills in demand from the automotive sector through the Mira Technology Institute (MTI).

Shown after collecting the prize are MTI operations director Lisa Bingley (left) and NWSLC chief executive Marion Plant outside St James's Palace in London.

The prizes are part of the UK's national honours system and are awarded every two years by the king on the advice of UK prime minister Sir Keir Starmer, following an independent review process.

More than 100 entries were submitted for the latest round of prizes and NWSLC is one of only 19 prize winners.

"The UK has always been a place of learning, invention and ambition," said Sir Keir. "Our institutions of higher and further education are among the very best in the world. They educate the next generation, train our workforce and lead the cutting-edge research that drives progress, not just here at home but across the world."

MTI is a collaboration led by NWSLC and its partners Horiba Mira, Coventry University, University of Leicester and Loughborough University and was built with a £9.5m investment from the government.

Panasonic evolves cyber security for SDV era

Panasonic has evolved its Verzeuse series of automotive cyber security to be compatible with software-defined vehicles (SDVs).

In addition to compatibility with traditional individual ECU configurations, Panasonic has expanded its innovations to support cockpit high-performance computers (HPCs) and integrated ECUs that aggregate and control multiple functions in a virtual environment, and to ensure security throughout the entire vehicle lifecycle.

The firm has implemented measures to respond to security issues that are particular to an SDV, at each stage of the vehicle lifecycle from design and implementation to assessment and operation, even in complex in-vehicle systems that include virtualisation technologies and software communications.

By enabling threat and weakness analysis based on the connection of a vehicle's entire configuration and functions rather than individual ECUs, this functions as security infrastructure that protects vehicles continually advancing, as is called for in this SDV era.

Saicec builds digital twins based on Siemens software

Saicec, a provider of chip and system design services for the automotive industry, has begun building complex digital twins of automotive architectures based on Siemens' Pave360 software, facilitating verification of automotive components from system level to chip level.

This initiative should accelerate the adoption of technology that helps overcome the difficulties of software-defined vehicle (SDV) development.

It also supports OEMs in identifying future chip technologies and developing critical systems at the scale and speed demanded by the mobility industry.

"Our collaboration with Siemens brings together world-class simulation technology and China's fast-growing automotive IC ecosystem," said David He, chief executive officer at Saicec. "With Siemens' Pave360 system-to-chip digital twin capabilities, we can shorten development cycles, improve functional safety and strengthen the foundation for intelligent mobility design."



Siemens helps Saicec create digital twins

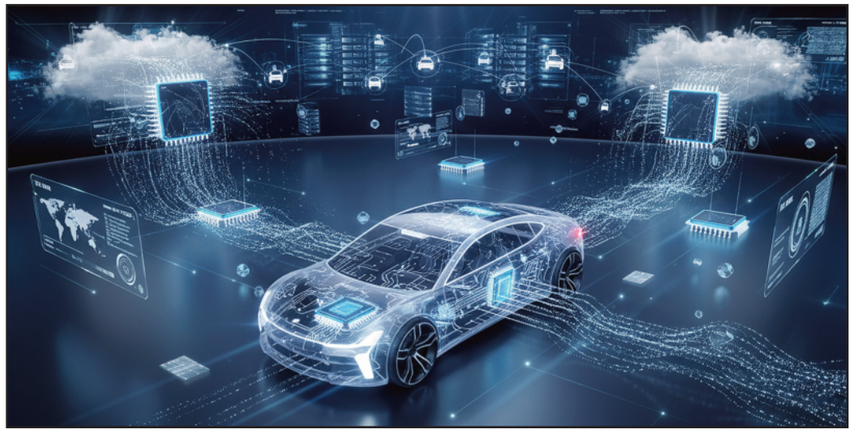
David Fritz, vice president at Siemens, added: "Our work with Saicec demonstrates how automotive OEMs are able to solve critical bottlenecks in adas and IVI capabilities development, and deliver the innovation that consumers across the globe are demanding. Pave360 is uniquely placed to provide the digital twin to support Saicec's new validation certification. With scalability at its core, the same multi-fidelity environment can be adapted over time to provide validation throughout the entire vehicle development flow."

SDV programmes are growing in complexity as consumer expectations for integrated technology also continue to increase. Today's automotive hardware and software teams often operate in silos across disparate environments, with limited access to a system-level view until final hardware is available.

This lack of early-stage validation can lead to costly redesigns when final hardware fails certification tests. System-level verification before hardware availability is now essential.

Pave360 leverages Siemens' Innexis software environment combined with supporting technologies to empower users to create system-level digital twins of adas and IVI capabilities. These digital twins can be connected to reference vehicles to perform functional validation from the earliest design stages.

OEMs and suppliers alike can leverage Pave360 to accelerate validation and foster innovation within a proven, real-world digital environment.



Arm processor roadmap accounts for OTA requirements

Arm support could lift eSync to OTA standard

Arm has joined the eSync Alliance as a charter member, becoming the first compute platform company to commit at eSync's highest membership tier.

Arm already powers more than 300 billion chips across mobile, cloud and embedded systems. Its support transforms eSync from an automotive industry initiative into a potential standard for vehicle software over-the-air (OTA) updates.

"This validates that eSync is becoming a universal language for automotive OTA," said Mike Gardner, executive director of the eSync Alliance. "When Arm commits as a charter member, it means every ECU supplier building on Arm-based processors can potentially plug into our pipeline without starting from scratch."

Automakers currently struggle with fragmented system updates. While some cars can be updated wirelessly, many more require dealership visits for software fixes.

According to ABI Research, in 2022 nearly ten million cars were recalled in the USA due to software-related issues, with nearly half requiring software updates by a car dealer, costing automakers half a billion dollars annually in in-person updates.

Arm's architecture provides the foundation to help make vehicles easier to update through OTA capabilities.

As a charter member, Arm has voting rights in eSync governance and direct input on specifications. This ensures its processor roadmap accounts for automotive OTA needs. Meanwhile, eSync benefits from architectural backing that can scale from entry-level vehicles to autonomous platforms without compatibility issues.

The partnership caps eSync Alliance's strongest growth year since 2018. Recent demonstrations at CES and AutoTech Detroit showed real-time software updates in moving vehicles.

The collaboration between Arm and initiatives such as eSync and Soafee reflects a broader push towards standardising interfaces and moving beyond a fragmented ecosystem.

The eSync Alliance is a non-profit trade association driving a multi-company option for OTA updates and diagnostics data in the automotive electronics space.

Parasoft bridges AI gap at Embedded World

At last month's Embedded World in California, Parasoft showed its latest innovations in software quality assurance for safety- and security-critical embedded systems.

The latest releases of its C/C++test and C/C++test CT introduce agentic AI workflows, static analysis for Cuda C/C++, and extended support for Google Test, empowering development teams to achieve higher levels of productivity, compliance and code quality.

With Cuda C/C++ static analysis, Parasoft extends safety and security enforcement to GPU-accelerated and AI-driven applications. From adas to autonomous systems, developers can now apply standards such as Misra, Autosar C++14 and Cert across CPU and GPU environments for consistency and confidence.

At the core is the MCP server, connecting AI agents to structured, standards-aware data from C/C++test.



Service guides drivers round indoor car parks

Hyundai and Parkopedia demo indoor car navigation

Parkopedia and Hyundai have demonstrated Europe's first end-to-end in-car navigation and mapping service, which provides a streamlined, stress-free parking process for drivers completing their journeys in indoor locations.

The indoor maps service directs drivers to specific parking spaces, EV chargers or zones, helping them navigate indoor or underground locations without the need for traditional GPS.

Once in production, the service is set to become a differentiator for automakers as drivers place more value in seamless in-car technology, helping drivers navigate indoors as well as outdoors.

Unlike user journeys that finish at the car park entrance, seamless end-to-end navigation completes the journey by guiding drivers all the way to their exact parking space or zone.

Parkopedia has improved 3D visualisation and linked indoor maps to its EV product for a seamless parking and charging experience.

Parkopedia, in partnership with Hyundai AutoEver, will be the first company to offer full high-definition indoor maps at scale across Europe, with North American mapping already underway.

In contrast to relying on low-fidelity map data, it uses rich 3D point cloud data to create high-definition maps, capturing precise real-world details. This means better contextual awareness, with map data including walking routes, EV chargers, accessible spaces and payment zones for a frictionless end-to-end experience.

Parkopedia already has a market-ready inventory of car parks across Europe and continues to add data and locations daily.

In addition, it is expanding the service into North America, starting with the San Francisco Bay Area, with active deployments underway to map new locations.

Parkopedia has prioritised indoor maps of key mobility hubs, including airports, train station car parks and large shopping centres to make parking and navigation simpler in the locations that drivers are most likely to encounter.

The company has already mapped 18 of the busiest 25 airports in Europe, with individual car parks up to 6000 spaces included.

The firm has invested resources into tooling and AI optimisation to improve the speed and efficiency of creating indoor maps. This involves automating repeatable tasks and taking advantage of computer vision and machine-learning technology, including developing algorithms that can recognise and log features such as entrances, staircases and elevators.

"We are pleased that Hyundai AutoEver has proven that our indoor maps service can be successfully integrated into its vehicles and highly valued by its users," said Duncan Licence, chief product officer at Parkopedia. "We are committed to making cities more liveable, with this technology contributing immensely to end-to-end multi-modal travel and seamless mobility across a variety of everyday use cases."

VDO brand returns following Continental's Aumovio spinoff

Following Continental's spinoff in September of Aumovio, its automotive technology and electronics company, its former spare parts portfolio for electronics and mechatronics will now be marketed entirely under the VDO brand.

This sees the long-established VDO brand celebrating its return to the independent aftermarket.

The entire portfolio of electronics and mechatronics, which has been marketed under the Continental brand since 2020, will gradually be available again under the VDO brand from this month on.

It includes fuel systems, sensors for engine management and tyre pressure monitoring, engine control units, common rail diesel systems and turbochargers.

Starting in 2026, sensors and cameras for adas will be added to the range for the first time.

The premium brake brand ATE will remain under Aumovio and will share its service structure with VDO in the future, including a technical hotline and certified workshop training.

"VDO is the ideal brand to lead our spare parts portfolio for electronics and mechatronics into the future," said Enno Straten, managing director of Aumovio Aftermarket. "It stands for OEM quality, safety, first-class service and expertise in the technologies of today and tomorrow."

VDO's product portfolio has recently been expanded by 700 parts with the spin-off of Aumovio and integration into the VDO range. A further extension of the aftermarket portfolio is planned for 2026.

"Our goal remains unchanged," said Straten. "Together with workshops, we want to shape the future of the independent aftermarket. That's why we are specifically expanding the VDO portfolio to include sensors and cameras for driver assistance systems, while at the same time consistently driving forward comprehensive expansion in all existing product groups."

Aumovio will introduce a new product group to the VDO range in 2026, offering a wide variety of adas products. These include smart multifunction and surround-view cameras as well as front and blind spot detection radars. The portfolio will be expanded gradually.

In collaboration with the brake brand ATE, VDO offers bundled services and practical support. Services include a technical hotline, training programmes on topics such as high voltage and business administration, online training courses on digitalisation, loyalty programmes and other partner concepts.

"We take a holistic view of workshops, working personally, competently and with a view towards the future, always with the aim of providing service that goes above and beyond the standard," said Straten.

In 2024, the business areas that now belong to Aumovio generated sales of €19.6bn. The company is headquartered in Frankfurt, and has over 86,000 employees in more than 100 locations worldwide.

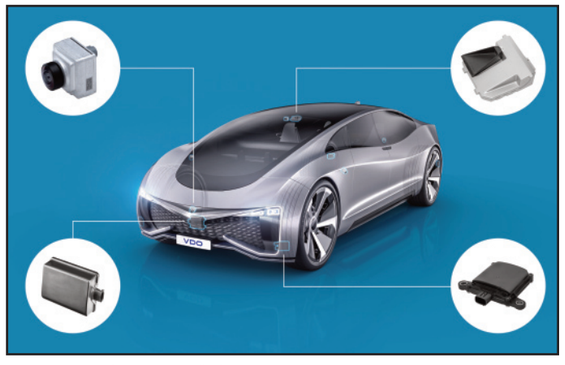
Li Auto picks Hesai lidar

Li Auto has selected Hesai Technology to supply lidars for all models in its future assisted driving platform.

This includes the L, i and Mega series. Hesai will continue to provide perception technologies for Li Auto as the exclusive lidar supplier.

Li Auto is a new-energy vehicle manufacturer that designs, develops, manufactures and sells premium smart electric vehicles, with over 1.46 million delivered as of October.

Hesai and Li Auto plan to deepen their collaboration, accelerating adas adoption and bringing safer assisted driving experiences to more users worldwide.



VDO's adas portfolio

Nissan and Monolith extend AI partnership

Nissan and Monolith have announced a three-year extension to their partnership, using AI to transform the vehicle development process and reduce physical tests.

The partnership contributes to Nissan's focus on bringing products out more quickly by reducing development time and working with partners to drive innovation.

First used to validate testing on the Sunderland-built Nissan Leaf EV, Monolith's AI technology will be applied to more tests for Nissan's future models in Europe.

Using more than 90 years of vehicle testing data, engineers at Nissan's technical centre in Cranfield, UK, will use Monolith's AI technology to predict accurately the results of physical tests. This reduces the reliance on physical prototypes, streamlines the development process and allows engineers to focus on hands-on problem solving and decision making.

The decision to extend the partnership follows the collaboration between Nissan and Monolith using AI to test the performance of bolt joints in vehicle chassis.

This resulted in a 17% reduction in physical testing compared with the non-AI process. Applying the same approach across the development of all Nissan's European vehicle range could cut testing time by half.

Researchers develop V2X-based edge computing

A research team from China's Tsinghua University and Nebula Link Technology are developing a V2X-based edge computing system for safety monitoring.

Current safety monitoring systems such as vehicle-side adas and road-side video face problems such as limited spatiotemporal coverage, low accuracy and transmission delays.

These issues lead to delayed warnings for potential hazards such as lane departures and vehicle collisions, and poor adaptability to different levels of connected and automated vehicles (CAVs).

Although some V2X-based studies exist, they often lack universality, ignore data measurement errors and transmission delays, and have limited scenario validation, thus failing to meet the safety monitoring needs of mixed traffic environments.

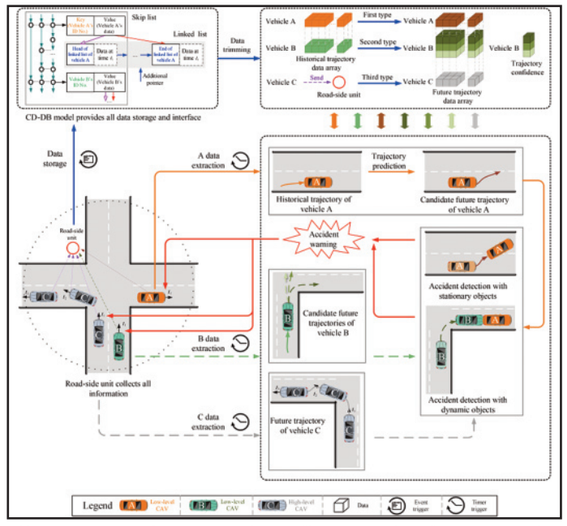


Illustration showing data flow in the framework

This study proposes a V2X-based edge computing safety monitoring framework to address these problems.

The framework is built on a cooperative vehicle-infrastructure system, which collects real-time data from CAVs via V2X communications and processes them through edge computing devices.

It includes four core functions: vehicle and map data storage using CD-DB data structure with skip list and linked lists for efficient data management; trajectory prediction with three algorithms for different CAV levels; accident detection with a line intersection algorithm for dynamic and stationary object collision assessment; and accident warning using dynamic warning triggering based on trajectory confidence and threshold judgment.

Extensive validations on the interaction dataset – including ramp merging and urban intersection scenarios – and real-world tests at the Beijing Shunyi testing field confirmed the framework's effectiveness.

It maintains over 80% true positive rate (TPR) under acceptable measurement errors, resists transmission delays within 0.1s, and outperforms single-vehicle systems in dynamic collision warning, that is 100% TPR for CAVs versus 85 to 90% for single vehicles in intersection scenarios.


Volkswagen's technology complex in Hefei

Volkswagen opens test workshops in Hefei, China

Volkswagen has opened its first test workshops in Hefei, China, marking its final expansion stage to bring end-to-end development capabilities directly to the Chinese market.

The new facilities expand the local R&D strength for Volkswagen China Technology Company (VCTC) and integrate software, hardware and whole-vehicle validation under one roof.

This should enable faster decision-making, closer customer alignment and accelerated rollout of technologies.

With the completion of the workshops, VCTC has become the group's most comprehensive R&D hub beyond its home market. It can support the development and validation of new vehicle platforms from very early phases outside Germany.

The workshops have more than 100 laboratories across around 100,000 square metres, delivering testing capabilities including software–hardware integration, battery and powertrain testing, and full vehicle-level validation.

"At our development centre in Hefei, China, we have now created all the conditions necessary to develop, test and locally manufacture the next generation of intelligent connected vehicles," said Oliver Blume, VW CEO:

Ralf Brandstätter, CEO of VW in China, added: "By expanding our footprint in Hefei, we are strengthening our ability to respond quickly to local needs and to shape technologies directly where they will be used."

It is the only group R&D centre dedicated exclusively to electric, intelligent and connected vehicles. VCTC is integrating core development units and decision-making processes for local vehicle and technology projects, while coordinating developmental processes with the R&D units of joint ventures.

By deepening integration into the local technology ecosystem, VCTC can proactively address China's market-defining trends – such as digitalisation and autonomous driving – at an early stage, allowing the company to harness the growth momentum and innovative vitality of the Chinese market.

In the Hefei workshops, VCTC and Cariad will make the first delivery of the China Electronic Architecture (CEA), a zonal EE architecture tailored to the needs of Chinese customers, within 18 months.

Enabled by a software-defined vehicle development process, the vehicle development cycle can be shortened by 30%. Leveraging local development and early supplier integration during the concept phase of new cars and technologies, the cost of a new model can be reduced by up to 50% in specific key projects.

The CEA also ensures seamless integration of digital cockpit and adas functions, and whole-vehicle level over-the-air upgrades.

"We can now run software, hardware and full-vehicle validation pro=cesses in parallel, shorten decision loops, and bring innovations to maturity much faster," said Thomas Ulbrich, CEO of VCTC.

As well as strengthening the group's commitment in China, the workshop will validate products and technology for export to Asean and the Middle East.

Future expansion in Hefei will include a functions integration test laboratory due to come online in mid-2026.

POWER TECHNOLOGIES

TURNING POINT

John Li shares insights into the growth potential for power electronics in electric vehicles

Scaled up SiC wafer production has strengthened supply chains of Chinese OEMs such as Li Auto

The electric vehicle power electronics market is set to exceed $42bn by 2036. While sales of battery-electric vehicles (BEVs) have slowed down at a global level, market penetration continues to grow.

The growth potential of SiC mosfets is significant, with the global slowdown in BEV growth being offset by increased deployments of SiC mosfets for traction inverters in plug-in hybrid electric vehicles (PHEVs).

Key OEMs and tier-one suppliers such as Toyota and Schaeffler have announced or released details of PHEV drivetrains using SiC mosfets.

This is another sign that SiC mosfets are moving towards market maturity. Even when only parts of the drive cycles are purely electric-run, and battery sizes are smaller, companies are still choosing to integrate SiC mosfets into their EVs.

Despite the re-engineering required for SiC inverters and the reduced revenue of device suppliers such as Wolfspeed this year, it's clear that SiC mosfets are now a more mainstream choice for EVs than they were a year ago.

A major driver of the overall cost reduction of SiC mosfets is the increased competition of SiC wafer suppliers, with many companies now scaling up SiC wafer production, many at 200mm. The wafer costs of SiC far exceed those of silicon products, and can be up to half the total cost of a SiC mosfet die.

Two years ago, only Wolfspeed and Coherent were capable of producing 200mm SiC wafers at scale. In 2025, Wolfspeed opened its 200mm SiC wafers to the wider market, and Infineon has scaled up 200mm SiC wafer production and delivered its first products based on its 200mm SiC platform earlier this year.

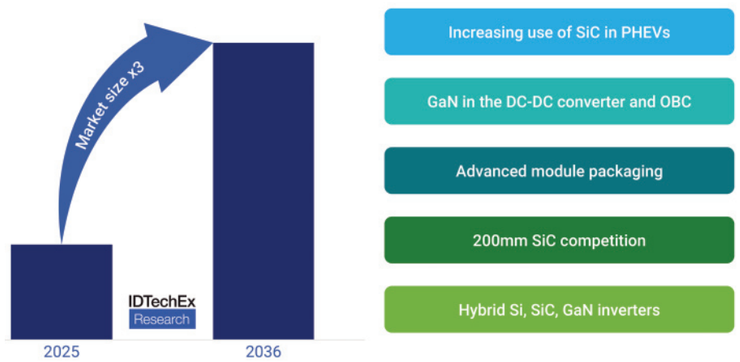
Simultaneously, Chinese companies have validated and scaled up SiC wafer production, strengthening the supply chain of domestic OEMs such as Xiaomi and Li Auto.

GaN

For years, the material properties of GaN have been predicted to revolutionise power conversion. Alongside the significant hype surrounding GaN in power supply units for data centres, the automotive industry should not be overlooked as a high-growth potential market for GaN.

GaN is already used for lidar and low-voltage DC-DC converters, and the first deployment of GaN will finally be seen in the onboard charger (OBC) of the Changan Qiyuan E07. This is expected to enter the market in 2026 with GaN devices supplied by Navitas. Its stated power density of 6kW/L is far greater than the power densities seen in research of existing OBCs, where 2kW/L is standard.

There are also multiple companies working on the design, control and power semiconductors using GaN in the traction inverter, including Visic Technologies, NXP and Cambridge GaN Devices. While commercial deployments of these will be later than in the OBC and DC-DC converter markets, the performance and potential cost savings of using GaN will drive technological maturity and market activity over the next ten years.



Power electronics for EVs market to triple from 2025 to 2036, driven by technology trends in SiC and GaN

Trends

Hybrid inverters are a hot topic, and another key development that will drive wide bandgap semiconductor (WBG) adoption in electric vehicles. By paralleling a mixture of different transistors (Si IGBT, SiC mosfet and GaN HEMT), performance can be optimised at all loads while reducing cost. Gate drivers and load balancing are challenges for these, and the rapid decrease in SiC mosfet cost could be a barrier to widespread adoption.

If a traction inverter could be produced at a competitive cost using only SiC mosfets, then the additional complexity of adding IGBTs in parallel would be less appealing.

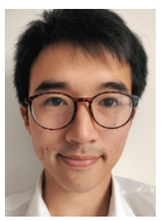
However, SiC mosfets are unlikely ever to reach cost parity with Si IGBTs, due to the temperatures required for crystal growth and the size of the boules grown compared with Si.

Embedded power modules, where the power semiconductor die is embedded into the PCB, are another way to increase power density, while eliminating the need for wire bonds and reducing parasitics and ringing. Although this has not been mass-deployed in on-road vehicles as of October 2025, it's another trend that will drive overall power densities of power electronics upwards.

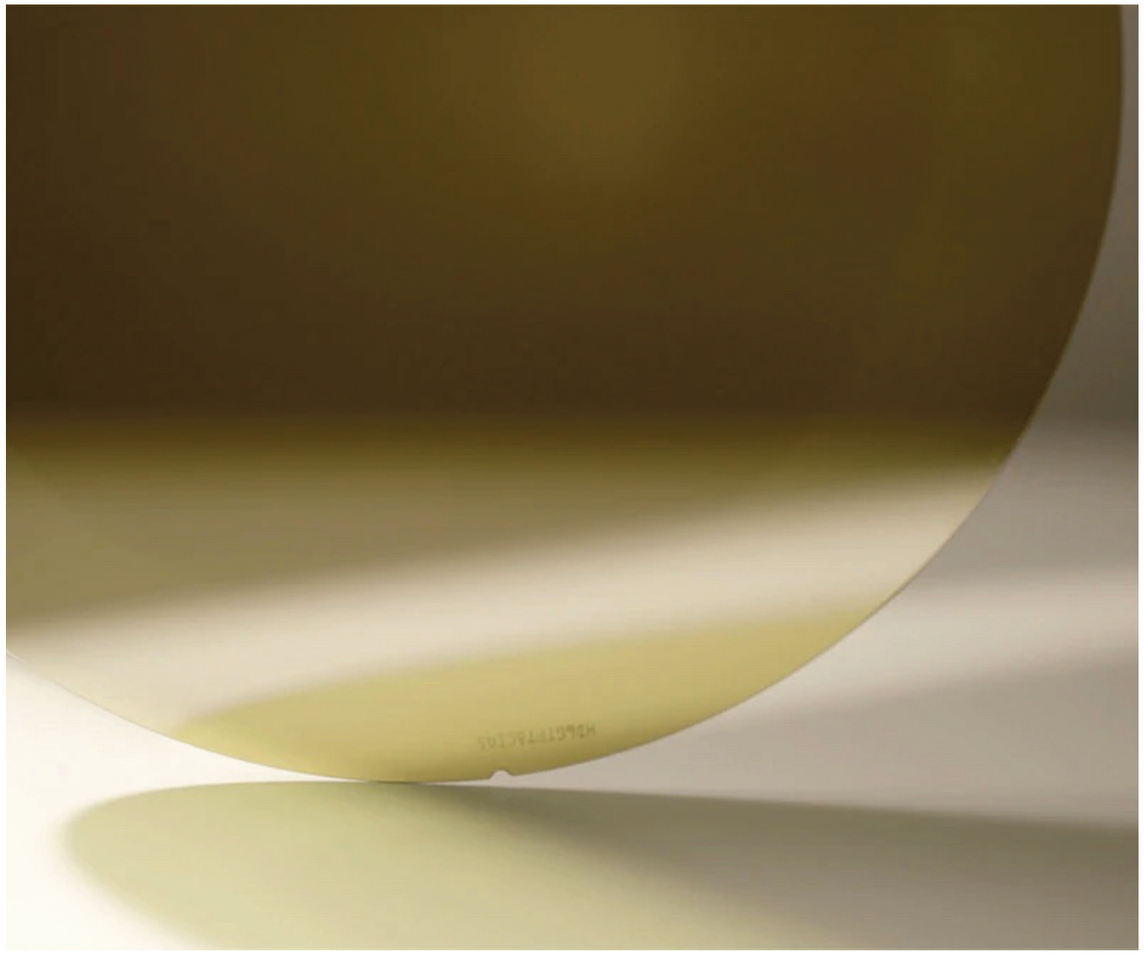
Conclusions

Power electronics are fundamental to the world, whether it's in phone chargers, solar panels or electric vehicles. This year has seen developments in the SiC supply chain, GaN technology and other innovations that will drive value upwards for power electronics in electric vehicles, faster than growth in the electric vehicle market itself.

This year has been a turning point for the power electronics industry. Despite a slowdown in EV sales, there will be a tripling in the market size of the power electronics for electric vehicles market to $42bn by 2036.



John Li is a technology analyst at IDTechEx



Wolfspeed has opened its 200mm SiC wafers to the wider market

SOFTWARE-DEFINED VEHICLES



DRIVING THE FUTURE

Sumeet Kulkarni discusses the critical role of precision timing in software-defined vehicles

If adas and V2X are the buzzwords, precision timing is the baseline. Software-defined vehicles (SDVs) are awash with possibilities, as potential applications and functions continue to spring up. There is a vast range of options to make the driving experience safer, more enjoyable and better connected.

There is a key enabler that is underpinning the automotive user experience of SDVs, delivering consistency and reliability across many aspects of today's data centres on wheels. That enabler is precision timing.

There are already 70 to 100 timing devices in the typical vehicle. This number is likely to increase, driven by transportation trends such as electrification and driving automation.

The adaptability and programmability afforded to engineers by the latest timing technologies are helping overcome problems.

Synchronisation

Four megatrends have converged to redefine automotive engineering. They are electrification, driving automation, shared mobility and active safety. The result of these developments is that high-performance electronics can now

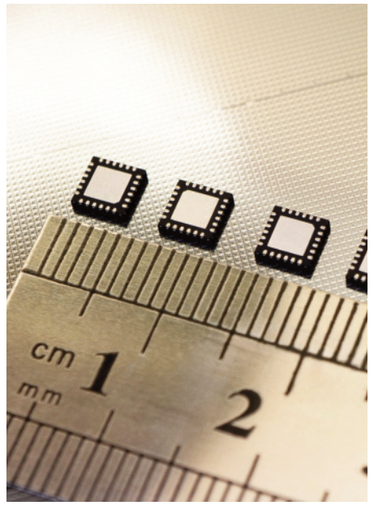
be found in every part of a vehicle.

In-vehicle networks now move an unprecedented volume of information at high speed. Automated vehicles can generate over 20Tbyte of data per hour. System complexity is rising, with modern designs incorporating hundreds of interconnected control units, cameras, radars and lidars. Architectures are becoming more centralised, as SDVs pull functions together into a powerful computing hub.

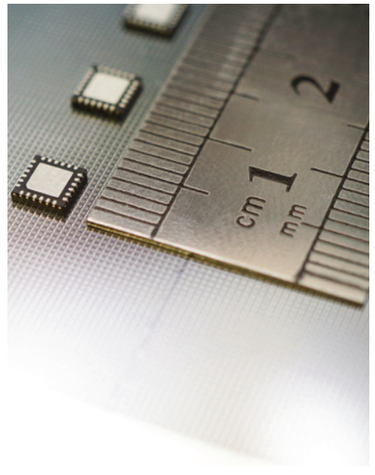
These characteristics all demand tighter synchronisation, making precision timing a key enabler for safe and efficient operation in many cases. Silicon microelectromechanical systems (mems) technology, which is replacing traditional quartz timing, has paved the way for more sophisticated features in SDV design with a single mems clock chip that synchronises different clocks.

This single chip integrates end-to-end monitoring of the clock signal's various functional blocks, alerting the system if there is a malfunction.

The end-to-end monitoring capability, as well as a lower failure rate than quartz, means the superior synchronisation brought to the table by precision timing is achieving the two key deliverables for SDVs: safety and efficiency. In other words, precision timing has become mission critical for SDVs.



Precise low-jitter timing devices for automotive systems



Clock generators deliver low jitter timing for adas and high-speed networking

Milliseconds

Precision timing has made itself indispensable in scenarios where milliseconds can make the difference in assuring safety and avoiding system failures.

An emergency braking event with adas is a case in point. A forward-facing radar identifies an obstacle, before the vision system classifies it, and the control ECU decides to apply the brakes. In the absence of precise synchronisation, even a slight misalignment may compromise the accuracy of sensor fusion and delay the braking command.

Timing instability has a spiral of negative consequences for safety in SDVs. It may corrupt high-speed Ethernet or PCIe data transfers, cause jitter that degrades camera, radar or lidar performance, and trigger V2X or 5G communication dropouts, impacting situational awareness.

The end-to-end monitoring function enabled by a single mems clock chip allows failures to be detected early in the clock tree, reacting quickly to bring the system back to a safe state. Without this ability to report a fault within microseconds, hundreds of milliseconds would pass before a failure is manifested downstream, identified by a module and reacted to. With the monitoring function in the latest mems devices, the system is in an unsafe state for no longer than it needs to be.

Environments

Quartz crystal oscillators have long provided the heartbeat for automotive electronics. But as systems have become more complex and demanding, quartz systems' inferiorities in terms of size, resilience and temperature stability are limiting.

Timing systems in SDVs must perform reliably in conditions characterised by extreme temperatures ranging from -40°C in winter to over +125°C in summer, engine bays, constant vibration and shock from rough roads and mechanical systems, and electromagnetic interference (EMI) from electric powertrains, charging systems and increasingly dense electronics.

Shared mobility models add further stress by keeping vehicles in service longer each day, increasing thermal cycling and component wear.

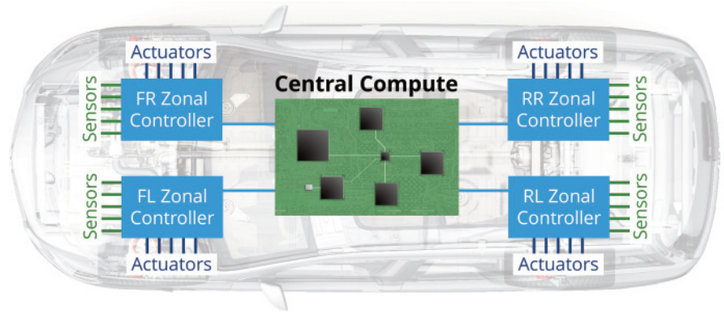
Silicon mems timing devices offer a far greater resistance to vibration and shock. They are vibration-insensitive and can cope with up to 20,000g of shock, making them up to 100 times more effective than quartz in the face of vibration and shock.

A high EMI immunity makes mems chips ideal for electric vehicles, and there is sub-ppm stability across the full automotive temperature range. In terms of size, the miniaturisation of mems devices – with resonators that have a 1000 times lower mass than quartz – allows them to fit into tightly packed sensor modules, enabling smaller timing footprints and increasing resilience.

Panel

At a recent expert panel discussion on SDVs, the discussion centred on how SDVs are reshaping the entire supply chain from OEMs and tier-one suppliers to semiconductor companies and software developers.

Historically, vehicles were designed with domain-based architectures, each with its own ECU optimised for a specific function, such as braking, infotainment, navigation or engine control. Software used to be written to fit the hardware, but the SDV model flips this approach. One panellist recalled how he used to design hardware and optimise software for the hardware, whereas in the SDV era, the reverse is true.



Zonal architecture and central compute with mems-clock tree

This change is profound. Instead of incrementally adding functionality ECU by ECU, SDVs rely on a centralised compute platform that hosts multiple applications. The advantage is scalability and efficiency, but the complexity of developing secure, safe and high-performance systems rises dramatically.

Precision timing is addressing this pain point. The disparate systems inside SDVs must communicate with each other before aggregating that communication outside the car to the infrastructure. For synchronisation of all these data, a reliable timing signal is non-negotiable. Precision timing at the physical layer ensures data flows don't lose coherence, undermining not only performance but safety.

Safety-critical systems in this software-centric architecture – such as anti-lock braking – are benefitting from faster response times afforded by the failsafe technology in products such as automotive clock generators that combine a mems resonator, oscillator and safety mechanisms in one package.

Precision timing goes further to allay engineer headaches by offering scalability across multiple vehicle platforms and adas levels, and interoperability in the absence of fully standardised timing protocols.

Future

Building better SDVs is not just about faster processors, smarter algorithms or better sensors. It is also about ensuring that every one of those systems keeps perfect time.

Precision timing is the silent enabler of safety, reliability and performance in the connected and automated vehicles of tomorrow.

As the SDV path winds towards an increasing focus on fully autonomous vehicles, the industry is confronting the twin challenges of rising complexity and uncompromising safety standards. In this software-oriented future where milliseconds matter more than ever, mems-based silicon timing is poised to become the heartbeat of automotive.



Sumeet Kulkarni is director of product marketing for automotive at SiTime

ELECTRIC VEHICLES

FASTER, HIGHER, FURTHER?



Peter Guse and Melina Danieli explain why distributed architectures are the future of DC charging

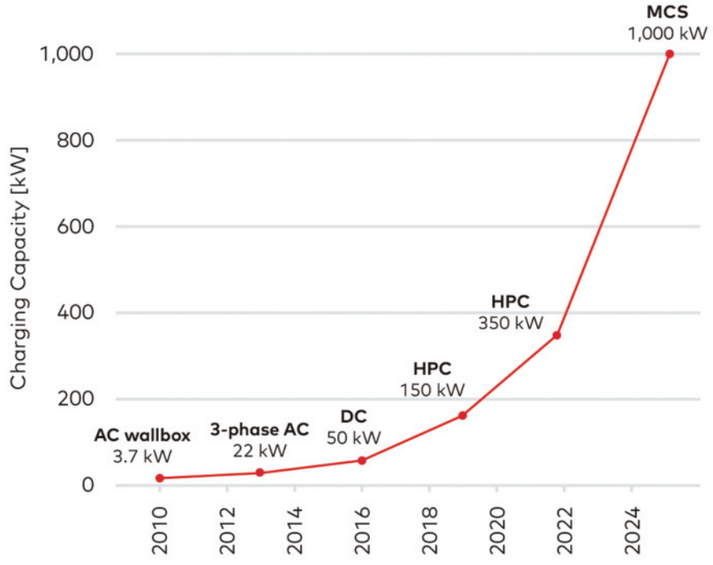


Fig. 1: Development of charging power from 2010, from the 3.7kW AC wallbox through DC fast charging and high-power charger technology up to MCS with 1000kW in 2024

As batteries grow larger and charging times shrink, traditional compact stations are reaching their limits. Distributed DC architectures promise a breakthrough: centralised power modules, intelligent switching matrices and dynamic power allocation can make charging parks more efficient, scalable and cost-effective.

Mobility is usually measured by how much can be moved from one place to another in a given time. Every minute counts, especially in commercial operations. As electric mobility has become increasingly common across all vehicle segments, larger batteries and faster charging have boosted vehicle uptime and transport performance.

This, however, demands ever-higher charging power. The question is no longer if faster charging will come, but how the required infrastructure can be built economically, safely and at scale, integrated into existing buildings, facilities and road networks.

The early adopters of electric mobility once valued the charging experience itself; simply plugging in and charging felt like a milestone. Today, as electrification becomes the economically superior option to combustion, charging has turned into a practical necessity, one that must fit seamlessly into both private and professional routines while expectations rise.

AC to DC

For long parking durations and small batteries, in passenger cars or light commercial vehicles, today's mature AC technology remains sufficient. The proven and cost-effective AC wallbox will continue to play a role as long as cars feature onboard chargers, and even more so once vehicle-to-home and bidirectional energy transfer become mainstream.

Fast DC charging, on the other hand, is essential when time is short, for instance, when a vehicle needs to recharge within minutes on the road, or when a large commercial vehicle battery must be fully charged within a few hours.

Faster charging increases the use and availability of electric vehicles, lowering cost of ownership, especially for fleets. But higher power means higher demand on the system: above 43kW, only DC charging is possible, and each charging point requires its own power electronics.

Beyond a certain power threshold, these components can no longer be placed near the vehicle, pushing system design towards distributed options. DC charging is therefore moving faster, scaling higher and spreading wider, especially for public long-distance and commercial applications.

Reliability, operational and information security, ease of use, and economic efficiency all become critical success factors.

Limits

Only about a decade has passed since single-phase 3.7kW AC wallboxes replaced simple outlets. Since then, charging power has surged, to 350kW with the combined charging system (CCS) and up to 1000kW with the megawatt charging system (MCS), see Fig. 1.

Alongside shorter charging times came improved usability, operational safety and backend integration, enabled by standards such as IEC 61851, ISO 15118 and OCPP/IEC 63584.

Range anxiety has faded, opening the door for electric vehicles in long-haul and heavy-duty transport. Yet, as charging power climbed, so did system weight, size and cost per charging point. Pushing compact stations with integrated power electronics and local battery storage even further raises practical questions.

In public spaces, bulky housings consume valuable space and generate additional noise from cooling; impractical, especially when use is low.

Centralised

Power electronics account for the largest share of cost, volume, weight and heat in DC chargers, and will continue to do so, even as components become more efficient. These modules are highly stressed yet often underused when dedicated to one or two fixed charging points, since charging power decreases with the vehicle's state of charge and occupancy fluctuates. Close to vehicles, they take up space and are exposed to damage.

It makes sense, then, to locate these expensive components centrally, in a protected, well-ventilated, and maintainable environment that can efficiently supply multiple dispensers.

This setup reduces cost per charging point and improves energy efficiency by allowing modules to operate near their optimal performance range. Only slim dispensers remain in vehicle proximity, see Fig. 2.

Central systems can be expanded on the fly by adding power modules, improving overall uptime since other modules can compensate if one fails.

Despite the distance, cable cross-sections remain comparable; whether transmitting DC over two conductors or AC over three or more to a rectifier, both must handle the same maximum current. Several manufacturers are already adopting centralised modules that flexibly power multiple dispensers.

Instead of assigning fixed power to each outlet, an intelligent switching matrix enables dynamic power allocation, distributing available power as needed among active charging points and adjusting it in real time during charging. This allows fewer power modules to serve the same number of vehicles compared with compact chargers.

The result: lower capital costs, reduced idle capacity, shorter charging times and higher energy throughput.

For logistics and public transport depots, this concept has an additional advantage: overnight, many vehicles charge slowly in parallel; during the day, a few selected vehicles can receive high-power charging, even up to megawatt levels via MCS.

Depending on average use and the mix between these scenarios, one centralised matrix system can efficiently support six to twenty charging points. The challenge now lies in developing switching matrices that are fast, safe, digitally controllable and cost-efficient, yet smaller than the power electronics they replace.

Control

This approach also reshapes system control and communications. The ISO 15118-20 standard enables dynamic adjustment of charging limits without interruption. Meanwhile, OCPP 2.1 and its device model create the foundation for configuring complex charging systems, integrating them into

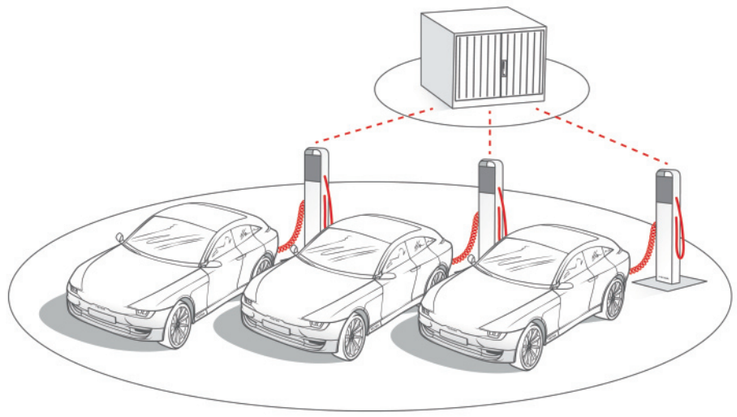


Fig. 2: Centralised bundling of power electronics and dynamic distribution across multiple charging points

backends, and managing them dynamically, see Fig. 3.

Physically separating logic and power components introduces challenges: the communication distance between vehicle and charging point via power line communications (PLC) or 10baseT1S is limited to about 7 to 15m.

A communication controller is being developed that bridges these distances, managing data between the vehicle, charging point and power units. It controls module switching, dynamically distributes available power and ensures seamless operation, forming the core of dynamic power allocation in centralised DC architectures.

An in-plug controller approach could embed vehicle communication electronics directly inside the charging cable connector. This overcomes the cable-length limitations of conventional PLC systems, allowing up to 100m between dispenser and power cabinet, suitable for layouts where vehicles park far from equipment. At the same time, the dispensers themselves can remain slim and simple.

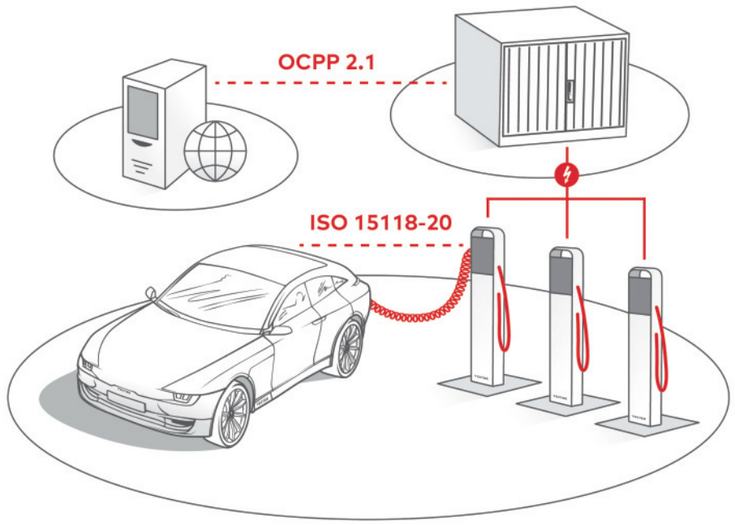


Fig. 3: Intelligent vehicle-to-charger interaction via ISO 15118-20 and central backend integration and control through OCPP 2.1

Safety and security

As overall system complexity and power levels rise, so do requirements for safety and cyber security. Interactions among distributed charging points demand architectures that can isolate faults locally without shutting down the entire system.

DC charging involves voltages above 1kV and currents of several hundred amperes, posing elevated electrical safety risks. According to Din EN 61851-1, mode-four charging requires strict measures for insulation monitoring, contactor diagnostics, mechanical interlocks and residual current detection. These prevent harm to people and vehicles during operation.

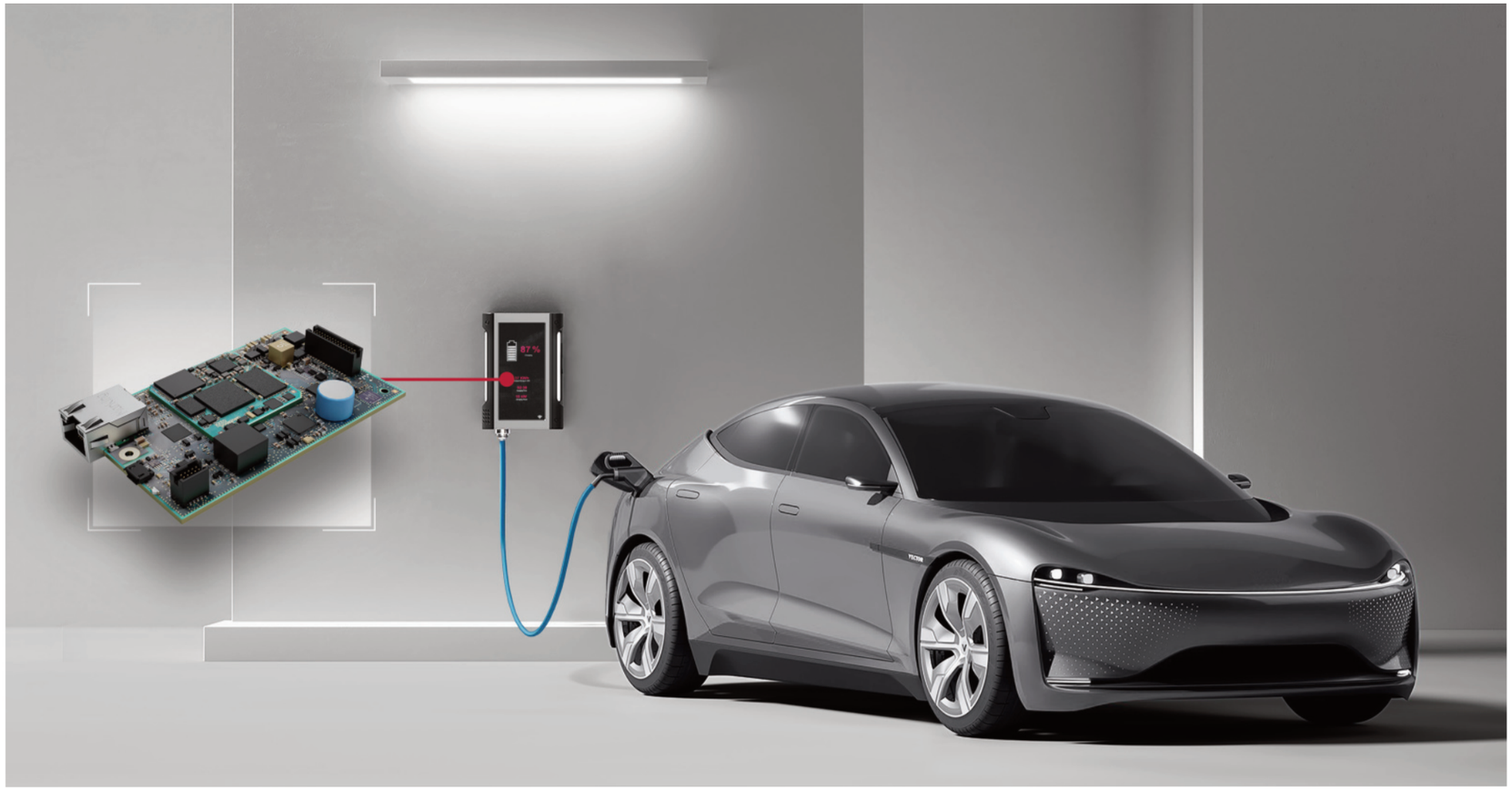


Fig. 4: From 2026, the European Union will increase standards for publicly accessible charging points

Modern systems go even further, integrating thermal sensors to detect overheating in cables or connectors and trigger immediate shutdowns. Regular testing ensures operational safety. A distributed charging network must also resist tampering and system failure.

Today's charging infrastructure connects vehicles, operators, power grids and backends, making it both mission-critical and grid-relevant. Consequently, the risks of manipulation and cyber attacks rise.

ISO 15118-20 and OCPP 2.1 mandate end-to-end encryption between vehicle, charger and backend, preventing interception or data manipulation. Digital certificates enable secure, convenient plug-and-charge authentication, while access control restricts physical and digital interventions. Verified, signed software and firmware updates ensure only authorised and untampered images are installed. From 2026, the European Union will require these security measures for all publicly accessible charging points, see Fig. 4.

Future

The direction is clear: faster, higher, distributed. Faster, because vehicles must charge within minutes. Higher, because power levels will reach into the megawatt range, enabling heavy-duty transport.

Distributed, because the future of DC charging doesn't lie in ever-larger compact stations, but in modular, centrally managed systems that deliver power precisely where it is needed.

By combining power electronics, control software and standardised communications within intelligent switching architectures, charging infrastructure can become more efficient, cost-effective and reliable.

Especially in commercial settings where uptime and turnaround time are mission-critical, this will be a decisive success factor.

Peter Guse is director of business development and





Melina Danieli is a marketing expert, both at Vector Informatik

TELEMATICS

FLEET MUSIC

Ohad Peled explains the critical role of telematics in EV fleets

Image by Amrothman from Pixabay

Vehicle Electronics

Fleet tracking has moved from operational nice-to-have to boardroom priority. According to Allied Market Research, the global commercial telematics market will surge from $16.9bn in 2020 to $64bn by 2030, a 14.3% CAGR, underscoring why telematics is moving from pilot project to board-level priority.

Whether managing long-haul trucks, last-kilometre delivery vans or a growing pool of electric vehicles, knowing where each asset is, how it is being driven and what condition it is in is no longer optional.

This is fundamental to managing costs, complying with evolving regulations and meeting customer expectations for speed, transparency and reliability.

But while early-stage pilots often succeed, the real test begins when telematics systems are deployed at scale. In complex, real-world environments where coverage drops, security threats evolve and logistics get messy, many deployments falter.

Gaps

During any typical driving session, vehicles pass through tunnels, parking structures, rural areas and other difficult connectivity zones. When that happens, back-end systems are left to guess what happened in between, risking incomplete data, failed audits or lost customer trust. However, the right connectivity tools can capture those blind spots. For example, devices that blend satellite positioning with wifi and cellular signals can store data locally for delayed transmission. Fleet managers can now achieve full visibility.

Security and maintainability present a second problem. Many telematics systems contain more than vehicle tracking data. They hold sensitive driver behaviour, customer data and route histories. Each device becomes a cyber-security risk if not properly secured and regularly updated.

Yet maintaining security patches across thousands of units, running different hardware revisions on dozens of mobile networks, quickly turns into a logistical nightmare. Installing hardware-based security provides a strong foundation, especially when combined with dedicated security chipsets.

These chipsets enable secure boot, encrypted storage and tamper resistance, allowing fleets to deliver trusted operations and lightweight incremental updates efficiently and safely.

In fact, New York already monitors more than 27,000 municipal vehicles in real time via its Department of Citywide Administrative Services' Geotab rollout, demonstrating that large-scale telematics can be operated and updated centrally without pulling trucks off the street.



Illustration of modern telematics: Secure vehicle tracking through GPS, wireless data and smart fleet analytics

Scaling

What works for a 50-vehicle pilot often breaks down when applied to a 50,000-unit rollout. Manual provisioning, multiple hardware configurations for different countries and inventory tracked in spreadsheets cannot sustain real-world operations.

What's needed is a unified approach: cloud-native device management, eSIM profiles that auto-configure on power-up, integrated SIMs (iSIMs) that provide out-of-the-box connectivity with swappable profiles for last-step provisioning, and hardware that supports global network bands out of the box. These are the building blocks for scaling smoothly, without spiralling complexity or cost.

Power consumption, too, is more important than many realise. Even when hardwired to a vehicle, trackers must consume as little energy as possible to preserve battery life, especially in electric fleets. Modern systems rely on low-power design and intelligent filtering to wake the modem only for meaningful events. That means fewer false alerts, lower power usage and greater confidence from OEMs and operators alike.

Meanwhile, demand for location precision is rising. In some cases, it is enough to know a vehicle was in the general area but, more often, accurate lane-level tracking is essential for billing, safety reviews and delivery verification.

Fortunately, sensor fusion technology is catching up. By blending multiple satellite constellations with wifi and cellular signals, it is now possible to achieve pinpoint accuracy without external processors.

Accuracy is also climbing the priority list. It is not enough to know in what neighbourhood was a vehicle. Telematics use cases often require frequent, high-precision location fixes combined with other behavioural data.

For billing, safety investigations and delivery verification, this level of precision is essential. Advances in sensor fusion now make this possible without external processors, combining multiple satellite signals with wifi and cellular data to fill in the gaps.

By enabling external GNSS for continuous 1m accuracy, asset trackers can support a high-quality level of service.

Infrastructure

What ties all of this together is the shift in mindset, moving from treating telematics as an add-on to embracing it as a strategic infrastructure layer.

That means designing systems to last a decade, meet emerging cyber-security standards and accommodate the ongoing transformation of transportation.

Getting there requires more than smart chips or sleek dashboards. It requires foresight, planning for real-world duty cycles, optimising firmware update strategies, and making sure every device can onboard and operate autonomously. Only then can fleets benefit from the full promise of telematics: cost savings, compliance, safer roads and better service.

The road ahead is clear. Fleets that invest in scalable, resilient and secure telematics platforms won't just keep pace, they will lead.



Ohad Peled is product marketing manager at Sony Semiconductor

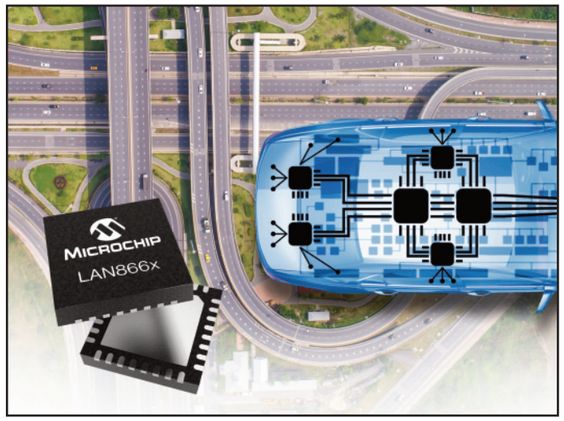


Connected fleets in motion: Integrating satellite, cloud and secure wireless technologies to enable real-time telematics and fleet management at scale

Endpoints advance zonal architecture

A family of 10baseT1S endpoint devices from Microchip extend Ethernet connectivity to the edge of in-vehicle networks, enabling the vision of software-defined vehicles (SDVs).

The LAN866x endpoints are designed to simplify network integration by serving as bridges that translate Ethernet packets directly to local digital interfaces.



Unlike conventional offerings, these endpoints are designed to be software-less, reducing the need for node-specific software programming, streamlining silicon usage and physical footprint.

With support for the standards-based remote-control protocol (RCP), the endpoints enable centralised control of edge nodes for data streaming and device management.

By using a 10baseT1S multidrop topology, this supports an all-Ethernet zonal architecture that helps reduce cabling, software integration and cost.

By removing the need for software development at every node, the endpoints are designed to reduce hardware and engineering costs, accelerate deployment timelines, and simplify system architecture.

The endpoints are suitable for critical automotive applications such as lighting, covering interior, front and rear headlamps, as well as audio systems and a wide range of control functions.

In these applications, the endpoints provide direct bridging of Ethernet data to local digital interfaces controlling LED drivers for lighting, transmitting audio data to and from microphones and speakers, as well as controlling sensors and actuators over the network.

The LAN866x family is available in limited sampling.

Verification toolchain adds Rust analysis

At last month's Embedded World in California. TrustInSoft announced the availability of Analyzer 2025.10, the latest release of its formal verification toolchain.

The update introduces comprehensive Rust analysis capabilities for detecting undefined and unwanted behaviour and delivers an improved multithreading experience.

It enables development teams working with Rust or mixed-language codebases in safety-critical environments to gain formal, mathematical confidence in the safety and reliability of their software.

Though Rust has been praised for its built-in memory safety, there are safety guarantees Rust doesn't provide, including protection against overflows and safe calling into C functions. Rust also has an unsafe sublanguage where the proof of memory safety needs to be conducted by the user.

In March, TrustInSoft formed a partnership with Ferrous Systems to bring Rust support and the benefits of its qualified compiler toolchain, Ferrocene, to TrustInSoft's formal analysis engine.

Analyzer 2025.10 now provides the same interactive root cause investigation, code coverage and mathematical proof guarantees for Rust as it does for C and C++.

For engineering teams mixing Rust with legacy C/C++ or working in safety-critical environments, this means something concrete: a way to detect undefined and unwanted behaviour, panics and memory vulnerabilities in mixed-language codebases before they hit production.

It introduces native support for analysing concurrent code, including real-time operating systems, interrupt-driven firmware and multi-instance threading scenarios.

The Analyzer doesn't just simulate a few scenarios, it explores all execution paths, flagging race conditions and non-deterministic behaviour with the same mathematical confidence it brings to single-threaded code.



HV fuses

High-voltage cartridge fuses from Littelfuse are the first AEC-Q200-compliant fuses rated at 1kV DC (828 series) and 800V DC (827).

Designed for electric vehicles (EVs), they have a 10kA interrupting rating, operating temperature from -55 to +125°C and multiple mounting configurations, including through-hole and bolt-down options.

These features make them suitable for onboard chargers (OBCs) and power distribution units where high voltage, high reliability and compact designs are essential.

AEC-Q200 qualified, RoHS compliant, halogen free and 100% Pb-free, these fuses help eliminate the need for additional mounting accessories or complex lead-forming processes, simplifying integration into high-voltage circuits while increasing PCB real estate efficiency.

Their construction ensures performance and durability in harsh environments.

Smart switch enables functional safety

An automotive e-fuse mosfet controller from ST Microelectronics combines fast-acting e-fuse features for harness protection and flexibility, enabling power saving and performance in automotive functional safety.

The VNF1248F reacts within 100μs, which is faster than a conventional wire fuse and ensures flexible and robust protection to avoid fault propagation inside the vehicle.

It integrates capacitive charging mode functionality to ensure proper driving of large capacitive loads with high inrush current.

In addition, an enhanced standby-on mode with current capability up to 600mA and current consumption lower than 75μA enhances the vehicle's efficiency when in park mode, helping increase autonomy.

An optional external supply pin for logic reduces power consumption by 0.4W in 48V systems, and battery-undervoltage shutdown compatible with the automotive LV124 standard ensures stability.

The chip facilitates reaching high safety-integrity levels in ISO 26262 applications thanks to features such as fault detection and reaction, fail-safe mode, and limp-home mode.

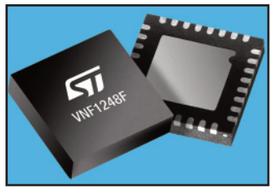
There are also built-in self tests for automatic diagnosis and a dedicated pin for direct hardware control of the external mosfet gate in case of a microcontroller fault.

Suitable for 12, 24 and 48V boardnets, it handles power distribution in zonal vehicle electrical architectures and general fuse and relay replacement. Other uses include as an ECU main switch and active supply for always-on circuitry in parking mode.

An SPI port interacts with a host microcontroller. Configuring the device using SPI saves conventional external programming components and allows flexible control of settings.

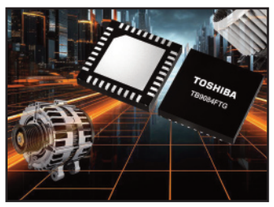
With non-volatile memory also on-chip, it can store an immutable default configuration to ensure consistent behaviour in failsafe or locked states.

The controller is in production now in a 5 by 5mm 32-lead QFN32 package.



Gate driver IC controls BLDC motors

Commercial sample shipments have started of Toshiba's TB9084FTG gate driver IC for three-phase brushless DC (BLDC) motors.



These motors are for on-board functions across diverse automotive applications, including body systems such as power sliding doors, back doors and seats, as well as electric pumps, fans and motor generators.

The IC integrates essential functions for three-phase brushless motor drive, including a built-in charge pump circuit, one-channel motor current sense amplifier, oscillation circuit, SPI communication circuit and various abnormality detection circuits.

The gate driver IC's streamlined core functions enable the use of a 6 by 6mm VQFN36 package with a wettable flank structure.

Embedded software environment uses standard interfaces

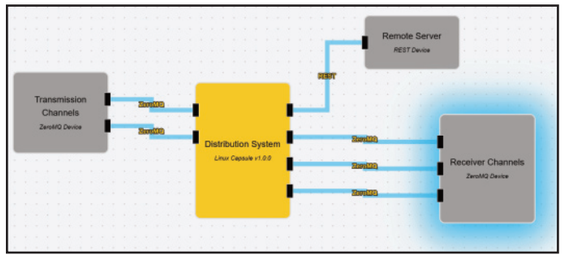
An embedded software environment from TeleCanesis is for teams creating smart industrial, medical, automotive and mobility products.

It helps interconnect system nodes using standard communication interfaces and protocols.

The toolkit is built on the QNX real-time operating system for mission-critical embedded systems such as those within robotics, automotive, medical devices and industrial controls.

Targeting use cases in automation and control, asset tracking, remote condition monitoring, e-mobility, smart agriculture and healthcare, it can reduce software development costs by 70% or more and accelerate time to market.

The environment provides a graphical web-based design application, a VSCode extension for editing and integration, and a runtime core for real-time control and connectivity. Engineers can define their required connections at a high level and then let the tools work out the interactions between nodes and generate code automatically.



The tools support a wide range of bus standards, communication protocols and HMI frameworks, which handle everything needed for translating between the different communication models.

Users can access the tools online, bundled with an engineering support package that provides individual attention from specialists to help understand the tools and integrate with their workflow.

Comprising three main elements, it is said to be easy to understand and use. System architects can take advantage of the web-based drag-and-drop gui, using built-in templates to perform hardware configuration and bus layout.

A VSCode extension provides a signal explorer and routing visualisation for software engineers, automates generation of test cases and endpoint bindings, and integrates seamlessly into typical work environments.

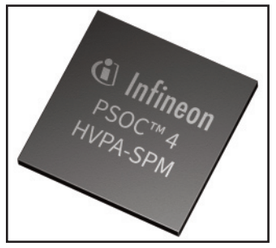
The runtime core provides real-time control and connectivity.

Microcontroller manages EV batteries

A microcontroller from Infineon is for high-voltage Li-ion battery management in EVvehicles.

The PSOC 4 HVPA-SPM 1.0 supports zonal architectures.

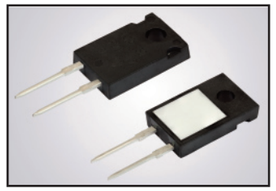
To increase its impact, Infineon is partnering with BMS provider Munich Electrification.



The device monitors current, voltage and temperature.

Compliant with Asil D, it ensures robust and reliable operation in high-voltage battery systems.

Its built-in Arm Cortex-M0+ processor delivers edge intelligence, enabling faster data processing and reducing the load on the central ECU.



Thick-film resistor

An AEC-Q200 qualified, 30W thick-film power resistor from Vishay comes in a compact TO-220 package for direct mounting on a heatsink.

Engineered for reliability and durability in extreme automotive environments, the Sfernice LTA 30 withstands high humidity conditions and temperatures to +125˚C, while providing tolerance against vibration and electrical stress.

In addition, the resistor combines a 500V operating voltage with an overload capability of 1.5x Pr for 5s to ensure stability under transients and high-voltage conditions.

Together, these characteristics can guarantee consistency in safety-critical applications.

Offering resistance values from 0.010Ω to 450kΩ, with tolerances down to ±1%, the device serves as the precharge or discharge resistor for on-board chargers, battery management systems and motor controls for electric vehicles, hybrid electric vehicles and plug-in hybrid electric vehicles.

Lin motor driver boost for aircon

An automotive Lin motor driver from Melexis delivers up to 5W, 0.5A per motor.

For air conditioning flaps and automated air vents in electric vehicles, the MLX81350 combines quiet, efficient motor operation with simplified system integration and reliability.

This fourth-generation IC is a smart Lin motor driver built on high-voltage SoI (silicon-on-insulator) technology. It offers flash programmability, robustness and function density while reducing BoM complexity.

By integrating analogue and digital circuitry, it provides a single chip that complies with standard Lin 2.x, SAE J2602 and ISO 17987-4 specifications for Lin slave nodes.

At its core is an evolved software architecture to enhance performance and efficiency. Key to this is improved stall detection and the addition of sensorless, closed-loop field-oriented control.

This enables smoother motor operation, lower current consumption and reduced acoustic noise to support a wide range of automotive hvac and thermal management applications.

The device maintains pin-to-pin compatibility with its predecessors, allowing engineers to migrate existing designs with little effort.

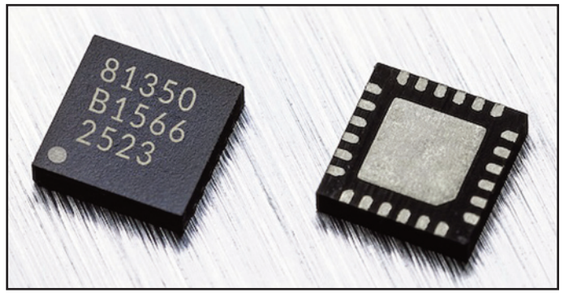
Its Lin interface enables seamless communication within vehicle networks, while built-in protection and diagnostic features – including over-current, over-voltage and temperature shutdown – ensure safe and reliable operation in automotive environments.

Peripherals support motor control and system integration, including a configurable RC clock (24-40MHz), four general-purpose IOs (digital and analogue), high-voltage input, uart, SPI and I²C master or slave interfaces, five 16bit motor PWM timers, two 16bit general timers, and a 13bit ADC with less than 1.2μs conversion time across multiple channels.

The IC is designed to ISO 26262 Asil B and offers flexible wake-up options via Lin, external pins or an internal wake-up timer.

Standby current consumption is typically 25μA, maximum 50μA, for energy-efficient operation.

Internal voltage regulators allow direct powering from the 12V battery, supporting an operating voltage of 5.5 to 28V.

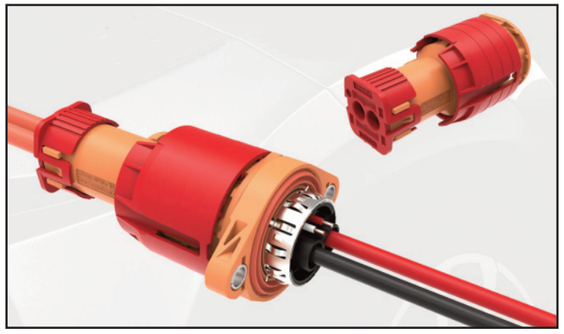


HV connector secures auxiliary functions

The first product in Molex's eHV high-voltage connector and terminal portfolio is designed to provide secure and reliable electrical connections in high-voltage power applications across auxiliary and primary systems in battery and plug-in hybrid EVs.

The eHV60 automotive connector is suitable for auxiliary high-voltage functions, such as DC-DC converters, onboard chargers, electric compressors and e-axles.

It adheres to USCar-2 and LV215 standards while being validated electrically and mechanically as a drop-in alternative to legacy products. This offers automotive OEMs and tier-one suppliers dual-sourcing options while assuring risk-free system integration and faster programme onboarding.



Its footprint is up to 30% smaller than existing products.

The shielded interface design ensures protection from EMI, which is critical for maintaining signal integrity and system safety in high-voltage environments.

Boost controller suits backlight use

An automotive-compliant high-efficiency 60V boost controller from Diodes is for backlight applications.

The AL3069Q includes four 80V high-precision current sink channels to accommodate larger LED display panels, and diagnostic functions for system safety and reliability.

Applications include infotainment panels, instrument clusters and heads-up displays.

With built-in adaptive boost voltage control, it operates over an input voltage range from 4.5 to 60V. This covers the common automotive power supply rails (12, 24 and 48V), providing flexibility in system design.

Its boost operating switching frequency is adjustable from 100kHz to 1MHz to address application requirements for high-efficiency or compact PCB layouts.

The four integrated 80V LED current sink channels can be set using an external resistor with a current matching of typically ±0.5% between channels and devices, ensuring display uniformity



and consistent brightness.

Each string can deliver 250mA, with a pulse current of up to 400mA, supporting a longer string of LEDs for higher output power. This capability makes the device suitable for differently sized and larger LED panels up to 81cm diagonal.

The device supports PWM-to-analogue dimming, achieving a minimum duty cycle of 1/5000 at 100Hz, enhancing brightness control precision and reducing LED colour shift.

Fault diagnostics and protection features include cycle-by-cycle current limit, soft-start, undervoltage lockout, programmable overvoltage protection, overtemperature protection, LED open and short protection, Schottky diode short and open protection, inductor-short-circuit protection, and V_{OUT}-short protection.

A dedicated fault indicator pin is included to report faulty conditions.

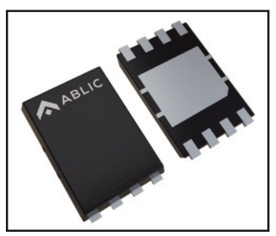
The device comes in the tssop-16EP (type DX) and U-QFN4040-16/SWP (type UXB) packages.

A standard compliance version, the AL3069, is for industrial and commercial applications.

PMIC enables camera module downsizing

A power management IC (PMIC) from Ablic for automotive camera modules supports 16V input and three power output channels.

The S-19560B integrates two step-down DC-DC converter channels and one LDO regulator channel into an HSNT-8 (2030) package measuring 2.0 by 3.0 by t0.5mm.



In the circuit design of camera modules requiring downsizing, by combining the three-channel output device with the firm's S-19255 high-PSRR LDO regulator, designers can configure a four-channel power supply circuit with a mounting area about 20% smaller than competing four-channel PMICs.

Furthermore, using an external LDO regulator offers the advantage of heat dispersion, contributing to space saving and improved thermal efficiency of the camera module.

By shortening the distance between the cmos image sensor and the LDO, external noise on the power line can be suppressed.

Additionally, image sensors and serialisers often require different output voltages and power-up sequences depending on the manufacturer and device model. This device simplifies these settings by providing preset configurations, reducing setup time and development effort.

It can be used immediately as a power supply after applying power, without the need for any initialisation operations.

Sensor captures high-res in-cabin images

A cmos RGB-IR image sensor from Sony is said to have the industry's smallest pixel size of 2.1μm for in-cabin monitoring cameras.

The IMX775 delivers RGB and IR imaging on a single chip and a resolution of approximately five effective megapixels.

It can capture wide-angle images of the interior of the vehicle including the driver and passengers. It also delivers image quality in visible light (RGB) and 940nm near-infra-red light (NIR) imaging on one chip.

The sensor uses a proprietary pixel structure. The pyramid array structure inside pixels enhances quantum efficiency (the conversion efficiency of light to electrons) even with the small pixel size. This also optimises pixel structure to increase photodiode capacity.

Diffracting incident light to enhance the absorption rate delivers a level of 35% quantum efficiency for a wavelength of 940nm even at a pixel size of 2.1μm.

The five-effective-megapixel resolution enables high-definition monitoring of conditions in the vehicle and, with the increased low-light sensitivity, the sensor offers high-precision recognition of the driver's line of sight and other elements.

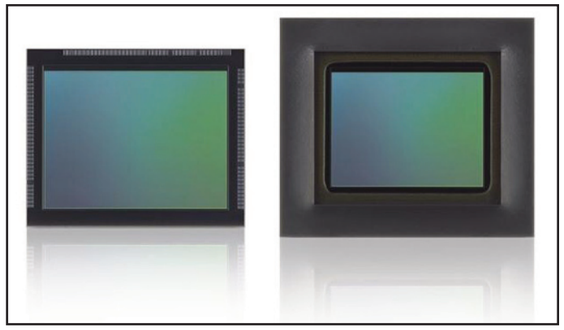
It is driven by a hybrid rolling and global shutter system for exposures to deliver the 110dB dynamic range in RGB imaging. A signal processing algorithm is used to remove NIR elements from the RGB pixels for on-chip processing, thereby delivering better colour reproduction.

This makes it possible to generate high quality RGB images even for the inside of vehicles with significant differences in brightness.

In NIR imaging, the global shutter exposure and high NIR sensitivity enables high-precision recognition of movements such as driver line of sight and blinking.

Built-in signal processing with upscaling to improve NIR image resolution, along with context switching that extracts arbitrary pixel areas from each frame for output, enable an overall compact system without using an external ISP.

Sony plans on obtaining AEC-Q100 grade-two certification by the time mass production begins. The company has also introduced a development process that complies with ISO 26262 Asil B.



Editor and Publisher:
Steve Rogerson
editor@vehicle-electronics.biz

Advertising Manager:
advertise@vehicle-electronics.biz

Web Site Manager:
Martin Wilson
admin@vehicle-electronics.biz

Published by: Vehicle Electronics Magazine, 72 Westwood Road, Nottingham NG2 4FS, UK

Web site: vehicle-electronics.biz
Twitter: @velectronicsmag

© 2025 Vehicle Electronics
ISSN 2055-1177

Vehicle Electronics is available to readers worldwide. It will be published twelve times a year in a digital-only format. The magazine complies with GDPR. All rights reserved. No part of Vehicle Electronics may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying or recording on any information storage system, without the written consent of the publisher. The publisher cannot be held responsible for loss or damage to unsolicited press releases or photographs. Views of contributors and advertisers do not necessarily refelect the policy of Vehicle Electronics or those of the publisher.