VEHICLE electronics

The monthly magazine for automotive electronics engineers

Google and Qualcomm announce agentic AI collaboration at CES

Qualcomm and Google have deepened their alliance to provide an agentic AI foundation for transforming the automotive industrys.

The goal is to unlock innovation, accelerating time to market, and opening capabilities in the rapidly evolving era of agentic AI.

This collaboration aims to establish end-to-end automotive technology that seamlessly integrates Qualcomm's Snapdragon Digital Chassis with Google's automotive software, helping automakers create vehicles that anticipate, react and adapt to driver needs with AI.

Together, Qualcomm and Google aim to deliver secure and scalable AI-powered experiences for millions of vehicles.

Building on a decade-long collaboration, the two companies showed AI-powered options at CES in Las Vegas that connect vehicles to the cloud, using a flexible architecture that blends on-device and cloud models.

This approach enables real-time personalisation for drivers and helps speed the rollout of features such as voice-driven and proactive assistants, simplifies compliance, and lowers costs.

For drivers, this helps enable smarter, safer and more adaptive vehicles, with dynamic personalisation and multimodal interfaces with always-on AI-driven features that can help enhance convenience and safety.

They are establishing a unified reference platform aimed at accelerating development cycles, strengthening quality assurance and streamlining production for vehicle manufacturers.

Qualcomm is introducing its Snapdragon vSoC virtual platform on Google Cloud, letting automakers design, test and validate entirely in the cloud without the need for vehicle hardware.

Leveraging Google Cloud's Arm-based Axion bare metal instances, C4A metal, vSoC provides high-fidelity validation and enhanced parity to in-vehicle SoCs.

• For more on CES, turn to pages 13-24.



Deal was announced at CES in Las Vegas

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Infineon in development MoU with HL Klemove

Infineon and HL Klemove have signed a memorandum of understanding (MoU) to strengthen their collaboration in automotive technologies.

The partnership aims to combine Infineon's semiconductor expertise and system understanding with HL Klemove's capabilities in autonomous driving systems to accelerate innovation in vehicle electronic architecture for software-defined vehicles (SDVs) and autonomous driving technologies.

Under the MoU, the companies will jointly develop zone controller applications using Infineon's microcontrollers and power semiconductors.

HL Klemove will lead application development, while Infineon provides semiconductor technology support.

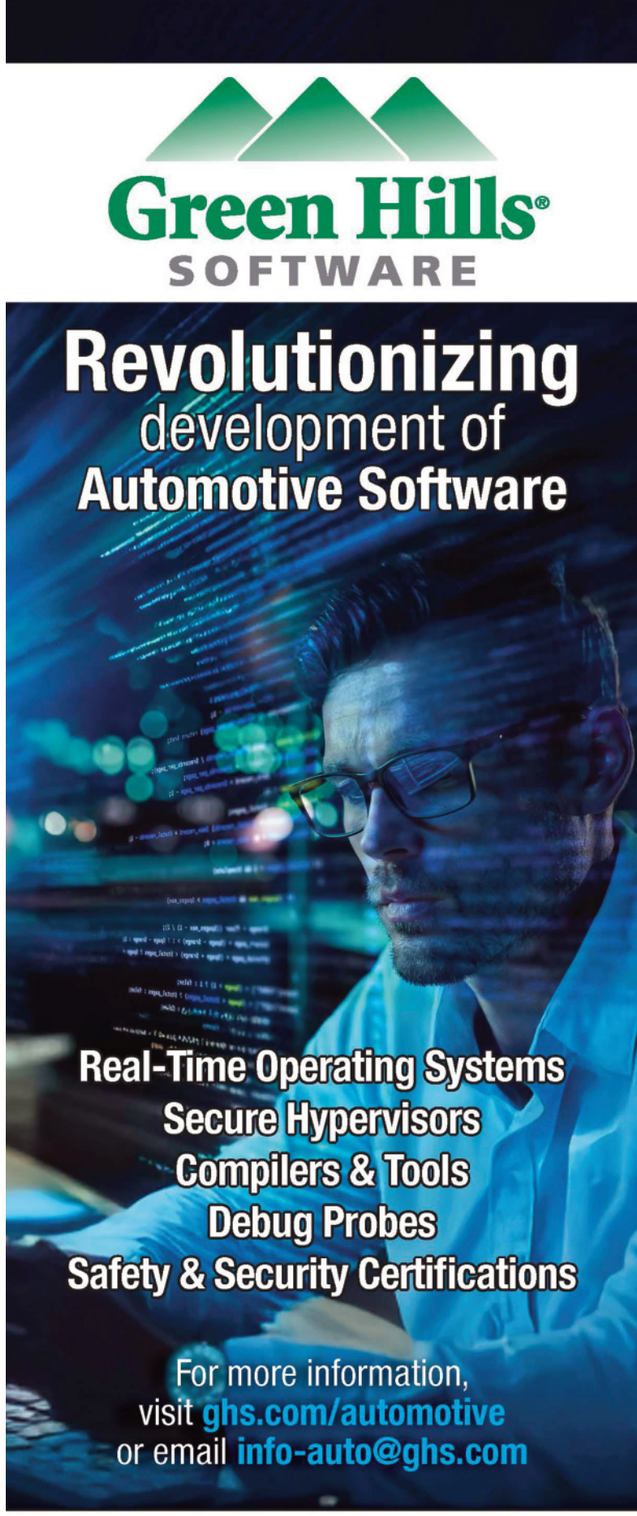
Through prototype development, the collaboration aims to strengthen competitiveness in SDV electronics architecture.

The partners will also cooperate on developing front camera modules and adas parking control units using Infineon's Ethernet technology. HL Klemove will handle system and product development, while Infineon provides Ethernet semiconductor and networking technology to enable high-speed, reliable in-vehicle networks.

HL Klemove will leverage Infineon's radar semiconductors to develop high-resolution and short-range satellite radar, preparing for commercialisation through proof of concept. Additionally, the companies will work on high-resolution imaging radar to achieve technologies capable of precise object recognition.

"Based on our holistic product portfolio, deep system understanding and application knowhow, Infineon aims to empower the automotive industry to accelerate time to market of software-defined vehicles." said Peter Schaefer, executive vice president of Infineon.

By optimising resources and accelerating proof of concept development, the partners aim to bring innovative technologies to market faster. Together, they plan to build the foundation for future key projects with high-performance, highly reliable autonomous driving that combines Infineon's semiconductor expertise and HL Klemove's system integration capabilities.





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Aumovio aids manoeuvring with trailers



Assistance system prevents collisions with pedestrians or obstacles

Aumovio has developed two adas functions that make it easier and safer to drive, manoeuvre and park while towing any type of trailer.

The first is a reversing aid that automatically moves both the vehicle and trailer back to its starting position at the touch of a button.

The second is a trailer collision warning system that prevents collisions with pedestrians or obstacles such as parked vehicles, and protects the vehicle-trailer combination from potentially extensive damage to the vehicle and trailer at critical angles of impact, making manoeuvring smoother and more secure.

They are expected to be available to the market in 2027.

Formerly Continental's automotive division, Aumovio has an extensive trailer functions portfolio and experience with many innovative features already in series production, in addition to intelligent driver assistance systems for cars, trucks and motorcycles.

North America is an important market for assistance systems that simplify driving with trailers. Many drivers tow cargo trailers or recreational vehicles with large pickups, but even seasoned drivers can struggle in tight spaces or when parking in difficult light or bad weather. This is where the trailering portfolio adds comfort and safety.

"Anyone who has to reverse with a trailer will appreciate an intelligent assistance system," said Ibro Muharemovic from Aumovio. "Manoeuvring with a trailer is one of the biggest challenges for drivers. With our two new assistance functions, we now offer support that makes handling a trailer effortless for everyone."

At the touch of a button, the trailer reverse assist automatically manoeuvres the vehicle-trailer combination back along the same path as when it was driven forward, preventing deviations from the ideal line. Users don't have to do anything other than press the button and the assistant takes care of the rest and initiates the manoeuvre.

The collision warning for turning and cornering manoeuvres helps trailers when reversing, starting off and passing.

When turning or manoeuvring, the significantly larger turning circle of a trailer can be misjudged, causing the rear corner of the vehicle to collide with the front corner of the trailer due to the angle of turn being too tight.

In addition, there is always a risk of collision with pedestrians, kerbs or other obstacles.

The assistance system uses existing surround-view cameras and, optionally, radar sensors in the vehicle to calculate the surroundings to detect pedestrians, bicycles or lampposts, for example, and warn the driver of possible collisions.

A real-time path overlay also shows the driver whether the vehicle and trailer are on a collision course with each other at the selected steering angle.

ESol supports Etas Autosar products in Japan

ESol, a developer of real-time embedded software for the automotive and mobility industry, has started selling Etas' Autosar products in Japan and will establish a support desk.

Engineering services based on these products will be offered from April.

Etas has for many years developed and provided a range of in-vehicle software, including Autosar products. ESol has also long offered Aubist, an Autosar product jointly developed with Denso.

By expanding its Autosar line to include Etas products, ESol hopes to meet a wider range of demands.

Furthermore, ESol will combine these products and tools with its full-stack engineering services.

Lauterbach backs Renesas with debug and trace

Lauterbach, a provider of debug tools, is supporting the Renesas R-Car gen-five X5H SoC, helping engineers develop architectures for software-defined vehicles (SDVs).

The X5H SoC is for application processing and AI acceleration, unifying automated driving and AI cockpit into one software-defined platform.

The chip integrates 32 Arm Cortex-A720 application processors, six Cortex-R52 real-time processors in lockstep operation, two Cortex-M33 cores for system management and up to 70 Arc-based AI accelerators in a heterogeneous multicore environment.

Lauterbach's Trace32 debug and profiling offerings ensure complete system-level visibility for the SoC, supporting functional safety, complementing automotive microcontrollers and virtualised SDV platforms with multiple OSes.

It provides Autosar-aware debugging, containerised workloads support and unlimited multi-core debugging across heterogeneous Arm and other architectures.

The debug and trace support the full automotive software stack provided by the R-Car Open Access (RoX) platform on current and future SoCs, and the entire lifecycle from virtual ECUs, including cloud-development to real silicon for in-field analyses in the car.

With expertise in safety certification, debugging and system profiling, Trace32 lets engineers build safe and secure automotive systems. Its hypervisor- and OS-awareness features give insight into applications, operating systems and virtualised environments.

"Designing with heterogeneous architectures can be challenging because multiple core types run different OS environments and must interact with each other in real time," said Aish Dubey, vice president at Renesas. "Lauterbach's debug and trace let automotive developers synchronise debugging across multiple CPU cores to maximise the SoC's throughput potential, thus increasing system integrity."



Hyundai picks Anritsu for hybrid eCall testing

Hyundai Mobis has selected Anritsu's eCall tester for the development and verification of the hybrid eCall and NG eCall automotive emergency call systems.

Starting this year, the European Union mandates the installation of NG eCall, which uses 4G networks, in all new vehicle models requiring type approval.

However, since 4G networks are not fully deployed in some regions, conventional eCall using 2G and 3G networks is still necessary.

To address this, Hyundai is developing hybrid eCall in-vehicle systems that are compatible with both NG eCall and eCall.

Verifying hybrid eCall has traditionally required separate testers. Furthermore, building a simulation environment replicating diverse network conditions for realistic operation posed a significant technical challenge to improving verification efficiency.

To overcome these problems, Hyundai has selected Anritsu's all-in-one tester combining the MX703330E eCall tester with the MD8475B signalling tester for testing of hybrid, NG and basic eCall.

In addition, its features – such as handover for switching between 2G, 3G and 4G systems and basestations, and cell configuration for adjusting signal strength – can simulate various network conditions. Leveraging this has enhanced the reliability and efficiency of Hyundai's development and verification processes.



Anritsu can test hybrid and NG eCall



SmartMCD board integrates Toshiba device

Toshiba helps Mikroe with smart motor controllers

Mikroe has integrated Toshiba's SmartMCD for dual brushed DC motors into the SmartMCD TB9M001FTG board.

The board helps automotive system engineers design a smart motor control driver for automotive applications, including electric sunroofs, wipers, powered windows and adjustable seats, to streamline prototyping.

The AEC-Q100 grade-one qualified device meets Asil-A requirements. It includes safety features, such as built-in error detection for overcurrent (low-side and high-side driver), overvoltage, undervoltage and thermal shutdown.

The device has a built-in microcontroller with an Arm Cortex-M0 core. It also integrates 16kbyte of ram and 192kbyte of flash, with an additional 16kbyte of data flash, all with ECC for single- and double-error detection.

The SmartMCD device integrates four low-side relay drivers, enabling forward and reverse control of two brushed DC motors when using single-pole double-throw relays. It also includes two high-side drivers for supporting 5 and 12V loads to external components, a Lin-transceiver for in-vehicle communication, and integrated power management that generates required voltage levels from the battery.

The board measures130 by 73mm, and includes all the circuitry required for motor control and operational testing, including multiple configurable GPIOs with several connection options, selectable by jumpers.

An on-board debugger, which is compliant with the CMSIS-DAP on-board emulator standard, enables out-of-the-box operation, testing and debugging of the device.

Aftermarket telematics set for rapid growth

The number of aftermarket car telematics shipments worldwide reached 26.5 million in 2024 and is forecasted to reach 39.3 million units in 2029, according to Berg Insight.

The installed base of active aftermarket car telematics units will see a CAGR of 8.7% from 90.3 million at the end of 2024 to 136.8 million worldwide at the end of 2029.

These units comprise cellular, GNSS and RF-based products.

Aftermarket car telematics is useful in applications such as stolen vehicle tracking (SVT) and recovery, vehicle diagnostics, wifi hotspot, convenience and usage-based insurance.

Remote vehicle diagnostics allow dealers and workshops to improve services to car owners.

"Dealers and finance companies can moreover leverage telematics for internal fleet management and manage the customer lifetime value," said Martin Cederqvist, senior analyst at Berg Insight.

Even though an increasing number of new cars are sold with embedded connectivity, a varying degree of market success for current OEM telematics enables aftermarket services to have a promising future even in mature OEM markets. Aftermarket services targeting a specific customer group can furthermore gain an advantage in specialisation compared with OEM telematics services that are mainly developed for a wide range of use cases.

Dealerships and workshops are examples of groups that aftermarket service providers serve successfully as the offering can be adjusted to fit their business needs.

Regional market conditions such as a high level of vehicle crime influence the demand for SVT and have made these products popular in countries such as Brazil, Israel, Russia and South Africa.

Today, there are many different form factors applicable for aftermarket car telematics ranging from professionally installed hardwired blackboxes to self-installed OBD dongles and battery-powered devices.

Products leveraging cellular technologies are most common across the industry, but RF-based units can be found in many markets, particularly for SVT .

Qualcomm improves Rav4 drive



The latest Toyota Rav4 will be powered by Qualcomm's Snapdragon Digital Chassis. It will use a Snapdragon Cockpit platform – a key component of Digital Chassis – to improve the in-vehicle experience, providing personalised, intuitive and seamlessly connected driving.

The Cockpit platform, with AI capabilities, enables high-resolution displays, intuitive touch interfaces and responsive voice-activated controls.

"We are excited to partner with Toyota to integrate our Snapdragon Digital Chassis into the new Rav4," said Mark Granger, vice president at Qualcomm. "By leveraging our next-generation Snapdragon Cockpit platform, Toyota is delivering an elevated driving experience that combines personalisation, immersive infotainment and connectivity. This collaboration brings advanced capabilities and safety innovations designed to make every journey smarter, more intuitive and more secure for Rav4 drivers and passengers."



Mathias Miedreich, Harman chair Young Sohn and Christian Sobottka

Harman acquires ZF adas business unit

Samsung subsidiary Harman has paid €1.5bn to acquire the adas business of ZF Group, comprising compute products, smart cameras, radars and adas software functions.

With this acquisition, Harman has secured inroads in the adas and central compute markets, reinforcing a foundation that advances its role in the SDV market.

By integrating ZF's adas capabilities with Harman's flagship digital cockpits within a centralised compute design, the acquisition should bolster its roadmap for vehicle architectures.

The combination creates a foundation for future central compute products that bring assisted and automated driving, safety and user experiences on a shared platform. This approach streamlines design, reduces integration complexity and supports more efficient innovation cycles, allowing Harman to help OEMs scale differentiated, context-aware vehicle experiences.

"The industry is at an inflection point where safety, intelligence and in-cabin experience must come together through a unified computing architecture," said Christian Sobottka, CEO of Harman's automotive division. "With this, we expand our portfolio with complementary adas capabilities that unlock a new class of cross-domain experiences ranging from perception-informed audio cues to more personalised, situation-aware driving."

Mathias Miedreich, CEO of ZF Group, added: "With Harman, we have found the ideal partner to fully unlock the growth and innovation potential of our adas business. At the same time, this deal makes an important contribution to reducing our company's debt and allows us to focus our resources on the core technologies in which ZF is a global leader."

Around 3750 ZF employees across Europe, the Americas and Asia are expected to move to Harman on closing of the transaction, expected in the second half of 2026, subject to approvals.

Upon closing, Harman will integrate ZF's adas capabilities into its centralised compute and digital cockpit roadmap, so OEMs can deploy more scalable, safety-integrated vehicle architectures.

The companies plan to maintain support for existing programmes while aligning engineering, adas and compute teams to accelerate innovation for future platforms.

BOS licenses Ceva architecture for adas SoCs

BOS Semiconductors has licensed Ceva's SensPro AI DSP architecture for its Eagle-A adas SoC for adas and autonomous driving, combining a high-end NPU, CPU and GPU with dedicated sensing interfaces for camera, lidar and radar fusion.

SensPro is optimised for lidar and radar preprocessing, handling raw sensor data and reducing latency in perception pipelines.

BOS's chiplet strategy enhances scalability, with Eagle-A designed to work alongside the Eagle-N AI accelerator in multi-die configurations connected via UCIe and PCIe. This helps OEMs tailor compute performance for diverse adas and autonomous driving.

Upstream strengthens cyber resilience at Škoda

Škoda is working with Upstream to strengthen cyber resilience across its connected vehicles.

The partnership aims to centralise cyber-related intelligence insights, enabling Škoda teams to identify risks earlier, streamline compliance activities and enhance operational collaboration.

As Škoda's digital footprint expands, the need to manage cyber-related risks consistently and efficiently has become increasingly critical for operational resilience and regulatory compliance.

Škoda partnered with Upstream to consolidate cyber threat intelligence, signals and risk information into one environment accessible to teams across the organisation. This enables streamlined collaboration, earlier visibility into potential risks, and reduced manual effort associated with compliance processes and internal reporting.

The growing complexity of the connected vehicle ecosystem has expanded the breadth of potential cyber-security risks for OEMs, from cloud environments and internal IT systems to consumer apps, charging infrastructure and supply-chain partners. Regulatory frameworks such as UNECE WP.29 R155 and ISO/SAE 21434 further require structured monitoring, documentation and risk management processes.

With Upstream's partnership, Škoda has consolidated risk-related information, enabling dozens of cyber-security and engineering professionals to review findings, share context, ask questions and document decisions within a unified workspace.

By streamlining communication and surfacing emerging issues earlier, the partnership enhances situational awareness across Škoda's connected vehicle and digital ecosystem. It also simplifies preparation for compliance reviews by organising evidence, actions and documentation in one structured environment.

Operations that once required extensive coordination are now handled more efficiently, with clearer processes and reduced administration. Consolidating workflows into one environment also improves audit readiness, making compliance a natural output of day-to-day cyber-security activities.

The partnership has evolved into a continuous improvement model, with frequent communication and shared feedback loops ensuring the platform adapts to Škoda's evolving needs.

Cyber-security standard provides global benchmark

Autocrypt's Automotive-CIS cyber-security infrastructure standard aims to present a global benchmark for vehicles.

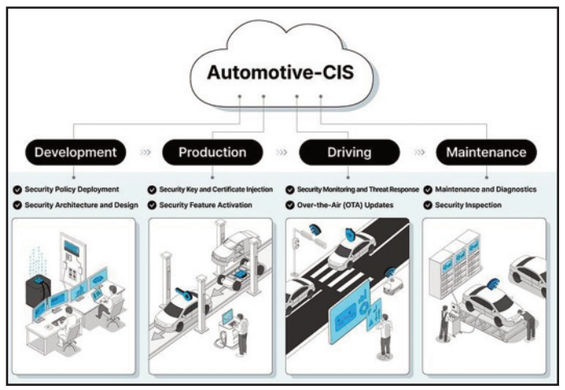
It is an expanded version of the firm's software security infrastructure previously delivered to automotive OEMs.

This version broadens its scope to include suppliers and establishes an integrated security architecture spanning the entire vehicle software lifecycle from development and production, all the way to driving and maintenance.

By integrating functions such as cyber-security management, software update management, vehicle security operations centre, and threat analysis and risk assessment into a single infrastructure standard, Automotive-CIS provides a core reference model for OEMs and suppliers as the industry shifts to software-defined vehicles (SDVs) and AI-driven mobility.

Autocrypt's proof-of-concept projects with domestic and international OEMs and suppliers have served as a foundation for the global vehicle cyber-security standard, shown through inclusion of tailored deployment roadmaps, expert consulting and comprehensive regulatory compliance plans across the supply chain.

"Automotive-CIS represents the essential foundations necessary for this new era of SDVs, AI mobility and post-quantum computing," said CEO Seokwoo Lee.



Cyber-security infrastructure standard

Mercedes F1 hopes to race ahead with Microsoft AI

Microsoft has signed a multiyear partnership with the Mercedes Formula One team.

As the team deals with F1 regulation changes, it is using Microsoft's cloud and enterprise AI technologies across the business, from the factory to the racetrack.



Microsoft logo on Mercedes F1 car

"Our sport is driven by those who lead through innovation," said Toto Wolff, Mercedes team principal. "By putting Microsoft's technology at the centre of how we operate as a team, we will create faster insights, smarter collaboration and new ways of working as we look ahead to the next generation in F1."

Each car carries more than 400 sensors, generating over 1.1 million data points per second. From tyre degradation and aerodynamic behaviour to energy recovery system deployment and evolving track conditions, every variable must be interpreted in real time.

Microsoft Azure and its AI capabilities will expand the team's existing high-performance computing and data capabilities, both at the factory and trackside, with scalable cloud and AI resources supporting simulation workloads, performance analysis, race strategy modelling and cross-team analytics.

"This partnership puts Microsoft's cloud and enterprise AI technologies at the heart of racing performance, where milliseconds matter and data determines outcomes," said Judson Althoff, CEO of Microsoft's commercial business. "We are harnessing data and turning it into real-time intelligence that powers faster decisions, smarter strategies and sustained competitive advantage both on and off the track."

Microsoft 365 and GitHub already underpin many of the team's engineering and operational workflows across its headquarters in Brackley and Brixworth, as well as trackside. Building on this foundation, the team will expand its use of Microsoft 365 to unlock more agility, accelerate innovation and enhance operational efficiency.

Going forward, the team's engineering, simulation and software development groups will deepen their integration of GitHub to modernise and accelerate development workflows.

Working with Microsoft Azure to accelerate AI technology experimentation and scale, the team used real-time sensor data and Azure cloud tools to pilot intelligent virtual sensors, enabling rapid testing without waiting for new on-premises infrastructure.

With the Azure Kubernetes service, they were able to adjust computing power, scaling up when demand was high and down when not, delivering meaningful technological advancements while meeting strict financial and regulatory requirements.

Xpeng develops AI that drives like humans

XPeng, in collaboration with Peking University, has developed a framework that enables autonomous driving AI to drive like a human by focusing only on essential information, achieving a 7.5 times reduction in computational load.

The FastDrive VLA is a visual token pruning framework designed for end-to-end autonomous driving vision-language-action (VLA) models. This work offers a different approach to visual token pruning by enabling AI to drive like a human by filtering out irrelevant data.

FastDrive is a novel reconstruction-based token pruning framework inspired by how human drivers focus on relevant foreground information while ignoring non-critical background areas.

The method introduces an adversarial foreground-background reconstruction strategy that enhances the model's ability to identify and retain valuable tokens.

When the number of visual tokens was reduced from 3249 to 812, the framework achieved a nearly 7.5 times reduction in computational load while maintaining high planning accuracy.

Lucid Gravity opts for Trimble positioning

Trimble's positioning technology will supply data used by the navigation and driver assistance systems in the latest Lucid Gravity.

By integrating Trimble RTX and ProPoint Go, Lucid Gravity becomes the first EV to feature a resilient positioning engine in a system that can enable centimetre-level accuracy even in tunnels, parking garages and dense city centres where standard GPS often fails.

This collaboration delivers technology that fuses satellite data with six-axis inertial sensors to help improve accuracy. While standard automotive navigation creates a margin of error measured in metres, this technology can narrow this down to a few centimetres and help validate the car's lane and position.

By serving as the primary source for location, velocity and heading, the system prevents the searching-for-signal lag often experienced in urban environments.

Accurate geolocation is fed directly into the hands-free driving assist system, ensuring the vehicle knows its precise spot on the highway.

Precise altitude data allow for smarter battery estimation, giving drivers an accurate reading of remaining distance based on real-world terrain.

Lane-level data unlock capabilities within mobile apps and the dashboard ecosystem.

High-fidelity tracking allows for better monitoring of fleet assets.

The positioning system will be standard on new Lucid Gravity vehicles from this month. Existing Gravity vehicles on the road will receive these capabilities via an over-the-air software update.

SST and UMC take eflash to fourth generation

Microchip subsidiary Silicon Storage Technology (SST) has completed full qualification and release to production of its fourth-generation embedded SuperFlash (ESF4) with full automotive grade-one (AG1) capability on UMC's 28HPC+ foundry process platform.

SST developed ESF4 in partnership with UMC to deliver enhanced embedded non-volatile memory performance and demonstrated reliability for automotive controllers while reducing the number of additional masking steps versus other foundries' 28nm high-k metal-gate stack eflash offerings, bringing cost advantages and manufacturing efficiency.

Those currently manufacturing automotive controller products using foundry 40nm ESF3 AG1 platforms are encouraged to explore the UMC 28nm ESF4 AG1 platform as they look to scale to the next process node.

"As automotive requirements accelerate, developers need to drive efficiency, speed up time to market and satisfy stringent industry standards," said Mark Reiten, vice president of Microchip's licensing business unit. "To meet these needs, UMC and SST have delivered a robust 28nm AG1, which is now ready for the production of customer designs."

Steven Hsu, vice president at UMC, added: "As the automotive industry rapidly advances towards more connected, autonomous and shared vehicles, the demand for highly reliable data storage and high-capacity data updates continues to grow. This has driven customer demand for scaling SuperFlash to the 28nm process."



SST developed ESF4 in partnership with UMC

TI accelerates shift to autonomous vehicles

Texas Instruments (TI) is accelerating the shift towards autonomous vehicles by expanding its automotive portfolio with analogue and embedded processing technologies.

The goal is to help automakers deliver smarter, safer and more connected driving experiences across their vehicle fleets.

TI's scalable TDA5 computing SoC family offers power- and safety-optimised processing and edge AI that supports up to level-three autonomy. The AWR2188 is a single-chip, eight-by-eight 4D imaging radar transceiver to help engineers simplify high resolution radar systems.



Future driving doesn't require hands on wheel

These devices, alongside the DP83TD555J-Q1 10baseT1S Ethernet phy, join the firm's broader automotive portfolio for adas and software-defined vehicles (SDVs).

TI debuted these products at CES in Las Vegas.

"The automotive industry is moving towards a future where driving doesn't require hands on the wheel," said Mark Ng, director at TI. "Semiconductors are at the heart of bringing this vision of safer, smarter and more autonomous driving experiences to every vehicle. From detection and communication to decision-making, engineers can use TI's end-to-end system offering to innovate what's next in automotive."

Designed for high-performance computing, the TDA5 SoC family offers edge AI acceleration from 10 to 1200Tops with power efficiency beyond 24Tops/W.

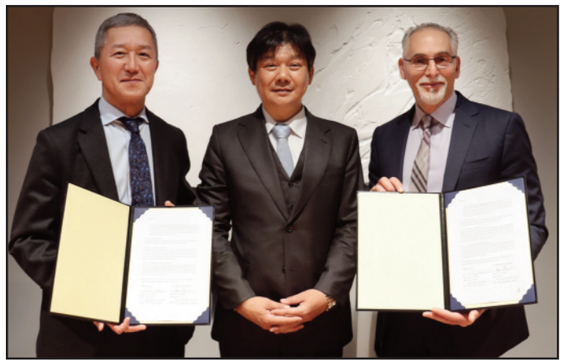
Rohm and Tata sign Indian manufacturing deal

Rohm and Tata Electronics have entered a partnership for semiconductor manufacturing in India.

As an initial focus, Rohm and Tata will establish a manufacturing framework for power semiconductors in India by combining Rohm's device technologies with the backend technologies of Tata.

In addition, by integrating the sales channels and networks, the partnership hopes to create business opportunities in India.

As the first step in this collaboration, Tata will assemble and test Rohm's India-designed automotive-grade 100V, 300A silicon mosfet in a toll package, targeting mass production shipments by next year.

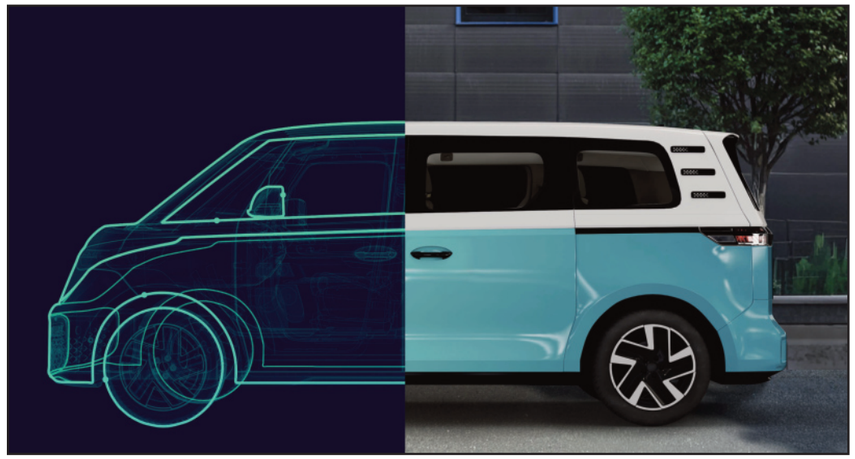


L to R, Sumihiro Takashima and Kazuhide Ino from Rohm with Steve Ghanayem of Tata

The companies will also explore co-development of high-value packaging technologies in the future. Both will combine efforts to market the products made through this collaboration.

"Through our semiconductor assembly and test facilities, Tata Electronics will deliver advanced chip packaging services to support Rohm in creating products tailored for Indian and global markets," said Randhir Thakur, CEO of Tata Electronics. "This partnership will go a long way in bringing in trust and resilience in the global semiconductor supply chain while also expanding our respective business opportunities."

Kazuhide Ino, managing executive officer at Rohm, added: "We aim to expand our line of packaged products manufactured in India and help build a sustainable, region-based supply chain network. We are confident this collaboration will enable us to meet the growing demand from Indian customers seeking domestically produced semiconductors. We also envision supplying jointly manufactured products to the global market."



Digital-twin software addresses escalating complexity

Siemens digital twin simplifies hardware-software integration

Siemens has developed digital-twin software that is pre-integrated and designed as an off-the-shelf offering to address the escalating complexity of automotive hardware and software integration.

Called Pave 360 Automotive, it helps automotive manufacturers and suppliers speed the development of software-defined vehicles (SDVs) with early full-system, virtual integration that mirrors real vehicle hardware and accelerates application and low-level software development for adas, AD and IVI.

This removes the need for users to build their own digital twins before testing software and reducing time to market for critical applications from months to days.

With vehicle hardware and software complexity rising, developers face mounting pressure to deliver innovation faster and compete with new market entrants while meeting increasingly sophisticated consumer expectations.

Traditional development methods are no longer sufficient to manage system-level interdependencies between adas, AD and IVI functions.

"The automotive industry is at the forefront of the software-defined everything revolution and Siemens is delivering the digital-twin technologies needed to move beyond incremental innovation and embrace a holistic, software-defined approach to product development," said Tony Hemmelgarn, CEO of Siemens Digital Industries Software. "Pave 360 will empower automotive companies to innovate with confidence, agility and scale, to realise the full potential of SDVs and set the standard for what's possible across all industries."

Pave 360 Automotive leverages expertise in digital-twin technology so automakers can jump-start vehicle systems development from the earliest phases with adas, AD and IVI customisable virtual reference designs.

They can unify development, optimise efficiency and increase cloud-based collaboration with one digital twin for all teams. They can customise and scale by adding software, models and external hardware.

Software development is made faster by leveraging hardware-like simulation speed of the latest automotive IP, including the new Arm Zena CSS compute subsystem. They can validate with real-world feedback by connecting digital twins to physical hardware and testing in real vehicles.

System-level digital twins for SDVs using existing technologies can be complex and time consuming to create and validate. To end this, Pave 360 Automotive delivers an integrated, system-level digital twin that can be deployed on day one, reducing the time, effort and cost to build such environments from scratch.

Following prior collaboration with Arm, which resulted in accelerated virtual environments for its Cortex-A720AE in 2024 and Zena CSS in 2025, Siemens is now integrating Zena CSS with Pave 360 so the industry can start building on Arm faster and seamlessly.

Access to Zena CSS in a digital twin environment can accelerates the development of software by up to two years.

Pave 360 leverages Siemens' Innexis software environment with supporting technologies to help users create system-level digital twins of adas, AD and IVI capabilities. General availability is scheduled for this month.

GOING PLACES

A roundup of the stories from January's Consumer Electronics Show in Las Vegas

CES

Green Hills and Smart Eye demo foundation for driver monitoring

Smart Eye and Green Hills Software jointly demonstrated how safety-critical driver monitoring can be seamlessly integrated into modern, consolidated automotive software-defined vehicle (SDV) architectures.

They demonstrated a production-ready foundation for OEMs and tier-one suppliers seeking to accelerate the development and deployment of safe and secure driver monitoring on modern, SDV architectures.

The combination helps automakers reduce integration complexity, shorten validation cycles, and meet the growing safety and regulatory requirements for driver monitoring, including the EU GSR and Euro NCap.

Built on production-grade software, the demo showed Smart Eye's driver monitoring software running alongside a digital instrument cluster on a single automotive ECU powered by Green Hills' Asil-certified Integrity rtos.

This demonstrated how mixed-criticality applications such as Smart Eye's safety-critical DMS can run safely and securely on the same compute platform while maintaining proven isolation and freedom from interference from other areas.

To illustrate this architecture in action, the demo was part of a network of multiple in-vehicle ECUs, a cloud-connected gateway and a driving simulation environment.

Real-world driving events generated by the Carla simulator were fed into the vehicle network, triggering visual alerts on the instrument cluster.

When Smart Eye's software detects driver distraction, the system broadcasts a DMS event across the network, prompting the cluster to display a "driver break needed" or "attention" warning on the cluster panel. These events are simultaneously logged by the gateway ECU and transmitted to the cloud by the gateway ECU for analytics and diagnostics.

The demonstration also highlighted Green Hills' Asil-certified development environment, giving developers a unified view across all applications and ECUs. In an intuitive graphical timeline display, engineers can trace events, monitor network messaging, and debug interactions across the cluster, gateway, zonal controller and driver monitoring applications, increasing developer productivity while reducing development and integration time.

"This shows how OEMs can bring safety-critical driver monitoring to market faster by combining our proven DMS software with a secure, consolidated compute platform designed for the challenging demands of today's vehicles," said Martin Krantz, CEO of Smart Eye.

Dan Mender, vice president at Green Hills Software, added: "By pairing Smart Eye's industry-leading driver monitoring software with our Integrity rtos and development tools, we're delivering to OEMs and tier-ones a clear path to deploy mixed-criticality applications safely and efficiently."

Teradar terahertz sensor provides reliable adas data

Outperforming legacy radar and lidar is Teradar's debut terahertz sensor Summit, providing reliable data for adas.

The company reckons its breakthrough vision can prevent up to 150,000 road deaths each year by reducing weather- and visibility-related crashes.

The start-up is a pioneer in the commercialisation of terahertz vision technology.



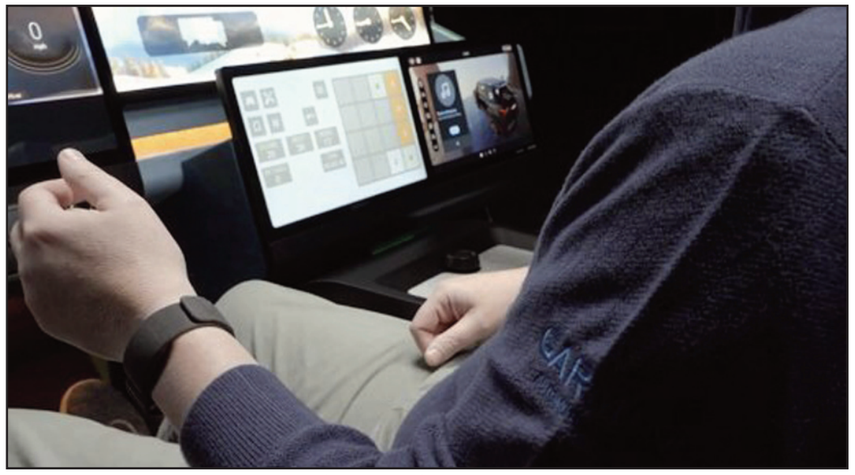
Summit sensor

The firm says it has already attracted tier-one suppliers and automotive OEMs who will manufacture and integrate its customisable chip design to enhance adas and L3 to L5 autonomy.

Currently in eight development partnerships across the USA and Germany, Teradar will begin bidding on high volume production programmes this year, targeting start of production in 2028.

Terahertz (THz) waves, which lie between radar and lidar on the electromagnetic spectrum, have always held promise for sensing applications due to the characteristics of the wavelength, which allows high-resolution and all-weather penetration. Previously constrained by available technologies, this category of sensing is now viable following Teradar's breakthrough in THz chip design.

The solid-state digital phased array architecture has a range of 300m and a native resolution of 13°.


PoC gives passengers control over infotainment

Garmin and Meta wearable concept controls infotainment

An automotive OEM proof-of-concept (PoC) that connects Meta's electromyography (EMG) technology with Garmin's Unified Cabin suite of in-vehicle technology was unveiled at the show.

The PoC lets passengers control select vehicle infotainment functions with gestures sensed by the EMG band using the thumb, index and middle fingers.

This initial concept sets the stage to introduce interaction methods for displays and vehicle functions while delivering a true lean-back entertainment experience for multiple passengers.

Meta Neural Band is a kind of wearable that translates subtle neural signals from the muscles at the wrist into digital actions. Its EMG technology allows for detection of a rich set of gestures that make interfacing with computers and cars feel natural.

Launched with a simple set of actions, such as clicks, scrolls and dials, the wristband can become capable of recognising increasingly complex inputs as time goes on, such as translating subtle finger handwriting movements into digital text.

"Meta Neural Band and its EMG technology could be the best way to control any device," said Meta vice president Alex Himel. "Once you start using the band regularly, you want it to control more than just your AI glasses. We've already developed prototype experiences for the band to control devices in your home, and it's been great to team up with Garmin to showcase its potential in your car."

Garmin Unified Cabin is a digital cockpit demo showcase that delivers scalable, intuitive, immersive and personalised entertainment experiences powered by a single control module.

Features demonstrated at CES included digital key, AI virtual assistant capable of executing multiple actions from a single voice command, seat-scoped audio and visuals, enhanced personalisation, cabin chat, cabin lighting show and personal audio sphere.

- Garmin has expanded its collaborations with the addition of the Nexus automotive-grade HPC platform. Powered by Qualcomm's Snapdragon Elite platform for automotive, Nexus can consolidate multiple vehicle domains such as in-vehicle infotainment, instrument clusters and adas into a single system.

Hyundai and Qualcomm sign MoU for SDVs

Hyundai Mobis and Qualcomm signed an MoU at the show to co-develop products for software-defined vehicles (SDVs) and adas.

Through this MoU, they will jointly develop integrated products tailored for emerging markets while pursuing global supply opportunities by leveraging Hyundai's expertise in system integration, sensor fusion and perception with Qualcomm' s SoC technology.

The companies will begin their work with their co-development of driving and parking products based on the Snapdragon Ride Flex SoC. These will target markets such as India, where adas is expanding across vehicle segments alongside rising demand for SDV-ready architectures.

They will also combine Hyundai software with Snapdragon to enhance performance and stability.

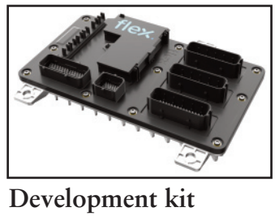
Infineon and Flex introduce zone control development kit

Infineon and Flex launched a zone controller development kit, a modular design for zone control units (ZCUs) engineered to fast track the development of SDV-ready EE architectures.

The kit follows a scalable approach and is based on reusable assets, combining approximately 30 unique building blocks. This allows developers to configure different ZCU implementations flexibly in short development cycles and offers a path from concept to series implementation.

In EE architectures, ZCUs can connect and power a large number of diverse peripherals. Not all peripherals remain consistent across vehicle platforms and models, leading to different ZCU requirements. Current ZCUs, however, are often not optimised for the specific use case or vehicle platform in which they are used.

With the kit's building block concept, developers can right size their designs for many individual implementations while preserving feature headroom for future models. This reduces the bill of materials and shortens development cycles.



Development kit

The design platform lets OEMs realise more than 50 power distribution, 40 connectivity and ten load control channels for rapid evaluation and early application development. A dual MCU plug-on module is available for high end ZCU implementations where high IO density and computational power are paramount.

This flexibility enables users to start with the superset, then optimise to either two cost effective MCUs or a single MCU based on feature and budget requirements.

The kit enables all essential zone control functions. The pre-validated hardware combines automotive semiconductor components from Infineon, including Aurix microcontrollers, Optireg power supply, Profet and Spoc smart power switches, and Motix motor controllers, with Flex's design, integration and industrial expertise.

The software stack includes contributions by Vector to leverage widely adopted tooling and knowhow in embedded software, testing and integration.


User interface of Amber software

DXC software enhances in-vehicle experience

DXC announced the Amber automotive software platform to enhance in-vehicle infotainment.

With embedded AI capabilities, Amber helps car makers navigate the complexity of software-defined vehicles by streamlining in-car software workflows, accelerating launches, reducing integration costs and improving the on-board experience.

Thanks to an open architecture, drivers can enjoy seamless digital cockpit interactions, including AI voice assistants, personalised vehicle functions and digital interfaces that transform time spent traveling into bespoke experiences.

Developed with ecosystem partners, Amber combines modular software components with ready-to-use services that simplify development and integration.

Instead of building from scratch, manufacturers can adopt proven building blocks for infotainment, instrument clusters and connectivity, supported by streamlined engineering. Thus, car makers can cut integration costs and bring features to market in less than half the time of traditional methods.

Prioritising hardware independence and continuous updates, Amber ensures manufacturers can adapt quickly to evolving technology and consumer expectations while maintaining compliance with standards and regulations.

The platform supports open integration models, giving control over their software roadmap while benefiting from DXC's experience in large-scale automotive programmes.

Amber integrates third-party AI to improve user experiences and is compatible across luxury and commercial vehicles and motorbikes.

Bosch first to deploy NXP SoC

Bosch is the first to deploy NXP's S32N7 processor, unveiled at the show.

Building on the same 5nm foundation as the S32N55, the SoC will be used in Bosch's vehicle integration platform.

It is designed to enable an era where car makers can digitalise the core functions of every vehicle – propulsion, vehicle dynamics, body, gateway and safety domains – cutting complexity and unlocking AI-powered innovation at scale.

Together, NXP and Bosch have co-developed reference designs, safety frameworks, hardware integration and an expert enablement programme, accelerating system deployment and reducing integration effort for early adopters.

"Bosch's vehicle integration platform is at the heart of new EE architectures enabling truly software-defined vehicles," said Matthias Breunig, senior vice president at Bosch Mobility. "Our intensive collaboration with NXP on its S32N7 processor series demonstrates how we combine leading semiconductor technology with our deep system expertise and highest standards of safety and security. By having Bosch ECU samples ready with the first NXP S32N7 silicon, we deliver to our customers a significant head start for development, ensuring rapid implementation and robust performance for next-generation vehicle computers."

The S32N7 is engineered to consolidate software and data into one centralised hub at the core of the vehicle, with safety and security. The processor empowers car makers to simplify vehicle architectures and reduce total cost of ownership by as much as 20%, achieved through the elimination of dozens of hardware modules, and enhanced efficiencies in wiring, electronics and software.

By centralising intelligence, automakers gain a foundation to scale AI-driven innovation across the entire vehicle. This accelerates software business models and enables intelligent features such as personalised driving, predictive maintenance and virtual sensors.

A data backbone on the S32N7 series ensures a future-proof path for upgrading to the latest AI silicon without re-architecting the vehicle, allowing car makers to differentiate continually.

Designed for the software-defined future, the S32N7 redefines vehicle architectures by digitalising the core functions of the vehicle, enabling scalable hardware and software across models and brands. Centralising software accelerates development and reduces costs.

With access to core vehicle data and high compute performance, the S32N7 can become the central AI control point for mobility.

"Our new S32N7 processor series redefines mobility by unlocking innovation well beyond infotainment and autonomy, deep into the core vehicle functions," said Robert Moran, vice president at NXP. "For OEMs, it means simplification and measurable cost savings. For drivers, it means an experience so intuitive, the vehicle anticipates every need."

The series offers a scalable portfolio with 32 compatible variants, delivering application and real-time compute with networking, hardware isolation technology, AI and data acceleration on a SoC, while meeting the strict timing, safety and security requirements of the vehicle core.

Autocrypt shows ML-DSA PKI offering

Cyber-security provider Autocrypt gave the first showing of its recently-launched public key infrastructure (PKI) offering supporting ML-DSA, a post-quantum digital signature algorithm.

Called PKI-Vehicles, it commercialises ML-DSA-enabled PKI that can be applied to automotive systems and OEM-specific environments.

The launch arrives as many industries prepare for the Nist standards for post-quantum cryptography (PQC) and evolving security difficulties posed by emerging quantum computing technologies.

It is ready for real-world issuance under the ML-DSA framework across automotive environments. ML-DSA was selected by Nist as part of the FIPS 204 post-quantum digital signature standard in 2024, and is considered the global cryptographic baseline.

Seokwoo Lee, CEO of Autocrypt, said: "This launch is the beginning of a new standard for quantum-safe automotive cyber security."

AI engine improves radar on cluttered roads

Atomathic, formerly Neural Propulsion Systems, announced Aisir for Radar, a physics-constrained generative reasoning engine to deliver stable, reliable radar perception in cluttered, high dynamic range (HDR) environments.

Aisir is an acronym for AI signal intelligence reasoning.

This is for the edge cases where conventional radar stacks degrade into phantom objects, target flicker and poor object separation. rendering them unreliable for safety-critical decisions.

Radar remains essential for L2 to L4 autonomy because it is the only sensor that can operate in fog, rain, spray, glare and low light, where cameras and lidar inherently struggle. Yet in real-world driving, production radar systems often fail in HDR, clutter-rich, multipath environments, particularly when detecting vulnerable road users near a lorry, school bus or roadside infrastructure.

In these scenes, sidelobes, inconsistent mmwave reflections and sparse-aperture ambiguity create unstable detections and intermittent tracking.

The industry has struggled to deploy radar as a critical safety layer, leading to setbacks, notably Tesla's withdrawal of radar from its full self-driving stack, trading potential safety redundancy for driving consistency.

Atomathic's approach reframes radar from a traditional filtering and thresholding pipeline into an inverse problem that requires rigorous reconstruction and physics-grounded inference.

Aisir for Radar works in tandem with Aidar (AI detection and ranging) to form a cognitive, dual-system perception stack.

Aidar performs rapid, per-frame sparse reconstruction, decomposing raw radar measurements into a compact set of physically meaningful atoms for hyper-resolution separation in clutter.

Aisir for Radar applies physics-constrained generative inference over time. It tests competing hypotheses using wave-consistent signal prediction, rejects physically inconsistent returns (ghosts), and stabilises perception using adaptive compute.

Elektrobit software speeds cockpit development

Aumovio subsidiary Elektrobit launched EB Civion software to give OEMs better supply chain control and accelerate the development of digital cockpits and applications for SDVs.

The software suite combines Elektrobit's automotive software and cockpit competence in a seamless ecosystem including a cloud-native, virtual cockpit development environment enabling rapid HMI and app creation in simulated environments.

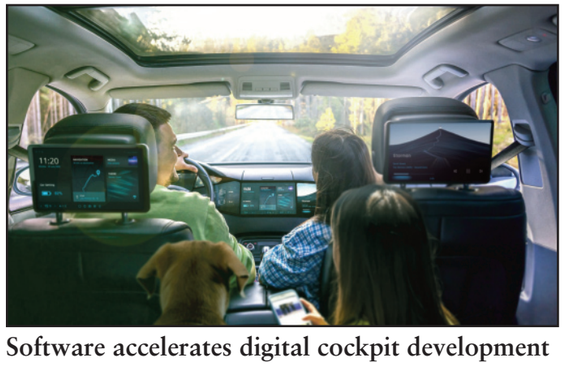
Bundled hardware-agnostic software assets are optimised for cockpit domain controllers that combine build-to-print designs and system software for specific SoCs.

This approach can accelerate time to market using cloud native, rapid-prototyping development cycles with mature, modular target software for real-time infotainment.

It can reduce complexity and cost through modular target software, hardware-agnostic development and testing.

Supply chain control can be scaled across platforms with pre-integrations for leading SoCs enabling a build-to-print approach.

"Next-gen digital cockpits are the centrepiece of the consumer in-vehicle experience, so selecting the right software for development is critical," said Maria Anhalt, CEO of Elektrobit. "EB Civion is redefining how automotive OEMs and suppliers approach cockpit development. We're accelerating time-to-market performance and empowering greater supply chain control, while providing the SDV with off-the-shelf software that is ready for integration to ultimately reduce costs. EB Civion gives our customers the tools that transform complexity into opportunity."



Software accelerates digital cockpit development



Autolink inks deals with AMD and Tata

Autolink announced a collaboration with AMD and signed an MoU with Tata Elxsi.

The collaboration with AMD aims to drive innovation in domain controllers, intelligent driving, AI and in-vehicle entertainment.

The MoU with Tata Elxsi could redefine software-defined vehicle (SDV) development for global OEMs.

Autolink plans to develop a deep fusion EE architecture based on AMD's Versal second-generation AI adaptive SoCs. The devices provide an integrated architecture, computing performance and design flexibility, enabling Autolink to achieve multi-domain deep integration in vehicles, low-latency data transmission, and safe and reliable intelligent driving functions.

Autolink will also work with AMD to create entertainment systems covering gaming and AI-driven audio-visual platforms, delivering an immersive experience.

By integrating their respective strengths in smart vehicle hardware platforms, EE architectures, software engineering and system integration, Autolink and Tata Elxsi will collaborate on joint design, engineering synergy and market expansion to provide OEMs with more competitive end-to-end intelligent vehicles.

Tata Elxsi brings its SDV software expertise and Avenir SDV framework, covering development, integration and validation across cockpit applications, adas algorithms, middleware and standards compliance.

The MoU marks the elevation of the partnership from individual projects to a long-term collaboration covering platform integration, joint development and global synergy.

ZF software kills tyre noise at source

ZF presented its active noise reduction software, which reduces tyre noise at the source without additional noise dampening hardware in the vehicle.

The purely software-based function for the chassis reduces annoying tyre noise in the interior.

The group plans to expand the use of the function to other ZF chassis actuators.

The software uses a smart chassis sensor with an integrated acceleration sensor to measure precisely vibrations transmitted from the tyres to the vehicle via the chassis.

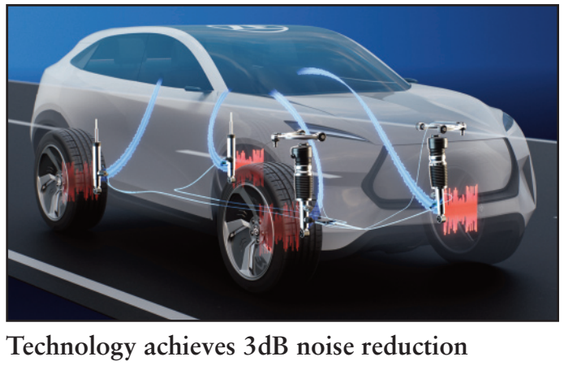
The vibration data are analysed using an algorithm that recognises the characteristic noise patterns of tyre cavity noise, typically around 20Hz. The software then generates a counter-signal provided by ZF's Cubix software via the valves of semi-active dampers.

The function uses micro-movements of the damper to reduce the noise interference without impairing the actual damper function.

"Active noise reduction is an excellent example of how we use smart algorithms to make ZF components even more efficient," said Peter Holdmann, head of ZF's chassis division. "This gives our semi-active CDC dampers a clear unique selling point in the market and sets new standards in comfort without the need for any additional noise dampening hardware."

The technology achieves noise reductions of more than 3dB today, with up to 10dB possible in the future.

Active noise reduction can be adapted to different vehicle types and user requirements via software. Series production of active noise reduction is due to start in 2028.



Technology achieves 3dB noise reduction

LG hides driver-monitoring camera behind cluster

LG Innotek unveiled an under-display camera (UDC) module for installation behind a vehicle's instrument cluster to monitor the driver.

The UDC is a core component of a driver monitoring system (DMS) that integrates a camera and software within the vehicle to monitor the driver continuously.

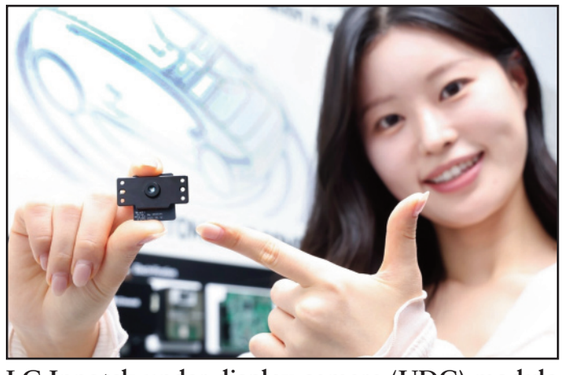
Mounted behind the vehicle's instrument cluster display, which serves as the dashboard, the UDC remains invisible to the driver and passengers while sensing and monitoring key status indicators such as drowsiness and attention level while on the road.

DMSs are gaining attention as safety devices to prevent careless driving, particularly as autonomous driving technologies advance.

Europe is mandating DMSs in new vehicles from July 2026, while the USA, China and Japan are considering similar moves.

The market is increasingly focusing on cameras as the core component of DMSs. The demand for invisible UDCs is thus surging, driven by the need for refined vehicle interiors that prioritise seamless aesthetics, particularly in the premium and autonomous vehicle segments. The invisible UDC is gaining popularity by alleviating drivers' psychological discomfort and privacy concerns associated with visible, protruding cameras.

Overcoming image quality degradation in DMS cameras, caused by the dashboard display blocking light transmission, is a critical problem for under-display technologies. Car makers have hesitated to adopt UDCs due to such persistent image quality degradation.



LG Innotek under-display camera (UDC) module

To address this, LG Innotek partnered with LG Display to launch the joint development of a UDC in 2024. After about a year of research and development, LG Innotek introduced the industry's first UDC that solves the problem of poor image quality while neatly concealing the camera behind the display.

Image quality is equivalent to that of existing products. It achieves image fidelity of at least 99% compared with unobstructed cameras positioned directly in front of the driver, without display panel interference.

LG Innotek applied its independently developed AI image restoration software to resolve the image quality degradation issue. The company's software recovers degraded image quality using algorithms such as deblur and denoise.

"Going forward, the next-generation UDC will recognise colours and passengers as well as the driver, enabling customised conveniences such as seat adjustment and interior temperature setting," said LG Innotek CEO Moon Hyuksoo.

Monitoring occupants in real time

Attendees experienced a live, in-vehicle demonstration of Seeing Machines' latest 3D cabin perception mapping for in-cabin intelligence.

The high-fidelity sensing monitors drivers and all vehicle occupants in real time.

By providing a precise, continuous understanding of occupant presence, position and behaviour, the technology helps car makers unlock safety performance while enhancing in-vehicle experience across an expanding range of scenarios.

The firm also demonstrated how its interior sensing technologies operate in concert with exterior sensor systems to create a more holistic perception of the driving environment.

This approach lets vehicles respond intelligently to complex road conditions and evolving in-cabin dynamics, supporting safer, more adaptive and increasingly automated driving.

The driver and occupant monitoring technology was also showcased through its integrated rear-view mirror, offering a wide field of view to monitor the driver and vehicle occupants.

This is in production as part of the company's largest automotive programme won to date.



HighTec and Intellias integrate Rust into Autosar

HighTec and Intellias showed hybrid C/C++ and Rust integration in Autosar Classic cases.

Ecosystem partners have integrated memory-safe Rust components alongside existing C/C++ in Autosar Classic applications using Intellias' ECU kit, enabling automotive software and a practical migration path for software-defined vehicles (SDVs).

HighTec is a commercial open-source compiler vendor and Intellias is a software engineering and digital consultant.

The integration of Rust into an Autosar environment was completed by combining the Intellias ECU kit, HighTec's compiler toolchain, and rtos and software components from Vector Informatik.

Leveraging Infineon Aurix microcontrollers, the ecosystem partners achieved a smooth migration from legacy C/C++ to a hybrid C/C++ and Rust environment, establishing a process to advance innovation in automotive software.

The joint project proves Rust can accelerate software development, enhance safety and security, and reduce overall development costs for SDVs.

Safety and security can be sustainably enhanced thanks to Rust's inherent memory safety features. At the same time, developers can decrease and control their costs as Rust helps them detect memory safety issues during compilation time at an early stage of the development process.

This prevents errors that would be very costly and time-consuming to fix later or, in the worst case, once the vehicle is already in production.

In a hybrid development approach, OEMs and suppliers can retain their Autosar Classic stacks and C/C++ investments while extending their code base with innovative and differentiating features in Rust.

With the ECU kit, Intellias demonstrated the migration of integrated Rust-based software components into the Autosar environment without changing the system's infrastructure. This practical demonstrator is based on the Infineon Aurix TriCore TC375 and being connected to Intellias' IntelliKit platform simulates real vehicle signals, such as speed, battery charge level or ultrasonic sensors.

By keeping the Autosar and C application code in place and adding Rust components through a defined integration path, the demonstrator shows a realistic, incremental migration strategy for OEMs and suppliers.

"Rust brings huge potential to automotive software development that still has to be exploited," said Adam Konopa, technology director at Intellias. "Together with strong ecosystem partners like HighTec, Infineon and Vector, we help customers quickly and successfully migrate to Rust in an Autosar Classic environment while achieving cost savings."

Teledyne thermal camera meets ISO 26262 Asil B

Teledyne Flir launched Tura, an Asil-B thermal longwave infra-red camera that complies with ISO 26262.

Tura is purpose-built to meet the perception requirements for vehicle-based night vision, adas and autonomous vehicles.

The automotive-qualified Tura has a passive 640 x 512 resolution far-infra-red sensor with sensitivity for detecting and classifying pedestrians, animals and other vulnerable road users.

It delivers perception far beyond headlights in complete darkness and through difficult conditions such as fog, smoke, sun glare and headlight glare.

"Safety and reliability are non-negotiable pillars of autonomous technology, and Tura sets a new industry benchmark with compatible functional-safety features starting from the sensor," said Paul Clayton, president of Teledyne Flir.

Teledyne Flir and Valeo previously announced their collaboration, and the two firms plan to deliver the first Asil-B thermal imaging technology for night vision adas.

This will complement Valeo's large range of sensors and rely on Valeo's adas software stack to support functions such as automatic emergency braking at night for passenger and commercial vehicles as well as autonomous cars.



Tura detects vulnerable road users

Tura supports the US FMVSS motor vehicle safety standard 127, which requires higher-speed night-time test scenarios where existing AEB systems struggle.

Teledyne thermal cameras are also deployed in fully autonomous vehicles. In addition to delivering forward-looking perception data, multiple thermal camera modules can be integrated to enhance 360-degree situational awareness. This enables reliable detection of heat-emitting objects such as people, vehicles and animals even in low-visibility conditions.

Tura has a heated IP6K9K enclosure to ensure round-the-clock performance. The shutterless design uses AEC-Q components to increase uptime, power efficiency and affordability.

AI-optimised integration allows simplified deployment with Teledyne training data and Prism perception software, trained with millions of annotations.

• Teledyne LeCroy has added Vesa DisplayPort AE automotive extension support to its quantum-data M42de DisplayPort 2.1 analyser and generator system to provide functional safety and interoperability for in-vehicle displays.

QNX and Vector unveil foundational vehicle software

QNX and Vector unveiled Alloy Kore, a foundational vehicle software platform to simplify and accelerate the development of software-defined vehicles (SDVs).

Designed to address the growing complexity of modern automotive software architectures, Alloy Kore offers a robust, scalable, safety-certified software foundation that helps car makers innovate faster and with greater confidence.

An early access release is available via different distributions from Vector and QNX.

Purpose-built to tame complexity, the platform combines QNX's safety-certified operating system and virtualisation with Vector's safe middleware to deliver a lightweight, scalable foundation for deploying applications across vehicle domains.

This unified platform reduces software integration overhead, accelerates development and frees OEMs to focus engineering resources on innovations that enhance the in-vehicle experience.

Select OEMs including Mercedes-Benz are already exploring how to integrate Alloy Kore into their SDV architectures, leveraging its modular middleware and safety-certified operating system to power centralised control units and enable over-the-air updates across vehicle fleets.

Nvidia brings human-like thinking to AVs

Nvidia unveiled the Alpamayo family of open AI models, simulation tools and datasets to accelerate the next era of safe, reasoning-based autonomous vehicle (AV) development.

AVs must safely operate across an enormous range of driving conditions. Rare, complex scenarios, often called the long tail, remain some of the toughest challenges for autonomous systems to master safely.

Traditional AV architectures separate perception and planning, which can limit scalability when new or unusual situations arise. Recent advances in end-to-end learning have made significant progress, but overcoming these long-tail edge cases requires models that can safely reason about cause and effect, especially when situations fall outside a model's training experience.

The Alpamayo family introduces chain-of-thought, reasoning-based vision language action models that bring human-like thinking to AV decision-making.

These systems can think through novel or rare scenarios step by step, improving driving capability and explainability, which is critical to scaling trust and safety in intelligent vehicles, and are underpinned by the Halos safety system.

"The ChatGPT moment for physical AI is here, when machines begin to understand, reason and act in the real world," said Jensen Huang, CEO of Nvidia. "Robotaxis are among the first to benefit. Alpamayo brings reasoning to autonomous vehicles, allowing them to think through rare scenarios, drive safely in complex environments and explain their driving decisions. It's the foundation for safe, scalable autonomy."

Alpamayo integrates three foundational pillars – open models, simulation frameworks and datasets – into a cohesive, open ecosystem on which any automotive developer or research team can build.

Rather than running directly in-vehicle, Alpamayo models serve as large-scale teacher models that developers can fine-tune and distil into the backbones of their complete AV stacks.

Lucid, Jaguar Landrover, Uber and Berkeley DeepDrive are showing interest in Alpamayo to develop reasoning-based AV stacks that will enable level-four autonomy.



Jensen Huang

Nvidia supports Omnivision sensors

Omnivision announced that two of its cmos image sensors with TheiaCel technology, the 8MP OX08D10 and the 3MP OX03H10, are supported on the Nvidia Drive AGX Hyperion autonomous vehicle platform.

Nvidia Drive AGX Hyperion, designed for the highest levels of functional safety and cyber security, was released by Nvidia at the show. It is a reference compute and sensor architecture that makes any vehicle up to level-four ready, enabling automakers and developers to build safe, scalable, AI-defined fleets.

Paul Wu, director at Omnivision, said this represented "a substantial leap in enabling developers and customers to accelerate the design and deployment of autonomous driving systems," adding: "We're giving developers the tools to push autonomous vehicle innovation from concept to commercial readiness while maintaining uncompromising safety functions and image fidelity across real-world driving scenarios."

The previously announced OX08D10 is the first image sensor that features the firm's 2.1µm TheiaCel technology, which harnesses the capabilities of lateral overflow integration capacitors and Omnivision's DCG high dynamic range (HDR) technology to capture LED lights without any flickering artefact for nearly all driving conditions.

TheiaCel enables the OX08D10 to achieve HDR image capture and detection ranges up to 200m. Its pixel design and HDR capture scheme balances between low light performance and dynamic range and is optimal for automotive exterior cameras.

ELECTRIC VEHICLES

SAFE CHARGING

Radu Etz presents hardware and software guidelines for in-cable control and protection devices in electric vehicles

Vehicle Electronics

The EV market is continuously and exponentially growing, and around 500 million EVs are expected to be on the road by 2030. Issues on climate change and air pollution in highly populated residential areas are the main drivers for high efficiency and zero tail-pipe emission transportation modes.

With the foreseeable growth in the number of EVs, the market not only needs to cope with the demand but also to deliver the most efficient charging, covering affordability, safety and environmental impact.

The rules that must be followed when building type-two electric vehicle supply equipment (EVSE) are found in IEC 61851-1 and the supplementary IEC 62752.

The negotiation between an electric vehicle (EV) and an EVSE during a charging session is presented through the control pilot (CP) waveform, highlighting the states defined in the standard.

The waveforms together with the presented debug messages validate the guidelines and offer a better understanding of the EV charging process, thus making the design process easier.

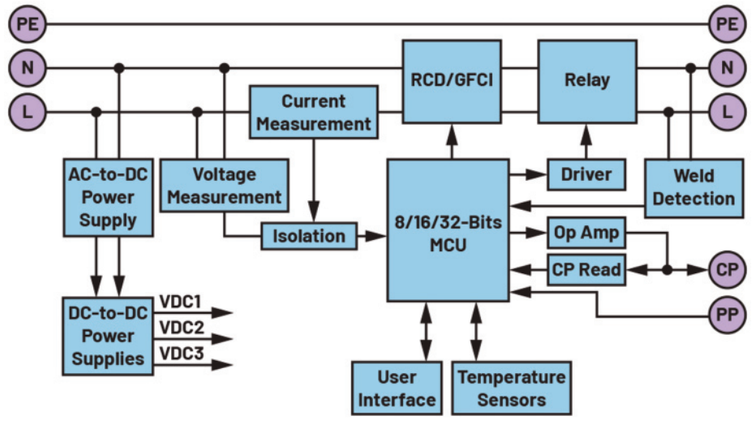


Fig. 1: General block schematic of a type-two EVSE

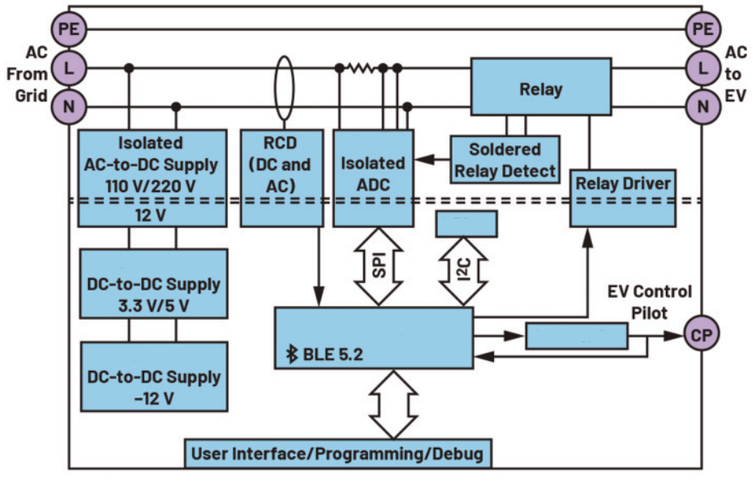


Fig. 2: Type-two EVSE simplified block diagram

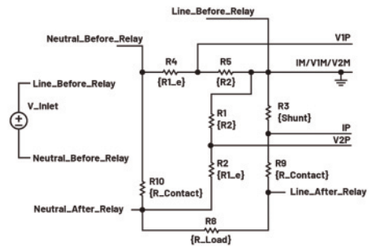


Fig. 3: Simplified schematic of the circuit connected to the ADC input channels

Lower power charging levels are deemed sufficient since most personal vehicle users drive only around 50km per day on average. For home EV charging stations, the in-cable control and protection devices (IC-CPD) supplied with newly purchased EVs are viable since these can eliminate the high costs involved in high power level installation and maintenance.

With the current complexity in charging considerations, not only will the EV market grow in the future, but the charging equipment market will as well.

EVSE

An EVSE lets the user charge a PHEV or BEV safely. EVSEs are classified based on charging power levels. A charging level in EV terminology refers to the electric power distribution type, standards and maximum power of a charging system as defined by SAE J1772, and internationally adopted under IEC 62196-1.

Mode two is a method for the connection of an EV to a standard socket-outlet of an AC supply network, using an AC EVSE with a CP function and system for

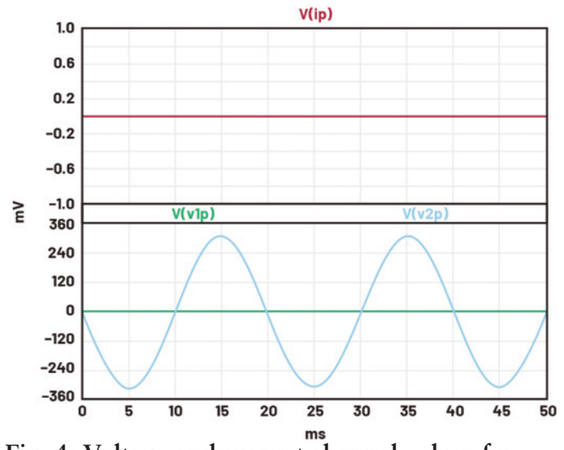


Fig. 4: Voltage and current channel values for relay opened contacts corresponding to Fig. 3

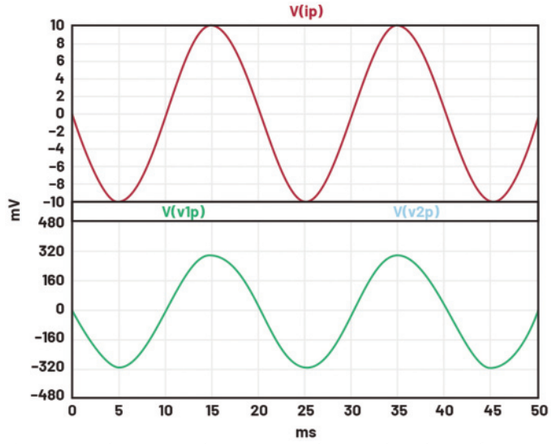


Fig. 5: Voltage and current channel values for relay closed contacts corresponding to Fig. 3

personal protection against electric shock placed between the standard plug and the EV, as defined in IEC 62752.

The most important function that is implemented with an IC-CPD is the protection against electric shocks. This is implemented with a residual-current device (RCD), at least type A, and an auxiliary circuit to detect DC, or with a type B RCD.

This function is crucial because the charger can be used outdoors, in public areas where there may be contact with water, and where it can be touched by people accidentally or intentionally. The protective earth must be present and, in case of a fault, the supply must be disconnected.

Fig. 1 presents a general block of a type-two IC-CPD. By using a schematic derived from this, all the mandatory functions in the IEC 61851-1 standard can be implemented. Depending on preferences, some blocks must be added or can be excluded from the general schematic.

For example, if the current is sensed through a current transformer, then the isolation IC can be excluded when interfacing with the MCU. In the same manner, the weld detection circuit can be excluded if a relay with weld detection is used.

The type-two EVSE block schematic in Fig. 2 includes a three-channel isolated sigma-delta ADC for voltage and current measurement on the single-phase power input and measurement of the relay voltage for solder contact detection.

Safe operation is enabled by the inclusion of a 6mA DC, 30mA RMS RCD. Detection of overvoltage, undervoltage, overcurrent, overtemperature, protective earth (PE) and EV diode presence is also available.

The integrated isolation makes the connection with the MCU straightforward. The low-power processor implements the logic for system control and communication with the EV over the CP interface. This also includes a programming and debugging interface.

The device's Bluetooth 5.2 interface enables connectivity to external devices. Communication between the MCU and the ADC is implemented over SPI.

The CP needed for

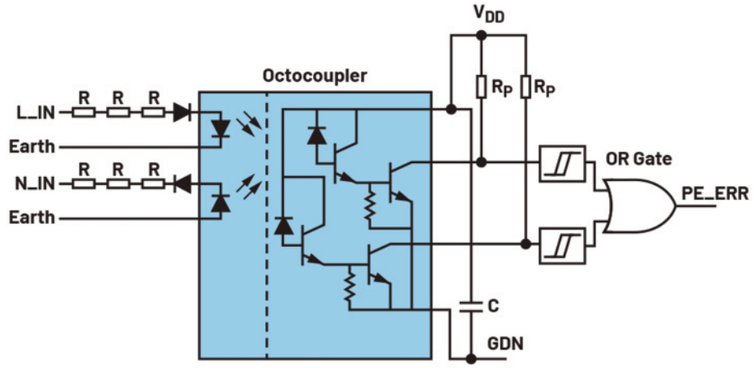


Fig. 6: PE grid presence detection circuit

implementing the communication between the EVSE and EV is generated using ta low noise, zero-drift op amp.

The system is powered by the single phase 230V AC input. An isolated AC-to-DC switch-mode power supply (SMPS) is used to deliver 12V to the board and dual synchronous buck converters for automotive applications are used to step down the voltage to 5 and 3.3V, providing power to the isolated side of the board. A 12bit digital temperature sensor monitors the temperature of the device and sends it to the MCU for protection against overheating.

The design is accompanied by an open-source software stack and reference applications, enabling custom software development to start with a proven implementation validated to meet the applicable standards. The system is designed to IEC 61851 and IEC 62752.

Isolated ADC

The isolated three-channel sigma-delta ADC for polyphase energy measurement applications uses shunt current sensors. This IC has three ADCs.

One channel is dedicated to measuring the voltage across a shunt when the shunt is used for current sensing. Up to two additional channels are dedicated

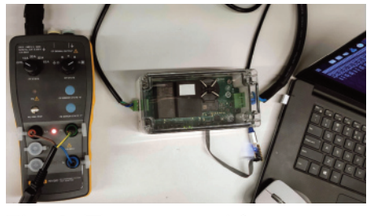


Fig. 8: Test setup with Fluke FEV300

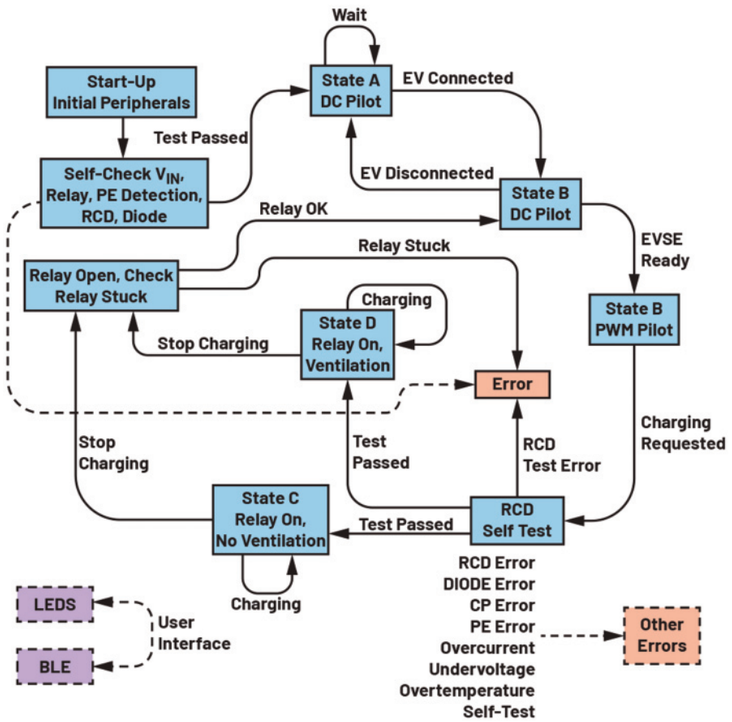


Fig. 7: State machine

to measuring voltages, usually sensed using resistor dividers. In this application, one of the voltage channels is used to detect if the relay contacts are soldered.

This ADC includes an integrated, isolated DC-to-DC converter. The DC-to-DC converter provides the regulated power required by the first stage of the ADCs. This device eliminates the need for an external DC-to-DC isolation block.

The chip scale transformer technology is also used to isolate the logic signals between the first and second stages of the ADC. The result is a small form factor, total isolation device. It provides access to the ADC outputs, configuration and status registers for easy interfacing with microcontrollers. It can be clocked from a crystal or an external clock signal.

The pin's input range of the ADC must be satisfied by choosing the appropriate values for the voltage divider resistors and for the shunt resistance. The range represents the peak-to-peak pseudo differential voltage that must be applied to the ADCs to generate a full-scale response when the IM and VxM pins are connected to AGND, pin 11. The IM and VxM pins are connected to AGND with antialiasing filters.

Detection

The second voltage input is used for the soldered relay contact detection.

Fig. 3 shows the simplified simulation for the circuits connected to the three input channels where R_contact is the value of the relay contact

resistance (open, Fig. 4, or closed relay, Fig. 5, value depending on the simulated case). V1P, V2P, V1M, V2M, IP and IM are the inputs of the ADC channels.

Grid test

The grid protective earth presence and phase-neutral reversed are sensed during the device power-off using the circuit in Fig. 6. If the earth is not present, the device enters an error state and an error message is displayed on the status LEDs. If the phase-neutral reversed needs to be detected, then the two outputs of the optocoupler are used with the PE_ERR signal.

The functionality of an IC-CPD is presented in Fig. 7. The implemented state machine follows IEC 61851-1 guidelines.

Test results

The tests used a Fluke FEV300 EV charging station adapter and different loads (Fig. 8) or the type-two cable connector using the same loads, or an EV.

Figs. 9 and 10 present the waveforms for two test measurements done using the test bench from Fig. 8.

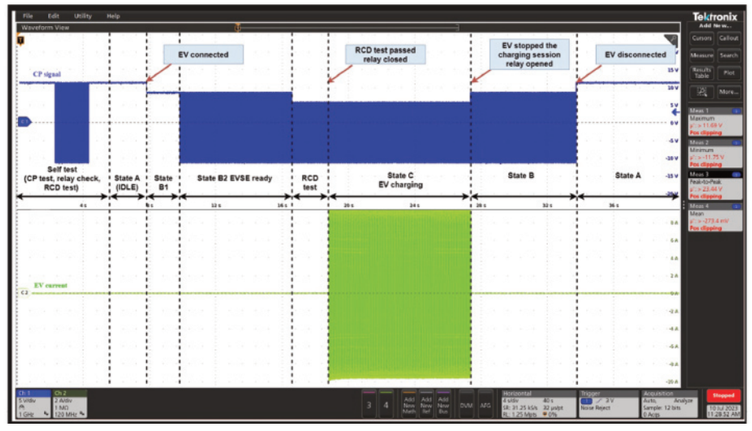


Fig. 9: Normal working conditions with highlight on the EVSE-EV states

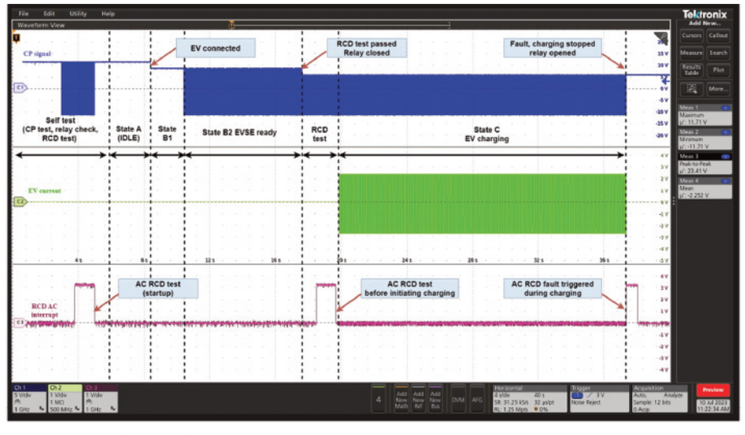


Fig. 10: RCD AC error detected during a charging session in state C, charging without ventilation

Fig. 9 presents a complete run of the state machine from power-up, with the EV disconnected (a resistive load in this case), to charging, where the states are highlighted on the CP waveform.

The difference between Fig. 9 and Fig. 10 is that during state C while the EV is charging, an AC RCD interrupt is triggered. This can be observed in the third waveform. The IC-CPD opens the relay and an error message is displayed on the LEDs.

The messages show a complete charging session from power-on to charging and EV disconnected. The debug messages also include information about the input voltage, current and temperature inside the enclosure, and active states at a moment in time.

Errors

In case of a CP error, the IC-CPD opens the relay and indicates the CP error on the LEDs. In a PE error (PE missing between EVSE and EV) that occurs in state C, the relay will be opened, and an error will be indicated on the LEDs.

If the PE error occurs during states A or B, the IC-CPD will see it as if the EV is disconnected and will remain or enter state A, depending on the state active when the error occurred. In this situation, the CP level cannot reach the state C value and the relay will remain open until the PE connection is re-established.

Radu Etz is an embedded systems architect at Analog Devices



POWER TECHNOLOGIES

Sanskar Chopra, Amr Elwakil, Mohamed Abdelrazek and Mahmoud Tolba discuss the key design considerations in high-voltage battery management systems

MANAGING THE MANAGER

Vehicle Electronics

The battery management system (BMS) is the brain of high-voltage (HV) battery packs. It is crucial for the safety and efficiency of the overall battery storage system. In applications such as electric vehicles (EVs), renewable energy storage or industrial applications, a well-designed BMS is necessary for monitoring battery health, communicating with external controllers and preventing critical failures such as thermal runaways.

In high-voltage applications, the design complexity of energy storage systems increases. It is mainly due to high cell density, which requires real-time monitoring of individual battery modules for temperature, voltage, current, and SoC and SoH estimations.

A poorly designed BMS can result in battery degradation, inefficiencies and hazardous failures such as fires or explosions. A well-designed BMS can increase battery performance, ensure safety and enable system integration. Without a reliable BMS, any HV battery system cannot meet its performance and safety requirements.

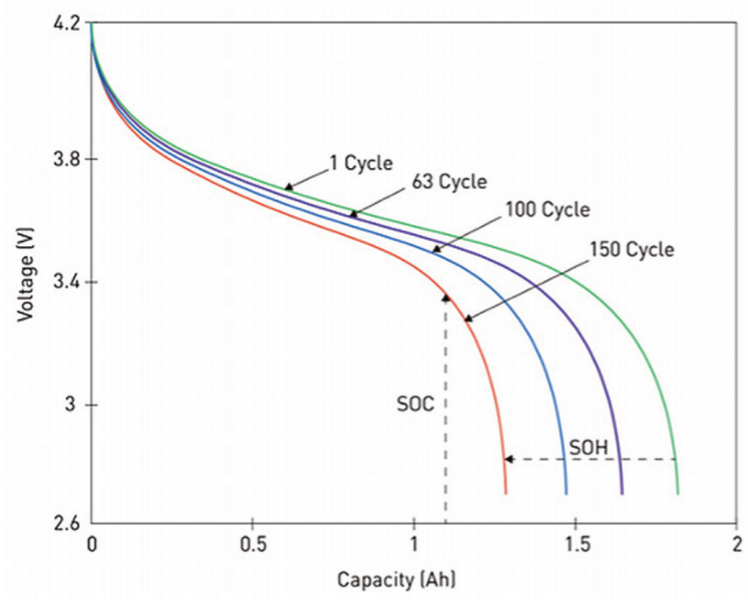


Fig. 2: States of charge and health (SoC and SoH)

Given the criticality involved in an HV BMS, engineers must be aware of the practical challenges that can occur during development and entire lifecycle of the battery system. Each BMS design element comes with its own set of challenges, from selecting the right design architecture to implementing robust communication protocols.

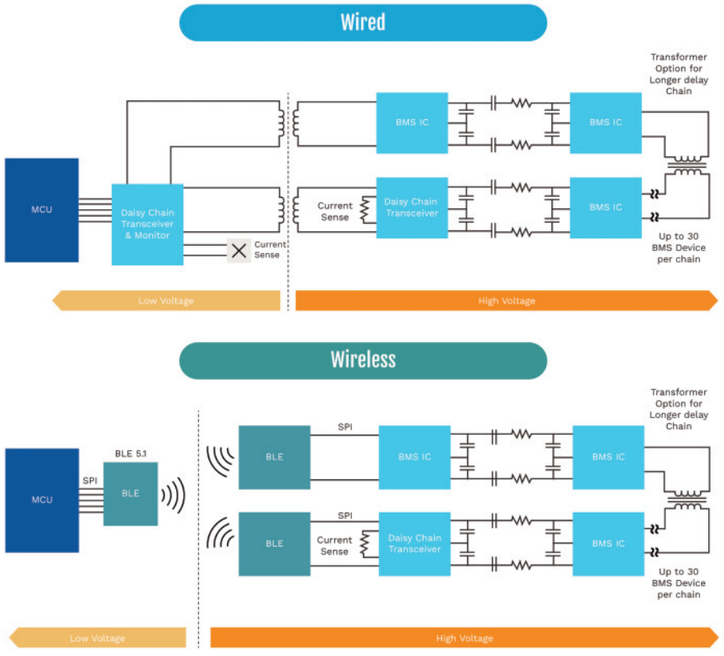


Fig. 1: Wired versus wireless BMS architecture

Wired and wireless

Wired BMS relies on robust, shielded comms lines. They connect cell monitoring units (CMUs) to the master controller. Wired systems offer established reliability and EMI immunity, but complexity increases with voltage and cell count.

Wireless BMS (wBMS) architectures remove complicated wiring harnesses, increase manufacturing savings and reduce transmission points of failure. However, data integrity, latency control and cyber security are key challenges for wireless systems.

To overcome these, an engineer can consider including low-power wireless transceivers that can handle dense electromagnetic environments.

Both architectures are further complicated by the need to comply with functional safety standards such as ISO 26262. As BMS architecture evolves from wired to wireless, the need for accurate battery state estimation becomes more critical. Fig. 1 compares wired and wireless.

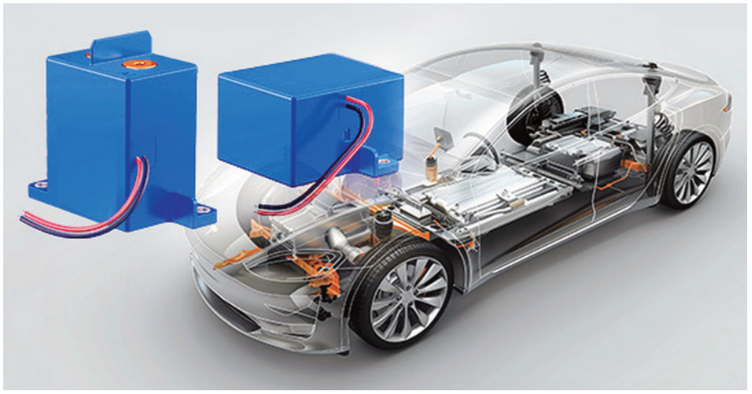


Fig. 4: Control of actuators

States

State of charge (SoC) determines how much energy a battery has available in the current state. State of health (SoH) evaluates long-term battery degradation.

Fig. 2 shows the changes in SoC and SoH according to charging and discharging cycles.

SoC estimations are difficult because battery dynamics are changing. There are various methods of estimation such as the Coulomb counting method, the open-circuit voltage (OCV) method and Kalman filtering techniques.

A blend of Coulomb counting, Kalman filtering and OCV calibration is typically optimal, but designers must optimise sensor accuracy and processing efficiency so as not to induce unnecessary complexity and power consumption.

SoH estimation is even more difficult as it addresses long-term degradation monitoring. The capacity-based method is not feasible for practical applications as it stresses the battery.

The accuracy of internal resistance measurement is affected by temperature and SoC variations. The efficacy of the Kalman filtering model depends on having good battery-aging models. Machine learning methods are faced with problems of computational cost, requirements of continuous learning and demands of large training data.

A combined SoH estimation

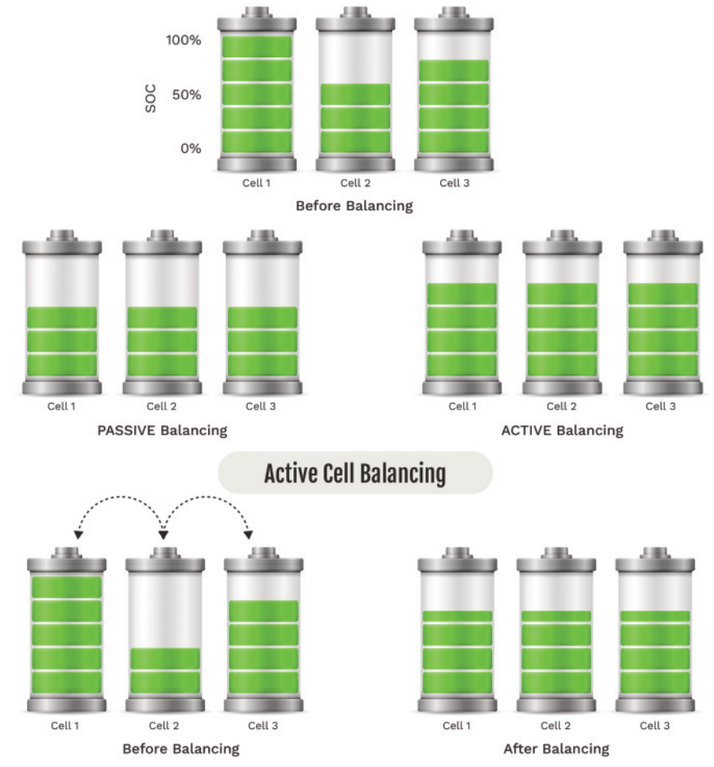


Fig. 3: Active versus passive cell balancing

technique based on impedance measurement, Kalman filtering and voltage tracking provides a sync between real-time monitoring, long-term trends and computational feasibility.

Cell balancing

Cell balancing also plays an important role in maintaining the health of a battery pack.

Passive balancing uses resistor bleed circuits to dissipate excess charge as heat. This is a low-cost, simple and space-efficient method for most applications. However, it is not efficient and not suitable for high-capacity or long-life packs as it wastes energy and cannot balance large SoC imbalances.

On the other hand, active balancing, see Fig. 3, transfers charge between cells via a switched capacitor, or an inductor-based or transformer-coupled circuit. While active balancing improves energy efficiency and extends the life of batteries, it comes with the cost of added design complexity.

The main challenges are the balancing speed versus circuit size trade-off, isolation between cells, and thermal management of the active components.

Designers must ensure the active balancing circuits do not interfere with the main power path or communication signals, particularly in high-voltage systems with strict EMI specifications.

Actuators

Actuators in an HV BMS, such as contactors, pre-charge circuits, cooling system pumps or safety disconnects, must be controlled accurately. The primary problem is the coordination of actuators under various operational and fault conditions to ensure safe pack operation. Control strategies must consider the actuator state monitoring via position sensors or current feedback, response time and failure diagnostics.

Besides, designing high-voltage contactors is difficult. It has various challenges such as inrush current limiting, arc quenching and welding of contacts.

Actuator status implementation in the fault-handling logic of the BMS is important, especially for functional-safety compliance. Actuator drivers must be galvanically isolated, allow real-time monitoring and be transient voltage event robust so improper operation does not compromise system safety or damage components.

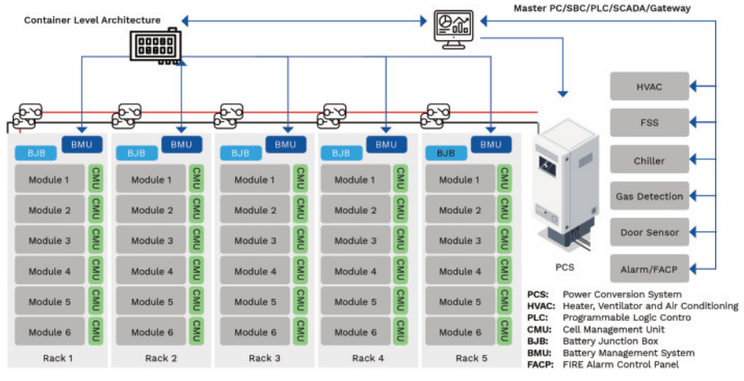


Fig. 5: Master-slave architecture

Protocols

A high-voltage BMS typically adopts the master-slave architecture with multiple slave CMUs, see Fig. 5. They monitor the cell voltages, temperatures and balance status and report the same to a centralised master controller.

This top-down approach provides difficulties in data aggregation, fault isolation and control of redundancy.

Communication protocols such as Can, Can-FD, SPI and Ethernet should be selected based on data rate requirements and system expandability. For example, Can has reliable performance but is not suited to bandwidth in large packs, whereas Ethernet provides a higher throughput with sophisticated isolation and error-checking.

Designers must also consider node synchronisation, measurement, timestamping and security. To prevent system-level failure due to communication failure, diagnostic coverage and fault tolerance are crucial.

Safety

A high-voltage BMS design involves two major safety issues – product safety and functional safety. Product safety ensures the system's physical resilience against mechanical vibrations, thermal stress and electrical hazards. This includes choosing the right materials, insulation and mechanical design to prevent injury under foreseeable fault conditions.

Functional safety focuses on how the BMS operates during faults such as thermal runaways, communication loss or sensor failures. It ensures the system can detect the fault and respond accordingly by reducing the risk of unsafe behaviour. There are certain standards such as IEC 61508 and IEC 60730 that are widely used to govern these behaviours.

The best practice is to align with IEC 61508 for hardware and system-level safety, and use IEC 60730-1 Annex H for software control. This dual compliance and standard strategy enables global certification and supports robust development of lifecycles and market readiness.

Regulations

There are various regulations that are pushing BMS design towards greater transparency, safety and sustainability.

For example, the EU Battery Regulation 2023/1542 introduced a battery passport. The objective is to enable real-time traceability and carbon footprint reporting by 2027. This demands secure data handling, cloud integration and traceable logging of battery life.

International standards such as UN/DoT 38.3, IEC 62619 and UL 1973 require design provisions for thermal safety and fault detection.

There are various regulations around second-life batteries and recycling goals further add to the need for SoH tracking and modular designs that ease reuse.

To meet these demands, the BMS must support OTA compliance updates, sustainability metrics and secure data collection, all without compromising performance or scalability.

Security

A BMS can be now connected via IoT, AI and cloud platforms. Due to this connectivity, cyber security is a critical design concern. There are many threats such as firmware tampering, denial-of-service attacks and data breaches that can compromise safety and performance.

To mitigate these risks, there are various strategies engineers can implement such as end-to-end encryption, secure firmware updates, intrusion detection and multi-factor authentication.

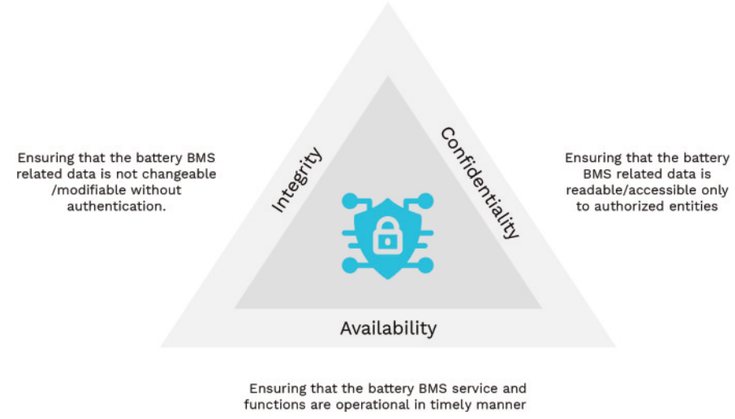


Fig. 6: BMS cyber-security fundamentals

Blockchain-based data integrity is also being explored for lifecycle traceability.

However, difficulties such as limited processing resources, latency introduced by encryption, and adherence to evolving standards such as ISO/SAE 21434 and IEC 62443 must be addressed. Future-ready BMS designs will require embedded cyber security from the beginning, supporting regulatory compliance and operational resilience.

Conclusion

BMS engineers and system integrators must address these problems. They should keep these design considerations in mind to develop a robust BMS for EVs, renewable energy storage or any industrial applications.



Sanskar Chopra is product marketing manager,



Amr Elwakil is director of engineering,



Mohamed Abdelrazek is embedded software technical lead



and Mahmoud Tolba is senior hardware engineer, all at Einfochips

Analyser and oscilloscope check Automotive Ethernet

An Automotive Ethernet tester from Anritsu delivers precise MDI media dependent interface return loss and mode conversion measurements for validating 100baseT1 and 1000baseT1 compliance.

Using the Anritsu ShockLine MS46524B vector network analyser (VNA) with the Tektronix 6 series MSO oscilloscope lets engineers conduct robust, standards-based verification of Automotive Ethernet components, including cables and connectors.

The automotive industry's transition to Ethernet-based in-vehicle networks demands strict conformance with IEEE 802.3bw, 802.3bp and 802.3ch to ensure interoperability and signal integrity across multi-vendor systems.

This tester addresses this with a measurement system that combines precision frequency-domain analysis and automated compliance testing aligned with the Open Alliance PMA TC8 test suite.

Using the MS46524B four-port VNA, engineers can perform high-accuracy S-parameter measurements to evaluate MDI return loss and mode conversion characteristics.

These tests confirm proper impedance matching and help ensure differential signal integrity, meeting IEEE compliance requirements. S-parameter data captured by the VNA are seamlessly transferred to the oscilloscope, where TekExpress software for Automotive Ethernet testing validates results and generates detailed compliance reports.



A typical configuration to measure MDI return loss and mode conversion loss uses an Ethernet test fixture, Automotive Ethernet DUT, common ground between the fixture and DUT, VNA, phase-stable cables and calibration kits.

Fixture qualification according to Open Alliance specifications ensures accurate and repeatable measurements, providing dependable physical-layer validation for Automotive Ethernet systems.

The VNA delivers the dynamic range, phase stability and measurement accuracy for differential S-parameter testing up to 43.5GHz.

This instrument supports SCPI-based remote control enabling integration into automated validation and production test workflows.

Software unites across domains

Software from TTTech Auto can unify and simplify automotive communication across all vehicle domains.

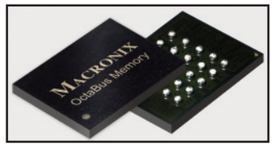
The MotionWise Communication middleware addresses the growing complexity of vehicle architectures. It helps OEMs and tier-one suppliers implement all relevant communication use cases at ECU and vehicle level with one off-the-shelf product for accelerating the transition to software-defined vehicles.

Based on communication protocols such as DDS and Zenoh powered by ZettaScale Technology, it inherits the data-centric approach of previous Zetta products and augments its scope by integrating automotive features to bring the middleware up to safety and security standards.

Modern vehicle architectures require communication paradigms such as data-centric, service-oriented and signal-based communication. Traditionally, these are supported by different offerings, creating integration complexity and cost.

The middleware eliminates this by supporting all main automotive communication use cases.

The beta version of the DDS safety-certified stack is available.



Flash memory

Macronix has expanded its MXSMIO family of flash memory to include safety features for automotive applications.

The flash devices, which have multiple IO interfaces, are now compliant with ISO 26262 Asil D.

It is targeting applications with high-risk functions, such as adas, driver-monitoring and autonomous driving.

The family provides two kinds of multi-IO interfaces, giving designers broader flexibility in product development.

The OctaFlash MX25 and 66 UM, LM, UW and LW feature the x8IO interface, whereas the QSPI MX25/66/U/L_G series uses a quad IO interface.

Features includes 3 or 1.8V operation for power efficiency, ECC providing content protection, bus cyclic redundancy check (CRC) protecting data transmission during high frequency operation, and real-time error correct signal and ECC or CRC status register, delivering error status to the host.

Bipolar transistors up thermal performance

Diodes has expanded its automotive-compliant bipolar transistor portfolio with the DXTN/P 78Q and 80Q series.

These low $V_{CE(sat)}$ npn and pnp transistors deliver conduction efficiency and thermal performance for power switching and control.

The 12 devices are for 12, 24 and 48V automotive systems. They are suitable for gate driving mosfets and IGBTs, power line and load switching, low-dropout voltage regulation, DC-DC conversion, and driving motors, solenoids, relays and actuators.

Rated for continuous operation up to +175°C, and offering high ESD robustness (HBM 4kV, CDM 1kV), they provide reliable operation in harsh environments.

Housed in the compact PowerDI 3333-8 package (3.3 by 3.3mm), these devices cut PCB footprint by up to 75% versus traditional sot223, freeing space for additional functionality.

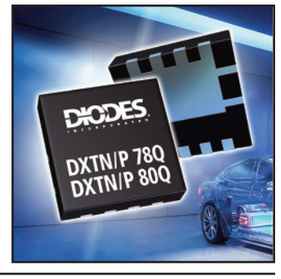
A large underside heatsink delivers thermal resistance of 4.2°C/W. The side-wall plateable feature improves automated optical inspection and strengthens solder joints. This enhances quality assurance, reduces manual inspection and supports efficient manufacturing.

Both series span BV_{CEO} ratings from 30 to 100V and deliver robust current handling.

The DXTN/P 80Q series provides extra headroom for designs, with continuous ratings up to 10A and peak pulse capability of 20A. A saturation voltage of 17mV at 1A and an on-state resistance down to 12mΩ reduce conduction losses, enabling cooler operation and higher efficiency.

This helps designers cut conduction losses by up to 50% versus previous generations, reducing heat and easing thermal management.

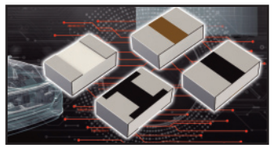
Standard compliance versions are also available for industrial and commercial applications.



Shunt resistors handle higher power

Shunt resistors from Rohm come in the 2012-size and are rated for 10 to 100mΩ.

The UCR10C series can handle higher power for current sensing in automotive and industrial equipment markets.



The products form a copper-based resistive element on an alumina substrate via sintering.

By optimising the heat dissipation structure, they achieve rated powers of 1.0 and 1.25W, double those of equivalent-sized products including thick-film and metal-plate types. This enables the replacement of products with wide terminal types or larger alternatives, facilitating miniaturisation and reducing the number of components required.

Using a metal resistive element achieves a TCR of 0 to +60ppm/°C. This reduces errors due to temperature changes, enabling high-precision current sensing.

Channel sounding for digital car keys

Using Bluetooth 6.1, Goodix has initiated development and validation for digital car key applications with its GR5410 automotive-grade Bluetooth LE SoC.

With more accurate ranging, higher performance and expanded peripheral interfaces, the SoC is designed to drive innovation for in-vehicle wireless applications.

It supports Bluetooth channel sounding and delivers enhancements in privacy protection and energy efficiency, meeting application needs such as high-precision ranging and low-latency communication.

Goodix has obtained Bluetooth 6.1 BQB and channel sounding certifications.

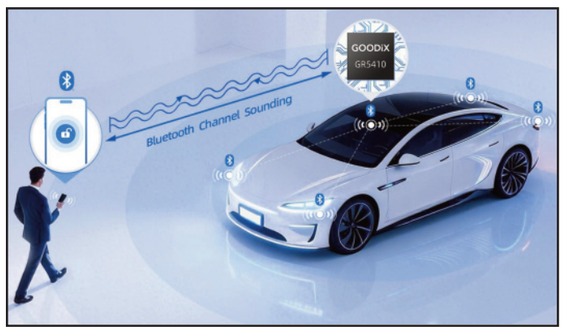
The single-chip wireless MCU integrates a Bluetooth 6.1 module, a channel sounding unit and Can-FD interface.

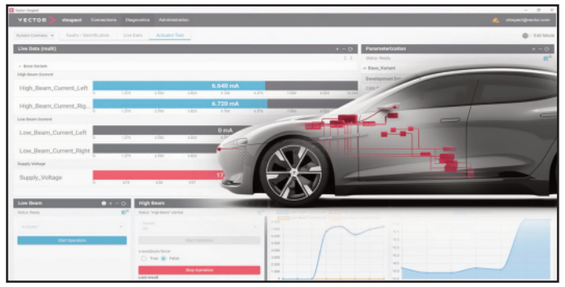
Powered by Arm China's Star-MC1 core, it has an architecture that supports secure boot, protected debugging, encrypted storage and a one-chip-one-key hardware security module mechanism, protecting intelligent cockpit and digital car key systems.

All nodes can complete synchronised ranging in approximately 200ms, enhancing ranging refresh rates and accuracy. Combined with proprietary AI-based ranging algorithms, it achieves accuracy of up to ±50cm with a maximum ranging distance exceeding 50m.

Compatible with RSSI broadcast scanning, RSSI monitoring and channel sounding ranging, the protocol stack provides flexible support for a wide range of digital car key use cases.

The chip has been selected for projects by multiple automakers and tier-one suppliers and is due to enter pilot production in this quarter.





Diagnostic tool allows flexible customisation

A customisable diagnostic tool from Vector Informatik is for vehicle components, combining rapid availability with flexible customisation options to help manufacturers and service organisations reduce their cost of ownership.

Called Vinspect, it bridges the gap between standard products and costly custom developments, breaking ground in vehicle diagnostics and software updates.

Companies gain access to a tool for diagnostics and software updates that is tailored to their needs, without the high costs of in-house development. This is made possible by a platform concept designed for customisation.

The software uses modern web technologies and can be completely customised to the company's corporate design: colours, logos and layouts can be individually adapted. This ensures the tool visually matches the company's brand identity.

This targets manufacturers and service organisations of components such as drive components, batteries, lighting systems, heaters, cooling systems and pumps.

Existing communication hardware based on D-PDU API (ISO 22900-2) or pass-through (SAE J2534) can be reused without issue, reducing investment costs.

The user interface can be customised with dashboards and widgets. The configuration is automatically distributed via the cloud for service organisations with many users.

Thanks to automatic configuration detection, it quickly adapts the settings to the detected vehicle component, offering convenient, intuitive and secure use both online and offline.

Additionally, flexible rights management ensures that access rights and roles are controlled based on competence, tailored to the tasks of the technicians in service.

Six current sensors enhance EV safety

Six automotive current sensors from Littelfuse can enhance electric and hybrid vehicle performance, efficiency and functional safety.

The automotive-qualified sensors provide precise, isolated current measurement across battery-management, motor-control and pyro-fuse safety systems.

Using open-loop Hall-effect technology, the sensors deliver reliable performance in compact, busbar-mounted form factors. Output configurations include analogue and digital Can and Lin communication, giving designers flexibility in integrating with existing EV architectures.

As EV and hybrid systems evolve, engineers face growing demands for high accuracy, fast response and compliance with functional-safety standards. These current sensors help OEMs and tier-one suppliers meet those challenges by offering scalable, Asil-capable products that simplify design while improving efficiency, safety and overall reliability.

Across the family, nominal current extends up to ±1.5kA, with better total-error performance and low thermal drift.

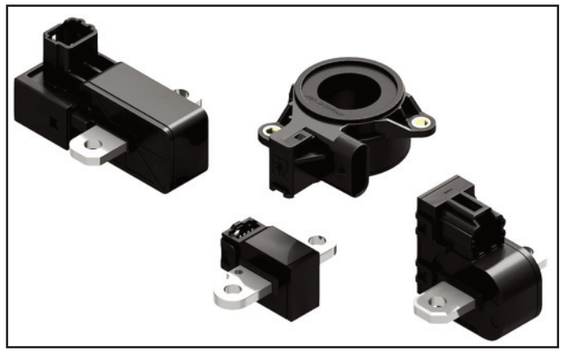
Models featuring Can 2.0B communication include Autosar E2E Profile 1A diagnostics and Asil-C-capable current measurement, allowing integration into safety-critical systems such as battery control or disconnect units.

The battery-management sensors are the CH1B02xB, CH1B032B and CH1B040B. These are for high-accuracy analogue or Can-based current measurement up to ±1.5kA for BMS, DC link and HV junction boxes.

The motor-control sensors are the CH1B02xM and CH1P01xM. These compact, low-noise, ratiometric analogue devices handle up to up to ±15kA (±900A for the CH1P01xM) supporting fast-switching inverter applications.

The CH1B050P pyro-fuse trigger module has an intelligent, fast-response design that directly triggers the pyro-fuse within microseconds. This rapid response helps prevent thermal runaway and protects passengers and high-voltage battery packs.

Their open-loop Hall-effect design provides precise, isolated current measurement to ensure operation across battery, motor and safety systems.



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

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