VEHICLE electronics

The monthly magazine for automotive electronics engineers

Intel debuts at Auto Shanghai with AI-enhanced SDV SoC

In its debut at Auto Shanghai, Intel unveiled its second-generation AI-enhanced software-defined vehicle (SDV) system-on-chip (SoC), the automotive industry's first multi-process node chiplet architecture.

Engineered to meet the growing demands of intelligent, connected vehicles, the SoC provides automakers with scalable performance, AI capabilities and cost efficiency.

"Intel is redefining automotive compute with our second-generation SDV SoC, combining the flexibility of chiplet technology with our proven whole-vehicle approach," said Jack Weast, Intel vice president.

The SoC has a multi-node chiplet architecture, letting automakers tailor compute, graphics and AI capabilities to their needs, while reducing development costs and accelerating time to market.

Intel also announced collaborations with innovators ModelBest and Black Sesame Technologies, expanding its automotive ecosystem and accelerating innovation in AI-powered cockpits, integrated adas and energy-efficient vehicle compute platforms.

ModelBest's gui intelligent agent brings a true on-device LLM to life, powered by Intel's SDV SoC and Arc graphics, enabling offline, AI-enhanced voice control and personalised interaction, even without network connectivity.

Combining its autonomous driving technology with Intel's SoC and Arc graphics, Black Sesame is developing a central compute platform that fuses adas and immersive cockpit experiences into one seamless, energy-efficient system.

Visitors experienced Intel's in-vehicle AAA-gaming powered by the firm's automotive SoC platform (Malibou Lake) and an Arc A760A graphics processing unit.

The hardware inside the vehicle runs on Intel's Linux-in-container technology.



Intel SDV demo at Auto Shanghai

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Visteon and Qualcomm redefine smart cockpits

At Auto Shanghai, Visteon and Qualcomm announced a collaboration to redefine AI-based intelligent cockpits.

This sees Visteon's high-performance cockpit powered by the Cognito AI framework and Qualcomm's Snapdragon Cockpit Elite platform.

"This technology collaboration marks a pivotal moment in automotive technology, where AI-driven insights will transform the way drivers and passengers interact with their vehicles," said Sachin Lawande, CEO of Visteon.

Visteon is working with Qualcomm to develop a hybrid multimodal AI architecture that integrates speech, camera inputs and vehicle data for proactive, context-aware interactions using LLMs. All models are quantised, optimised and converted using the Qualcomm AI Engine Direct (QNN) and run on the Qualcomm Hexagon NPU optimised for edge inference on the Snapdragon Cockpit Elite platform.

This end-to-end AI handles complex tasks such as predictive recommendations, environmental awareness and multimodal reasoning, delivering responsive and smart in-vehicle experiences.

The Cockpit Elite platform uses the Qualcomm Oryon CPU, Hexagon NPU for multimodal AI and Adreno GPU.

Cockpit Elite supports rich multimedia features, on-device AI capabilities and edge orchestrator, gaming and 3D graphics.

Designed to meet Asil-B safety standards, Cockpit Elite offers long-term support and API compatibility, and can run the instrument cluster, infotainment dashboard and multiple passenger interfaces in separate virtual machines allowing for seamless content and data sharing when needed.

Cognito AI, developed in-house by Visteon, brings AI capabilities to create an immersive in-cabin experience to the automotive cockpit. Built on a foundational language learning model, it integrates vehicle knowledge and diverse ECU data with tailored modules to create actionable intelligence that enables real-time decision-making and HMI interactions.

Unlike AI systems that depend on the cloud and generic prompt engineering, Cognito AI operates securely within the vehicle itself, making it more adaptable and capable of evolving over time to unlock SDV potential.

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Infineon partners Marelli on mems display technology

Infineon and Marelli are partnering to advance automotive display technology with a mems laser beam scanning (LBS) system.

Based on Infineon's LBS technology, this enables Marelli to create immersive cockpit experiences free from the constraints of traditional displays.

This technology was showcased during Auto Shanghai.

"The automotive industry's demand for innovative optics in cockpit designs is accelerating, and Infineon is committed to delivering these to our customers faster than ever before," said Thomas Schafbauer, head of Infineon's sensor and RF business unit. "With our focus on a faster time to market, we're helping our customers stay ahead of the curve and capitalise on the growing demand for next-generation display technologies."

The mems LBS system is fully automotive-compliant. It is shock and vibration robust, and compliant up to Asil B. Its compact chip-scale package ensures versatility and enables flexible design possibilities for easy integration across various applications.



Infineon target application with mems LBS

Furthermore, the system's efficiency provides a bright, clear display even in high ambient light conditions and reduces power consumption and heat generation, making it suitable for demanding automotive environments.

A large depth of field also offers focus-free projection, simplifying the optical design. These features allow OEMs to differentiate their cockpit designs while maintaining rich information displays.

"We are thrilled to collaborate with Infineon on mems LBS, which represents a significant leap in automotive display technology," said Joachim Fetzer, chief technology officer at Marelli. "This innovation offers significant design freedom and efficiency, enabling us to create unique and engaging cockpit experiences for our customers with a faster innovation-to-customer approach."

Highlights of Marelli's stand also included an OLED TFT applied to the pixel rear lamp, near-field ground projection technology and a thin lit line headlamp.

Continental names automotive group Aumovio

Continental's independent automotive company will be known as Aumovio, the firm revealed at Auto Shanghai.

Aumovio will offer electronic products and mobility technology for software-defined vehicles and safe, connected and autonomous mobility.

Aumovio is scheduled to list on the Frankfurt Stock Exchange in September.

"As an independent company, we gain significantly more creative power and speed," said Philipp von Hirschheydt, member of Continental's executive board. "Aumovio will be characterised by a triad of technologically leading products, a consistent value creation strategy and a global synergetic network, combined with a strong local presence for our customers. Our aim is to further expand our position in the future growth markets of mobility."

Continental's automotive group has been present in China for 30 years and employs around 10,000 people there. In 2024, the group generated around 14 per cent of its global sales in China.

At Auto Shanghai, it presented the Luna and Astra driver assistance systems. Both were developed in the joint venture Horizon Continental Technology.

Luna supports active safety as well as basic driving and parking functions to increase safety and comfort.

Astra enables assisted driving without a high-resolution map and parking assistance with memory function.

The automotive group employs around 92,000 people and sales were around €19.4bn in 2024.

Dirac and MediaTek MoU enhances in-car audio

Digital audio pioneer Dirac and semiconductor firm MediaTek have signed a memorandum of understanding (MoU) to co-develop a proof of concept for enhancing in-car audio performance.

The goal is to integrate Dirac's digital audio software into MediaTek's automotive-grade systems-on-chip (SoCs).

This should help OEMs deliver better in-car sound with easier system integration and accelerated time to market.

"This collaboration with MediaTek is a key milestone in Dirac's ongoing expansion in the automotive sector," said Ramzi Khalaf, director at Dirac. "By combining MediaTek's powerful, energy-efficient chipsets with our proprietary audio technologies, we're raising the bar for automotive sound performance. This partnership not only strengthens our global reach, it also reflects our commitment to future-ready hardware platforms that simplify integration and accelerate time to market for our customers."

The initial phase of the collaboration focuses on integrating Dirac's digital audio technologies into the Hifi 5 DSPs, featured in the MediaTek Dimensity auto cockpit chipsets for automotive applications. The initiative marks the beginning of a broader, long-term partnership.

As consumers increasingly expect high-fidelity, immersive sound inside vehicles – on par with premium home audio systems – automotive manufacturers are turning to software-defined options. Dirac is at the forefront of this shift, delivering technologies that increase speaker performance and create consistent, high-quality sound for every seat in the cabin.

Dirac works with brands such as Volvo, Polestar, Genesis, NIO and BYD.

In recent years, it has accelerated its automotive industry growth through partnerships with semiconductor and framework companies such as NXP, Analog Devices, QNX, Black Sesame and now MediaTek.



Synaptics partners Murata on wireless

Synaptics and Murata are working together to develop a turnkey wireless connectivity module for automotive tier-one suppliers and OEMs.

Through this partnership, Synaptics' Veros wifi and Bluetooth combo SoCs featuring integrated RF front-ends will be designed into a module co-developed with Murata.

The wireless SoCs balance performance, low system design cost and low power consumption while keeping throughput at the high temperatures required by automotive applications.

Synaptics is applying its Veros portfolio, which encapsulates field-hardened technology and IoT connectivity expertise, to provide long-term support for automotive manufacturers.

Its SYN4383 Wifi 6E and SYN4384 Wifi 7 automotive products are pin-to-pin compatible, with software upgradability, and the SYN4390 brings high-throughput Wifi 7 to this application.

A recent licensing agreement with Broadcom demonstrates Synaptics' wireless roadmap, including Wifi 8, to meet automotive requirements.

"Synaptics shares our commitment to high-quality products and engineering, and we are excited to collaborate on innovative wireless modules for the automotive market," said Masatomo Hashimoto, director at Murata.

Veros encompasses Synaptics' entire wireless portfolio, incorporating features aimed at performance, interoperability, coexistence, energy efficiency and bill-of-materials integration.

Veros includes built-in support for Synaptics Astra, an AI-native compute platform for the IoT.



Veros encapsulates IoT connectivity expertise



BMW with integrated V2X

BMW integrates Joynext V2X

BMW has released its 5 Series with Joynext's V2X technology in China, marking BMW's first model to feature integrated V2X capabilities.

This cooperation accelerates the promotion of smart connectivity technology and is said to demonstrate BMW's commitment to more profound local cooperation in China.

V2X ensures vehicle-road-cloud communication, providing various proactive safety information. The risk of traffic accidents could be reduced through real-time warning of potential collision hazards.

Joynext, with its independent R&D capabilities and experience in globalised product implementation, expects to elevate BMW's driving experience while jointly promoting a smart city vision.

Joynext is the automotive connectivity business unit of Joyson Electronics. With over two decades of experience as a tier-one supplier, it has established and maintained long-term partnerships with automotive brands such as Volkswagen, BMW, Audi and NIO.

It provides OEMs and users with personalised products in the areas of intelligent cockpit, smart connectivity, autonomous driving, software and software engineering.

It works with ecological partners such as Huawei, Qualcomm, Horizon Robotics, Black Sesame Technologies, Oritek, QNX, Elektrobit, Microsoft, Brose and Autobrains to promote the transformation of the intelligent automobile industry.

Melexis starts local manufacturing in China

Melexis is establishing an embedded logistics hub and end-to-end local manufacturing in China.

The growth of China's automotive, consumer, industrial and robotics industries has made the region a key focus for the Belgian company.

In 2024, the Apac area accounted for 60% of Melexis' total sales, with China contributing nearly half of that.

Melexis has secured notable design wins in China, particularly in automotive powertrain, interior lighting, steering and braking systems.

In early 2024, Melexis established a partnership to outsource semiconductor assembly and test locally in China to aid its ability to serve the region. Since late 2024 and as part of its expanded strategy, Melexis has collaborated with a Chinese semiconductor wafer fab partner to manufacture products developed by Melexis, tailored to the Chinese market, and scheduled to enter production early next year.

In addition, a larger office space was opened in Shanghai in March. This expanded space serves as a core hub for sales, marketing, brand presence, technical support and engineering activities.

"We continue and expand our roadmap in China," said Dieter Verstreken, Melexis VP. "Melexis has grown its activities in China for more than 20 years and, in 2024, we concluded an agreement for end-to-end local manufacturing. This exciting next step will see new products coming from our Chinese wafer manufacturer from early 2026, helping to improve lead times."

Nextbase acquires AI assets



Dashcam brand Nextbase has acquired AI product, platform and intellectual property assets from automotive AI company Humanising Autonomy.

The acquired assets, combined with Nextbase's proprietary AI and computer vision portfolio, should accelerate and enhance its AI-powered features in dashcams to improve the safety and efficiency of drivers. With five million Nextbase dashcams sold worldwide, the company plans to include AI features such as object detection, driver alerts, security and driver monitoring systems.

This AI technology will also be used to advance Nextbase's crowd-sourced imagery (CSI) platform, which lets users share previously unused imagery with stakeholders in mapping, infrastructure management and public safety. By receiving this low latency imagery, these partners are transforming the freshness of maps and speed and efficiency of road maintenance.

To drive mass community adoption and compliance of the CSI platform, Nextbase has created the Road Safety Club, that allows users to opt-in, be rewarded and contribute to improving road safety.

Every year drivers with Nextbase dashcams cover over 245 billion road kilometres, with this number growing daily. The products offer coverage of global road networks using AI and computer vision for quick processing and redaction of identifying features.

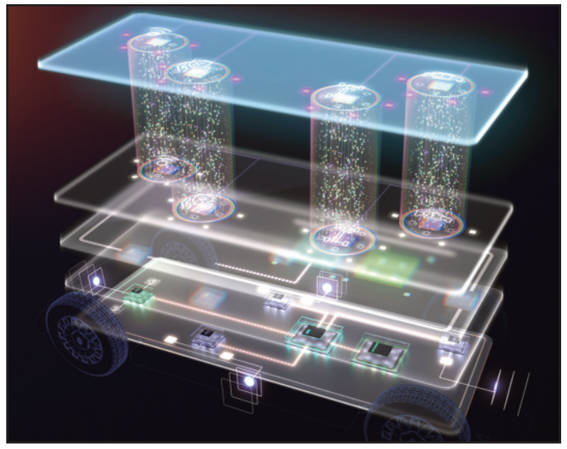
Renault vehicles adopt Ampere SDV architecture

Trafic, Estafette and Goelette are the first Renault vehicles built around the software-defined vehicle (SDV) architecture developed by its subsidiary Ampere.

Ampere has based its SDV approach on a single platform with centralised software architecture and a connected, intelligent operating system to control, analyse and upgrade vehicle functions quickly and reliably.

High-performance computers act as the vehicle's brain, processing the data collected by the onboard sensors, and in particular by the driver aids, powertrain, chassis control, and multimedia and connectivity services. These computers can be upgraded with functions to modernise the vehicle or extend its service life, using the Car Os operating system designed by Ampere.

Business users will be able to upgrade their vehicle, as they would their laptop or phone, adding functions in real time throughout its service life. Personalised offers could be made available, reflecting the actual usage and driving habits of each individual.



Ampere SDV approach

In this way, the experience could be enhanced for business users, with functions tailored to their activity and requirements.

Vehicles with specific functions, such as ambulances, fire engines, police vehicles, refrigerated vehicles and other conversions, could include dedicated apps for unique, centralised operation of each component.

Companies using their own operating system, to make deliveries, for example, will be able to integrate their OS with the onboard multimedia system to send out information in real time to delivery drivers on their rounds.

Fleet users will be able to log into their profile and access a personalised interface with their preferred vehicle settings and apps.

Already available on existing vehicles, predictive maintenance will become more precise with the greater computing capacity and intelligence of SDV architecture. This will make it possible to track the wear and tear of some parts in real time and to initiate remote diagnostics to plan for repairs or take direct corrective action where possible.

Being able to update software-defined vehicles over the cloud will bring benefits not only in terms of the driving and onboard experience, but also in vehicle value. In practical terms, this means a vehicle that is three or four years old will lose less of its value, since it will have been enhanced with more functions.

Developed in partnership with Flexis and built in France at the Renault Sandouville plant, Trafic, Estafette and Goelette were presented at last month's CV Show in Birmingham.

• **Renault vision with Emblème concept car, see page 29.**

Elektrobit and Metoak evolve SDVs

Elektrobit is working with Metoak, a Chinese provider of intelligent driving technology, to accelerate the large-scale adoption and evolution of software-defined vehicle (SDV) technology.

The collaboration leverages Elektrobit's EB Corbos Linux for Safety Applications, an open-source operating system compliant with automotive functional safety, and Metoak's chips and driving algorithms.

The first mass-production project under this partnership has entered its initial phase, focusing on breakthroughs in stereoscopic vision perception and multi-sensor fusion technology.

The companies will also collaborate on Asil-D-certified Autosar Classic software and services to optimise real-time communication and functional safety.

STM embeds extensible memory in MCUs

ST Microelectronics has embedded extensible memory into its Stellar series of automotive microcontrollers, transforming the process of developing software-defined vehicles (SDVs) and evolving platforms for electrification.

Instead of managing multiple devices with varying memory options and the associated development and qualification costs, Stellar with xMemory introduces a single device with extensible memory.

This simpler approach from the start can help car makers future-proof their designs, with room for additional innovation later in their development, reducing costs and accelerating time to market with a simpler supply chain.

This will be first available on the Stellar P6 MCUs, which target drivetrain trends and architectures for electric vehicles, with production to start later in 2025.

"STM has developed the ultimate memory technology for the automobile market with the smallest bit cell to meet the endless need for more memory," said Luca Rodeschini, vice president at ST Microelectronics. "Stellar with xMemory will streamline the car architectures of tomorrow, making them more cost-effective and significantly reducing development time for car makers."

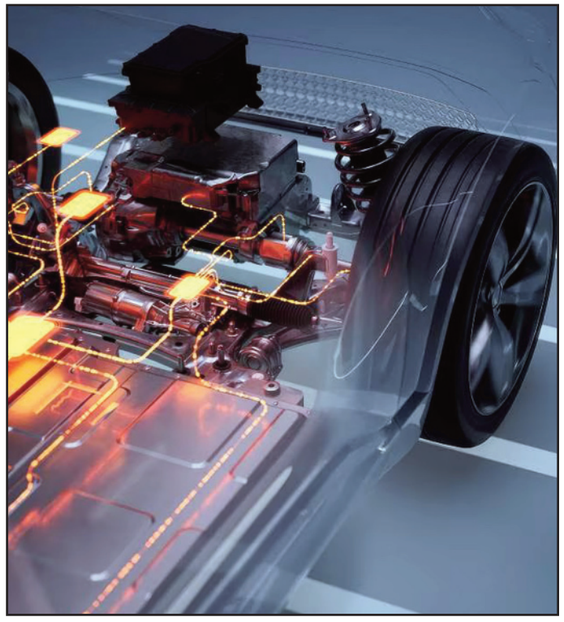
Car makers need seamless integration of software and hardware to increase reuse across platforms, extend vehicle longevity and enhance digital capabilities. Memory becomes a bottleneck as software complexity grows, driven by new features and regulations, memory-hungry AI and machine-learning applications, and over-the-air (OTA) updates.

The xMemory addresses this by extending the memory either during the development phase or when the vehicle is in the field, giving unlimited application upgrades.

Selecting the right MCU at the start of the SDV lifecycle ensures sufficient on-chip memory for future software development. Today's choice of over-specifying memory increases costs, while under-specifying may necessitate finding and re-qualifying a different MCU with extra memory later, adding complexity, cost and delays.

STM has been at the forefront of the transition from flash to eNVM technology in automotive MCUs, introducing the first 28nm eNVM qualified for automotive applications, which is at the core of the xMemory. The firm's embedded phase-change memory (ePCM) fabricated at 18 and 28nm nodes provides twice the memory density of other technologies.

The latest-generation PCM technology will be available on all upcoming Arm-based Stellar P and G automotive MCUs. The Stellar family is dedicated to automotive applications and simplifies vehicle electrical architectures for increased power, flexibility and safety.



Stellar MCUs suit centralised zone and domain controllers and body applications

Brake-by-wire for software-defined chassis

At Auto Shanghai, Nexteer launched a brake-by-wire system that enhances safety, comfort and serviceability, and supports software-defined chassis integration.

The EMB electro-mechanical brake replaces hydraulic fluid and mechanical linkages with electronic control.

Building on its steer-by-wire, software and integration expertise, Nexteer developed EMB as a first step in a broader, chassis motion control strategy.

Many of its skills, toolsets, software controls and hardware components are shared between its steering and braking development.

R&S helps ADI with 10baseT1S

Rohde & Schwarz helped Analog Devices (ADI) accelerate the development of the10baseT1S Automotive Ethernet variant by offering compliance, trigger and decode options.

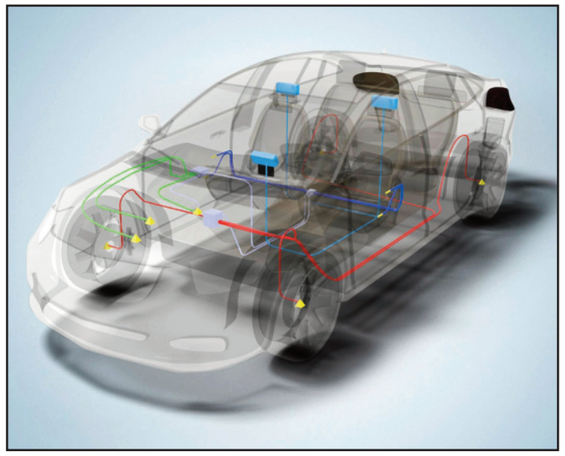
Rohde & Schwarz worked with ADI to use the R&S MXO 4 and 5 series oscilloscope with the MXOx-K560 option to decode the 10baseT1S communications. The 10baseT1S Ethernet to edge bus (E^2B) from ADI provides a low complexity, high flexibility edge node implementation for automotive applications.

The oscilloscope, known for its fast update rate and deep memory, captures, triggers and decodes packets quickly as well as capturing the big picture and smallest details of electrical signals with accuracy. It can also detect intermittent faults in the communication bus with fast acquisitions.

The 10baseT1S (IEEE 802.3cg) is a type of Ethernet networking technology for use in automotive and industrial applications, and 10baseT1S E^2B products from ADI enable optimised yet flexible hardware-based Ethernet edge node connectivity.

The variant is not just introducing a lower speed grade of 10Mbit/s over distances of 25m and beyond but also adding novel capabilities such as multi-drop transmission, thus eliminating the need for a switch.

By eliminating the need for microcontrollers at the edge nodes, E^2B enables the centralisation of all software to help enable zonal architectures and software-defined vehicles (SDVs). This is particularly applicable for linking sensors and actuators throughout the car body, powertrain and beyond to a domain or zonal controller.



R&S worked with ADI to decode 10baseT1S

On the MXO oscilloscopes, the decoded packets are displayed in a colour-coded manner, thereby making it straightforward for ADI engineers to identify crucial protocol messages such as beacon, commit and mac frames. This allows for more efficient test validation, thus helping enable shorter time to market.

The 10baseT1S takes advantage of PLCA (physical layer collision avoidance) technology to verify the timing and performance of various nodes connected onto the network. The time alignment of all decoded frames with the captured waveform simplifies debugging and facilitates precise timing measurements.

ADI engineers can switch between various data representations such as DME symbols, scrambled or unscrambled, providing insights into the captured network traffic.

The 10baseT1S Ethernet technology supports a high number of nodes on a single network, making it suitable for complex systems. Its short reach and low data-rate make it energy efficient and cost-effective.

ADI's approach to 10baseT1S ensures that SDVs can deliver value to OEMs by reducing form factors, cutting costs at the edge, lowering boot times, and offering bounded low latency, power saving, timestamping and timed actuation, so all nodes in the system are synchronised and operate seamlessly.

Advantech points Arrow at EV charging

Advantech and Arrow Electronics have combined their strengths to deliver a SECC (supply equipment communication controller) for the EV charging market.

This joint effort will be showcased at Smarter E Europe in Munich from 7 to 9 May.

Arrow brings its ISO 15118 software stack, which was developed to support EV chargers.

The compliance with the OCPP (Open Charge Point Protocol) ensures efficient communication between charging stations and central management.

Advantech introduced its AFE-E420 single board computer (SBC) with integrated dual PLC earlier this year.

Ford kills vehicle network project due to rising costs

Ford has scrapped plans to create a fully-networked zonal architecture to unify the electronics across all its vehicles.

The fully networks vehicle (FNV) project was a priority as the car maker tried to cut costs while increasing quality, as well as bringing in revenue through subscription-based software features.

Ford had invested heavily in the project but rising costs and project delays forced it to pull the plug. Some of those delays were caused because the task of incorporating software from different suppliers proved more difficult than anticipated.

However, some of the achievements so far will be incorporated into future R&D efforts, notable by its Skunkworks team, which is in charge of EV and connected-car development.

Skunkworks is a secretive small team in Irvine, California. It is believed to be crucial for the car maker's electrification plans including an all-new commercial van that will begin production in 2026 in Ohio, closely followed in 2027 by two more pickup trucks.

Ford established the Skunkworks team in 2022 to change the company's approach to vehicle development and bending the cost curve on electric vehicles. The team takes a systems-integration approach across design, engineering, supply chain and manufacturing to rethink the full vehicle.

Former Apple and Tesla executive Doug Field was in charge of the FNV4 project. He joined Ford in 2021.

His goal was to streamline software in the vehicle to reduce complexity and enable over-the-air updates.

The FNV4 project was seen as a way to challenge the Rivian EV maker into which Volkswagen has invested around $6m, and to follow Tesla's example of increasing revenue by adding software during the life of a vehicle.

Other car makers have also invested in moving to a zonal architecture to reduce the amount of wiring in a vehicle.

Autoliv becomes safety partner for Formula E

Autoliv has become the official mobility safety partner for the Formula E world championship.

The provides Autoliv with a platform to showcase its expertise and improve awareness of automotive safety in an electric racing setting.

"We are proud to partner with Formula E and showcase our expertise in automotive and electrical safety," said Gabriella Etemad, senior vice president at Autoliv. "This partnership represents a significant milestone in our journey to show how we empower safety within the automotive industry."

Through Formula E's platform and fan base, Autoliv aims to inspire people to use seatbelts, choose vehicles equipped with advanced safety systems, and drive safely in every traffic situation.

"This collaboration is a testament to our dedication to making vehicles safer for everyone, and we are enthusiastic about the opportunities this partnership can bring for advancing global automotive safety standards," said Etemad.

Tiziana Di Gioia, chief commercial officer for Formula E, added: "As we have some of the fastest and most advanced race cars in global motorsport going wheel to wheel on our circuits, safety is our number one priority. This focus and attention to detail aligns perfectly with Autoliv's own ethos and business strategy. Collectively, we won't just promote vehicle safety to our current fan and consumer bases but look how we can continually develop and deploy cutting-edge systems in the motorsport and automotive industries."

Branding activations include the Autoliv logo on the safety and medical car, as well as local promotions at various races.



Autoliv's logo on Formula E safety car



Bosch and Horizon MoU signing ceremony

Bosch and Horizon collaborate on adas

Horizon Robotics and Bosch are intensifying their collaboration to provide assisted driving technology for multiple automakers.

Horizon Robotics provides smart driving technology for passenger vehicles. It has signed a memorandum of understanding (MoU) that will see Bosch develop its multi-purpose camera based on Horizon's Journey 6B processing hardware and its adas family for mid-segment vehicle using the Journey 6E/M, enhancing safety, convenience and comfort for drivers and passengers.

The camera supports safety and comfort functions for SAE level-two assisted driving. With mass production due mid-2026, the camera has already secured several design wins with global and Chinese OEMs.

Journey 6B is designed for adas, focusing on active safety features and engineered as a standard configuration.

Using Journey 6E/M processing hardware, Bosch enables high-level adas features including urban navigation-based assisted driving, supporting up to ten routes of urban memory driving and parking, and smooth parking with one move parking assist function.

These platforms have secured contracts with five OEMs, including Jetour, Dongfeng and BAIC, with the first mass-produced model scheduled for launch next month. Additionally, its first overseas project is planned for mass production early next year, inaugurating Bosch adas for mid-segment global expansion empowered by Horizon's Journey 6.

More than 20 OEMs have selected Journey 6, empowering 100 smart vehicle models. With its shipments projected to exceed a million units this year, Horizon is poised to become the first adas technology firm to surpass the ten-million-unit milestone.

"At this pivotal moment for vehicle intelligence, Bosch is fully engaged, partnering openly with industrial value chain companies such as Horizon Robotics," said Wang Weiliang, president of Bosch in China. "By combining our software and hardware expertise in embedded systems, we're driving the smart mobility revolution together."

Stradvision and Axera cooperate on scalable adas

Stradvision, a specialist in AI-powered vision perception technology, and AI SoC provider Axera announced at Shanghai Auto a cooperation aimed at delivering competitive and scalable adas and autonomous driving.

The partnership brings together Stradvision's SVNet software-based perception and Axera's AI SoC platforms to develop integrated, market-ready products for adas and autonomous mobility.

The companies will collaborate closely to ensure SVNet is optimised on Axera's current and future platformss.

As part of the initiative, Stradvision and Axera will align on joint technical efforts, exchange product and technology roadmaps, and engage in business development with mutual partners.

ZF optics boost data speed in software-defined vehicles

ZF has improved its ProAI computer for optical multi-gigabit Ethernet used in automotive.

Newly developed chips and connectors enable data to be transmitted via automotive-grade optical fibres according to the IEEE 802.3cz.

"This ultra-fast transmission is key technology for future vehicle electrical systems of software-defined vehicles," said Oliver Briemle from ZF.

The technology enables short- and long-distance transmissions up to 40m. Series production is possible as early as next year.

Optical multi-gigabit Ethernet offers advantages for various vehicle classes. Tests have confirmed the suitability of this technology for use in cars, lorries, buses and shuttles and have proven its robustness under various operating conditions.

Optical data transmission is based on the transmission of light signals through glass optical fibre (GOF) or plastic optical fibre (POF) cables. Fibre optic cables offer high bandwidth and low losses.

High data transmission rates and reliability are advantages of optical data transmission systems in the automotive industry. Optical systems such as Most were introduced in the automotive sector approximately 20 years ago. These older systems relied on polymer fibres as the physical layer for data transmission.

In contrast, new standards, such as the optical multi-gigabit Ethernet according to IEEE 802.3cz-2023, are based on glass fibres, which offer a higher bandwidth and lower losses.

The standard supports data transfer rates of 2.5, 5, 10, 25 and 50Gbit/s. These speeds are crucial to cope with the growing volumes of data generated by adas, infotainment and networked services.

The standards enable a greater transmission distance than older optical or copper-based transmission systems used in automotive.

Compared with copper cables, the use of fibre optics saves a significant amount of weight, which in turn helps reduce fleet consumption.

Optical fibres are not susceptible to electromagnetic interference and offer stable data transmission even under extreme environmental conditions. Galvanically isolated data communication between different voltage levels can also be realised. They are also more resistant to wear, which enables long-term use.

Optical data transmission systems are more energy efficient than conventional copper-based systems. They require less energy for data transmission, which leads to a reduction in overall energy consumption in the vehicle.

Optical multi-gigabit Ethernet is future-proof and scalable, as it is possible to upgrade high-performance computers, ECUs and multi-domain computers to higher data transmission speeds without having to change the existing optical cabling components.

This facilitates the integration of new technologies and functions in future vehicles.

The OM3 optical fibres specified in IEEE 802.3cz-2023 are widely used worldwide and are already being produced in large quantities.

The current high production volumes of VCSELs (laser diodes) and photodiodes for use in the specified wavelengths are also very high.

This leads to cost savings in production and makes the technology economically attractive for series use in the automotive industry.

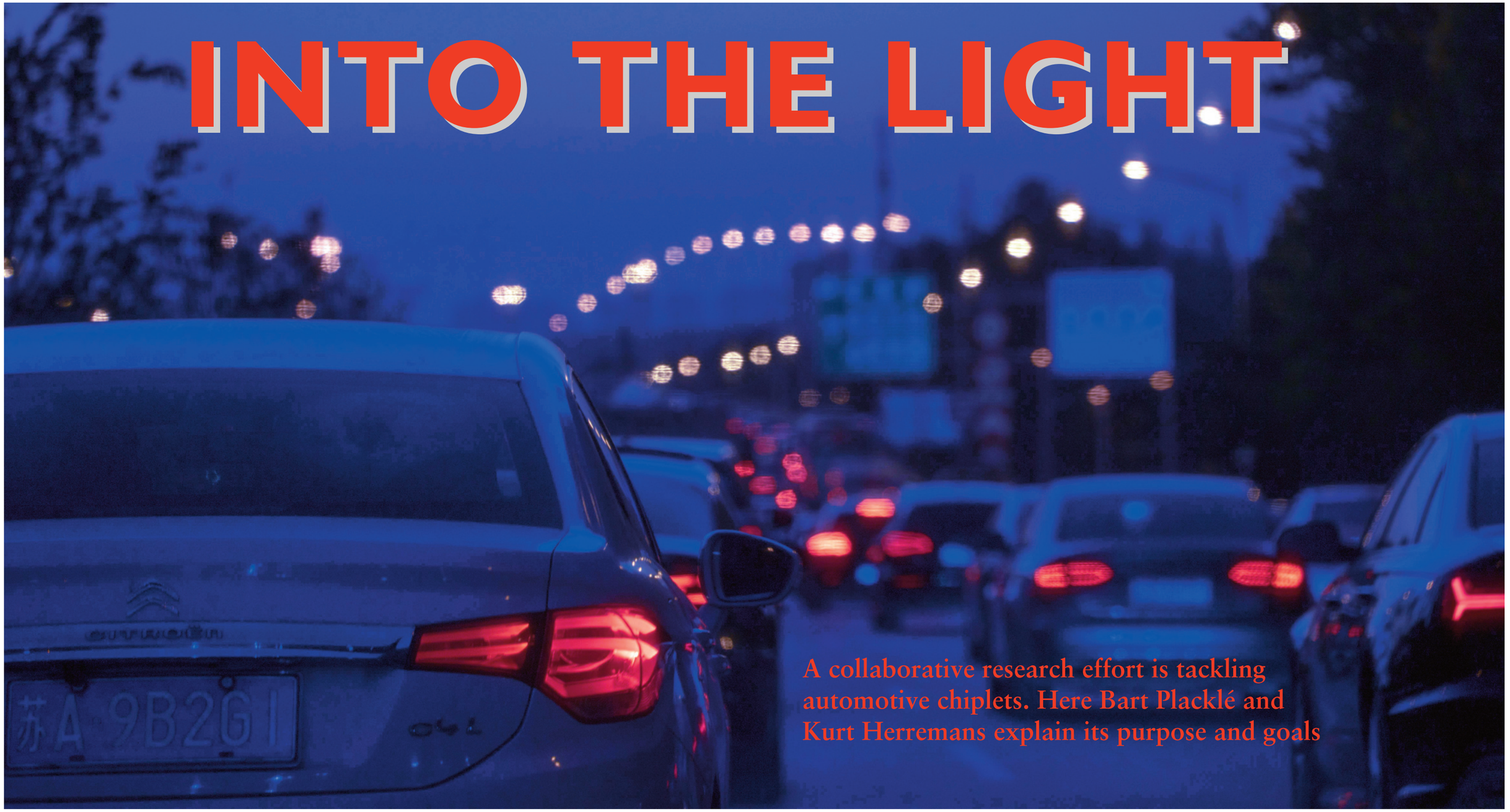
Optical multi-gigabit Ethernet offers near-ideal communication channels with low physical layer complexity. This results in lower equalisation complexity, no echo cancellation and therefore lower power consumption and lower latency.



Data can be transmitted via automotive-grade optical fibres

CHIPLETS

INTO THE LIGHT



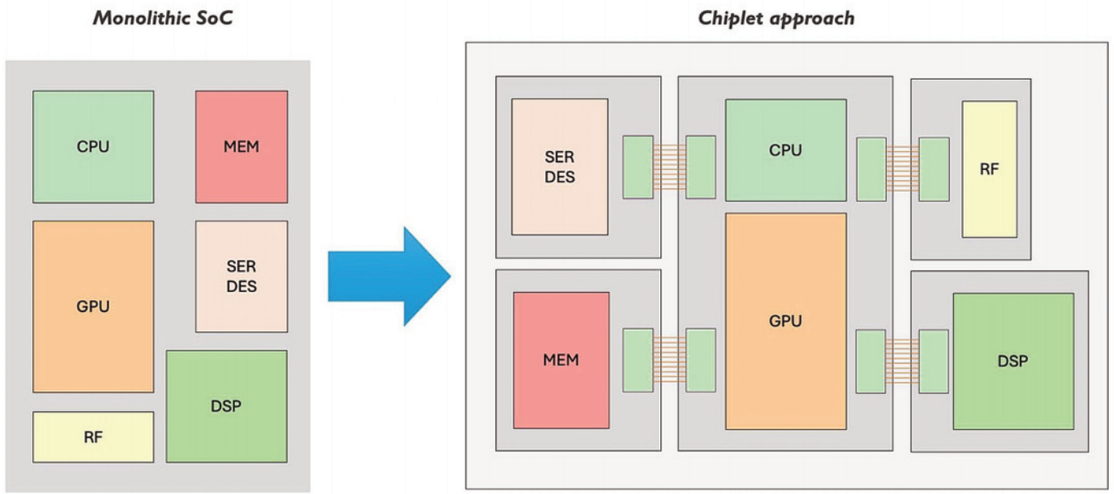
A collaborative research effort is tackling automotive chiplets. Here Bart Placklé and Kurt Herremans explain its purpose and goals

Nearly 150 years after Carl Benz unveiled his Benz Patent-Motorwagen, car manufacturers face a whole new set of challenges. The electrification of their product portfolios and the quest for improved battery capacity remain top priorities.

This shift is complicated by the simultaneous transition to software-defined vehicles whose intelligent functions are powered by high-performance and traditionally energy-guzzling computers and countless lines of code.

Another key area of focus is the development of differentiating, personalised driving features for which consumers are willing to pay a premium. And all the while, society is demanding ever more advanced safety features to reduce traffic fatalities.

Each of these, along with the technological innovations required to address them, is driving the automotive industry to increasingly rely on chip technology. But OEMs and tier-one suppliers have traditionally had limited access to core semiconductor development. This has severely hampered their ability to translate forward-



Chiplets offer a modular system that combines separate chips from different vendors and technology nodes, instead of designing all functions into one monolithic system on chip

looking visions into solid product offerings.

Hence, it is time to put car manufacturers back in the driver's seat and empower them to shape the roadmaps of chipmakers.

Crossroads

Gone are the days when cars were defined solely by mechanical features such as horsepower and torque. The focus has shifted to creating smart, personalised high-performance supercomputers on wheels that offer an entirely new driving experience.

The rise of these software-defined vehicles, containing millions of lines of code, brings a host of exciting opportunities and innovative applications. However, it also introduces a new level of complexity, requiring safety-critical and increasingly electronic products to be designed from the ground up.

In parallel, battery capacity constraints mean EVs and their underlying sensing and computing systems must operate as energy-efficiently as possible. Because what good is a smart car if it needs to be recharged every few kilometres?

In other words, car manufacturing is at a crossroads, prompting OEMs and their partners to reinvent longstanding R&D practices. A critical step will be to establish collaborative models that allow OEMs to shape actively the specifications and features of the next generation of automotive microchips, a technology that automakers have been incorporating into their vehicles since the late 1970s, but which needs another leap forward to meet today's challenges.

Collaboration

Despite continuous advancements, chips still fall short in delivering the computing power and energy efficiency needed for tomorrow's automotive systems. Adding to the complexity, chip technology developed today must remain relevant for up to two decades, given the typical development timeline and lifespan of a car.

And, finally, affordability is crucial to ensure smart, electric vehicles are accessible to a broad customer base, rather than being exclusive and prohibitively expensive.

The newly launched Automotive Chiplet Programme aims to tackle these challenges head-on. By focusing on chiplets, the programme brings together stakeholders from across the automotive industry in an unprecedented pre-competitive research effort. Its goal is to evaluate the best chiplet architectures and packaging technologies to meet car manufacturers' semiconductor needs, thereby extending the benefits of chiplet technology, such as greater flexibility, improved performance and cost savings, to the entire automotive sector.

Companies developing supercomputing, data centre and smartphone products have long embraced chiplet technology to meet their rapidly growing computing demands. But the automotive industry has been more hesitant to embrace the chiplet paradigm. This reluctance largely stems from the sector's unique challenges.

Vehicles require components that are exceptionally robust and reliable to withstand extreme conditions such as high temperatures, vibrations and varying weather. Moreover, automotive applications, especially in electric vehicles, demand superior energy efficiency to conserve battery life.

OEMs therefore need to be absolutely certain the technology meets their stringent requirements before integrating chiplets into their product portfolios.

It is clear, though, that the flexibility of chiplets will be key in helping the automotive ecosystem swiftly adapt to evolving market demands and technological breakthroughs in areas such as autonomous driving, sensor fusion and other advanced electronic functions.

Concretely, chiplets enable car manufacturers to meet reliability and safety standards by using proven dies from previous car designs. Their modular approach shortens time to market and simplifies the process of updating or replacing electronics, a task that is far more complex with monolithic SoCs.

The modularity of chiplets also allows for the integration of specialised components optimised for specific functions, thereby improving overall performance.

For example, integrating dedicated AI accelerators as chiplets can significantly boost the performance of adas and autonomous driving systems. Along with this optimised performance comes a reduced power consumption and more compact designs.

Magic of chiplets

Ranked by MIT Tech Review as one of the top ten breakthrough technologies of 2024, chiplets – that is modular chips designed to perform specialised functions efficiently, and that flexibly combined create more sophisticated systems – have made a significant impact in the semiconductor world.

Chiplet-based designs address the slowing of Moore's Law, which has driven the semiconductor industry for decades. To maintain the biannual doubling of components on integrated circuits, chipmakers have historically explored various approaches, continuously packing more components onto monolithic system-on-chip (SoC) designs. Mobile phones exemplify the success of these designs, integrating mathematical functions, wireless communication, audio and more onto a single chip.

Today, however, further semiconductor scaling has become increasingly difficult, to the point where traditional chip architectures are struggling to meet the demands of ever more complex automotive systems such as adas and immersive in-vehicle infotainment (IVI) services.

The adoption of chiplet technology would represent a disruptive shift in central vehicle computing design, offering distinct advantages over traditional monolithic approaches. For one, chiplets enable rapid customisation and upgrades, while reducing development time and costs.

However, transitioning to a chiplet architecture is a complex exercise that is prohibitively expensive for OEMs if done in isolation. The commercial viability of the chiplet approach in the automotive sector thus hinges on collaboration and industry alignment around a set of chiplet standards, and requires an open ecosystem in which car manufacturers can source base function chiplets from the market and augment them with proprietary chiplets to build unique offerings.

"It is time to put car manufacturers back in the driver's seat and empower them to shape the roadmaps of chipmakers"

CHIPLETS

Finally, by fostering a more open ecosystem, chiplets help mitigate the risk of vendor lock-in and enhance supply chain resilience.

Against this backdrop, the Automotive Chiplet Programme seeks to harness the collective wisdom and assets of the automotive ecosystem to accelerate the development of a chiplet architecture that is tailored to the sector's needs.

In addition, the pre-competitive insights gained from the programme will fuel further R&D and product innovation, helping partners advance their own long-term roadmaps.

In fact, this collaborative approach mirrors the successful practices that have propelled the semiconductor industry forward over the past four decades.

Major automotive players such as Arm, ASE, BMW, Bosch, Cadence Design Systems, Siemens, SiliconAuto, Synopsys, Tenstorrent and Valeo have already committed to the initiative.

Conclusion

It is safe to say the automotive industry is heading for a bumpy ride.

Powertrain electrification, hardware-software co-optimisation, and the development of novel chiplet architectures present challenges that can only be overcome through international, cross-sector collaboration.

Within this ecosystem, the semiconductor industry plays a pivotal role, as chip technology needs to take another leap forward to meet the demands of OEMs.



Initiatives such as the European Chips Act and the Advanced Chip Design Accelerator (ACDA) supported by the state of Baden-Württemberg in Germany will be instrumental in getting there. They will boost regional research and development efforts, help preserve geopolitical equilibria and help the industry cope with supply chain hiccoughs.

However, car manufacturers will also need to step up by actively helping define the specifications for the next generations of microchips.

It is a shift towards a new and tighter collaboration model, one the semiconductor industry is not only ready for, but eager to embrace, as is shown by the



Automotive Chiplet Programme.

Bart Placklé is vice president of automotive technologies and Kurt Herremans is programme director for automotive, both at R&D body Imec



SENSORS

INERTIA

Mark Looney shows how to optimise mems IMU data coherence and timing in navigation systems

Vehicle Electronics

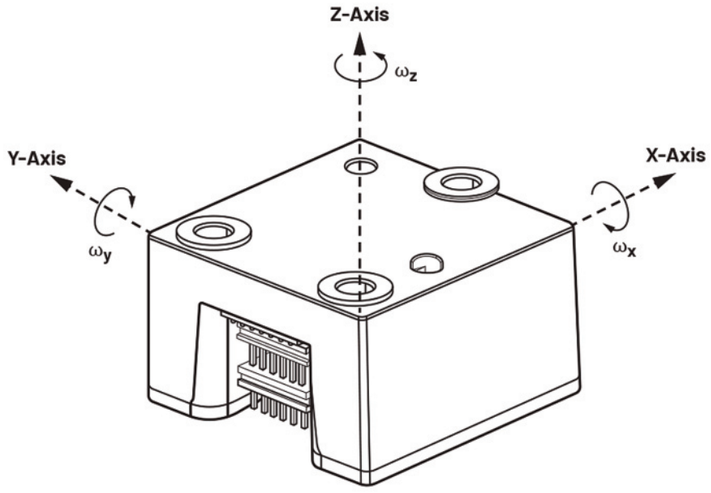


Fig. 1: Inertial reference frame

For those seeking to assess inertial sensing for the first time, existing computing and IO resources may limit data rates and synchronisation functions, which might impede progress towards proper in situ assessment of sensor capability.

One of the most common difficulties is establishing time-coherent data capture at data rates that microelectromechanical systems (mems) inertial measurement units (IMUs) require for the best available performance and digital post-processing capacity.

Main loops in computing platforms can be as slow as 10Hz and often run on platforms that cannot support interrupt-driven data capture, based on data updates, from sensing functions. This article identifies techniques that system developers can use to manage the gap between slow, asynchronous computing loops and high-performance data capture and processing in mems IMUs.

Faced with a complex set of threats to existing GPS or GNSS position navigation timing (PNT) services, many navigation platform developers must quickly assess emerging technologies, which can help address vulnerabilities to their current PNT strategies.

Guidance navigation control (GNC) systems for autonomous vehicles (AVs) are one example of such systems that must identify a complex set of threats, which are associated with loss or corruption of PNT services.

In fact, many AV developers and operators are facing several challenges that are forcing them to consider adding inertial sensors to their platforms for the first time. For those who are using mems IMUs for the first time, establishing data coherence at sample rates that support the best available performance can be a significant challenge.

Even in early prototyping and preliminary field trials, sample rates and synchronisation can make a difference, especially when system developers are relying on preliminary results to inform their longer-term requirements in the development process. Therefore, identifying and optimising key operating attributes of a mems IMU is an important first step.

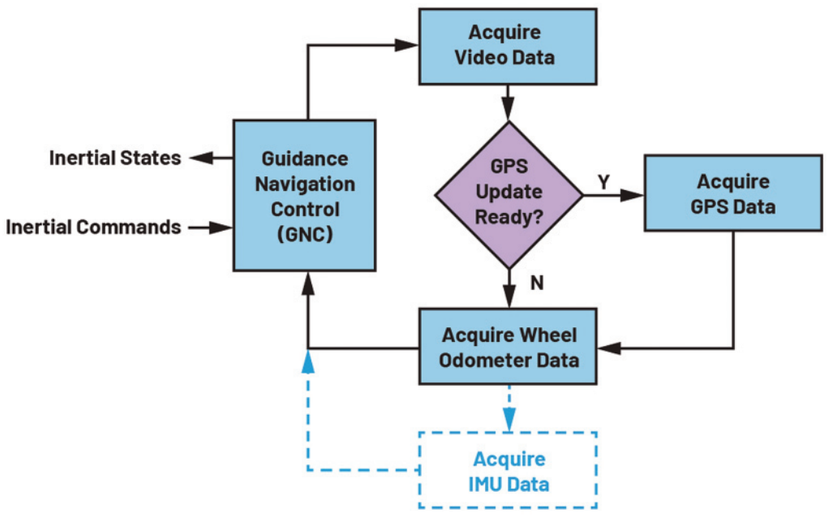


Fig. 2: Simplified AGV processing flowchart

Mems IMUs typically include triaxial linear acceleration and triaxial angular rate (gyroscopes) sensing, along and around three mutually orthogonal axes. Fig. 1 illustrates the inertial reference frame, along with each sensor's polarity and axis assignments.

AGV

Fig. 2 illustrates a simplified flowchart for the main processing loop of an autonomous ground vehicle (AGV) that uses video, wheel-based odometry and GPS for inertial navigation and tracking. The dotted lines also illustrate adding an operation to read the six inertial sensors from a mems IMU into this loop.

For illustration, the main loop acquires data from the video and wheel-based odometers at the main loop rate of 50Hz, while it updates GPS and PNT data at a rate of 10Hz.

The first generation of this AGV provides basic supply delivery service between buildings at an airbase.

In the next generation, AGV operators must evaluate additional sensors for managing partial GPS outages – such as only two GPS satellites available – and they need to upgrade to GNC to double the velocity over complex, off-road terrains. The mems IMU is the first candidate for evaluation.

The first challenge is to address the large gap (factor of 80) between the loop update rate and the sample rate at which the mems IMU will provide the best available performance and operation. Increasing the processing loop of the GNC system will require major changes, which may not be practical for the first prototypes and preliminary field trials.

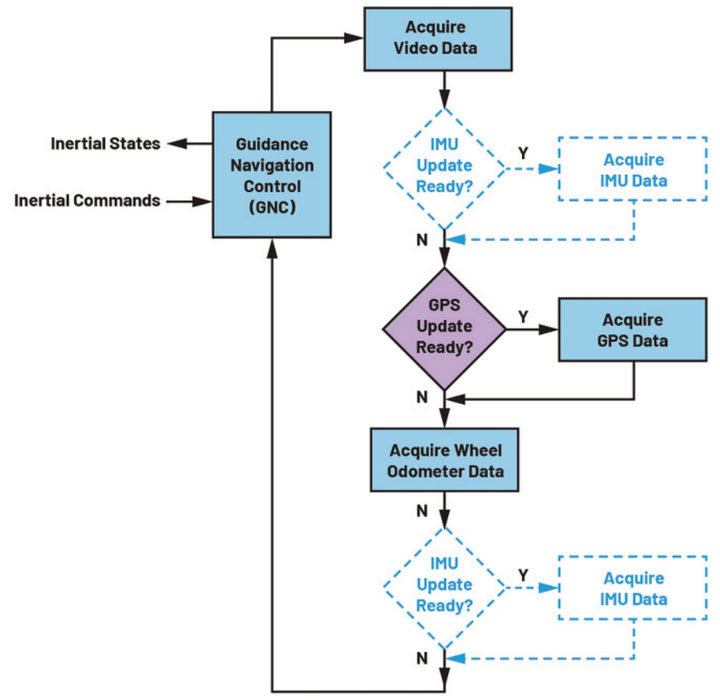


Fig. 3: Simplified AGV processing flowchart with IMU interrupts

What can be done to ensure the preliminary field trials have the best chance to evaluate the merit of the mems IMU in this particular use case? The answer lies in optimising a combination of the following operational attributes: data reduction, time coherence, synchronisation and buffering.

Data reduction

Reducing the data rate can be as simple as acquiring data at a slower rate.

However, this approach can under-sample the signals, which can introduce errors, especially under conditions at which AGV platforms are most reliant on the mems IMU for feedback sensing: highly dynamic motion and environmental profiles.

Mems IMU core sensors, such as accelerometers and gyroscopes, and signal chains often have bandwidths that are wider than most other AGV sensing platforms. Therefore, reducing the bandwidth needs to be part of any strategy for reducing the data rates in the inertial signals.

One convenient method for managing this vulnerability is through the use of digital filtering in the mems IMU's signal chain. For example, when adapting the mems IMU to the system in Fig. 2, setting its Bartlett FIR filter to 64 taps per stage will reduce the cut-off frequency to approximately 20Hz. Setting its decimation filter to average 80 sequential samples for each data



AGV providing delivery services at Ramstein Air Base in Germany

update will reduce its output data rate (ODR) to 50Hz.

When employing these filters, make sure the data widths will support the resultant bit growth. In this example, the system processor will need to acquire two 16bit registers (32bit total) for each inertial sensor.

Accommodating this requirement (32bit inertial sensor data) will increase the communication sequence time from 24μs to 40μs, when using a burst-read command, with a serial clock frequency of 8MHz and a 4μs allocation for communication overhead.

Time coherence

After optimising the data rates and associated bandwidth, the next opportunity for optimisation comes from establishing time coherence between the IMU data sampling and a system clock reference. For purposes of illustration, let's define the video sync (50Hz) as the system reference.

When operating in its factory-default configuration, the mems IMU will use an internal clock reference, which inevitably will have some mismatch with the video sync. When the IMU's ODR is lower than the video sync, the consequence will be reading stale data on occasion. When the IMU's ODR is faster than the video sync, the consequence will be missed samples. The frequency of this occurrence will depend on the scale of the mismatch between each clock. Another limitation will be that the latency of the IMU data will vary by an entire sample cycle (20ms = 1/50Hz).

There are two different methods for establishing stronger time coherence. The first is to use the IMU's data ready signal to trigger IMU data collection.

Fig. 3 provides a flowchart that checks for IMU data after two different operations. This approach will eliminate the problem of missing data samples to establish a time coherent flow of IMU data at the main loop rate of 50Hz. This concept can also expand to check for new data in the IMU, in between the GNC processing and video read.

Synchronisation

Another method for establishing time coherence and precise latency is to use external synchronisation features on the mems IMU. There are two primary options: direct and scaled. Using the scaled sync mode will be the most appropriate mode for the flowchart in Fig. 2.

Since the system clock is operating at 50Hz and this device provides the best performance at 4000Hz, set the clock scale to a factor of 80.

When used with the on-board filtering, the outcome will still be a bandwidth of 20Hz and an ODR, but with a fixed latency with respect to the system clock reference (video sync).

Data buffering

Data buffering is a useful technique for cases that value maximum data sample rates but must start their initial field trials with platforms that can only provide synchronous data communication service.

System architects can implement data buffering by making this a requirement in their IMU selection or by pairing the IMU with a co-located, embedded processor.

Using the same example from Fig. 2, while disabling all onboard filtering in the IMU, the on-board fifo will collect 80 samples during one cycle of the main loop.

Since this configuration uses no filtering in the IMU's signal chain, systems can optimise the communication times by using 16bit data formats.

Therefore, the AGV processor can acquire all 80 samples, for all six inertial samples, in less than 4ms when using a serial clock of 8MHz and a stall time of 6μs between each 16bit communication segment.

Conclusion

Getting the most out of a mems IMU may drive architectural change. Prior to making large investments in such upgrades, optimising available digital features can help AGV developers evaluate their use cases and eventually develop credible requirements for meeting their most important operational objectives.

Quick prototyping that provides time-relevant representation of mems IMU responses will be an important step for AV developers who are seeking to manage both expansion of their mission profiles, along with the increasing threats to their existing PNT services.



Mark Looney is an applications engineer at Analog Devices

SOFTWARE-DEFINED VEHICLES

TALK TO ME

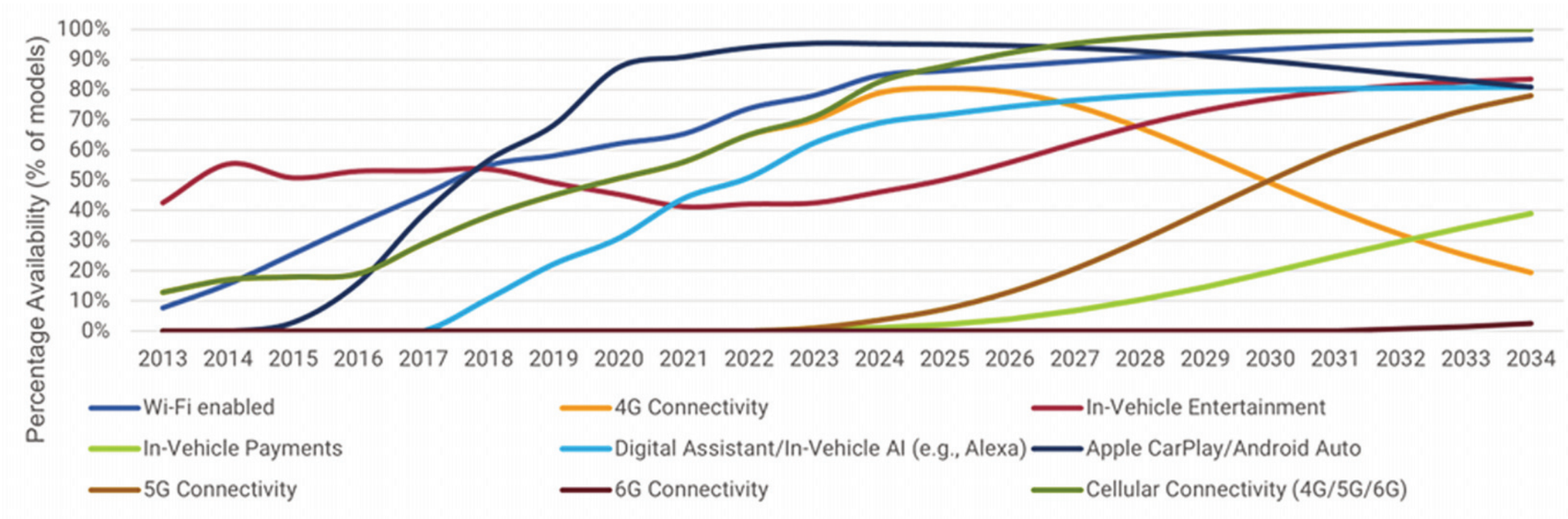
Yu-Han Chang discusses how SDVs could change interactions with vehicles

Software-defined vehicles (SDVs) represent a combination of automotive features that provide new possibilities for passengers to engage with vehicles. Cellular connectivity within SDVs can provide access to IoT features including OTA (over-the-air) updates, personalisation and entertainment options.

Artificial intelligence within an SDV can work as a digital assistant to communicate and respond to the driver, with some vehicles using AI-visual characters that appear on the dashboard to make interactions more engaging.

An AI assistant can have multiple benefits, from explaining the vehicle's features to the driver to using biometric authentication to place a coffee order from the nearest drive-through coffee shop, ready to be collected upon arrival. AI assistants within SDVs can also communicate with the driver when the car needs servicing and will be able to locate the nearest dealer and make payments with the same secure system.

Overnight OTA updates are another key benefit for drivers of SDVs when the latest software becomes available to ensure the vehicle's features, apps, performance and security are all running as optimally as possible. OTA updates are already available from some car companies such as Tesla and can provide an ease of maintaining the vehicle without drivers having to remember to check for updates or book an appointment at their service centre, where they would otherwise have to wait for completion.

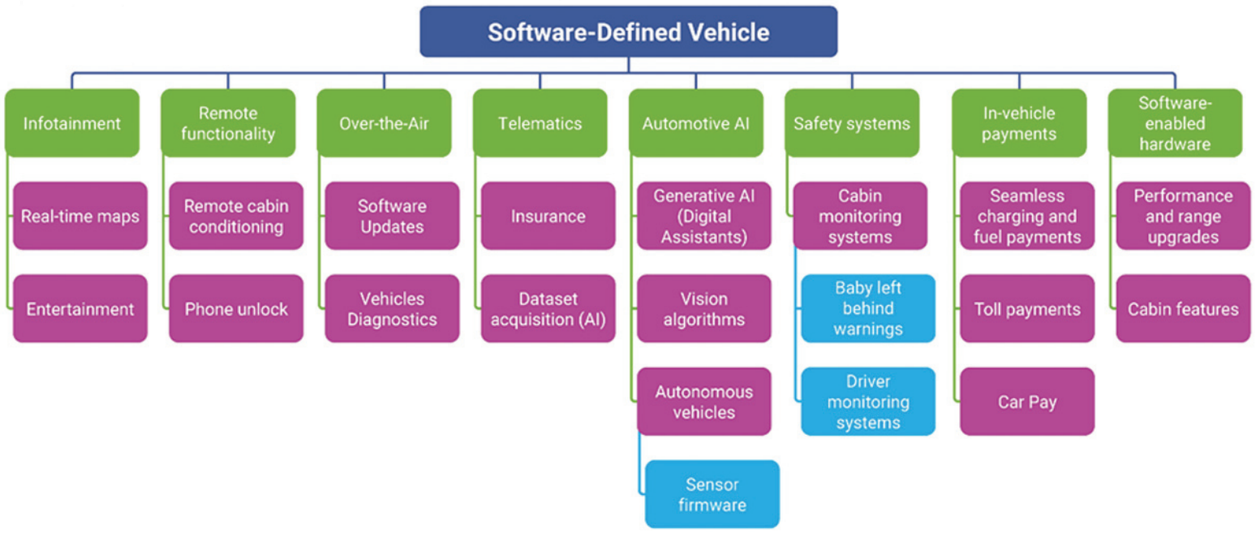


Projected availability of features included in SDVs

Authentication

Individual profiles can be created within SDVs using biometric authentication, such as face scans to remember seat positions, climate control preferences, preferred radio stations and more.

Touchscreens spanning across the dashboard will also adjust to personalised preferences, including favourite apps, colours and layout.



SDV feature that could be available over the next decade

The car could even use this secure biometric authentication to log passengers into email accounts and make payment options accessible, so fuel, EV charging and drive-through food and drink could be paid for from the vehicle without the driver needing to find their wallet or leave the car, saving time and creating a more streamlined experience.

BMW is one OEM that has a selection of SDV features that it offers as add-in options for drivers when they purchase the car, including driving assistants and traffic camera information, which is then reset for when the car is resold, meaning the next owner can make their own new personalisation preferences.

Joining work video calls, watching TV or playing games on touchscreens in the vehicle is another benefit of SDVs that can allow cars to feel more personalised, making journeys more enjoyable with passengers able to carry out normal activities while on the go.

Maps

Connected car technology includes the possibilities of real-time maps to make journeys safer. Interconnectivity between cars can help vehicles form an accurate and up-to-date driving map, with the ability to detect collisions and traffic jams as they happen, sharing the information with others in the network and suggesting the best possible routes for time-saving and safety.

BMW provides an example of connected car technologies, where one vehicle can send a warning to others of upcoming poor weather or road conditions.

Volvo also carried out a trial where cars received the location of connected cycle helmets to inform drivers where cyclists would be on the road.

Outlook

A futuristic high-level SDV could include features such as 6G cellular connection, touchscreen features across the entire front of the vehicle connecting the driver and front-seat passenger, multiple app store access, and levels of autonomy enabling hands-free driving. Alternative revenue streams can be generated for vehicle OEMs as a result of SDV developments as they begin to employ more advanced software in cars, driven by consumer demand.

Yu-Han Chang is principal technology analyst at IDTechEx



SOFTWARE-DEFINED VEHICLES

DECARBONISATION

SOUND vision



Renault is tackling climate change while keeping onboard technology in the fast lane with the Emblème concept vehicle

Renault says it has a vision of the future in which onboard technologies and innovation are required to be useful, practical and humanised. The car maker has embodied this vision in the Emblème concept car, which was built in response to the challenges of climate change and the conservation of resources.

As the automotive industry engages in a major transformation, Renault is continuing the exploratory studies initiated with the Scenic Vision concept in 2022. Exploring the field of possibilities, its aim is to create a working prototype of a family car that is spacious, comfortable and high-tech while taking decarbonisation to new levels.

No aspect of decarbonisation can be studied as an isolated issue. Any approach has to address the entire vehicle lifecycle from cradle to grave in five key areas: eco-design, selection of resources, production, use and end of life.

Developed by Ampere, the group entity dedicated to intelligent electric vehicles, the Emblème is a demo car reflecting this approach. A vision of a low-carbon family car from start to finish, it emits 90% less greenhouse gases (CO_{2eq}) over its entire life cycle than the 2019 baseline.

Every technical, technological and stylistic choice was dictated by stringent specifications, targeting new levels of low-carbon mobility. Renault is exploring intelligent, credible and viable combinations, particularly in terms of resources, materials, production, use and end-of-life recovery.

DECARBONISATION

In this way, the car achieves a 70% reduction in the carbon footprint for the production of all parts. At the same time, half of the materials used to build the car are recycled and virtually all the materials are recyclable at the end of their service life.

Engineers and designers worked together to find the best methods in terms of aerodynamics and energy efficiency. The result is stunning: an elegant shooting brake, 4.8m long, with equal emphasis on styling, interior technology and its carbon footprint.

Innovative technologies include a new wide open panorama screen spanning the length of the dashboard.

The dual-energy electric powertrain under the rear floor is powered by electricity and hydrogen, suitable for low-carbon journeys over short and long distances.

Onboard

The Emblème embodies a vision of the future by Ampere. This is particularly true of the cockpit facing the driver and passenger at the front.

The elegantly curved open panorama screen stretches the entire length of the dashboard. The screen is 1.2m long and 12cm high with 8K quality display and a 120cm diagonal, allowing it to deliver a multimedia experience where the driver and passenger have access to information that is both shared and dedicated.

The multimedia system is particularly intuitive to use.

It relies on a second touchscreen on the central console and a rotary dial backed up by steering wheel controls.

The onboard technology makes extensive use of digital and voice controls, requiring fewer components. Although technology is present, the Emblème adopts a shy-tech approach, in which the styling is very much low key. The interior ambience is relaxed, inviting the driver to take the wheel. The central screen features a discreet matt film, while the buttons and touch-sensitive keys on the doors are housed under the textile. Everything is placed where passengers need it, where they would naturally expect to find things.

All the equipment is energy-efficient. For example, the screens include automatic deactivation of the LEDs in the black display areas and local dimming. This function contributes to decarbonisation in use.

Reflecting the same approach, the Emblème achieves a balance between physical and digital controls, keeping down the number of buttons. Manual settings include a thumbwheel built into the interactive panel, which lights up only when the user stretches out a hand

SiC

Emblème uses ST Microelectronics' SiC technology for the traction inverter, to convert energy from the EV battery to drive the motor.

SiC complements silicon in power electronics, essential for managing energy flows, autonomy and vehicle charging. It is more robust than silicon for high-performance EVs and more environmentally friendly, as it reduces energy losses, handles higher power and voltage levels, and offers better energy and thermal performance.

By 2030, STM aims to reduce CO_{2eq} emissions of the traction inverter by around 80% over its lifetime, compared with a 2018 Renault Megane. This reduction is based on STM's carbon neutrality roadmap, covering all direct and indirect emissions and product transportation, and achieving 100% renewable electricity sourcing by 2027.

Innovative semiconductor designs will also cut CO_{2eq} emissions in production and use phases.



Elegantly curved open panorama screen stretches entire length of dashboard

Wipers

Valeo has developed a wiper system comprising a brushless motor, Nanojet Aquablade wipers and 3D printed polymer parts, for a total reduction in CO_{2eq} emissions around 60%.

The Nanojet Aquablade is made from recycled materials and uses a technology with a larger number of spray holes along its blade, which is of a smaller diameter than the conventional AquaBlade achieving 60% reduction in CO_{2eq} emissions.

This design improves cleaning performance while requiring fewer cycles to maintain the same wiping quality. As a result, it uses less cleaning solution, and therefore works with a smaller, lighter tank.

3D printed polymer parts reduce CO_{2eq} emissions by half. Finally, the brushless motor is lighter and more efficient, reducing CO_{2eq} emissions by 70%.

Battery

Designed by Verkor, with a production projection towards 2035, the Emblème electric battery displays a 72% reduction in carbon emissions compared with an equivalent traditional battery. This performance is achieved through optimised manufacturing processes, a factory powered by low-carbon electricity, local suppliers, and optimised recycling of waste and end-of-life batteries.

Goals

Renault says it is positioning itself as a key player in low-carbon mobility. Following the Paris Climate Agreement in 2015, the group adapted its strategy to reduce the greenhouse gas (GHG) emissions of its activities and contribute to maintaining the global temperature increase well below 2°C.

Contributing to the goal of carbon neutrality, Renault is seeking to achieve net zero globally by 2050 and by 2040 for operations in Europe. This ambition is supported by Ampere. Emblème is at the forefront of this.

"The ambition of the Renault Emblème project was to achieve maximum decarbonisation by designing a car that is attractive, efficient, family-friendly, comfortable, high-tech and versatile in use," said Renault CEO Fabrice Cambolive. "More than a concept car, it's a demo car on the road that's a pleasure to look at, to be in and to drive, a real invitation to travel."

Mosfets increase power density

Infineon's CoolSiC G2 750V mosfet technology can improve efficiency and increase power density in automotive and industrial power conversion applications.

The technology offers a granular portfolio with typical $R_{DS(on)}$ values up to 60mΩ at +25°C, making it suitable for a wide range of applications, including on-board chargers (OBCs), DC-DC converters, auxiliaries for electric vehicles and EV charging.



$R_{DS(on)}$ values of 4 and 7mΩ suit static-switching applications, making the mosfets suitable for e-fuses, high-voltage battery disconnect switches, solid-state circuit breakers and solid-state relays.

The 4mΩ $R_{DS(on)}$ comes in a top-side cooled Q-DPak package, designed to provide optimal thermal performance and reliability.

The technology also exhibits $R_{DS(on)}$ x QOSS and best-in-class $R_{DS(on)}$ x Qfr, contributing to reduced switching loss in hard-switching and soft-switching topologies with efficiency in hard-switching user cases.

With reduced gate charge, the technology allows for faster switching and reduces gate drive losses, making them more efficient in high-frequency applications.

Additionally, the mosfets combine a typical high threshold voltage of 4.5V at +25°C and low QGD/QGS ratio, which reinforces robustness against parasitic turn-on.

The technology allows for extended gate driving capabilities, supporting static gate voltages up to -7V and transient gate voltages up to -11V.

This enhanced voltage tolerance provides engineers with greater design margins and compatibility with other devices.

The mosfets adhere to the AEC Q101 standard for automotive-grade parts and Jedec for industrial-grade parts.

Q-DPak 4, 7, 16, 25 and 60mΩ samples are available to order.

Integrated SoC targets ambient lighting

An integrated system-on-chip (SoC) from Novosense is for modern automotive ambient lighting systems.

The NSUC1500-Q1 can be combined with the high precision NSLxxxxx series of linear LED drivers for conventional taillights, through-type dynamic taillights and illuminated grilles for integrated automotive lighting.

The integration is targeted at automotive taillights and interior lighting modules, EV charging door indicators, and other RGB and RGBW-based lighting systems requiring compact, efficient and intelligent control.

At the heart of the device is a 32bit Arm Cortex-M3 core with 32kbyte flash, 2kbyte eeprom, 15k rom and dedicated memory for runtime operations. The SoC has four LED driver channels capable of delivering up to 64mA each, controlled through 16bit independent PWM outputs.

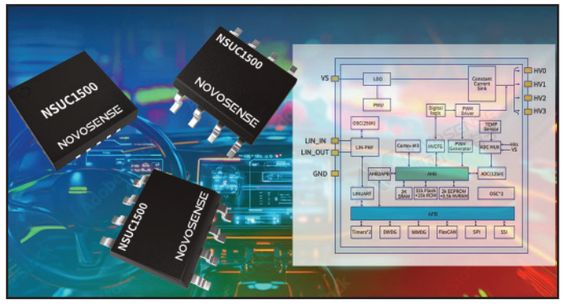
A 12bit ADC, with integrated temperature sensor and voltage monitoring, enables automatic compensation for LED colour shift due to temperature changes or aging.

The integrated Lin transceiver and controller support Lin 2.x and SAE J2602, with features such as auto-addressing to simplify network setup.

The SoC also supports software updates via the rom-based UDS bootloader without occupying flash memory.

It is available in QFN-24, sop8 and hsop8 packages and supports an operating voltage from 6 to 28V.

• Novosense has announced the European launch of four interference-resistant Can transceivers and a stepper motor driver in its portfolio of body control devices for European OEMs and tier-one suppliers.



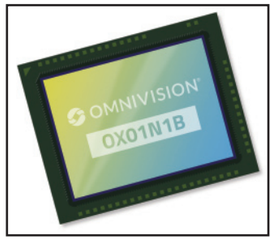


Image sensor

An image sensor from Omnivision is for in-cabin automotive driver monitoring systems.

The OX01N1B is part of the firm's Nyxel near-infra-red (NIR) family of automotive sensors and is a 1.5Mpixel RGB-IR or monochrome BSI global shutter (GS) sensor with a pixel size of 2.2μm and an optical format of 1/4.51in.

NIR quantum efficiency is 36% for low-light performance. A high modulation transfer function improves image quality and resolution.

The device uses OmniPixel 4-GS technology for simultaneous image detection in all pixels to reproduce rapid motion without distortions.

Integrated Asil-B and cyber security meet the latest industry standards.

It comes in an a-CSP package, allowing for higher-performance image sensors in tighter camera spaces.

It is available as a reconstructed wafer option for designers who want to assembly a bare die imager into their camera module.

Resistor protects against short transient pulses

An AEC-Q200 qualified thick-film power resistor from Vishay delivers pulse absorption up to 75J/0.1s.

Offered in a clip-mount TO-247 package for direct mounting on a heatsink, the Sfernice LTO 150H has a power dissipation of 150W at a +45°C case temperature.

The device features a design that provides 30% higher energy absorption than existing LTO series devices for enhanced protection against short transient pulses. The result is more stable operation in high stress environments, reducing the risk of failure and improving overall reliability.

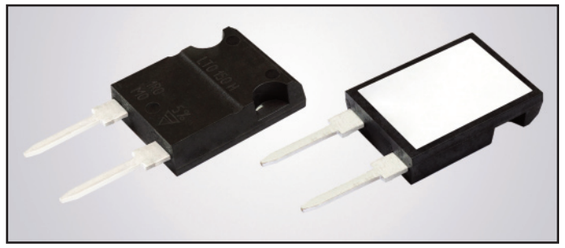
The high power dissipation and low thermal resistance of 0.87°C/W enhance its ability to deliver consistent performance and safeguard sensitive components, while allowing fewer devices to be used, saving board space, simplifying layouts and reducing costs.

It operates up to +175°C, has resistance values from 1Ω to 2.2kΩ and tolerances down to ±2%.

The device can serve as the precharge or discharge resistor for controls, 48V board nets, BMS, fuel cells and on-board chargers for HEVs, EVs and low speed electric vehicles; energy monitoring and metering systems; agricultural vehicles and farm equipment; industrial motor drives, welding equipment and power tools; switches, routers and optical network equipment; and weapons guidance systems.

The RoHS-compliant resistor offers a non-inductive design and is available with bended termination options.

Samples and production quantities are available with lead times of ten weeks.



Mosfets boost figure of merit

Alpha & Omega Semiconductor's third-generation 1.2kV αSiC mosfets can increase efficiency in high power applications.

They provide up to 30 per cent improved switching figure of merit compared with the firm's previous generation.

They have AEC-Q101 qualification, with extended lifetime and HV-H3TRB capabilities.

For EV designs, they help engineers create higher power density systems with more efficiency, reducing battery consumption and extending vehicle range.

$R_{ds(on)}$ is from 15 to 40mΩ in a TO27-4L package. There are plans to roll out the mosfets in additional surface mount and topside cooled packages as well as in case modules.

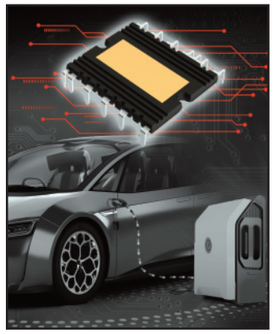
The firm has also qualified a larger 1.2kV, 11mΩ mosfet die for high-power EV traction inverter modules and it is available for wafer sales.



SiC moulded modules hit high heat dissipation

Four-in-one and six-in-one SiC moulded modules from Rohm come in the HSDIP20 package optimised for PFC and LLC converters in on-board chargers (OBCs) for electric vehicles.

The line includes six models rated at 750V and seven at 1.2kV.



All basic circuits required for power conversion in various high-power applications are integrated into a compact module package, reducing the design workload for manufacturers and enabling the miniaturisation of power conversion circuits in OBCs and other applications.

The package has an insulating substrate with heat dissipation properties that suppress the chip temperature rise even during high power operation.

When comparing a typical OBC PFC circuit using six discrete SiC mosfets with top-side heat dissipation with this six-in-one module under the same conditions, the package was verified to be about 38°C cooler at 25W operation.

This heat dissipation performance supports high currents even in a compact package, achieving power density more than three times higher than top-side cooled discretes and over 1.4 times that of similar DIP type modules.

As a result, the package can reduce mounting area by about 52% compared with top-side cooled discrete configurations.

Rugged switches for vehicle exteriors

Rugged automotive switches from EAO target demanding exterior operational functions on heavy-duty and special-purpose vehicles.

The durable, sealed pushbutton switches feature intuitive operation. They are simple to identify and operate even when wearing gloves.

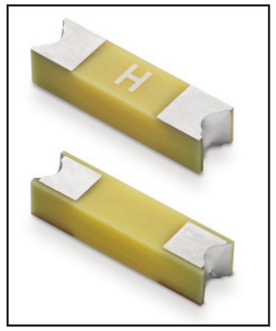
The additions to the Series 09 family of automotive HMIs include rugged weather-proof push-button switches developed to operate reliably on the exterior of heavy-duty vehicles such as municipal trucks and agricultural and construction vehicles.

This includes heavy-duty lifting and handling vehicles, construction vehicles, agricultural and forestry vehicles, road sweepers and refuse trucks, and fire-fighting appliances.

They are simple to install wherever a hard-wired switch is needed, outside or inside the vehicle. The 24mm coloured lenes are securely integrated into rugged, rubberised 39mm front actuators that provide IP67 ingress protection.

Numerous lens colours are available, marked with standard and a wide range of application specific symbols.





SMD fuse

An AEC-Q200-qualified, high-voltage surface-mount (SMD) fuse from Littelfuse has high interrupting ratings.

Designed to meet the requirements of modern automotive applications, the 823A has a 5 by 20mm footprint while delivering overcurrent protection for 1kV DC systems.

Its wire-in-air design improves temperature stability. Interrupting rating is 100A at 1kV DC.

It suits high-voltage applications, such as battery disconnect units, battery management, DC–DC converters and automotive fuel cell cooling.

Operating temperature is -40 to +125°C.

The device can prevent nuisance opening caused by high inrush and surge currents, and provides protection against overcurrent events in high-voltage environments.

The space-saving design facilitates integration into compact automotive electronics.

Controller validates Automotive Ethernet

A controller from Göpel Electronic is for testing and validating Ethernet-based vehicle networks.

The G PXIe 6242 extends the firm's range of automotive test products for Ethernet-based vehicle networks including 10baseT1S

The PXI Express card has four independent 10, 100 or 1000Mbit/s Ethernet interfaces that can be individually adapted to requirements by modular extension boards. This makes the controllers versatile with a range of different phys.

As a flexible test interface, the Automotive Ethernet controller includes on-board functionalities and tools for DoIP, DoSoAd, TLS, PTP, XCP, iPerf and Ping, and can be integrated into existing test environments via C-API (G API) or LabView.

The FPGA-based switching matrix offers a wide range of options for flexible data paths such as tapping, bypassing and routing.

It achieves up to 100% guaranteed bus load with valid and invalid static data. In addition, the adapter's interfaces support 10baseT1S IEEE 802.3cg technology and have integrated PLCA.

With the new standard, devices can be integrated into Automotive Ethernet via multi-drop configuration, since no additional switches are required, and the cabling effort is reduced.

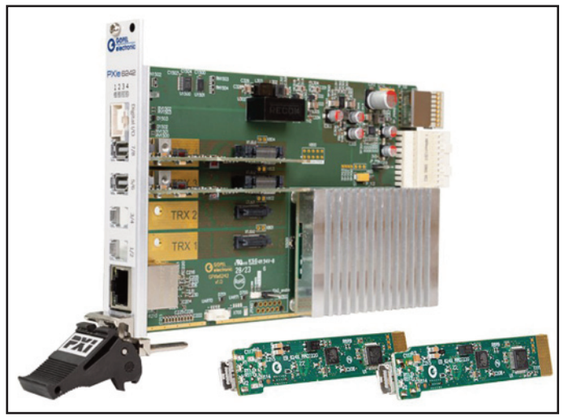
Vehicle bus systems such as Can or Lin can be replaced by 10baseT1S. Gateways to connect different bus systems are no longer needed. 10baseT1S communicates in half-duplex mode over a twisted pair of wires and enables data transmission at 10Mbit/s.

However, for reliable operation of critical functions, data transmission via 10baseT1S Ethernet must be always ensured and in all climatic environments.

Thanks to this controller, this functionality can be tested during development and in production.

In combination with the Net2Run software tool chain, further high-performance simulation options for ECU communication are available.

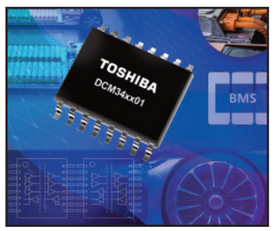
Net2Run, which is based entirely on Autosar, offers the option to import all common ECU description files such as ARXML, DBX, LDF and Fibex, and provides the user with support when configuring the corresponding restbus simulation based on an intuitive gui.



Digital isolators provide immunity at 50Mbit/s

Ten AEC-Q100 qualified, four-channel digital isolators from Toshiba provide common-mode transient immunity (CMTI) of 100kV/μs typical at data transmission rates up to 50Mbit/s.

Applications for the DCM34xx0 series include on-board chargers and battery management systems for hybrid and full electric vehicles.



These digital isolation devices leverage the firm's proprietary magnetic coupling technology to deliver the high CMTI at supply voltages from 3.0 to 5.5V with a common-mode voltage of 1.5kV.

This makes them resistant to common-mode electrical noise at the input and output nodes, thereby ensuring they can deliver stable equipment control signals for reliable equipment operations.

Flexible configuration options comprise four forward-only channels, three forward with one reverse channel, or two forward with two reverse channels.

They provide pulse-width distortion of 0.8ns typical and suit multi-channel high-speed communications, including non-automotive uses such as IO interfaces with SPI.

Devices in this series are available in the 16-pin soic-16W package and offer stable operation in temperatures from -40 to +125°C.

Hall effect sensor eases rotary motion

An automotive-compliant 3D linear Hall effect sensor from Diodes detects the magnetic field in the x, y and z directions, allowing for reliable and high-precision contactless rotary motion and proximity detection.

Applications for the AH4930Q include rotary and push selectors on infotainment systems, stalk gear shifters, door handles and locks, and powered seat adjusters.

It integrates a 12bit temperature sensor for accurate on-chip compensation. Its robust signal path and 12bit data converter via ADC provide high resolution for each measurement direction down to 0.1mT per bit for precise positional accuracy.

The implemented I²C interface enables seamless communication for measurement data reading and runtime programming with host systems as fast as 1Mbit/s to support real-time adjustments.

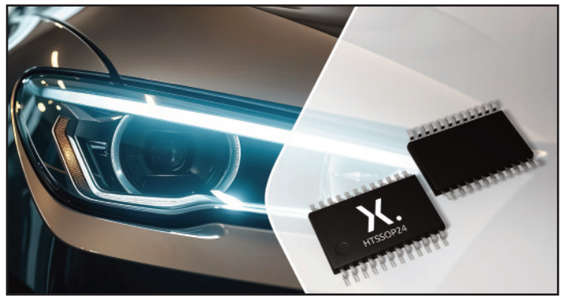
The device has three operating modes plus a power-down mode where it consumes 9nA. Its three operating modes provide a power consumption-data acquisition compromise, including a low-power mode consuming 13μA (10Hz), to its fast-sampling mode of 3.8mA (3.3kHz) for constant measurement functions.

With a 10μs wake-up time, 4μs response time and wide bandwidth, it can delivers fast data acquisition even for demanding applications.

Supply voltage is from 2.8 to 5.5V and temperature range -40 to +125°C.

The sensor is housed in a six-pin sot26 type A1 package. A standard version, the AH4930, is available for industrial and commercial use.





12ch LED driver supports Asil B

A 12-channel LED driver from Nexperia supports Asil-B functional safety compliant automotive lighting designs.

The AEC-Q100-qualified 40V high-side LED driver IC is for use in functionally safe automotive lighting, including tail, brake, signal and in-cabin illumination applications. This addresses the demand from manufacturers for ICs that can help achieve Asil-B compliance much earlier in the design cycle.

The NEX13120FPC-Q100 has a low dropout voltage of 600mV at 100mA current, which translates into power saving of 15mW per channel and 5°C reduction in operating temperature.

This dropout voltage is said to be 200mV lower than similar competing LED drivers for the same test conditions.

Independent channels on the IC can deliver up to 100mA of 8bit programmable output current and can be connected in parallel for applications with higher current requirements.

It supports phase-shift PWM dimming to deliver better load transient and reduced EMI. Configurable analogue and PWM dimming can support dynamic animation effects.

Long distance off-board communications at data rates up to 2Mbit/s are supported by the uart over a Can digital interface, which can handle up to 27 node addresses.

Diagnostics include LED open-circuit, short to ground and single LED short-circuit detection. A configurable watchdog automatically places the device in a fail-safe state if connection to the Can bus is lost.

Operating junction temperature is from -40 to +150°C and it is housed in a thermally enhanced 24-pin htssop package.

NFC readers suit digital key applications

Two automotive NFC readers from ST Microelectronics have improved wake-up and detection range for enhanced user experiences.

The ST25R500 and ST25R501 meet Car Connectivity Consortium (CCC) and Wireless Power Consortium requirements for digital key and centre console applications for device pairing, and engine start and wireless charging NFC card protection.

The readers combine 2W peak output power and high receiver sensitivity, improving interaction range.

The ST25R501 is housed in a 4 by 4mm QFN package and is suitable for doorhandle and B-pillar modules.

While the ST25R501 is optimised for space-constrained applications, the ST25R500 has higher continuous output power and suits applications such as keyfob charging.

Both ICs support protocols such as NFC-A, NFC-B (ISO14443A/B) and NFC-F (FeliCa), as well as NFC-A and NFC-F card emulation for Qi charging NFC card protection.

They are AEC-Q100 qualified, NFC Forum CR13 compliant, and meet the requirements of car and phone OEMs.

In addition to car access and start systems, they can be used in NFC card protection on centre-console Qi chargers, phone pairing and data transfer.

Noise suppression and receiver sensitivity lets them operate in harsh conditions while simplifying electromagnetic immunity and easing certification.

A dynamic power output has active wave-shaping control on each power level. Diagnostics and NFC card protection includes test outputs for non-intrusive debugging.

Dynamic power output automatically adjusts the transmitted power to compensate the detuning effects of different antenna sizes and distances, keeping within NFC Forum limits and ensuring the safety of tags.

Active wave shaping helps simplify compliance with NFC Forum and mandatory CCC digital key requirements including monotonicity tests and signal over and undershoot limits. Developers can adjust the signal with simple register settings to meet these conditions.

Software libraries and APIs include code for automotive applications.

The ST25R500 is in production now, in a 5 by 5mm QFN package. The ST25R501 will be available later this year.



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