VEHICLE electronics

The monthly magazine for automotive electronics engineers

Honda and Renesas to develop SDV SoC

Honda and Renesas have signed an agreement to develop a system-on-chip (SoC) for software-defined vehicles (SDVs).

The SoC will deliver AI performance of 2000Tops combined with a power efficiency of 20Tops/W, and is slated for use in Honda 0 electric vehicles to be launched in the late 2020s.

Honda is developing original SDVs to provide a mobility experience optimised for each customer. The Honda 0 will adopt a centralised EE architecture that combines multiple ECUs for controlling vehicle functions into one ECU.

The core ECU, which serves as the heart of the SDV, manages essential vehicle functions such as adas and automated driving (AD), powertrain control, and comfort features.

To achieve this, the ECU requires a SoC that provides higher processing performance than traditional systems, while reducing any increase in power consumption.

Renesas is committed to providing automotive semiconductors that help automobile OEMs develop SDVs. Its R-Car products provide AI performance with the ability to customise by leveraging multi-die chiplet technology and integrating AI accelerators into its SoCs.

Honda and Renesas have agreed to develop a SoC for core ECUs. Using TSMC's 3nm automotive process technology, this SoC also can reduce power consumption. Additionally, it realises a system that uses multi-die chiplet technology to combine Renesas' generic fifth-generation R-Car X5 SoC series with an AI accelerator optimised for AI software developed independently by Honda.

The SoC chiplet will provide the AI performance for functions such as AD, while keeping power consumption low.

This agreement should accelerate the integration of semiconductors and software into the Honda 0 series.



Katsushi Inoue (left) from Honda and Vivek Bhan from Renesas

Issue 134
February 2025

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Here and Aiden enhance privacy for in-vehicle services

Aiden Automotive and Here Technologies are collaborating on in-vehicle services with enhanced privacy.

Combining location technology with privacy-first design could create smarter, safer and more personalised driving experiences.

Aiden is integrating Here's contextual, personalised automatic road and traffic alerts into vehicles using its in-vehicle platform. This technology seamlessly integrates with any Android Automotive-powered vehicle, delivering real-time, context-aware information based on the conditions of each vehicle.

Factors such as weight, speed, location and road conditions are analysed, enabling vehicles to display only the most relevant information to drivers at precisely the right moment.

For instance, if a car is near its weight limit for a particular road, approaches speed thresholds, or encounters hazardous traffic conditions such as slippery roads, simple, intuitive alerts are shown on the infotainment screen. This eliminates unnecessary distractions, ensuring drivers only see what's important when they need it.

For commercial vehicles, truck drivers benefit from warnings about road-specific weight restrictions, avoiding fines and optimising truck usage by ensuring they are neither overloaded nor underused. This system operates in the background, requiring no additional apps or driver input, and functions regardless of whether the built-in navigation system is in use.

Drivers will get optimised routes with real-time traffic and hazard updates powered by Here's location technology.

The collaboration goes beyond ensuring compliance with global privacy regulations, including GDPR, CCPA and LGPD, by making privacy an integral part of the products and services developed and offered to customers.

Any data that are collected follow the principles of data minimisation, processed lawfully and fairly, to ensure integrity and confidentiality.

Aiden's platform works with multiple vehicle makes and models, enabling easy access to Here's navigation and location-based services without the need for additional hardware.



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NXP acquires TTTech Auto for $625m



From the left, Dirk Linzmeier, Jens Hinrichsen and TTTech Auto CTO Stefan Poledna

NXP has acquired TTTech Auto in an all-cash transaction valued at $625m.

TTTech Auto, based in Vienna, Austria, specialises in safety-critical systems and middleware for software-defined vehicles (SDVs). It has business relationships with many automotive OEMs.

Pending regulatory approvals, TTTech Auto including its management team, intellectual property, assets and approximately 1100 engineering staff will join NXPs automotive team. It will continue to serve existing customers.

NXP introduced its CoreRide platform last year to help car makers swiftly transition to SDVs. The platform features NXP's S32 vehicle compute, networking and system power management.

TTTech Auto augments NXP's hardware with added software expertise, delivering a platform from which automakers can build SDVs.

TTTech Auto joined the community of CoreRide software partners last year. NXP's inclusion of TTTech Auto's safety and integration capabilities should enable stronger hardware-software integration.

TTTech's MotionWise middleware platform features automated software deployment in automotive high-performance compute platforms. Its middleware is designed to manage the interconnected systems in SDVs, prioritising safety-critical functions while ensuring seamless integration and adaptability.

MotionWise also lets automakers efficiently scale software across car models, streamline safety integration, and easily move or add safety-critical features, all while maintaining a safety-by-design approach.

"The inclusion of TTTech Auto's software into the NXP CoreRide further strengthens NXP's automotive value proposition and accelerates the automotive industry's transformation to software-defined vehicles," said Jens Hinrichsen, executive vice president at NXP.

Dirk Linzmeier, CEO of TTTech Auto, added: "The emergence of intricately connected and adaptive frameworks in SDVs highlights the need for middleware to tackle challenges in integration, safety and scalability. NXP and TTTech Auto both clearly recognise this need and share the same vision for SDV transformation. Together, MotionWise and CoreRide empower automakers with a robust SDV foundation, ensuring seamless coordination of diverse systems that help automakers deliver innovative features while maintaining reliability and safety at scale."

SGS-TÜV certifies Kernel functional safety

SGS-TÜV Saar has certified the Rtos X Kernel industrial-grade alternative to Eclipse Thread X for off-the-shelf functional safety.

Developers leveraging Kernel can use the rtos certification artefacts to save time and money during application certification for safety-certified devices.

Kernel achieved functional safety certification to ISO 26262 Asil D as well as the highest levels of IEC 61508, IEC 62304 and EN 50128 functional safety standards.

Derived from the latest Eclipse Thread X release, it is refactored and infused with technology from PX5 rtos, including pointer and data verification (PDV) and central error handling.

It is 100% API and functionally compatible with standard Thread X, preserving its small memory footprint, multi-threading and hard real-time functionality.

Existing Thread X-based applications require no modification when moving to Kernel.

Safran and AIMotive integrate simulation

Safran's GNSS simulation technology has been integrated with AIMotive's AISim simulation platform to create a robust environment for developing safer, smarter vehicle technologies.

"Safety is paramount in the development of driving assistance technologies, as these systems have already proven to save lives by preventing accidents," said Szabolcs Janky, AIMotive senior vice president. "Thorough testing in diverse, realistic scenarios is crucial to achieving this, and our partnership with Safran allows our customers to push the boundaries of what's possible in simulation, testing and validation."

A cornerstone of adas and AD functionality is the use of GNSS to provide accurate vehicle positioning, even in complex driving situations. However, as automated driving becomes increasingly dependent on GNSS, the risks posed by cyber-security threats, system failures and environmental factors grow.

GNSS must not only deliver high accuracy but also show resilience to problems such as signal jamming, spoofing, urban canyons and environmental interferences.

The integration of Safran's GNSS simulation technology into AIMotive's AISim addresses this by enabling the rigorous testing of sensors in diverse and realistic traffic scenarios.

Powered by the Skydel simulation engine, Safran's GNSS simulators can generate high-capacity signals, replicate complex interferences, and simulate multi-antenna and multi-vehicle scenarios.

Combined with AISim's open and closed hardware-in-the-loop configurations, this partnership offers a seamless environment to validate system performance under demanding conditions.

"Safran's Skydel-based GNSS simulators offer unparalleled precision, realism and flexibility for testing and validating adas in autonomous vehicles," said Pierre-Marie Le Véel, Safran director.



Marelli uses EIS to advance BMS

Marelli believes it has made a pioneering advance in battery management systems (BMS) for automotive by using electrochemical impedance spectroscopy (EIS).

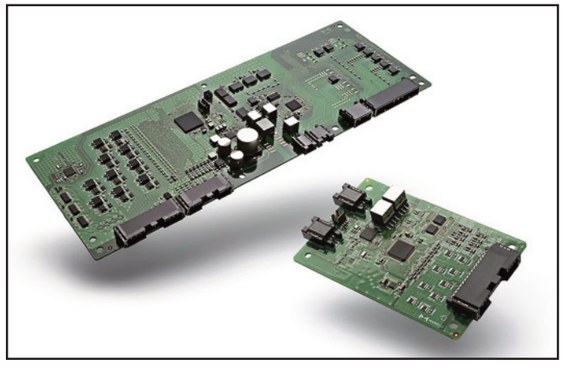
This development could elevate the standard for battery cell management by ensuring optimal operation and enhanced battery pack performance.

Using EIS provides insights specifically into the lithium-ion batteries' degradation, and related capacity reduction and increased resistance. Such insights are essential for accurately determining the remaining useful life of the batteries and therefore their residual economic value.

Traditionally, EIS has been an expensive laboratory tool, but Marelli has developed a cost-effective option ready for large-scale production, capable of early anomaly detection, thus preventing thermal runaway.

The current Marelli Energy EIS-ready BMS platform already brought improvements related to measuring impedance in lower frequency ranges. Moving from that point, the development of the full EIS BMS, set for release this year, will further enhance capabilities, enabling higher frequency measurements and providing an overview of each battery cell's condition.

Integrating cloud tracking and AI applications to empower calculation algorithms, the platform optimises real-time estimation of the state of charge and power of the battery pack, offering a precise evaluation of the battery's remaining useful life and degradation. This can lengthen battery life, improve drivability and extend driving range.



EIS looks into lithium-ion battery degradation



Goodyear integrates TNO tyre intelligence into AEB

Goodyear integrated TNO tyre intelligence technology into the automatic emergency braking (AEB) system of a vehicle to demonstrate the potential to mitigate crashes, particularly in difficult road conditions.

Buildng on Goodyear and TNO's integration of tyre intelligence into antilock braking systems (ABS), this project underscores the role of tyre data in advancing automotive safety systems.

While existing AEB systems are typically tuned for high-friction surfaces such as dry asphalt, integrating Goodyear's SightLine tyre intelligence products can help the AEB function effectively across a wider range of driving environments, including low-friction surfaces such as wet roads or ice.

Through the contact patch with the road, tyre intelligence can provide the AEB with deeper insights into actual tyre and road conditions to enable smarter, more precise decision-making.

Chris Helsel, chief technology officer at Goodyear, said: "By providing critical inputs about tyre and road conditions into AEB systems, we are helping OEMs and their customers take a leap forward in safety, well ahead of the NHTSA 2029 mandate for AEB systems in passenger vehicles."

Recent wet road testing indicates that enhanced AEB incorporating SightLine could help mitigate impacts at speeds of up to 80kph by engaging braking earlier. Integrating AEB with SightLine insights on tyre and road condition data helps ensure robust performance across diverse scenarios.

"Our collaboration with Goodyear aims to predict the braking distance of a vehicle in more conditions, like dry and wet asphalt, and trigger the AEB timely to reduce accidents and safe lives," said Martijn Stamm, marketing director at TNO.

Security holes found in Mercedes-Benz MBux

Researchers at Kaspersky have found several vulnerabilities in the Mercedes-Benz MBux infotainment system.

They managed to compromise the testbed of the head unit and found vulnerabilities for a real car via physical access.

The testbed compromise has three potential use cases: a criminal wanting to disable the anti-theft protection in a stolen head unit; a car owner tuning and unlocking prepaid services on their vehicle; and a tester conducting research to find new vulnerabilities.

In the case of a real car, the identified vulnerabilities can be triggered through an exposed USB service that is available to the general user.

This research follows Keen Labs three years ago finding various security issues in MBux where it successfully exploited some attack surfaces on the head unit and T-Box.

"We have gained first physical access and subsequently remote access to the main infotainment ECU: the head unit," said Keen Labs. "This enabled us to perform certain vehicle functions remotely."

These included changing internal lighting colours and displaying images on screens.

"We demonstrated how to compromise an internal chip on T-Box, which was proved by sending arbitrary Can messages from a debug version T-Box," said Keen Labs.

Mercedes-Benz first introduced MBux in the A-Class in 2018, and is adopting the system in its entire vehicle line.

"The exploitation of Mercedes-Benz user experience systems is a stark reminder of the evolving attack surface presented by connected devices and embedded systems in modern vehicles," said Jamie Akhtar, CEO of CyberSmart. "This incident highlights the increasing convergence of cyber security and the automotive industry, where software vulnerabilities can expose both users and manufacturers to significant risks. It underscores the urgency for robust security measures to be integrated at every stage of development, from design to deployment."

Hyundai checks passenger posture



Hyundai Mobis has developed technology capable of detecting posture, actions and bio-signals to assess the safety of passengers in a car, in the front and rear seats. It is expected to prevent careless behaviour such as drowsy driving and mobile phone use and even check children in the rear are properly secured in their car seats.

The in-cabin monitoring system consists of cameras that monitor passengers and software logic that analyses data. The camera detects posture and position of passengers and their bio-signals in real time. The software then analyses data from the cameras to determine potential risks and alert passengers with audio and visual warnings.

For instance, it can alert the driver when they close their eyes and doze off and suggest they'd better take a break.

More than ten scenarios have been developed in which the system can help prevent accidents including using mobile phones or smoking while driving, taking hands off the steering wheel, not wearing a seatbelt, and leaving young children unattended in the rear seat.

Zeekr adopts Mapbox navigation platform

Zeekr, Geely's electric mobility brand, is using Mapbox's mapping and navigation platform to improve in-car experience for customers globally.

Zeekr is developing and delivering software-defined vehicles (SDVs) to enable the car to evolve seamlessly with technology. The SDV platform is built on layers of innovation to ensure an adaptable and customer-focused vehicle experience.

By integrating Mapbox's navigation platform, Zeekr drivers will have an always up-to-date navigation experience in their smart electric vehicles that adapts to their needs and the dynamic nature of their journeys, receiving the latest software advancements without requiring hardware updates.



Mapbox navigation platform keeps Zeekr drivers up to date

The improved electric vehicle routing and cruise mode simplifies waypoint management for smooth and efficient trip planning, whether in city traffic or on highways. Charging filters make long journeys more convenient by helping drivers locate the most suitable charging stations based on their choices, while trip preferences let users set a minimum state of charge upon arrival.

The redesigned map interface offers flexible 2D, 3D and satellite views, enhanced with real-time traffic updates to keep drivers informed. On longer trips, dynamic rest area recommendations suggest rest stops, while traffic incidents and rerouting features help drivers avoid delays with smart alternative routes.

Finally, a streamlined user feedback system allows drivers to share screen recordings and audio feedback directly with the navigation team, enabling continuous improvements through co-creation.

"Our partnership with Mapbox brings a new level of adaptability and user-centric design to Zeekr's SDV platform," said Giovanni Lanfranchi, CEO of Zeekr in Europe. "Navigation and AI are core elements of the technology stack enabling the intelligent cockpit. With Mapbox's real-time, cloud-based navigation capabilities, we're able to offer our customers an evolving experience that responds to their feedback and keeps their vehicle at the forefront of innovation."

Peter Sirota, CEO of Mapbox, added: "Partnering with Zeekr is an exciting opportunity for Mapbox to support the future of mobility. Together, we're setting a new standard for innovation, using our cloud-first navigation and location platform to create a driving experience that's more responsive, customisable and future-ready."

DXC races ahead with Ferrari extension

DXC has extended its partnership with Ferrari to develop in-vehicle infotainment helping drivers be closer to the functionality of the vehicles.

DXC will aim to ensure Ferrari infotainment systems are engineered to provide a better automotive experience for owners.

"DXC is a market-leading innovator in the automotive industry, enabling us to accelerate the development of our software platform and its components as well as state-of-the-art functionalities and usability," said Ernesto Lasalandra, chief R&D officer at Ferrari.

In 2021, DXC started reengineering the HMI systems for current and future models.

In a recent project, DXC developed the software for the F80, Ferrari's supercar launched in October 2024 and suitable for road and track. Thanks to DXC's bespoke software, the F80's multiple displays deliver a seamless, high-speed, performance-oriented experience for the driver and, thanks to the additional optional screen, the passenger.

The F80's digital cockpit offers functionality for public road use and transforms into a racing display when on the track. It provides real-time performance data including speed, G-force, revs and tyre pressure, and immersive visuals to improve the racing experience.



Ford lorries are early users of AI smart vision system

Ambarella helps Gauzy replace mirrors with smarter vision

Gauzy's partnership with edge AI semiconductor company Ambarella has led to breakthroughs in the use of AI for adas and the potential to enhance road safety and redefine urban mobility.

Incorporating a CVflow AI system-on-chip (SoC) from Ambarella into the design of Gauzy's AI-powered Smart-Vision camera monitor system (CMS) can enhance road safety for drivers of commercial vehicles.

Based on Ambarella's CV2FS AI SoC, it is already operational in Ford lorries.

CMS replaces traditional side and rear-view reflective-glass mirrors with high-resolution cameras mounted around the vehicle. Also known as e-mirrors, these include a live video stream to interior displays, allowing drivers to see a wider view of their surroundings and reducing blind spots, which improves overall safety and visibility on the road.

The CMS features self-learning and predictive capabilities.

These include adaptive manoeuvre lines that are displayed while a vehicle is in motion and during trailer calibration to provide drivers with better visibility of their surroundings, as well as the ability to analyse large amounts of data and imagery for reduced latency and real-time visibility.

It is programmed to detect potential road hazards automatically before they are encountered, reducing the possibility of accidents or fatalities. The system also provides clear lines of sight via high image quality, across a wide variety of weather or lighting conditions.

Surveillance mode deters theft and vandal damage, is compatible with various truck models and configurations, and can be integrated into existing fleets.

"We recognised early on the monumental impact AI will have in redefining mobility and are proud to have already developed what we believe is the most sophisticated AI-powered adas on the market," said Eyal Peso, CEO of Gauzy.

Replacing traditional mirrors with Smart-Vision on trucks and buses provides multiple safety enhancements, including reduced human error, fewer blind spots, improved night vision, and enhanced detection of obstacles and pedestrians. The system can also deliver operational benefits through better fuel efficiency, lower maintenance costs and increased productivity.

"There is universal support for making our roadways safer, and we are pleased to help play a role in this effort through the application of our technology," said Fermi Wang, CEO of Ambarella.

The Smart-Vision CMS has passed homologations and certifications for safety, including UN R46, UN R10, UN R118 and UN R151, as well as cyber-security Automotive Spice standards set by OEMs, including UN R155 and UN R156.

Minda buys 49% stake in Flash

Automotive components maker Minda has bought a 49% stake in Flash Electronics.

The collaboration aims to create an EV platform by combining their strengths.

Minda specialises in automotive body electronics, while Flash Electronics focuses on engine and powertrain electronics, including motor controllers, vehicle control units, and ignition electricals for two- and three-wheelers.

WeRide provides tech for Swiss autonomous driving pilot project

WeRide is providing the autonomous driving technology for a pilot project in Switzerland.

This project is funded by the Canton of Zurich and Swiss national railway Schweizerische Bundesbahnen (SBB) and managed by the Swiss Transit Lab (STL), with WeRide providing products and operational support.

The project will use WeRide's level-four autonomous driving technology and operational experience.

During the test phase, two autonomous cars with WeRide technology will be in service. When operations start, which is expected in the second quarter, up to four cars will be deployed. Fully unmanned mode will operate for up to five years.

In 2026, the fleet is expected to expand with eight additional autonomous vehicles, with further expansion planned.

The first automated vehicles will operate in Switzerland's Furttal region. Residents will be able to book the autonomous vehicles by an app supplied by Ioki.

"The launch of the Swiss public transportation service pilot project demonstrates WeRide's commitment to expanding autonomous driving in Europe," said WeRide CEO Tony Han.

In Switzerland, trains serve as the main arteries connecting major cities and towns. According to the Federal Office of Transport (FOT), on average, Swiss residents take the train about 70 times a year, the highest rate in Europe. However, suburban areas face limited transportation options.

SBB, one of the project investors, was established in 1902, and is Switzerland's state-owned railway company with a 3000km network. The Canton of Zurich is the second-largest investor. STL, the project manager, is dedicated to exploring and promoting innovative mobility.

Leveraging WeRide's autonomous driving technology, the parties will work to expand Switzerland's intelligent transportation network.

This is WeRide's third project in Europe within eight months. Recently, WeRide launched Europe's first commercial autonomous minibus project at Zurich Airport and provided L4 autonomous shuttle services at the 2024 French Open in Paris.

This is said to show the versatility of the WeRide One autonomous driving technology platform and its adaptability to different products.



Nissan Ariya autonomous vehicle for Swiss project

Tata uses virtual Qualcomm SoCs for SDV development

Tata Elxsi plans to work with Qualcomm to develop virtual models of Snapdragon Digital Chassis for cloud-native application development.

Tata Elxsi will develop a virtual ECU platform for automakers and tier-one suppliers using Snapdragon virtual systems-on-chip (VSoCs) for passenger, commercial and off-highway vehicles.

Tata aims to use the Snapdragon Digital Chassis VSoCs to improve the software-defined vehicle (SDV) development process, helping R&D teams accelerate software development and validation. By reducing the dependency on hardware availability, this should streamline and speed up development lifecycles.

At January's CES in Las Vegas, Tata showed this process using the company's Avenir SDV suite integrated with Qualcomm's Snapdragon Ride Flex SoC.

"This combination of world-class software and system expertise, virtualised models and ready-to-adopt SDV software offers OEMs a compelling and future-ready path to SDVs and next generation mobility," said Shaju S, vice president of Tata Elxsi.

Laxmi Rayapudi, Qualcomm VP, added: "Access to leading edge, high performance heterogeneous compute environment in the cloud enables the future of pre-and post-production approaches to software development."

Mahindra and Vector collaborate on SDV architecture

Mahindra and Vector Informatik are working together to strengthen network architecture and prepare for the increasing demands of software-defined vehicles (SDVs).

Vector provides technical consulting, covering every critical aspect of SDVs, from network design and defining use cases to implementing over-the-air functions, back-end infrastructure, security, software factory, and HIL and SIL testing.

This collaboration was guided by the challenge of creating a future-ready SDV architecture while incorporating transferable components. The project required a redevelopment of the core high-performance computing (HPC) and domain architecture, along with the integration of existing software architecture components.

To address concerns about significant architectural changes, Mahindra and Vector worked closely with other partners to align objectives.

Mahindra adopted a future-oriented SDV architecture, fostering alignment across engineers, suppliers and Vector's support in India.

The result uses Ethernet as the network backbone, interconnecting three HPCs and three zonal ECUs. Microsar Adaptive was selected as the base layer for the HPCs.

Microsar Adaptive was used for safety applications, while Android serves as the platform for infotainment.

Within a one-year timeframe, they defined the middleware for HPCs and zonal ECUs, named Maia, for Mahindra AI architecture.

Göpel designs EMC chamber for automotive tests

Göpel Electronic has developed a type of EMC chamber especially for automotive testing.

This EMC housing makes it possible to carry out shielded measurements and tests when testing a single control unit.

This allows the high data rates of the signals to be taken into account and the supply lines to the control unit to be kept as short as possible.

The absorber material used for the enclosure serves to reduce unwanted electromagnetic constructive and destructive interference. Other technical shielding measures include galvanic isolation from the mains, mains filters, earthing options and shielded cables.

Interference or malfunctions caused by EMI are potentially safety-critical, particularly in the automotive sector. Interference can not only lead to false alarms in safety functions such as the airbag system, brake assistance or steering, but also to dangerous malfunctions.

This is why the EMC test is an indispensable measure, especially in the automotive sector, to ensure electronic components in vehicles work reliably and safely under real conditions.

Göpel's in-house communication controllers can be used for automotive bus systems. These are based on the Series 62 hardware platform and implement the residual bus simulations for vehicle components using the Autosar standard.

A server-based API is used to control the correspondingly implemented hardware in the test system. This already contains a library that offers and displays commands for executing functions as well as specific tests in connection with the hardware in the test system.

Due to the abstraction layer that forms the API, the control for any software and hardware can be extended by Göpel's own or third-party hardware.

Various measurement results can be retrieved and included on a database basis with corresponding logging.



Göpel EMC test chamber

Microsoft helps VicOne protect SDV software

Microsoft is helping automotive cyber-security firm VicOne let developers of vehicle software secure firmware and ensure end-to-end protection across the automotive software lifecycle.

Makers of software-defined vehicles (SDVs) benefit from differentiated automotive threat intelligence, streamlined and secure code development, enhanced continuous integration and automated security analysis.

Automotive software developers can access a seamless workflow for securing their software, using GitHub security for Azure dev-ops for source-code analysis, VicOne xZeta for binary analysis and the patent-pending VicOne VVIR vulnerability impact ratings. The end product can run on Microsoft Azure infrastructure.

Microsoft Visual Studio Code and GitHub Copilot assist developers in writing secure code. GitHub security performs secret scanning and source code analysis. VicOne xZeta delivers firmware and binary analysis with real-time vulnerability ratings.

XZeta is already available as a part of development within GitHub.

AMD adopts RFPro for parking simulation

AMD has adopted the RFPro-powered AV Elevate simulation platform to accelerate the development of automated driving technologies.

AMD is using AV Elevate's simulation capabilities to tune and test its automated parking systems on thousands of parking scenarios while reducing reliance on physical testing.

"AV Elevate's ability to generate precise synthetic training data and test complex parking scenarios quickly has significantly reduced our development time and cost," said Simon George, director at AMD. "The platform allows us to more rapidly iterate and develop our automated parking systems by testing them against countless edge cases that would be impractical to recreate in the real world."



AMD-RFPro demonstration at last month's CES

The AMD-powered automated parking was demonstrated at last month's CES in Las Vegas. The demonstration highlighted the technology's ability to handle difficult parking scenarios, including tight spaces, complex manoeuvres and various lighting conditions.

"It has been fascinating to collaborate with AMD who are at the forefront of automated driving and adas technologies," said Matt Daley, technical director at RFPpro.

AV Elevate is an integrated simulation product that enables the tuning of sensors, the training of perception and control algorithms, and the testing of the full AV technology stack.

It provides closed-loop perception testing and the creation of engineering-grade synthetic training data.

The platform integrates high-fidelity sensor models for all major AV sensor types, such as cameras, lidar and radar, and includes a library of standard sensor models alongside digital twins of commercially available sensors.

At the core of AV Elevate is RFPro's physically modelled virtual environments and ray tracing rendering technology. Every element in the scene has been physically modelled with realistic material characteristics and a road surface model accurate to 1mm, enabling the production of realistic training data.

A library of more than 180 real-world digital twins provides an accurate and diverse virtual proving ground. This provides AMD access to a range of locations for complex scenarios, including typical underground, city and rural parking locations as well real-world public roads.



Ceres and Apptronics combine in-car display technologies

Ceres Holographics and Appotronics are combining their technologies for in-car displays, including driver and passenger transparent head-up displays (HUDs).

The agreement expands Appotronics' foothold in automotive laser display and illumination and provides Ceres and its other holographic windshield partners with a link in the supply chain to deliver complete systems to its OEM customers.

The aim is to provide more intuitive, flexible and distraction-free high-resolution displays.

The partnership leverages Ceres' HoloFlext manufacturing technology and Appotronics' ALPD laser phosphor display projection technology to meet size, cost, reliability and viewability requirements.

The two companies have the manufacturing infrastructure in place to implement this quickly.

Appotronics invented the ALPD technology in 2007 to reduce the cost of laser light sources. ALPD is widely used in cinema, professional AV applications and smart homes. Now the company is creating applications and markets in automotive illumination and displays.

Appotronics has developed products for the fast-growing EV market in China and beyond. Its projection systems have been implemented in various use cases and it has demonstrated an ability to meet the specifications of automotive applications.

The pairing of a Ceres holographic-enabled windshield or side window and Appotronics projectors helps car makers introduce automotive-qualified, safety-oriented and differentiated displays in their vehicles.

"We have seen much interest in our projectors and displays to enhance the user experience in vehicles," said Meng Han, senior director at Appotronics.

Ceres' precision digital mastering and replication technology overcomes the traditional barriers to the design and manufacture of very large-format holographic optical elements (HOEs) in high volume. HOEs are key to enabling configurable high performance transparent displays for automotive and other display applications in adjacent markets such as transportation, industrial and consumer.

Seamlessly embedded into a windscreen as a thin film over the entire windshield, each precision engineered HOE functional area is paired with a high-resolution Appotronics projector which is discreetly integrated in the vehicle's instrument panel.

HoloFlekt film technology can transform any windscreen or other glass structure into a bright, full-colour display. In car windshields, it can realise large format pillar-to-pillar HUDs where safety, operational, navigation and infotainment content can all be shown directly to the intended viewer in a clear and non-distractive manner regardless of external light conditions.

Ceres manufacturing technology allows multiple display areas to be implemented into one windshield sized film. Each active display area is paired with its own projector, and its viewing geometry customised for the intended viewer, making it only visible to them, ensuring safety, comfort and optimal UX while keeping the driver's attention on the road ahead.

Enabling multiple display areas in one sheet of film saves on total system cost and simplifies the manufacturing process to implement a multi-display transparent HUD.

NEWS FROM THE STRIP

CES

Some of the key announcements from the Consumer Electronics Show in Las Vegas

Intel points way to software-defined vehicles

Intel unveiled an expanded product portfolio and partnerships to accelerate automakers' transitions to electric and software-defined vehicles (SDVs).

Intel now offers a whole-vehicle platform, including high-performance compute, discrete graphics, artificial intelligence (AI), power management and zonal controller alongside the Intel Automotive VDE virtual development environment co-developed with Amazon Web Services (AWS).

Intel's approach addresses automakers' cost and performance scalability problems, enabling faster, more efficient and more profitable SDV development and deployment.

"Intel Automotive is bringing innovations that reduce cost in the SDV revolution," said Jack Weast, general manager of Intel Automotive. "Our whole-vehicle approach, combined with cloud integration, drives down total cost of development and deployment while empowering automakers to build the future of mobility faster, more efficiently and more profitably."

The whole-vehicle platform can reduce inefficiencies of traditional fragmented approaches to vehicle architectures. Optimising the entire vehicle's electrical and electronic architecture can drive cost reductions and performance improvements.



Jack Weast: "Innovations that reduce cost in the SDV revolution."

Supporting this platform, Intel introduced an adaptive control unit (ACU) for electric vehicle (EV) powertrains and zonal controllers.

The U310 ACU is a new kind of processing unit that supports the consolidation of multiple real-time, safety-critical and cyber-secure functions, applications and domains in a single chip.

Traditional time and sequential processing-based micro and zonal controllers struggle to handle multiple workloads due to limited deterministic processing capabilities.

In contrast, ACUs integrate a flexible logic area that offloads real-time control algorithms from the CPU cores, ensuring performance, freedom from interference and deterministic data delivery even when consolidating multiple microcontroller workloads into a single zonal MCU.

This dual-brain approach can enable greater workload consolidation, lower cost, and enhance safety, cyber security and performance.

When used in an EV powertrain, the U310 supports algorithms that reduce vehicle energy demand from the battery, automatically adapting high voltage and control frequencies to individual driver styles and road conditions.

The ACU reduces cost per kilowatt and enhances energy efficiency, allowing the vehicle to reclaim up to 40 per cent of the powertrain system energy losses. This translates to increased range, faster charging and a more responsive driving experience while reducing per-vehicle costs, electric motor size and battery costs.

Stellantis Motorsports has adopted the adaptive control technology into its inverter to improve performance and efficiency in racing environments. The technology will control the electric motor and recover energy during braking.

The inverter plays a crucial role during a Formula E race, where any gain in efficiency is transformed into a competitive advantage.

Karma Automotive announced support for the ACU, showing an Intel co-branded inverter featuring optimal pulse pattern control algorithms to improve efficiency and enable four unique driving profiles, including features such as torque ripple reduction and range boost.

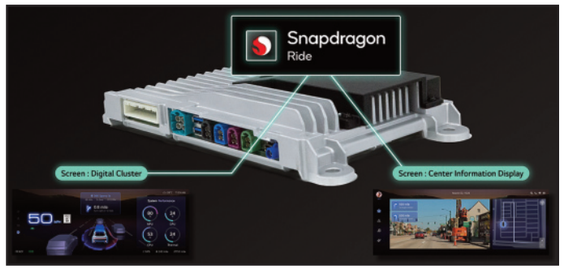
The ACU's programmability allows it to serve as a software-defined zonal controller, adapting to different vehicle topologies and applications. This flexibility streamlines the transition to SDVs, simplifies supply chains and reduces the complexity of vehicle costs.

Building on its first-generation AI-enhanced SDV SoCs, Intel announced the upcoming second-generation Intel Arc B-series graphics for automotive set for production by the end of 2025. This provides the high-performance compute needed for more advanced in-vehicle AI workloads, human-machine interface engines, and immersive in-vehicle experiences and AAA PC gaming.

Paired with an AI-enhanced SDV SoC, it delivers scalable performance for complex AI tasks, supported by the Intel AI ecosystem.

Intel and AWS introduced an automotive virtual development environment on AWS, an approach that ensures hardware and software parity from cloud to car. This offering addresses challenges throughout the vehicle development life cycle, enabling engineers to switch seamlessly between virtual and physical hardware setups.

It integrates Intel Xeon processor-based Amazon EC2 instances and incorporates Intel's automotive SDV SoCs within the AWS environment, eliminating the need for expensive ECU simulators or developer boards.



Qualcomm SoC features in LG controller

Qualcomm helps LG with cross-domain controller

LG Electronics, working with Qualcomm, introduced the xDC cross domain controller platform for vehicles.

Based on Qualcomm's Flex SoC, which pre-integrates Snapdragon Ride automated driving stack and computer vision, this platform incorporates LG's in-vehicle infotainment (IVI) system and adas in one controller.

Due to the increasing complexity of modern vehicles, the need for a central computer that can efficiently manage diverse functionalities has become paramount. The Flex SoC addresses this, presenting a single SoC with pre-integrated adas, automated driving capabilities and an open platform offering support for digital cockpits and IVI.

By using Qualcomm's flexible, multifunctional chipset, the platform can rapidly process data from IVI and adas concurrently.

The xDC also delivers the proactive assistance of adas confidence view, which combines 3D and 2D graphics to help drivers maintain focus on the road.

The platform helps drivers and front seat passengers intuitively access information through the vehicle's main display. This includes critical adas alerts, such as distance to the vehicle ahead and lane departure warnings, as well as alternative routes based on real-time traffic conditions.

It can even provide useful lifestyle information, such as promotions from frequently visited stores.

The Flex SoC has Asil-D certification.

"The xDC platform, which leverages the cutting-edge Snapdragon Ride Flex SoC, offers automakers a flexible option that simplifies complex systems while enhancing the driving experience," said Eun Seok-hyun, president of LG's vehicle company.

Harman Luna AI personalises in-car experience

Samsung subsidiary Harman unveiled intelligent, contextual technologies and products that are redefining what it means to drive and ride in a car.

The latest enhancements to its Ready portfolio include Luna, an avatar powered by Ready Engage, its new emotionally intelligent AI system.

Luna personalises interactions through voice and visuals, fostering a natural and intuitive bond between occupants and technology.

Integrated with the Ready Vision products, including the QVue windshield display, it delivers immersive augmented reality features such as dynamic street visualisation and transparent hood views to elevate safety, comfort and engagement.

Customisable by each automaker, the Ready Engage AI system redefines the in-cabin experience by connecting to its occupants' needs and environments.

Helping power these innovations are the Ready Upgrade cockpit domain controllers and central compute unit (CCU). These are the brains behind intelligent in-cabin experiences, integrating products such as Ready Engage into vehicles.

Ready Upgrade reduces development cycles and costs with turnkey options, enabling software updates as fast as every three months and vehicle launch updates in as little as six months.

Harman's collaboration with HL Klemove takes this innovation further, delivering a light CCU based on Ready Upgrade and HL Klemove's level-two software stack and adas sensor set. This collaboration unites Harman's in-cabin expertise and HL Klemove's adas offerings.

In the next level of their collaboration, Harman and HL Klemove are developing a product-grade CCU platform that will integrate their latest cockpit and adas feature sets and offer automakers shorter time to market and flexibility to customise.

"Harman is pioneering the next frontier in automotive technology by translating user states and situational understanding into truly contextual in-cabin experiences," said Armin Prommersberger, chief technology officer at Harman.

Christian Sobottka, president of Harman Automotive, added: "At Harman we believe when it comes to transforming the industry we are better together, and collaboration is the key to unlocking everyone's full potential. By working with industry leaders across the automotive and technology sectors, we are embracing collective intelligence to create a new level of in-cabin experiences that adapt to what consumers want and automakers need."

In collaboration with Cerence AI, Harman is integrating generative AI into vehicles. Luna features pre-integration with Cerence AI's voice assistant platform while remaining adaptable to the evolving advancements and continuous step changes in AI technology.

Offering personalised AI-powered interactions that anticipate needs and respond naturally through voice and visuals, Ready Engage creates a connection that feels friendly, easy and approachable.

Cerence AI's CallM Edge automotive-grade, on-device small language model (SLM) is now integrated into Ready Upgrade. This makes it easier for third-party app developers to create in-car applications that bring consumers' preferred, personalised content into the vehicle while ensuring that personal data remain secure.

The integration offers SLMs embedded into Ready Upgrade software for in-vehicle use, which developers can access through a standardised interface provided by Harman.

Leveraging Samsung's consumer electronics expertise, Harman's in-cabin experiences meet the performance and design standards of today's personal devices.

A key example is the Ready Display products being powered by Samsung Neo QLED with automotive-qualified cadmium-free Quantum Dot technology and Blue Mini LED-based local dimming displays.

These bring home-theatre quality into the vehicle with enhanced brightness, clever algorithms and sleek design.

Harman and Samsung are pushing the boundaries of in-vehicle display performance, co-developing the HDR10+ automotive standard with Ready Display as the first HDR10+-compliant product due early in 2025.

Harman is also working closely with Miovision and Qualcomm to ensure its Ready products deliver the right information at the right time, supporting safety.



Intelligent, contextual technologies redefine car driving

Ready Aware, a vehicle-to-network SaaS offering, enhances driver's situational awareness with a focus on traffic lights and road hazards. In collaboration with Miovision, Ready Aware offers contextual and intelligent alerts, including time to green and red-light assist, to help navigate intersections and support safe driving experiences.

The Ready Connect 5G telematics control unit (TCU) brings satellite communication to a TCU. Based on the second-generation Qualcomm Snapdragon Auto 5G modem-RF, this enables mobility services such as emergency messaging based on satellite network operator coverage.

Together, the two companies are delivering connectivity while increasing upgradability, scalability and usability to meet the evolving needs of the automotive market.

Furthering its multi-year collaboration with Gentherm, it is enhancing the in-cabin experience by prioritising safety and comfort. Ready Care, a product that measures a driver's visual and cognitive load as well as vital signals in real time, now integrates with Gentherm's WellSense in-cabin comfort product, delivering personalised in-cabin interventions, such as seat heating and cooling based on driver stress levels, distraction and drowsiness.

Infineon and Flex design modular zone controller

Infineon and Flex presented a modular zone controller design platform for software-defined vehicles (SDVs).

The platform is a scalable zone control unit (ZCU) that features a modular MCU architecture and common hardware building blocks.

It is an automotive-grade design for rapid ZCU implementation, so automakers can deliver SDVs at scale.

The combination of Infineon's chipsets with Flex's design and manufacturing provides a zone controller with optimised power distribution, gateway and motor control. This production-ready platform can be quickly adapted to automakers' requirements, speeding manufacturing ramp-up and time to market.

"We are very pleased to work with Flex, whose design expertise complements our strengths," said Hans Adlkofer, senior vice president at Infineon.

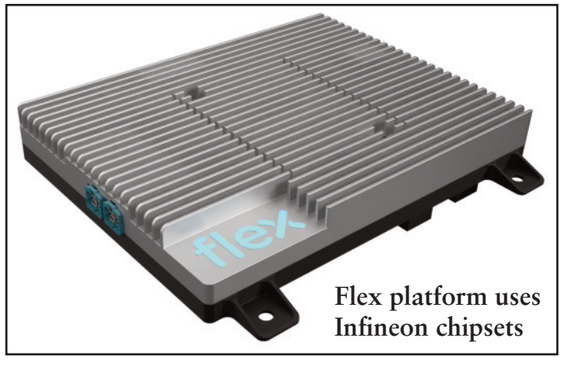
The platform optimises ZCU development by enabling efficient and fast implementation.

The Infineon chipset supports rapid evaluation of key component features, including hardware data accelerators, sequential diagnostics, I²T protection and SPI control.

With endpoint-agnostic control implementation, the platform allows seamless integration of the modular MCU with power distribution and actuation functions.

"As SDVs pave the way for next-generation mobility, the automotive industry must embrace partnerships that empower automakers to move faster and focus resources on creating brand-defining experiences through software," said Mike Thoeny, automotive president at Flex.

The platform will be available to customers this year.



Flex platform uses Infineon chipsets



Radar tester made first appearance in USA

R&S radar tester makes US debut

Rohde & Schwarz unveiled automotive testing innovations for adas, electric drivetrains and connectivity.

For the first time in the USA, the firm showed its Radest automotive radar tester, a compact, versatile radar target simulator that meets the range of testing needs from lab-based functional testing to vehicle-level production checks and beyond.

Visitors learnt how to streamline radar sensor testing using the Radest in radar sensor calibration, adas and AD functional testing, and on OEM production lines.

Additionally, visitors gained insights into the latest testing options for in-vehicle networks such as GMSL and Ethernet connections. These are designed to ensure high-speed data transfer and energy efficiency.

Testing GMSL and Ethernet compliance ensures automotive systems can handle the high data rates required for infotainment and autonomous driving.

Demonstrations showed advancements in adas sensor fusion and hardware-in-the-loop (XiL) testing. These technologies are crucial for ensuring accurate and reliable data integration from multiple sensors in autonomous vehicles.

By simulating real-world driving scenarios and combining them with virtual models, R&S enables testing of complex sensor systems. This ensures autonomous vehicles can effectively perceive and respond to their surroundings with precision and reliability.

Also, the test firm showed how to characterise and optimise drivetrain components using the MFIA from Zurich Instruments, MXO 5 oscilloscope and RT-ZISO isolated probing system.

Garmin and Qualcomm unify digital cockpits

Garmin and Qualcomm announced the expansion of their automotive technology collaboration with the Garmin Unified Cabin 2025, a digital cockpit featuring scalable domain controller capabilities from a single control module.

Powered by Qualcomm's Snapdragon Cockpit Elite, it delivers intuitive and immersive entertainment experiences across all vehicle displays, facilitating a software-defined vehicle (SDV) architecture.

Through the collaboration, Garmin digital cockpits will offer hardware built on the Snapdragon Cockpit Elite, with enhanced onboard generative AI enabled by a dedicated neural processing unit (NPU), supporting theme customisation and voice assistants.

Based on the Qualcomm Oryon CPU, the improved Adreno GPU and the Hexagon NPU for multimodal AI performance, the Cockpit Elite platform is designed to bring in-vehicle experiences and on-device AI to all tiers of SDVs.

"Garmin and Qualcomm have formed a close relationship to deliver innovations that drive both the feature set and capabilities of next generation domain controllers," said Matt Munn, executive vice president at Garmin Automotive.

Nakul Duggal, general manager for automotive at Qualcomm, added: "This next-generation digital cockpit offers automakers unparalleled entertainment and personalisation for their vehicles, setting a new standard for software-defined vehicle architecture."

Garmin and Qualcomm first teamed up in 2019 to deliver domain controllers for a major OEM to market, and in 2022 the companies collaborated on the first iteration of the Garmin Unified Cabin based on the Snapdragon Cockpit platform, with subsequent models delivered each year since.

Garmin has since worked with Qualcomm on digital cockpits as part of a multi-year project, showcasing features through the seamless integration of various peripherals and displays to create a multi-zone, multi-user architecture within the vehicle, complemented by software components to deliver a comprehensive infotainment, digital cluster and entertainment system.

"Garmin Unified Cabin has resonated strongly with global automakers because there is nothing else like it on the market today," said Munn.



Unified Cabin 2025 from Garmin integrates generative AI, child presence detection and zoned audio and video

Anritsu and Autocrypt MoU advances cyber security

Anritsu and Autocrypt signed an MoU to advance automotive security testing through simulated 5G networks.

The agreement underscores a shared commitment to security testing methodologies for vehicles worldwide.

The collaboration will integrate Autocrypt's CSTP cyber-security testing platform with Anritsu's MT8000A radio communication test station, which provides a simulated 5G network environment.

The partnership aims to simplify and enhance cyber-security testing, ensuring robust protection for evolving vehicle systems.

The MoU comes as governments and regulatory organisations worldwide implement stricter cyber-security standards for connected and autonomous vehicles. With frameworks such as the UNECE's WP.29 UN R155 and 156, India's AIS-189, and China's GB/T standards, automotive manufacturers and suppliers face mounting pressure to demonstrate compliance.

The collaboration will also enable security testing for various applications beyond vehicle communications such as modern day connected mobility.

Here builds partnerships with BMW and Sony Honda

Here Technologies announced a partnership with Sony Honda Mobility (SHM) and extended a partnership with BMW.

The deal with SHM concerns the Afeela electric vehicle brand. SHM plans to leverage Here's SDKs for Afeela's digital cockpit and mobile apps.

The extended partnership with BMW focuses on improving the driving experience and road safety, and the delivery of a software-defined vehicle (SDV) architecture.

As of this year, new BMW models will use a unified stack of standard and high-definition map data from Here to enable a range of driving functions, from lane-level positioning to adas and automated driving.

The detailed and continuously updated map from Here supports BMW with its compliance with the European Union's ISA intelligent speed assistance regulation and helps BMW achieve top NCap ratings.

The product of a joint venture between Sony and Honda, Afeela aims to challenge the typical EV, blending Sony's expertise in digital technology with Honda's automotive innovation.

The unified mapping architecture from Here enables SHM to power multiple in-car systems and location-based applications in Afeela's SDV, such as visualisation, range management and augmented reality.

The Here SDK Explore edition integrated into the Afeela mobile app delivers real-time map updates and seamlessly connects Afeela experiences to the digital lives of drivers and passengers.

By leveraging Here's unified mapping architecture, Afeela plans to deliver an intuitive and personalised mobility experience that goes beyond standard navigation.

"Navigation is an important component of Afeela and, with Here Navigation SDK, we are expanding beyond simple navigation to create an intuitive and personalised mobility experience," said Izumi Kawanishi, COO of SHM.

Mike Nefkens, CEO at Here Technologies, added: "Here is building a live platform that enables Afeela to stay connected and shape its own uniquely connected digital cockpit experience."

What to do with rear-side windows



Continental showed technology that projects content onto the vehicle's rear side windows, which is then visible from the outside. When the vehicle is parked, it can communicate directly with its environment and display information such as the charge level of an electric vehicle or the logo of the person's favourite sports club.

The content can be easily personalised. When the system is activated, the window is fully darkened electrically to ensure optimum image display. A projection unit in the roof lining of the vehicle projects the content onto the side window. The projection, which is visible from the outside, displays the content in high resolution directly on the windowpane. The projector requires less than half a litre of installation space.

"Our engineers are already working on additional measures to make future generations of the system even more compact," said Pavel Prouza from Continental.



Adas lidar

Hesai unveiled its AT1440 adas lidar with 1440 channels and a solid-state blind-spot FTX lidar.

Leveraging high-efficiency photodetection and parallel processing, the AT1440 achieves an angular resolution of 0.02°, and delivers high-definition image-level point clouds. It offers a resolution more than 30 times higher than mainstream automotive lidar.

The FTX is for adas-equipped passenger cars and robotic applications. Using solid-state electronic scanning, it supports a maximum field of view of 180° by 140°.

Range can reach 30m at 10% reflectivity, achieving a point rate of 492,000 points per second, 2.5 times higher than the previous generation.

High-definition blind-spot scanning lets it capture objects such as strollers, pedestrians and electric scooters.

It weighs 66% less than the previous generation and the exposed window area is reduced by 40% to 50 by 30mm through embedded installation.

VicOne AI Guardian secures P3 assistant

Automotive cyber-security firm VicOne demonstrated its AI Guardian securing the Sparq AI voice personal assistant from P3 Digital Services, a provider of in-vehicle infotainment (IVI).

The personal assistant is an intuitive automotive co-pilot offering hands-free control, navigation support and personalised assistance for drivers.

AI Guardian, part of VicOne's Smart Cockpit Protection portfolio, is an in-vehicle offering that shields AI-based applications such as the Sparq assistant from data leaks caused by AI prompt injections, unsecure outputs and vulnerable or unsecure third-party plug-ins.

"Drivers can seamlessly control car functions, adjust temperature instantly or change the music at any time with our AI voice personal assistant," said Marius Mailat, P3 CTO. "Meanwhile, the AI Guardian averts leaks of sensitive data and addresses all security risks. The dependable protection delivered by VicOne fosters trust among vehicle users that they can securely take advantage of the innovative safety and convenience benefits enabled by the AI voice personal assistant."

Hyundai full-windshield holographic display

Hyundai Mobis introduced a full-windshield holographic display.

Unlike conventional systems that rely on traditional screen-based components, this innovation operates without physical screens.

The display, integrated into Kia's EV9 electric vehicle for the show, transforms the front window into a transparent screen without additional display devices. Driving data, navigation and music playlists are seamlessly projected onto the lower portion of the windshield, providing a more intuitive and immersive experience.

From the outside, the windshield looks like a standard transparent glass window. However, inside the vehicle, it delivers crystal-clear visuals for drivers and passengers, even under bright outdoor conditions.

The display has a special film embedded with a holographic optical element (HOE), which uses the principle of light diffraction to project images and videos directly to the viewer's eyes.

Hyundai developed this holographic technology in collaboration with optical company Zeiss. At the show, Hyundai Mobis CEO Lee Gyu Suk and Zeiss CEO Karl Lamprecht discussed their partnership, reviewed the status of the holographic windshield, and explored opportunities for future business collaboration and mass production.

Hyundai and Zeiss plan to complete pre-development by mid-2026, with the goal of bringing the product to market by 2027.



Lee Gyu Suk and Karl Lamprecht at CES

Zeekr turns to Qualcomm for intelligent cockpits

Geely mobility brand Zeekr plans to use Qualcomm's latest Snapdragon Cockpit platform in upcoming vehicles.

Thousands of Zeekr hardware and software engineers in China and Europe are developing intelligent cockpit features, including intelligent navigation, enhanced voice interactions and eye-control to offer an immersive, multi-sensory experience to global users.

Demonstrating this, Zeekr showed its 001 FR, 009 and Mix vehicles, all powered by the Snapdragon SA8295P cockpit platform.

Future integrations of Snapdragon will provide intelligent navigation, enhanced voice interactions, and innovative eye-control systems but will also include immersive entertainment, personalised user interfaces such as customisable dashboards, and over-the-air updates.

"We are thrilled to see our Snapdragon Cockpit platform empowering automakers like Zeekr to deliver dynamic and immersive mobility experiences," said Lei Xian, vice president of Qualcomm. "We are eager to continue this journey together, bringing transformations that redefine the in-car experience."

Zeekr believes hardware and software engineering are crucial to offer safe and comfortable autonomous driving journeys.

On its stand, Zeekr showed its self-designed intelligent driving domain controller, the first for an OEM that integrates the Nvidia Drive AGX Thor SoC running on the safety-certified DriveOs. The soon-to-be-mass-produced domain controller powered by Nvidia's accelerated compute will roll out in a model coming later this year that will be able to handle multiple intelligent driving scenarios and parking capabilities.

Zeekr RT, which is already undergoing real-world road testing, will be a mass-produced purpose-built vehicle for autonomous mobility. Zeekr will begin delivering mass-produced RTs to Waymo for further testing this year, ready for a future public robotaxi launch.

Zeekr plans to deploy thousands of Zeekr-branded charging piles in international markets, starting in Thailand and Australia.



Zeekr 009 MPV arrives in Las Vegas

Demo shows sensor fusion for in-cabin monitoring

MulticoreWare and Cipia teamed up to showcase a demonstration of in-cabin monitoring sensor fusion.

This demo fused 60GHz radar and infrared camera technologies to provide precise tracking of driver and occupant vital signs, even in complex conditions.

MulticoreWare's radar sensor data processing expertise has led to a robust option for tracking vital signs and detecting child presence, with applications across the healthcare and automotive industries. This technology can contribute to real-time monitoring, enabling improved decision-making and proactive interventions.

By collaborating with Cipia, a specialist in computer vision and AI in-cabin monitoring, MulticoreWare aims to push the boundaries of innovation and deliver safety options for the automotive industry.

"Together, we are showcasing innovative radar and IR camera fusion, optimised for edge computing platforms," said Vish Rajalingam, vice president at MulticoreWare.

Solidvue lands award for single-chip lidar

Solidvue's SL-2.2 single-chip lidar sensor IC with a 400 x 128 resolution won a CES Innovation Award.

The technology enables accurate object recognition for autonomous vehicles, drones, robots, security cameras and traffic management systems.

Established in 2020, Solidvue designs SoCs for lidar sensors.

"While mechanical lidar has been the standard, the latest trend is to replace it with semiconductor chips," said co-CEO, Jung-Hoon Chun.

Solidvue claims to be the only company in South Korea to have developed lidar sensors that completely replace mechanical components with semiconductor technology.

The sensors are compatible with solid-state lidar systems, which are ten times smaller and 100 times cheaper than traditional mechanical lidar systems.

"Our sensors offer ultra-compact chips compared with competitors, but their performance is not just on par, it's superior," said co-CEO Jaehyuk Choi.

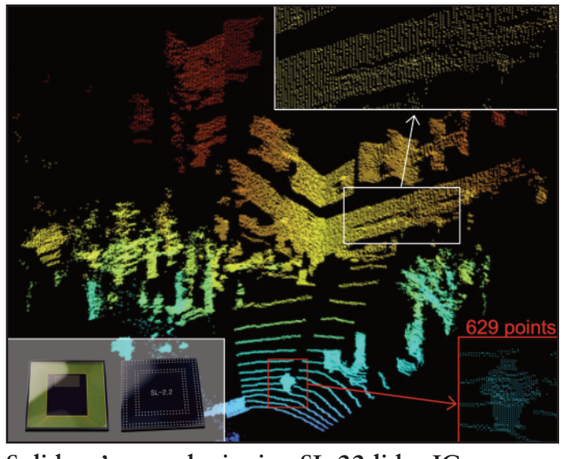
The company's proprietary cmos spad (single photon avalanche diode) technology enhances measurement accuracy by detecting sparse photons even at the single-photon level.

The SL-2.2 can output high-resolution 3D images up to 400 x 128 pixels, surpassing the 200 x 116 resolution of existing products. It can detect objects up to 200m away with a 99.9% accuracy.

As a single-chip sensor, it is fabricated using standard cmos semiconductor processes. The sensor core measures 0.9 by 0.9cm and comes in a 1.4 by 1.4cm BGA-type package, enabling seamless integration into various lidar systems. Its single-chip design reduces power consumption, enhancing energy efficiency and improving reliability.

Scheduled for an official release this year, the SL-2.2 is a successor to the company's first product, the SV-110, with a 200 x 116 resolution and a 128m detection range.

"We are actively collaborating with numerous domestic and international companies and research institutions to push the boundaries of lidar technology," said Jaehyuk Choi. "With the rapidly growing demand for lidar, we are committed to continuously expanding our product line to meet diverse market needs."



Solidvue's award winning SL-22 lidar IC

Arbe and Nvidia enhance free-space mapping

Arbe Robotics is collaborating with Nvidia to enhance free space mapping and AI-driven capabilities for automotive.

At the heart of Arbe's innovation is its AI-powered processing of a dense, high-resolution point cloud. Arbe's perception radar supports tens of thousands of detections per frame, powered by a mimo array of 48 receiving and 48 transmitting channels.

This enables high resolution in azimuth and elevation, providing long-range detection capabilities in all weather and lighting conditions, with few false alarms.

The perception radar can detect small obstacles such as a tyre on the road or lost cargo, and manage urban complexities with a high dynamic range, all designed for adas and autonomy scenarios.

Additionally, it delivers high-quality data for seamless integration with cameras and other sensors.

Arbe presented a live demonstration of its high-resolution radar integrated with the Nvidia Drive AGX in-vehicle computing platform for radar-based free space mapping. Nvidia's processor, optimised for AI-driven capabilities, enables hands-free driving and real-time safety applications.

The combination redefines vehicle perception and decision-making, paving the way for safer and smarter mobility.

AUTOSPORT INTERNATIONAL

ON TRACK

Steve Rogerson reports from January's Autosport International in Birmingham, UK

F1 teams go down Lane for smaller connector

A small five-way size 01 connector will be transferring sensor data in Formula One cars from the 2025 season onwards.

The sensor made by Eaton is available from Lane Motorsport and its business development director Sam Furminger said three F1 teams had bought large quantities of the sensor and two or three more teams were looking at it. He wouldn't say which teams but his colleague sales advisor Richard Ruck said: "The usual British teams will be using it."

Lane had both the existing three-way and the new five-way connector on show.

The five-way has 26 contacts and is said to be 20% smaller and lighter than the size 02 connector. It can resist motorsport fluids and has an anti-vibration design.

"The three-way connector is already in Formula One cars and the five-way will be in from this season onwards," said Ruck. "This is absolutely as small as you can get. The size 02 used to be the smallest and now we are down to size 01."

The five-way became available last summer. Furminger said he expected it to be used by all F1 teams within the next 12 months or so. And Ruck said he expected them to spread down to other motorsport applications after that.

"They can be used for all sensor applications," Furminger said. "They are for any electronics in the car that are that small. The connectors won't get smaller than this."



Richard Ruck (left) and Sam Furminger



Richard Palmer: "Pretty much unlimited range."

Autotel turns to 4G for keeping in touch

Autotel is taking advantage of the reach and reliability of 4G cellular for its push-to-talk (PTT) radio system for all types of race car.

The Race 470 system uses the 3G or 4G network as a voice radio system without having an open phone call connection.

Voice calls are sent through the radio network as data packets and then converted back to voice on reception.

"This gives pretty much unlimited range," said Richard Palmer, Autotel's managing director," as you have with mobile coverage. With radio, you need boosters to get the range."

He said some cellular systems worked by making a phone call.

"With this, you don't need an open phone call all the time," he said. "It is a lot more flexible than radio. You can have an unlimited number of channels, so if you are a larger team with multiple cars, it works."

He said with conventional radio systems, teams paid for each channel.

"With this, you don't need to," he said.

He said teams could buy a basic system and Autotel would reconfigure it depending on needs.

The firm was also showing its recently introduced G51MS wireless pit intercom system.

"You can have any number of headsets from one system," said Palmer.

The system provides full duplex communications between team members and can be used alongside an existing team radio, providing better pit communications without congesting the radio channel.

How to start a career in motorsports

Despite a shortage of engineers in motorsports, students looking to get into the trade must still work hard to get themselves on the radar of the top teams.

That was the message from James Oliver, who set up his own recruitment agency – Oliver Talent – last year.

"There are a lot of opportunities in motorsport," he said, "but you need to get your face in front of the right people at the right time."

He said potential candidates should go to trade shows, ask people questions, ask how they got there, and keep in touch.

It is no good making that connection at a show and then not being able to follow it up.

"Carry business cards and hand them over and then get one back," he said. "You need the contact details. You can make up business cards very cheaply."

Online platforms such as LinkedIn, he said, were good tools to build relationships.

"Find ten to twenty companies you really like and immerse yourselves into them," he said. "Be conversational with them. Ask about their projects, and tell them about yours.



James Oliver

Ask for advice."

He said by the time a team advertised a job, it was often too late.

"Make yourself known to them so you are considered before they advertise," he said. "Don't just send in random job ads because they will just end up in the general noise. In the bigger teams, the HR departments were just too busy. Look for people who are already doing the job and start conversations with them."

He said it was important to be persistent.

"Don't give up if you get no response," he said. "Interact with them. Like posts, comment on posts. You need to build up touch points. Network as if your life depends on it."

There was a serious demand, he said, for software engineers as the industry moved to software-defined vehicles.

"Software and data engineering are the hot topics," he said.

Road car ABS just can't hack it

Road car ABS just can't handle the needs of motorsport, said Matthew Payne, marketing director at Specialist Control Systems (SCS), as he plugged the firm's Delta ABS for motorsport.

"Road car ABS systems are fundamentally flawed for race cars," he said. "They are about safety and stability whereas the motorsport ABS is about performance."

The Delta system has a ten-position adjustable in-car setting via the Can bus or through a direct connection for different grip conditions, stability and braking performance.

It is compatible with most active wheel speed sensors.

The system is user configurable for vehicle parameters, diagnostics and live data via SCS's PC software tool and Can interface.

"This gives the driver ways to control the car," said Payne. "It is just better." He said the around £3000 price tag made it affordable for club level motorsport.

"We are very happy with it," he said. "A European car maker has this for all its cars."

It is designed for front-rear split applications. The kit includes two brake pressure sensors measuring front and rear master cylinder pressures separately for use with a brake balance bar.

There are on-board diagnostics for all sensor inputs and actuator outputs.



Matthew Payne: "It is just better."

DIGITAL TWINS

POINTING THE WAY

Nand Kochhar discusses a software-defined future for the automotive industry



Vehicle Electronics

DIGITAL TWINS

Vehicles today are brimming with sophisticated software and electronics systems. With all the benefits this brings to vehicle performance, the growing importance of software and electronics systems dramatically changes how manufacturers evaluate benefits and risk.

Autonomy, for example, certainly raises the floor of safety, but it also means automakers are taking on the risk previously in the hands of drivers.

At the same time, the shift from mechanical systems for electric vehicles (EVs) changes the understanding of vehicle durability.

And a greater reliance on electronics brings along supply challenges due to an expanding supplier network.

To stay competitive and meet these evolving market dynamics, automakers will need to accelerate the adoption of digital transformation across their tools and workflows as they move from a mechanical definition of vehicles to the software-defined vehicle (SDV).

This shift in the automotive industry is best understood through three industry trends: the growth of electrical vehicle powertrains, the proliferation of semi-autonomous driving capabilities, and the extension of digitalisation into the realm of manufacturing. Just as the products themselves are seeing a convergence of hardware and software, so too should the processes evolve and become more digital in the design, manufacture and maintenance of these vehicles.

Collaboration

Electrification was the first major trend that encouraged auto manufacturers to move beyond the traditional approaches to automotive design and manufacturing. This shift away from mechanically defined vehicles has led many companies to re-examine what information needs to be available to a driver behind the wheel of an EV. That, in turn, pushes manufacturers to re-examine how their vehicle software and EE systems are architected.

The future of battery electrification will be driven heavily by battery technology and charging infrastructure. That might entail new battery management software to extend the life of battery packs by learning the charging behaviour of drivers in different regions or even down to individual users.

Other OEMs may provide more charging capabilities after a vehicle has left the lot, as Ford, Rivian and GM have done in their adoption of the North American Charging Standard (NACS), providing access to Telsa's existing Supercharger network.

Working together, these manufacturers implemented a software update with physical connection adapters to provide charging interoperability between NACS and Combined Charging Standard 1 (CCS1).

Regardless of the application, OEMs need comprehensive integrations across their supplier networks to manage the interdisciplinary architectures of EVs.

Digital threads enable this integration by allowing automakers to establish a structured flow of data for workflows across all the product lifecycle. Every design discipline can access relevant data, leading to a more optimised product design. By digitalising development, a real-time and two-way exchange with suppliers becomes possible to federate updated requirements and understand suppliers' part availability or sourcing.



Charging a car takes longer than filling one with fuel, so it is important to make the process as streamlined as possible

And the strong connections in the digital twin from design to manufacturing results in a rapid and smooth transition between the two domains. Traceability through design, production and operation also helps ensure accurate and expedient over-the-air updates over the lifetime of a vehicle, increasing value for OEMs and customers.

As a result, the companies that most effectively leverage software to innovate and adapt to the increasingly dynamic market will gain a significant competitive advantage.

Workflows

Autonomy in vehicles is imperceptibly increasing, with lane departure warnings and adaptive cruise control becoming standard and many manufacturers offering level-three autonomous driving capabilities.

But achieving greater autonomous capabilities requires closer interconnections between mechanical, electrical, electronic and software systems, driving up complexity and cost in development.

Moreover, the transition to higher levels of autonomy in consumer vehicles is slowed by the immensity of the verification and validation challenge operating on dynamic city streets.

Streamlined interdisciplinary collaboration during design will be required to make autonomy a more viable business strategy for passenger vehicles, which means automakers need to rethink the integration between engineering disciplines and avoid early prototyping. This is where the digital twin becomes critical.

It can help engineers uncover potential issues during early simulations. As a result, automakers can more readily solve the problems and do so within the context of a digital twin

of the whole vehicle. Furthermore, a fully digital option can provide greater design exploration to find the most optimal designs across mechanical, electrical, electronic and software domains.

Breaking down the traditional silos that exist between these different domains will require defining and communicating system requirements digitally throughout the process. The traditional document-based approach of communication across a vehicle programme has a high cost in time and risk from misunderstanding.

An error in conveying system requirements can delay development or, if left unaddressed until late in the programme, can create high risks in safety-critical features and functions, such as self-driving systems.

In contracts, a digital process helps manage the complexity and cost implications of increased electronics and software earlier in the design process.

Additionally, when system requirements are delivered dynamically to suppliers earlier, subsystems can be readily validated with connected systems. For example, a sensor for autonomous capabilities can be validated against the control board, the mechanical interfaces and even software-in-the-loop tests early in the process.

The benefits of a digital framework extend well beyond the initial product design and development. The greatest advantage of requirements-driven digital workflow based on the comprehensive digital twin is traceability and data accessibility. Understanding requirements in context can mitigate risks and provide a more rigorous workflow without slowing development.

Digitalisation also brings immense value once a vehicle is on the road. Creating a digital feedback mechanism between the factory and the vehicle, OEMs can continue to update and improve the software-based functionality of the vehicle. For example, as vehicles in the field encounter novel driving scenarios or experience other system errors, automakers can leverage data from the vehicles in the field to improve their digital twin and provide over-the-air updates to existing vehicles and use the data to improve the vehicles still in development.

This continuity of data provides the flexibility and scalability OEMs need to implement autonomous technologies, driving innovation and improving safety.



With flexible and agile options such as smart manufacturing, automakers can win back some of their timeline in the factory environment

Manufacturing

Building autonomous features and overhauling powertrains for electrification adds time and complexity not only to the design of the vehicle, but also for how it will be manufactured. In the face of the escalating complexity of SDV architectures, OEMs are turning towards smart manufacturing technologies to achieve flexible, efficient and sustainable operations. And the resulting faster implementation on the factory floor means businesses can pivot faster when confronted with supply chain issues from global supplier networks.

Using a digital twin of production, manufacturers now have the ability to optimise production in the virtual world. They can virtually explore all the possible configurations and then virtually commission machine operations with as little down time as possible. Connecting the worlds of design and manufacturing, the comprehensive digital twin helps businesses optimise their very valuable time while still delivering on aggressive quality, sustainability and time to market goals.

Furthermore, digitalisation helps streamline the flow of data between these worlds and provides more opportunity for adaptability and innovation.

By fostering a culture of cross-functional collaboration with smart manufacturing powered by the comprehensive digital twin, automakers can achieve flexible operations, next-level automation and proactive sustainability. Merging the real and digital worlds brings the newest generation of mobility to market, successfully, with actionable insights before physical commissioning and throughout production. This shift-left drives high quality and sustainable manufacturing in SDVs.

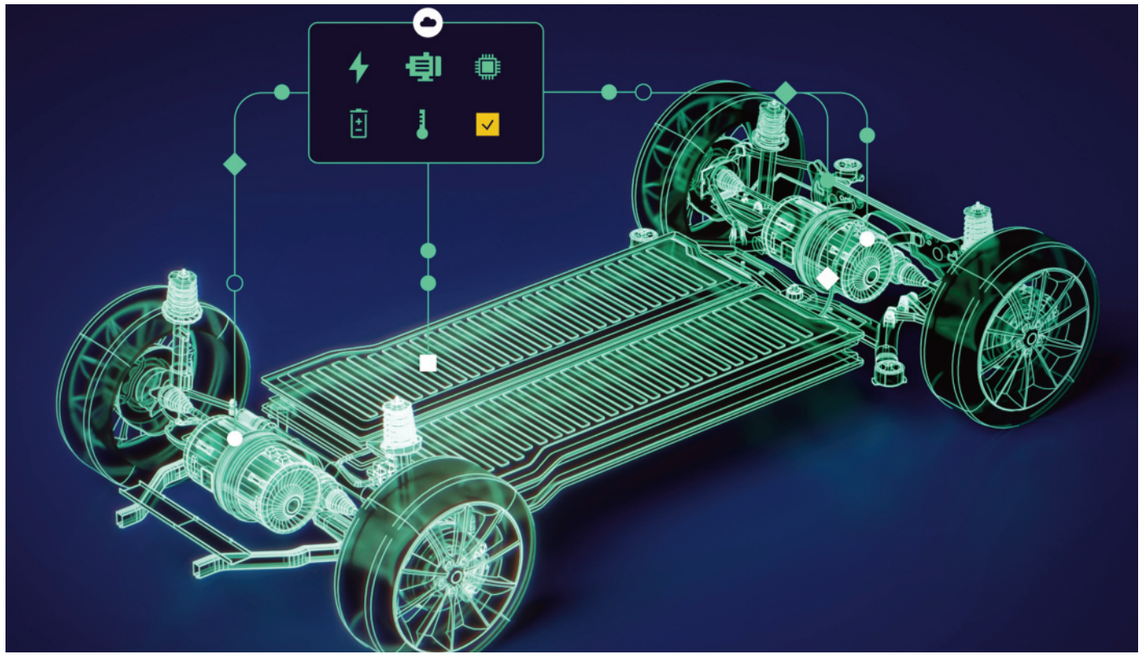
Software

Designing and manufacturing software-defined vehicles for tomorrow requires greater collaboration across engineering domains, automotive manufacturers and the global supply chains they rely upon. A digital transformation of automotive design and manufacturing is the answer for addressing the increased cost, time and risk software and electronics bring to the automotive industry.

Creating a comprehensive digital twin of the SDV and a robust digital thread between all key disciplines helps ensure the overall system requirements are met and validated. Digitalisation provides the framework and accessibility to make success sustainable for the next big transition in the automotive industry.



Nand Kochhar is vice president of automotive and transportation for Siemens Digital Industries Software



Software development is critical to modern cars but requires thoughtful planning to integrate it into the mechanically-focused industry

BRIGHT EYE

Jason Bai explains how an LED matrix manager can empower high-density automotive intelligent and safe front light systems

An LED matrix manager can provide OEMs with a front light system that enhances safety and distinguishes their brand. It can offer seamless integration, high performance coupled with safety features, and effectively reduce EMI.

Additionally, it can incorporate a built-in logarithmic fade-in and fade-out function, low $R_{DS(ON)}$, and slew rate control for optimal operation.

The increasing adoption of intelligent front light systems is primarily driven by safety and the desire for unique brand identities. These systems are growing at a rate of 8.3% annually. They feature glare-free high beams, LED and matrix lighting, which together form adaptive driving beam (ADB) systems.

These ADB systems eliminate the risk of blinding oncoming traffic. To enhance safety and comfort further for drivers, automotive OEMs are incorporating additional adaptive lighting functions (AFS) such as cornering light and dynamic curve light.

The LED matrix manager plays a crucial role by efficiently managing current for matrix and pixel lighting. It typically controls LED voltage up to 65V using six to twelve integrated switches, simplifying design and saving time. An integrated mosfet, rated

between 5 and 14V, has a low on-resistance, $R_{DS(ON)}$, allowing it to handle LED currents up to 2A.

Additionally, the LED matrix manager can offer an optimal pulse-width modulation (PWM) dimming setup. This includes smooth transitions between PWM dimming states and the option for internal or external clock control for PWM dimming.

The rapid advancements in the dimming performance of LED matrix managers can contribute significantly to increased safety, improved driving experiences and enhanced brand identities.

Headlights

Currently, automobiles use halogen, xenon or LED lamps for their front lights. Xenon lamps were common in higher end vehicles for a while, but now LED lamps are becoming more popular.

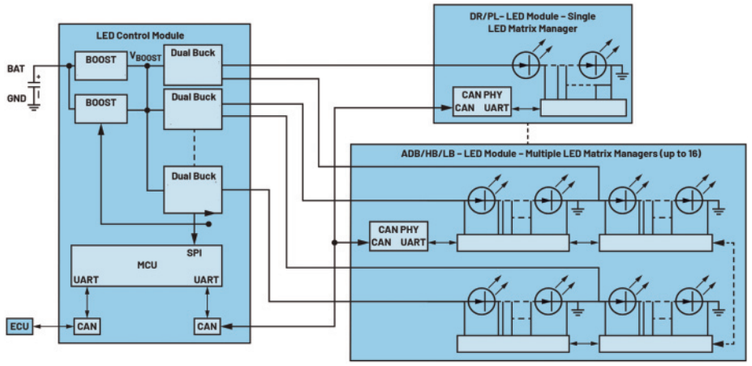


Fig. 1: LED front light system

It is likely that LED lamps will soon be the most common choice.

The differences among these lamps are summarised in Table 1. LED lamps are brighter than halogen, but not as bright as xenon. Xenon lamps can be too dazzling at night. Typically, halogen lamps use only 20% of their power for light, while LED lamps use 80%.

Even though LED lamps cost more initially, their long lifespan and energy efficiency can save money in the long run. They are also smaller, giving car makers more design freedom for headlights.

Front light

A front light system as shown in Fig. 1 includes a microcontroller, voltage sources, current sources and LED lamps. The microcontroller, referred to as the LED module (LM), is situated outside of the lamps. It is commonly known as the LED control module (LCM). The LCM often employs the Can bus to communicate and monitor the status of the LM, including features such as animation and brightness.

Inside the LCM, buck-boost topologies are frequently used as LED drivers, allowing them to accommodate different LM configurations, such as six or twelve LEDs in a single LM.

In Fig. 1, the LED driver within the LCM comprises voltage and current sources. Typically, the voltage sources adjust the battery

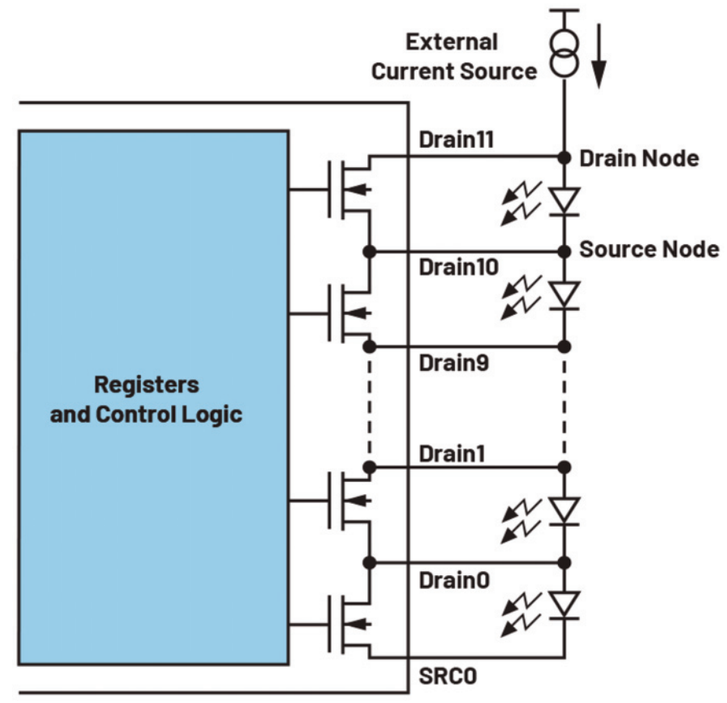


Fig. 2: LED fault detection

	Halogen Lamp	Xenon Lamp	LED Lamp
Brightness	Low	High	Medium
Energy Efficiency	Low	Medium	High
Lifespan	Short	Medium	Very long
Size	Large	Large	Small
Price	Low	Medium	High

Table 1: Comparison between halogen, xenon and LED lamps

voltage to a higher level, determined by the number of LEDs, while the current sources deliver a consistent current to the LM and lower the boosted voltage.

The automotive exterior front lighting system has several lighting functions, including a low beam (LB) headlamp, high beam (HB) headlamp, daytime running light (DRL), front position lamp (PL), and turn indicator. Depending on the specific lighting functions, the LM is set up with varying numbers and colours of LEDs. This means the LCM must provide the appropriate current source to regulate brightness.

To save costs, manufacturers might integrate two or more lighting functions into one LM, say by combining daytime running light and front position light.

LED matrix managers are used to control LEDs individually with different dimming scenarios, such as welcome functions and a wiping indicator. An LED matrix manager consists of multiple switches that can be independently programmed to bypass the LEDs across each of the switches in the string. Each switch can be turned fully on, fully off or dimmed with or without fade-transition mode. The dim frequency is set by an internal oscillator or set to an external clock source.

ADB

ADB systems are smart HB control systems that can adaptively adjust the beam pattern based on driving conditions. The full high beam can be distracting to oncoming drivers and pedestrians. The adaptive capabilities of an ADB system can automatically turn the bright lights off or partially beam to avoid dazzling drivers and pedestrians.

Based on different headlight resolution requirements, the LM of an ADB system would consist of four or more LED matrix managers to control four or more LED zones. With an LED matrix manager, ADB systems can be easily implemented and LEDs in an ADB system can be dimmed individually.

Fault detection

Detecting if LEDs are open or shorted is vital for safety. A

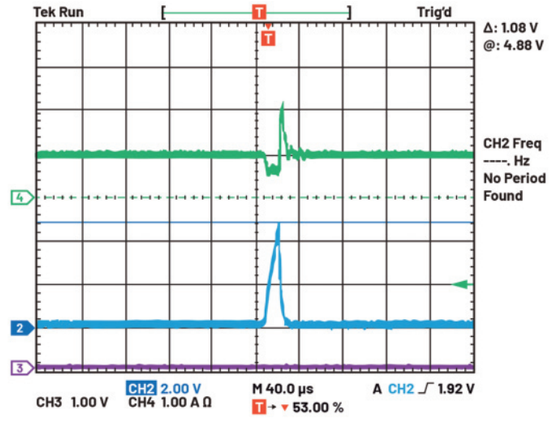


Fig. 3: LED open detection:
Channel 2: drain voltage; Channel 3: FLTB;
Channel 4: LED current

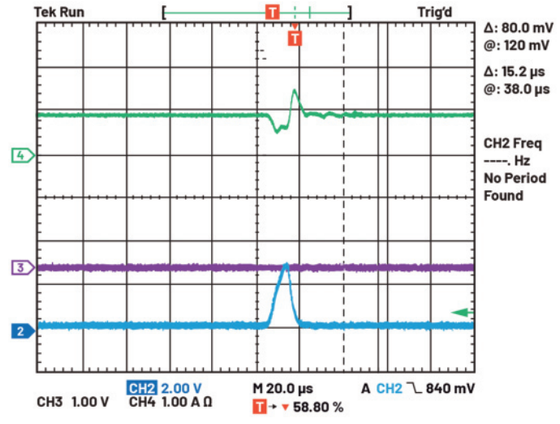


Fig. 4: LED short detection:
Channel 2: drain voltage; Channel 3: FLTB;
Channel 4: LED current



Fig. 5: Example of write command

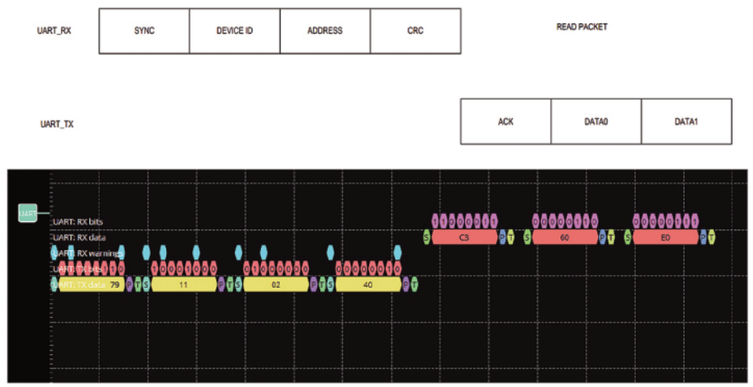


Fig. 6: Example of read command

system with safety features reduces the impact of potential failures. Checking for open or shorted LEDs in the headlight system helps catch any issues that might occur.

An LED matrix manager naturally provides protection against short circuits and open circuits by keeping track of any faults related to open or short circuits.

The open-LED fault is triggered when the voltage between the individual LED switch drain node (Fig. 2) and the switch source node exceeds the open threshold and is reported in the status register.

As shown in Fig. 3, the voltage cross switch is 4.88V, which triggers an LED open fault, when open threshold is set to 4.66V. A short LED fault is triggered when the voltage between the switch drain node and the switch source node is below the short threshold for an open switch condition and is reported in the status register.

Fig. 4 provides an example, whereby the voltage cross switch is 2.4V, which triggers an LED short fault when the short threshold is set to 1.4V.

Uart

A matrix manager can provide multidrop uart communications between the microcontroller and up to 16 devices. The write and read command examples are shown in Figs. 5 and 6. To ensure data security, the read-write transactions are protected using a 3bit cyclic redundancy check (CRC) on the packet.

If the microcontroller transmits a data packet with an incorrect CRC, the matrix manager does not reply and discards the attempted communication. In the event of lost communication, the uart watchdog feature sets the switches into a preconfigured state.

When a microcontroller communication line is inactive for more than the set time, the fault indicator is on, and the LEDs enter a preconfigured state if the uart watchdog is enabled.

As shown in Fig. 7, the uart watchdog timer is set to 500ms. After a uart receiver signal is inactive for 480ms, the LEDs are turned off since the preconfigured state is off.

Performance metrics such as thermal and EMI performance can easily be evaluated.

As shown in Fig. 8, the matrix manager is driven by a boost buck LED driver with all switches closed on the matrix manager and

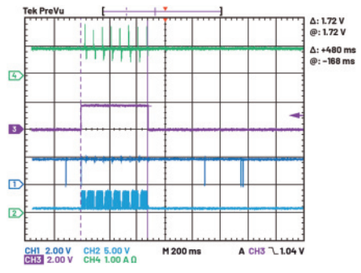


Fig. 7: Uart watchdog function – Channel 1: uart receiver; Channel 2: drain voltage; Channel 3: FLTB; Channel 4: LED current

provides a 1.5A output to 12 LEDs. Under a room temperature environment, only a 30.4°C temperature rise is captured.

Performance

An LED matrix manager can offer integration, high performance and safety, flexibility and EMI mitigation functionality such as the following:

- Integration: Provides built-in logarithmic fade-in and fade-out capability that simplifies LED programmability and reduces taxation on system bus lines.
- Performance and safety: Features fault protection and management for open, short and open-trace LED detection; low $R_{DS(ON)}$ safely enables high LED current.
- Flexibility: Supports multiple ICs to manage large LED pixel counts; allows designers to configure LED groups, such as one string x 12 series switches, and two strings x 6 series switches.
- EMI mitigation: Slew-rate control reduces EMI and noise.

Under the same test environment of a 1A output to 12 LEDs, EMI results show no spikes due to the charge pump design,

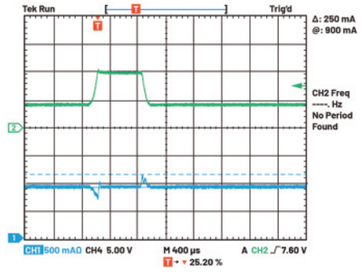


Fig. 10: Current spikes during dimming

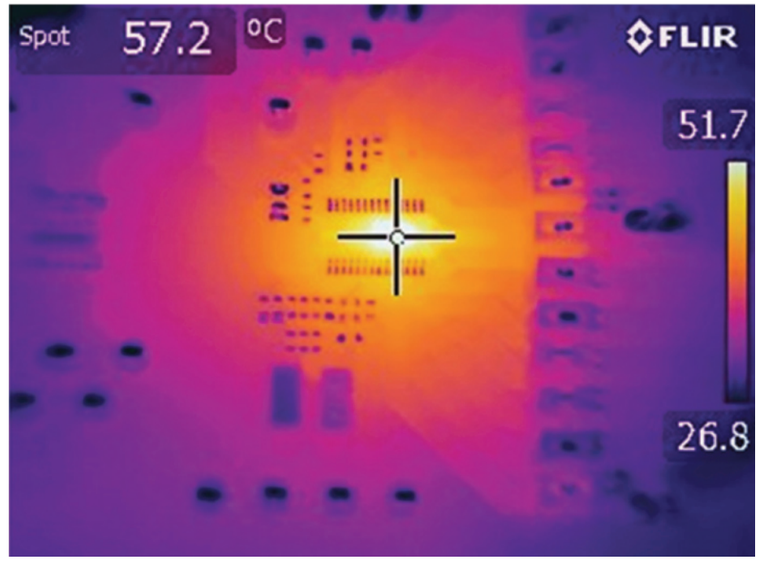


Fig. 8: Thermal camera capture under 1.5A condition

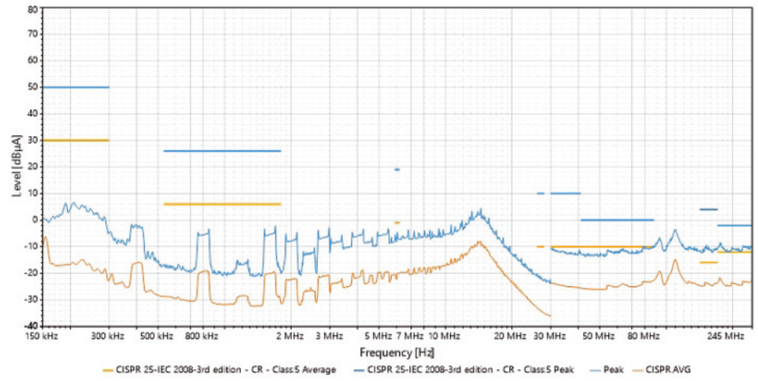


Fig. 9: Conducted EMI

as shown in Fig. 9.

The matrix manager is driven by an H-bridge LED driver with two LEDs at each channel. A 4.7μF output cap and a filter (1μH + 0.1μF) are added. The current spike is measured while dimming, as shown in Fig. 10.

Conclusion

As the trend of vehicle electrification and intelligence is growing fast, the lighting system has become an increasingly important feature in present and future vehicle designs. The lighting system is characterised by flexibility, efficiency, reliability, and more personalised and artistic effects.

ADB and AFS are considered advanced safety features. In these designs, an accurate, efficient and reliable LED manager for the LED matrix is required.

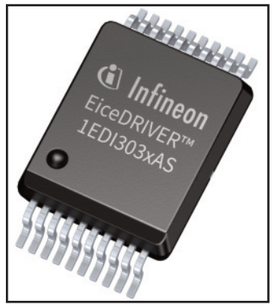
Jason Bai is an application engineer at Analog Devices

Gate driver ICs suit IGBT and SiC

Isolated gate driver ICs from Infineon are for IGBT and SiC technologies in electric vehicle traction inverters.

The EiceDriver devices support the firm's HybridPack Drive G2 fusion module, a plug-and-play power module that implements a combination of silicon and silicon carbide (SiC) technologies.

The pre-configured third-generation products, 1EDI-302xAS (IGBT) and -303xAS (SiC and fusion), are AEC-qualified and ISO 26262-compliant, for traction inverters in xEV platforms.



The 1EDI-3025AS, -3026AS and -3035AS provide an output stage of 20A and drive inverters of all power classes up to over 300kW. The -3028AS and -3038AS with an output stage of 15A are for entry-level battery and plug-in hybrid EV inverters as well as the excitation circuit of externally excited synchronous machines.

A tunable soft-off feature provides short-circuit performance to support the latest SiC and IGBT technologies.

Monitoring functions, such as an integrated self-test for desaturation protection and overcurrent protection, improve the handling of latent system errors while the primary and secondary safe-state interface enables versatile system safety concepts.

In addition, a continuously sampling 12bit delta-sigma ADC with integrated current source can read the voltage directly from temperature measurement diodes or an NTC.

The gate drivers also provide reinforced insulation according to VDE 0884-17:2021-10 to enable safe isolation following standard qualification and production testing procedures.

Furthermore, the compact package (PG-DSO-20) and compatibility with the latest power stage technologies help users drive system integration and reduce design cycle times.

IC helps shrink battery backup systems

A battery protection IC from Ablic operates from -40 to +125˚C, and lets manufacturers replace multiple nickel hydride batteries with a single lithium battery in emergency backup systems.

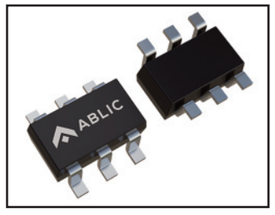
The S-19161A/B exceeds the conventional +85˚C limit of most protection ICs, enabling enhanced protection for one-cell automotive batteries and improving safety in high-temperature applications.

Overcharge detection accuracy is ±15mV with three-level discharge overcurrent protection to isolate abnormal current in safer areas. This improves detection voltage accuracy and application device safety.

Overcharge detection voltage is 3.5 to 4.8V ±15mV, and overdischarge detection voltage 2 to 3V ±5mV. Short-circuit detection voltage is 0.02 to 0.10V ±5 or ±4mV.

Current consumption during operation is up to 4.0μA and during power-down up to 50nA.

Designed for e-call systems and telematics control units, it meets PPAP requirements and is undergoing AEC-Q100 grade-one certification.





MLCC extension

TDK has expanded its CGA series for automotive and C series for commercial MLCCs to 10nF at 1250V in 3225 size (3.2 by 2.5 by 2.5mm), with C0G characteristics for Class I dielectric.

Circuits using SiC mosfets, which can withstand high temperatures and high voltages, are being adopted, and more circuits are using higher voltages and currents to reduce EV charging times. With this, the demand for high-voltage resistance for resonant and snubber capacitors grows.

C0G products change their capacitance only slightly over temperature and voltage, making them suitable for such uses.

These MLCCs are high voltage resistant. This makes it possible to reduce the number of MLCCs mounted in series.

Compared with the firm's previous products, it can reduce the heat generated and thus help prevent excessive heat in the applications.

Mass production has started.

Packet switches comply with PCIe 4.0

PCIe generation 4.0 switches from Microchip come in variants to support packet switching for automotive and embedded computing applications.

The PCI1005 is a packet switch which expands a single host PCIe port to as many as six endpoints. The PCI1003 device enables multi-host connectivity through non-transparent bridging and is fully configurable to support from four to eight ports.

All devices in the Switchtec PCI100x 16-lane family are compliant with the PCI-Sig generation-five specification and operate up to 16GT/s.

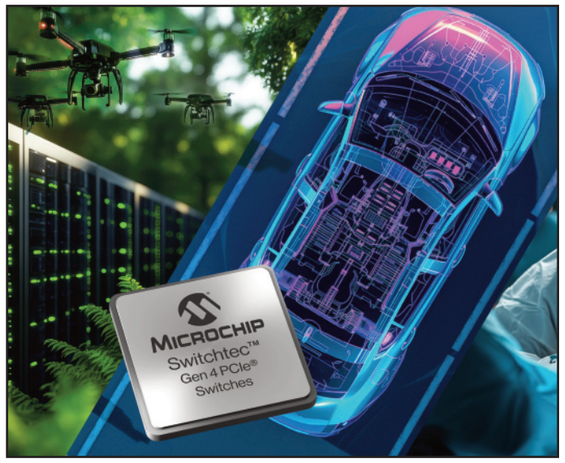
High-speed DMA is supported on all variants. Switchtec technology features include automatic error reporting (AER), downstream port containment (DPC) and completion timeout synthesis (CTS).

Devices are available in commercial (0 to +70˚C), industrial (-40 to +85˚C) and automotive grade-two (-40 to +105˚C) ambient temperature ratings.

The firm's portfolio of PCIe switches provides high-density, low-power and reliable options for applications such as data centres, GPU servers, SSD enclosures and embedded computing.

The portfolio also includes Flashtec NVMe controllers and NV-ram drives, Ethernet phys, and switches, timing products, and flash-based FPGAs and SoCs, supporting markets such as storage, automotive, industrial and communications.

The PCI1005 and PCI1003 switches are available in limited sample quantities.



Mosfets deliver high-current switching

High-power 100V n-channel mosfets from Renesas deliver high-current switching for motor control, battery management, power management and charging.

End products include electric vehicles, e-bikes, charging stations, power tools, data centres and uninterruptable power supplies (UPS).

The Rexfet-1 mosfet wafer manufacturing process helps the devices reduce on-resistance by 30 per cent, contributing to lower power loss.

The process also lets the mosfets offer a ten per cent reduction in Qg characteristics (the amount of charge needed to apply voltage to a gate) and a 40 per cent reduction in Qgd, the amount of charge that needs to be injected into the gate during the Miller Plateau phase.



The RBA300N10E-ANS and -HPF mosfets are available in standard TOLL and TOLG packages that are pin-compatible with devices from others, and 50 per cent smaller than traditional TO-263 packages.

The TOLL package also has wettable flanks for optical inspection.

They are available in production volumes. A reference design with application note helps shorten design cycles.

The firm has combined the mosfets with compatible devices from its portfolio to offer a 48V mobility platform and three-in-one electric vehicle unit comprising inverter, onboard charger and DC-DC converter.

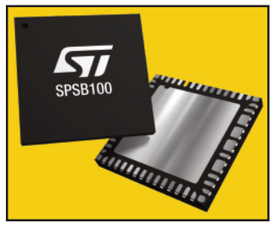
These designs are technically vetted architectures from mutually compatible devices that work together seamlessly to reduce risk.

PMIC suits functional safety use

A configurable power-management IC from ST Microelectronics is for general-purpose and functional-safety applications throughout vehicles.

The IC is for highly integrated processors such as Stellar automotive microcontrollers and lets users programme the power-up sequence and fine-tune output voltages and current ranges.

This is to help meet system requirements.



The SPSB100 can be used throughout vehicles, in zonal control unit (ZCU), vehicle control platform (VCP), body control (BCM) and gateway modules.

Three switched-mode buck converters and two linear voltage regulators (LDOs) supply the voltage rails required for the system microcontroller and can power external peripheral loads and sensors.

Additionally, there are two wake-up inputs and failsafe functionalities. An internal boost controller stabilises the power during transients such as cold-cranking pulses, start and stop operation, and weak battery conditions.

All the buck converters have overcurrent detection and current limiting for safety, with built-in soft start to prevent excessive inrush currents. Two of the converters can deliver up to 3A output current at a selectable output voltage of 3.3, 5 or 6.5V. The third can deliver up to 6A at 3.3, 1.25, 1.2, 1.1 or 0.98V.

One LDO has a fixed 5V output capable of sourcing up to 120mA with 2% accuracy. The second can be configured to track any of the buck converters at 3.3 or 5V.

A high-side driver provides open-load and overcurrent diagnostics.

Features include integrated non-volatile memory (NVM) for storing the output-voltage values and power-up sequence.

An SPI port allows programming and supports control and diagnostics, allowing designers to use the device in many electronic platforms that require different rails and peripherals.

A deep-sleep mode draws less than 40μA quiescent current. There is also a dedicated interrupt pin for failure communication, a microcontroller-reset generator, and overtemperature warning and protection.

Documentation is available for applications that must fulfil ISO 26262 Asil requirements for functional safety.

Although fully configurable, the PMIC is supplied in one of two pre-programmed configurations, SPSB100B or SPSB100P, respectively, for directly powering the core or the internal switched-mode power supply of the microcontroller.

It is AEC-Q100 qualified and available in an 8 by 8mm VFQFN56 package.

Laser diode improves distance measurement

A high-output laser diode from Rohm enables precise distance measurement and spatial recognition for lidar-equipped adas.

The RLD8BQAB3 also targets applications such as drones, robot vacuum cleaners, automated guided vehicles and robots.

The technology delivers narrow laser emission widths, supporting accurate long-distance lidar with its 125W, eight-channel array design.

This 3.3 by 5.6mm surface-mount infra-red laser diode is optimised for time-of-flight systems. It has eight emission areas, each 300μm wide, per element, mounted on a high-heat-dissipation submount.

A clear glass cap ensures high beam quality by preventing light scattering caused by scratches.

The product also enables flexible irradiation options, including individual and simultaneous emissions, achieving 1kW-class output.



Mating technique stabilises connection

A patent-pending mating technique from Molex can ensure secure and stable connections while maintaining electrical ground continuity.

The MMCX power over coax (PoC) suits space-constrained applications where reliable RF connections and continuous power delivery are paramount, such as automotive LCD mirrors, driver monitoring systems and industrial sensors.

The PoC product alleviates persistent reliability problems and is backwards compatible with IEC 61169-52 MMCX jack receptacles to facilitate seamless product upgrades.

This alleviates the need to redesign existing PCB receptacles, which can save time while reducing costs associated with product integration.

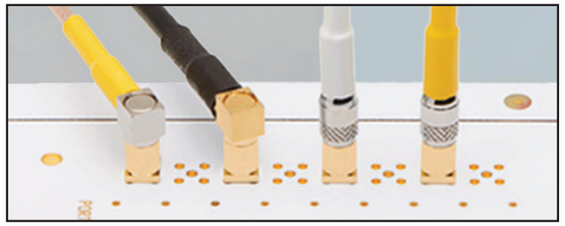
Compliance with current and future standards offers a future-proof option to meet evolving RF connection and power delivery requirements.

The product is 30% smaller than traditional MMC connectors, making it suitable for those seeking to replace larger, heavier MCX connectors as well as more robust and reliable performance.

MMCX PoC is especially advantageous where separate power and data connectors are either impractical or undesirable. It is being tested and deployed in various agriculture, automotive and industrial automation applications.

It accommodates the reliability requirements for GPS antennas, intelligent transport management systems and wireless meter readers.

PoC right-angle and straight-plug cable assemblies are available for RG178, Condumex RG174LL, RG316 and Dacar 462 cable types.



Wifi 7 modules for infotainment

A Wifi 7 module from U-Blox can improve Apple CarPlay and Android Auto user experiences.

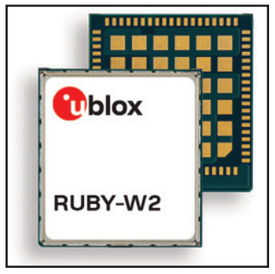
The Ruby-W2 module uses Qualcomm Wifi 7 capabilities to help OEMs enhance the user experience of in-vehicle infotainment and telematics.

The module brings multiple benefits of Wifi 7, including higher throughput, support for more concurrent users and lower latency, resulting in better network availability and user experience in vehicles.

Typical use cases span infotainment, navigation and telematics.

The module supports 2x2 mimo multi-link operation. It provides simultaneous performance on 5 and 6GHz bands, overcoming the 2.4GHz congestion.

The module also incorporates Bluetooth 5.4 with support for Bluetooth LE Audio.



AI chiplet SoC



An automotive AI accelerator chiplet SoC has been jointly developed by BOS Semiconductors and Tenstorrent.

The Eagle-N incorporates Tenstorrent's Tensix NPU core, which is tailored for automotive use and delivers AI performance and energy-efficient operation for adas and in-vehicle infotainment (IVI) domains.

It provides up to 250Tops NPU performance along with PCIe gen-five and UCIe high-speed interfaces to build an add-on NPU and AI subsystem to develop autonomous driving functions and immersive in-cabin experiences.

Every kind of adas and IVI processor in the market can be connected with Eagle-N, and OEMs and tier-one suppliers can implement Eagle-N on top of their existing adas or IVI domain computing system to upgrade its AI performance.

In addition to Eagle-N, BOS is also committed to developing Eagle-A, which is a one-chip adas SoC that can be used with Eagle-N.

Photorelay with 900V breakdown voltage

An automotive-compliant transistor output photorelay from Toshiba has a breakdown voltage of 900V, and is suitable for 400V battery-related controllers.

Housed in an SO12L-T package, the TLX9150M delivers a minimum breakdown voltage of 900V with a maximum reaction time of 1ms. This is critical for control-sensitive applications such as battery and fuel-cell control and battery management systems for monitoring voltages, and detecting mechanical relay sticking and ground faults.

It consists of an infrared emitting diode optically coupled to a photo-mosfet, providing electrical isolation between the primary (control) side and the secondary (switch) side, enabling safe switch control across varying ground potentials.

Trigger current is more than 3mA, which reduces energy consumption.

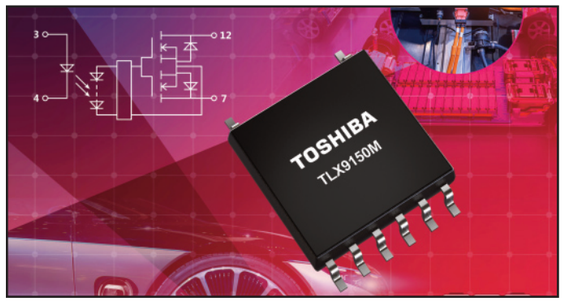
In addition, this device's off-state current is 100nA maximum at ambient temperature, drawing little power while inactive.

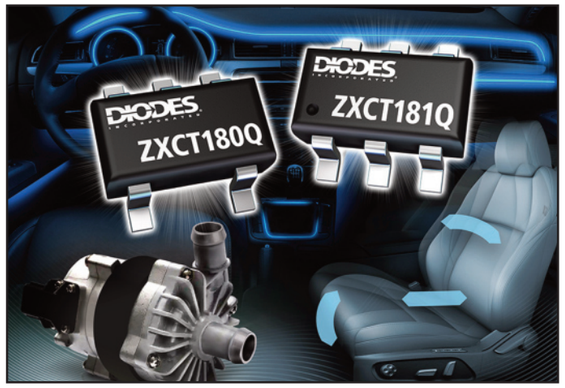
The IR LED has a forward current of 30mA, while its photodetection element has an on-state current rating of 50mA at ambient.

Form factor is 7.76 by 10 by 2.45mm, which is 25% smaller than the firm's existing SO16L-T package. This helps shrink the battery unit and allows cost reduction.

The pin pitch and pin layout of the two package sizes are the same, enabling a common circuit board pattern design.

This normally-open (1-Form-A) device exhibits 8mm minimum creepage and clearance distances and 0.4mm minimum insulation thickness, confirming effective isolation even in operating temperatures from -40 to +125˚C.





Current monitors enable rapid fault detection

Automotive-compliant current shunt monitors from Diodes enable high-precision voltage sensing for rapid fault detection.

The ZXCT18xQ single-stage instrumentation amps accurately measure very small sense voltages across a wide range of common-mode voltages up to 26V while operating from a 2.7 to 5.5V supply.

Automotive applications include ambient lighting control, battery management, heated seats and other body control systems.

The ZXCT180Q supports unidirectional current measurement, and the ZXCT181Q also supports bidirectional flow. The ZXCT180Q has two pin assignment configurations – versions A and B – with its out pin at different locations, allowing flexibility in PCB layout.

When the ZXCT181Q is used for bidirectional current sensing, such as those found in battery management systems, a voltage is introduced to the ref pin. This action serves to offset the output voltage. For unidirectional current flow, the ref pin is tied to ground.

Both have four fixed voltage gain options of 20, 50, 100 and 200V/V.

These devices measure voltages across shunts at common-mode voltages from -0.3 to 26V, independent of the supply voltage with a maximum supply current of 370μA. They support small-signal bandwidths as high as 400kHz at 20V/V and fast large-signal slew rates of 2V/μs.

These capabilities let them detect rapid changes in the sensed current as well as quickly slew the output for applications that require a quick response to input current changes.

Operating range is -40 to +125˚C.

Software enhances signal analysers for mm-wave

Anritsu has added software functions to its MS2830A, MS2840A and MS2850A signal analysers to extend the spectrum measurement frequency to encompass the mm-wave band by connecting VDI or Eravant external mixers.

Using mm-wave sensing enables detection of subtle changes in human body surfaces caused by breathing and heartbeat, as well as identifying the position of people and objects. These advancements open applications up in medical care, automotive and facial-recognition security.

This suits automotive radar technology, which is undergoing advancements with the development of wideband 79GHz band radar capable of detecting small targets such as pedestrians and bicycles at high resolution.

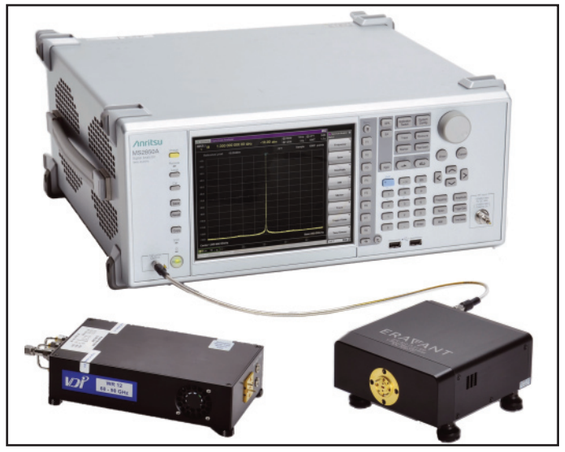
The mid-range benchtop signal analysers span the RF to microwave and millimetre-wave frequency bands and accommodate narrow-band to wide-band signals.

For spectrum, signal and phase-noise measurements, the frequency range can be extended by installing the firm's MX284090A external mixer connection function, which supports connection of a recommended external mixer from Eravant or VDI to the signal analyser's first local output port.

An image response can occur when measuring with external mixers lacking preselectors to eliminate unwanted signals, causing erroneous reception of signals at different frequencies from the intended signal. These analysers have intermediate frequencies of 1.875 or 1.8755GHz, facilitating conversion of received high-frequency signals to manageable frequencies for processing.

This enables suppression of image-response effects up to 7.5GHz using a proprietary preselector simulation function, facilitating measurement of hard-to-distinguish variable signals.

The single coaxial-cable connection between the signal analyser and recommended external mixers enhances flexibility in positioning the analyser and allows the external mixer to be placed close to the device under test.



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72 Westwood Road, Nottingham NG2 4FS, UK

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ISSN 2055-1177

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