VEHICLE electronics

The monthly magazine for automotive electronics engineers

NXP and VinFast reveal EV collaboration at CES

At CES in Las Vegas, NXP and VinFast announced a collaboration to develop smarter, cleaner and connected electric vehicles.

They will engage in the early development phases of VinFast automotive projects, leveraging NXP products. VinFast seeks to leverage NXP's processors, semiconductors and sensors.

Additionally, NXP will share its partner ecosystem with VinFast to help the company accelerate time-to market.

Together they will establish a joint expert collaboration to develop products based on NXP's reference evaluation platforms and software layers with the purpose of designing and building electric vehicles.

VinFast is part of Vingroup, the largest conglomerate in Vietnam. Other companies in the group will also be able to leverage NXP's technology for smart cities applications.



VinFast and NXP announce partnership at CES

"Our collaboration with NXP will help streamline our next-generation designs, technology and manufacturing," said Le Thi Thu Thuy, chairwoman of VinFast. "Our future all-electric vehicle fleet will leverage NXP's innovative, high-quality semiconductors to enable safe, secure and electric mobility as well as IoT that removes barriers for the citizens of today's smart cities."

Lars Reger, CTO of NXP, added: "We are excited to collaborate with VinFast, a company that is well positioned to identify and take advantage of the opportunities at the crossroads of automotive and smart cities. We look forward to bringing our strong portfolio, expertise and ecosystem to a relationship based on inspiring and shared future vision."

• Round-up of CES on pages 13 to 24

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Wind River and GuardKnox set design framework

GuardKnox is collaborating with Wind River to lay the framework to improve automotive domain flexibility.

Combining the Wind River VxWorks rtos and GuardKnox's service-oriented architecture (SOA) and tool suite could serve as a roadmap for engineers and developers.

GuardKnox is an automotive technology company building secure-by-design software and firmware products.

The combination of GuardKnox's core framework and tools suite with VxWorks could provide OEMs with another layer of flexibility for software distribution, decreasing development and deployment time leading to shorter time to market for applications.

Adaptive manufacturing, on-the-edge processing and intelligent systems are becoming the go-to production and development methods for the automotive industry.

The combination of GuardKnox and Wind River lets users build SOA-based applications on VxWorks to use technologies such as OCI containers for rapid applications deployment.

"Our collaboration with GuardKnox will enable engineers and developers to advance the rollout of placing innovative features directly into the hands of drivers," said Christina Ungaro, vice president at Wind River.

Moshe Shlisel, CEO of GuardKnox, added: "The automotive industry is at a significant juncture as the shift towards the software-defined vehicle continues to occur at a rapid pace. The GuardKnox and Wind River collaboration ensures OEMs and tier-ones are able to bring new vehicle features to market in a matter of weeks, and to upgrade existing functionalities as the market demands."

Hyundai shows vision at CES



At January's CES in Las Vegas, Hyundai Mobis president Cho Sung-hwan presented his vision of a mobility company that provides an integrated platform combining software and hardware.

Hyundai Mobis also announced its plan to develop a level-three integrated autonomous driving controller and software platform with Qualcomm's Snapdragon Ride platforms.

This growth strategy was demonstrated in M.Vision To, a purpose-built concept vehicle unveiled by Hyundai Mobis at the show. This electric autonomous vehicle combines its drive module battery system to pillar modules centred on an e-corner system, autonomous driving sensor and communication lighting.

It offers scalable shapes and sizes, and extends freedom of movement including crab driving and zero-turn with 90 degrees rotating wheel. Applications range from driving in narrow downtown streets to transporting cargo.

Hyundai Mobis is to develop a software platform, where the autonomous driving controller is the key component for implementing level-three or higher autonomous driving. Development is due to be finished in the first half of this year.

• Round-up of CES news on pages 13 to 24.

Continental adds Elektrobit software to Autosar frame



Continental HPC with Elektrobit software

Elektrobit's software is available in the Continental Automotive Edge (CAEdge) framework, providing automakers and tier-one suppliers with full-stack software-hardware architecture for developing software-defined vehicles.

CAEdge brings together Continental's high-performance computer (HPC) with Elektrobit's production-proven software for Classic and Adaptive Autosar and over-the-air (OTA) updates in one platform.

This can save car makers time and resources by eliminating the process of sourcing and integrating software on their own.

Continental and its Elektrobit subsidiary have collaborated for many years on HPC-based projects, and this experience and integration of hardware and software lets car makers move seamlessly from predevelopment to series development of vehicles, using the same hardware, software and tools.

One commercial vehicle OEM was able to start developing applications within two weeks of using the framework; the alternative approach to sourcing and setting the necessary software development stack would have taken several months.

"Software-defined vehicles require accelerated development of customer-facing systems," said Martin Schleicher, head of software strategy at Continental. "Elektrobit and Continental have worked together on many HPC projects. We're now pleased to extend our field-tested products and expertise to all OEMs and tier-ones."

The following Elektrobit products are integrated in the CAEdge framework HPC development kit: EB Corbos development suite for Adaptive Autosar; EB Tresos AutoCore implementation of Classic Autosar-compliant basic software for automotive ECUs; and EB Cadian Sync toolchain for OTA software and firmware updates.

"All OEMs are challenged with creating the architectures for their next-generation vehicles, their unique automotive OSes," said Michael Robertson, vice president at Elektrobit. "Key to these are standardised software platforms for Classic and Adaptive Autosar and OTA updates. By partnering with Continental, we're saving our customers the time, money and hassle associated with integrating these on their own.

"This frees up their time and budgets to focus on what's really important: developing the customer-facing applications that will differentiate their vehicles from the competition."

Visteon and Qualcomm cockpit domain controller

Visteon and Qualcomm are developing a cockpit domain controller for global automakers.

Visteon's SmartCore cockpit domain controller software was developed in India and integrates digital instrument clusters and Android-based infotainment with cloud-enabled applications such as navigation, radio, multimedia playback and voice smart assistants.

The SmartCore platform is over-the-air software upgradeable and has an integrated, white-label app store with curated apps for delivering customised and regionalised experience for drivers across the globe.

With new models from automakers using four or more cameras externally and up to two cameras inside the cabin, it also includes vision processing capabilities to offer surround vision, driver monitoring and remote surveillance through a smartphone app.

"The automotive cockpit is emerging as a critical competitive battleground for the industry, and SmartCore software addresses the consumers' demand for an experience that matches their expectations," said Sachin Lawande, Visteon CEO.

Integrity and SaeSol protect connected vehicles

Integrity Security Services has entered a partnership with SaeSol Tech to deliver security technology so automotive manufacturers can protect connected and autonomous vehicles.

This brings together Integrity's automotive security platforms for device lifecycle management (DLM) and V2X connectivity with integration, support and development services for global automotive manufacturers.

"Partnering with SaeSol Tech to deliver our industry-leading security for customers in Asia will allow us to provide the very best security design, support and technology integration to support the next generation of connected vehicles," said David Sequino, president of Green Hills subsidiary Integrity.

In 2019, Integrity delivered Australia's Queensland C-ITS security credential management system (SCMS) based on the European V2V standards and including the current Australian C-ITS Root CA.

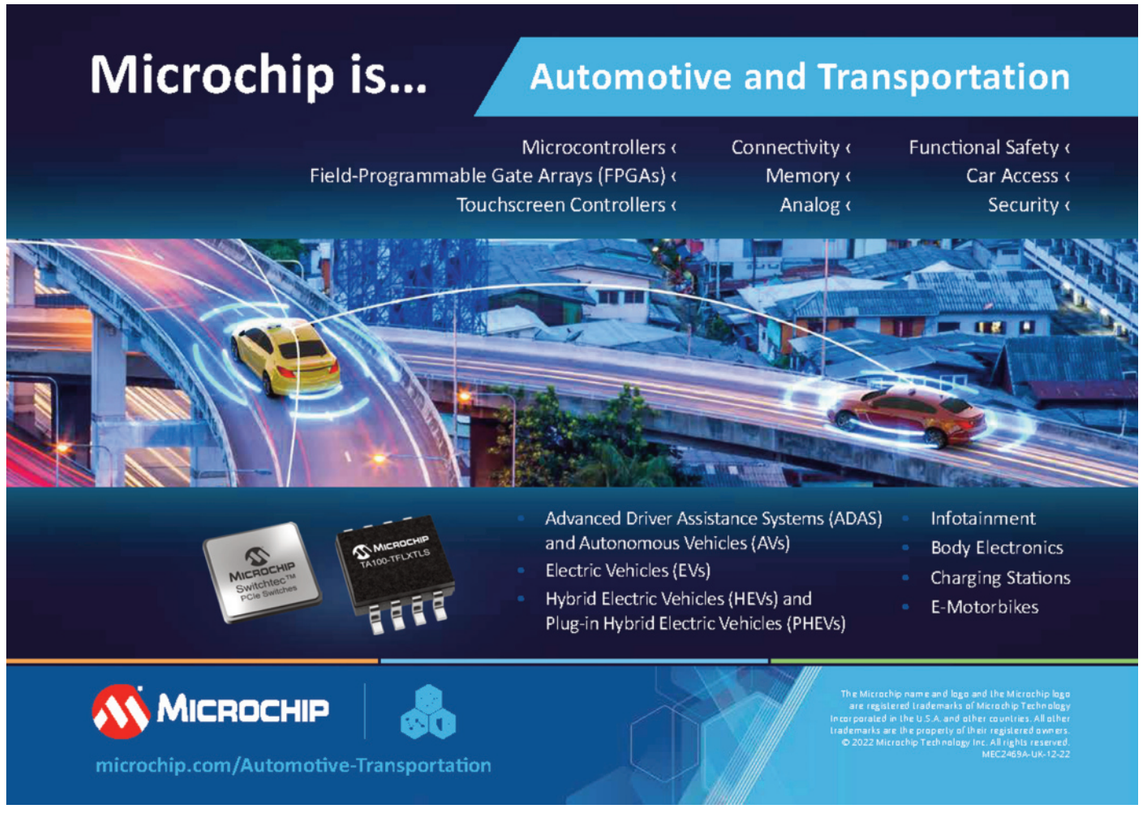
In addition to these production-grade systems, Integrity provides the SCMS infrastructures used throughout the world in various pilots and trials in all markets.

Working with SCMS Manager, the North American V2X authority, Integrity operates the V2X Root CA and certificate management system that supports all interoperable connected vehicle deployments in North America. This Root CA has attained and maintained the WebTrust for Certification Authorities Trust Services Seal.

"This technology is a key enabler for widescale connected and autonomous vehicle production," said Brian Romansky, Integrity's general manager for connected vehicles.

Through the partnership, SaeSol gains access to Integrity platforms and intellectual property, and clients from both companies in Asian markets gain access to expert design, integration, deployment and support.

SaeSol brings V2X infrastructure and client software expertise.



Reference design combines hardware and software

Combining hardware from HL Klemove and software from Sonatus has produced a reference design to accelerate development and exploration of how core vehicle networks are designed.

Autonomous driving electronics firm HL Klemove and software-defined vehicle specialist Sonatus created the automotive gateway reference design to accelerate development and production of automotive systems from conventional gateways to zonal architectures.

"This collaboration forms a valuable foundation to unlock new value and possibilities for the future of mobility," said Pal-Joo Yoon, CEO of HL Klemove. "Together our innovations future-proof the fundamental shift towards new EE architectures and software-defined vehicles."

Jeffrey Chou, CEO of Sonatus, added: "With modern EE architectures, the industry is going through a transformation similar to the evolution in data centres years ago. As the industry evolves the vehicle's compute, network and storage, an advanced vehicle subsystems integrated approach is required, drawing on sector-specific expertise in hardware and software working together."

The hardware is based on the NXP S32G vehicle network processor and can support safety architectures up to ISO 26262 Asil D.

"Our NXP S32 automotive platform is well-positioned to serve processing needs from central compute to zonal end nodes," said Brian Carlson, marketing director at NXP. "The new reference design enables developers to explore a wide range of software-defined vehicle applications from service-oriented gateways to zonal controllers."

Through high-speed interfaces for Can-FD and Automotive Ethernet, the system enables high performance communications both within the vehicle and to and from the cloud, including for OTA updates.

It includes a Marvell Brightlane 88Q5192 Automotive Ethernet switch targeted for Asil B. It also has 256Gbyte of automotive-grade NVMe SSD from Micron.

The Sonatus software helps automakers create a foundation for dynamic software-defined vehicles that can evolve and adapt in real time.

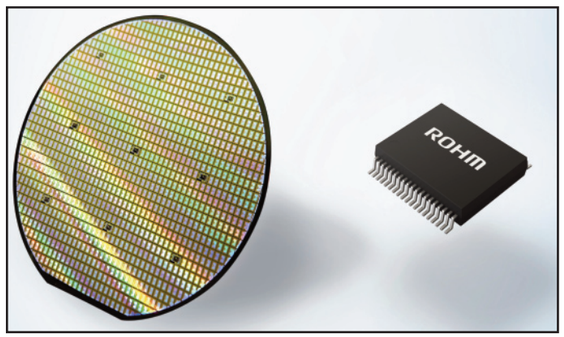
This platform spans from vehicle network and services management to value-added capabilities including dynamic data collection, vehicle automation, security and critical aspects needed for future zonal vehicle architectures.

Hitachi picks Rohm SiC mosfet for inverters

Rohm's latest SiC mosfets are to be used in Hitachi Astemo's inverters for electric vehicles.

These will contribute to longer range and smaller systems in EVs in Japan and overseas from 2025.

Hitachi has picked Rohm's fourth-generation SiC mosfets and gate driver ICs.



Rohm's SiC mosfets and gate driver IC

The inverter plays a central role in the drive system, and needs to be made more efficient to extend the cruising range and reduce the size of the onboard battery, increasing the expectations for SiC power devices.

As the first supplier in the world to begin mass production of SiC mosfets in 2010, Rohm continues to develop these technologies including the fourth-generation mosfets that deliver improved short-circuit withstand time along with low on-resistance.

This makes it possible to extend EV cruising range by reducing power consumption by six per cent compared with IGBTs, as calculated by the international standard WLTC fuel efficiency test, when installed in the main inverter.

This marks the first time SiC devices will be adopted for Hitachi Astemo's main inverter circuit to improve performance.

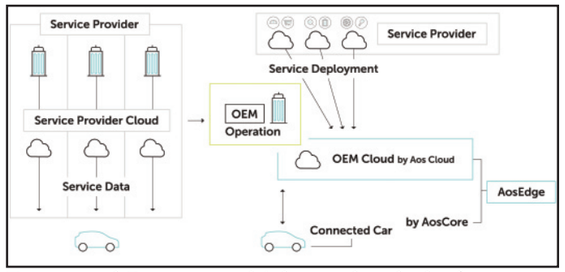
Epam and Renesas develop vehicle-to-cloud platform

Epam Systems and Renesas have developed a vehicle-to-cloud (V2C) platform they say represents the next phase in the evolution of connected cars.

The AosEdge platform can provide a more efficient way to deliver in-vehicle software and simplify how different software elements operate in the same environment, so OEMs can develop true software-defined vehicles.

The platform combines Epam's digital platform expertise with Renesas' embedded automotive software to provide a complete software infrastructure from installation to operation for vehicles connecting to the cloud.

"We're excited to expand what's possible in the connected automotive experience by offering a platform that helps automakers and third-party OEMs seamlessly and securely interact with one another to deliver compelling, much desired digital vehicle experiences," said Alex Agizim, CTO at Epam. "As software releases and updates for vehicles become easier, we look forward to the many unique ideas that will be introduced to the automotive market. When the vehicle is software, the process of upgrading is streamlined, making it easier to keep pace with innovation and the evolving consumer appetite for next-gen digital experiences."



Epam and Renesas vehicle-to-cloud platform

The development of the platform stems from the growing need to create V2C platforms that are as reliable and seamless as smartphones. Due to complex vehicle connectivity requirements, most cars are unable to receive software updates automatically after they have come off the manufacturing line, making it difficult for these vehicles to take advantage of the latest safety features and services.

With this platform, these critical software updates will be delivered using a cloud-to-edge computing platform, similar to the way smartphones receive over-the-air (OTA) updates via the cloud.

"We developed the V2C platform by partnering with Epam and leveraging our experience in helping OEMs around the world transform their EE architectures," said Takeshi Fuse, head of business development at Renesas. "We are confident that this platform will contribute to the growth of the automotive industry and our society by making people's lives easier."

AosEdge is a V2C platform that transforms the way OEMs and service providers install and manage services or applications in vehicles. It consists of AosCloud on the cloud side provided by Epam and AosCore on the vehicle side implemented in Renesas' R-Car SoC.

The platform has been proven to work with Epam's cloud environment and Renesas' R-Car SoC for automotive applications. Therefore, OEMs and service providers only need to develop the software they want to deliver and continue to offer unique services to users.

BMW shares digital key across Apple and Google

BMW has made it possible to share a digital key between iPhone and Android devices. Previously, keys could only be shared via Apple iMessage.

There is no longer a need for a specific app or a set method of transmission. Instead, keys can be passed to friends or family from the wallet using the native share function known from many apps.

The key can be sent by email, SMS or other messaging service such as WhatsApp. The recipient does not require a specific app or a BMW ID.

If the owner and recipient are standing next to each other, the key can also be shared via Apple AirDrop or Android Nearby Share.

Light engine uses 16,384 pixels for headlights

Nichia and Infineon have developed a high-definition (HD) light engine with 16,384 micro-LEDs for headlight applications.

Automotive LED lighting technology has developed rapidly in recent years as a means for vehicle manufacturers to enhance driving comfort and road safety. Matrix LED technology for adaptive driving beams has become an important headlight feature for selective road illumination.

Three years ago, Nichia and Infineon announced they were working together on this. Now, both companies are launching a fully integrated micro-LED light engine for HD adaptive driving beam applications.

The micro-LED matrix will be seen in a German premium vehicle this year.

"It combines high-definition resolution with industry's highest light output," said Yusuke Yamazaki, head of marketing at Nichia. "This enables a new automotive lighting experience by providing four-times wider field-of-view with significantly higher light output than any other current micro-mirror-based HD matrix light."

For this reason, the HD light can warn drivers of hazards by highlighting people or objects on or by the side of the road. It can also project markings on the road to guide the driver through a construction site or intersection.

In addition, functions such as the glare-free high beam or bending light work more precisely and smoothly compared with current adaptive driving beams.

"This takes the driver's road safety and driving comfort to a new level," said Yamazaki.

The HD light engine uses Nichia's micro-LED technology and an integrated LED driver IC from Infineon that can drive all 16,384 micro-LEDs individually using pulse-width modulation (PWM) control.

"Our innovative μPLS is much more energy efficient than current HD matrix lighting, contributing to saving global CO_2 emissions and extending the range of electric vehicles," said Andreas Doll, Infineon senior vice-president. "Furthermore, we enable the vision of our customers to deploy fully digital light on the road, saving them overall system cost at a very small form factor at the size of a single semiconductor chip."

The driver IC monitors each micro-LED separately and provides on-chip temperature monitoring, improving thermal control. Integrated video interfaces enable high-speed transmission of the video signal from the light pattern generator unit.

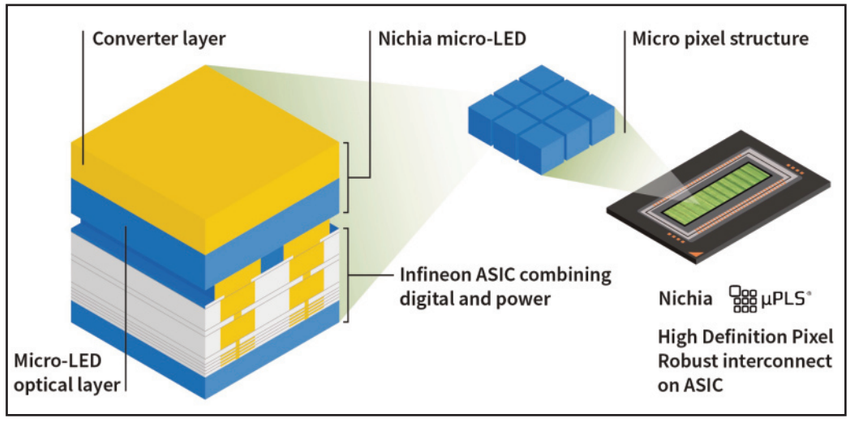
Unlike current HD matrices, the driver IC only activates the LEDs that are actually needed for a light pattern.

This increases the energy efficiency of the light engine at much smaller form factor compared with micro-mirror-based HD matrices.

This allows for smaller and slimmer headlamp designs. In addition, the HD light engine enables adjustments that can be digitally programmed at the factory or activated by the vehicle manufacturer or driver on demand.

For example, the different requirements of left- and right-handed drivers can be considered, increasing usefulness.

Founded in 1956 as a specialty chemical producer, Nichia quickly became a specialist in luminescent materials (phosphors). It developed and commercialised the first high-brightness blue LED in 1993 and the first white LED in 1996. Additional nitride-based LEDs in various colours were developed, including ultraviolet and visible laser diodes.



Reducing design and production complexity for vehicle manufacturers



Alibaba gives Geely digital makeover

Alibaba Group is giving Chinese automaker Geely a digital makeover.

This will include areas such as cloud computing, sustainable development and digitalisation.

Leveraging Alibaba's digital capabilities and Geely's expertise in smart vehicles, they will work on building digital technology for the automotive industry.

Connected, electric and autonomous cars are gaining ground in China. The number of intelligent and connected vehicles in China will reach 28 million by 2025, accounting for 82% of cars in the country, according to China's state agency the National Development & Reform Commission.

Geely, one of China's largest car makers, has been making the leap from a traditional automaker to a mobility tech company. It has launched electric vehicles with intelligent capabilities and doubled down on smart technologies to improve cars' autonomous driving experience.

As cars become computers on wheels, cloud computing and artificial intelligence are becoming essential.

Alibaba's cloud computing arm will help Geely boost computing efficiency, and work with Geely's research institute to explore building an intelligence computing platform.

It will also work with Geely to build data-driven manufacturing capabilities, powered by cloud-native technology.

More than 70% of automobile companies in China rely on Alibaba for cloud computing services. Electric vehicle maker Xpeng worked with Alibaba earlier last year to launch a computing platform to accelerate AI training for its autonomous driving model.

Geely will use Alibaba's TMall ecommerce platform for marketing and as a one-stop shop for consumers that want to buy cars online, from searching for their favourite models to vehicle pickup and delivery.

Consumers can book a test drive and place their order on Geely's flagship store on TMall and its livestreaming channel.

ASA camera MoU

Connectivity company Aviva Links has signed a memorandum of understanding (MoU) with Omnivision to develop automotive cameras based on the Automotive Serdes Alliance (ASA) specifications.

The sensors will combine Aviva's high-speed connectivity with Omnivision's image sensor technologies, paving the way towards the development of intelligent and autonomous vehicles.

Since the founding of ASA in 2019 by OEMs and tier-one suppliers, the alliance has gained traction in the automotive industry and emerged as a standard of choice for OEMs. With more than 100 active members, ASA has amassed an ecosystem consisting of car manufacturers, tier ones, semiconductor vendors, cable and connector manufacturers, test tool vendors, and test houses.

These companies are working to build an ASA ecosystem that enables the standardisation and optimisation of serdes technology for use in software-defined automobiles.

"Camera systems with high-speed data transfer inside vehicles are going to be critical for the next wave of intelligent vehicles," said Kamal Dalmia, COO at Aviva.

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ADI and Seeing Machines accelerate driver monitoring

Analog Devices and computer vision company Seeing Machines are working together to develop driver and occupant monitoring systems (DMS and OMS).

Long-haul driving and congested traffic are two scenarios where driver fatigue and distraction often occur and frequently cause accidents, resulting in injury or worse.

The collaboration pairs ADI's infra-red driver and GMSL gigabit multimedia serial link camera connectivity with Seeing Machines' artificial intelligence (AI) DMS and OMS software to support eye gaze, eyelid, head and body-pose tracking that more accurately monitors driver fatigue and distraction.

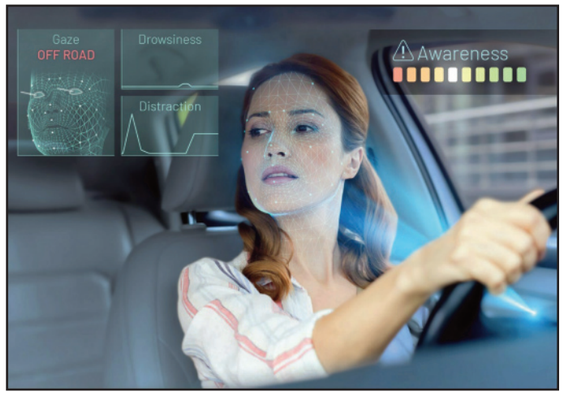
The combination will meet EC GSR general safety regulations and Euro NCap requirements. It is also conducive to enabling future occupant monitoring features and in-cabin camera placement options, previously unworkable due to challenges related to power efficiency, functional safety, hardware footprint and image quality.

Semi-autonomous driving systems rely on in-cabin DMS and OMS to recognise and address driver fatigue and distraction. These systems must operate in all lighting conditions and require proper infra-red lighting to ensure image quality frame-by-frame, necessary for eye tracking in real time.

The combination leverages ADI's infra-red driver for DMS and OMS, capable of delivering up to 100W of peak power in a compact and functionally safe manner. This allows for a non-intrusive, smaller camera module in the cabin.

Seeing Machines' AI software interprets signals from the optical hardware, monitors and diagnoses the problem, and combines with adas features to enable output signals to warn drivers and vehicle occupants when necessary.

"Seeing Machines exists to get people home safely, and our work with ADI aims to support semi-autonomous driving with increased safety levels to deliver what we call supervised automation," said Nick DiFiore, general manager at Seeing Machines. "ADI's proven automotive-grade, near-infra-red drivers and GMSL devices enable a sophisticated optical path to provide critical illumination and high-speed video bandwidth for real-world and real-time processing of interior cabin environments."



Cabin monitoring can be complex

Yin Wu, director at Analog Devices, added: "Cabin monitoring is complex and requires careful integration of infra-red illumination, image capture, data processing and algorithm layers to achieve a real-time response. Together with Seeing Machines, we are supporting the automotive industry to help reduce collisions and save lives."

Foretellix verifies and validates automated driving

Foretellix has developed safety-driven verification and validation for large-scale deployment of automated driving systems.

The approach addresses the growing gap between manual safety engineering and automated verification that hinders commercial deployment of automated driving.

Daimler subsidiary Torc Robotics has announced a multi-year collaboration with Foretellix to create virtual verification and validation capable of testing the millions of driving scenarios required to ensure the safe deployment of level-four autonomous trucks.

While levels three and four systems can operate most times in limited areas, they struggle to extend to larger areas, and there are too many edge cases where they fail.

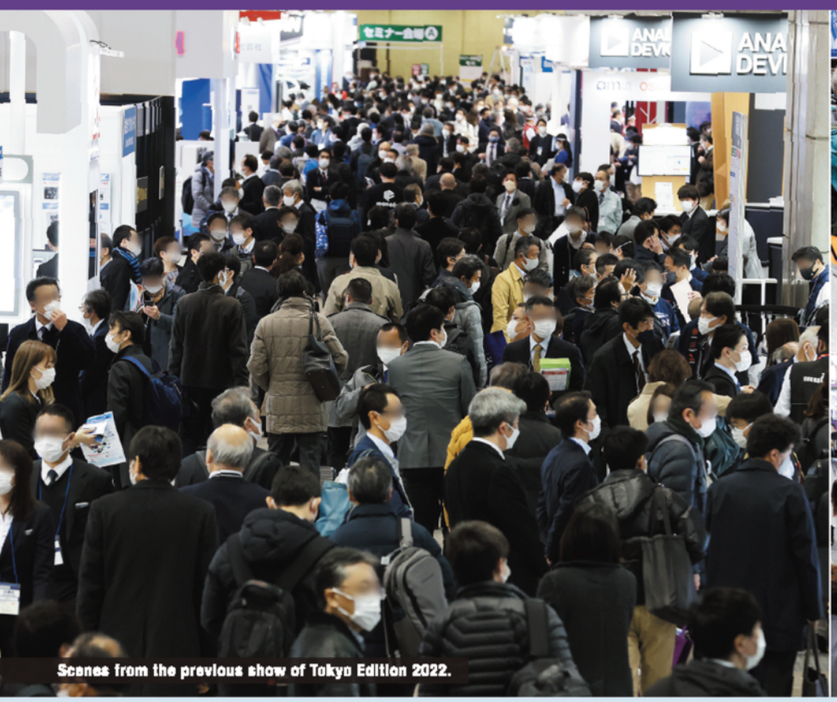
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Ferrari races ahead with Harman partnership

Ferrari is to use Harman's Ready Upgrade hardware and software to deliver upgradeable consumer electronics-level experiences into the cabin across its vehicles, quickly and cost effectively.

The deal extends to the racetrack, as Samsung subsidiary Harman becomes the exclusive in-cabin experience team partner of Scuderia Ferrari starting with the 2023 Formula One season.



Ferrari has announced a multi-year partnership with Harman

"Our partnership brings together two brands celebrated for excellence and for pushing the boundaries of technology and innovation," said Benedetto Vigna, CEO of Ferrari. "We look forward to working with Harman to extend our in-cabin experience advantage and deliver to our customers a drive like no other."

Harman revealed six road-ready products during January's CES in Las Vegas, see page 19, that deliver specific vehicle safety, well-being, entertainment and connectivity benefits. These included the Ready Upgrade products that help consumers easily upgrade their own vehicle experiences.

For Ferrari, Ready Upgrade adapts to its vehicle networks and tunes the performance without having to invest in large software development efforts, accelerating the creation of its differentiated and signature in-cabin experience.

"Harman and Ferrari share an expertise, tenacity and innovation mindset tailor-made for activating a new era of driving," said Christian Sobottka, president of Harman Automotive. "I have no doubt this combination will deliver experiences that will excite consumers and bring our value proposition of automotive-grade consumer experiences to life on the track and on the road."

Kia picks OnSemi SiC modules for EV

Hyundai has selected OnSemi's EliteSiC silicon carbide (SiC) power modules for the Kia EV6 GT electric vehicle, which can accelerate from zero to 96kmph in 3.4s and reach a top speed of 260kmph.

Within the traction inverter of a high-performance EV, the EliteSiC module enables efficient power conversion from the 800V DC of the battery to the AC drive for the rear axle.

The module's package reduces parasitics and thermal resistance and improves reliability using innovative interconnects. This leads to reduced power losses associated with DC-AC conversion along with reduced size and weight of the traction inverter, increasing performance and EV range by five per cent.

"Our collaboration with Hyundai and Kia is rooted in the superior performance of our EliteSiC technology," said Simon Keeton, executive vice president at OnSemi. "As important is our quickly growing, vertically integrated SiC supply chain that allows OnSemi to plan for the necessary scale to support high-volume production for EVs."



Kia EV6 GT electric vehicle



WHAT HAPPENED IN VEGAS?

A round-up of the news from January's Consumer Electronics Show (CES) in Las Vegas

Collaborators develop vehicle haptics display

Innovobot Labs, TDK, Microchip and BOE Varitronix have jointly developed an automotive haptics display.

TDK will supply its patented PowerHap actuators, for sharper feeling haptics. BOE Varitronix will provide the screen and related controllers, while Microchip will add its haptics electronics system, including amplifier and microcontroller. Innovobot Labs is responsible for overall system design and integration.

The project comes in response to a need for more cost-effective haptic technology in the automotive industry. Large dashboard screens that lack good tactile feedback are difficult to use.

Providing enhanced haptics to displays in cars and trucks lets designers add feel and texture to buttons, as well as sliders to touchscreen elements. This makes it safer for drivers when they interact with the displays.

Tier-level suppliers quote haptics at high prices because the available technology is challenging and risky. The product proposed by the project partners should lower the adoption barrier, allowing a broader number of suppliers to quote haptics more aggressively, with increased confidence in their ability to meet performance specifications.

"We are thrilled to be collaborating with Innovobot on the development of a new high-definition haptic display to experience the advantages of the PowerHap piezo technology," said Harald Kastl, executive VP at TDK. "At the same time, we are strengthening our integration know-how to support our customers in the automotive and industrial segments."

Jack Su, CEO of BOE Varitronix, added: "Each company is contributing expertise and resources from our unique diverse backgrounds to achieve new creative technological breakthroughs and co-create new value. We believe that working together, we will soon bring forth more high-end, diversified and integrated vehicle display products to the market."

And Guy Lafond, chief commercial officer at Innovobot, said: "This collaboration is a perfect illustration of our open innovation model, where companies from diverse backgrounds come together to move the human experience forward."



LG puts OLEDs on display

LG introduced automotive displays based on P-OLED and LTPS LCD technology, while showcasing an autonomous concept car equipped with various displays including an 46cm slidable automotive OLED panel.

The P-OLED is based on Tandem double-layered OLED with two organic light emitting layers to improve brightness and durability.

LG will start mass-producing the second-generation Tandem OLED this year. This will further improve brightness and durability while reducing power consumption by around 40 per cent.

With a combination of OLED and plastic substrate, LG's P-OLED reduces power consumption and weight.

Therefore, when this technology is applied to electric vehicles, it should enhance their energy efficiency.

LG also introduced its Advanced Thin OLED (ATO), with its thickness reduced by a fifth compared with a conventional OLED display.

LG's 145cm LCD, said to be the world's largest automotive LCD, covers the full dashboard from the left pillar to the right.

The 31.2cm glasses-free 3D LCD cluster gives the driver real-time information on the road with 3D images by tracking the driver's eyes.

LG also unveiled its switchable privacy mode, engineered to help drivers focus on the front view rather than distracted by the side view of the passenger's display by controlling viewing angles.

And the firm unveiled a self-driving concept car equipped with the company's 46cm slidable automotive OLED and transparent OLED panels.

Inside this fully autonomous concept car, the OLED display is usually hidden in the ceiling and extended downwards when watching movies on the screen on the move. In addition, this vehicle's window on the side is equipped with a 140cm transparent OLED to enjoy the outside scenery and watch various content and information on the screen at the same time.

LG's thin actuator sound elevates the infotainment experience for everyone on board through its 22.2 channel sound.

Whereas conventional speakers are heavy and bulky because of their many components, thin actuator sound can be extremely slim and lightweight courtesy of film-type exciter technology, which lets it vibrate off display panels and various interior parts to achieve a richer 3D-immersive sound experience.

Nvidia and Foxcomm partner on autonomous cars

Nvidia and Foxconn announced a partnership to develop automated and autonomous vehicle platforms.

Foxconn will act as a tier-one manufacturer, producing electronic control units (ECUs) based on the Nvidia Drive Orin for the global automotive market.

Foxconn-made electric vehicles (EVs) will feature Drive Orin ECUs and Drive Hyperion sensors for automated driving capabilities.

"This strategic cooperation with Nvidia strengthens the intelligent driving Foxconn will be able to provide," said Eric Yeh, senior director at Foxconn. "Together, we are enabling the industry to build energy-efficient, automated vehicles. This is a well-considered partnership that leverages unique strengths on each side in the pursuit of innovative EV development and opportunities."

The partnership with Foxconn will allow Nvidia to scale its efforts and meet growing industry demand as more transportation companies select Orin for intelligent vehicles.

In addition, by building EVs on the Hyperion qualified sensor set, Foxconn will speed its time-to-market and time-to-cost strategies.

"Our partnership with Foxconn will provide OEMs developing intelligent driving with a world-class supplier that can scale for volume manufacturing of the Nvidia Drive Orin platform," said Rishi Dhall, vice president at Nvidia. "Foxconn's decision to also use the Drive Hyperion sensor suite for its EVs will help accelerate their path to production without compromising safety, reliability or quality."

The automotive-grade Orin system-on-a-chip achieves up to 254 trillion operations per second and is designed to handle the large number of applications and deep neural networks that run simultaneously in autonomous vehicles.

Hyperion is a modular development platform and reference architecture for designing autonomous vehicles.

Combined, they serve as the brain and central nervous system of the vehicle, processing massive amounts of sensor data in real time so autonomous vehicles can safely perceive, plan and act.



Foxconn will use Nvidia SoCs for EVs

Opsys and SL develop lidar taillight

Opsys Tech showed a lidar-integrated smart taillight co-developed with South Korean auto parts supplier SL.

The patented solid-state scanning lidar technology is for production cars as early as 2025. SL supplies several automakers.

"This successful co-development with world leading auto parts supplier SL validates that Opsys lidar meets all technical requirements necessary to enable integrated lidar smart lighting," said Opsys CEO Rafi Harel. "It represents a strong recognition that Opsys true solid-state scanning lidar is superior to other lidar technologies and significantly increases vehicle safety while maximising installation flexibility. We look forward to continuing our close collaboration with SL, including lidar integration into headlights and smart-lighting in the cabin interior."

Automakers are pursuing use-cases and installation flexibility of lidar to increase vehicle safety with adas to reduce accidents and for L3, L4 and L5 autonomous driving. Other near-term sensor integration may occur in headlights, windshields, grilles and roofs.

"SL has completed the verification of smart taillights with integrated Opsys lidar for autonomous parking and safety enhancement, plus elimination of blind spots behind the vehicle," said Wanseok Kim, senior researcher at SL.

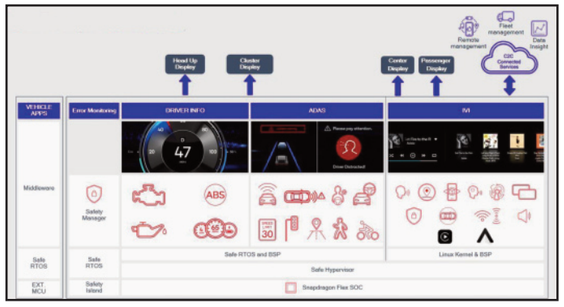
The lidar has no moving parts and delivers above 90% probability of detection at 200m range for 10% reflectivity

Qualcomm SoC supports digital cockpit and adas

The latest addition to Qualcomm's Snapdragon Digital Chassis portfolio is the Ride Flex system-on-chip (SoC).

The Flex SoC supports mixed-criticality workloads across heterogenous compute resources, allowing for digital cockpit, adas and automated driving functions to co-exist on a single SoC.

Designed to meet the highest level of automotive safety, it enables a hardware architecture to support isolation, freedom from interference and quality-of-service for specific adas functions, and comes equipped with a dedicated Asil-D safety island.



Flex SoC supports mixed-criticality workloads

The first Snapdragon Ride Flex SoC is sampling now for an expected start of production beginning in 2024.

"We continue to remain at the forefront of automotive compute innovation and, as we enter the era of software-defined vehicles, the Snapdragon Ride Flex SoC family defines a new setpoint for high-performance power-optimised mixed-criticality architectures," said Nakul Duggal, senior vice president at Qualcomm. "We are making it easier and more cost effective for automakers and tier-ones to embrace the transition to an integrated, open and scalable architecture across all vehicle tiers with our pre-integrated suite of hardware, software, and adas and AD stack while enabling the ecosystem to differentiate on our platforms with an accelerated time-to-market."

Qualcomm also highlighted the global momentum of multiple generations of the Snapdragon Ride platform, which has had an accelerated adoption rate from global automotive companies who are developing safe and updateable adas and AD equipment.

The first generations of the Snapdragon Ride platforms are available in commercial vehicles across the globe.

The next Snapdragon Ride platforms built with 4nm SoCs and integrated vision stack to support safety critical systems through to comfort adas functions are sampling with tier-one suppliers who are targeting 2025 for production vehicles.

"As the industry's only scalable and open system designed for adas and AD, we are pleased with the steady momentum our Snapdragon Ride platforms have had since their introduction in 2020," said Duggal. "We attribute the success of our Snapdragon Ride platforms to the strong relationships and collaborations we have with automakers and tier-one ecosystem and look forward to our continued efforts to innovate together to advance the industry's efforts in delivering safe and secure adas and AD systems."

RTI reveals path to software-defined vehicles

Real-Time Innovations (RTI) showed its Connext Drive automotive-grade, safety-certified connectivity framework for software-defined vehicles.

Software stack flexibility comes from an agile data-centric integration framework that allows architects to abstract from hardware and operating systems, prioritising intelligent connectivity at the core of the vehicle.

On the stand, RTI integrated three demonstrations running across hardware and software platforms that address the main challenges in developing software-defined vehicles: zonal architecture; high performance compute; and telematics and cloud connectivity.

Connext Drive helps software developers add and update vehicle functionality by providing fast and efficient connectivity at the core of the vehicle, from ECUs to the cloud. It supports safety up to ISO 26262 Asil D.

This is said to be the only framework that can bridge the full spectrum of automotive ecosystems including Data Distribution Service (DDS), Autosar Classic and Adaptive, and ROS2.

At CES, RTI partnered with GuardKnox to integrate Connext Drive with the GuardKnox SOA Framework.

Dirac makes noise with NXP chips

Dirac's digital audio technology for entry-level vehicle sound systems has been combined with NXP's SAF4000 multi-standard software defined radio processors.

Through this collaboration, car makers can more easily, cost-efficiently and consistently digitally upgrade the performance of entry-level sound systems, which are typically those supplied in cars using up to nine speakers.

The collaboration, which includes both NXP's SAF4000 radio and audio technology and i.MX 8 series applications processors, will also enable the companies to scale their bundled offering to reach more automakers worldwide.

"Premium in-car audio is increasingly in demand – no longer just in high-end luxury vehicles but in all vehicles, across all makes, models and classes," said Lars Carlsson, Dirac vice president.

Dirac's Opteo and Virtuo include patented digital sound optimisation and spatialisation technologies, including measurement-based magnitude response correction, virtual bass and virtual centre, to tackle common acoustic challenges such as negative car cabin impact, unbalanced soundstage and lack of immersion.

The two are built upon an all-in-one intelligent audio platform consisting of a measurement system, tuning tools, sound optimisation algorithms, and a hardware interface platform that together help manufacturers achieve perfected sound faster, more easily and consistently across vehicle models.

They use a semi-automatic tuning system based on scientific measurements that optimises performance and delivers signature sound in a way that is efficient, consistent and predictable.

The SAF4000 uses an audio DSP processing core with an integrated software-defined wideband radio capable of covering all global broadcast audio standards. It simplifies the development of infotainment platforms as it replaces multi chips with a single compact RF cmos device combining radio and audio IC.

Dirac's automotive audio technology is used by Rolls Royce, Volvo, Polestar, BMW, Nio and BYD.

• NXP announced a 28nm RF cmos radar one-chip IC family for adas and autonomous driving systems.

The SAF85xx combines NXP's radar sensing and processing technologies in one device, offering tier ones and OEMs flexibility in addressing short-, medium- and long-range radar to serve NCap safety requirements.

"This advanced radar sensing technology plays an essential part in accelerating the development of next-generation adas," said Hiroshi Kondo, head of safety systems at Denso. "We know Denso will extend its leadership position in adas by leveraging NXP's compact high-performance SAF-85xx radar SoC."


Dirac uses NXP processors for vehicle sound

Lava flows for Android

Embedded software development house RT-RK launched the Lava software tool for enabling access to adas from Android Automotive.

Android Automotive is the fastest growing in-vehicle infotainment (IVI) platform and some believe will dominate the automotive industry in the long term. However, it will not reach its potential until car-centric applications have been enabled on a larger scale, requiring deeper integration of adas and IVI.

The tool enables service-oriented communication between adas and Android using Some IP or DDS control protocols and generates all necessary Android APIs and services to access adas functions from Android apps.

Lava simplifies the development of complex use cases such as getting different car settings via voice commands, video calls with DMS camera, rendering autopilot computer vision on a head unit, driver coaching, and recording with external cameras.

READY TO GO

Samsung subsidiary Harman unveiled road-ready innovations that can deliver tangible and meaningful experiences to drivers, passengers and other road users.

The firm's showcase had live in-vehicle demonstrations of products ready for integration by OEMs and designed to enhance safety, wellbeing and entertainment.

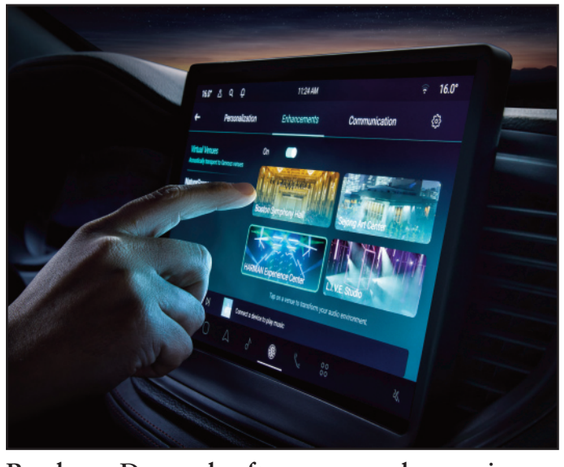
These included Ready Care, which features a visual and cognitive load measurement product that keeps eyes and mind on the road, and the Ready on Demand software platform for delivering branded audio experiences.

Each product is able to work independently or be integrated for more enhanced safety, wellbeing or entertainment.

"The consumerisation of automotive has rapidly and drastically changed expectations for what vehicles today need to deliver," said Christian Sobottka, president for automotive at Harman. "We all expect our vehicles to become an extension of our digital lives and deliver the same connected experiences we enjoy at home, at work and everywhere in between."

Ready Care is a closed-loop interior sensing and tailored interventions product that measures a driver's eye activity, cognitive load and vital signs to determine the level of focus and attention on the road ahead.

Using neuroscience, artificial intelligence and machine learning, it classifies a driver's behaviour into a focused versus distracted state and initiates a personalised in-cabin response to help mitigate dangerous driving situations such as stress, anxiety, distraction and drowsiness. The technology came from Harman's acquisition of Caaresys last year.



Ready on Demand software expands experiences

Launching with Neo QLED Auto, Ready Display optimises premium performance, price and design to fit virtually any modern vehicle display need, using consumer electronics from Samsung.

Ready on Demand is a software platform for delivering branded audio value, feature enhancement, upgrades and monetisation opportunities in an easy-to-use app. It acts as a foundation for providing expanded experiences and upgrades that can be unlocked by the consumer at any time via in-app purchases throughout the life of the vehicle.

Just as a smartphone needs software updates to ensure users are receiving the latest security features and applications, vehicles need regular updates too. Ready Upgrade provides OEMs and their drivers with software and hardware that enables frequent and efficient interface updates.

Ready Vision provides an immersive audio-visual experience to assist the driver and create a safer and more informed journey with its augmented reality (AR) head-up display hardware and AR software. It combines a wedgeless display with a large field of view, directional audio alerts, and AR technology to serve the right content, at the right time, with the right level of visual detail.

Harman also debuted a sound and vibration sensor and external microphone, which allow for applications to enhance safety and user experience, from detecting emergency vehicle sirens to listening for exterior speech commands from drivers or traffic controllers to detecting glass breakage or vehicle impact.

The sensor can be invisibly integrated into a vehicle's exterior while the external microphone has been designed to withstand environmental elements and can be configured as a single element or multi-element array.



R&S presented radar and UWB test options

Rohde & Schwarz presented the ATS1500C radar test chamber for interference and RF performance testing of automotive radar sensors for autonomous driving.

Another highlight was ultra-wideband (UWB) testing for smartphone and automotive applications using the CMP200 radio communication tester with the ATS800R anechoic chamber.

Developers of automotive radar modules experienced one of the most complete radar sensor characterisation systems on the firm's stand with the ATS1500C antenna test system, able to conduct all validation tests necessary before volume production.

It offers full transmitter and receiver measurements as well as interference immunity tests. Other features include a temperature test option and a feed antenna.

The Arc-Temp temperature test option enables temperature-controlled measurements from -40 to +85°C within the chamber, saving time and expense compared with heating and cooling the radar module in a separate climate cabinet.

Furthermore, the Arc-FX90 universal feed antenna enables parallel access to vertical and horizontal polarisations.

The fine-ranging and security capabilities of UWB technology are suitable for applications such as vehicle access control, gesture recognition and child presence detection.

Used with shielded chambers, the CMP200 radio communication tester offers a complete option for transmitter, receiver, time-of-flight and angle-of-arrival (AoA) measurements in conducted and radiated mode, compliant with IEEE 802.15.4a/z and able to conduct UWB FiRa certification measurements.

Kinara and Awiros partner on AI video

Kinara, a developer of AI processors for edge computing applications, showed the results of its partnership with Awiros.

Awiros is a video intelligence platform that enables the deployment, scaling and management of video AI apps.

The partnership provides a turn-key offering that combines the Kinara Ara-1 edge AI processor's performance and power with Awiros' easy-to-use video AI inferencing applications.

The supported technology suits smart city, warehousing and manufacturing applications.

For example, Awiros' edge-based intelligence can be accelerated with Kinara's Ara-1 for use in applications such as vehicle counting, crowd counting and identification, wrong-way detection, and other instances where low latency edge-based analytics are required.

The partnership lets both companies provide their mutual customers with the foundations to produce commercial-grade AI applications.

"The Awiros platform provides Kinara customers with click-button application selection and provisioning with an extensive repertoire of choices for various vertical markets," said Ravi Annavajjhala, CEO of Kinara. "This approach enables Kinara customers to deploy game-changing AI for a range of exciting new applications."

Awiros CEO Vikram Gupta added: "While our Awiros platform is architecture agnostic, Kinara's AI accelerator provides a strong advantage for customers that require an optimised combination of performance, energy and cost."


Applications include vehicle counting

LeddarTech front view suits adas L2 and L2+

LeddarTech introduced its LVF family of front-view technology for levels 2 and 2+ adas .

The family is a flexible and scalable front-view fusion and perception stack that supports entry-level to premium adas highway assist and five-star NCap and GSR use.

The LVF-E is a front-view fusion and perception stack and the LVF-H a premium companion fusion and perception stack with extended sensor configuration.

These two distinct low-level fusion and perception software stacks optimally combine sensor modalities.

Created for those seeking to develop entry-level adas safety and highway assistance applications, LVF-E is said to double the effective range of the sensors and enable a method with only a single 1.2Mpixel 120˚ front camera and two short-range front corner radars in a 1V2R configuration.

The LVF-H premium companion fusion and perception stack extends sensor configuration to 1V5R based on a single 3Mpixel 120˚ camera, single front medium-range radar and four short-range corner radars.

The stack extends the perception support to highway assist applications, including 160km/h adaptive cruise control, 200m range and semi-automated lane change. It also enhances the NCap 2025 support for overtaking, reverse and dooring scenarios.

Furthermore, with implementation on the TDA4L platform and a single Hailo-8 deep-learning accelerator, low-cost sensing achieves economic front-view L2 and L2+ adas.

B-sample is planned for Q3 2023, targeting vehicle SOP in 2026.

“I am excited to announce our newest sensor fusion and perception products to support entry-level to premium adas highway assist levels 2 and 2+ applications,” said Charles Boulanger, CEO of LeddarTech. “The market’s need for a high-performance sensor fusion and perception product while also being cost-effective, flexible and scalable has never been greater, and our LVF family of products addresses that need.”

Dongfeng climbs Blackberry Ivy

Chinese car maker Dongfeng Motor has selected a Blackberry Ivy-powered Pateo digital cockpit for its all-electric Voyah H97 model following the completion of a proof-of-concept project.

Ivy, a cloud-connected automotive AI platform co-developed by Blackberry and Amazon Web Services (AWS), has been pre-integrated on three commercially-available digital cockpit platforms from Bosch and Pateo.



Vito Giallorenzo

As a result of the agreement, Dongfeng can rapidly deploy applications to help enhance the in-vehicle experience for drivers and passengers.

Set to enter mass production in 2024, the Voyah H97 will also incorporate Electra Vehicles’ Eve-Ai Ivy-powered AI battery management to provide real-time, personalised recommendations for EV battery management to improve EV range and lifetime, and alleviate range anxiety.

At the show, Blackberry and AWS demonstrated several Ivy-powered applications deployed on commercial automotive platforms.

Bosch’s information domain compute platform within a Jeep Grand Cherokee showed how AI can be used for predictive maintenance of brake and tyre wear, powered by Compredict, as well as secure in-vehicle payments, powered by CarIQ.

Visitors saw how live vehicle data were abstracted, normalised and processed securely to create machine-learning insights helping predict the behaviour of automotive components before maintenance issues arise and secure authentication of vehicle payment transactions.

A virtualised Ivy platform, powered by AWS Graviton processors, demonstrated how automakers can rapidly develop machine learning for scene detection and cyber security.

“Ivy is a unique automotive platform that has undergone significant development, is highly scalable and integrated with commonly-used automotive platforms,” said Vito Giallorenzo, senior vice president at Blackberry.



Marelli grounds images

Marelli showed how near-field ground projections expand communication and safety features beyond the vehicle.

Ground projection technology plays a role in the 360˚ illumination of the car. Static, semi-dynamic or dynamic projections provide opportunities for various welcome, safety and communication scenarios to be displayed on the ground surrounding the outside of the vehicle.

Users can customise vehicles with animated and personalised logo projections or welcome messaging, provide amplified alerts with extended turn indicators or reverse driving warnings, or communicate key information such as charging status.

Static and semi-dynamic projections use coloured pictures, gobo or multi-lens array technology, while dynamic projections use digital light processing.

Visitors were invited to define their brand’s personality or DNA by configuring their own car.

Socionext SoCs give OEMs edge

Socionext showed its automotive custom SoCs that help OEMs and tier-one suppliers achieve complete ownership of key differentiating technologies with an added competitive edge.

These custom SoCs enable applications such as adas sensors, central computing, networking, in-cabin monitoring, satellite connectivity and infotainment.

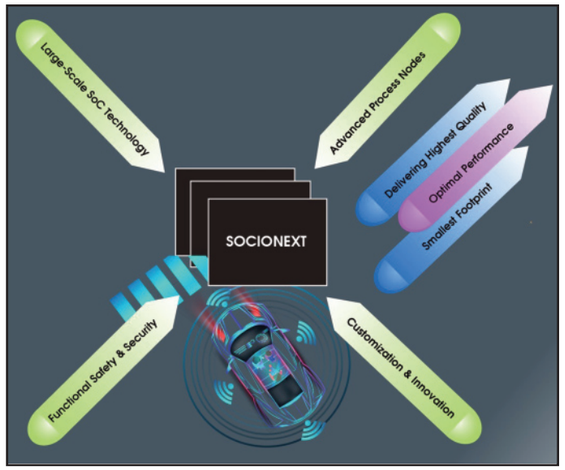
The integrated ISO 26262-certified SC1721, SC1722 and SC1723 graphics display controllers have built-in safety mechanisms that enable error-free, safety-critical content to meet the safety standards required by multi-display cockpit applications.

The firm has created various smart radar products, including at 24 and 60GHz, and has developed a roadmap showcasing future technologies.

The 60GHz RF cmos sensor has features and capabilities to support multiple in-cabin uses, including seat occupancy monitoring, child presence detection and theft prevention.

The company has partnered with artificial intelligence (AI) provider BrainChip to develop intelligent sensor data based on Brainchip’s Akida processor IP.

The flexible AI processing fabric IP delivers neuromorphic, event-based computation, improving performance while reducing silicon footprint and power consumption. Sensor data can be analysed in real time with distributed and low-power edge inferencing, resulting in improved response time and reduced energy consumption.



Custom SoCs enable various applications

ECar X and Smart use AMD

ECar X and Smart unveiled their co-developed immersive digital cockpit computing platform powered by AMD technology.

The cockpit is set to feature in Smart’s all-electric production vehicles to be launched from 2024. It is the first in-vehicle computing platform designed and developed by ECar X using AMD technology, following their collaboration announcement last year.

Using AMD Ryzen V2000 embedded processors and Radeon RX 6000 GPUs, the cockpit will offer computing power and game console-grade visual graphic rendering capabilities.

Geo and Omnivision demo cabin monitoring

Geo Semiconductor and Omnivision demonstrated simultaneously capturing and processing high-quality colour (RGB) and infra-red (IR) automotive interior video from a single sensor.

This combined Omnivision's OX05B1S 5MP RGB-IR image sensor with Geo's upcoming GW6 smart camera video processor, which provides image processing for the RGB-IR sensor.

The GW6 can support the full 5MP RGB-IR 4x4 pattern of the OX05B1S running at 60frame/s and provide two unique video streams with high-quality video for both computer vision and viewing applications.

This results in an integrated in-cabin option for driver and occupant monitoring algorithms while using only one high-resolution RGB-IR image sensor.

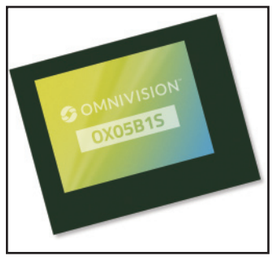
"We partnered with Omnivision due to its leading pixel technologies and strong track record in working with automotive tier-ones around the globe," said John Casey, vice president at Geo. "Geo's engineering team has utilised its experience on previous in-cabin programmes and developed market-defining RGB-IR."

The OX05B1S is built on Omnivision's 2.2μm PureCel Plus-S and Nyxel pixel technologies. Nyxel delivers NIR quantum efficiency at 36%, three times better than the previous generation.

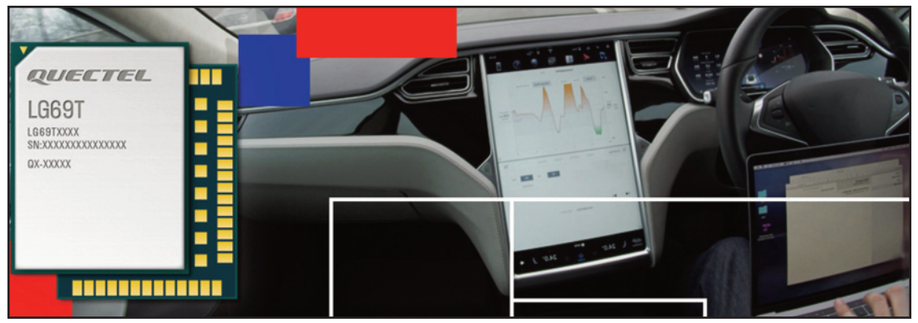
The GW6 was developed on the TSMC 16nm automotive process and will be offered in a 7 by 7mm fcCSP package for video processing only or a 17 by 17mm fcCSP package for the neural network version.

The OX05B1S image sensor comes in a 7.9 by 6.3mm automotive CSP.

"Geo brings image processing capabilities, as well as in-depth knowledge of customer pain points," said Naresh Shetty, product marketing manager at Omnivision. "Following the recent success of our OX05B1S image sensor, we saw the need to jointly develop this and make it easier for designers to create high-value cabin monitoring for mainstream vehicles."



OX05B1S sensor



Quectel demonstrates positioning module

IoT provider Quectel Wireless demonstrated an automotive module that meets Asil requirements.

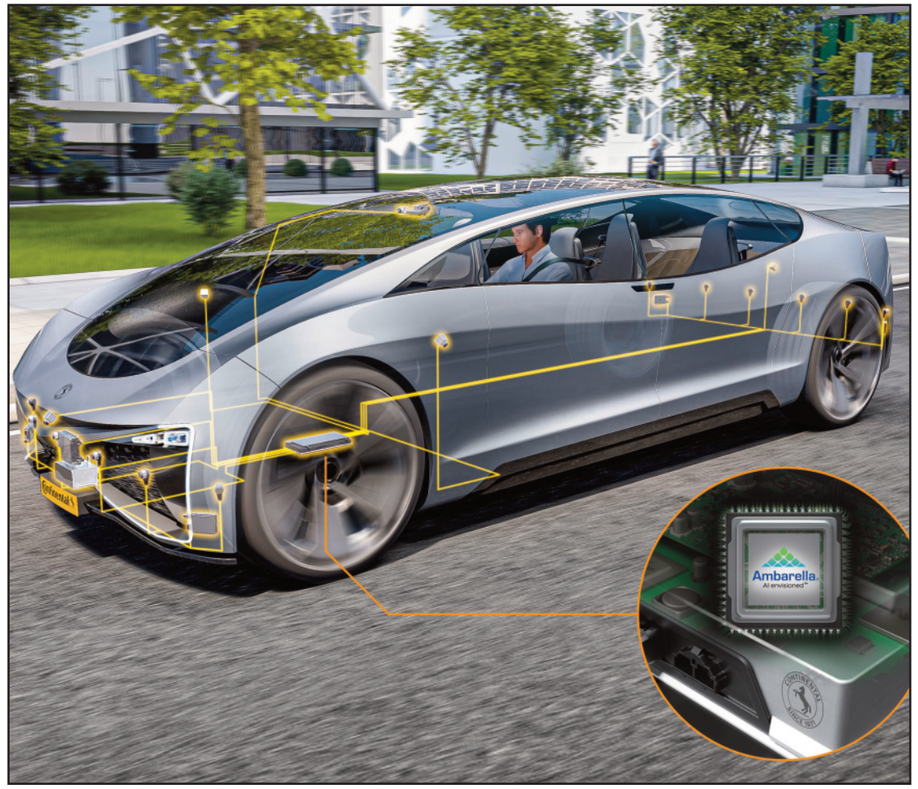
The positioning device can provide precision, availability and reliability for maintaining absolute in-lane positioning, satisfying Asil B and appropriate for adas and autonomous driving.

The design uses Quectel's LG69T-AB automotive module and will be compatible with the Trimble software positioning engine, Trimble RTX correction service, ST Microelectronics Asil-rated Teseo APP GNSS chipset, and the Murata SCHA600 Asil inertial measurement unit.

"We're excited to demonstrate this advanced Asil option," said Mark Murray, vice president for GNSS and automotive at Quectel Wireless. "The interoperability of Quectel's leading hardware with Trimble's industry-leading software and service enables us to deliver advanced positioning that will ensure optimal precision, availability and reliability for all automotive OEM and tier-one manufacturers."

Reducing time to market and saving cost, the integrated positioning unit should remove risk for OEMs and tier one automotive manufacturers, satisfying requirements for developing adas and automated driving.

First generation engineering samples are being tested on the road.



Continental is working with Ambarella

Continental and Ambarella use AI to automate driving

Continental announced a partnership with edge AI semiconductor company Ambarella.

The two companies will jointly develop scalable, end-to-end software and hardware based on artificial intelligence (AI) for assisted and automated driving, on the way to autonomous mobility.

The partners are combining Ambarella's computer vision know-how, SoCs and software modules with Continental's software and hardware expertise and automotive systems.

In addition to the development of camera-based perception for adas, Continental and Ambarella are focusing on full-stack systems for level 2+ up to highly automated vehicles. These full stacks take a multi-sensor approach, including Continental's high-resolution camera, radar and lidar, as well as the associated control unit and the required software.

The collaboration follows Continental's announcement in November to integrate Ambarella's SoC family into Continental's adas.

Series production is planned for 2026.

Continental also showed its curved ultra-wide display concept with an invisible control panel. This immersive pillar-to-pillar display is illuminated by more than 3000 LEDs, producing high-contrast picture quality.

The operating concept based on an invisible control panel only appears when required. It enables convenient and safer control. Volume production of the display is planned for 2025.

"We are continuously challenging the status quo and are among the leaders for the world's transformation in mobility," said Nikolai Setzer, CEO of Continental. "Our displays and the partnership with Ambarella for future autonomous mobility will undoubtedly contribute to a safer, cleaner and more efficient mobility experience."

Continental's driver identification display adds a feature to driver monitoring by enabling contactless, secure driver face authentication. This allows for applications such as in-car payment without the need for any additional devices.

VEHICLE NETWORKS

MISSING LINK

Fionn Hurley looks at why 10baseT1S is the missing Ethernet link for automotive communications

New IEEE automotive Ethernet standards continue to emerge, one of the latest being 10baseT1S. This supports trends in the automotive industry dictating changes in a vehicle's electrical and electronic (EE) architecture.

The industry is going through one of its most revolutionary periods. Car manufacturers need to provide technology quickly to cover several significant megatrends such as personalisation, electrification, autonomy and full connectivity.

OEMs will need to modify their EE architecture radically to support the new functionality.

While this revolution presents a significant technical challenge, it also provides an opportunity for OEMs to consider moving EE architectures away from domain-based options, which have become unwieldy from continuous add-ons over platform generations. With this architecture change, OEMs can focus on enabling better technology while adding post-sale revenue streams through features such as vehicle personalisation, sale of services and over-the-air (OTA) upgrades.

The industry is gravitating towards a common architecture, often referred to as zonal architecture, and looks to leverage technology and lessons from other industries, most notably the IT sector, making the car essentially a computer on wheels.

Zonal architectures determine connectivity by physical location rather than function, as was the case in domain-based architectures. This change reduces the number of ECUs in the vehicle and removes up to 1km of harness cabling.

Secondly, it decouples hardware and software, providing a service orientated architecture (SOA).

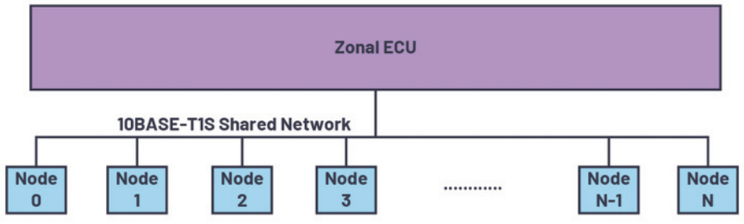
Many OEMs are investing heavily to bring ownership of software in house to provide an end-to-end option that simplifies integration of platforms and offers more cross-functional capability.

This scalable software platform approach will redsuce variants, open opportunities to new revenue streams, lead to reduced R&D investment in the longer term, and shorten development times while supporting multiple car lines.

These architecture changes come with difficulties and have led many OEMs to restructure their entire companies away from individual groups with ownership to deliver only specific domain functions and towards more integrated cross-functional organisations.

Automotive is rapidly becoming a major consumer of Ethernet devices, and widespread Ethernet rollout in vehicles is seen as one of the key pillars to the successful introduction of these architectures. Ethernet brings the required scalability, supports multiple speed grades, is a proven robust transmission media, supports a service-based architecture, and has fully developed safety and security building blocks.

Ethernet has a clearly defined and well understood OSI model that makes it easier to manage the complexity of the entire car network.



10baseT1S bus topology

Aspects

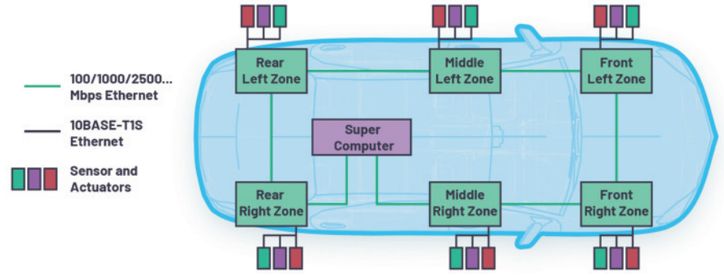
While many fundamental Ethernet concepts can be leveraged from other industries, the automotive EE architecture has some unique requirements that dictate the need for new technology developments.

One key focus for automotive is to reduce the weight of the vehicle, which has a direct impact on vehicle range. The cable harness used today is one of the three heaviest subsystems in the vehicle, weighing up to 60kg.

Traditional Ethernet cables use four differential pairs for data transmission, adding weight and routing complexity, which is not optimal for automotive applications. To address this, IEEE standards were developed to support Ethernet transmission over single twisted pair cables, which, coupled with the reduced cable harness lengths enabled by zonal architecture, can offer significant cable savings and weight reduction.

Drivers

As the concept of zonal-based architectures evolved, it became evident that Ethernet connectivity all the way to edge sensors and



Automotive zonal architectures

actuators would be required to leverage fully the advantages of this architecture. Existing legacy connectivity technologies such as Flexray and Can require protocol translation normally implemented in gateways, which can add cost, complexity and latency.

Existing automotive Ethernet technologies such as 100baseT1 did not meet the system costs to support transitioning edge connectivity applications to Ethernet, as this technology required the use of point-to-point switched connectivity. The result was a call for interest from the IEEE to solve this problem. Some of the key requirements included:

- Faster communications than existing technologies, for example, Can-FD;
- Replacement of legacy in-vehicle networking technologies such as Flexray;
- An alternative to 100baseT1 for ECUs where 100baseT1 is not cost and energy efficient; and
- The ability to support connectivity for simple and redundant sensor networks.

Specification

The 10baseT1S specification was developed as part of the IEEE 802.3cg standard, which was published in February 2020. 10baseT1S provides the missing link in the automotive Ethernet ecosystem, enabling true Ethernet-to-the-edge connectivity and addressing the needs of zonal architecture.

One exciting, unique aspect of 10baseT1S differing from other automotive Ethernet technologies is the support for a multidrop topology with all the nodes connected over the same unshielded twisted pair cable. This bus implementation provides an optimised BoM only requiring a single Ethernet phy in each node, removing the need for a switch or star topology implementation associated with other Ethernet technologies.

The standard specifies that at least eight nodes must be supported – it can support many more – and bus lengths of up to 25m must be possible.

One other new aspect of the standard is physical layer collision avoidance (PLCA), which, as the name suggests, avoids collision on the shared network. This implementation ensures deterministic latency dictated mainly by the number of nodes on the network and the amount of data to be transmitted.

Each node is assigned an opportunity to transmit. If a node has no data to transmit at the time, it hands over the transmit opportunity to the next node, thereby supporting very high use of the 10Mbit/s available.

Power over a 10baseT1S network is also possible given it is an AC-coupled system. This provides further cable saving, reduced connector sizes, and improved reliability resulting from reduced cable and connector complexity. Standardisation of power over data lines (PoDL), which is already available for point-to-point implementations, is ongoing as part of the enhancements to IEEE standards to support the multidrop topology.

Applications for 10baseT1S in automotive are broad and varied with many sensors and actuators across multiple functions in body domain, comfort, infotainment and adas under discussion.

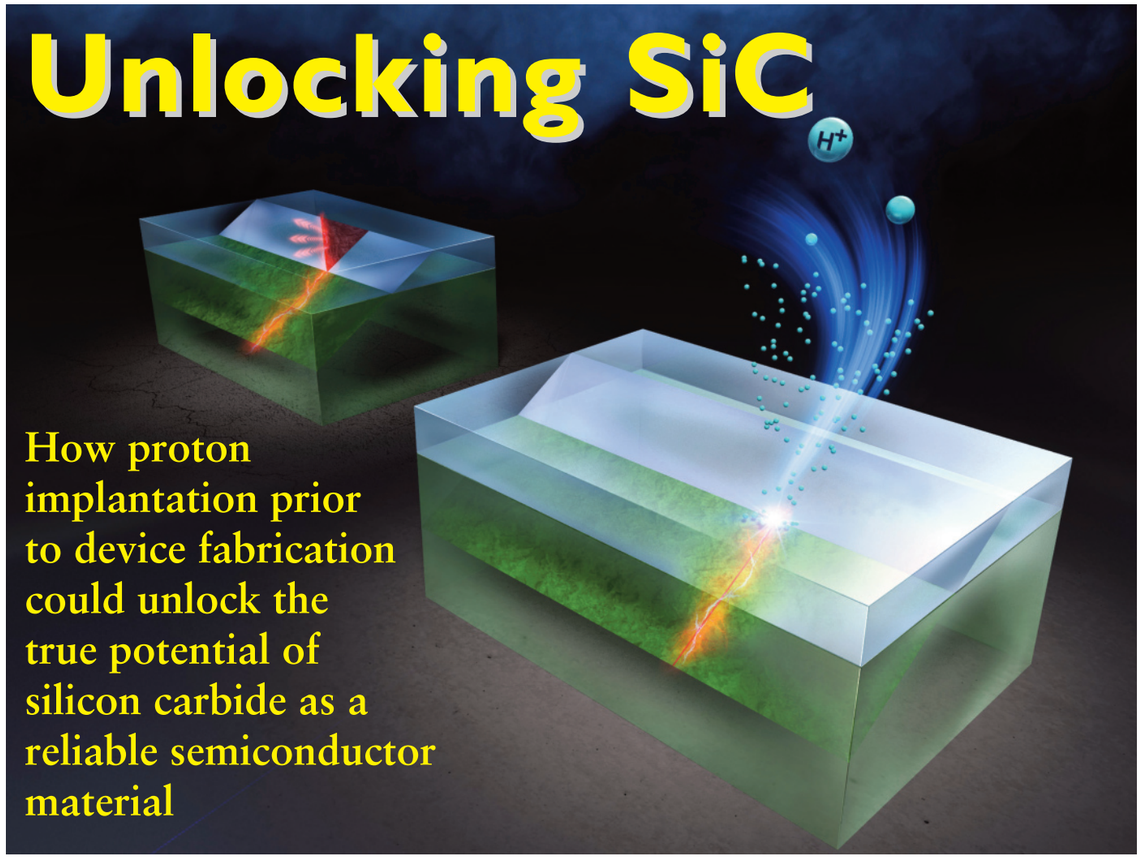
Conclusion

The EE architecture is undergoing a revolutionary change. The transition to zonal architectures is imminent. 10baseT1S provides the missing link to support this transition with optimised Ethernet to the edge connectivity.

There are still hurdles to overcome in this rollout such as the perception that Ethernet connectivity adds component cost and complexity to module implementations. 10baseT1S directly addresses these concerns by providing reduced system cost and various product options that support different kinds of signal chain partitioning.



Fionn Hurley is marketing manager at Analog Devices



Silicon carbide (SiC) is a promising semiconductor material for power electronic devices, but it suffers from bipolar degradation, which severely limits its lifespan. To address this long-standing issue in a cost-effective manner, researchers from Japan have developed a proton implantation-based suppression method that can prevent the expansion of stacking faults, which lie at the root of bipolar degradation.

This development could pave the way for reliable, economical and power efficient SiC semiconductor devices.

SiC is a semiconductor material that outperforms pure silicon-based semiconductors in several applications. Used mostly in power inverters, motor drives and battery chargers, SiC devices offer benefits such as a high power density and reduced power losses at high frequencies even at high voltages.

Although these properties and its relatively low cost make SiC a promising contender in various sectors of the semiconductor market, its poor long-term reliability has been an insurmountable barrier since the past two decades.

One of the most pressing issues with 4H-SiC – a SiC type with superior physical properties – is bipolar degradation. This phenomenon is caused by the expansion of stacking faults in 4H-SiC crystals.

Put simply, small dislocations in the crystal structure grow over time into large defects called single Shockley stacking faults that progressively degrade performance and cause the device to fail. Although some methods to mitigate this problem exist, they make the device fabrication process more expensive.

Fortunately, researchers from Japan, led by associate professor Masashi Kato from the Nagoya Institute of Technology, have now found a feasible solution to this problem.

In their study in the journal *Scientific Reports*, they present a fault suppression technique called proton implantation that can prevent bipolar degradation in 4H-SiC semiconductor wafers when applied prior to the device fabrication process.

"Even in the recently developed SiC epitaxial wafers, bipolar degradation persists in the substrate layers," said Kato. "We wanted to help the industry navigate this challenge and find a way for developing reliable SiC devices, and therefore decided to investigate this method for eliminating bipolar degradation."

Associate professor Shunta Harada from Nagoya University and Hitoshi Sakane, an academic researcher from Shi-Atex, both in Japan, were also part of this study.

Proton implantation involves injecting hydrogen ions into the substrate using a particle accelerator. The idea is to prevent the formation of single Shockley stacking faults by pinning down partial dislocations in the crystal, one of the effects of introducing proton impurities. However, proton implantation itself can damage the 4H-SiC substrate, due to which high-temperature annealing is used as an additional processing step to repair this damage.

The research team wanted to verify if proton implantation would be effective when applied before the device fabrication process, which typically includes a high-temperature annealing step.

Accordingly, they applied proton implantation at different doses on 4H-SiC wafers and used them to fabricate PiN diodes. They then analysed the current-voltage characteristics of these diodes and compared them with those of a regular diode without proton implantation.

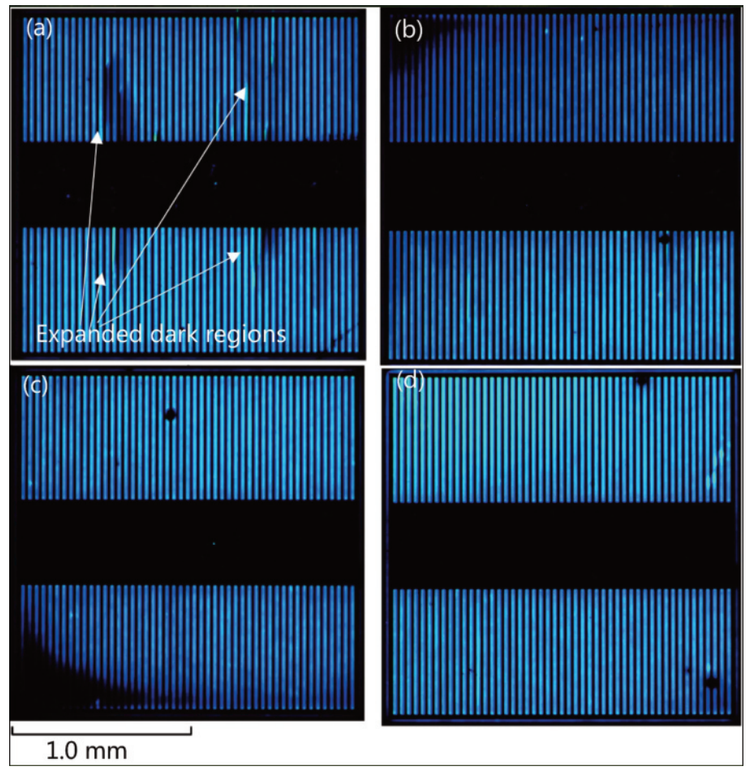
Finally, they captured electroluminescence images of the diodes to check whether stacking faults had formed or not.

Overall, the results were very promising as diodes that had undergone proton implantation performed just as well as regular ones but without signs of bipolar degradation. The deterioration of the current-voltage characteristics of the diodes caused by proton implantation at lower doses were not significant. However, the suppression of the expansion of single Shockley stacking faults was significant.

The researchers hope these findings will help realise more reliable and cost-effective SiC devices that can reduce power consumption in trains and vehicles.

"Although the additional fabrication costs of proton implantation should be considered, they would be similar to those incurred in aluminium-ion implantation, currently an essential step in the fabrication of 4H-SiC power devices," said Kato. "Moreover, with further optimisation of implantation conditions, there is a possibility of applying this method for the fabrication of other kinds of devices based on 4H-SiC."

Hopefully, these findings will help unlock the full potential of SiC as a semiconductor material for powering next-generation electronics.



EL images of PiN diodes at 25A/cm^2 after the electrical stress with 2h for (a) without proton implantation and when implanted with (b) 1012cm^{-2}, (c) 1014cm^{-2}, and (d) 1016cm^{-2} doses of protons

AUTOSPORT INTERNATIONAL

KNOW YOUR RACE

Steve Rogerson reports from Autosport International in Birmingham, UK

McLaren puts F1 sensors into other racing classes

McLaren Applied launched a sensor range with the quality needed for Formula One but with off-the-shelf mechanical specifications so the price can be kept a level that suits all racing classes.

There are initially nine models in the McLaren Sport range covering fluid temperature, air temperature, speed, rotation, barometric pressure, acceleration and object temperature.



Paul Beresford: "We are keeping costs down."

"Every Formula One team wants different specifications," said Paul Beresford, McLaren's account manager for motorsport. "With the Sport range, we are keeping costs down with a single mechanical specification."

He said all the top-tier teams wanted bespoke sensors. This range he said had the same specifications but with fixed mechanical dimensions. This will let its distributor HCI Systems have all the parts in stock within the next two to three months.

The range probably will be extended but Beresford said first the company needed to see what was popular.

"In Formula One, there are so many sensors and they are so expensive," he said. "Not everyone wants all these sensors. You measure everything in Formula One and a lot of people are not interested in all that."

One planned extension is for a tyre-pressure monitoring sensor.

"We have no tyre-pressure monitor in the range yet," he said," but that will come with all the accuracy of Formula One but simplified."

Lane fills gap with Lemo M connectors

Lane Motorsport is filling a gap in its connector range with Lemo M series high-power threaded models.

They have a maximum current rating from 140 to 430A, whereas the firm's existing products go down to 80A and up to 750A.



Sam Furminger: "We were missing the middle."

"We were missing the middle range," said Sam Furminger, Lane's business development manager. "This is what these are for."

The firm has been stocking the lower range model for a while and Furminger said they were small, rugged lightweight connectors for motorsport.

"They have high density for sensors and so on," he said. 'The M series is an extension of this. They can be used in motorsports for anything that requires high power, such as alternators and batteries."

Temperature range is -55 to +200˚C and they are resistant to shock, vibration, oil and fuel. There is 360˚ screening for full EMC shielding. Protection is to IP68 when mated, a rating also available when unmated as an option.

Reverse gender configuration is also an option.

They use a ratchet-coupling mechanism, are scoop proof and have IP2x finger protection.

An alternative brass housing is for 1000 hours salt fog resistance.



Andrew Kenna: "Pro models are advanced."

Boost for power and engine management

ECU Master was showing extensions to both its power management and engine management units.

The PMU-24 DL is a 24-channel power management unit.

"The existing unit, which we have had for a couple of years, is for 16 channels," said the firm's Andrew Kenna. "The new unit give you more outputs, especially for rally cars, which can run out of outputs."

The product had its first public view back in October and this show marked the UK launch. It should be available to buy in March.

"We fit these in rally cars and track cars," said Kenna. "It will replace your fuses and relays and make them future proof. It also has smart logic and can simplify your wiring."

Operating voltage is 6 to 22V. Data logger memory is 256Mbyte.

The two engine management units are the EMU Pro-8 and Pro-16.

"These are brother and sister units," said Kenna. "They have similar features, but the Pro-16 is a more souped-up version."

Both are targeted at motorsports with higher specifications than the firm existing EMU Black and Classic models that Kenna said were cheap enough to go into a road car.

"The Pro models are much more advanced," he said. "They will be on the market late February or early March."

All three products are AEC-Q100 grade one qualified and handle temperatures from -40 to +125˚C.

DTA Fast tweaks ECU software

Incorporating features such as closed-loop camshaft control, dual maps, idle control, auto mapping capability and protection against electrical and environmental mishaps, the T series ECUs from DTA Fast suit harsh conditions such as found offroad and in rally cars.

Though the range has existed since early 2021, the firm's Ben Jones said the show marked the proper launch.

"We have had a good reaction so far," he said, "and we are now working on that feedback to improve the software and make it easier for the user."

A key feature is wideband lambda control allowing closed-loop control for mapping and running using the onboard Bosch wideband controller. There is a full three-dimensional lambda target map with twin lambda mapping on some models.

The company's Alex Chard said the range covered ECUs for a basic engine layout right the way up 12-cylinder engines.

"As long as it is a spark ignition engine, we can deal with it," he said.

Design work on the range, he said, started back in 2019 and 2020.

"It has been a three-year project," he said, "with Covid and the chip shortage, so we were behind where we wanted to be, but we are here now."

The PC interface for the T series presents the user with a logical arrangement of the various maps and data used in engine control.



Ben Jones (left) and Alex Chard

Battery monitors beat accuracy record

Automotive battery cell and pack monitors from Texas Instruments are said to have the most accurate measurement capability available for increasing EV drive time and enabling safer operation.

The BQ79718-Q1 battery cell monitor and BQ79731-Q1 battery pack monitor measure battery voltage, current and temperature to determine the true range of a vehicle and increase the life and safety of the battery pack.

Even a slight change in temperature can impact an EV's range, and colder weather, in particular, can impact battery range by up to 40%.

The BQ79718-Q1 provides battery cell voltage measurements down to 1mV accuracy, and the BQ79731-Q1 allows measurement of the battery pack current down to 0.05% accuracy.

Voltage and current synchronisation at 64μs enables instantaneous monitoring of battery pack power, providing a real-time snapshot of battery health.



This level of synchronisation enables electrochemical impedance spectroscopy, which provides vital insight into the cell core temperature, battery aging and state of charge of the battery.

The battery cell monitoring IC achieves Asil accuracy for main path, redundant path and residual error seeking.

The 18-channel BQ79718-Q1 comes in a 10 by 10mm, 64-pin thermally enhanced thin quad flat package (HTQFP). The BQ79731-Q1 comes in a 7 by 7mm, 48-pin HTQFP.

Evaluation modules are available for both.

SoC delivers LED flicker mitigation

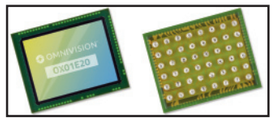
A 1.3Mpixel system-on-chip (SoC) from Omnivision is for automotive 360° surround view systems (SVS) and rear-view cameras (RVC).

The OX01E20 includes LED flicker mitigation and 140dB high dynamic range capabilities.

It is pin-to-pin compatible with the firm's previous 1.3MP SoCs.

The device provides imaging performance for SVS and RVC across a range of lighting conditions.

In a single 0.25-inch optical format package, it uses a a 3μm image sensor, an image signal processor, and full-featured distortion and perspective correction and on-screen display, enabling designers to achieve a small form factor with low-light performance, low power and reduced cost, while improving reliability by using only one PCB.





RTC modules

The Epson RA4000CE and RA8000CE real-time clock (RTC) modules integrate the crystal unit and IC into a single pack.

Digital temperature compensation technology achieves high accuracy over a -40 to +125°C temperature range with low power consumption.

For battery management systems, in-vehicle networking and infotainment, they have an integrated 32.768kHz digital temperature compensated crystal oscillator.

The modules include functions such as a second-to-year clock and calendar with leap-year correction, time alarm, wakeup timer, time update interrupts, clock output, time stamp function that can record two times and dates when an external or internal event occurs, and reset self-monitoring.

These products meet AEC-Q100 grade two.

The interface is SPI or I^{2}C bus. Current consumption at backup is 300nA typical at 3V. Stability is ±5 to ±50ppm.

Dimensions are 3.2 by 2.5 by 1.0mm maximum.

Five bridges nice in SM package

ST Microelectronics has introduced five automotive-grade power-semiconductor bridges in popular configurations.

The Acepack SMIT package is said to ease assembly and enhance power density over conventional TO packages.

Engineers can choose from two STPower 650V mosfet half bridges, a 600V diode bridge, a 1200V half-controlled full-wave rectifier, and a 1200V thyristor-controlled bridge leg.

All devices meet automotive requirements and are suitable for electric vehicle on-board chargers (OBCs) and DC-DC converters, as well as industrial power conversion.

The surface mounted package delivers the easy handling of an insulated package with the thermal efficiency of an exposed drain. It allows direct-bonded copper die attachment for efficient top-side cooling.

The 4.6cm^2 exposed metal topside permits easy attachment of a planar heatsink. This creates a low profile that increases thermal dissipation for greater reliability at high power.

The module and heatsink can be placed using automated inline equipment, which saves manual processes to boost productivity.

While reducing the stack height and enhancing power density, the topside cooling design and 32.7 by 22.5mm package footprint allow 6.6mm lead-to-lead creepage distance. The tab-to-lead insulation is 4500Vrms. The package also has low parasitic inductance and capacitance.

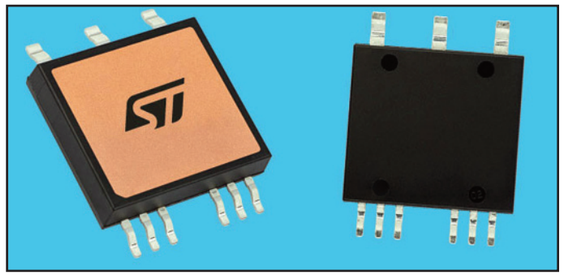
The two 650V-MDmesh DM6 mosfet half bridges are AQG-324 qualified. Their maximum Rds(on) of 41mΩ in the SH68N65-DM6AG and 97mΩ in the SH32N65-DM6AG increases electrical efficiency and lowers thermal dissipation.

They can be used in DC-DC converters for OBCs and high to low voltages. Their multi-role flexibility helps streamline inventory and simplify procurement.

The STTH60RQ06-M2Y 600V, 60A full-wave bridge rectifier comprises fast diodes with soft recovery characteristic and is PPAP capable for use in automotive applications.

The STTD6050H-12M2Y 1200V, 60A half-controlled single-phase AC-DC bridge rectifier is AEC-Q101 qualified and has high noise immunity with dV/dt of 1000V/μs.

The STTN6050H-12M1Y is a 1200V, 60A half bridge that comprises two internally connected thyristors. AEC-Q101 qualified, it can be used in automotive OBCs and charging stations and industrial applications such as AC-DC conversion in motor drives and power supplies, single- and tri-phase controlled rectifier bridges, totem-pole power-factor correction, and solid-state relays.



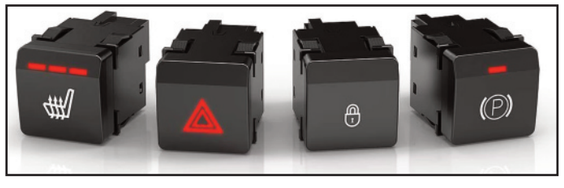
Dual-contact switches for in-cabin use

Working to the IATF 16949 quality standard, EAO has extended its series 09 universal switch family with configurable dual switch-contact variants for in-cabin vehicular applications.

As with all switches in the 09 family, the devices have been designed for reliable and safe E1 operation in automotive HMIs, particularly within EVs, buses, lorries and special vehicles.

Made with a durable surface coating, the dual contact switches have a modular, ergonomic design that delivers enhanced haptics, tactile feedback and IP5K4 protection. They are available with illuminated symbols in accordance with ISO 7000.

The basic range includes switches with white symbol illumination, and the option of one, three or zero red LED status indicators. Devices with red symbols for use as warning lights are available.



Device safely controls power distribution

An automotive intelligent power device (IPD) from Renesas can safely and flexibly control power distribution within vehicles, addressing the requirements of EE architectures.

The RAJ2810024H-12HPD is available in the TO-252-7 package and reduces the mounting area by about 40% compared with the conventional TO-263 package.

A current detection function allows accurate detection of abnormal currents such as overcurrent. Since it detects abnormal currents even at low loads, engineers can design safe and precise power control systems that can detect even small abnormalities.

In a conventional distributed EE architecture, power supply from the battery is distributed to each ECU via long, thick wires from a power box consisting of mechanical relays and fuses. IPDs have a longer life than mechanical relays and are maintenance-free, so they can be placed anywhere in the vehicle.

As the automotive industry moves towards centralised or zone-oriented EE architectures, IPDs are becoming suitable for building efficient and flexible power supply networks since they use shorter, thinner wires.

The single-channel high-side IPD in the TO-252-7 package measures 6.1 by 6.5mm, excluding pins.

On-resistance is 2.3mΩ at +25˚C typical.

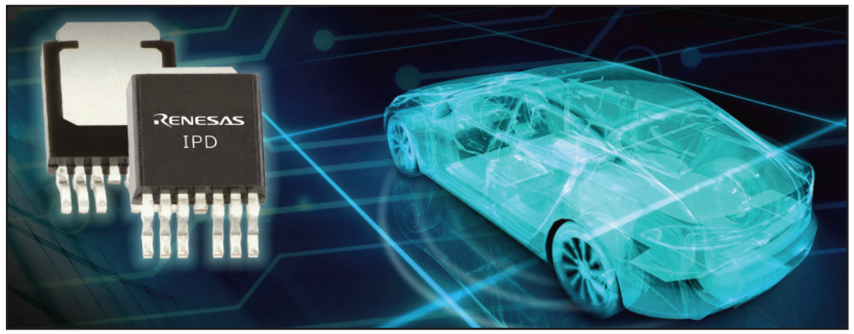
It has a built-in charge pump and self-diagnostic feedback by load current sense. It supports a 3.3 and 5V logic interface.

Protection functions include load short-circuit, overheat detection, sense current output and GND open protection. There is battery reverse connection protection with self-turn-on.

The device complies with AEC-Q100 and RoHS standards.

Renesas offers a power distribution box with an e-fuse that uses an existing IPD. By replacing the conventional fuses in the power supply box with small IPDs and programming the fuse characteristics into the microcontroller, developers can optimise the wiring harness and improve reliability through current monitoring.

The IPD is available in sample quantities with mass production scheduled for early next year.



Gate driver IC suits LEVs

A three-phase gate driver IC has been added to Infineon's Motix family for automotive and industrial motor control.

The 6ED2742S01Q 160V silicon-on-insulator gate driver has an integrated power management unit and comes in a 5 by 5mm QFN-32 package with a thermally efficient exposed power pad.



This makes the device suitable for battery-powered industrial BLDC motor control drives including in light electric vehicles (LEVs).

Integrated bootstrap diodes power three external high-side bootstrap capacitors. Through a trickle charge pump, they support 100 per cent duty cycle operation.

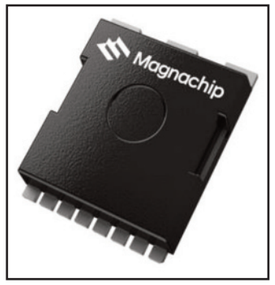
The output drivers integrate a high-pulse current buffer stage for low driver cross-conduction.

A current sense amplifier with selectable gain between the low-side supply voltage and the low-side power ground return is integrated.

It provides a 1A source and 2A sink current with independent under-voltage lock-out for high-side and low-side gate drives.

Propagation delay is 100ns and minimum dead time is 100ns with built-in delay matching.

The exposed pad provides low thermal resistance. Operating temperature is -40 to +125˚C. It supports battery voltages from 10.8 to 120V.



LEV mosfet

Magnachip's eighth-generation 150V MXT mosfet is optimised for light electric vehicle (LEV) motor controllers and battery management systems (BMSs).

The MDT15N054-PTRH uses the firm's eighth-generation trench mosfet technology to lower RDS(on) by 28% compared with the previous generation. Based on the design of the core cell and termination, a high figure of merit can be achieved and an increase in the total gate charge can be avoided.

It is available in a surface mount device TO-leadless (toll) package to reduce size and improve heat dissipation. The energy efficiency is also enhanced by fast switching, while enabling high power density.

In addition, a guaranteed operating junction temperature from -55 to +175˚C and a high level of avalanche ruggedness help the device exceed the performance requirements of LEV motor controllers and BMSs.

Varistors meet Ethernet standards

Kyocera AVX has extended its AntennaGuard low-capacitance range with two 0402 multilayer varistors (MLVs) that meet IEEE 100baseT1 and 1000baseT1 testing requirements.

The ASPGuard MLVs have surface-mount packages for high-density designs and exhibit high current and energy handling capabilities, bidirectional overvoltage protection, sub-nanosecond response times, and multi-strike capabilities.

They also provide EMI and RFI attenuation in their off state, which can reduce or even eliminate the need for additional EMC capacitors, and offer lower insertion loss, lower leakage current and better reliability than diodes.

In addition, they are qualified to the Open Alliance standards for automotive Ethernet applications and for AEC-Q200.

Available in 0402 case sizes with maximum respective heights of 0.5 ±0.10mm and 0.80 ±0.15mm, they are rated for working voltages from 18 to 70V DC, capacitance values from 1.5 to 4.7pF, energy transients spanning 0.02 to 0.04J, 1 to 3A of peak current, and operating temperatures from -55 to +150˚C.

They also deliver up to 25kV of ESD protection per IEC 61000-4-2 and meet 48V DC jump start requirements.

One is rated for 70V DC and 1.55pF with a ±0.13pF capacitance tolerance for use in 1000baseT1 Gigabit Ethernet applications, while the other is rated for 70V DC and 4.7pF with a ±1pF capacitance tolerance for use in 100baseT1 100Mbit/s automotive Ethernet applications.

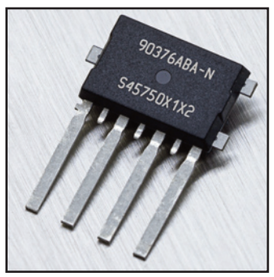
They have RoHS-compliant nickel-tin terminations.



Position sensor handles stray fields

An absolute magnetic position sensor IC from Melexis can handle 360˚ rotary automotive applications with strong stray field immunity (SFI).

The MLX90376 device supports system integration up to Asil-D functional safety, offering sensing for steering and valve applications, as well as Asil-C safety element out of context.



Based on proprietary technology, it belongs to the firm's Triaxis family.

Designed for demanding steering wheel angle, throttle valve and thermal management valve applications, this IC has the option for dual-stacked die in a PCB-less version.

SFI is up to 5mT (4000A/m) for 360˚ rotary applications to ISO 11452-8. This mitigates the sources of electromagnetic noise regularly found within electric cars.

It can be housed in SMP-4 PCB-less or surface-mount device (SMD) packaging. Use of the SMP-4 version makes mechanical integration easier, speeding up development and design.

Connectors handle harsh outdoor use

For reliable high-speed data and power transmission in harsh environments, Rosenberger has developed the HSI connector system.

Designed for demanding outdoor conditions and standardised in cooperation with the Agricultural Industry Electronics Foundation (AEF), the HSI high-speed implement bus system is the latest standard.

For applications from trucks to construction machinery to agricultural, the connectors are said to be true all-rounders.

High-performance and robust connections between tractors and trailers or seed, fertiliser and harvesting machines are needed for reliable high-speed data transmission, an increasingly important component in the electronics of vehicles and machines.

HSI connectors are robust and electrically reliable in other all-terrain applications in demanding environments, such as in the construction vehicle industry.

Applications include monitoring systems, data systems for consumption, seed and fertiliser optimisation, GPS coordination, and level and tonnage measurement.

They feature reliable power and data transmission, break-away connection, waterproofing and UV resistance.

The portfolio includes plug straight vehicle connectors, housings for in-cab and break-away, jack straight implement connectors, and cable assemblies. They have SI and EMC performance for 1000baseT1.

Usage up to 48V is possible, depending on cable parameters. Cable length is up to 40m.

There are different timings of power and data pins. Mating cycles are more than 3000 and they are waterproof to IPX9K.





Local dimming IC enables larger LCDs

A local dimming IC from Synaptics can enable larger, higher-contrast, higher-resolution automotive LCDs while lowering overall power and cost.

The AEC-Q100 grade-two-qualified SB7900 SmartBridge works with the firm's portfolio of touch and display driver integrated (TDDI) ICs.

By combining the ability to drive multiple TDDI controllers with local dimming of the backlight array, it provides better image quality, more system implementation flexibility, and reduced device footprint, power consumption and complexity for displays up to 76.2cm and resolutions up to 6K.

High contrast is critical for display readability. To accomplish this, it supports full-array local dimming, which allows independent control of each zone of an LCD's LED backlight array.

By analysing incoming images, it can precisely control the brightness of each LED in the array, enabling contrast ratios of up to 10000:1 while reducing halo – light fringing at the border of bright and dark areas of the image – which affects clarity.

The result is an easy-to-read display with improved visibility and higher image quality across various lighting conditions, even for large zone sizes.

The device also adjusts image parameters in sync with the LED backlight calculations for improved image visibility and outputs the final image to the Synaptics TDDI display driver ICs.

It has a Vesa embedded DisplayPort (eDP) v1.4b. Multi-data-rate support in the main link is 1.62, 2.7, 5.4 and 8.1Gbit/s. It supports one, two or four lanes of eDP main link.

The high-speed bi-directional auxiliary channel works at 1MHz.

Modules deliver 5G NR communications

Automotive grade 5G NR modules from Quectel deliver multi-gigabit cellular connectivity and C-V2X PC5 direct communications.

The AG59x's multicore application processor can also improve location services as well as strengthened security.

Based on AEC-Q100-qualified chipsets, the modules include the AG59xH series, which integrates the Qualcomm SA525M, and the AG59xE series featuring the SA522M.

They comply with IATF 16949: 2016 and work in high temperatures.

Meeting the 3GPP release 16 specification and supporting 5G NR standalone (SA) and non-standalone (NSA) modes, the modules are backwards compatible with existing LTE, WCDMA and GSM networks, allowing them to be connected in areas without current 5G NR deployment.

Dual sim dual standby (DSDS) technology can help tackle poor signal coverage when needed.

They support 4x4 downlink mimo, which improves wireless communication and optimises data speeds.

Maximum downlink rate for the AG59xH is are 4.4Gbit/s and uplink rate 900Mbit/s for 5G NR, while the AG59xE provides up to 2.4Gbit/s peak downlink rate and 550Mbit/s uplink rate. This ensures user emergency data and diagnostic data can be transferred in real time for increased reliability.

Supporting optional C-V2X PC5 direct communications, the modules suit V2V and V2I communications.



Each module integrates an application processor with up to 20K DMips computing power available to run C-V2X stack and applications. It also has an integrated ECDSA engine to fulfil C-V2X verification capability.

Additionally, it provides flexible GNSS positioning services including L1+L5 and L1+L2 (optional) dual frequency GNSS, dead reckoning, and PPE + data correction service to achieve quick and precise positioning.

Available in LGA packages, it is pin-to-pin compatible with the firm previous 5G NR automotive modules AG55xQ and AG57xQ.

Interfaces include PCIe 3.0, USB 2.0 and 3.1, SDIO, I²S, SPI, I²C, uart, PCM, ADC, (U)sim, 1PPS and GPIO. It also supports RGMII and SGMII interfaces to improve the adaptability of in-vehicle Ethernet.

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