VEHICLE electronics

The monthly magazine for automotive electronics engineers

Automotive semiconductor market set for 12.3% surge

The automotive semiconductor industry is set to surge at a compound annual growth rate (CAGR) of 12.3% until 2025 on the heels of a strong comeback from the pandemic, according to a report from Omdia.

Semiconductor content in automobiles has been increasing steadily for the past decade, but several recent trends have combined to accelerate revenues, Omdia says.

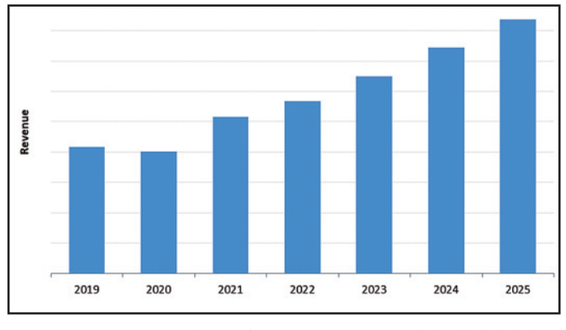
Those include rising sales of battery electric vehicles (BEVs) and growing demand for adas, infotainment and telematics, according to Sang Oh, senior research analyst at Omdia.

"The average BEV creates 2.9 times more semiconductor revenue than a vehicle with a traditional internal combustion engine," Oh said. "In addition, adas applications like camera modules for park assistance and collision warning, plus infotainment and telematics applications like the transition from analogue or hybrid instrument clusters to digital clusters, are also driving increased semiconductor content."

Covid-19 dealt a blow to the global automotive semiconductor industry in the first half of 2020 as global vehicle production ground to a halt during the early days of the pandemic. But the industry posted a strong rebound beginning later in 2020.

The sector's recovery accelerated in 2021, with annual revenues hitting a projected $51.6bn, up 28.6% from the prior year. This came when the automotive supply chain continued to experience disruption, and global vehicle production grew just 2.5% in 2021 against the prior year.

"The much stronger recovery in the automotive semiconductor market than we see in the industry as a whole can be attributed to the dramatic increase in average selling prices for auto semis as supplies became constrained, as well as the trend for electronics manufacturers to pre-order and increase their inventories and safety stocks," said Oh.



Automotive semiconductor revenue 2019-2025

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March 2022

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Veniam and TomTom reduce data bottleneck

Veniam, a specialist in intelligent networking for connected vehicles, is combining its technology with mapping giant TomTom to deliver connectivity for onboard use by car manufacturers.

Veniam's software and cloud services ensure connected vehicles can make the most out of available networks such as 4G, 5G, wifi and V2X. This means more and better telemetry data, infotainment content and over-the-air software updates at a claimed 60% lower cost per gigabyte.

TomTom's Indigo open digital cockpit software offers car makers, integrators, software developers and content providers an open and secure environment to develop software and apps, giving car makers choice while delivering a safe in-vehicle experience.

The platform unifies in-vehicle displays through a common user interface that gives passengers and driver access to climate control, audio system, vehicle settings, and the latest apps and services.

Veniam's intelligent networking lets Indigo users split data flows and charge separately for applications. Instead of billing all data costs to the OEM or fleet provider, navigation services providers can pay for map updates, adas firms can pay for sensor data, and infotainment providers can pay for content transfers, all at a less than the cost of cellular data.

With rising demands for more and better data driven by consumer applications and AI-based connected services, Veniam's approach breaks the data networking bottleneck and enables new commercial services and business models.

With Indigo and Veniam technology, drivers and passengers could see their user experience improve fast even after purchasing the vehicle, enjoying features, maps and content.

Application developers can use Veniam's APIs and cloud services for connection, data, security and policy management.

"By maximising quality of service, reducing data costs and enabling separate billing for different applications, the Veniam platform, made available through the Indigo APIs, gives auto OEMs unprecedented control over data connectivity, while providing drivers and passengers with best-in-class connected experience," said Joao Barros, CEO of Veniam.

Qualcomm accelerates Ferrari F1



Qualcomm is helping accelerate the digital transformation at Ferrari as it prepares for the new Formula One season.

Qualcomm will serve as Ferrari's systems provider for its upcoming road cars, as well as a premium partner for the Scuderia Ferrari Formula One and eSports teams.

Ferrari will use the Snapdragon Digital Chassis to bring the automotive technology advancements to its road cars. The Digital Chassis comprises open and scalable cloud-connected platforms including telematics and connectivity, digital cockpit, and adas functions, and uses a unified architecture to enhance safety and immersive digital experiences that are updateable. Qualcomm will also help Ferrari design, develop and integrate digital cockpits.

Snapdragon will be in the new Scuderia Ferrari's F1-75 single-seater (pictured). Additionally, the Maranello marque's eSports activities will be part of the partnership.

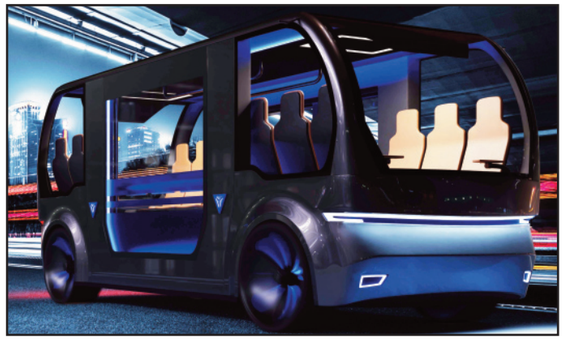
Collaboration to drive autonomous mobility

Benteler EV Systems, Beep and Intel subsidiary Mobileye are collaborating to develop and deploy automotive-grade, fully electric, autonomous movers in public and private communities across North America.

Aimed at first- and last-kilometre use cases in urban areas, the shuttles are due to begin production deployments in the USA in 2024.

The collaboration should facilitate the development and deployment of a fully autonomous SAE level-four electric mover designed to meet automotive industry and safety standards for public road use.

The purpose-built autonomous mover from Benteler EV Systems will be underpinned by Mobileye's Drive self-driving system and supported by Beep's deployment and operations systems, technology and services.



Fully electric, autonomous shuttle

"Multi-passenger micro-transit needs are ever-increasing in our cities and towns globally and must be addressed to reduce road congestion, protect the environment and provide safe, reliable mobility for all to access," said Hinrich Woebcken, advisory board member for Beep. "Bringing to market an affordable, automotive-grade, electric, autonomous mover will transform mobility as we know it today."

Beep has experience in the operations of micro-transit and mobility, Benteler in the design and manufacturing of automotive safety systems, and Mobileye in the delivery of automated driving.

Benteler will develop an autonomous mover and integrate all individual subsystems into the final vehicle. This includes the industrialisation and production of the mover. Production will take place in the USA, with the ambition to roll out the mover to other countries.

Beep has tested autonomous electric shuttles in public road projects for tens of thousands of riders over tens of thousands of road kilometres in 2021 alone.

Mobileye picks Arm IP for EyeQ

Arm is targeting adas and automation vision applications with its latest IP, and Mobileye is one of the first users.

The Mali-C78AE ISP was developed to meet the performance and safety needs in automotive uses. Combined with Cortex-A78AE and Mali-G78AE, the Mali-C78AE provides a full adas vision pipeline to optimise performance, reduce power consumption and provide a consistent approach to functional safety.

"As the number and sophistication of vehicle cameras increase, so does the compute power needed to translate the high throughput of image data – efficiently and safely – into outputs that meet the varying requirements for machine and human vision," said Chet Babla, vice president at Arm. "To enable new capabilities in adas and autonomous driving, the industry will need a new approach to image processing and, to address this, we have added the Mali-C78AE ISP to our portfolio of IP."

One of the first users of the ISP is Mobileye for its EyeQ automotive vision-safety technology.

"When Mobileye started development of the Mobileye EyeQ Ultra and EyeQ6H, it selected the Mali-C78AE to process image data efficiently and, by coupling it with the Mali-G78AE GPU, enable safety-capable, smooth, real-time intuitive graphics rendering capabilities needed to meet the application's demanding requirements," said Babla.

Adas will rely on safe, flexible, power efficient, vision technology that can be scaled across different vehicle types, models, configurations and price points. Mobileye has deployed the ISP and GPU processing to meet the growing demands of parking-assistance and visualisation workloads.

Baraja and Tier IV combine lidar and cameras

Lidar technology firm Baraja and Tier IV, an open-source autonomous driving company, are collaborating to research and develop a software-defined suite combining lidar and HDR cameras for autonomous vehicles.

The suite will bring together Baraja's Spectrum-Scan lidar technology with Tier IV's sensor fusion software and HDR cameras, creating a perception offering to improve performance in various environments for autonomous vehicles.

The two companies will collaborate with automotive OEMs on building a reference unit that will form the basis of future commercial product.

The automotive-grade HDR cameras, which have high dynamic range, LED flicker mitigation and on-board lens distortion correction, provide a 2D representation of the scene, while Spectrum-Scan lidar provides a high-definition, 3D point cloud that enables greater density of data.

Together with Tier IV's sensor fusion software, the resulting data should provide a rich, accurate representation of the physical world for automotive perception algorithms that will enable autonomous vehicles to make better decisions, faster in real time.

Spectrum-Scan lidar is the same technology platform underpinning Spectrum HD, Baraja's lidar platform. With Spectrum-Scan, Tier IV will be able to access lidar technology to ensure its sensor fusion suite can adapt to different driving environments and help integrate hardware into vehicles.

Federico Collarte, CEO of Baraja, said: "With this combination, we'll be able to provide a dynamic and configurable feature system that can be adopted by a broader range of vehicles as they move to level-two-plus autonomy and beyond."

The features and benefits of this should provide enhanced perception ability and enable more reliability for long-range detection and object classification while handling edge cases, especially under environments such as heavy rain and fog.



Nvidia roars at Jaguar partnership

Starting in 2025, all new Jaguar and Land Rover vehicles will be built on the Nvidia Drive software-defined platform.

This follows the signing of a multi-year partnership between the companies to develop and deliver automated driving systems plus AI-enabled services and experiences for its customers.



Jensen Huang (left) and Thierry Bolloré

These will include active safety, automated driving and parking as well as driver assistance. Inside the vehicle will be AI features including driver and occupant monitoring as well as visualisation of the vehicle's environment.

This full-stack is based on the Nvidia Drive Hyperion, which features Drive Orin centralised AV computers; Drive AV and IX software; safety, security and networking systems; plus surround sensors. Orin is the AI brain of the car and runs the JLR operating system, while Hyperion is the central nervous system.

JLR will also leverage in-house developed data centre technology with Nvidia DGX for training AI models and Drive Sim software built on Nvidia's Omniverse for real-time physically accurate simulation. JLR's software-defined features and its end-to-end verification and validation architecture will enable the delivery of assisted and automated driving services throughout the life of the vehicle via over-the-air software updates.

"Collaboration and knowledge-sharing with industry leader Nvidia is essential to realising our reimagine strategy, setting new benchmarks in quality, technology and sustainability," said Thierry Bolloré, Jaguar Land Rover CEO. "Jaguar Land Rover will become the creator of the world's most desirable luxury vehicles and services for the most discerning customers. Our long-term strategic partnership with Nvidia will unlock a world of potential for our future vehicles as the business continues its transformation into a truly global, digital powerhouse."

Jensen Huang, Nvidia CEO, added: "Next-generation cars will transform automotive into one of the largest and most advanced technology industries. Fleets of software-defined, programmable cars will offer new functionalities and services for the life of the vehicles. We are thrilled to partner with Jaguar Land Rover to reimagine the future of transportation and create the most advanced cars."

JLR aims to achieve net-zero carbon emissions across its supply chain, products and operations by 2039.

Black Sesame picks Elektrobit for Autosar

Black Sesame Technologies has selected Elektrobit's Autosar Classic platform (CP) and EB Tresos CP software development for its autonomous driving work.

Black Sesame is one of the first domestic autonomous driving chip makers in China to use Autosar technology. Already, its A1000 chip can support Elektrobit's Autosar CP.

The A1000 chip should enable smart cockpit features and functions.

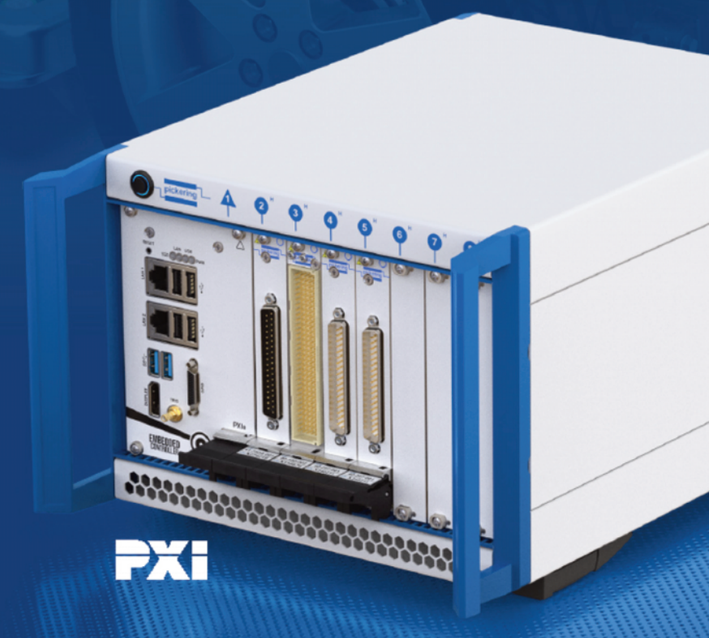
"At Black Sesame Technologies, we are committed to making intelligence for better living," said David Zeng, senior vice president of Black Sesame Technologies. "Currently, we have built a complete customer empowerment system that will enable car factories to safely and quickly produce quality products from chips, algorithms, data, software and tools. Through this cooperation with Elektrobit, we will further expand into the field of autonomous driving while also providing customers with safer, more economical and more comprehensive autonomous driving."

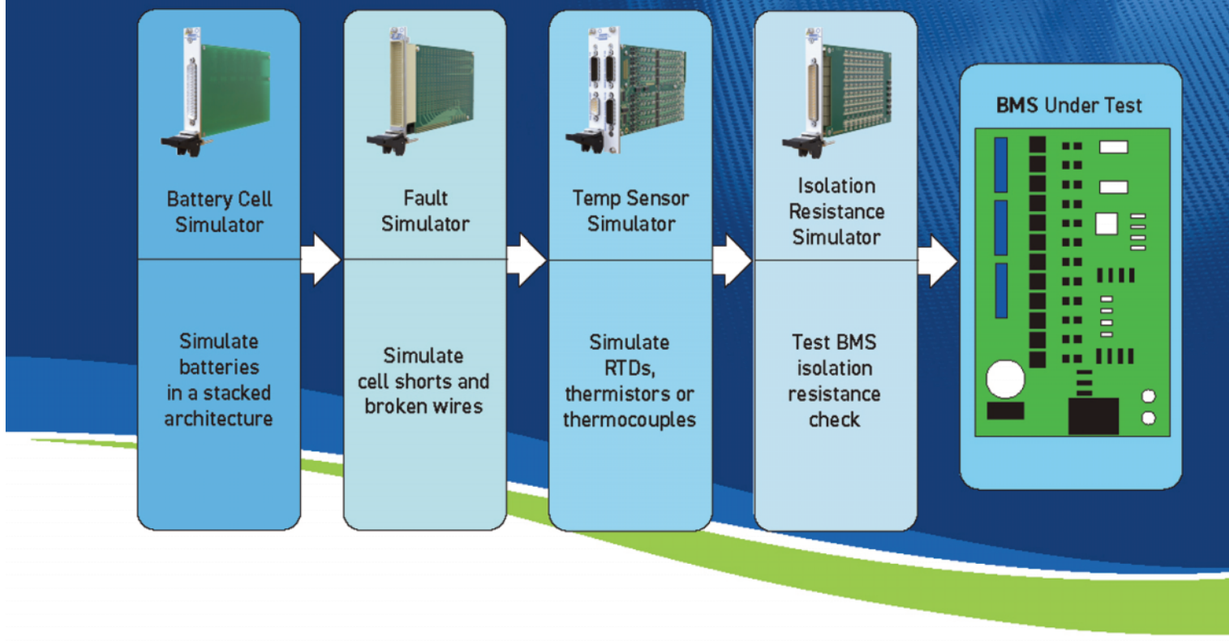
Woody Zou, vice president of Elektrobit in China, added: "With Elektrobit's proven Autosar-compliant software and tools that meet ISO 26262 requirements for automotive functional safety, the two companies are creating one-stop-shop software and hardware."

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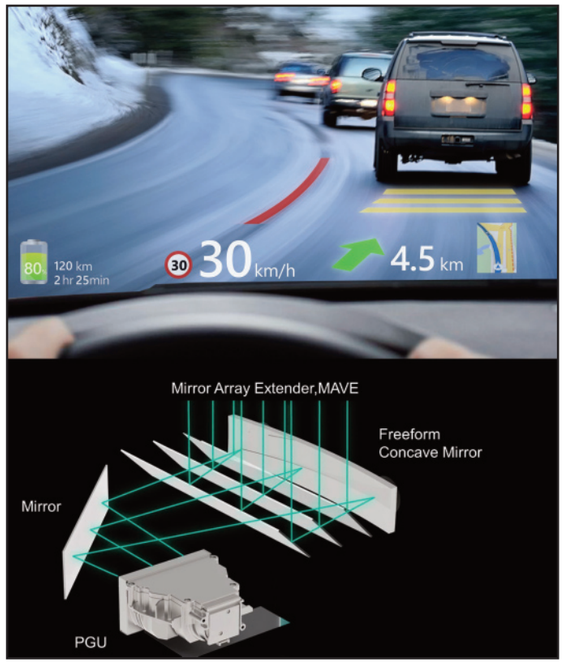
Unimax breaks AR HUD barrier

Taiwanese firm Unimax has announced an augmented-reality head-up display (AR HUD) with mirror-array vision extender (mave) technology, a method of displaying real-time information on car windshields that is said to be smaller, cheaper and more energy efficient.

Because AR HUD needs the light to pass through layers to achieve high-quality VID and FOV attributes, the size of devices is larger than windshield reflection and combiner HUD types.

Thus, when it is installed in front of the dashboard, there are significant restrictions, limiting it to a few car models. Medium and large-sized vehicles are easier to integrate than smaller ones.

The Unimax flat AR HUDs differs using mave technology so the external light paths can penetrate and be reflected, such as with window blinds. Wide-format images can be projected without the need for a large panel. The size volume can be reduced by at least 30% and can be integrated into most vehicles. It also eliminates the need to use expensive wedge glass in the windshield.



Unimax AR HUD improves waveguide efficiency

The optical properties of traditional HUD designs mean if the image is projected onto a standard windshield then ghosting will occur, where a second, fainter image appears in the driver's eye line. To combat this, so-called wedge glass is used to create a slight-but-vital angle between the inner and outer layers of the windshield. This adds significantly to manufacturing costs.

The optical technology behind the Unimax AR HUD works with standard windshields, making it feasible for lower-cost automobiles.

The need to dissipate less heat also reduces the space needed for installation, as well as engineering complexity.

EMapgo directs Ford vehicles in China

Luokung subsidiary eMapgo is providing mapping services in China for the Ford Evos and Mustang Mach-E, both of which are equipped with the car maker's BlueCruise active drive assist system.

The Evos is an upper midsize SUV and the Mustang Mach-E is an all-electric SUV.

BlueCruise supports L2 autonomous driving. When activated, the system automatically determines whether the vehicle can operate the BlueCruise system under current road conditions, and notifies drivers on the vehicles' instrument panel.

It then starts monitoring drivers' observation of traffic in real time and provides warnings and alarms when necessary.

BlueCruise integrates full-speed adaptive cruise with stop-and-go automatic follow-up function, and lane centring assistance, as well as acceleration, deceleration and steering control as part of its active driving assistance, to relieve stress and improve driving safety.

The mapping services cover most highways and city expressways in mainland China and use over-the-air technology for updates and technical support for BlueCruise.

"Ford is a leading international automaker known for its excellence in providing high-quality and innovative vehicles to its customers, and we believe its use of our mapping services validates the quality and advanced capabilities of our product," said Xuesong Song, Luokung's CEO. "We look forward to exploring other opportunities with top automakers looking to strengthen their assisted driving technologies."

Harman acquires AR firm Apostera

Samsung's subsidiary Harman has acquired Apostera, a German automotive technology company.

Apostera's augmented reality (AR) and mixed reality (MR) software will expand Harman's automotive product offerings.

"Harman is dedicated to delivering in-car experiences with the speed and flexibility of consumer technology together with the reliability and performance of automotive grade solutions," said Christian Sobottka, president of Harman's automotive division. "By seamlessly blending AR with the physical environment, Apostera's mixed reality furthers this goal, transforming any display in the car into a richly contextual experience."

Apostera's mixed reality offering combines AR, machine learning, computer vision and sensor fusion in hardware-agnostic software. Combined with Harman's digital cockpit product portfolio, this software can bridge the gap between the physical and digital worlds.

"We are proud to join Harman, a visionary leader in automotive technologies that has been central to the digital transformation of the industry," said Andrey Golubinskiy, CEO of Apostera. "The scale and reach that Harman will bring to our technologies will propel their adoption as the industry benchmark and bring richer in-vehicle experiences to more drivers than ever before."

Apostera's employees will join Harman as part of the company's automotive division.

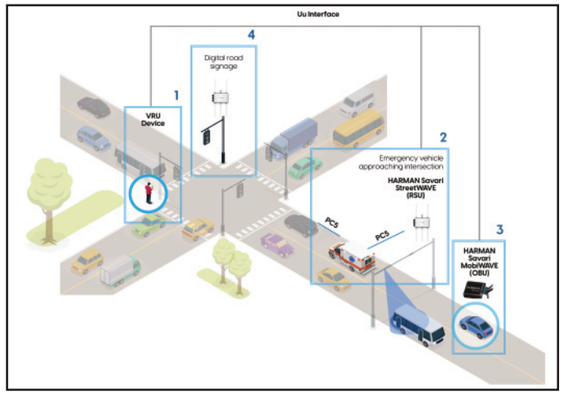
"We welcome our new team members to Harman," said Sobottka, "and we look forward to delivering together the next breakthrough MR products to our partners across the automotive industry."

Harman has just introduced Savari Mecwave, a multi-access edge compute (mec) software platform that lets automakers and mobile network operators deliver low latency applications and services on edge computing infrastructure.

At its recent Explore 2022 event, it also announced two acoustic innovations, Ready Together and Software Enabled Branded Audio.

Ready Together uses acoustic technology to streamline and enhance in-vehicle communication and entertainment.

Software Enabled Branded Audio is an on-demand software platform that upgrades the sound quality and feature set of existing unbranded car audio systems with the touch of a button. Both are ready for in-vehicle integration.



Savari Mecwave edge compute software

Opsys to supply solid-state lidar to Hasco

Opsys Tech is to supply its solid-state scanning lidar to auto parts supplier Hasco for inclusion in production vehicles as early as 2024 or 2025.

This follows a recent announcement that Opsys will supply lidar units to another Asia-based supplier for production vehicles within the next two to three years.

"This agreement with a world leading tier-one automotive supplier Hasco enables Opsys to enter the Asian automotive lidar systems market segment," said Opsys chairman Eitan Gertel.

Xie Bin, general manager of Hasco's adas business unit, added: "Hasco has decided to go with the pure solid-state scanning lidar technology which Opsys Tech developed and Hasco has tested."

The pure solid-state lidar has no moving parts. The patented scanning micro-flash technology combines existing methods; it is said to delivers the advantages of flash lidar with the better range and resolution of mechanical-sweep or oscillating mirrors.

The technology has four times the range of flash lidar while surpassing flash lidar's resolution and scanning rate.

Low-cost production is achieved by using vertical-cavity, surface-emitting lasers and single photon avalanche diode silicon receiver ICs.

EasyMile picks Ansys to demo driverless safety

EasyMile, an all-electric autonomous technology supplier from Toulouse, France, chose Ansys software with the support of Cadfem France for a single-source, turnkey option to demonstrate the safety of its driverless vehicles.

Ansys allowed engineers to work from a single model for all safety activities across platforms, shortening development cycles, speeding time to market and reducing operational costs for the company's driverless shuttle and tow tractor.

Both electric vehicles (EVs) operate at level four, meaning they are fully autonomous until a system failure is detected.

EasyMile deployed Ansys software to conduct functional safety analysis of infrastructure and connected architecture for both vehicles.

An autonomous vehicle (AV) function depends on a high level of information to operate safely. The real-time data-processing supporting AV functionality is driven by input from a complex system of lidar, radar, cameras, IoT sensors, GPS and navigation software, all working together to give a 360° perspective of vehicle surroundings. To demonstrate safety at this level is difficult and requires clearly defined methods and tools for managing the complex architecture of these nonclassical systems.



EasyMile driverless shuttle

Using Ansys software, EasyMile had all the tools needed to analyse its complex AV system architecture. With Ansys' help, it established clear guidelines for safety analysis, along with the templates and supporting documentation needed to demonstrate the safety of the AV for customers and various government regulatory bodies.

"It has been difficult in the past to demonstrate the safety of our products to clients," said Romain Dupont, in charge of R&D for EasyMile. "Ansys Medini Analyze really helps us to streamline the process and bring it all together in a way that our clients can understand. Together with Ansys' support, we're helping shape future standards for autonomous vehicle safety."

Medini Analyze is a software toolset supporting safety analysis for electronically-controlled safety related functions. It allows for the consistent and efficient application of industry guidelines specific to AV applications, helping eliminate inconsistencies during analysis to accelerate certification.

"Autonomous vehicle technology is developing at a lightning-fast pace," said Shane Emswiler, who is senior vice president at Ansys. "This challenges manufacturers and OEMs to reliably test and demonstrate the viability of these incredibly complex systems. We're continuously evolving Medini Analyze to meet ever-changing safety criteria in support of successful customer deployments."

Siemens tests Infineon SiC module on Munich streetcars

A power module from Infineon has proven its worth in a joint field test by Siemens Mobility and Stadtwerke München (SWM).

An Avenio streetcar in Munich was equipped with the XHP 2 power modules and tested in passenger service for a year, covering around 65,000km.

Siemens concluded that this use of power semiconductors based on silicon carbide (SiC) had made it possible to reduce the energy consumption of streetcars by ten per cent. At the same time, it was also possible to reduce engine noise significantly during operation.

"Innovative semiconductors for rail technology are an important driver for green mobility," said Peter Wawer, president of Infineon's industrial power control division. "The successful field test with streetcars in Munich demonstrates the benefits of SiC technology for manufacturers, rail operators and residents."



SiC mosfets show worth in rail-bound vehicles

The tests were carried out under the European development and research project Pinta and are part of the European research and innovation initiative Shift2Rail, which aims to create a sustainable European rail system through targeted investments.

Implementing SiC in power modules for traction propulsion systems can also pose major challenges: On top of an efficient and robust SiC chip, packages that allow high switching speeds are needed, as are interconnection technologies that enable a long service life.

Since trains accelerate and decelerate frequently, the power cycles for semiconductors in rail applications are demanding. The constant temperature fluctuations stress the interconnection technology.

Infineon's XT technology can improve the lifetime during power cycles and has been used successfully for years in applications such as wind turbines.

In the XHP 2 power module, CoolSiC mosfets reduce conversion losses while maintaining reliability. They are the basis for increased energy efficiency and are already used in applications such as photovoltaic systems.

The package has low stray inductance, a symmetrical and scalable design, and high current capacity.

Aptiv invests in TTTech Auto's safety software

Vienna-based automotive safety software company TTTech Auto has raised €250m from Aptiv and Audi in its latest funding round.

Aptiv is investing €200m while Audi is increasing its existing stake by €50m.

The transaction is subject to regulatory approval and is expected to close within the next two months.



Georg Kopetz: "The next few years will be critical."

Aptiv joins Audi, Samsung Electronics and Infineon as part of TTTech's blue-chip shareholder base.

The investment will let TTTech expand its product portfolio for automotive manufacturers and its technology partners, expand internationally, and extend its capabilities through strategic M&A and product investments.

TTTech Auto will apply the funding to its flagship MotionWise safety software platform to support car manufacturers in shortening development cycles for software-defined cars, while guaranteeing safety across all car functions.

About two million vehicles are already based on MotionWise, which will be delivered as an open, modular, standards-based platform.

"The next few years will be critical for the entire industry in the transition from automation to semi-autonomous driving and the software-defined vehicle," said Georg Kopetz, CEO of TTTech Auto. "With MotionWise, we are supporting this industry transformation as an independent company with the most advanced safety software platform on the market. This funding will strengthen our position as a leader in automotive safety software and significantly increase our global footprint."

Specific tools will enable car manufacturers to accelerate the software development process, from the idea stage to series production, including feature updates over-the-air, post-sales.

In the next few years, TTTech plans to create hundreds of high-tech jobs globally. Expansion plans include international growth with a strong focus on Asia.

In China, TTTech Auto already operates the joint venture company Technomous with Saic Motor.

TTTech Auto says it will hire talent in software and safety engineering, strategic product management and business development in Europe, North America and Asia.

The company will also continue its M&A strategy by acquiring complementary products, technologies and services to meet the growing safety needs of car manufacturers as the industry reaches new levels of automation on its path to autonomous driving and the complexity of software-driven car functions increases.

"TTTech Auto's expertise in providing end-to-end real time behaviour for safety critical systems complements our software platform to accelerate development, integration, testing and validation," said Kevin Clark, CEO of Aptiv. "This investment further advances our software strategy, and adds to Aptiv's full-stack capabilities, enabling customers to democratise advanced safety systems faster and at a lower cost."

Solera acquires Spireon to strengthen AI software

Solera, a provider of integrated vehicle lifecycle and fleet management software, has acquired Spireon, one of North America's largest device-independent telematics and connected vehicle intelligence companies.

The acquisition should strengthen Solera's position as a provider of AI-powered software, services and data assets.

More than 13,000 Spireon users in the automotive, fleet, trailer and asset sectors with nearly four million connected devices generate 900 billion discrete data points on its cloud native IoT platform each year.

"This acquisition is aligned with our existing fleet and dealership growth strategies and will expand our customer base," said Darko Dejanovic, Solera CEO.

Kevin Weiss, Spireon CEO, added: "Solera's position as a growing, global leader can bring new avenues to expand Spireon's IoT platform."

Bosch acquires mapping firm Atlatec

Bosch is expanding its expertise in automated driving and strengthening its market position with the acquisition of Atlatec, based in Karlsruhe, Germany.

Atlatec will become part of the Bosch cross-domain computing division as an independently operated company following an agreement signed by both companies.

Atlatec is a provider of high-resolution digital maps for driver assistance and automated driving. The company, which was spun off from the Karlsruhe Institute of Technology in 2014, employs around 25 people in Germany, Japan and the USA.

"The planned acquisition of Atlatec further expands our expertise in the field of high-resolution digital maps and makes us even more diversified," said Mathias Pillin, president of the cross-domain computing division. "It makes Bosch the only company that can offer its customers all the necessary building blocks of automated driving – from actuators and sensors to software and maps – from a single source. We are thus consistently expanding our strong position in this area."



Atlatec has developed a sensor box and software

Henning Lategahn, CEO of Atlatec, added: "In Bosch, we have found the right partner for us as we take the next step in expanding our digital mapping expertise even further."

The purchase price will not be disclosed and the acquisition is subject to approval by antitrust authorities.

High-resolution digital maps play an essential part in making automated driving functions safe and convenient. Atlatec offers the building blocks for mapping from a single source: its portfolio includes not only data recording and processing but also creation of the maps themselves as well as the requisite quality control.

For the creation of maps, Atlatec has developed its own sensor box and software. The raw data this collects are analysed using artificial intelligence (AI) and enriched with information such as traffic signs and the sharpness of bends, as well as structural features such as streetcar tracks.

"Atlatec's technology package for creating high-resolution maps makes the company an ideal addition for Bosch," said Stephan Hönle, senior vice president at Bosch. "The resulting mapping is very intelligent and agile, which sets it apart from other vendors. For example, the AI it uses identifies and maps road features such as guardrails and lane markings with the highest accuracy and consistency. This lets us design our driving strategy algorithms even more precisely."

BMW uses two e-sims per connected car

BMW connected cars using technology from Giesecke+Devrient are equipped with two e-sim cards. One is for ecalls, navigation or traffic information services, and the other for the driver's private information and entertainment services.

The technical base is G+D's DSDA (dual-sim dual-active) and AirOn-360 e-sim management platform. These are used in the BMW iX and i4 and will be available in other BMW models.

Embedded sims (e-sims) have been mandatory since March 2018 in the EU for ecall automatic emergency calls.

G+D is taking this a step further with BMW, as the vehicles will have two independent e-sims. The basis is the DSDA concept, which takes a user-centric approach to connectivity. The telematics e-sim ensures the manufacturer's digital services such as ecall, navigation or traffic information, while the personal e-sim is for information and entertainment applications of the driver and passengers.

This also facilitates the path to meeting different regulatory requirements in many countries.

DRIVER ASSISTANCE

SOUND ADVICE

David Katz discusses how to plan for success in real-time acoustic processing

Vehicle Electronics

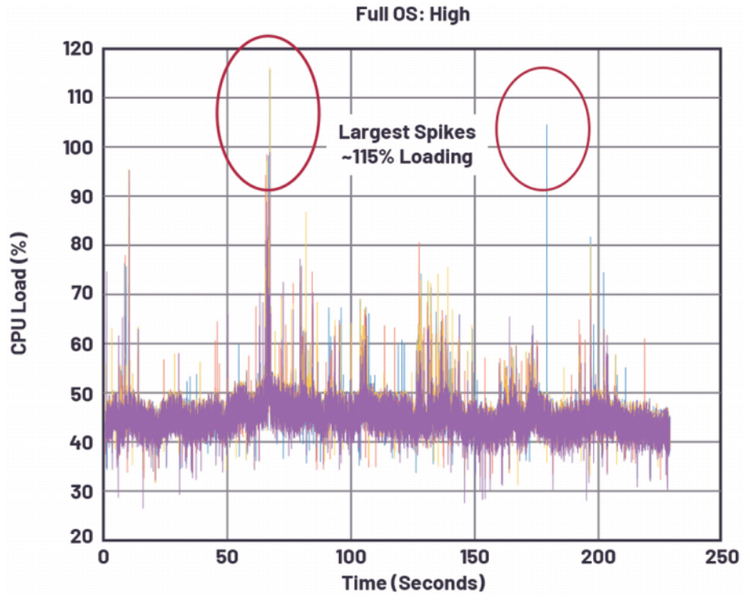


Fig. 1: Instantaneous CPU loads for a representative SoC running high audio memory processing in addition to other tasks

Low latency, real-time acoustic processing is a key factor in many embedded processing applications, among them voice pre-processing, speech recognition and active noise cancellation (ANC). As real-time performance requirements steadily increase within these domains, developers need to adopt a strategic mindset to accommodate such needs properly.

Given the significant performance offered by many larger systems-on-chip (SoCs), it may be tempting simply to load these devices with any additional tasks that arise, but it's important to understand that latency and determinism are critical elements that can easily lead to major real-time problems if not considered carefully.

As such, there are issues designers should consider when choosing between a SoC and dedicated audio DSP to avoid unpleasant surprises in real-time acoustic systems.

Low latency acoustic systems cover a wide range of applications. For instance, in the automotive space alone, low latency is critical for personal audio zones, road noise cancellation (RNC) and in-car communication systems, to name a few.

With the emerging trend of vehicle electrification, RNC becomes even more important because there's no combustion engine generating noticeable noise. Therefore, the sounds associated with the car-to-road interface become much more noticeable and offensive. Reducing this noise not only creates a more comfortable riding experience, but it also reduces driver fatigue.

There are numerous challenges associated with implementing a low latency acoustic system on a SoC as opposed to a dedicated audio DSP. These include latency, scalability, upgradeability, algorithm considerations, hardware acceleration and customer support.

Latency

The issue of latency in real-time acoustic processing systems is important. If the processor cannot keep up with the real-time data movement and computational demands of the system, unacceptable audio drops can result.

Typically, SoCs have small on-chip srams and, accordingly, must rely on cache for most local memory accesses. This introduces nondeterministic availability of code and data, and it increases processing latency. For a real-time application such as ANC, this alone can be a deal breaker.

Also, SoCs run non-real-time operating systems that manage heavy multitasking loads. This amplifies the nondeterministic operating characteristic of the system, making it very difficult to support relatively complex acoustic processing in a multitasking environment.

Fig. 1 shows a concrete example of a SoC running a real-time audio processing load, where CPU loading spikes as higher priority SoC tasks are serviced. These spikes may occur, for example, due to SoC-centric activities such as media rendering, browsing or app execution on the system. Whenever the spikes surpass 100% CPU loading, the SoC is no longer operating in real time, and this will result in audio dropouts.

Audio DSPs, on the other hand, are architected for low latency throughout the signal processing path, from sampled audio input to composite (for example, audio plus anti-noise) speaker output.

L1 instruction and data sram, the single-cycle memory closest to the processor core, is ample to support many processing algorithms without offloading intermediate data to off-chip memory.

Additionally, on-chip L2 memory – further from the core but still much faster access than off-chip dram – helps provide a buffer for intermediate data operations when L1 sram storage is exceeded.

Finally, audio DSPs commonly run a real-time operating system (rtos) that ensures incoming data can be processed and sent out to their target destination before new input data arrive, thus ensuring that data buffers don't overflow during real-time operation.

The actual latency in system boot – often measured by time-to-audio availability – can also be an important metric, especially in automotive systems where audible warnings must be broadcast within a certain window from start up. In the SoC world, where it's typical to have a lengthy boot sequence that involves bringing up the operating system for the entire device, it can be difficult or impossible to meet this start-up requirement.

On the other hand, a standalone audio DSP running its own rtos unaffected by other extraneous system priorities can be optimised for fast boot that comfortably satisfies the time-to-audio requirement.

Scalability

While latency concerns are problematic for SoCs in applications such as noise control, another key shortcoming for SoCs aspiring to perform acoustic processing is in scalability. In other words, SoCs that control large systems such as automotive head-end units and clusters with

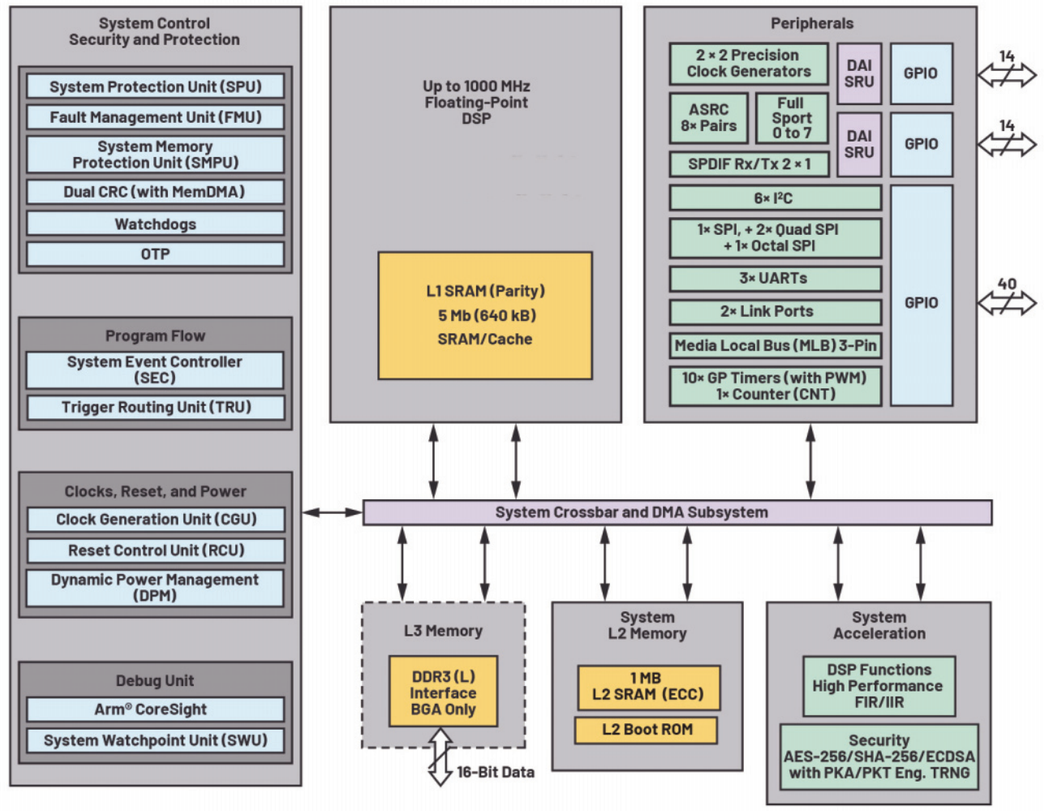


Fig. 2: DSP, illustrative of a highly scalable audio processor

many disparate subsystems cannot easily scale from low end to high end audio needs because there is constant conflict between the scalability needs of each subsystem component, requiring trade-offs in the overall SoC use.

For instance, if a head-end SoC connects to a remote tuner and, across automotive models, that tuner needs to scale from a few channels to many channels, each channel configuration will amplify the real-time concerns mentioned earlier. This is due to each additional feature under the SoC's control changing the real-time behaviour of the SoC and the resource availability of key architectural components used by multiple functions. These resources include aspects such as memory bandwidth, processor core cycles and system bus fabric arbitration slots.

Apart from the concern about other subsystems connecting into the multitasking SoC, the acoustic subsystem itself has its own scalability issues. There's a low end to high end scaling (for example, increasing the numbers of microphone and speaker channels in an ANC application), and there's also the audio experience scaling, from basic audio decode and stereo playback up through 3D virtualisation and other premium features. Though these requirements do not share the real-time constraints of ANC systems, they nonetheless relate directly to the choice of audio processor for a system.

Using a separate audio DSP as a coprocessor to a SoC is a perfect solution to the audio scalability problem, enabling modular system design that is cost-optimised. The SoC can focus much less on the real-time acoustic processing needs of the larger system, instead offloading that processing to the low latency audio DSP.

Moreover, audio DSPs that offer several different price-performance-memory levels across a comprehensive code-compatible and pin-compatible roadmap offer increased flexibility for system designers to right-size the audio performance offering for a given product tier.



Fig. 3: Graphical development environment

Upgradeability

As over-the-air firmware updates become more common in today's vehicles, upgradeability to issue critical patches or provide new functionality becomes increasingly important. This can cause major issues for a SoC because of the increased dependencies among its various subsystems.

First, on SoCs, multiple processing and data movement threads are vying for resources. This increases competition for processor Mips and memory when new features are added, especially during bursts of peak activity.

From the audio perspective, feature additions in other SoC control domains can have an unpredictable effect on real-time acoustic performance. One side effect of this is new functionality must be cross-tested across all operating planes, resulting in myriad permutations between various operating modes of the competing subsystems. Thus, software verification increases exponentially for each upgrade package.

Viewed from a different angle, it could be said that improvements to SoC audio performance are dependent on available SoC Mips, in addition to the feature roadmaps for the other subsystems controlled by the SoC.

Algorithms

It should be apparent that, when it comes to developing real-time acoustic algorithms, audio DSPs are purpose-built for the task. As a significant differentiator to SoCs, standalone audio DSPs can offer graphical development environments that allow engineers with little DSP coding experience to add quality acoustic processing into their designs.

This type of tool can lower development costs by reducing development time without sacrificing quality or performance.

As an example, a graphical audio development environment can offer a wide variety of signal processing algorithms integrated into an intuitive graphical user interface, allowing the creation of complicated audio signal flows. This can support graphical A^{2}B configuration for audio transport, helping to catalyse real-time acoustic system development.

Hardware

In addition to a processor core architecture that's specifically designed for efficient parallel floating-point computations and data accesses, audio DSPs often have dedicated multichannel accelerators for common audio primitives such as fast Fourier transforms (FFTs), finite and infinite impulse response (FIR and IIR) filtering, and asynchronous sample rate conversion (ASRC).

These allow real-time audio filtering, sampling and frequency domain conversion outside of the core CPU, increasing the effective core performance. Additionally, they can facilitate a flexible and user-friendly programming model due to their optimised architecture and dataflow-management capabilities.

Because of the proliferation of audio channel counts, filter streams, sampling rates and the like, it's important to have a configurable pin interface that allows in-line sample rate conversion, precision clocking and synchronous high speed serial ports to route data efficiently and avoid added latency or external interface logic. A digital audio interconnect is shown in Fig. 4.

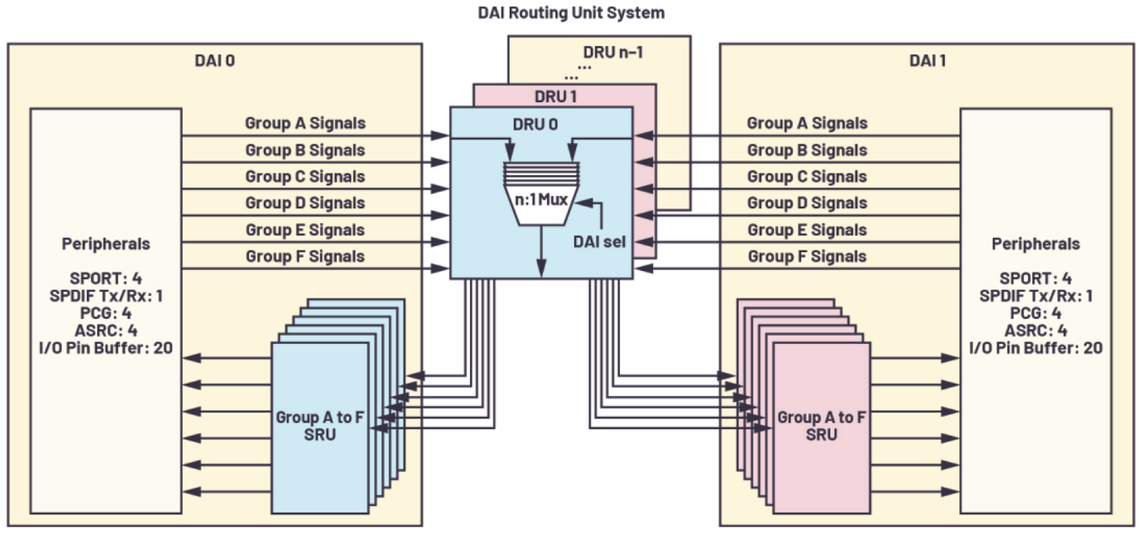


Fig. 4: Digital audio interconnect (DAI) block diagram

Conclusion

It is apparent that designing real-time acoustic systems involves deliberate, strategic planning of system resources and cannot simply be managed through allocating leftover processing headroom on a multitasking SoC.

Instead, a standalone audio DSP optimised for low latency processing is likely to lead to increased robustness, decreased development time and optimal scalability to accommodate future system needs and performance tiers.

David Katz is infotainment systems architecture director at Analog Devices



DISPLAYS

HEADS UP



Continental transfers head-up display technology from cars to trams

Continental has developed a head-up display (HUD) for trams. From its Continental Engineering Services (CES) in-house development and production service, the HUD is aimed at making intra-urban traffic safer by ensuring tram drivers can focus their full attention on what is happening on the road.

This also enables, for instance, a reduction in the number of emergency braking manoeuvres.

Trams mostly operate in heavy and frequently challenging inner-city traffic, an environment in which the number of unprotected road users is increasing. More people are cycling or riding e-scooters or compact electric mopeds. Moreover, many road users allow themselves to be distracted by their mobile phones.

According to information from transport services, this has resulted in an increasing number of accidents, including those involving trams.

Commissioned by a rail vehicle manufacturer, CES is currently bringing the display to production maturity. It will initially be used in Europe from the middle of this year.

To date, real head-up displays have been non-existent in rail transportation. Key components of the display, including the powerful light source, come from Continental's automotive portfolio, and are already installed in various vehicle models from major automotive manufacturers.

"With the development of a head-up display for trams, we are taking a major step towards greater safety in urban rail transport," said Christoph Falk-Gierlinger, general manager of CES. "Information previously displayed on different cockpit instruments can now be placed in the driver's field of vision via a central head-up display. Their view is not distracted from the traffic. The journey will become safer for tram drivers and passengers."

The advantages of using head-up displays in rail vehicles are immense. As in the automotive sector, the trend is towards ever larger windshields and consequently lower set dashboards.

Here, however, the necessary head movements distract from the traffic situation. Moreover, the eyes constantly have to switch focus between near and far vision as the driver's gaze moves between cockpit and road. This is very tiring for the driver.

Projecting vital information – for example, warning signals, speed and distance to the next stop – in the driver's direct field of vision makes driving more comfortable, resulting in greater safety. This is particularly the case because information is displayed virtually as if it were at some distance in front of the vehicle. That way, the eyes do not have to refocus constantly.

Field of vision

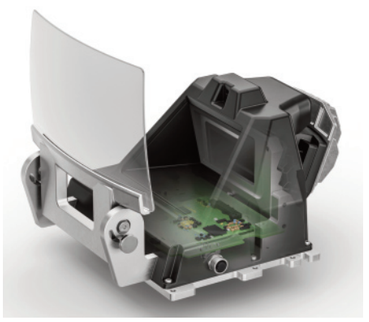
The Combiner head-up display projects information onto an external transparent screen in the driver's field of vision. This enables cost-effective use of the technology regardless of the respective manufacturer models, both in newly-developed vehicles and as a retrofit for existing models.

Drivers are not only able to see the road and cockpit display simultaneously; the information also appears at what is perceived as the same distance. Furthermore, thanks to powerful LEDs, the head-up display, which has already proven itself in the automotive sector, meets high standards in terms of light and image quality, even in strong sunshine.

CES has in-depth understanding of and expertise in adapting automotive technologies from large-scale production for new areas of application. In addition to the head-up display, CES's technology portfolio for rail vehicles includes other system technologies such as driver status monitoring, which monitors the driver using a camera, or a front or side-facing collision warning system, for example.

All these technologies have already been successfully brought to the road in the passenger car or commercial vehicle sector. For their use in trams, CES engineers intensively studied the operation and control of trams, the technical challenges, and the design of tram cockpits.

In close collaboration with a major manufacturer of rail vehicles, the first step was to develop a head-up display that is innovative and tailor-made for rail transport based on automotive quality standards. Further fields of application are conceivable in future as the technology can also be used in long-distance trains.



Combiner head-up display

V2G

POTENTIAL ENERGY



Michael Colijn says the key to unlocking the Earth's power potential is smart energy management

Amstelland-Meerlanden (AML) e-buses using rapid charging technology as a part of Schiphol Airport's bus charging depot, the largest in the world

The surge in demand for EVs across the globe has not come as a shock. EU nations declared the transition to 100% zero-emission sales of new cars and vans would happen by 2040. EVs are driving government efforts to reach net-zero and are playing a significant role in decarbonisation efforts.

The sentiment behind the EV charge is all well and good, but current infrastructure has been called into question. More specifically, can energy grids – which are already in need of revamping – handle such a significant strain?

But what if there was a system that could support all energy needs sufficiently? What if the grids didn't have to struggle? And what if there was a system that allowed governments, city planners, commercial operators and even consumers to profit from their contribution? All these hypotheticals can be answered and become a reality through EVs.

But their energy potential comes down to smart energy management; the real key to unlocking the grid's full potential.

Foundation

The electrification of vehicles puts pressure on the grid, particularly during peak hours when people are charging their batteries. This, in turn, impacts consumers who have to pay peak prices, face grid slowdowns and even run the risk of outages across the network.

Every day issues such as these come down to a weak and inefficient energy infrastructure. Consumers' energy usage is fast on the rise, the grid narrowly focuses energy into one space, risking nations' electricity and heat. As the imperatives of climate change commitments loom large, city planners and local governments are set to explore options that step away from centralised energy grids.

To move away from traditional grids means decentralising national grids. Coined as a key element of smart energy management, energy should be dispersed in a way that is cost efficient and is reusable. As such, advancements are needed in energy storage. This is the key to unlock smart energy management as it will enable consumers to be active participants rather than passive end users. And as the world heads to the peak energy usage in years, more is needed from current energy system.



Nissan Leaf charged using V2G allows EV drivers to activate charging at times when it will have the least impact on the grid

V2G

Smart energy management uses digital technologies to monitor and control the transport of electricity to meet the varying demands of end users. This technology coordinates needs and capabilities so all aspects of the grid operate as efficiently as possible, reducing strain while increasing reliability.

Smart energy management systems will overcome the everyday issues of centralised charging by using software to activate a vehicle's charging at times where it will have the least impact on the grid.

Known as vehicle-to-grid (V2G) technology, the potential of this can be seen in a recent partnership between Nissan and Octopus Energy.

What's more, V2G allows for energy stored in EV batteries to support the grid where it's needed most, turning EVs themselves into distributed energy resources that are extensions of the network rather than drains upon it.

The Nissan scheme aimed to empower EV owners to recharge their vehicles during off-peak hours when prices were at their lowest and then sell that energy back to the grid when prices were higher.

Technology such as this shows



Combined charging system charger, part of a larger energy management system powering up to 150kW of energy to German bus operator Rhein-Neckar-Verkehr's e-buses

the potential that smart energy management can have on meeting the growing demand gap. However, to take this from an idea into a reality, a reliable and sufficient system needs to be deployed at scale. That means governments, energy providers, vehicle manufacturers and public transport authorities need to come together to standardise this practice across the entire network.

Scale

Deploying smart energy management at scale requires investment into EV infrastructure, as well as those involved to create an ecosystem of joint offerings. The structure needed is decentralised but as it stands energy systems aren't quite there yet.

The traditional approach to energy in the EU has been a siloed process of building national infrastructure around centralised power stations that prop up the grid, by producing huge amounts of electricity from fossil fuels.

But times are changing. There is a shift towards a system of localised energy networks, where power is generated in close proximity to where it's being used. This shift towards decentralisation means instead of relying on a few major pillars to maintain the grid, the load is spread across thousands of nimble producers.

This helps overcome the inherent intermittence of low-carbon energy, but it also helps fuel competition, driving down prices and, in particular, helping bolster energy security.

The good news is such as ecosystem of joint offerings is already being seen in action. UPS for example has developed its own smart grid of decentralised generation and storage to service its London-based fleet of 50 all-electric delivery vans.

But to unlock the planet-saving potential of smart systems, this kind of project needs to be deployed across tens of thousands of commercial fleets and the public transport network.

What's needed

The world is facing a pivotal moment in the campaign against climate change. Cop 26 was filled with inspiring commitments to reduce global emissions. But none of those goals are achievable without serious investment in the infrastructure that's needed to deliver them.

Current energy systems aren't designed to meet the pressures that will be placed upon them as the world shifts towards a sustainable future. Instead, the time has come to reimagine the way energy consumption is managed.

To be strategic with the way energy is managed is to engage in smart energy management. Achieving Cop 26 goals is important, but there are a range of other advantages that smart energy management can provide. These benefits manifest in the form of stabilised infrastructure, increased energy resilience and stress relief on grids. As such every person can benefit from smart energy management in the e-mobility sector.



Michael Colijn is CEO of Heliox

ON THE ROAD

VANtastic

The latest generation of the long-established Renault Trafic van sees the introduction of car-like levels of refinement, equipment and technology

With its capacious and ergonomically designed load area now complemented by features that bolster safety, connectivity and comfort, the latest Trafic van is even more suited to the requirements of tradespeople and corporate fleets.

Distinguished by a bold new front-end design, the latest version also has an entirely refreshed interior, a wider range of



Vehicle Electronics

Euro 6D-Full compliant engines, enhanced infotainment and the latest adas.

The release combines traditional long and short wheelbase variants, plus a choice of roof heights, with the availability of four trim levels – Business, Business+, Sport and Sport+. A long wheelbase Crew van version adds more versatility and usability, as does the availability of the six-speed EDC dual-clutch automatic transmission with certain engines.

In total, there is a choice of 44 versions, and the capability to customise the van thanks to options, accessories and tailor-made modifications.

Previous models of the van have sold more than 2.2 million in 50 countries since its introduction in 1980.

Exterior

The completely new front-end design includes full LED lighting with C-shaped running lights and a redesigned bumper that complements the upright grille, finished with chrome detailing.

The LED headlights, with better light distribution and a 15m greater range, enhance visibility by 20 per cent, while manoeuvres are made easier thanks to 30 per cent larger electric folding door mirrors.

The LED fog lights have chrome edging to complement that of the new grille, while a cornering function aids visibility while manoeuvring at night.

The 43cm Avens alloy wheels feature on Sport models – diamond-cut on Sport+ models – with elegant 41cm Siras wheel covers on Business and Business+ variants.

There's a new radio antenna and Cumulus Blue paint option, the distinctive shade being one of eight exterior colours available with users also able to choose from Urban Grey, Glacier White, Magma Red, Highland Grey, Slate Grey, Jet Black and Carmin Red.

A choice of short and long wheelbase body lengths sees both having the option of low or high roof heights. A long wheelbase Crew Van is also available, with left- and right-side loading doors, with those of Sport and Sport+ versions having opening windows.

Interior

The interior has undergone a transformation with the latest technology and an airy, comfortable feel. Influenced by Renault's range of passenger cars, the interior provides an attractive environment for the driver and passengers, with eye-catching details, quality materials and clever practical touches.

A full-width horizontal trim detail adds a sense of width and space to the cabin, with all versions receiving new gear lever and steering wheel designs, heating controls embellished with chrome detail and a sleek, cohesive overall design that's easy to operate and more user-friendly.

The instrument panel houses a crisp 10.7cm TFT colour display and clear dials on Sport and Sport+ variants; there is an 8.9cm monochrome display on Business and Business+ specification.



Instrument panel is designed for ease of use

Depending on the version, a 20.3cm Easy Link display sits in the driver's eye line for greater ease of use with more functions, supplemented by a row of piano-touch keys just below for further vehicle controls.

Chest height under the roof at 14° is 934.5mm, and there is up to 84 litres of on-board storage space, split between 54 litres under the passenger bench seat, 14.6 litres in the doors and the rest via numerous dashboard spaces.

For those needing the interior to double as a workspace, there is a mobile office feature that comes as standard on Business+ and upwards. Together with the enhanced storage space, this includes a fold down middle passenger seat, with detachable A4 clipboard, plus laptop and smartphone cradles.

The rear load area has a load length of 4.15m using the load-through bulkhead underneath the passenger seat, a total capacity of up to 8.9m^3 and a payload up to 1166kg. Usability of the load area is accentuated with LED lighting, which is up to five times brighter than standard halogen lamps, as well as up to 16 anchorage points.



LED headlights have a 15m greater range

For added convenience, the driver can choose to lock and unlock the cabin and/or loading area via a zoning mode on the ignition key or handsfree key card, heightening security.

The Crew van, in Business or Business+ specifications, has a second row of seats with a bench seat that can accommodate three passengers.

The front passenger bench seat gains under-seat storage and the rear interior side panels stretch up to the windows.

Upwards of Sport trim, the second row consists of three individual passenger seats, all of which have adjustable headrests, two armrests and under-seat storage. The outer two seats also have Isofix fittings.

Powertrain

Four versions of the 2.0-litre Blue dCi diesel engine are available, with a choice from dCi 110, 130, 150 and 170 variants.

All versions are front-wheel drive and have fuel-saving stop-start functionality, contributing to the van's compliance with Euro 6D-Full emissions regulations.

New to the range is the dCi 110 engine, which produces 110hp and 300Nm of torque, returning up to 17.4km/litre and emitting as little as 182g/km of CO_2. This engine is paired to a six-speed manual gearbox and is available solely in Business trim.

Available in Business, Business+ and Sport trim levels, the dCi 130 is now 10hp more powerful than its equivalent engine in the previous Trafic. Paired to a six-speed manual transmission, it has peak power of 130hp yet can return up to 17.4km/litre with CO_2 emissions of 182g/km.

The dCi 150 engine is available with the six-speed manual or six-



The model is even more suitable for tradespeople and corporate fleets

speed EDC dual-clutch automatic transmissions. The manual variant also returns up to 17.4km/litre and 182g/km of CO_2 emissions, while the smooth-shifting EDC dual-clutch automatic returns 16.9km/litre and 185g/km of CO_2.

The dCi 170 engine is reserved for Sport and Sport+ versions, offering the option of manual and automatic transmission. Mated to the six-speed manual, the 170hp engine is capable of 17.2km/litre with CO_2 emissions of 184g/km. When paired with the seamless automatic gearbox, it returns up to 16.9km/litre and emits 186g/km CO_2. Performance is strong with a 185km/hr top speed and 0-100km/hr covered in 10.6s.

Technology

The van features the latest infotainment technology as well as the most up-to-date adas available across the Renault Pro+ line.

An addition to the cabin is the 20.3cm Easy Link display on the dashboard, offering connectivity and usability for Business+ users.

The touchscreen system supports full smartphone integration via Apple CarPlay and Android Auto, plus the full selection of Dab, Bluetooth and USB connectivity options that are available on Business models.

In the Sport and Sport+, the Easy Link system has satellite navigation with connected navigation services for three years, and includes Google search for places of interest, live traffic information and weather forecasts.

The Sport+ also offers keyless entry, while an optional wireless smartphone charger is available.

Driver aids and safety systems include adaptive cruise control that safely maintains the distance to the car in front and an active emergency braking that provides braking force if a potential collision is detected ahead of the vehicle and the driver does not take action following visual and audible warnings.

Further safety features include blind spot monitoring and lane departure warning with lane keep assist, traffic sign recognition and automatic high and low beam for the LED headlights, which offer a 20 per cent increase in beam range over the previous generation.

There's also a passenger airbag that has been optimised to protect two passengers occupying the two front passenger seats alongside the driver, while a parking assist system aids manoeuvres together with a reversing camera.

Manufacturing

The Trafic is produced on a dedicated LCV line at Renault's Sandouville plant in northern France.

Renault announced its plan to make Sandouville an LCV production centre in 2011. In preparation, 5000 tonnes of cast iron were used to manufacture LCV production line tooling, equivalent to three-quarters of the weight of the Eiffel Tower's metal frame.

In body assembly, 20,000m² of space was freed up to install new tooling, including 187 robots to make the 5000 spot welds required to assemble the body.

In the paint shop, a complete transformation was necessary to adapt the processes to LCV dimensions. The anti-corrosion treatment tunnel was raised by 70cm and the paint booth extended by 12m.

Resources specific to LCVs were put in place: cradles and conveyor belts to help operators adopt the correct positioning in applying part of the 120m of mastic beading; and interior robots to apply mastic and paint the interior.

Site management placed particular emphasis on developing the skills of operators through training, with 20 days of tuition for each operator prior to starting the job, and the appointment of quality and safety support for personnel with respect to the installations.

Since 2014, the Sandouville plant has been the only factory to produce the third-generation Trafic for all markets around the world.

In 2021, the plant celebrated its 57th anniversary, with more than eight million vehicles produced, including more than 800,000 Trafics.



Capacity is up to 8.9m³ and payload up to 1166kg

PCIe switches provide adas connection



High-speed, low-latency connectivity for distributed, heterogenous compute systems is fundamental for autonomous driving applications.

Microchip Technology is thus announcing genfour automotive-qualified PCIe switches.

These Switchtec PFX, PSX and PAX switches provide compute interconnect capabilities for adas.

They provide the high-speed interconnect that supports distributed, real-time safety-critical data processing in adas architectures.

PCIe is emerging as a preferred compute interconnect for the automotive industry for the same reasons it has become pervasive in the data centre market. It provides low latency and low-power bandwidth scalability to CPUs and specialised accelerator devices.

The firm's ChipLink diagnostic graphical user interface provides debug, diagnostics, configuration and forensics tools for rapid deployment.



ESD protection

Three devices have been added to Nexperia's portfolio of Automotive Ethernet ESD protection devices.

The AEC-Q101-qualified and Open Alliance IEEE 100baseT1 and 1000baseT1 compliant devices are designed to protect two bus lines from damage caused by ESD and other transients. There is no need for users to perform their own qualification.

They are silicon-based and are said to offer advantages over alternative ESD protection products such as varistors.

They provide reliability and a diode capacitance of 1pF maximum to improve signal integrity.

Microcontrollers enable software-defined EVs

Microcontrollers (MCUs) from ST Microelectronics are for electric vehicles and centralised – domain and zonal – electronic architectures. They can enable EVs to become more affordable, drive further and charge faster.

In current EVs, high-efficiency SiC (silicon carbide) power modules enable the greatest driving range and faster charging. Until now, they have required dedicated high-speed signal processors to control the SiC power semiconductors.

The Stellar E MCUs integrate high-speed control-loop processing on-chip. Now, one MCU can control the entire module. This simplifies the module design, saves costs, and eases compliance with automotive safety and security standards.

The Arm-based MCUs are designed from the ground up with the car as a platform in mind. As a centralised domain and zone controller, they simplify automotive electrical architectures for increased power, flexibility and safety.

Currently, the MCU family includes Stellar P series for integration and vehicle control and the G series for body applications. The family architecture integrates multiple Arm Cortex cores with the opportunity for lockstep redundancy and support for real-time hardware virtualisation.

All Stellar devices are designed for software upgradeability through secure over-the-air updates.

The first product in the E series, the Stellar SR5E1 for EV on-board chargers and general DC-DC converters, is sampling to lead customers. Full production will begin in 2023.



Driver protects 48V battery systems

For 48V battery systems in mild hybrid electrical vehicles, trucks, e-wheelers and solar panels, Infineon has introduced the EiceDriver 2ED4820-EM smart gate driver with SPI interface.

Li-ion battery systems need to be protected against negative and positive voltages. In addition, these batteries must be able to disconnect quickly and reliably from loads within microseconds in the event of an overcurrent.

Since a battery unit may not be dedicated to one vehicle, status diagnostic and protection threshold configurability can be key.

To address these requirements, the gate driver is a companion to the firm's 80 and 100V Optimos mosfets. It is also an option for switching high-current loads in a 48V board net.

This dual-channel high-side gate driver can tolerate negative voltages at Vbat down to -90V and voltages up to +105V. These various voltage conditions could occur during a short circuit or a poor contact connection event.

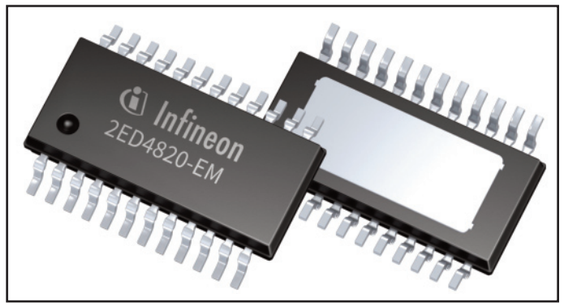
Furthermore, the device includes a current sense amplifier for high or low-side measurement.

The low-side measurement helps reduce cost, PCB space and the overall power dissipation, since the existing shunt resistor of the battery management system can be used.

With the two integrated output channels, it is possible to control a dedicated pre-charge path or separate the charging and discharging current path of the battery, further reducing PCB space and overall cost.

It is in production now, is Pro-Sil ISO 26262-ready and comes with a safety application note to facilitate use in functional-safety applications.

An evaluation board and a reference board are available.



Switcher ICs contain SiC mosfet

Two AEC-Q100 qualified, 1.7kV rated ICs have been added to Power Integrations' InnoSwitch 3-AQ family.

The automotive-qualified switching power supply ICs incorporate a silicon carbide (SiC) primary switching mosfet.

Delivering up to 70W of output, the ICs are for use in 600 and 800V battery and fuel-cell electric passenger vehicles, as well as electric buses, lorries and industrial power applications.

Devices from the family are now available with a choice of silicon, gallium nitride (GaN) and high-voltage SiC transistors.

Offered in an InSop-24D package, the ICs use a FluxLink feedback link, providing reinforced isolation up to 5kV RMS for secondary-side control. FluxLink technology enables direct sensing of the output voltage, providing accurate regulation and fast transient response.



The circuit will start from 30V without external circuitry, critical for functional safety. Additional protection features include input under-voltage, output overvoltage and over-current limiting.

The inclusion of synchronous rectification and a quasi-resonant flyback controller achieves greater than 90% efficiency.

These parts consume less than 15mW at no-load, which is suitable for reducing self-discharge in battery management systems.

A reference design, DER-913Q, and hardware kit RDK-919Q, are available for designers wishing to evaluate the devices.

Buck converters support point-of-load applications

Automotive-compliant synchronous buck converters from Diodes support an input voltage from 3.8 to 32V.

With 2 and 3A current ratings, respectively, the AP6320xQ and AP6330-xQ are for automotive point-of-load applications, including powertrains, instrumentation clusters, telematics and infotainment. They can also help the performance of automotive body electronics and lighting, plus adas implementations.

The AP6320xQ devices integrate 125 and 68mΩ high and low-side power mosfets and the AP-6330xQ 70 and 40mΩ high and low-side power mosfets, enabling both to deliver step-down DC-DC conversion, while keeping down external component count.



They use peak current mode control and integrated loop compensation networks.

The gate driver arrangement in these AEC-Q100 grade-one qualified buck converters mitigates switching node ringing effects, without lengthening mosfet turn-on and turn-off times. This reduces high-frequency radiated EMI noise.

The AP632-00Q, 03Q and 05Q and AP63300Q devices incorporate a frequency spread spectrum function that helps alleviate EMI. A pulse frequency modulation mode improves light load efficiency levels. It enables a quiescent current of 22μA typical.

The AP632-00Q, and 01Q, and AP633-00Q and 01Q support 500kHz switching frequencies. The AP632-03Q and 05Q support 1100kHz, and their faster switching allows the use of smaller inductor and capacitor components.

Both come in TSOT26 packages, with each having an operational temperature of -40 to +125°C. Undervoltage lockout, output overvoltage and thermal shutdown mechanisms are incorporated. They are PPAP capable.

Cmos sensor enables lidar depth imaging

A one-chip non-stacked cmos image sensor from Newsight Imaging is for depth imaging and lidar applications.

The NSI9000 chip is equipped with 491,520 depth 5x5 micron pixels (1024x480), global shutter with up to 132 frames/s on full resolution, and an estimated depth accuracy of less than 1% of the distance.

The sensor is designed for an optimal distance of up to 200m.

Applications include lidar systems, adas, metaverse AR and VR, Industry 4.0, smart city, and IoT, including smart traffic 3D vision systems.

The sensor is a result of five years of collaboration by Newsight and partners such as Fraunhofer and Tower-Jazz.

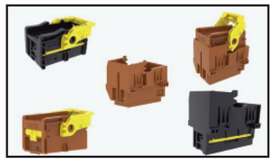
It uses the same enhanced time-of-flight (eToF) technology as on the NSI1000 sensor chip. This enables flexibility using multi-sets of configurations, in-pixel accumulation and a depth calculating method that does not require heavy calculations and an expensive MCU.

A circuit enables event driven imaging, while another attached to each pixel makes it possible to broadcast only lines with pixels that were changed from a previous frame. This is for smart-city enabled cameras and smart traffic systems.

Multi-triangulation is for Industry 4.0 applications and measurement devices of 480 depth points, down to micron accuracy for close 3D inspection of production rail objects.

Built-in fusion allows the sensor to extract a full resolution monochrome image with a depth image from the same frame data, making image and depth fusion easier for systems developers.

The design uses a standard cmos image sensor process, with only two system power source requirements – 1.8V digital and 3.3V analogue.



Unsealed connectors

TE Connectivity has expanded its unsealed interconnection system for industrial and commercial transportation vehicles with the addition of unsealed 36 and 48 position monoblock connectors.

These use a robust, compact and high-density design with a lever system that reduces the mating force and improves the assembly process.

They are for inside-cabin, bulkhead and control-unit applications of on- and off-road vehicles.

Integrated and separate secondary locking features enhance contact alignment, and they adopt the Amp MCP 1.5K and MCON 1.2 contact systems with an all-in-one mono housing composition improving strength and the overall application experience.

The four colour codes help reduce mis-mating with all 36 and 48 position connectors fitting in existing bulkhead cut-outs to eliminate demand for more design changes.

They can be used in lorries and buses, as well as construction, agriculture, ATV and UTV vehicles.

Module adds Can-FD support

Can-FD support has been added to the Can USB module from ESD Electronics.

Data rates of up to 8Mbit/s can be transmitted via Can-FD and USB 2.0 with the USB 2.0 interface in use being designed for 480Mbit/s.

The module has a solid and small aluminium housing with status LEDs in the front. It is powered by the USB port and is equipped with an electrically isolated Can-FD interface according to ISO 11898-2.

The core element is the Arm Cortex-M7 microcontroller, with the help of which Can messages can be sent with time stamps in a resolution of 1μs.

With analysis tools, the Can USB/3 FD module supports silent mode. It is compatible with application programmes that are based on the ESD NTCan API.

The module comes with drivers for Windows 7, 8 and 10 and Linux free of charge, and Windows 11 is now supported. CanOpen and J1939 protocol libraries are available for classic Can applications. Dimensions are 55 by 55 by 25mm.

For quick setup of Can, Can-FD and CanOpen networks, tools as part of the ESD-Can SDK are available to the user free of charge.

With the help of the data logging function, the tools also enable diagnostics and help the user record the data traffic for later analyses and to process the data as a CSV file.

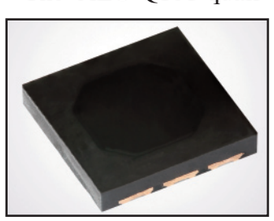


Silicon photodiode detects small signals

An automotive-grade four-quadrant silicon pin photodiode from Vishay comes in a standard surface-mount package.

Enabling various sensor and control applications for automotive, consumer and industrial markets, the K857PH combines high photo sensitivity with 0.1% crosstalk and virtually no tolerance between its segments.

The AEC-Q101-qualified device has four monolithic pin diodes, each with an active area of 1.6mm², integrated into a single 4.72 by 4.72 by 0.8mm top-view, surface-mount package.



The sides of the package are opaque, which eliminates stray light irradiating the photodiodes, improving signal-to-noise ratio. The device's linear photo response enables small signal detection for automotive rain and light sensors, industrial automation systems, laser beam alignment, and virtual reality applications.

Built on homogenous technology, the photodiode has a sensitivity from 710 to 1100nm, a peak wavelength of sensitivity of 950nm, and reverse light current of 11μA per segment at Ee = 1mW/cm² and a 940nm wavelength.

The device provides a ±60° angle of half sensitivity and operates over a temperature range of -40 to +110°C. RoHS-compliant, halogen-free and Vishay Green, it has a floor life of 186 hours in accordance with J-STD-020.

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

Single-slot fault insertion modules

Pickering Interfaces is expanding its range of supported protocols with 1000baseT1 PXI and PXIe fault insertion switching modules.

The single-slot 40/42-203 and 40/42-204 modules provide switching to 200V and 0.8A with typical differential bandwidths of 1.6GHz and 700MHz, respectively. The modules use PXI or PXIe control interfaces enabling flexibility in chassis selection.

They come with various channel counts and two fault bus connections. The 40-203 (PXI) and 42-203 (PXIe) units permit fault insertion on up to six channels of two-wire connections, while the dual mux 40-204 (PXI) and 42-204 (PXIe) provide fault insertion on one or two channels of two-wire connections.

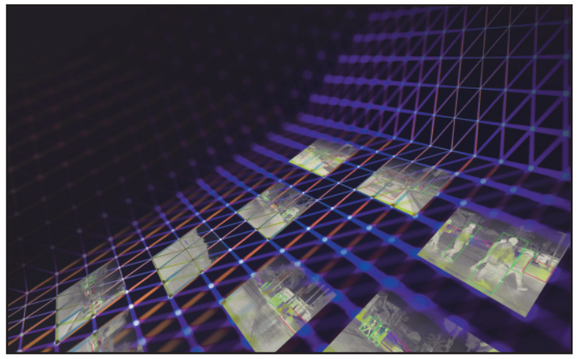
Both offer 100Ω controlled transmission line impedance signal paths. The 40/42-203 uses reed relays designed for high-frequency applications, while the 40/42-204 is based on electromechanical relays.

For smaller test applications, both come in partially populated options, with the 40/42-203 available with three channels and the 40/42-204 as a single channel.

If the testing requirements increase, the fully populated modules double the channel count to six and two, respectively, in the same single chassis slot footprint. Both use the MMCX connector interface, which permits a high channel count in a small panel area, although not differential.

The 1000baseT1 standard was initially developed for the automotive market, but has also been adopted for use in industrial control and building infrastructure Ethernet installations.





Software helps engineers handle thermal imaging

Cloud-based dataset development subscription software from Teledyne Flir is for perception engineers using thermal infra-red and visible image datasets to train neural networks.

Subscribers to Conservator also gain access to application specific segments of the firm's annotated image library of more than one million images with more than 100 object label categories.

Designed to meet the workflow demands of data scientists in automotive, military, security and smart cities applications, it scales to support enterprise artificial intelligence (AI) teams in the research and development of object detection models.

The software includes dataset workflow tools for annotation, curation, quality assurance and dataset version control. Built on a scalable and stable database, it can manage petabyte scale libraries.

In addition, the included Insights desktop tool provides analysis and visualisation of model performance against ground truth references.

This empowers data scientists to pinpoint quickly the specific images in large datasets causing false positives or missed detections, enabling rapid dataset iteration and neural network re-training.

This follows the recent release of the firm's expanded free starter thermal dataset for adas and self-driving vehicle researchers and developers.

With both thermal and visible annotated images across 15 object categories, the free starter thermal dataset allows the automotive and academic community to evaluate the vehicle safety algorithm performance, neural network testing and thermal sensors.

Ethernet bridge suits zonal architecture



An Ethernet bridge IC from Toshiba is for use in automotive zonal-architecture, infotainment, telematics or gateways as well as industrial equipment.

The TC9563XBG incorporates two 10Gbit/s Ethernet media access controllers supporting interfaces including USXGMII, XFI, SGMII and RGMII. Both ports support Ethernet IEEE802.1 audio-video bridging (AVB) for real-time processing and low-latency IEEE802.1 time-sensitive networking for synchronous processing.

The ports also support simplified single root IO virtualisation on PCIe devices.

The IC includes a PCIe gen-three switch with three external ports for communications with the host-controller SoC and additional devices equipped with PCIe interfaces such as 5G-modem modules.

The PCIe switch upstream port supports up to four lanes (32GT/s) for connection with the host SoC, whereas, depending on the configuration, the downstream ports can connect with one and two lanes to PCIe-capable devices.

Automotive networks are evolving towards zonal architecture that requires real-time transmission between the zones using multi-gigabit Ethernet communication. As such, the IC with its dual 10Gbit/s AVB and TSN capable Ethernet interfaces is suitable.

As automotive communication requirements increase in terms of the amount of data as well as the required speeds, the bridge IC will support various applications including in-vehicle infotainment and telematics. It can also replace the existing Ethernet-to-PCIe TC9560 and TC9562 bridges, thereby upgrading throughput and performance.

Recently the use of PCIe interfaces has proliferated for device-to-device communication such as wifi, often leaving designers short of PCIe interfaces on the host SoC. Using the IC's three-port PCIe switch function for these connections addresses this.

Housed in a 10 by 10mm, 0.65mm pitch P-FBGA package, it will be compliant with AEC-Q100 grade three.

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