VEHICLE electronics

The monthly magazine for automotive electronics engineers

Nvidia buys Arm for $40bn

Automotive chip makers are worried Nvidia's proposed $40bn takeover of Arm from Japan's Softbank will lead to it getting preferential treatment for future Arm cores.

The fear is Nvidia will have early access to designs so it come to market quicker than its rivals.

Nvidia says it will expand Arm's R&D presence in Cambridge, UK, and build an artificial intelligent supercomputer to help with research.

Nvidia says it will also expand training facilities for developers and build a start-up incubator to attract research talent and create a platform for innovation and industry partnerships in fields such as healthcare, robotics and self-driving cars.

"Arm and Nvidia share a vision and passion that ubiquitous, energy-efficient computing will help address the world's most pressing issues from climate change to healthcare, from agriculture to education," said Simon Segars, CEO of Arm. "Delivering on this vision requires new approaches to hardware and software and a long-term commitment to research and development."



Nvidia plans to expand Arm's Cambridge HQ

Jensen Huang, founder and CEO of Nvidia, added: "AI is the most powerful technology force of our time and has launched a new wave of computing. In the years ahead, trillions of computers running AI will create a new internet of things that is thousands of times larger than today's internet-of-people. Our combination will create a company fabulously positioned for the age of AI."

He said uniting Nvidia's AI computing capabilities with the ecosystem of Arm's CPU would let the combined company advance computing from the cloud, smartphones, PCs, self-driving cars and robotics, to edge IoT, and expand AI computing to every corner of the globe.

"This combination has tremendous benefits for both companies, our customers and the industry," said Huang. .

Completion of the transaction is expected to take place in approximately 18 months.

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Siemens and VSI in self-driving collaboration

Siemens and VSI Labs, a researcher of active safety and autonomous vehicle (AV) technologies, are partnering to advance development of self-driving car technology.

Through the partnership, Siemens' Pave 360 platform will be used to create digital twin simulations for the validation and testing of all processors, electronics, sensors and systems powering the VSI Labs Capability Demonstrator, an AV development vehicle with components from automotive technology companies and integrated by VSI engineers.

"The primary objective of this partnership is to demonstrate equivalence between Siemens' industry-leading digital twin technology and a physical platform, thereby increasing confidence in digital twin-based modelling methodologies well in advance of the existence of a physical vehicle," said Ravi Subramanian, senior vice president at Siemens subsidiary Mentor. "This collaboration with VSI has the potential to significantly advance the AV space with the creation of a high-fidelity autonomous vehicle digital twin that simulates the interaction and combined power of the most advanced AV components and technologies in the world."

The Pave 360 pre-silicon autonomous validation environment delivers a platform for multi-supplier collaboration across the automotive ecosystem. It can extend simulation capabilities beyond processors to create digital twins that include automotive hardware and software sub-systems, full vehicle models, fusion of sensor data, traffic flows and even the simulation of smart cities through which self-driving cars will ultimately travel.

The two companies say they plan to collaborate on multiple engineering projects, beginning with the validation of digital twin technology for systems functionality across the electronics, system-on-chip (SoC), sensor and mechanical levels of the VSI demonstrator vehicle.

DSpace and Velodyne partner on lidar



DSpace and Velodyne have joined forces to accelerate developments of lidar for autonomous driving, as part of the Automated with Velodyne programme.

This gives DSpace the opportunity to emulate laser sensors from Velodyne into simulation at an early development stage. DSpace plans to develop simulation models for testing and validation, and provide the sensor simulation environment for validating camera, lidar and radar sensors throughout the development process.

The simulation generates point clouds in real time to simulate objects. The models help determine the most effective positioning of the sensor on the vehicle, as well as the sensor limits. Through the partnership, Velodyne's customers can seamlessly integrate sensor models from DSpace into their development activities.

"The simulation accuracy provided by DSpace is remarkably close to reality, and our customers will appreciate the efficiency these Velodyne simulation models will offer them," said Jon Barad, vice president at Velodyne.

Continental picks Xilinx SoC for 4D imaging radar

Radar designers were not happy with the attention being given to lidar and cameras for adas and have upped their game, according to Willard Tu, senior director for automotive at Xilinx.

He was speaking at the announcement that Continental's ARS540 radar sensor will by powered by the Xilinx Zynq UltraScale+ MPSoC platform when it goes into production around the middle of next year.

Some European and US car makers have already committed to the sensor, though their names have not been revealed. Its attraction is that it is said to be the industry's first production-ready 4D imaging radar.

This means it can determine an object's location in range, azimuth, elevation and relative speed to provide detailed information about the driving environment not provided by earlier automotive radars that captured only speed and azimuth.

"I think the radar industry got tired of everyone talking about cameras and lidar and showed what they can do with imaging radar," said Tu. "This is a big moment for us. We are working with Continental and we are excited about this."

Continental's 77GHz radar sensor has a 300m range and a ±60˚ field-of-view, which enables multi-hypothesis tracking for precise prediction while driving. This can be critical for managing complex driving scenarios, such as the detection of a traffic jam under a bridge.

Its horizontal and vertical resolution enables detection of potentially hazardous objects on the road and responds appropriately.

Tu said it could be used in autonomous driving situations from levels two to five.

"The radar will be available next year, which means we will also see revenue next year," said Tu.

The Xilinx SoC uses 16nm technology and is adaptable so the radar can be agnostic to multiple sensor-platform configurations and meet OEM specifications. Parallel processing within the device's programmable logic enables the independent, yet simultaneous processing pipelines that are critical to the 4D sensing. The DSP slices enable hardware acceleration of real-time radar sensor inputs.



Xilinx's SoC powers Continental imaging radar

"Radar is very pervasive in the automotive market and there is still innovation going on," said Tu. "A lot of hoopla has been made about lidar and a lot of money has been invested, but there are multiple approaches and lidar does not have the pervasiveness of radar."

Camera technology was also changing, he said, with most automotive applications once needing 1 to 2Mpixel but now increasing to 4 to 8Mpixel to handle the wider of field of view and resolution needed for adas.

He described the ARS540 as "a huge leap forward for radar" putting radar on an equal footing with some low-end lidar systems.

"For fully autonomous vehicles, you need a mixture of lidar, radar and cameras," he said. "Sensors are complementary to each other. It is not the case that one can do everything. You can do some things with only one sensor but you will have a lot of false positives and that can be dangerous."

Bosch and Schaeffler steer partnership

Schaeffler is embarking on a development partnership with Robert Bosch Automotive Steering to expand its intelligent rear wheel steering (iRWS) portfolio.

The aim of the partnership is to grow the market by offering integrated products for rear wheel steering systems.

Under the partnership, Schaeffler is providing mechatronic iRWS systems, and Robert Bosch Automotive Steering is contributing software and electronics in the form of steering control units.

Regulations hamper car connectivity, says Tata chief

Varying rules across countries, different frequency bands and changing mobile technologies hamper car makers' efforts to provide global connectivity for vehicles.

This was the view of Nick Mavrokordatos, associate director of Tata Communications, speaking at the IoT in Automotive online seminar, organised by the IoT M2M Council (IMC).

"The OEMs want to provide a service globally," he said. "They want to scale their offering."

But he said just providing a basic service involved complexities. These increased for those wanting to provide a differentiated service and layer intelligence on top.

This is why OEMs are investing heavily in connected car programmes, especially as drivers increasingly say in-car connectivity influences their choice of vehicle.

Benefits include letting OEMs continue the relationship with car owners after the sale and creating revenue streams for selling services, such as linking to a smart home so the car can, say, turn off lights and set alarms.

"Connectivity can enrich the driver experience and improve safety," said Mavrokordatos. "The car is a new living space."

When it comes to security, blockchain technology can help, according to Josh Taubenheim, technology analyst at Machnation. He gave examples of how blockchain could be used in automotive.

The first was smart charging for electric vehicles. The blockchain can act as a transaction broker between the utility provider and the user.

Bringing in machine learning gives the potential to predict user behaviour to make the service more efficient.

Secondly, cars can collect data as they are driven. These data can help provide real-time traffic alerts and information on driving conditions to other drivers. Information can be sent to first responders more quickly if there is an accident. The blockchain can validate the information.

Finally, crypto wallets can pay for ride share services, with the blockchain securing the transaction, protecting the user's credit-card details.



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GM adopts ADI wireless manager

General Motors is to become the first car maker to use a wireless battery management system (wBMS) from Analog Devices in production electric vehicles.

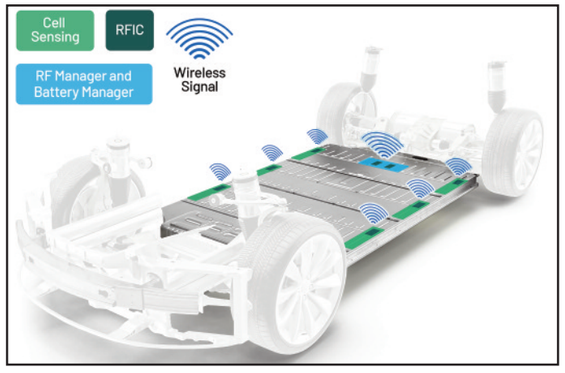
It will debut on vehicles powered by Ultium batteries.

The implementation eliminates the traditional wired harness, saving up to 90% of the wiring and up to 15% of the volume in the battery pack, as well as improving design flexibility and manufacturability, without compromising range and accuracy over the life of the battery.

It includes all ICs, hardware and software for power, battery management, RF communications and system functions in a single system-level product that supports Asil-D safety and module-level security.

"The transition of battery packs from wired to wireless connectivity enables automotive manufacturers to scale their electric vehicle platforms across multiple vehicle models to meet growing consumer demand," said Patrick Morgan, vice president at Analog Devices. "Our wBMS not only simplifies manufacturing, but also allows new systems to be built on wireless data, accelerating the entire industry towards a sustainable future"

Additional features let batteries measure and report their own performance, increasing early failure detection and enabling optimised battery pack assembly. The data can be monitored remotely throughout the battery lifecycle, from assembly to warehouse and transport through installation, maintenance and into a second-life phase.



Wireless battery management for production EVs

Analog Devices and General Motors recently announced a collaboration, bringing the wBMS technology to General Motors' Ultium battery platform. The technology helps ensure scalability of Ultium across GM's future line, which will encompass different brands and vehicle segments, from work lorries to performance vehicles.

Kent Helfrich, executive director at General Motors, said: "The wBMS technology enables the more widespread electrification of our fleet, and we look forward to a continued collaboration with ADI to deliver innovation in safety, quality and performance for the future."

Hua Hong launches 90nm ULL eflash line

Pure-play foundry Hua Hong Semiconductor has launched a 90nm ultra-low-leakage (ULL) embedded flash (eflash) and eeprom platform to meet the needs of large-capacity microcontrollers.

Continuing its 0.11μm ULL technology, the platform provides lower power consumption and suits automotive applications as well as IoT, wearables and industrial use.

The leakage of 1.5V core n- and p-type mos transistors hits 0.2pA/μm, effectively extending the standby time of MCUs. The eNVM (embedded non-volatile memory) IP features 100,000 to 500,000 endurance cycles and 30ns read speed.

The platform uses integrated logic that exceeds 400kgate/mm^2.

It integrates the company's proprietary split-gate NORD eflash technology. It is said to have the smallest cell size and smallest area embedded NOR flash IP under the 90nm process, and fewer layers of mask.

The platform supports RF, eflash and eeprom.

"The company is committed to innovation and continuous optimisation of differentiated technologies to provide customers with urgently needed, cost-effective process and technical services," said Kong Weiran, executive vice president of Hua Hong Semiconductor. "While improving the eight-inch platform, it is speeding up the capacity expansion and technology R&D of the 12-inch production line. IoT and automotive electronics are incremental markets for MCU applications."

Li Auto to integrate Nvidia Orin SoC in 2022 EV

Li Auto will be the first OEM to use the Nvidia Orin system-on-a-chip in its full-size extended-range electric vehicles to be launched in 2022.

The single-chip computing power of the Orin SoC can reach 200Tops, seven times that of the previous Xavier SoC.

Li Auto will provide end users with upgrades for software and hardware, expanding the vehicle's overall computing power to 2000Tops and enabling level-four autonomous driving.

The Chinese car maker says this is part of a three-way cooperation with Nvidia and its Chinese partner, Huizhou Desay SV Automotive.

"As one of the emerging powers in China's new energy vehicle market, Li Auto plans to further increase its research and development investment in autonomous driving, while building the company's vehicles on a solid hardware base by adopting Nvidia's next generation SoC for autonomous driving," said Kai Wang, chief technology officer of Li Auto.

The Orin SoC was released in 2019 and is due to be in production in 2022. It uses 7nm production. Baseline power consumption is 45W.

"Through close cooperation with companies such as Li Auto and Desay SV, we aim to bring all new AI-based autonomous driving functions to the new energy vehicles in China and around the world," said Rishi Dhall, vice president at Nvidia.

Desay SV will build on the Orin SoC, and provide an autonomous driving domain controller. Li Auto will develop autonomous driving designs and algorithms, aiming to become the first new energy vehicle company to develop independently L4 autonomous driving systems in China.

"As artificial intelligence continues to evolve, we are collaborating with the industry's best partners in order to participate in the evolution of autonomous driving and providing smart mobility for our customers," said Dapeng Gao, CEO of Desay SV.



Continental and Osram scrap lighting venture

Continental and Osram have decided to scrap their joint venture set up two years ago to develop intelligent vehicle lighting systems.

The two German companies each have a half share in the venture and are holding talks that should be concluded by the end of the year. The joint venture will then be dissolved.

The negotiations are tackling the issue of how the capital and assets contributed by each company should be separated, including 1500 employees at 14 locations, who will be repatriated to the participating companies.



Continental and Osram blame difficult market

The companies blame the difficult market situation caused by the continuing, low global level of vehicle production and the economic crisis, which was exacerbated by the effects of the coronavirus pandemic.

Continental does not expect global vehicle production to return to 2017 pre-crisis levels before 2025 and, against this current backdrop, the former joint expectations of profitable growth for the joint venture can no longer be realised.

Through a future cooperation agreement, the companies plan to stay connected to their automotive industry customers. The future will see lighting systems based on the close interaction of electronics, software functionality and modern LED lighting sources.

To make sure the resulting innovations and projects go into serial production on time, the two companies will jointly ensure the continuity of project implementation and the necessary expertise for their automotive customers. Existing customer relationships, they say, will therefore not be affected by the negotiations or their outcome.

Obligations entered into and orders received to date will be fulfilled by both companies.

BMW cars go all touchy-feely

Tactile data and virtual sensing technology company Tactile Mobility is to embed its software into BMW vehicles globally from next year.

This collaboration marks one of the first commercial integrations by an OEM of tactile sensing technology and data, which will be used to enhance driving performance and detect road conditions.

The collaboration will equip BMW vehicles with the ability to analyse the road surface attributes under their tyres, enabling detection of road conditions and vehicle dynamics management functions.

The software suite uses vehicles' built-in, non-visual sensors to collect and analyse data about vehicle and road dynamics, enabling smart and connected vehicles to analyse the road surfaces below their tyres as well as modelling vehicle systems performance and road conditions.

In-vehicle, real-time data include attributes such as available grip level, which signifies the specific vehicle and road traction limits.

Tactile Mobility's VehicleDNA is an anonymised representation of each vehicle's systems characteristics, including suspensions, powertrain, braking efficiency and tyre health. SurfaceDNA is a bundle of mapping layers of road attributes, conditions and distresses that offers an in-depth view of driving environments to anticipate road conditions ahead and pre-configure vehicle systems.

"We are thrilled to partner with the BMW Group to equip their smart and future automated vehicles with the sense of touch and show the commercial viability of tactile sensing technology," said Boaz Mizrachi, Tactile Mobility's CTO.

The long-term cooperation began through the BMW Startup Garage, the venture client unit of the BMW Group.

"We are appreciative of the support the BMW Startup Garage and the entire team at the BMW Group has given us," said Rani Plaut, executive board member of Tactile Mobility.

NXP partners Autocrypt to secure V2X

South Korean autonomous vehicle security firm Autocrypt is working with NXP Semiconductors on several automotive security related applications beginning with secure V2X.

Support for Autocrypt V2X will be streamlined across NXP's V2X-related offerings, including the SAF5X00 modem chipsets and the SXF-1800 secure element IC for V2X communications, as well as the i.MX 8 application processor.

By integrating Autocrypt's IEEE 1609.2-compliant V2X security into NXP's platform, secure exchange of V2X messages as well as performance optimisation can be achieved more effectively.

"As an increasing number of vehicles and infrastructure rely on connectivity, it is tantamount that processors have the highest ability to secure V2X communication," said Daniel ES Kim, CEO of Autocrypt. "As a major player in the automotive market, NXP values security as much as Autocrypt. We are looking forward to joint development to continue to progress in our target to keep connected cars secure."

StradVision and Socionext partner on object recognition

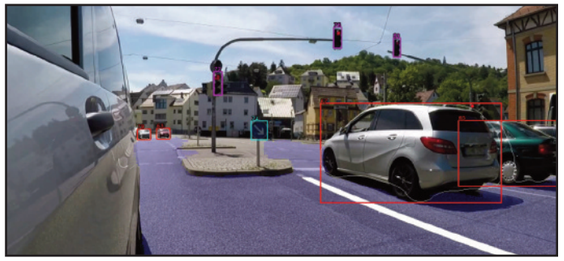
StradVision and Socionext, respective developers of AI-based camera perception software and systems-on-chip (SoCs), are working together to bring object recognition to automotive.

This will use StradVision's SVNet deep learning-based camera perception software.

Through this collaboration, the two companies will provide object recognition technology with software and hardware for deep learning to the adas and autonomous driving markets.

"This collaboration allows us to optimise the integration of our perception software into SoCs developed by Socionext, resulting in extremely stable software operation within vehicles," said Junhwan Kim, CEO of StradVision. "SVNet running on Socionext's SoCs will be great for the adas and autonomous markets where robust performance and safety are essential."

The software lets vehicles detect and recognise objects on the roads. It performs even in harsh weather conditions and can prevent traffic accidents by processing collected road data with high speed and accuracy.



The software detects and recognises objects

The software can be customised for different hardware thanks to StradVision's patented deep neural network.

SVNet is used in mass production models of adas and autonomous driving vehicles that support safety function levels two to four, and will be in more than 8.8 million vehicles worldwide.

"Socionext has a proven track record of supplying a large number of custom SoCs for various in-vehicle applications, offering cutting-edge design development technology including support for miniaturisation processes and quality control," said Koichi Yamashita, head of the automotive business unit at Socionext. "It is now possible to provide object detection with high recognition accuracy that is optimised for vehicle-mounted cameras."

He said software such as SVNet could detect vehicles, pedestrians, lanes and free space.

"In the automotive market, where significant growth is expected in the future, we will actively utilise StradVision's software with the aim of providing custom SoCs that are a source of customer differentiation and competitiveness," he said.

Acerta raises $7m in series A round

Automotive intelligence firm Acerta Analytics has raised $7m in series A funding.

Acerta Analytics uses artificial intelligence to help car makers leverage their data for insights into vehicle assembly or on-road performance.

The round was led by Omers Ventures, with additional participation from Microsoft's venture fund M12, StandUp Ventures, Radical Ventures, EDC and Techstars.

Acerta operates in Europe, North America, Canada and Japan.

Allegro acquires Voxel to advance lidar

Allegro Microsystems has acquired Voxtel to drive lidar development for automotive safety.

The acquisition pairs eye-safe photonics with Allegro's portfolio for adas applications in semi-autonomous and autonomous vehicles.

Voxtel is a privately held company specialising in photonic and 3D imaging technology including long-range, eye-safe lidar.

This acquisition brings together Voxtel's laser and imaging expertise with Allegro's automotive knowledge.

Voxtel has been pioneering photonics since 1999, developing products for military, space, automotive and surveillance applications. Its miniature lasers, read-out ICs, and near-infra-red and short-wavelength infra-red photodetectors are supported by more than 38 US patents.

Allegro's portfolio of motor drivers, position sensors, regulators and current sensors, when combined with photonics, provides semiconductor components in the transmit and receive blocks of automotive lidar systems.

"Allegro is a market leader in magnetic sensors for the automotive market," said Ravi Vig, CEO of Allegro. "Annually, we ship more than one billion devices into automotive systems, 100 million of which are shipped into advanced automotive safety systems, including semi-autonomous vehicle systems.

"Our experience, scale and design for quality uniquely position us to enhance the Voxtel lidar portfolio for adas applications, aiming to make lidar systems safer, cost-effective and widely adopted features in the cars of the future."

Škoda app aids e-scooter travel



Škoda hopes to make e-scooters the popular was to travel across the Czech Republic following a partnership with travel operator RegioJet.

The partnership combines RegioJet's rail and coach infrastructure with Škoda's ride-sharing BeRider e-scooter and HoppyGo initiatives.

Imagine taking an e-scooter to the bus or train station, hopping onto a coach or train to another city and renting a shared car for the last kilometre of a journey. This is exactly what the collaboration aims to make a reality, allowing users to travel quickly and conveniently using one app.

When purchasing a RegioJet coach or train ticket, customers can register for the Škoda Auto DigiLab e-scooter-sharing service. Following confirmation, they will be emailed a code that entitles them to use the city scooters free of charge for 60 minutes.

The HoppyGo private peer-to-peer car-sharing service is also included.

Škoda plans to incorporate the RegioJet lines in its Prague Citymove mobility app. Using the app, people will have access to a mix of mobility options, such as BeRider e-scooters, buses, trams, metro, rental bikes, taxis and ride-hailing services.



Subaru EyeSight driver assist platform

Subaru picks OnSemi to enhance vehicle vision

Subaru has selected image-sensing technology from On Semiconductor to enable camera-based adas in its latest EyeSight driver assist platform. The Levorg, a 2020 all-wheel drive sports tourer, is the first model with the system.

EyeSight is a widely deployed vision-based system. The latest version improves the stereo camera architecture by providing adas features such as adaptive cruise control, lane keep assist and pre-collision braking.

OnSemi's image sensing technology acts as the eyes to enable these safety functions.

The latest Eyesight, recently announced in Japan, provides additional features such as active lane change assist and an emergency driver stop system.

"We have teamed with On Semiconductor for every generation of the EyeSight adas system and continue to adapt its image sensing technology optimised for image recognition performance in automotive applications with higher resolution," said Eiji Shibata, EyeSight general manager at Subaru. "Our engineering partnership and technical collaboration on this system are vital to achieving our shared vision of improving safety and achieving zero traffic fatalities in the near future."

OnSemi has shipped more than 120 million image sensors into adas applications. The technology provides the resolution and frame rates that enable automotive camera systems to perform.

"Subaru's high quality standards and commitment to road safety make their choice of our technologies a powerful endorsement," said Ross Jatou, vice president at OnSemi. "We are thrilled to continue to collaborate with them and together save lives with safer roads from adas and autonomous vehicles."

Xpeng P7 adopts Desay and Blackberry control

An autonomous driving domain controller developed by Blackberry and Desay SV Automotive has been mass produced for the P7 fast-charging intelligent EV sports sedan from Chinese car maker Xpeng Motors.

The Desay IPU-03 domain controller runs Blackberry's QNX OS for Safety.

Through multi-sensor data collection, the IPU-03 calculates the vehicle's driving status and provides 360˚ omnidirectional perception with real-time monitoring of the surrounding environment to make safe driving decisions.

"Desay SV Automotive has extensive experience in intelligent cockpits, smart driving and connected services," said John Wall, senior vice president ar Blackberry. "Augmented with the safety expertise of Blackberry QNX, together we can address the diverse needs of an auto industry that is undergoing meaningful transformation."

QNX OS for Safety is an Autosar-compliant rtos containing safety components running on the MCU.

Backup redundancy design methodology has been adopted.

The IPU-03 fulfils ISO 26262 Asil D and forms the backbone for Xpeng's intelligent driving system.

In addition, the Nvidia Xavier platform has a computing capacity of up to 30 trillion operations per second, making it capable of processing massive data input from the vehicle's various sensors, including radars, cameras, lidar and ultrasonic systems, in real time and running algorithms such as perception, positioning, planning and control without delay.

"We are excited to work with Blackberry QNX who is known for its safety, security and real-time capabilities," said Li Huang, general manager at Desay.



Xpeng P7 uses Desay controller running QNX

Qualcomm and Veoneer mix adas software and SoCs

Qualcomm is working with automotive technology company Veoneer on scalable adas, and collaborative and autonomous driving.

The aim is to use Veoneer's perception and driving policy software stack and Qualcomm Snapdragon Ride systems on chip (SoCs) and accelerators.

This could create an open platform for levels one to four autonomous driving for tier-one suppliers and car makers.

Designed to address the growing complexities associated with developing adas, including safety compliance, the integrated software and SoC platform aims to provide power-efficient compute, connectivity and cloud service capabilities across all vehicle tiers.

This platform will integrate Veoneer's fifth-generation perception software and its driving policy software with the current and future Snapdragon Ride portfolio.

Qualcomm intends to make this integrated SoC and software stack available to global car makers and tier-one suppliers.

Veoneer will serve as a tier-one system integrator, while continuing to develop, sell and launch its adas and collaborative driving products and systems.

The open and programmable platform will be designed to create more customisation opportunities while charting a course for automotive architecture evolution. The companies expect the integrated platform to be available for 2024 vehicle production.

The companies plan to launch an automotive grade, functional safety compliant platform, which will include a full range of optimised Euro NCap features for up to hands-free driving on highways and slow-moving traffic. The platform will be continuously upgradeable through over-the-air updates.

Snapdragon Ride is based on the Snapdragon family of automotive SoCs and accelerator products, which are built on scalable and modular heterogenous multi-core CPUs for planning and decision making, energy efficient AI, and computer vision engines, GPU for high-end visualisation, image signal processors for camera sensors, and dedicated safety and security subsystems.

"There has been a growing desire within the automotive ecosystem to have a full SoC and stack that can scale from the entry tier of active safety systems to higher-end automated driving," said Cristiano Amon, president of Qualcomm. "Combining our best-in-class product roadmap of integrated automotive platforms, which supports broader functionalities like 5G, 4G, telematics and infotainment, with Veoneer's proven software stack for perception and driving, creates a unique offering to support this need."

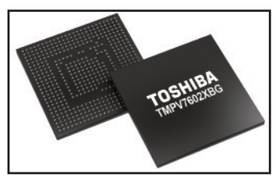
The integrated platform with Veoneer's software stack will offer scalability from level-one adas to level-four autonomous driving.

The parties have signed a non-binding letter of intent and expect to finalise a definitive agreement before the end of this year.

"This relationship not only strengthens our product portfolio, but also broadens our go-to-market position and opportunities, while giving customers more ways to access world-leading technology," said Jan Carlson, CEO of Veoneer.

Zhejiang picks Toshiba

Chinese braking system maker Zhejiang will use the Toshiba Visconti 4 image-recognition processor in its latest adas. This is the first time that a Visconti processor will be mass-produced for a company outside Japan.



Visconti 4 processors

The Chinese government introduced evaluation of emergency brakes in 2018. The decision recognised the growing number of vehicles incorporating adas on China's roads, with the Chinese market for vehicle-mounted cameras expected to grow fourfold from 2019 to 2030, to almost US$6.1bn.

The Visconti 4 integrates eight media processing engines, allowing it to execute eight applications simultaneously. It detects and analyses camera-generated images, and can recognise traffic lanes; nearby vehicles, both parked and moving; traffic signs and signals; the headlights of oncoming vehicles; and vulnerable road users such as cyclists and pedestrians.

Mobileye and Al Habtoor advance mobility in Dubai

Intel's Israel-based subsidiary Mobileye and United Arab Emirates-based Al Habtoor Group are collaborating on deployment of autonomous vehicles and mobility services in Dubai.


Khalaf Al Habtoor (left), chairman of Al Habtoor Group, and Mobileye CEO Amnon Shashua

The agreement between companies based in Israel and the UAE was made possible by the recently signed Abraham Accords.

The collaboration includes multiple components including mapping technologies for adas, self-driving vehicles and smart cities.

"This historic collaboration between Mobileye and Al Habtoor Group presents an opportunity to transform UAE cities by accelerating smart city development and advancing transportation services with the most cutting-edge technology," said Amnon Shashua, Mobileye president and CEO.

The agreement between the companies signals a long-term cooperation for the deployment of driverless mobility in Dubai based on Mobileye's autonomous vehicle technology.

Together, we are bringing to the UAE the best of Israeli artificial intelligence," said Khalaf Ahmad Al Habtoor, chairman of Al Habtoor Group." I am confident of the added value of this new technology to the comfort and safety of the drivers on the road. I believe that the technology which is today made accessible to the UAE by this MoU between Al Habtoor Group and Mobileye, will improve the quality of life for all UAE residents."

Beginning in early 2021, Al Habtoor expects to equip vehicles with Mobileye 8 Connect, a collision avoidance system that collects insights for safer driving, autonomous vehicle mapping and city planning.

Through Mobileye's Road Experience Management (REM) technology, vehicles will become intelligent agents on the road, capable of harvesting important information to improve the efficiency of cities and the livelihood of citizens.

The information will offer visibility into issues from road conditions and the status of assets to traffic jams and accident-prone areas.

Later in 2021, Mobileye-powered autonomous vehicles are expected to be deployed in Dubai to begin public-road testing, leveraging HD maps created and insights gained from the Al Habtoor fleets to prime the region for future driverless mobility.

In 2022, Mobileye and Al Habtoor are expected to start an early-rider programme to test its mobility-as-a-service offering.

Mobileye will support Al Habtoor Group with the infrastructure of back-office, teleoperation and mobility intelligence, as well as final validation to prepare for a commercial service.

Building on insights gained, the parties will seek to launch and commercialise a Mobileye-powered driverless mobility service for UAE consumers in 2023.



CITY EYES

Bob Dolan looks at how optical character recognition is making cities smarter

Many have seen optical character recognition (OCR) technology used in crime shows, or perhaps used it to deposit a cheque with a smartphone.

No matter the current experience level with OCR, most are likely to become very acquainted with it soon as more and more cities are implementing the technology to improve infrastructure and streamline processes, specifically with video surveillance and physical security systems.

OCR – also commonly called automatic number plate recognition (ANPR), automatic licence plate recognition (ALPR) and licence number plate recognition (LNPR) – takes alphanumeric characters that are visible to the human eye, such as those on licence plates, cheques and passports, and makes them electronic.

Correct identification of these various characters can help organisations more accurately perform functions that were previously subject to human error. It can also help accelerate the speed at which computers and readers can perform the task. Combined, these can help organisations become more efficient.

Traditional uses

Equipping video surveillance cameras with OCR is the most common use of the technology, but there are countless other uses for OCR. The technology can be used in distribution centres for tracking orders as they travel through the conveyor and shipping systems. Toll roads use the technology to charge fees to accounts by recording licence plate numbers from traffic cameras. In the travel industry, OCR is used to read passports and licences as travellers pass through airports and other facilities.

Surveillance cameras with OCR monitor rail cars and trailers being brought to and from properties. This is valuable for the customer as freight companies will charge for the time the car sits on their property while it's unloaded. If the customer can reduce unloading time, they can reduce their operational costs.

Smart cities

Challenged with rising costs and budget limitations, many cities are looking to OCR technology to help optimise, manage and improve mobility statistics, traffic, law enforcement, safety and security, and more.

Licence plate recognition systems are essential to traffic cameras that have the capability to fine vehicles automatically for running red lights, exceeding speed limits or entering restricted areas.

In parking areas, OCR can cut costs and improve efficiency by automating many previously manual operations. Now, systems can detect the entry and exit of vehicles and automatically charge the rate according to the time parked to drivers' accounts or credit cards.

One of the more demanding smart city applications for OCR is within police patrol cars. Law enforcement agencies around the world see OCR as a powerful tool to reduce crime, increase police efficiency and improve safety.

Patrol cars can be equipped with cameras that are constantly scanning licence plates and comparing them with their databases, which are updated on a central server. This is used to identify stolen vehicles, vehicles wanted in relation to crimes and vehicles without compulsory insurance.

Other popular applications include the identification of vehicles in restricted areas, such as bus lanes and pedestrian zones. Vehicles can also be checked to ensure they have passed the relevant technical inspections.

By reducing defective vehicles on the road, the number of deaths and injuries due to accidents caused by mechanical malfunction could also be reduced.

Additionally, by combining OCR with artificial intelligence (AI), text recognition is more accurate than ever. Before AI, to improve the reliability of OCR data, a human had to measure and monitor the results manually. Now, AI can be integrated with OCR to do this automatically while pulling insights from the text.

The technologies work together to capture and comprehend the data simultaneously, improving accuracy and efficiency while also eliminating the labour costs associated with doing this manually.

Whether on a construction site or in a smart city, optical character recognition has proven to be a reliable, cost-effective way to improve efficiency and increase resources while cutting costs.



Bob Dolan is director of physical security technology at Anixter



Cameras equipped with OCR can check cars running red lights



US research project aims to automate valet parking

Ford Motor, Bedrock and Bosch are launching a demonstration project with connected Ford Escape test vehicles that can drive and park themselves inside Bedrock's assembly garage in Detroit using smart infrastructure.

This is the first US infrastructure-based design for automated valet parking where the vehicle will park itself inside a parking garage.

The research will take place in the Corktown neighbourhood, the site of Ford's new mobility innovation district, anchored by Michigan Central Station. The district should draw mobility innovators from around the world to develop, test and launch ways to solve urban transportation problems, improve mobility access for everyone, and prepare for the increasingly connected and autonomous world ahead.

"We are continually searching for opportunities to expand our leading suite of Ford Co-Pilot 360 driver-assist technologies that help people drive more confidently, and we believe automated valet parking technology holds great promise," said Ken Washington, chief technology officer at Ford Motor. "Our work with Bosch and Bedrock also aligns with our vision for the future, which includes increasingly automated vehicles that are more aware of their surroundings while requiring less on-board computing to help



Drivers use a smartphone app to send the vehicle into an automated parking manoeuvre

improve design, packaging and affordability."

The demonstration project will be on display on the ground floor of Bedrock's assembly garage, the real estate developer's first residential redevelopment project in the Corktown neighbourhood.

The project aligns with Bedrock's vision of combining ground up and historical developments with the newest technology in parking and mobility, including the current installation of the US Midwest's first automated parking stall, which parks and retrieves vehicles in the basement of the Free Press Building using street-level load bays.

"We strive to be at the forefront of parking and mobility initiatives in Detroit because we recognise the importance of interconnectivity between real estate and mobility," said Heather Wilberger, chief information officer at Bedrock. "In addition to drastically reducing park time, we see this as the first step to bringing automated parking to our city, providing the ultimate convenience for our tenants, visitors, neighbourhoods and residents."

Infrastructure

The connected Ford test vehicles operate in a highly automated fashion by vehicle-to-infrastructure (V2I) communications with Bosch's intelligent parking infrastructure.

The infrastructure sensors recognise and localise the vehicle to guide its parking manoeuvre, including the ability to help avoid pedestrians and other hazards. If the infrastructure senses something in the vehicle's path, it can stop the vehicle immediately.

"For Bosch, automated valet parking brings together our deep cross-domain experience in mobility and building technologies to deliver a smart infrastructure that improves everyday life," said Mike Mansuetti, president of Bosch in North America. "This technology enables consumers to see the benefit of highly automated technology as the vehicle handles a task such as parking in a garage."

Upon arriving into the garage, a driver will leave the vehicle in a designated area and use a smartphone app to send the vehicle into an automated parking manoeuvre.

Drivers will also use the app to request the return of the vehicle to the designated pick-up area, expediting the parking experience



Connected Ford Escape test vehicles drive and park themselves



An automated stall parks and retrieves vehicles

and removing the responsibility of finding the vehicle upon return to the garage.

Collaboration

The demonstration project at Assembly Garage brings together one of the world's largest car makers, Ford, the largest property developer in Detroit, Bedrock, and the world's largest automotive supplier, Bosch, to demonstrate how organisations are working together on mobility initiatives.

"Michigan continues to lead the way through unprecedented investments in the smart infrastructure that is critical to developing and deploying the most advanced forms of mobility," said Garland Gilchrist II, lieutenant governor of Michigan. "With the office of future mobility and electrification, we are ensuring our state solidifies its position not only in the manufacturing of advanced automobiles, but also in the future of smart, connected roadways and parking areas."

The demonstration project will enable the three companies to gain insights regarding user experience, vehicle design, parking structure design and application to expand the technology and its application.

"The city of Detroit continues to be at the forefront of mobility and the heart of the automotive industry," said Mike Duggan, mayor of Detroit. "Ford has a long and storied history with the Motor City and it is exciting to see them collaborate with Bosch and Bedrock on this innovative effort to propel the region into the future of mobility. I look forward to the day when Detroit residents and visitors alike will see a benefit from future technologies such as automated valet parking; it will undoubtedly save space in our garages and make the entire parking experience more convenient."

Efficiency

Automated parking brings value to garage owners by allowing for the more efficient use of spaces inside a parking garage. With automated valet parking, the same amount of space can accommodate up to 20 per cent more vehicles. It can be deployed via retrofitted systems such as the one in the Assembly Garage or with embedded infrastructure planned into construction of new garages that enables optimised design for increased capacity.

In addition to simply parking, a vehicle could also drive itself to areas within the garage for specific services such as vehicle charging or a car wash. During the demonstration project, Ford, Bedrock and Bosch will demonstrate vehicle paths showing how a vehicle would move between service areas and ultimately to a parking spot before the user calls it back to leave the garage.

CCTV



ONE TO WATCH

Emily Hardy says vehicle CCTV helps cut insurance costs, prevent crime and save lives

Vehicle CCTV has proven valuable for fleet operators with many choosing to equip their vehicles with the technology to improve safety, support driver training and prevent fraudulent claims.

Vehicle CCTV has become increasingly popular in recent years, with the technology being used across many sectors including bus networks, delivery fleets and emergency vehicles.

As well as helping support driver training, there are a number of benefits to installing vehicle CCTV. These include:

- Proof against insurance claims such as crash-for-cash scams;
- Providing protection for drivers who may have been wrongly accused as the cause of an incident;
- Providing irrefutable evidence in the case of accidents and legal proceedings;
- Encouraging driver best practice, resulting in less vehicle damage and fewer accidents;
- Deterring vandalism; and
- Providing peace of mind for passengers and drivers.

Safety

Bad driving poses a risk to drivers themselves, as well as other road users. To qualify as a lorry, bus or coach driver, excellent driving skills and road safety knowledge are essential. Drivers must be able to concentrate for long periods, and be prepared to work alone for lengthy stretches.

Completing record sheets, log books and other trip data accurately are also important requirements.

A CCTV system can provide drivers with a bird's eye view of their vehicle, allowing them to view areas they cannot see from the cab. Live images can be streamed directly to the driver using ultra wide-angle cameras, covering the front, rear and each full side of the vehicle, including that all-important near-side.

Such a device can also incorporate warning alarms, which sound an alert should a person or vehicle move into a blind spot, or if the driver is getting close to an object while manoeuvring at low speeds.

These can be linked with mobile digital recording systems that record the activity around the vehicle. In the event of an incident, the captured footage can be used as evidence and helps protect drivers if there are conflicting reports.

Insurance

HGV and other commercial vehicle operators suffer from high insurance premiums just as with car drivers. When accidents involve lorries, buses or heavy machinery, the temptation is to point the blame at the larger vehicle; often that's simply because it's bigger and can be viewed as more intimidating.

Yet an American study has shown that only a fifth of accidents involving lorries were due to truckers' movements or loss of control, while half were due to car drivers' encroachments such as tailgating, suddenly slamming on brakes or veering into a trucker's lane due to reckless or distracted driving.

Having recorded footage when there are conflicting reports of actual events or being able to prove a staged accident means companies can make major cost savings in the long term. More importantly, they can also support their drivers, who are often the subject of increased scrutiny after an incident.

By giving the driver a clear view around their vehicle and recording activity, these types of camera safety systems enable HGV drivers and plant operators to move and drive safely, and prevent accidents. As fewer accidents mean fewer claims, the installation of safety equipment on fleets can reduce insurance premiums.

Crime

Incidents involving vehicles are time-consuming issues to resolve. A lack of solid evidence can often mean companies automatically accept liability in the event of an incident. However, easy settlements have led to an increase in cases against those operators, which quickly become known as a soft target for further similar claims.

Having a vehicle CCTV system not only helps refute these claims, but also deters the perpetrators of false claim crimes from targeting a vehicle in the first place. Clear and visible warning stickers on vehicles, which have been fitted with vehicle CCTV, have also proven to be an effective tool for tackling this issue and discouraging culprits.

Cost

While tough monetary decisions do need to be made, it's clear this technology should be embraced as an opportunity not only to reduce risk and enhance road safety for drivers and road users, but also lower costs for the whole industry through reduced insurance premiums.

It is estimated that fitting cameras to be five times worth the investment over five years, so although the short-term outlay might be deemed costly, there are financial benefits to be gained in the long term.



Emily Hardy is marketing manager of Brigade Electronics

POWER TECHNOLOGIES

LOW ANXIETY

Steven Shackell explains how advances in power semiconductors enable level-three DC fast charging, overcoming EV range anxiety

Vehicle Electronics

Power level Types	Charger Location	Typical Use	Energy Supply Interface	Expected Power Level	Charging Time
Level 1 (Slow)	On-board 1-phase (AC charging)	Charging at home or office	Convenience outlet	1.4kW (12A) 1.9kW (20A)	11-36 hours 4-11 hours
Level 2 (Intermediate or slow)	On-board 1- or 3-phase (AC charging)	Charging at private or public outlets	Dedicated power connector	4kW (17A) 8kW (32A) 19.2kW (80A)	2-6 hours 2-3 hours 1-4 hours
Level 3 (Fast/less than 1 hour)	Off-board 3-phase (DC charging)	Commercial, same as gas station	Dedicated power connector	50kW 100kW 250kW 350kW	0.4-1 hours 0.2-0.5 hours

Table 1: Charger levels and performance (USA)

The uptake of electric vehicles is still hampered by range anxiety and reluctance to wait hours for recharging on the road. However, fast DC charging promises to bring the wait down to minutes with an increasing number of charging stations being deployed.

These high-power chargers, rated up to 350kW, must be as electrically efficient as possible to be cost-effective, using the latest power conversion topologies and semiconductor switch technology.

Electric vehicles are surely on the road to wider acceptance, with a sales growth rate of around 60%. However, the same analysis also shows a market penetration of just 2.2% by the end of 2018 so there is still some way to go before EVs become dominant. The commitment from manufacturers is there though, with more than 400 EV models projected to be available by 2023.

There are several factors influencing the decision to move away from petrol-powered vehicles, not the least of which is acquisition cost, but range anxiety is still up there. For short commutes and local trips there may not be an issue, with overnight top-ups from home chargers, but there is real concern that the less than 480km range typically achieved is just not enough for longer trips, especially in areas where public charging points are few and far between.

If recharge takes several hours a long way from base, then the viability of using an EV becomes very hard to sell. Even home-charging of a fully drained 100kWh battery such as in a Tesla might take 14 hours to full from a 240V AC supply, leaving barely enough time before the next day's trip. There are, however, fast DC chargers becoming available that measure charge time in minutes rather than hours.

Levels

There are different charging options for home, office and roadside with some debate about the terminology but it is generally accepted that level one uses a regular 120V AC home outlet in the USA and 230 or 240V AC in Europe with the slowest charging rate. Level two uses 240V AC or sometimes 400V AC three-phase through an installed charging station with control and protection built in, but this can still be home based and provides a faster charging rate.

Both levels one and two use the vehicle on-board charger to generate DC for the battery.

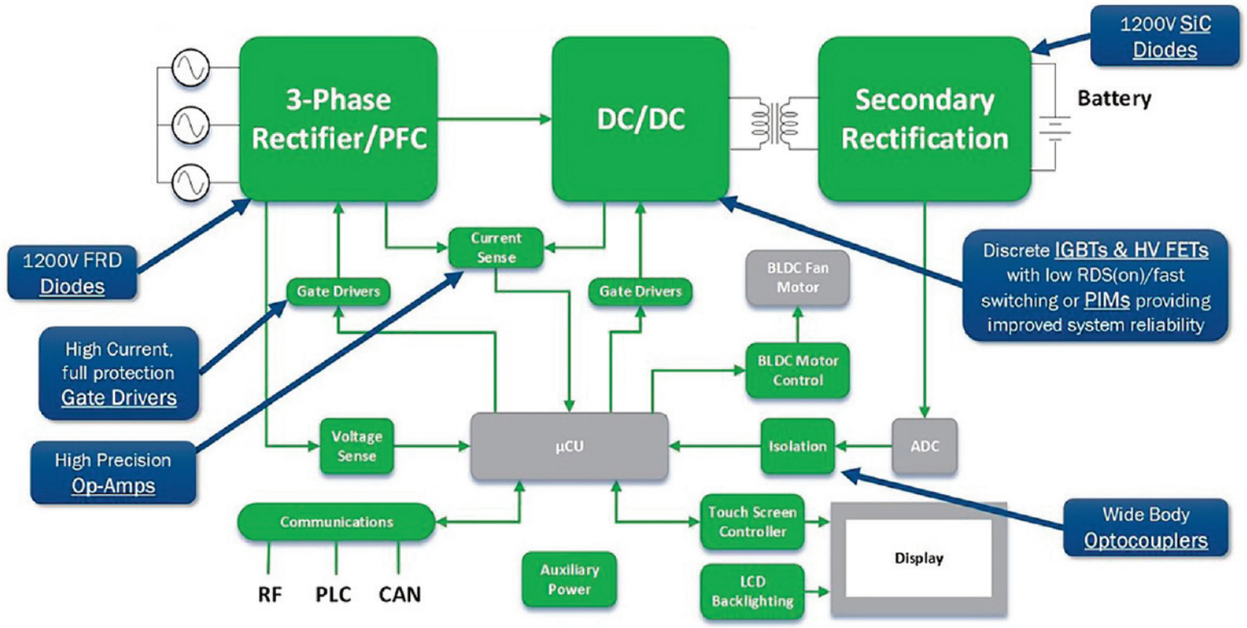


Fig. 1: Typical fast DC charger outline

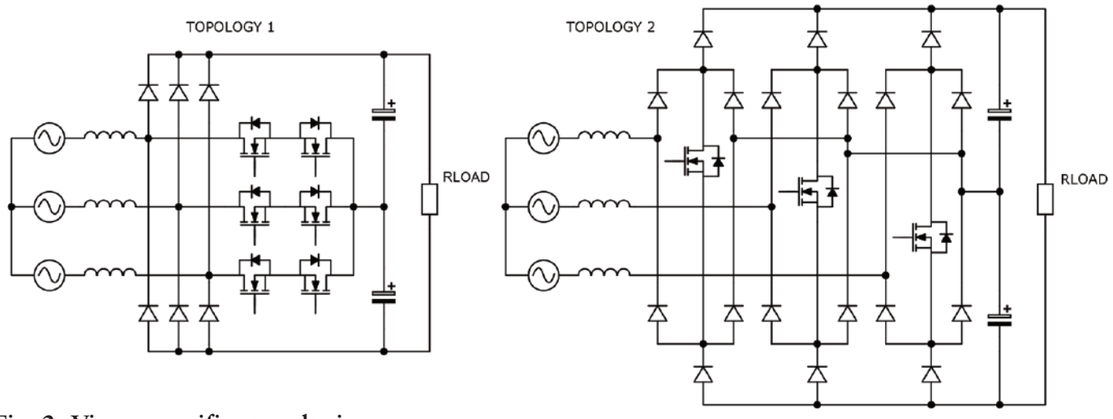


Fig. 2: Vienna rectifier topologies

Level three is taken to mean DC charging direct to the battery from a static AC-DC converter, typically at a petrol station, needing a three-phase AC supply. With this arrangement, at the maximum power available, 350kW, charging time is reduced to minutes, similar to the time needed to refuel an internal combustion engine (ICE) vehicle.

Table 1 summarises the performance of the three EV charging levels in the USA.

Fast charge

Level three chargers, at powers up to 350kW, are the most demanding to design. Low cost is always a priority but conversion efficiency is also key; every watt wasted represents a higher electricity bill, less energy available for the battery and longer charge time, with excess heat lost also reducing the environmental benefit of the EV.

High efficiency also scales-down cooling hardware requirements, helping in turn to reduce cost and size. A typical DC fast charger outline is given in Fig. 1 with major elements highlighted.

At the multi-kilowatt level, three-phase AC rectification and power factor correction (PFC) is typically implemented with a Vienna rectifier. This can be of two different forms, see Fig. 2.

Topology one has fewer components and the highest efficiency but the diodes must be relatively expensive 1200V types and complex control is needed for the six switches. Topology two, however, uses just three switches with less complex control, and the diodes can be 600V types, but efficiency is lower as there are more diodes in the conduction paths.

In each topology, high voltage Si or SiC mosfets can be used, but for lowest cost, IGBTs can be considered if frequency is kept low.

The Vienna rectifier stage produces a regulated high voltage bus for the main DC-DC conversion stage, which can be one of several topologies. Common implementations are the full bridge interleaved LLC and three-level LLC shown in Fig. 3.

The interleaved version can use

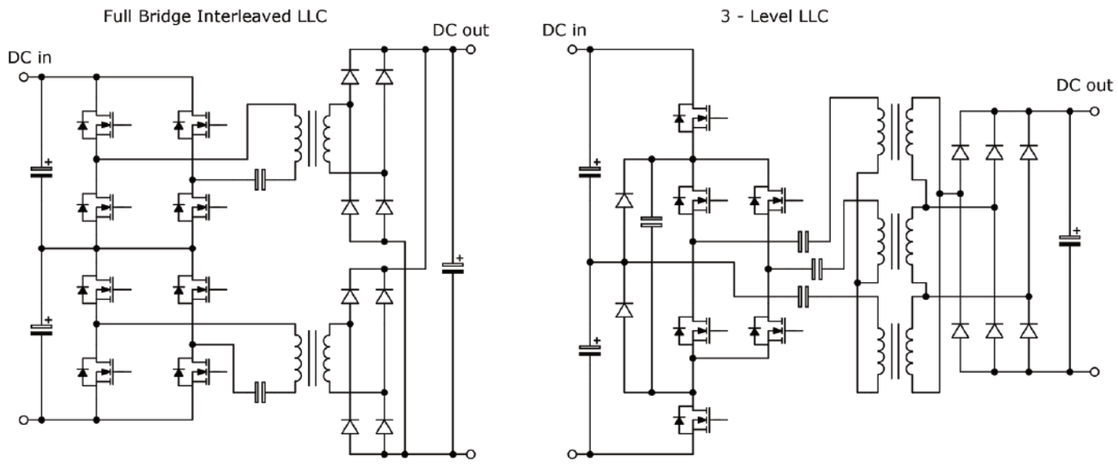


Fig. 3: Alternative converter topologies

650V super-junction mosfets as each sees only half the supply voltage.

For higher efficiency and power density, 900 and 1200V SiC mosfets can be used, with the higher part cost offset by smaller magnetics at higher switching frequency. The high voltage rating allows use of just a single H-bridge without interleaving, with fewer switches, again saving cost.

Output diodes can be 1200V silicon types, or for lower losses, 1200V SiC types.

The three-level LLC topology uses fewer diodes and switches with their associated isolated gate drives and, although three transformers are required, output ripple is much lower. Again, Si or SiC mosfets or IGBTs can be used, depending on the performance versus cost trade-off.

Wide band gap

The option to use SiC wide band-gap switches and diodes has multiple benefits; fast high-voltage switching with low losses can reduce system cost, size and weight while saving energy.

Experiments comparing a silicon device using a Vienna rectifier and full bridge LLC converter with a SiC-based three-phase half bridge rectifier or PFC and full bridge LLC converter showed, for the SiC version, a 25% improvement in power throughput with 22% reduction in weight and 62% reduction in volume, all with 20% fewer parts, yielding a more reliable product.

Packaging

Getting the most out of power semiconductors is often down to the packaging, especially at higher switching frequencies where parasitic effects such as lead inductances can degrade performance. Modern packages address the issue while providing enhanced thermal performance.

For significant reduction in production assembly time and parts count, power integrated modules (PIMs) can be considered with multiple devices integrated in one package including mixes of IGBTs, Si and SiC mosfets, and Si and SiC diodes as appropriate, along with other components such as sense resistors.

Performance of pre-assembled PIMs can be guaranteed, eliminating development risk, reducing parts inventory and enabling faster time to market.

Conclusion

The latest power semiconductors in high-efficiency power conversion topologies are enabling fast EV DC charger designs that address the problem of range anxiety. IGBTs, Si and SiC mosfets, and diodes can provide power with supporting components such as analogue and digital controllers, isolated gate drivers, low-loss current sense amplifiers, and optocouplers.



Steven Shackell is in charge of industrial business development at On Semiconductor

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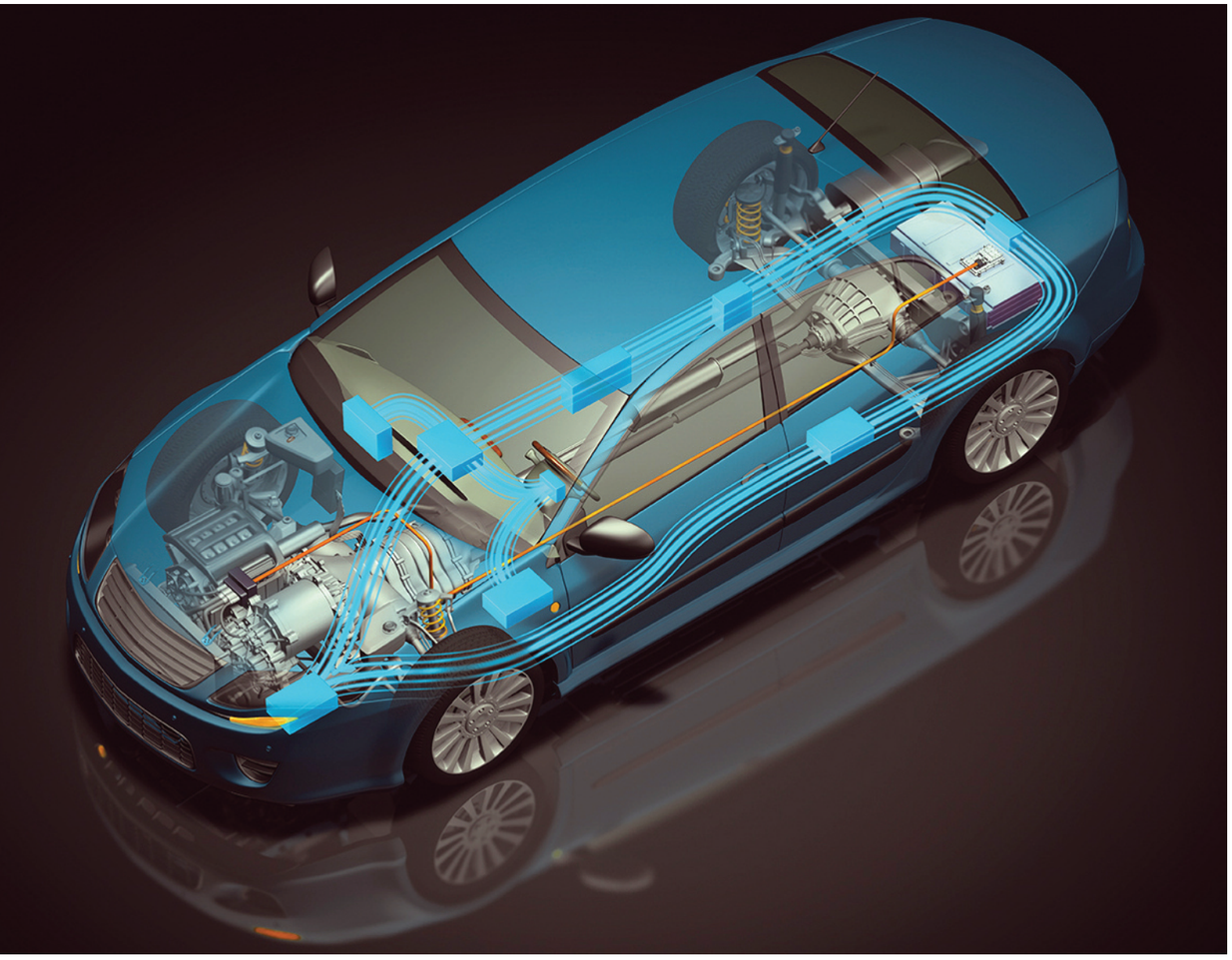
FUNCTIONAL SAFETY

BANKING ON SAFETY

David Ward explains how to achieve best practices for functional safety with new automated lane keeping regulations



Vehicle Electronics October 2020, 28



Achieving functional safety entails ISO 26262 being applied to safety-related systems that include one or more electrical and/or electronic systems installed in series production passenger cars

With just three months until the new UN regulations on automated lane keeping systems (ALKS) are enabled, car makers are preparing for a new common rulebook for level-three automation of vehicles. But with an international standard for functional safety already in place, what does best practice look like in the ALKS era?

When the UN published its ALKS regulations in June, it was another step forward for functional safety engineering standards.

Set to apply to 60 countries including the UK, Japan and EU member states from January 2021, the regulations are designed to enable the safe introduction of level-three automation features in certain traffic environments. At level three, the driver is permitted to take their hands off the wheel and eyes off the road, but is expected to be ready to take back control if required in case of malfunction or error.

Most recently, the move towards ALKS became the subject of numerous national headlines as the UK government launched its consultation on the technology, marking the start of a much greater onus on this important step forward in the transition to autonomy.

In practice, ALKS will most likely mean that automakers may need to take a closer look at their functional safety processes. The requirements are certainly progressive as, for the first time, they put functional safety of automation features on the road to becoming, eventually, a legal obligation.

In reality, those car makers who are already committed to safety and working to existing international standards, are likely to achieve and maintain compliance with the new regulations too.

Functional safety

Of course, functional safety is nothing new for automakers. For a number of years, the industry has been working to meet the requirements of ISO 26262. The standard applies to safety-related systems that include one or more electrical and/or electronic (E/E) systems that are installed in series production passenger cars.

It addresses possible hazards caused by malfunctioning behaviour, including those through interaction between systems.

The standard was first introduced in 2011 and updated in 2018 and, while there is no direct legal obligation to follow it, it is considered state of the art and best practice across the industry and is widely followed worldwide.

This has also played a part in contributing towards functional safety in engineering becoming a relatively mature discipline. However, the extent to which the standard is likely to be adhered to very much still depends on each organisation, its engineering programme or product lifecycle.

The ALKS regulation makes an explicit reference to ISO 26262 and, although the document doesn't explicitly mandate it, audit and assessment should be carried out in line with the standard to demonstrate compliance in the processes being used. It is reasonable to assume, therefore, that adherence with ISO 26262 will ensure compliance with ALKS.

Sotif

There is another international document that supports the safety



Regulations are designed to enable the safe introduction of level-three automation features in certain traffic environments from January 2021

of autonomous vehicles. ISO/PAS 21448 Road Vehicles – Safety of the Intended Functionality (Sotif) provides guidance on design, verification and validation measures relating to functional performance. Once again, the ALKS regulation makes explicit reference to this document, so the expectation is that adherence to ISO/PAS 21448 will ensure compliance with ALKS.

It applies to the functional performance of a system, recognising that faults could come from inaccurate performance of, for example, a sensor such as a radar or camera, which could give false positive or false negative detection of objects. This is in contrast with traditional functional safety (ISO 26262), which is concerned with mitigating risk due to system failure or malfunction.

One of the challenges with Sotif is the continuous development of enhanced technology. There is always something new that emerges, so when to stop testing? There is also some debate about whether Sotif and functional safety are really separate as the two documents would suggest, or whether they are closer – in fact, Sotif was originally intended as an additional point in ISO 26262.

However, it is clear in the new regulations that both are critical and the approval body will be looking for both being considered.

The additional challenge is that Sotif is a more emerging concept and ISO/PAS 21448 is only deemed to cover up to level-two automation. While an initial PAS document has been developed as the industry works towards a Sotif standard to level three, it remains a working project for those actively engaged in writing the new standard at international level.



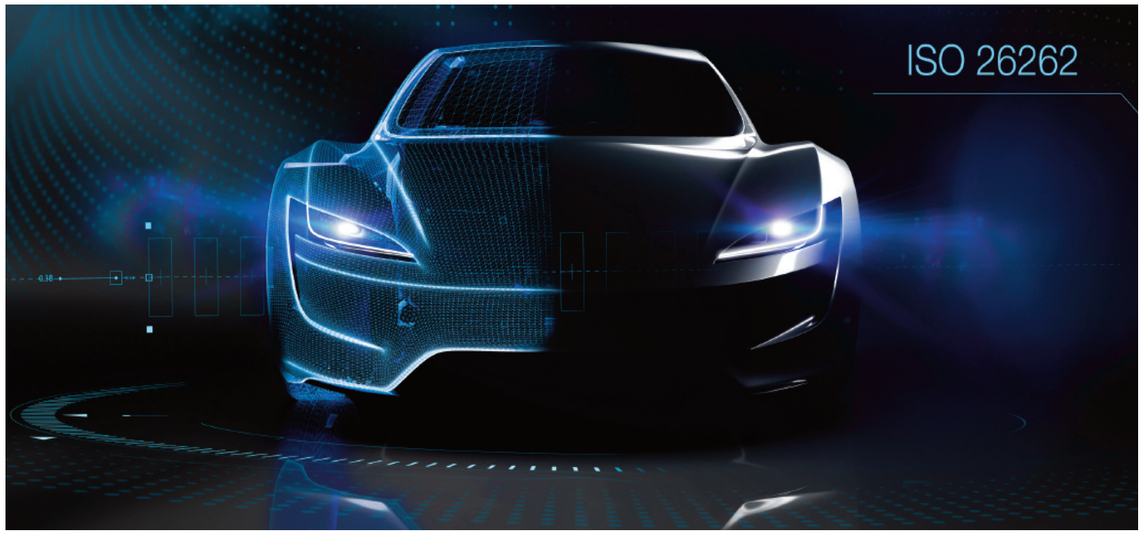
Proving grounds help with independent functional safety assessment

Compliance

With this in mind, the key for many automakers is in being prepared for external scrutiny. This is not just a case of meeting regulations at the time of going for approval, manufacturers need to demonstrate they are following the correct procedures through a continual process of checking and compliance. In most cases, the focus therefore will be on documentation and preparation, rather than introducing any specific new safety measures or processes.

Those organisations adhering to ISO 26262 and ISO 21448 should already be doing the right things to meet the new regulatory scrutiny, which will be placed upon them from January 2021. The key will be in formalising processes and demonstrating the effectiveness of those processes through a full safety process audit and possible certification, for which many will turn to a third-party auditor.

Crucially, this can also support external certification to the ISO standards, which again is not a requirement of the new regulations, but does make it easier to demonstrate adherence while mandating the requirement for on-going surveyance to maintain compliance too.



The new requirements put functional safety of automation features on the road to becoming a legal obligation for the first time

Early engagement

One of the benefits of external assessments – whether it is to demonstrate the requirements of legislation or not – is addressing any potential safety issues early can reduce costly redesigns further in the production process.

The ALKS regulation states that the approval authority shall undertake an assessment of the product to determine whether it meets the safety aspects required. The challenge for manufacturers will be how much information they want to share in terms of product design.

Independent functional safety assessment can be a staged activity, going in at key gateways throughout the programme to ensure early identification of any potential safety issues and this, in turn, will provide the information required for approval authorities because assessments can be carried out throughout the process.

Ultimately, the ALKS regulations will state the regulatory requirements expected of manufacturers and, in doing so, set a globally accepted minimum set of expectations around the ISO 26262 and ISO 21448 standards. There will be further changes as this fast-paced industry continues to develop, but greater clarity will only support enhanced safety. Now the focus turns to manufacturers in submitting their commitment and processes to external scrutiny.



David Ward is senior technical manager for functional safety at Horiba Mira

Eeprom doubles density to 4Mbit

Automotive systems that use user-specific data sets to optimise the consumer experience could benefit from a 4Mbit eeprom from Microchip.

These non-volatile data sets – including calibration constants, background conditions, user preferences and changing noise environments – are often adjusted by the end system or user a few bytes at a time.

Serial eeprom is the memory of choice for these applications providing non-volatility, byte-level control, ease-of-use and low-power consumption.

The 25CSM04 is the company's largest eeprom for developers, doubling the 2Mbit density to which designers were previously limited.

Until now developers have used lower-cost NOR flash ICs for any 2Mbit+ non-volatile data set application.

However, eeprom has performance advantages over NOR flash, such as a standby current of 2μA versus 15μA.

It can perform single-byte, multi-byte and full-page writes, and has sector erase-rewrite times of 5ms versus 300ms and more erase-rewrite cycles – one million versus 100,000.

The MPLab starter kit for serial memory products includes a serial memory interface board, serial eeprom starter pack, USB cable, CD containing the MPLab X integrated development environment, Total Endurance software model and a serial eeprom interface tool.

The memory is also suitable for portable consumer and medical devices including fitness trackers, hearing aids and glucose monitors.



Connectors suit lorries and buses

On-vehicle data plug connectors from Amphenol are for vehicle diagnostic and data communication. The AT circular connector can perform in demanding applications in heavy-duty lorries and buses.

They meet J1939 specification, can withstand more than 100 mating cycles, have an operating temperature of -55 to +125˚C and are RoHs compliant.

The three- and five-pole electrical plugs are designed to improve the quantity and quality of options offered. The nine-pole unit provides a J1939 option of receptacle, contacts and accessories.

This connector gives support on Can systems and helps electrical devices communicate with each other. Applications include GPS tracking and Can data communications for diagnostics of vehicle engine speed, temperature, oil temperature and exhaust emissions.



The round receptacles use jam nut mounting for quick assembly and a smaller flange that saves space on mating panels. The heavy-duty industrial connectors are environmentally sealed against moisture and contaminants.

A reverse bayonet coupling allows for quick mating and unmating.

They work with standard size 16 contacts and are made from copper alloy. Nickel or gold plating is available.



Reference design aids e-scooter development

A 48V mobility reference design from Renesas could accelerate the development of e-scooters and e-bikes.

It uses a modular approach in hardware and software to showcase core and optional functional blocks that can be adopted for 24 to 48V applications.

The combination has 15 Renesas ICs, including three key devices: the ISL94216 16-cell battery front end (BFE); HIP2211 100V mosfet drivers; and RX23T 32bit microcontroller for motor control.

It is powered from a 25AHr Li-ion battery that drives a 1600W inverter to attain speeds up to 5000rev/min.

Two boards address the higher battery cell count and power levels mobility applications require. The BFE and charger board focuses on larger, higher voltage battery packs.

The motor control and inverter board has synchronised current-voltage measurements and drivers that are pulse width modulated to actuate the motor and monitor motor status.

The algorithm with the hardware is for driving brushless DC motors.

Two optional boards are available – a wireless charging receiver board and a Bluetooth Low Energy 5.0 control board.

For system control, it uses a cost optimised, energy-efficient RX23T MCU with built-in floating point unit and six timers tooled for complex inverter control algorithms. These can help engineers reduce time in software and hardware development and debug.

The ISL94216 balances and monitors system conditions to improve battery life and safety, independent of the MCU. The ISL81601 60V bidirectional four-switch synchronous buck-boost controller is for fast charging. The controller's CC/CV charger profile is implemented through the system MCU.

The BFE supports up to 200mA external cell balancing for enabling fast recharging and use in large battery packs with hot plug tolerance up to 62V. It provides full high-side battery protection and monitoring for 4S to 16S cell battery packs.

ISL28214 op amps deliver low power consumption and input bias, and the ISL81601 increases charging efficiency and uses current sensing and IO monitoring to adjust input levels.

The ISL84051 multiplexer handles up to eight inputs with low RDS_{on} connectivity and nanosecond switch times.

The motor control and inverter board includes a DC-DC converter, ISL28191 op-amp current sensors, ISL80410 LDO regulator, HIP2211 100V half-bridge mosfet drivers, and mosfet bank; it connects to the BFE and charger board

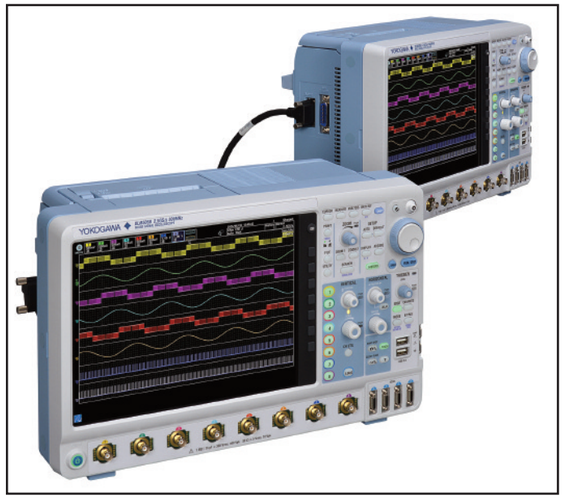
An optional BLE control board with RX23W MCU enables secure mobile phone connectivity via BLE for throttle control, battery status, GPS connection and saved route history.

A wireless charging receiver board has two Renesas wireless receivers used in parallel to boost output as needed.

A mobile phone application unlocks the scooter, and controls on-off power and motor start. It sends diagnostic and parametric data to a mobile phone's secure BLE channel in 1s intervals.

The ISL94216 16-cell BFE is available in a 64-lead QFN package.

Mixed signal oscilloscope takes up to eight analogue inputs



A mixed signal oscilloscope from Yokogawa has from four to eight analogue inputs and the ability to link two units to increase measurement flexibility.

The DLM5000 has a sampling rate double that of its predecessor the DLM4000.

For use in automotive, mechatronics, power electronics, aerospace, railway and consumer electronics industries, it is suitable for developing intelligent power-semiconductor technologies and mechatronics in modern electric vehicles, motor controls and energy efficient electronic designs.

The instrument can monitor eight analogue channels and up to 32bit of logic input, 16 as standard plus 16 optional, while simultaneously performing protocol analysis such as uart, I²C, SPI, Can, Can-FD, Lin, CXPI, Sent and Flexray.

The soon-to-be-released DLMsync feature allows two units to be linked with a dedicated cable enabling sampling clock and trigger synchronous measurement of up to 16 analogue channels plus 64bit logic.

All channels can be used simultaneously.

With the /L32 option, up to 32 logic signals can be measured. Also included are a bus and state display and an optional D-A calculation function for evaluating A-D and D-A converters.

The 30.7cm touchscreen allows monitoring of waveforms, not only when inputting eight channels, but also when the number of waveforms is increased by calculation or zooming.

There is also a traditional oscilloscope panel so users can navigate through the analysis features.

The memory can save up to 100,000 captured waveforms.

With the history function, the user can display one or all captured waveforms on screen and perform cursor measurement, computation and other operations on these displayed waveforms. This allows the analysis of rarely occurring abnormal signals, even when an appropriate trigger condition is hard to find because its waveform shapes are not constant.

Various methods can be used to search for waveforms meeting characteristics defined by the user.

Four ESD protection devices

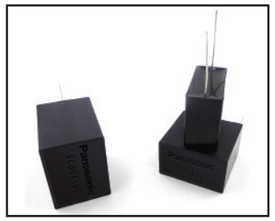
Four TrEOS ESD protection devices from Nexperia meet AEC-Q101 for automotive use and can work up to +175˚C.

In common with all TrEOS components, the parts combine low capacitance ensuring high signal integrity, low clamping and high robustness for modern automotive interfaces.

Applications include infotainment, multimedia and adas featuring USB 3.2, HDMI, LVDS, serdes and SD-card interfaces.

The protection technology uses active silicon-controlled rectification to overcome the traditional protection trade-off challenge. Capacitance is kept down to 0.5pF, clamping voltage is 3V and devices can withstand surge and ESD pulses up to 10A 8/20μs. These come in the SOT23 package.





Safety caps

Panasonic has expanded the voltage range of its AEC-Q200 qualified Ecqua safety class X2 capacitors for automotive to 310V AC.

These polypropylene film capacitors use an in-house patterned metallisation process with fuse mechanism function. This technology delivers a stable capacitance level over the product lifetime.

Voltage is 275 to 310V AC, and nominal capacitance is 0.1 to 10μF. Operating temperature is from -40 to +110˚C.

A flame-retardant plastic case and non-combustible resin led to accreditation with UL, CSA and European safety regulation for class X2. All are RoHS and Reach compliant.

THB test is +85˚C, 85%, 240V AC for 1000 hours with 275V AC products and 275V AC for 1000 hours with 310V AC products. Thermal shock resistance is -40 to +85˚C for 1000 cycles.

Applications include IO filtering for charging stations or the input side of on-board chargers, EVs and PHEVs.

Radar evaluation kit for adas development

An ultra-short and short-range imaging radar evaluation kit from Vayyar is for developing adas and autonomous vehicle applications.

Based on a 4D mimo radar-on-chip (RoC), the kit includes a high-resolution point cloud, with a wide field-of-view in azimuth and elevation, no dead zones, and zero minimum distance.

The radar hardware-software package aids rapid prototyping and experimentation. It features an automotive grade RoC with a large mimo array on a single-chip based module. The system supports natural resolution and a rich 4D point cloud, without the need for RFIC concatenation.

Included are 4D image reconstruction algorithms and software for data representation structures.

This allows rich target data streaming to a vehicle central-host-processor over a low bandwidth interface, supporting on-board applications as well as enabling vehicle-level fusion.

An API enables application development, sensor fusion, configuration and data recordings. The gui provides a 4D display option with support for a side-by-side camera view, for referencing.

The technology detects and tracks multiple targets around the vehicle including other vehicles, objects and vulnerable road users. It includes hardware support for dynamic ranges from 10cm to 30m.

This kit can be used to evaluate and develop around vehicle monitoring and other adas and autonomous vehicle applications such as assisted parking, front and rear autonomous emergency braking, collision warnings, blind spot detection, lane change assist and keyless access systems.

It supports robotaxi features and meets upcoming NHTSA and Euro NCap requirements. The kit is AEC-Q100 and Asil-B compliant, and ready for SOP 21/22.

Software evaluates C-V2X PC5 designs

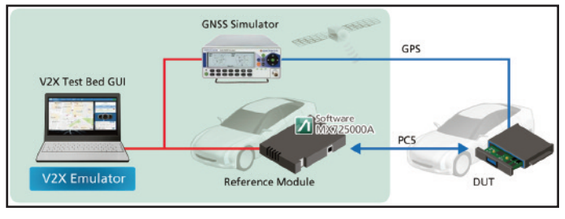
Functional test software from Anritsu is for graphical evaluation of designs using C-V2X PC5 communications technology.

The MX725000A LTE C-V2X PC5 software can create a test environment for verifying C-V2X.

The software links a communications reference module, V2X emulator software and GNSS simulator to support evaluation of PC5 communications in emerging V2V and V2I designs.

It replaces systems that integrate expensive hardware and need high-level programming skills to create test scenarios emulating combinations of communications and driving conditions.

Functional and regression tests can be made to ensure designs are compliant with the C-V2X PC5 standard defined by 3GPP release 14.



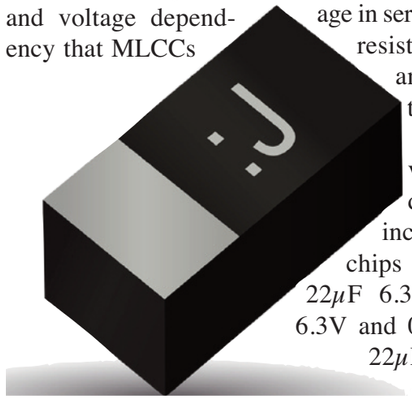
Tantalum chip capacitors meet AEC-Q200

High-CV resin-moulded, surface-mount tantalum chip capacitors from AVX have a low-profile facedown design for automotive electronics applications.

The F98-AJ6 capacitors are available in 0603 and 0805 chip sizes with maximum heights of 1.0 and 0.80mm, ±0.10mm, respectively.

Facedown under-tab terminations are designed to achieve high capacitance, volumetric efficiency and PCB assembly densities, and help conserve board space and reduce costs.

The series includes what is claimed to be the industry's smallest and highest-CV 0603 tantalum capacitor rated at 10μF 10V and qualified to AEC-Q200. It is free from the DC capacitance and voltage dependency that MLCCs experience, and is lead-free compatible and RoHS compliant.

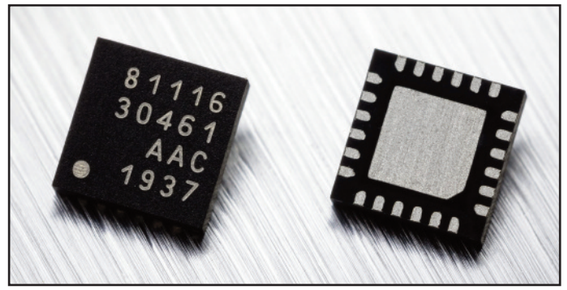


Applications include secondary power line circuits in automotive applications including infotainment and cabin electronics systems, camera modules, and digital millers.

The 0603 chips are rated for 4.7μF 10V, 4.7μF 16V and 10μF 10V, and the 0805 chips for 10μF 16V at +85˚C with a ±20% capacitance tolerance at 120Hz.

Operating temperatures extend from -55 to +125˚C and they have been subjected to load humidity testing to verify their ability meet automotive requirements for capacitance change, dissipation factor and leakage current after 1000 hours' application of rated voltage in series with a 33Ω resistor at +85˚C and 85% relative humidity.

Additional values in development include 0603 chips rated for 22μF 6.3V and 33μF 6.3V and 0805 chips at 22μF 10V and 47μF 6.3V.



LED driver enables smart in-cabin lights

A multichannel RGB-LED driver from Melexis supports the MeLiBu high-speed communications IP to enable intelligent animated automotive lighting concepts.

The technology is being used by car makers to enhance the safety of their latest models with animated lighting in the cabin to convey driver-assistance prompts and vehicle-status information.

Current design thinking envisions using an RGB-LED lightbar to communicate to the driver through colour coding, colour changing and blinking sequences. Engineering challenges include maintaining consistent colour across all LEDs in the lightbar, and ensuring they all change at the same time.

The MLX81116 addresses this through its MeLiBu high-speed communication interface IP. This controls all individual LEDs separately in the lightbar to produce the lighting effects commanded by the vehicle. The controller also provides real-time compensation of any LED colour drift caused by environmental changes.

Support for dedicated optical parameters allows colour-mixing accuracy with a delta UV of 1% to ensure no distinguishable differences between individual LEDs in the lightbar. In addition, intelligent high resolution for temperature-related colour drift helps maintain a consistent and non-distracting user experience under all operating conditions.

The IC has a wide dimming range that allows brightness adjustment for daytime and night driving.

Meeting ISO 26262 up to Asil B, it has low EMI emission and high immunity thanks to the use of the Can-FD physical layer, which eases compliance with EMC regulations.

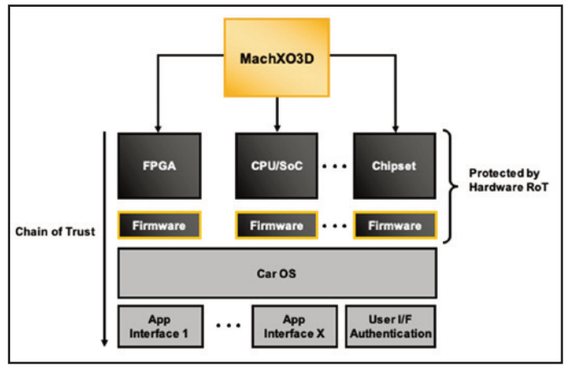
FPGAs increase safety and control

Lattice Semiconductor's Mach XO3LF FPGAs suit flexible deployment of robust automotive control applications and Mach XO3D FPGAs are for system security that supports extended operating temperatures for automotive and other rugged applications.

The XO3D FPGAs augment the system control capabilities of the Mach XO FPGA architecture with security features including hardware root-of-trust, platform firmware resilience and secure dual-boot support.

Both devices target control, bridging and IO expansion applications that must operate reliably in rugged environments, including adas, infotainment, motor control, 5G communications infrastructure, industrial robots and automation systems, and defence systems.

They are supported by the firm's Diamond integrated design software suite, a gui-based FPGA design and verification environment with tools optimised for low-power FPGAs.



Operating junction temperature is -40 to +125˚C.

An instant-on control hub powers the platform up and powers and simplifies deployment by single 3.3 or 1.2V supply operation with a high IO-to-logic ratio. They enable deterministic IO operation by eliminating power-up glitches with default pull-down and maintaining signal integrity with programme slew rate, drive strength and hysteresis

On-chip flash memory secures bitstream and user data against malicious attacks via OTP mode and password protection. The XO3D has an immutable embedded security block to enable security compliant with Nist SP-800-193 guidelines for protecting, detecting and recovering firmware from unauthorised access.

The on-chip flash also enables single-chip, instant-on and dual-boot images for fail-safe programming and in-field updates.

Secure reprogramming supports in-system updates with fail-safe reprogramming enabled by secure dual boot. A configuration engine prevents unauthorised access to configuration memory.

Mixed voltage support on IO eliminates GTL buffers and level shifters.

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