VEHICLE electronics

The monthly magazine for automotive electronics engineers

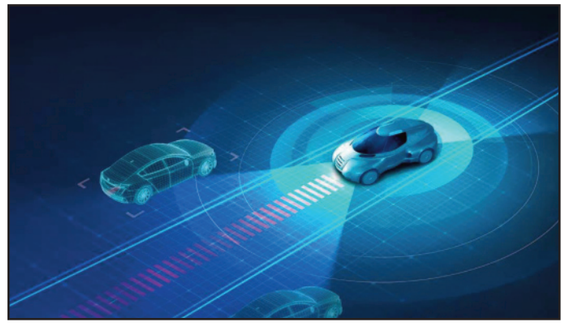
Microsoft partners eMapgo on autonomous driving data

Microsoft is partnering China-based company eMapgo Technology to help car makers collect, store, analyse, manage and simulate testing of autonomous driving data.

EMapgo is a subsidiary of Luokung Technology, a spatial-temporal intelligent big data services company and provider of interactive location-based services and high-definition maps. In China, eMapgo provides navigation and electronic map services.

Under the agreement, eMapgo anticipates continuing to work with Microsoft to provide data services when large-scale commercialisation of autonomous driving takes place. The two companies plan to form a close cooperation that addresses market opportunities presented by autonomous driving in China.

EMapgo has already obtained service contracts from European and US car makers. These two contracts are expected to be implemented in the coming months.



Microsoft partners Chinese firm eMpago

"As the demand for flexible computing continues to expand, China's autonomous driving data service market shows significant room for growth," said Xuesong Song, CEO of eMapgo. "We believe our core competencies in location-based services and HD maps are an ideal fit with Microsoft's considerable advantages in areas of cutting-edge technology such as cloud computing, artificial intelligence, elastic computing and mixed reality. We are pleased to deepen our existing relationship with Microsoft in this effort to promote the development of safe and intelligent autonomous driving in China."

Backed by proprietary technologies and expertise in HD maps and related intelligent spatial-temporal big data, Luokung established city-level and industry-level holographic spatial-temporal digital-twin systems and serves industries including autonomous driving, vehicle-road collaboration and smart transportation.

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October 2021

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Arm collaborates on software-defined vehicles

Arm hopes to accelerate the software-defined future of automotive

The chip designer is leading a collaboration across the automotive supply chain delivering a software architecture and reference implementation called Soafee, for scalable open architecture for embedded edge, and two reference hardware platforms.

"The automotive sector is at a critical inflection point and the supply chain – from IP design to car makers – is being re-examined and redefined," said Chet Babla, vice president at Arm. "The industry has asked Arm and its ecosystem to accelerate the vision for a software-defined future."

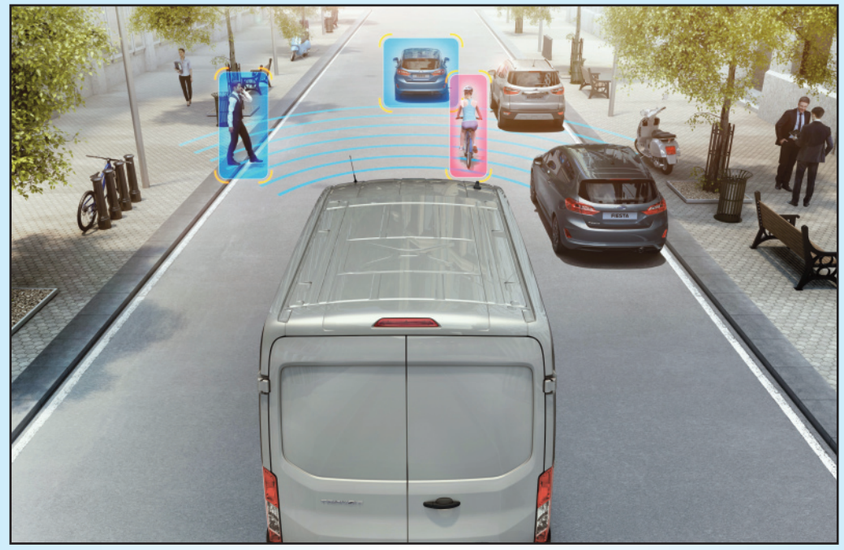
Soafee is the result of automakers, system integrators, semiconductor, software and cloud technology companies coming together to define an open-standards-based architecture for the software-defined vehicle. The reference implementation will be free open-source software aimed at allowing broad prototyping, workload exploration and early development.

Partners in the project include Adlink, Ampere, AWS, VW subsidiary Cariad and Continental. There has also been support from Apex.AI, Auto-Core, Capgemini, Green Hills Software, Linaro, Marvell, MIH Consortium, Red Hat, Suse, Tier IV, Woven Planet, Zing Robotics and others.

Based on the success of Project Cassini and SystemReady from Arm, which enable a standards-based cloud-native experience at the edge, Soafee enables cloud concepts such as container orchestration with automotive functional safety and in real time.

An initial release of the Soafee collateral and reference implementation is available to download.

Ford adds tech to Transit range



Ford is boosting the productivity of its Transit commercial vehicle with a major technology and specification upgrade that introduces driver assistance and connectivity features, while standardising key active safety technologies on volume-selling models.

The car maker is fitting pre-collision assist with pedestrian detection autonomous emergency braking technology and lane-keeping system as standard on all Transit Trend, Limited and Trail models from spring 2022.

It is also introducing the connected Sync 4 communication and information system with a 30.5cm touchscreen to expand driver assistance systems with features such as reverse brake assist and 360° camera.

"We are sharpening our focus on the productivity of Transit customers, prioritising new technologies that make a real difference to uptime and cost of ownership," said Hans Schep, general manager for commercial vehicles for Ford in Europe. "Transit has always been a technology leader, but this package of upgrades means more drivers than ever before can benefit from our advanced active safety and connectivity technologies, for greater comfort, productivity and peace of mind."

Motovis and Xilinx partner on forward camera technology

Xilinx is pairing its XA Zynq system-on-chip (SoC) platform with Motovis' convolutional neural network (CNN) IP for the automotive market, specifically for forward camera systems' vehicle perception and control.

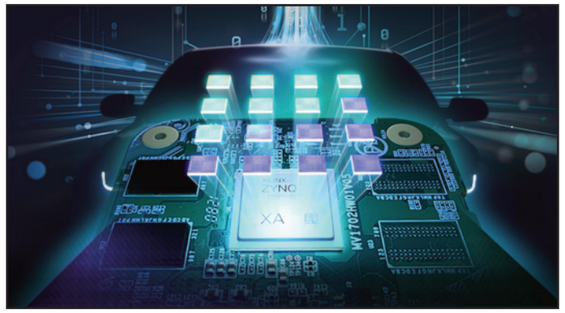
Forward cameras are a critical element of adas because they provide the sensing required for safety-critical functions, including lane-keeping assistance, automatic emergency braking and adaptive cruise control.

Available now, it supports parameters necessary for the Euro NCap 2022 requirements by using CNNs to achieve a cost-effective combination of low-latency image processing, flexibility and scalability.

"This collaboration is a significant milestone for the forward camera market as it will allow automotive OEMs to innovate faster," said Ian Riches, vice president at Strategy Analytics. "The forward camera market has tremendous growth opportunity, where we anticipate almost 20 per cent year-on-year volume growth over 2020 to 2025."

The forward camera system scales across the 28 and 16nm XA Zynq SoC families using Motovis' CNN IP. This supports image resolutions up to 8Mpixel. OEMs and tier-one suppliers can now layer their own feature algorithms on top of Motovis' perception stack to differentiate and future-proof their designs.

"With Motovis' customisable deep learning networks and the Xilinx Zynq platform's ability to host CNN-specific engines that provide unmatched efficiency and optimisation, we're helping to future-proof the design to meet customer needs," said Zhenghua Yu, CEO of Motovis.



Motovis and Xilinx combine technologies

The European Commission General Safety Regulation, National Highway Traffic Safety Administration and NCap have issued formal mandates or strong guidance regarding automakers' implementations of lane-keeping assistance and AEB in vehicles produced between 2020 and 2025 and onwards.

"Motovis' expertise in embedded deep learning and how they've optimised neural networks to handle the immense challenges of forward camera perception puts us both in a unique position to gain market share, all while accelerating our OEM customers' time to market," said Willard Tu, senior director at Xilinx.

LG gets green light for ISO 26262 testing

LG Electronics' software testing centre has officially been recognised as an ISO 26262-certified lab to conduct functional safety tests on software designed for autonomous vehicles.

As South Korea's first facility certified to test such software, the results issued by the centre will have international credibility in over 70 countries and regions, including the USA, Europe and Japan.

ISO 26262 is an international standard for the functional safety of electrical and electronic systems found in production road vehicles. One measurement of ISO 26262 determines the probability of accidents caused by errors in automotive software or development processes, a critical factor in the commercialisation of self-driving vehicles.

Certification allows LG to test the functional safety of software written for self-driving vehicles as well as all automotive software systems and Autosar that fall under ISO 26262 without the involvement of external agencies.

The accreditation was issued by the Korea Laboratory Accreditation Scheme (Kolas), which is an internationally recognised agency charged with the establishment of national standard systems and operation of industrial standardisations in matters related to safety and quality.

"LG Electronics is extremely proud to be entrusted with the world's best functional safety verification capability for automotive software," said IP Park, CTO of LG Electronics.

Renesas completes Dialog buy with automotive combinations

Renesas has completed its acquisition of Dialog Semiconductor for approximately ¥624bn.

"This represents an important milestone for Renesas," said Hidetoshi Shibata, CEO of Renesas. "This transaction builds on our long-term strategy to offer more leading-edge analogue and mixed signal products that deliver value and innovations. Together, we are positioned to capitalise on an array of growing opportunities including the IoT, industrial and automotive fields."

Buying Dialog follows previous acquisitions of Intersil and IDT. Renesas aims to combine Dialog's low-power mixed signal products, low-power wifi and Bluetooth connectivity expertise, flash memory, battery and power management as well as its experience in providing configurable mixed-signal products.

As an immediate benefit, Renesas and Dialog have launched more than 35 Winning Combinations. These are product combinations of embedded computing, analogue, power and connectivity.

Nine of these are specifically for automotive users, including one for in-vehicle infotainment combining Dialog's PMIC and CMIC with Renesas' automotive R-Car SoCs, buck regulators and timing ICs.

Another combines Dialog's LED backlight and haptic drivers with Renesas' PMIC for LCD to realise an automotive display system.

Further combinations are underway, including wireless battery management with Dialog's Bluetooth LE IC and Renesas' battery management ICs and MCUs.

"Dialog's outstanding analogue technologies add depth and breadth to our automotive line," said Takeshi Kataoka, general manager of Renesas' automotive business unit. "By combining the best of both companies' offerings, we expect to develop innovative automotive products that reduce our customers' development burden and time to market."

About 2300 Dialog employees have joined Renesas, and the two companies say they will work together to integrate both businesses.



TÜV SÜD certifies NXP to ISO 21434

NXP is the first semiconductor supplier to be certified by TÜV SÜD to comply with the ISO/-SAE 21434 automotive cyber-security standard.

The standard aims to provide connected vehicles with protection from malicious cyber attacks. It requires OEMs and their supply chains to apply a security-by-design approach to their components, servers and processes to reduce the risk of being vulnerable to attacks at any point in the vehicle lifetime, from the initial concept and design phases to end of life.

From July 2022 onward, vehicle manufacturers must comply with the R155 automotive cyber-security regulation for new vehicle type launches in Europe, Japan and Korea, which represents over a third of global vehicle production. Other regions are expected to follow.

ISO/SAE 21434 supports the implementation of the R155 requirements in organisations across the supply chain. NXP's ISO/SAE 21434 certification helps enable OEMs to meet requirements of the R155 regulation.

Connected vehicles will inevitably communicate with outside entities, from other vehicles to smart city infrastructure and to the cloud. If left unsecured, the vehicle electronics could be compromised by attackers.

Security measures are essential to prevent attacks and protect the vehicle, its systems and the back-end networks that serve them from cyber attacks.

The existing policies and processes of NXP have been refined and extended to meet the requirements of ISO/SAE 21434. TÜV SÜD audited NXP's organisation, its policies and processes for compliance with ISO/SAE 21434.



NXP has received TÜV SÜD certification



Zeekr vehicles using Mobileye technology

Zeekr plans models using Mobileye adas

Intel subsidiary Mobileye is expanding its influence in the adas industry through a partnership with Zeekr, a Geely Holding electric mobility technology brand.

Together, Mobileye and Zeekr plan to introduce safety technology for intelligent vehicles.

Mobileye will work with Zeekr to create adas with capabilities for various models. The collaboration will begin with the launch of vehicles towards the end of this year featuring Mobileye SuperVision, a full-stack adas powered by two EyeQ5 system-on-chip (SoC) devices processing data from 11 cameras.

The two companies also plan to collaborate further on a system powered by six EyeQ5 SoCs that is expected to make its debut in 2023.

"Zeekr's powerful vision for the future of driving makes them an ideal partner to Mobileye," said Amnon Shashua, CEO of Mobileye. "By working closely together, we have an exciting opportunity to reach a new level of excellence in adas, bringing to market what will be the industry's most state-of-the-art, full-feature system."

The collaboration follows an equity investment of $100m in Zeekr by Intel as part of a $500m investment from five companies. The funding will be used to build a Zeekr ecosystem for providing mobility.

"We believe that EV technology and mobility have the potential to positively impact our global infrastructure and provide transportation options that are safer, smarter and more efficient," said Anthony Lin, head of Intel Capital. "Zeekr's ambitions to meet the growing EV demands globally match Intel Capital's aim to be a force multiplier for some of the most innovative technology in the world."

Aston Martin tackles cyber-crime surge

Aston Martin is respecting cyber criminals as it tackles a surge in cyber crime over the past year, said Robin Smith, the car maker's chief information security officer, speaking at September's Cyber Security & Cloud Expo in London.

"We are seeing a growth in cyber crime and we need the capacity to deal with a massive surge," he said. "That surge has happened in the last year. At Aston Martin, we want to get ahead of that."

He said the "malicious innovations" of cyber criminals needed respect.

"They are there as soon as soon as something new comes out," he said. "Cyber crime has become industrialised. The value of cyber crime is bigger than the GDP of a number of countries."

Recently, he said, the biggest peak came from ransomware, but the market was dynamic and companies such as Aston Martin were always playing catch-up.

"Globally, ransomware in a major problem," he said. "It is a global problem and we need global solutions. At Aston Martin, we want to address the problem and get ahead of the malicious innovators. The attacks will continue and mutate, so we need an adaptive response."

With car makers such as Aston Martin the protection extends not just to their internal systems but to the cars they produce.

"If someone buys a new car, they don't want a problem," he said. "We have not got everything right at Aston Martin, but we have started the process of a new approach to security and risk."



Robin Smith sees growth in cyber crime.

Tuxera acquires HCC Embedded

Storage software and networking technology company Tuxera has acquired HCC Embedded, a Hungarian developer of embedded file systems, flash management and network data transfer software.

HCC Embedded will officially operate as Tuxera Hungary.

The acquisition deepens Tuxera's commitment to deliver reliable data management in a world increasingly fuelled and vitalised by data.

Since its founding in 2002, HCC Embedded has achieved ISO 9001:2015 quality management and ISO 27001 information security management standards.

This complements Tuxera's focus on serving its customers with safety- and mission-critical data requirements, particularly in the automotive industry.

Safety design standards and increasingly rigorous regulations continue to put more demand on embedded systems designs, not only in the automotive sector, but in the avionics, aerospace, medical, rail and shipping, and industrial automation industries.

The acquisition also brings deep hardware enablement knowledge and expertise to Tuxera, allowing the company's storage management software to interact more closely and optimally with a wider range of hardware environments.

Additionally, HCC Embedded brings a range of Misra-compliant networking products to Tuxera's portfolio, covering domains such as network management, security and TCP/IP applications.

These products will enrich Tuxera's expertise beyond fail-safe storage and management of data-at-rest and data-at-use, to encompass the reliable and secure transport of data in, out and through limitless data-driven, connected devices.

Tuxera develops fail-safe software for managing data, with roots stretching back to 1983.

Analog Devices completes Maxim acquisition

Analog Devices (ADI) has completed its previously announced acquisition of Maxim Integrated Products.

The combined company strengthens ADI's position in analogue semiconductors with trailing twelve-month revenue of over $9bn and free cash flow of over $3bn on a pro forma basis.

"Today is a tremendous milestone for ADI and I'm delighted to welcome the Maxim team, who share our passion for solving our customers' most complex technology problems," said Vincent Roche, CEO of Analog Devices. "With more than 10,000 engineers and the increased breadth and depth of our best-in-class technologies, we are well-positioned to develop more complete, cutting-edge solutions for our customers. Together, we will drive the next waves of analogue semiconductor innovation, while engineering a healthier, safer and more sustainable future for all."

Maxim stockholders received 0.63 of a share of ADI common stock for each share of Maxim common stock. Maxim common stock will no longer be listed for trading on the Nasdaq stock market.

Tunç Doluca, former CEO of Maxim, and Mercedes Johnson, former founding executive of Avago Technologies, will join the Analog Devices board of directors. Both served on Maxim's board of directors until the closing of the transaction

Toyota introduces girls to stem



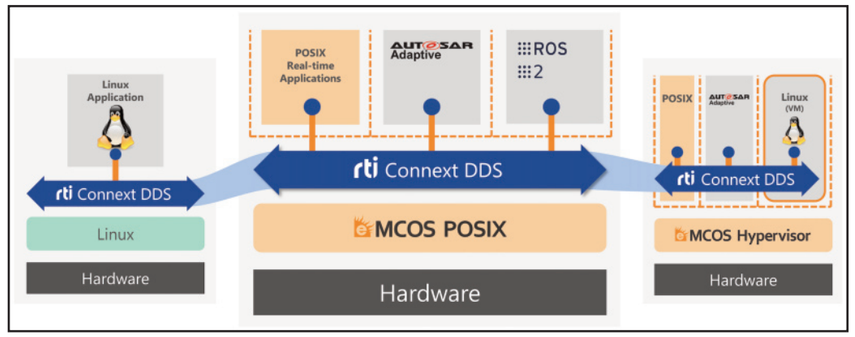
Toyota has launched its Girls Stem the Future programme in Europe aimed at bringing schoolgirls in direct contact with women working in the company.

Data show there are not enough women choosing stem careers, only 18% in Europe. Just 26% of schoolgirls are interested in stem subjects. Studies have shown that this can almost double when kids have a role model.

"Through the Girls Stem the Future programme, Toyota role models interact with schoolgirls in classroom sessions, on-site visits at our research and development centre, innovation camps and online video hub," said Ann Heylen, role model at Toyota.

The car maker is working with JA, Europe's largest education programme provider, and Inspiring Girls International, dedicated to raising girls' aspirations.

"This partnership with Toyota is an exciting opportunity to introduce young women to a full variety of opportunities available to them in the automotive industry and inspire them to aim high," said Miriam González Durántez, chair of Inspiring Girls International.



RTI Connext DDS integrated with eSol eMCos scalable rtos platform

RTI and eSol support embedded applications

Real-time embedded software developer eSol and software framework company Real-Time Innovations (RTI) are working together to support high-performance, secure embedded applications for automotive and industrial applications running on multicore systems.

RTI developed the foundations of the Data Distribution Service (DDS) connectivity standard, and eSol is a commercial rtos vendor with multicore support for the first chip with an Arm multicore CPU.

Through the partnership, RTI Connext DDS has been integrated with the eSol eMCos scalable rtos platform. This lets eMCos developers take advantage of various benefits when developing distributed real-time systems while leveraging open standards and cots technology.

Both companies enable real-time applications based on a modern architecture design in the embedded sector. The Connext DDS data-centric connectivity framework combined with the eMCos multi-kernel architecture provides low multicore latencies for an rtos on multicore hardware. Together, these technologies provide efficiency and security for developers of complex multicore systems, such as autonomous vehicles or industrial robots.

"To meet the huge challenges of embedded systems in terms of efficiency and security, we cannot rely on proprietary solutions," said Bob Ueyama, executive vice president of eSol. "We need to develop and use open standards to jointly tackle future development problems."

Kelvin Hor, regional manager at RTI, added: "We are pleased to work with eSol to enable next-generation applications for the industrial and automotive markets. Our mutual commitment to open standards and high-performance technology provides developers with proven, low-latency software without the need for custom code."

Ansys and IPG link simulation

IPG Automotive and Ansys aim to accelerate vehicle development with an interface between their simulation platforms CarMaker and VRXperience.

Targeting autonomous driving and driver assistance, the combination should let mutual customers benefit from both platforms.

As an open integration and test platform, CarMaker provides the basis for virtual test driving. The simulation platform follows the automotive systems engineering principle and enables a seamless development and validation of the overall system in the full vehicle and in realistic scenarios.

For this, CarMaker combines a holistic environment model including detailed simulation.

Foxconn and Stellantis target smart cockpits

Foxconn's FIH Mobile subsidiary and Stellantis have formed a joint venture called Mobile Drive to produce smart cockpits for connected vehicles.

This follows a memorandum of understanding (MoU) signed in May.

Mobile Drive will be equally owned by Stellantis and FIH. The partnership has combined Foxconn's capabilities in the ICT industry with Stellantis' expertise in the automotive sector.

The venture will focus on developing infotainment and telematics as well as a cloud service, which will aim to deliver a smart cockpit. Its roadmap of software innovations will include AI-based applications, navigation, voice assistance, ecommerce store operations, and payment services integration.

Funding boost for Eatron and WMG battery project

A partnership between Eatron Technologies and WMG at the University of Warwick has been formed for the Cobra (Cloud & Onboard Battery Remaining useful life Algorithm) project, thanks to funding from the Faraday Battery Challenge.

The project will create algorithms that will estimate the remaining useful life (RUL) in an electric vehicle (EV) battery, and could contribute to the UK becoming a supplier of advanced battery management systems (BMSs).

The innovation combines battery ageing models developed by WMG with Eatron's machine-learning-based approach to RUL estimation from existing internal R&D work.

The technology has been refined to a level of usability, reliability and maturity that gives battery manufacturers and integrators the confidence required to enable mass adoption.

Cobra aims to develop a unified physics and machine-learning-based approach for battery RUL estimation with accuracy of over 90%, and integrate this in automotive-grade BMS hardware and a cloud-based platform for fleet operation services.



Umut Genc from Eatron

Eatron is developing and integrating battery diagnostics algorithms for its BMS and cloud-based battery analytics.

As well as extending a batteries' first life by giving an accurate indication of a battery's remaining life, Cobra will also improve second-life applications by reducing the need for expensive testing, as well as increase the effective power of batteries by allowing the safe use of a wider operating window.

"We are delighted to work with Eatron technologies on the Cobra project, and look forward to using our novel battery ageing technology to test out their algorithms in their battery management system," said Dhammika Widanalage from WMG. "If their algorithms means consumers can get more out of their EV battery, then it's possible more people may be inclined to buy one, therefore helping the UK pave the way to a cleaner greener zero-carbon future."

Umut Genc, managing director of Eatron Technologies, added: "This funding has brought the project forward by 12 months, and there is huge demand from potential customers."

Rohm and Geely partner on SiC

Rohm and car maker Geely have entered a partnership to develop automotive technologies using SiC technologies.

The companies have been collaborating on automotive applications since 2018. This partnership is expected to promote cooperation and accelerate innovation for automotive applications.

Geely wants to extend the cruising range of electric vehicles while reducing battery costs and shortening charge times by developing high efficiency traction inverters and onboard charging systems that use Rohm's SiC power devices.

Geely also wants to improve the user experience through the development of adas and intelligent cockpit systems using communication ICs and discrete devices.

As a first step, traction inverters equipped with Rohm's SiC power devices are being integrated in EV platforms being developed by Geely.

Qualcomm and Google design in-cabin experience for Renault

Qualcomm will work with Google to design a rich and immersive in-vehicle experience for Renault's Mégane E-Tech electric vehicle that was unveiled at IAA Mobility in Munich.

Renault will use the third-generation Snapdragon automotive cockpit platforms from Qualcomm to power the vehicle's infotainment system, which is comprised of portrait-sized touchscreen displays for audio, visual and navigational functions.

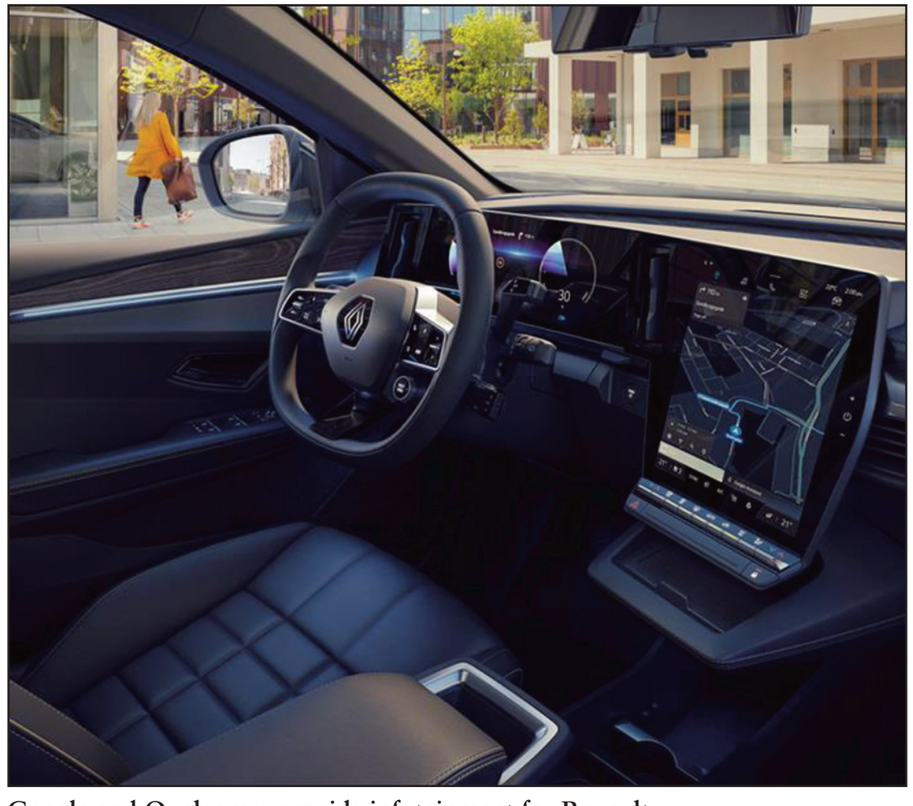
To enhance the experience for drivers and passengers, the infotainment will come with built-in Google apps and services to provide in-vehicle applications such as Google Assistant, Maps and Play, but also keep the vehicle fresh and current with evolving digital trends with its upgradeable capabilities.

As the automotive industry's first-announced scalable artificial intelligence (AI)-based offering, the Snapdragon cockpit platforms are designed to transform in-vehicle experiences, supporting higher levels of compute and intelligence needed for capabilities such as intuitive AI experiences for in-car virtual assistance, natural interactions between the vehicle and driver, and contextual safety use cases.

"We look forward to extending our long-term relationships with industry leaders like Google and Renault to reimagine and redesign the overall experience for drivers and passengers within this new digital age," said Nakul Duggal, senior vice president at Qualcomm.

The digital cockpit is powered by the Android automotive operating system, using Google's technology to bring intelligence into the vehicles. This will let driver and passengers have hands-free help from Google Assistant, positionally precise navigational maps with Google Maps, and an ecosystem of automotive applications and services on Google Play.

"Digital cockpits have quickly transformed how drivers and passengers interact with their vehicles, allowing for more personalisation and enhanced comfort," said Thierry Cammal, vice president at Renault. "We believe that our continued work with Google and Qualcomm is critical to redefining in-vehicle experiences, allowing us to provide advanced features and capabilities to elevate the experiences for drivers and passengers."



Google and Qualcomm provide infotainment for Renault

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Olli integrates Perrone AV technology

Autonomous vehicle technology from Perrone Robotics is being integrated into Olli, the shuttle designed and manufactured by Local Motors.

The collaboration brings together two innovators in the autonomous vehicle (AV) industry.

Perrone Robotics holds a patent for its Max general-purpose robotics operating system and, with its Tony product, the company has produced a drop-in any vehicle retrofit kit approach to autonomy, making it flexible and adaptable.

The Olli line complements Perrone's innovation, leveraging 3D printing and agile processes to deliver integrated vehicles that evolve at the speed of user needs.

Under the agreement, the companies aim to improve mobility options across transit and transportation while enhancing the end-user experience. The two companies plan to launch the Olli vehicle with Perrone's Tony AV technology in autumn and Perrone Robotics will now be the strategic software vendor for the Olli autonomous shuttle.

Perrone will contribute its expertise in AV robotic technology development and deployment and integrate its patented Tony retrofit kit across the Olli vehicle line for public and private roads where fully autonomous capability at posted speeds is required.

Local Motors will support the integration, testing, deployment and mass production of the Olli vehicle. In addition, both companies will focus on scaled delivery and deployment of Olli vehicles integrated with Perrone's technology.



Olli autonomous shuttle

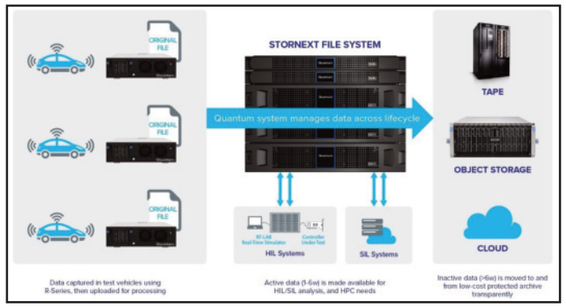
"This new OEM agreement is an important step in expanding our current customer base while enhancing the vehicle experience for passengers," said Vikrant Aggarwal, president of Local Motors.

Paul Perrone, CEO of Perrone Robotics, added: "Local Motors' Olli vehicle line represents a novel approach to autonomous people movement in a visionary futuristic platform that can be micro-manufactured at scale today."

Quantum leaps on reference architecture

Quantum has released an end-to-end reference architecture for adas and autonomous driving.

By enhancing the acquisition, movement, storage and curation of the data to develop autonomous vehicle software, the architecture can address the needs of every stage of adas and AD development.



Quantum portfolio manages data

"Although still relatively nascent, organisations developing autonomous vehicles are at a crossroads," said Jamie Lerner, CEO of Quantum. "The volume of data being captured is increasing exponentially, presenting an urgent need for speed, capacity and cost-efficiency in the data management lifecycle."

Test vehicles capture terabytes of sensor data per hour generated by cameras, lidar and radar. Adas and AD development systems rely on collecting and processing these unstructured data to build machine-learning models and algorithms needing intelligent data management.

TESTING TIMES

Steve Rogerson reports from September's Aesin conference in Birmingham

One of the biggest headaches facing developers of future autonomous driving systems is how to test that they work before putting them in the hands of real people. There have already been some much-publicised accidents in which early versions have been involved.

For technology that has a selling point of reducing accidents, that is not a good situation. But when designing a car that has to drive itself in an unlimited number of unknown situations, testing with a high degree of certainty is not easy.

And while real-world testing, that is testing these cars on actual roads with real traffic and pedestrians, brings the most important data, in the long term for cost reasons most testing will need to be done through simulation.

These were among the problems troubling delegates at September's Aesin conference at the UK's National Motorcycle Museum near Birmingham. Aesin is the Automotive Electronics Systems Innovation Network and speaker after speaker at the event expressed joy at actually being able to be at a live event. As expected, numbers were down, about half the attendees this event got before the pandemic, but it was still a good turnout of top minds in the industry.



Ken Horne: "We need to bring the road into the lab."

Testing

The testing issue was brought to the fore by Ashish Naik, a business development manager for autonomous driving at National Instruments. He is a big fan of collaboration.

"You can't do this alone," he said.

The reason is that new approaches are needed to find a suitable balance between work in the laboratory, pure simulation and driving on real roads.

"Today," he said, "most of the time is spent in physical and real-world testing. But where the industry wants to be is, near enough, doing everything in simulation."

The main obstacles to this include the technology not being ready, a lack of trust and a lack of skills. Plus, a lot of car makers need to change the way they have thought about these problems for years.

"It is different for start-ups because they don't have that change to do," said Naik.

The technology challenge to move to nearly pure simulation is gathering the real-world data in such a way that they can be modified to fit different situations such as weather conditions, variable road surfaces and so on, in the form of a digital twin that can be updated with new data as and when needed.

"We want to take data from the real world and make digital variations to move from finite scenarios to infinite scenarios," said Naik.

Another company tackling this issue is Keysight Technologies, and its strategic planner Ken Horne, who says that for there to be the necessary confidence in autonomous vehicles, the testing has to be up to scratch.

"Simulation has great advantages but it can't emulate what the real sensors see," he said. "That would require millions of test miles and that is not feasible and possibly dangerous. So there is a gap between what software can do and what needs to be done. We need to bring the road into the lab."

Keysight is developing what it calls ADE, for autonomous drive emulation, to try to bridge that gap because he said a lot of driving situations could not be tested on open roads because they were too dangerous or difficult.

ADE uses radar target simulators and the company has a proof of concept available, but



Ashish Naik: "You can't do this alone."



Chris Tubbs: "It is a terrible way to develop software."



Siddartha Khastgir: "The assumptions are different in different countries."

Horne said the whole system was still being developed including adding other sensing technologies such as lidar.

Another tricky issue in the testing world is proving the autonomous vehicles comply with local highway regulations.

"That can be difficult to show," said Siddartha Khastgir, head of verification and validation at WMG at Warwick University. "The assumptions are different in different countries. The exact rules are specific for every country and maybe for regions within a country."



Andrew Patterson: "Software-defined vehicles are here."

Radar

WMG is investigating potential problems with radar such as picking up ghost images and interference with radar from other vehicles.

This could turn into a major problem if, as is hoped, large numbers of vehicles are fitted with radar.

"It could be a big problem if you have five to eight radars per car on every single car," said Jonathan Robinson, a project engineer at WMG. "That is a lot of radar on a busy motorway or crowded town centre. We are trying to find out if that could cause a serious problem."

He said the group was also experimenting with machine-learning models to eliminate ghost images.

Software

With so much of a car's functions being controlled by software, a situation that is going to increase rapidly, Chris Tubbs, business development director at Green Hills Software, believes there has to be changes in the way software is created.

"We are moving to something incredibly complex, but we are still looking at the same way of developing software," he said.

The main problem he said was that people were still wanting to change the requirements as development progressed, and every time a change is made there is less time to carry out tests. That introduces a lot of vulnerabilities.

"It is a terrible way to develop software," said Tubbs.

He said it was important to have fixed requirements, which meant thinking things through properly at the start.

"It is difficult because that way of thinking is not embedded," he said.

He also said developers should look to reducing the complexity by reducing the number of lines of code. This would make the software less vulnerable.

"More code does not equal good code," he said. "In fact, the opposite is generally true."

On security, he said companies should ask how secure was their development departments.

"If someone gets in, they could put malware in the source code," he said. "And a lot of software is outsourced. When you buy software, you need to know it has been independently assessed."

Another tip was to decide early what needed to be safe and secure and not worry too much about the rest.

"We are never going to be able to stop the bad guys getting in," said Tubbs. "What we need to do is buy us enough time to identify the threat and mitigate it. To do this, you start with a multi-layered defence. That is what buys you the time."

He said it was inevitable that hackers would get more sophisticated.

"They are pretty sophisticated now," he said. "The only way to stop them is to be more disciplined when you write the software."

Andrew Patterson, senior director at Siemens, was pushing service-oriented architecture (SOA) as the way forward for software-defined vehicles, which requires a move to Autosar Adaptive.

"The term software-defined vehicle has been talked about a lot, and it is here," he said. "For many years, we relied on the classic Autosar platform, but this was not enough to support SOAs, so Autosar Adaptive was developed."

He said an SOA would allow services inside and outside the vehicle.

"We are already seeing Autosar Adaptive being designed for non-safety-critical services," he said.



Jonathan Robinson: "It could be a big problem."

Digital vision

Earlier in the conference, Joanna White, a director at National Highways, which used to be called Highways England, laid her digital road vision, a plan to use technology to improve the way roads operate.

"We want to push information out so people can plan their journey," she said. "There is value in bringing in vehicle-to-vehicle (V2V) communications. The more we know what is happening on the network, the more we can provide information to people."

Conclusion

Though the world seems to have been put on hold for the past 18 months, the work to develop the future autonomous vehicles is continuing. The challenges of testing and ever more complex software are being addressed. And it was good to talk about these, at long last, face to face.



Joanna White: "We want to push information out."

SENSORS



Sarven Ipek explores the perceptions and challenges associated with lidar

A successful autonomous vehicle is going to have to use a tightly integrated system of sensors to replicate the driving abilities of a human being. The typical human driver uses two eyes, two ears, and the tactile feedback of the car to drive.

Their brain processes all this information in real time and references their vast database of driving experience.

The sensors required to replicate human driving will include radar, lidar, cameras, inertial measurement units (IMUs) and ultrasonic sensors. Each of these will have its strengths, but also literal blind spots. It is highly unlikely one sensor will ever be so refined as to negate the need for the others.

So what are the top level design considerations for lidar, which is a sensor that will provide significant data for any autonomous driving?

Lidar is a close partner of radar in an autonomous vehicle. Both technologies operate without visible light, which is crucial for night driving or low light conditions. Radar is good for long distance detection and tracking, while lidar provides higher angular resolution allowing for object recognition and classification.

Put another way, radar is good for detecting there might be something out there, while lidar can tell you more about that something once the radar finds it.

There are technical challenges when designing a lidar system, the obvious one being staying below the eye safety limitations for near infra-red wavelengths. These safety guidelines are outlined in IEC 60825-1.

This is not to diminish the importance of eye safety; the aspects discussed here all play into decisions that affect eye safety.

There are many different lidar system topologies, with varying degrees of design complexity, which come with their own advantages and disadvantages.

At the core, all designs have the same fundamental aspects that need attention. Let's focus on considerations other than eye safety that affect system design, namely increasing signal-to-noise ratio (SNR), detection requirements, field of view, thermal considerations, power consumption and dead reckoning.

Looking at the receive path, the SNR of the system affects the ability to detect small objects at a long distance, say100 to 300m.

The ADC noise floor cannot exceed the other sources of noise in the receive path. If the background light or the signal shot noise contributions are lower than the ADC's noise floor or the printed circuit board (PCB) noise, the accuracy will be limited.

Performing time of flight (ToF) calculations in a direct detect topology demands that the system can output short pulses – ~1 to 5ns – and detect them with a high sampling rate ADC. Sampling speeds of 1GS/s enable this on the receive signal path. Also, keep in mind, the ADC effective number of bits (ENOB) must allow full output range from the

transimpedance amplifier (TIA) without clipping the signal.

Basketball

Does the system need to detect a basketball at 100m away? Determining the reflectivity and size of objects of concern, as well as the distance, limits the acceptable SNR of the TIA. The same pulses the ADC must detect require the TIA to have a bandwidth that detects narrow pulses. Due to the range of distance, reflectivity and size of objects systems must handle, the TIA must be able to recover from a saturation event.

Saturation events can occur from a highly reflective object returning a high percentage of the light that was transmitted, which saturates the amplifier, for example a close object such as a speed limit sign. These events are common, and the speed at which a system can recover to provide accurate information is critical for safety.

The field of view and angular resolution required will also impact the ability to detect the basketball. Transmit and receive optics are the main contributing components to determine the field of view. Angular resolution will determine whether it can detect and classify an object such as a basketball at some farther distance or just detect that an object exists.

Handling the power required for these systems and the heat that can be generated poses significant challenges for lidar designers. And, of course, lowering the power consumption of the signal chain will lower the heat generated.

A component's performance over temperature can be greatly shifted, and some components of the signal chain that are more susceptible will need temperature compensation.

Thermoelectric controllers are a great way of cooling or heating ICs with high accuracy. For example, laser diodes need temperature compensation to maintain operation of wavelength and efficiency over the lidar system's operating temperature range.

Voltage biases for avalanche photodiodes and lasers in some cases require hundreds of volts, positive or negative, to operate. Generating these voltages with high efficiency and with as few components as possible is the best design practice. Precision digital-to-analogue converters (DACs) are needed to generate bias points, current and voltage for providing accurate reference inputs.

Along with the traditional voltage domains of 1.8 to 12V, there is an increased need for voltage levels in a lidar system. Careful selection of power options pays off, especially when another voltage is added. It is also important to choose ICs and power supplies that have a shutdown or low power mode where the system has flexibility to cycle through many channels.

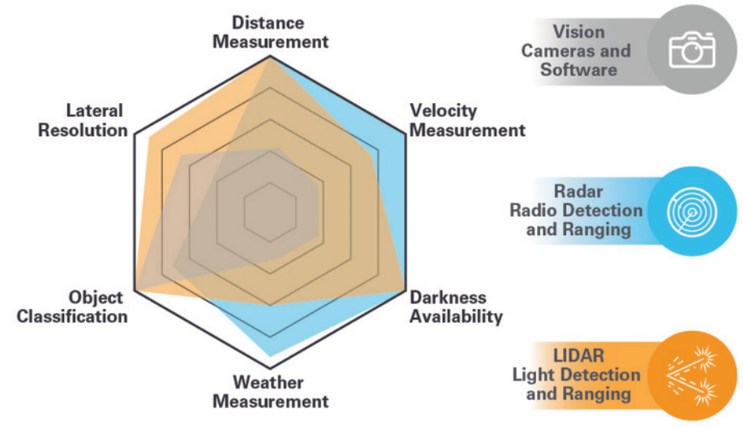


Fig. 1: Spider chart comparing vision, radar and lidar

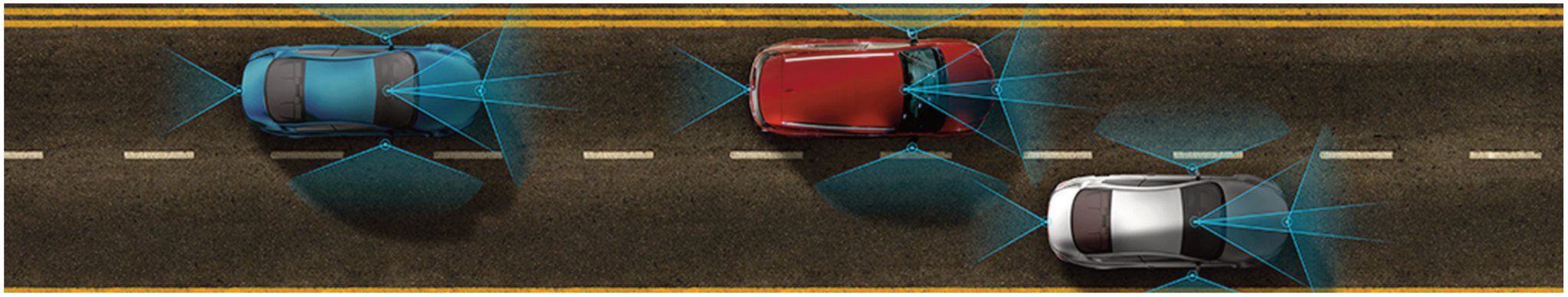


Fig. 2: Lidar perception for autonomous vehicles

IMUs integrated with lidar sensors provide many benefits. IMU sensors intelligently fuse multi-axis gyroscopes and accelerometers to provide reliable position and motion discernment for stabilisation and navigation applications. Precision microelectromechanical systems (mems) IMUs deliver the required accuracy levels even in complex operating environments when faced with extreme motion dynamics.

IMUs provide an autonomous driving system with dead reckoning, localisation and stabilisation capability. This in turn provides trusted data to the system when adas or GPS performance is degraded or unavailable. IMUs benefit from fast update rates (thousands of samples per second) and are immune to changes in the external environment. The more stable the IMU, the longer it can be trusted to provide critical insights to the system.

IMUs can be integrated directly into lidar modules to detect, analyse and correct for vibrations commonly found in an automotive environment. For example, the IMU output can be used to shift lidar point clouds that would have otherwise been misaligned due to the vehicle running over a pothole on the road. Bearing wear on spinning lidar systems can also be detected using an IMU, which allows the lidar to be serviced before a failure occurs in the field.

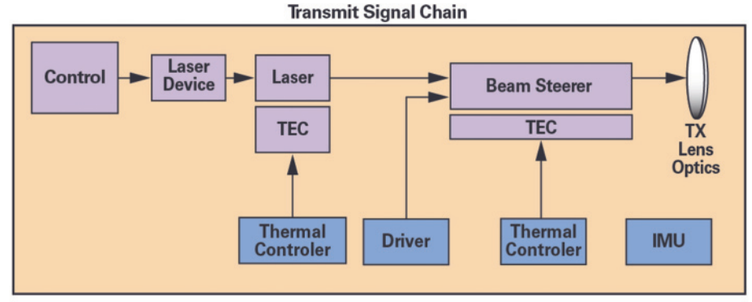


Fig. 3: Lidar electrical architecture

Conclusion

The complexities for a lidar system require attention during initial product definition to determine the acceptable SNR, detection requirements, field of view, thermal limits and power consumption.

Realising which components are the main contributors to each, along with careful IC selection, increases the chances of a successful design.



Sarven Ipek is lidar marketing manager at Analog Devices

FPGAS

LOGICAL APPROACH



Steve Rogerson talks with Lattice Semiconductor about its latest FPGAs for automotive use

Cars are becoming data centres on wheels and therefore protocols need to be in place that can protect them from hackers. But, in such a fast-moving industry, there needs to be flexibility when moving from the design stage to manufacture and onwards, and it is in this area that FPGAs are typically used. And not just for functional safety, though obviously important.

One big market is in-cabin artificial intelligence (AI). Here there are relatively simple but important AI functions such as driver monitoring, counting passengers, checking for items and even children left behind in the vehicle, and so on.

Infotainment is another big market with features such as 360° surround view where the FPGAs can be used to stitch together the images from different cameras. Adas is another massive area as cars gain functionality on their way to an autonomous driving world. Here the FPGAs can be used for bridging and aggregating the various sensors.

One of the big players in the low-power high-volume segment is Lattice Semiconductor. The company has just expanded its portfolio of automotive products in the Certus-NX FPGA family, bringing knowledge gained in other segments into the automotive world.

A good example, according to Deepak Boppana, a senior director at Lattice, is human presence detection for checking if anyone is still in the car and if the driver is paying attention to the road, using technology being developed for laptop computers.

"Some of the next-generation laptops are looking at user attention," said Boppana. "If you turn or face away for a time, the screen will dim. If someone is behind you, they will alert you about it."

He said some companies were implementing this in software but Lattice was putting it into hardware.

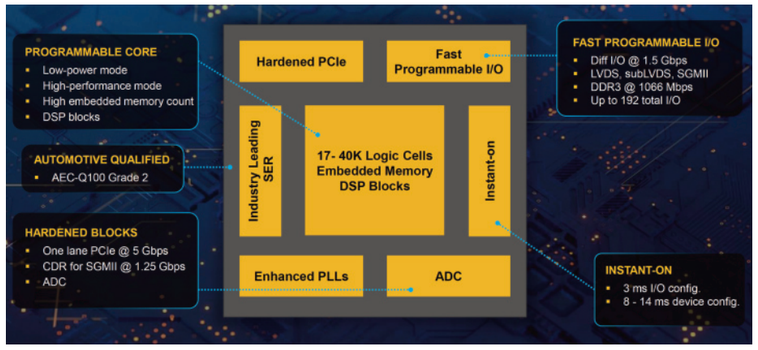
"The same is happening with security," he said. "Some of our FPGAs are in data centres to protect them from malicious attacks, and that is now coming into the automotive space."

He said infotainment and adas would be the main drivers for the firm's FPGA technology in the next two years with in-cabin AI and security more in the future, in the three-to-five-year timeframe.

"We are talking with OEMs about this now," he said.

The Certus-NX devices combine automotive-grade features with IO density, power efficiency, small size, reliability, instant-on performance, and support for PCI Express (PCIe) and Gigabit Ethernet interfaces.

"Demand for automotive semiconductors is increasing as the ongoing trends towards automotive system electrification, autonomy and connectivity have



What is inside a Certus-NX FPGA

manufacturers looking for ways to deliver the advanced features and user experiences drivers are looking for in their next vehicle," said Jay Aggarwal, director of silicon product marketing at Lattice Semiconductor.

The FPGAs are for automotive applications such as motor control, LED control in in-vehicle infotainment, in-vehicle networking and sensor data co-processing in adas applications.

They have up to four times lower power use than similar FPGAs, says Lattice, with a programmable back bias that enables user-selectable high performance or low power operating modes, depending on the needs of the application. They are also said to be three times smaller with up to double the IO density compared with similar competing FPGAs.

"The small form factor is good for some the modules in a car that are space constrained," said Juju Joyce, product marketing manager at Lattice Semiconductor. "This is reinventing the low-power automotive FPGA sector."

Joyce said the Certus-NX 40K LC could achieve a much lower power consumption than say the Xilinx Artiz-7 50K LC or the Intel Cyclone V GT 77K LC devices because these were over specified for the types of automotive applications being targeted.



Juju Joyce: We have the better balance between power and performance."



Deepak Boppana: "We are doing a good job of supply management."

"To achieve the low power, we have targeted the optimum amount of clock speed for the application," he said. "The other competing devices tend to over-target performance in this class of products. They start with a very high-end FPGA and scale the architectures down. That means you tend to end up with more performance than you need and that translates to higher power. We have the better balance between power and performance."

He acknowledged that the other parts were quite old, but said those companies "have not gotten in and focussed on the segment".

Device configuration from SPI memory is up to twelve times faster than similar competing FPGAs, with individual IOs able to configure in 3ms, and full-device start-up in 8 to 14ms, depending on device capacity.

"This is important for rear-view displays that need to turn on as soon as needed," said Joyce. "If not, it can affect car safety."

The IO IP library includes: 1.5Gbit/s differential IO with claimed performance up to 70 per cent higher than competing FPGAs; and 5Gbit/s PCIe, 1.5Gbit/s SGMII and 1066Mbit/s DDR3.

They are AEC-Q100 qualified and are said to provide up to 100 times better soft-error rate (SER) performance than similar FPGAs.

Joyce said this included the Cyclone part mentioned earlier though he admitted he had not seen exact data from Intel.

"We are confident we are better than it based on real silicon results we have seen," he said.

To protect bitstreams against unauthorised access, they support AES-256 encryption with ECDSA.

"The main security requirement used to be encryption to stop the device being cloned," said Joyce. "But more recently, hacking attacks mean that authentication is the number one concern of many car makers. This is big for over-the-air software updates. Anyone could send an update over the air and you need to know that it is from an authorised user and not some hacker trying to alter the car's operation."

There are two versions of the part, with 17,000 or 39,000 logic cells.

Lattice's Radiant and Propel software tools help simplify and accelerate automotive design. The FPGAs are also supported by the firm's mVision and SensAI stacks so designers can leverage the stacks' modular hardware platforms, reference designs, neural network IP cores and custom design service.

"As more automotive systems go digital, modern cars have essentially become mobile data centres," said K Ganesh Rao, practice head for FPGAs at Tata Elxsi. "Automotive developers need access to secure and reliable silicon with fast IO performance to ensure mission-critical automotive systems can perform their functions instantaneously. Lattice Certus-NX FPGAs provide the reliability, performance and feature set we need to make tomorrow's automotive applications possible."

Automotive-grade versions are now sampling with select users. Full production is expected towards the end of this year or early next year. Non-automotive versions are in full production.

As to when they will be in road cars, Boppana said: "We are seeing faster times to market, so they could be in cars within two to three years. They are being designed in now. This used to take four to five years, but with the new players we are seeing shorter design cycles."

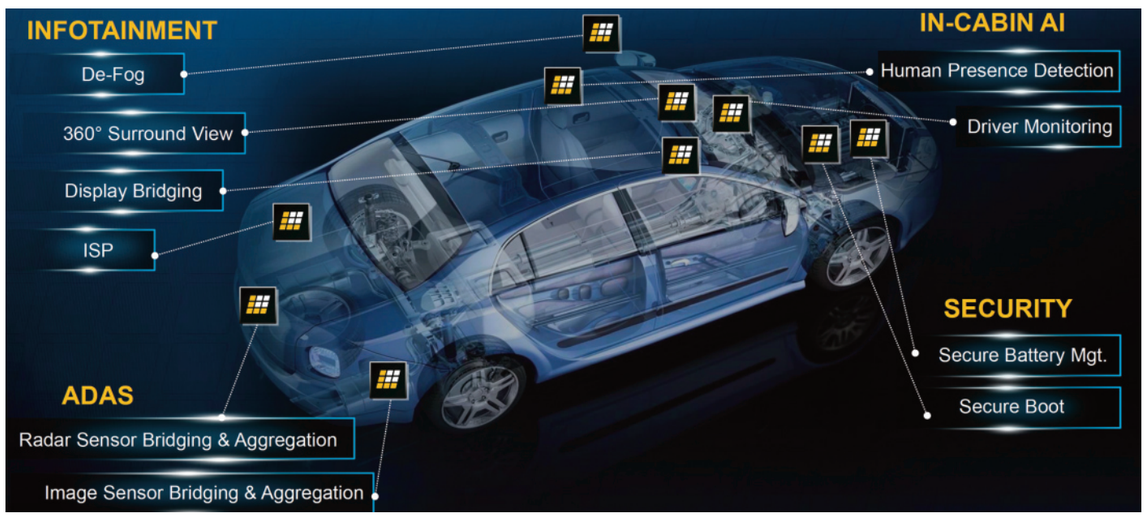
As to chip supply, he said Lattice was doing a "good job" of managing this and was thus not suffering from the shortages hitting other companies.

"Customers are paranoid about what is happening now," he said. "There is a lot of hand holding and working together on supply and backlog. The supply problems will leave some scars in the industry."

On self-driving cars, he said level-four autonomy was still a long way away but that this was an evolution with more sensors coming into cars. The technology, meanwhile, was being tested with drones and industrial robots.

"The technology is coming together," he said.

As to the future, next year Lattice is planning to launch some mid-range FPGAs, with higher performance and capacity than the current range. It is talking with car makers about other applications as features such as in-cabin AI and security had opened doors, and it was time to walk through them.



Main applications for the Certus-NX FPGAs

MANUFACTURING

SPARKS OF INTELLIGENCE

AI and machine vision combine to improve quality and reduce costs in automotive manufacturing

Vehicle Electronics

Artificial intelligence (AI) is proving a game changer in ensuring the quality of automotive components, which are complex, price sensitive, high volume and frequently safety-critical. By pairing it with machine vision (MV), it has become possible to inspect every part coming off the line – something that was neither economic nor practical using human operators.

This lets a camera feed be reviewed in real time and have faulty widgets identified and tagged either physically or virtually.

Two installations point to the lessons in terms of realising these benefits in the context of a safe and secure connected IT environment.

Audi

One of the pioneers was the Audi A3 line at its Neckarsulm plant. This site has 2500 autonomous robots on its production line. Each robot is equipped with a tool of some kind, from glue guns to screwdrivers, and performs a specific task required to assemble an Audi automobile.

Audi assembles up to approximately 1000 vehicles every day at the Neckarsulm factory, and there are 5000 welds in each car. To ensure the quality of its welds, Audi performs manual quality-control inspections. It is impossible to inspect 1000 cars manually every day, so Audi uses the industry's standard sampling method, pulling one car off the line each day and using ultrasound probes to test the welding spots and record the quality of every spot.

Sampling is costly, labour-intensive and error prone. So the objective was to inspect 5000 welds per car inline, and infer the results of each weld within microseconds.

A machine-learning algorithm was created and trained for accuracy by comparing the predictions it generated to actual inspection data that Audi provided. The machine-learning model used data generated by the welding controllers, which showed electric voltage and current curves during the welding operation.

The data also included other parameters such as configuration of the welds, the types of metal and the health of the electrodes. These models were then deployed at two levels, first at the line itself and also the cell level. The result was that the systems were able to predict poor welds before they were performed. This has raised the bar in terms of quality.

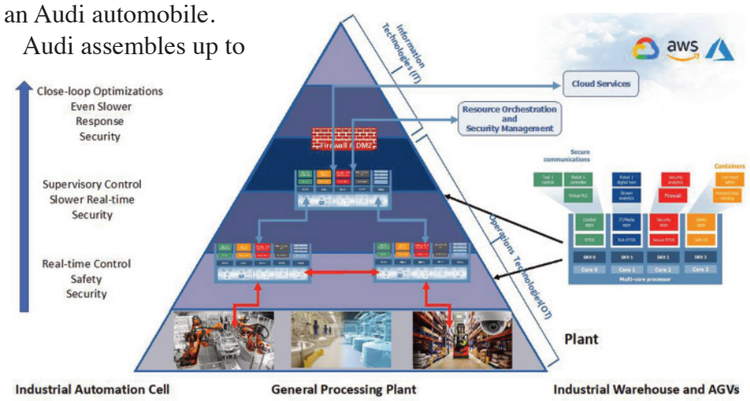


Fig. 1: Industrial pyramid and mission-critical edge computing for orchestrated deployment of applications on a distributed infrastructure

Bosch

Bosch, is trialling a similar approach. In partnership with Lynx Software, Bosch VHIT, the vacuum and oil pumps subsidiary of Bosch, is testing a proof-of-concept camera-based quality programme for use with real-time decision making in industrial settings.

The move is part of Bosch VHIT's digital transformation of its processes and product development. The programme captures data from cameras on manufacturing plant floors and logistics warehouses and harnesses machine-learning algorithms to identify quality issues and feed information into the MES system, to generate an optimal decision in real time.

When securely connected to the cloud, the system benefits from continued access to artificial intelligence algorithms and data analytics packages.

Since these systems are critical to the manufacturing process, they need to be protected against hacking and the malfunction of another programme running on the same hardware. By partnering with Lynx, Bosch VHIT was able to close the digital feedback loop that is reliant on capturing quality images and analysing the data to provide a safe real-time action.

The Lynx Mosa.ic for industrial product enables the programme to run multiple functions on a single SoC without compromising performance, security or safety.

"As we continue advancing cutting-edge technology applications for factory automation, we are excited to partner with Lynx to accelerate a new, secure IIoT-based quality system for the market," said Riccardo Sesini, digital transformation manager at Bosch VHIT. "In increasingly connected manufacturing environments, manufacturers require safe, versatile and resource-conserving solutions. Lynx has a long history of robust, safety-critical, high-availability systems and was the obvious choice to help us realise this latest programme in a safe and scalable way."

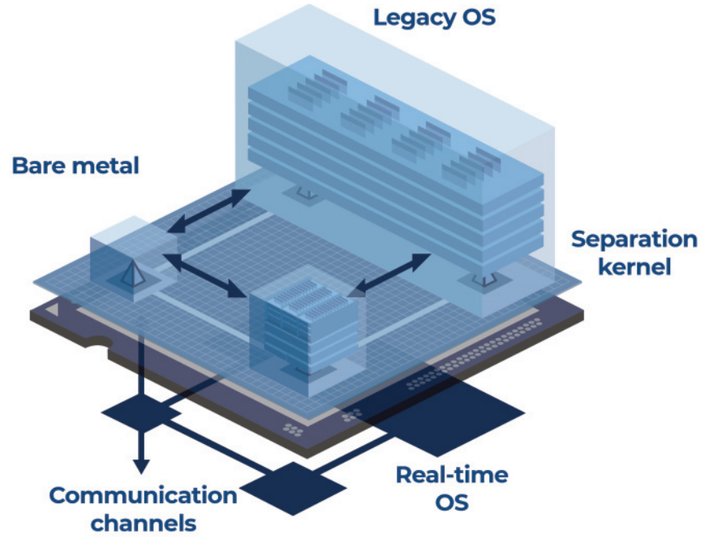


Fig. 2: Lynx framework consolidates mixed criticality workloads running on the same multicore processor

Security

Central to the success of both installations is the collection and processing of data relating to a mission critical process at the edge – that is on the production line – rather than in the cloud, so that adjustments to the process can be made in real time. For these new manufacturing quality systems, the Lynx Mosa.ic for industrial framework is focused on ensuring security and mitigating any period of equipment downtime that could impact business output.

It provides software that can run the inference engine and control functionality on the same platform, so these applications are appropriately isolated and allocated the right hardware permissions, and nothing more, to perform their tasks.

A camera might highlight an issue; then a soft PLC can then connect to the line and make appropriate process improvements. This infrastructure is called the mission-critical edge, see Fig. 1.

The Lynx framework consolidates mixed criticality workloads running on the same multicore processor – the resources and performance provided by the hardware platform, and the capability of the software components, see Fig. 2.

At the same time, it completely isolates critical applications from non-critical workloads to provide high levels of immunity to the former from cyber attacks. Additionally, this greatly reduces the architectural complexity, cost and number of points of failure, a critical factor in ensuring business resiliency.

Conclusion

Many manufacturers are exploring better ways proactively and continually to improve quality. While these approaches may generate some false positives, this is much better than failing parts making their way to end users.

As the algorithms improve, the incidence level of those occurrences will reduce.

The combination of AI and MV is significantly more effective than batch testing, which is used to trace faults manually and retrospectively back to the manufacturing environment, and for workers to understand root causes and make changes to processes.

However, it is important to appreciate that this approach relies on the availability of robust edge technology for the connected camera-based quality system that enables real-time responses to be delivered to events while ensuring critical applications run reliably and safely alongside other functions operating on the server and gateway hardware.

BACK TO TRUCKING

Steve Rogerson reports from the Commercial Vehicle Show in Birmingham, UK

Dakota adds voice to Truckfile vehicle inspection technology

Digital workshop and fleet management specialist Truckfile worked with Dakota and Honeywell to let technicians use their voice to carry out vehicle inspections.

The company has been making vehicle inspection systems since 2006, initially using PDAs to replace paper-based systems, then onto laptops and tablets. Technicians can now use their voice to add notes to the cloud-based technology.

Using a headset with noise cancellation features, handy for noisy workshops, the technician is guided through a checklist as he or she inspects the vehicle, with opportunities to add voice notes at any point. The headset connects to the input device using Bluetooth.

"This increases efficiency and reduces errors," said Paul Whittingham, who was the company's operations director at the show but is now managing director. "This means they can get more inspections done in a day. One technician could do one more inspection each day. It is the way to go. It is hands free so they don't have to hold onto a tablet."



Philip Jarrett (left) and Paul Whittingham

Truckfile already worked with Honeywell and asked the company about using voice. Honeywell suggested talking with its existing partner Dakota that had produced similar voice technology for warehouse management and other applications.

"We work in a number of sectors but transport, logistics and fleet management were areas we wanted to penetrate, so Truckfile was a perfect partner," said Philip Jarrett, commercial director at Dakota. "We are data capture experts and specialise in voice."

The technology takes the technician through an inspection process in the most optimal sequence in a step-by-step process. This ensures standardisation and compliance. If a fault is reported, it will suggest the technician takes a photo, or picks one from a range of common defects, and then it asks them if they want to record further notes. It includes a voice-to-text translator.

Truckfile will help workshops learn to use the system, and this can take three to five days training.

The main device communicates with the cloud over 5G or wifi and with the headset using Bluetooth with a 10m range. Initially, a technician will train the system to recognise his or her voice and this can be used to provide voice authentication.

Truckfile is used across the UK and Ireland and one of its biggest customers is Mercedes. It has rolled out systems in the Netherlands and is looking to expand in Germany and France.

Start-up uses video tech to assess drivers



Victoria Kroll: "This will give a level of driver risk."

University spin-off Esitu hopes to have a commercial version of its driver training technology available early next year.

The company was a spin-off from Nottingham Trent University in May this year and had a demo version of its video software at the show. The plan is to launch a web-based commercial version in February.

The demonstration version uses pre-recorded video of road incidents and uses these to assess how drivers respond.

"These are shown to drivers and then we ask them what happens next," said Victoria Kroll, Esitu's chief executive officer. "They have to be really watching to know, so if you are not paying full attention you won't know the answer."

There are different versions depending on the type of driver.

"This is one way to get people through a long assessment," said Kroll. "This will give them a level of driver risk and show who needs to have more on-road training."

The web version will let companies put lots of drivers through the test and the management will be able to see all their scores.

"You can pick out what the problems are to give corrective action," said Kroll.

The system uses high-definition video and computer-generated imagery to create tests that overcome known problems with the traditional hazard perception test used by the DVSA in the UK to identify which drivers are most at risk of a collision.

Lytx takes integration route for dashcams

Dashcam maker Lytx has seen strong growth in the past year after it switched emphasis from selling its products directly to having them integrated into video telematics systems.

The US company has been around since 1998.

"We are now looking to indirect rather than direct markets," said Kristin Hodgkinson, channel marketing manager at Lytx. "We are working with big telematics partners to integrate our video into existing platforms. We are not just selling directly but taking our video knowledge and layering that into telematics products."



Kristin Hodgkinson: "It has been going well."

The company started doing this a year ago and Hodgkinson said it had been going very well.

"We are growing quickly with this new strategy," she said. "We are offering both options in the USA but outside we are not really selling to end users. The direct model is still available if a client wants to expand from the USA to the UK or elsewhere."

An example of the integrated product at the show was the Surfsight AI-12 dashcam that automatically flags risky driving behaviour. It combines machine vision and artificial intelligence to analyse what it sees and anticipate what might happen next.

It also includes infrared night vision.

Vision events are captured based on built-in sensors and it triggers on critical events using the Geotab rules engine.

Continental to automate cabotage rules

Continental is working on technology to automate the new cabotage rules coming into Europe in the next two years.

Cabotage is the system that allows a trucker crossing into another country to make a number of pick-ups and drop-offs while in that country before returning to the home country.

In the past, this has been routinely monitored to make sure some people are not breaking the rules. This involved a lot of checking of loading and unloading paperwork that could be difficult across EU countries.

From February next year, drivers must manually enter border crossings on a tachograph, but from August 2023 all new vehicles will have smart tachograph technology.

This will use satellite signals that automatically record border crossings on built-in maps.

"These will automatically log when vehicles cross the border," said Keith Lloyd, head of product management at Continental Automotive. "But drivers will still have to log loading and unloading operations. Originally, this was going to be automatic with load sensors. However, most European countries do not want to go for that but use sensors in the road to check vehicle loads. So, automatic logging of loading and unloading will probably not occur but will require drivers to log this. It is down to the honesty of the driver."

However, he said the legislation only came out at the end of July.

"We are only just getting our heads round this as a tachograph manufacturer," he said.



Keith Lloyd: 'We are only just getting our heads round this."

MCY pulls out of show



Given current Covid rules, some might have been surprised to see a Chinese company in the list of exhibitors. Could MCY Technologies really get round all the legislation involved in international travel to attend a UK trade show?

Well, it seems the intentions were there as the stand was built but, as can be seen from the picture, nothing arrived to fill it.

MCY was established in 2012 and specialises in researching, developing, manufacturing and servicing vehicle monitoring products. These include mobile cameras, mobile DVRs, TFT monitors, dashcams, rear-view mirror systems, surround-view technology and adas.

Reference design for HD cameras

Renesas Electronics and OmniVision Technologies, have introduced an integrated reference design for a high-definition automotive camera system.

The design features Renesas' recently introduced Automotive HD Link (AHL) technology that transmits high-definition video over low-cost cables and connectors.

The AHL components in the design pair with OmniVision's OX01F10 1.3MP SoC, which provides imaging performance across a wide range of lighting conditions.

HD video is increasingly important in car safety systems for object recognition functionality.

The RAA279971 AHL encoder and RAA279972 decoder use a modulated analogue signal to transmit the video, enabling transmission rates ten times less than required to transmit HD signals digitally.

The lower transmission rate means unshielded twisted pair (UTP) cables and standard low-cost connectors can be used, as can existing traditional analogue video cables and connectors.

AHL can be paired with other Renesas products, such as the R-Car automotive SoCs, RH-850 MCUs, automotive PMICs and analogue components to implement safety features in virtually any vehicle.

The OX01F10 SoC integrates a 3.0μm image sensor and an image signal processor with OmniVision's PureCel Plus technology for low noise, automotive rear view cameras and surround view systems achieving a small form factor with low-light performance, low power and reduced cost while improving reliability by enabling single PCB designs.





Inductors

Vishay has added a 2020 case size to its high-temperature automotive-grade IHLP low profile, high current inductors.

The Dale IHLP-2020CZ-8A combines a continuous operating temperature to +180°C with a 3mm profile for under-the-bonnet use.

The AEC-Q200 qualified device is for energy storage in DC-DC converters up to 2MHz. It provides attenuation of noise in high current filtering applications up to the SRF of the inductor.

The device is for filtering and DC-DC conversion in engine and transmission controls, diesel injection drivers, adas, exhaust gas recycling pumps, and entertainment and navigation systems, in addition to noise suppression for motors, windshield wipers, power mirrors and seats, HID and LED lighting, and heating and ventilation blowers.

Typical DCR is from 3.95 to 195mΩ and inductance from 0.22 to 15.0μH. The device provides rated current to 18A and handles high transient spikes without saturation.

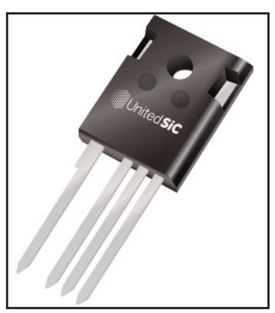
Nine devices include 6mΩ SiC fet

A 750V, 6mΩ SiC fet from UnitedSiC has an RDS(on) claimed to be less than half that of the nearest SiC mosfet competitor. Short-circuit withstand time rating is 5μs.

Complemented by the already available 18 and 60mΩ devices, there are nine more device and package options in the series, rated at 6, 9, 11, 23, 33 and 44mΩ. All devices are available in the TO-247-4L package while the 18, 23, 33, 44 and 60mΩ devices also come in the TO-247-3L.

They are a cascode of a SiC Jfet and a co-packaged silicon mosfet. These together provide the advantages of wide band-gap technology such as high speed and low losses with high temperature operation, while retaining an easy, stable and robust gate drive with integral ESD protection.

Applications include traction drives and on- and off-board chargers in electric vehicles.



Supercaps boost reliability

Miniature supercapacitors from Kemet can extend lifetime, increase power density, speed charging and improve reliability at +85°C for energy storage in automotive electronics applications.

The FMD and FU0H series deliver 1000 hours at +85°C and 85% RH-rated voltage and operational temperature from -40 to +85°C. The FMD series offers the higher lifetime with up to 4000 hours.

These supercapacitors are qualified to an automotive testing protocol. They are made in an ISO TS16949 certified plant and are subjected to PPAP, PSW and change control.

They are suitable for automotive applications needing a main power system backup during a power loss, such as adas, autonomous vehicles and central gateway ECUs.

Using supercapacitors for automotive electronics enables freedom from the design limits imposed by finite battery lifetimes.

The supercapacitor's benign open-circuit failure mode contrasts with typical short-circuit battery failures that may result in outgassing or ignition.

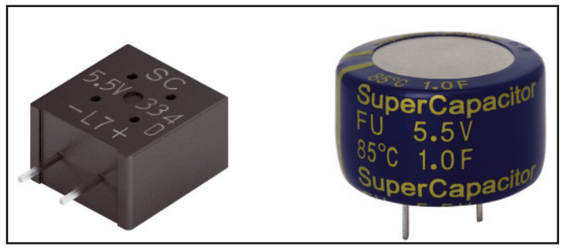
Furthermore, they can be a cost-effective alternative to small backup batteries.

Depending on the type of load and current demand, they can store enough energy to provide backup for durations ranging from a few seconds to several hours.

A proprietary aqueous electrolyte solution provides durability against liquid leakage, vibrations and thermal shock, thus reliability in harsh environments. Aqueous electrolytes are highly conductive, have a low environmental impact, and are non-toxic and non-flammable.

Unlike a battery, supercapacitors store and release energy quickly through physical adsorption and the ions desorption in the electrolyte between their electrodes. With low internal resistance, these devices can fully charge within a few seconds. In contrast, a secondary battery cell can take from ten minutes to several hours to charge fully.

There is no theoretical limit to the life cycle, whereas a lithium-ion secondary cell has a finite lifetime of about 500 cycles. They also typically have a greater resistance to moisture absorption than organic compounds, resulting in a longer life with better stability.



Power switch protects subsystems

A precision-adjustable current limit power switch from Diodes protects automotive subsystems. The AP22653Q programmable switch can streamline power design and provide a controlled and protected power path.

It handles continuous load currents up to 1.5A. Uses include protecting a vehicle's USB ports and ECU supply rails, and infotainment and telematics subsystems.

With an accuracy margin of ±7% at high current levels, the current limit threshold can be set anywhere between 125 and 1735mA via standard value external resistors.

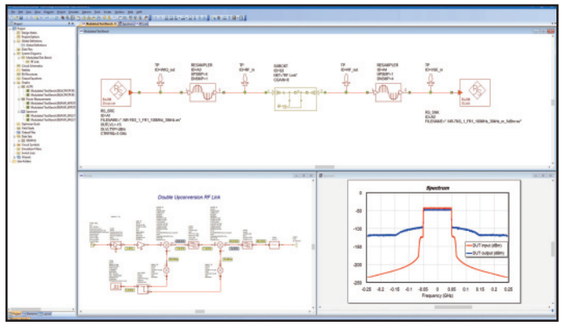
The device's controlled rise and fall times mitigate the effect of surges during turn on and off. In addition, its 5μs short circuit response helps avoid situations requiring system shutdown and restart.

A 55mΩ typical on-resistance reduces power loss and voltage drop at high load currents. The integrated reverse-current protection safeguards against reverse currents when peripherals are being externally powered.



Tool uses realistic signals for simulation

Rohde & Schwarz and Cadence have developed a tool that simplifies the engineering process from RF design to implementation and enhances accuracy with realistic signals for simulation and test.



The R&S VSEsim-VSS combines EDA simulation with hardware testing for the wireless, automotive and milaero industries as well as for manufacturers of active components and systems.

Realistic signal simulation at the early stages in RF system design is important. Using the same signal creation methods and analysis algorithms as for subsequent hardware testing enables direct result correlation from the early design stages to implementation verification, allowing conclusive and consistent analysis of widely used key performance indicators such as error vector magnitude.

The tool supports major standards such as 5G and the latest wifi evolutions. The joint offering combines signal generation, design simulation and signal analysis.

It functions as an addition to the Cadence VSS visual system simulator for system simulation and modelling, particularly for RF components and RF assemblies used in wireless communications and radar design.

The tool adds realistic signals to the workflow, increasing simulation accuracy and simplifying the design process, and benefits from two established software tools from Rohde & Schwarz for testing operative circuits, modules and devices – the signal generation capabilities of the WinIQSim2 simulation software and the signal analysis capabilities of the VSE vector signal explorer software.

This tool combines these functions and adds plug-ins for Cadence EDA tools.

A data sink plug-in provides access to the signal at any point in the design process. The signal can be transferred to a vector signal generator and applied to available hardware, enabling system level analysis of hybrid hardware and simulated implementations.

It supports direct digital predistortion techniques to verify the effects of linearisation already in the simulation phase of power amp development.

An added benefit is increased compatibility between R&S and Cadence tools. Signal generation and analysis provided by R&S products can be used in connected Cadence products such as the Microwave Office circuit design software or the Virtuoso RF product for RF integrated circuits and modules.

Box enables power supply programming

For mobile machines and commercial vehicles, Würth Elektronik has developed the Can Box 8FR6 for power distribution and function control.

It can be fully programmed and offers various diagnostic options.

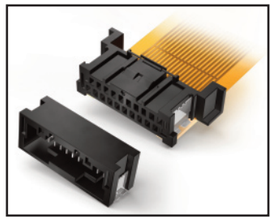
The 8FR6 has an NXP 32bit Cortex M4 microprocessor, 128kbyte of ram and a 512kbyte flash memory as well as 2kbyte fram.

The 17 by 14 by 7cm IP64-rated box has eight fuse and relay outputs and six high-side outputs and is used for power distribution to multiple loads. In addition, there are eight analogue inputs, four digital or frequency inputs with switchable pull-up resistors and two Can bus interfaces.

Each relay output can accommodate a load of up to 15A, and each high-side output up to 2A. The high-side outputs are all PWM-capable, meaning they can also be used for dimming lighting systems.

All outputs, including the eight relay outputs, are current sensing.





FPC connector

Following demand for the heat and vibration-proof CF1 board-to-FPC connector, Panasonic has launched the double-row CF2 version for automotive battery management and lighting systems.

For simplified, time- and cost-efficient assembly, just two parts – a plug and a receptacle – are needed for a reliable, vibration resistant high-power connection, making relay wire harnessing sets redundant.

These are for daytime running lamps and battery management systems.

Following the CF1 connector with four to ten pins in one row, the CF2 type has 20 pins in two rows, with other pin configurations available on request.

A metal terminal connection structure on both makes the direct connection between the FPC and the board possible.

Suitable for applications that require shock, vibration and a +125°C heat resistance, the connector's double-sided contact and inertial lock structure prevent incomplete mating.

Laser and optical amp enable long-range lidar

A tunable high power FMCW (frequency-modulated continuous-wave) laser module and semiconductor optical amplifier (SOA) chips from NeoPhotonics are optimised to enable long range automotive lidar and high-resolution industrial sensing applications.

The FMCW laser is C-band tunable and can be directly modulated to provide more than 21dBm (126mW) fibre coupled power and a narrow linewidth FMCW optical signal.

The SOA chip is designed for integration with photonic integrated circuit (PIC) lidar engines and provides more than 23dBm optical output power.

These products are based on the firm's photonic integration platform and improve sensitivity and range, which enables automotive lidar systems to see considerably farther than 200m.

Both operate in the 1550nm band, which is believed to be more eye safe, and are being sampled to customers.

In addition, tunable FMCW laser sources enable lidars with configurable operating wavelength thus enhancing the immunity of coherent lidars to external light interference.

FMCW lidar uses coherent technology to increase range and sensitivity by measuring the phase of the reflected light instead of relying only on intensity measurements. The technology is implemented in PICs using indium phosphide and silicon photonics integration platforms.

Coherent detection, whether for lidar or communications applications, uses PICs to extract phase and amplitude information from the optical signal. Narrow linewidth and low phase noise lasers are required for precise phase measurements and high optical power is required to compensate for optical loss in the silicon photonics optical chips and to provide a sufficient return signal from distant objects for efficient detection.

The narrow linewidth laser and SOA can be used together or separately to optimise the lidar module performance.

SMD brick fuses act fast

Bel Fuse-Circuit Protection has announced the 0ACH series of fast-acting, high current SMD brick fuses.

They have high current ratings and high interrupting ratings within a package size of 4.5 by 4.5 by 12.3mm.

The series is for automotive and other applications that require a high current fuse, and where any reduction in size, weight and power is beneficial, such as high-power battery systems, routers and blade servers.

The range is supplied as tape and reel for auto-insert SMD processes.

The devices deliver current ratings of 60 to 100A and a DC voltage of 72V with interrupting ratings up to 1kA.

They meet AEC-Q200 requirements, are RoHS compliant and halogen free, and comply with UL 248-1 and UL 248-14.



Single gate drivers suit light-rail use

Single gate-drivers from Power Integrations are for light-rail, renewable energy and other high-reliability applications that demand compact, rugged devices.

The Scale-iFlex single gate-drivers are for the dual 100 by 140mm IGBT modules.

They support modules up to 3.3kV and samples are available now for design-in.

They fit the outline of standard IGBT power modules including the Mitsubishi LV100 and HV100, Infineon xHP2 and xHP3, ABB LinPak, Hitachi nHPD^2 and similar products.

They use the firm's Scale-2 asic technology, which reduces component count compared with conventional products.

The asic also provides active clamping overvoltage protection during normal operation, an improvement over simple soft shut down, which adds protection in case of short-circuit during turn-on.

Devices are conformally coated and have reinforced isolation between modules when they are mounted side-by-side.

Devices are pre-qualified according to railway standards IEC 61373 for class 1B shock and vibration, IEC 61000-4-x for EMC tests, and IEC 60068-2-x for serial environmental tests.

Burn-in is optionally available.

The drivers are rated at 20A peak output current per channel at +85˚C ambient temperature with no air flow. Higher power levels are possible with cooling or a lower ambient temperature. Both electrical and fibre-optic interfaces are available.





Chip caps work up to +150˚C

Automotive-grade polymer chip capacitors from AVX are for operation up to +150˚C at category voltage and meet AEC-Q200 stress qualification for passive components.

These ensure stable performance at +85˚C, 85% relative humidity and rated voltage for up to 1000 hours.

The TCO series is based on the firm's field-proven TCQ automotive polymer capacitors. The chip capacitors are made in an IATF-16949-certified facility and have J-lead constructions comprised of tantalum anodes, tantalum pentoxide (Ta2O5) dielectrics, and conductive polymer electrodes that exhibit a benign failure mode under recommended use conditions.

They also exhibit low DCL (0.1CV) and basic reliability of 1% per 1000 hours at +85˚C and rated voltage with 0.1Ω/V series impedance and 60% confidence.

They suit high-temperature, low- and medium-power automotive, industrial and telecommunications applications.

The capacitors are available as D-case (EIA Metric 7343-31) components rated MSL 3 per J-STD-020 and for 10μF ±20% tolerance, 50V DC at +105˚C, a maximum of 50μA DCL, 150mΩ maximum ESR at 100kHz, and operating temperatures from -55 to +150˚C; other codes are in development.

They are RoHS compliant, lead-free compatible, and can withstand three reflow cycles at +260˚C.

Applications include automotive cabin control, infotainment and comfort systems; body electronics that manage safety, power management and diagnostic systems; and aftermarket electronics such as dashcams, radar detectors, navigation systems, subwoofers, amplifiers and headrest monitors.

Package passes tier-one BLR tests

One of Nexperia's surface-mount device packages – the clip-bond CFP15B FlatPower package – has passed board level reliability (BLR) testing for automotive applications by a tier-one supplier.

Initially, it will be used in an engine control unit.

BLR provides a means of evaluating the robustness and reliability of semiconductor packages. The rigorous testing procedure is relevant in automotive applications, where safety and reliability are critical.

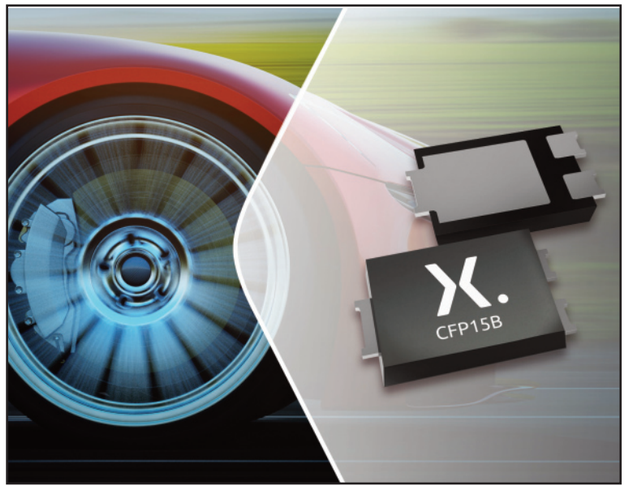
Accreditation is important as the industry shifts towards more electric and connected vehicles, increasing the complexity of onboard electronic systems.

The CFP15B thermally-enhanced, thin surface-mount package suits automotive components such as engine control units, transmission control units and other safety applications such as braking.

BLR verification confirmed that it exceeded twice the level of reliability performance that would be expected in accordance with AEC-Q101.

Power temperature cycles, combining temperature cycling and intermittent operating life tests, saw the device achieve a qualification of 2600 cycles.

The CFP15B is manufactured from high-grade materials. It provides zero delamination in the areas around the leads, die and clip, therefore eliminating moisture ingress and increasing reliability.



Thermal resistance is reduced using a solid copper clip. This optimises the transfer of heat into the PCB, allowing compact PCB designs. The device is up to 60 per cent smaller than DPak and SMx packages, with no compromise on thermal behaviour.

The package is used by different power diode technologies such as Schottky or recovery rectifiers but can also be extended to silicon-germanium power diodes or bipolar transistors.

It provides product diversity, covering single and dual configuration and between 4 and 20A.

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72 Westwood Road, Nottingham NG2 4FS, UK

Web site: vehicle-electronics.biz
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ISSN 2055-1177

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