VEHICLE electronics

The monthly magazine for automotive electronics engineers

AMD buys Xilinx for $35bn

AMD is to acquire Xilinx for $35bn taking the iconic semiconductor firm into markets such as automotive and 5G.

Xilinx has a portfolio of automotive-qualified products that meet ISO 26262 certification.

The takeover should let AMD offer a strong range of processor technologies, combining CPUs, GPUs, FPGAs, adaptive SoCs and deep software expertise for cloud, edge and end devices.

"Our acquisition of Xilinx marks the next leg in our journey to establish AMD as the industry's high performance computing leader and partner of choice for the largest and most important technology companies in the world," said Lisa Su, AMD's CEO, who stays in charge of the combined company. "This is truly a compelling combination that will create significant value for all stakeholders, including AMD and Xilinx shareholders who will benefit from the future growth and upside potential of the combined company."

With a combined team of 13,000 engineers and over $2.7bn of annual R&D investment, AMD should have additional talent and scale to deliver a stronger set of products.



AMD's California headquarters

"We are excited to join the AMD family," said Victor Peng, Xilinx CEO, who will stay president of the Xilinx part of the business. "Our shared cultures of innovation, excellence and collaboration make this an ideal combination. Together, we will lead the new era of high performance and adaptive computing."

AMD expects to achieve operational efficiencies of approximately $300m within 18 months of closing the transaction, which has been unanimously approved by the boards of both companies.

The acquisition is subject to approval by AMD and Xilinx shareholders, certain regulatory approvals and other customary closing conditions, and is expected to close by the end of 2021. Until then, the parties remain separate, independent companies.

At least two Xilinx directors will join the AMD board upon closing.

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December 2020

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Synopsys and Samsung streamline ISO 26262 SoC design

Synopsys and Samsung Foundry have released a validated automotive reference flow to streamline SoC hardware design for in-system test, implementation, verification, timing and physical signoff for ISO 26262.

This reference flow is targeted for Asil-D autonomous driving and adas applications. It provides SoC architects, designers and verification engineers with differentiated design and IP that deliver complex functional safety analysis, implementation and verification capabilities.

The automotive reference flow uses Synopsys' automotive design flow and Asil-D functional safety processor IP.

"We have reached a higher standard with a unified automotive reference flow based on our 14LPU process technology," said Sangyun Kim, vice president at Samsung. "Samsung Foundry's automotive reference flow, enabled using Synopsys' differentiated automotive design flow, will help our customers streamline safety-critical SoC design projects including for ISO 26262."

The automotive design flow includes unified functional safety verification and native automotive options, letting designers prove at the planning and implementation phases that their chip safety architecture can achieve target Asils.

Designers can perform FMEA and FMEDA for unified fault campaign management. Early functional safety analysis at RTL or gate level can quickly identify candidates for triple-mode redundancy (TMR) and dual-core lock-step (DCLS) redundancy and estimate metrics for target Asils.

Synopsys offers self-test instantiated directly into the RTL that tolerates indeterminate digital states while achieving high fault coverage. It can implement functional-safety mechanisms, such as TMR, DCLS and finite state machine, perform formal verification, and check and report that safety mechanisms are properly implemented.

Digital and analogue fault injection and simulation can produce reliable metrics for FMEDA and roll-up.

The functional safety processor integrates hardware safety features, such as redundant processors, error-correcting code, parity protection, safety monitors and user-programmable windowed watchdog timers.

Flying car passes road tests



This flying car has passed the stringent European road admission tests and now is allowed on the streets with an official licence plate. The Pal-V Liberty has been undergoing a rigorous drive test programme on test tracks since February 2020, and it is now ready to take to the roads.

"We have been cooperating with the road authorities for many years to reach this milestone," said Mike Stekelenburg, CTO of Pal-V. "The excitement you feel in the team is huge. It was very challenging to make a folded aircraft pass all road admission tests. I feel the energy and motivation in our team to push hard for the last few milestones and get the Liberty certified for flying too."

Since 2015, the design has been going through aviation certification with the European Aviation Safety Agency. Finalisation is expected in 2022. More than 1200 test reports need to be completed before the final 150 hours of flight testing can take place. After this, deliveries to customers can start.

PSA, Anritsu and Thales enable rapid e-sim switching

Car maker PSA partnered test company Anritsu and tech giant Thales for live and simulated testing of vehicle sim cards, enabling rapid switching from network tests to a laboratory environment.

Based on Anritsu's MD8475x base station simulator platform and Thales' OSM on-demand subscription manager, it let PSA conduct a full laboratory test of a vehicle with the e-sim integrated into a car's telematics control unit (TCU).

"By speeding up the testing of vehicles with embedded sim cards and giving testers complete control of the test regime, it will bring immense benefits to any industry where this technology plays a leading role," said Martin Varga from Anritsu.

The e-sim in the car has a profile allowing it to connect to the mobile operator's network providing connectivity to PSA group vehicles. Until now, only one environment, live or laboratory, could be used in the validation and in the verification test of the vehicle.

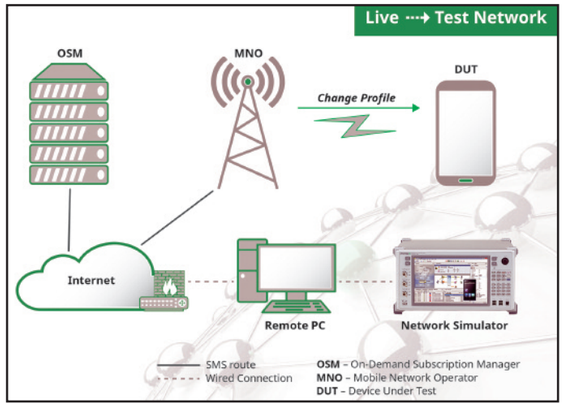
This development ensures the e-sim can be switched easily to the laboratory profile, allowing the test team to control all aspects of the simulated network environment as well as all measurements.

Using the Thales OSM, the profiles can be switched over the air at the press of a button. During integration, it could change from the live to the test profile and back again. Initially connected to the live mobile network operator, the e-sim switched its connectivity to the test radio network from the base station simulator.

This brings benefits over previous ways of swapping profiles, one of which involved physically desoldering the e-sim and replacing it with another, bringing delays and the risk of damage. An alternative is to use commands in the TCU, which can be complicated due to the use of proprietary software and may lead to undesired changes in TCU firmware.

"This technology brings many advantages to Groupe PSA," said Cyril Vialleton from PSA, "such as great flexibility for the teams in charge of current and future telematics gateway development of our vehicles."

Christine Caviglioli, vice president at Thales, added: "With more than 240 connectivity platforms already deployed, Thales has proven expertise in e-sim technology and related subscription management services. Our partnership with PSA and Anritsu demonstrates how to swap connectivity provider for vehicles in a laboratory environment. Together we are building trust in the safety of connected cars."



The integration enables rapid switching from network tests to laboratory environment

Ivex and Siemens improve validation

Ivex and Siemens have partnered to improve the validation and verification of autonomous vehicles (AVs) and adas. This should benefit developers in simulation, validation and verification efforts.

With Simcenter Prescan 360, Siemens delivers massive virtual validation and verification of automated driving functions. In a combination with recently introduced raw sensor acquisition systems, Siemens lets engineers design and test technology to make vehicles drive autonomously.

The process leverages products such as Simcenter Prescan and Heeds, and the recently introduced Simcenter Scaptor.

Ivex's safety assessment tool is used to identify safety critical and edge case situations in recorded or simulated driving data supporting the validation of AV and adas functions.

They are collaborating to create a toolset that integrates Siemens' simulation environment with the qualitative safety metrics from Ivex.

Green Hills adopts automotive cyber-security standards

Green Hills Software has adopted the two international security standards and regulations for automotive cyber security – ISO/SAE 21434 and UNECE WP.29 – for its Integrity rtos and associated products.

By offering compliant products and associated evidence reports for these standards, the company hopes to build on its pedigree as a run-time software provider to OEMs and tier-one suppliers.

Using these security standards lets manufacturers design and deploy purpose-built, secure, software-defined systems in connected vehicles, including highly automated driving, compute clusters, domain controllers, vehicle gateways, telematics, keyless entry, diagnostic connections and electric vehicle charging stations.

As reliance on vehicle connectivity grows and demand for software-defined services rises, the risk of cyber attacks against connected vehicles increases. They are a target-rich platform for cyber attacks.

As a result, governmental bodies and independent regulators are drafting two related measures for managing cyber-security threats throughout a connected vehicle's lifecycle.

The draft ISO/SAE 21434 vehicle cyber-security engineering standard was recently published and is a baseline for vehicle manufacturers and suppliers to ensure cyber-security risks are managed from a product lifecycle and organisational perspective spanning concept, development, production, operation, maintenance and decommissioning.

The WP.29 regulations from the UN Economic Commission for Europe (UNECE) make OEMs responsible for cyber-security mitigation in four areas spanning the entire vehicle lifecycle: managing cyber risks; securing vehicles by design; detecting and responding to security incidents; and providing safe and secure over-the-air software updates.

While WP.29 defines concrete examples of threats and mitigations, OEMs can choose how they show the threats are addressed, such as complying with ISO/SAE 21434.



Overcome Design Challenges with ISELED-Enabled MCUs

Speak the ISELED Protocol with 8-, 16- and 32-bit MCUs Featuring Core Independent Peripherals

In-vehicle LED lighting can pose complex challenges in manufacturing. Microchip, in partnership with the open ISELED Alliance, is solving these technical barriers by combining a broad portfolio of ISELED-enabled microcontrollers (MCUs) with the ability to implement innovative design block sets.

The next generation of in-car lighting will connect up to 4,079 of the ISELED LEDs via a differential bus at a speed of 2 Mbps and can be controlled by a single, external 8-, 16- or 32-bit MCU. A special protocol, which can be configured via Microchip's MPLAB® Code Configurator, ensures coordination of the individual hardware and software components, guaranteeing optimum integration of the smart LED and the controller. This capability additionally allows for the implementation and mixing of design block sets including a local interconnect network (LIN), a bootloader, capacitive touch sliders and capacitive proximity sensors.

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End of Trump could boost EV sales

Steve Rogerson talks with Chirag Patel of Analog Devices about changes in electric vehicles

The removal of Donald Trump as president of the USA could lead to the country taking a more green route and see an expansion of the use of electric vehicles.

That is the view of Chirag Patel, director of automotive business development at Analog Devices (ADI). He said EV growth was outstripping that of traditional vehicles but that this growth was being led by China and Europe.



Chirag Patel: "Things could change in the USA."

"China has been leading," he said, "but Europe has been making a large push in the last two quarters."

But so far, take up has been slow in the USA.

"Things could change in the USA now that we have had an election," said Patel. "The current administration has been pushing more on internal combustion engine vehicles, but that may now flip."

He said Europe had been a leader in automotive development and that China has been investing as well. But big American players such as General Motors and Ford were also in the game.

However, as well as the Trump administration holding back green developments, the USA also has specific problems, notably range anxiety – average drive distances tend to be longer – and the tendency to go for heavier vehicles.

"Some of our technology allows for long range between charges," said Patel. "The USA tends to go for larger vehicles that are heavier, so the battery has more to carry for a certain amount of charge."

He said Analog Devices was pushing for innovations that could lead to a more sustainable future.

"There is a push for a greener environment," he said. "There is now a move towards electric vehicles."

He said this was across the range from two-wheelers to pick-up trucks and even larger vehicles "not just for moving people but also moving goods".

And he said that ADI's leadership in battery management systems (BMS) was helping this.

"We can make things more flexible for the OEMs by doing it wirelessly," said Patel. "And we have other technologies that help make the world a greener place."

He said BMS growth for EVs was in double digits and could save more than 75 million tons of CO_2 emissions this year.

However, he said a major challenge was disposing of the batteries when they are finished. Sending them to landfill was not a good idea, but that was happening.

"We need a circular economy so we can use the batteries when they are done," he said.

While a battery may no longer be good enough for an electric vehicle, it could find uses in grid storage or solar panels.

Another problem is cobalt.

"Cobalt can come from mines with child enforced labour," said Patel. "This is impacting third-world countries. People are looking to minimise the amount of cobalt or to get rid of it altogether."

Better, he said, was to use Li-ion phosphate.

"Our BMS can adapt to all these, especially Li-ion phosphate," he said. "We can scale from eight to 18 channels, which some of the competition can't do. And we are working with General Motors on wireless BMS."

BMS accuracy, he said, was important as it directly affected the amount of usable energy available. For example, he said a conventional BMS with ±5% error leads to 60% usable energy whereas ADI had devices at ±1% error leading to 68% usable energy.

ADI has also been working to reduce cable weight within the car through its A^2B automotive audio bus and C^2B car camera bus. Coming next year will be the E^2B Ethernet to edge bus.

"We have been showing this under NDA to those who are interested in it," said Patel.



Participants in the China plugfest

Qualcomm partners Chinese companies to push C-V2X

Qualcomm collaborated with more than 100 automotive and technology companies in China to showcase a complete ecosystem with cellular vehicle-to-everything (C-V2X) at the core.

At the recent China 2020 C-V2X Cross-industry & Large-scale Pilot Plugfest, the companies tested and demonstrated performance and reliability of C-V2X in large-scale communications and explored performance of this technology with map and positioning technologies.

Around forty car makers, more than forty terminal manufacturers, ten chipset vendors, twenty information security vendors, five map providers and five position vendors took part in this cross-industry interoperability demonstration and C-V2X large-scale capacity test.

The demonstration across chip modules, terminals, vehicles, security platforms and map providers used digital certificate formats, added high-definition maps and positioning, and deployed continuous scenarios closer to reality and commercially oriented applications.

The serviceability of C-V2X products and systems in deployments at scale was validated in the C-V2X large-scale capacity test based on the interoperability and security mechanism validation already achieved in previous C-V2X interoperability work.

A total of 180 C-V2X onboard and roadside units were used as a test background to emulate complex conditions such as rush hour in urban areas and congested roads.

Most of the tested vehicles were equipped with the Qualcomm 9150 C-V2X chipset. The tests are also featured with the Qualcomm Snapdragon automotive 4G platform, supporting stable connectivity.

VW doubles investment in digital technology

Volkswagen plans to spend around €73bn on electrification, hybrid powertrains and digital technology over the next five years.

Investments in capex and R&D for future technologies will be raised-from 40 to 50 per cent of the group's total investments of around €150bn.

Investments in digitalisation will double to €27bn by mid-decade, reflecting the group's focus on building software capabilities. Approximately €35bn will be spent on battery-electric vehicles. A further €11bn has been earmarked for the development of hybrid versions of existing models.

"The transformation of the group and its brands and the strategic focus on the core areas of mobility will be consistently implemented," said Hans Dieter Pötsch, chair of VW's supervisory board.

Due to the role software will play, capital spending on digitalisation will total around €27bn, double the amount set in the previous planning round. This includes spending on the group's Car.Software organisation, which was launched earlier this year.

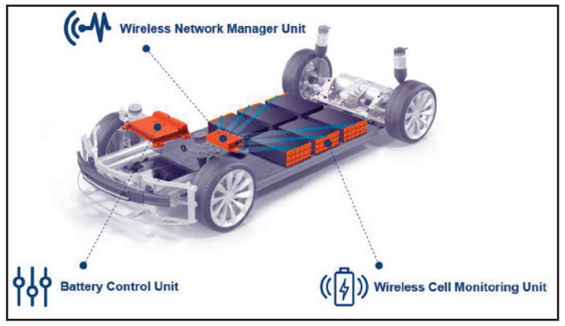
The goal is to build a proprietary software stack, which will be deployed in Audi's Artemis project from 2024. The company's own share in software is to increase from 10 to 60 per cent. In addition, a large share of the funds earmarked for digitalisation will be invested in the mission-critical fields of artificial intelligence, autonomous driving and digitalisation of significant business processes.

"In the coming years, it will be crucial to also reach a leading position in car software in order to meet people's needs for individual, sustainable and fully connected mobility in the future," said Herbert Diess, VW CEO. "To that end, we have doubled our digitalisation spend."



Flying the flag: VW invests in digitalisation

GM to equip EVs with Visteon BMS



Visteon battery management system

General Motors will be the first car maker to equip its electric vehicles (EVs) with a completely wireless battery management system (BMS) from Visteon.

GM will make the system standard on all planned EV models powered by its Ultium batteries. It can monitor battery packs continuously for state of health and charge.

"Our wireless BMS technology eliminates wiring harnesses found in the battery packs of traditional systems, delivering a secure, safe and robust battery system for EVs," said Sachin Lawande, CEO of Visteon.

It was built with GM and other collaborators and provides a platform to deliver high battery cell measurement accuracy for the lifetime of the vehicle, along with increased energy use per cell to improve vehicle range.

Additionally, it can support safe and sustainable zero-cobalt battery chemistries, such as lithium iron phosphate.

The modular product handles multiple charging protocols and can meet OEM cost, weight and packaging requirements.

"Agility is the key to maintaining GM's leadership position in EVs," said Kent Helfrich, executive director at GM. "While we have vertically integrated many crucial EV components, it still makes sense for us to partner with great companies like Visteon to accelerate our vision for battery technology."

GM expects the wireless BMS to drive GM's Ultium-powered EVs to market faster, as time won't be needed to develop specific communications systems or redesign complex wiring schemes for each new vehicle. Instead, the wireless system will help ensure the scalability of Ultium batteries across GM's future line, encompassing different brands and vehicle segments, from heavy-duty lorries to performance vehicles.

Because the integrated hardware architecture and software can extend across multiple vehicle platforms with few module configuration changes, it can reduce engineering costs and be more easily integrated with thermal management systems and other vehicle controls.

"The wireless BMS keeps a constant eye on battery health and operation, helping automakers enhance vehicle and passenger safety and improving overall quality and reliability," said Lawande. "The technology is another milestone in the development of EVs as the industry transitions to cleaner transportation."

The wireless innovation should reduce end-user repair costs since the types of physical harnesses and wires where issues can originate have been eliminated.

Origin and Murata detect kids in vehicles

Origin Wireless is working with Murata to bring wifi sensing technology to automotive OEMs and tier-one suppliers to enable rapid adoption into vehicles by 2023.

This should help car makers meet the Child Presence Detection mandate of Euro NCap to achieve the highest vehicle safety rating.

The partnership combines Origin's Wireless AI wifi sensing software with Murata's wifi connectivity modules to streamline development and deployment into production vehicles.

The Wireless AI software has transformed thousands of standard wifi devices into sensitive virtual motion sensors. The algorithms leverage common wifi signals to detect motion triggered by anyone inside the car, even in scenarios where passengers are small children sleeping in car seats and covered by blankets.

It can detect breathing anywhere in the car without blind spots, while eliminating cameras or wearables.

Infineon SiC supply deal enables automotive push

Infineon hopes to expand its silicon carbide (SiC) offering into automotive following a five-year supply agreement with GT Advanced Technologies.

Under the brand CoolSiC, Infineon already markets the technology for industrial applications and is rapidly expanding its offerings towards consumer and automotive products.

"We are seeing a steadily increasing demand for SiC-based switches, especially for industrial applications," says Peter Wawer, president of Infineon's industrial power control division. "However, the automotive sector is quickly following suit. With this supply agreement, we ensure that we will be able to meet the rapidly growing demand of our customers with a diversified supplier base."

He said GT's SiC boules should provide an extra source for competitive SiC wafers fulfilling material standards now and in the future.

"This supports our ambitious SiC growth plans, making good use of our existing in-house technologies and core competencies in thin-wafer manufacturing," he said.

SiC has mainly been used up to now in photovoltaic inverters, industrial power supplies and the charging infrastructure for electric vehicles. This is where the advantages of SiC at the system level, compared with classical silicon, have already come into play.

Other industrial applications such as uninterruptible power supplies and variable-speed drives are increasingly making use of the semiconductor technology. In addition, electric vehicles show potential for application options, including the main inverters for the drive train and onboard battery charging units.

"GT will enable Infineon to achieve a secure high-quality internal SiC wafer supply by applying their proprietary thin-wafer technology to GT's crystal," said Greg Knight, CEO of GT Advanced Technologies. "The growth of SiC device adoption is tied largely to the aggressive cost down of the substrate, and this agreement is significant towards achieving that goal."

Access Android BML opens Japanese market

Access has enhanced its NetFront Browser BML Edition for cars to extend support from embedded operating systems such as Linux and QNX to Android.

Broadcast Markup Language (BML) is needed for delivering interactive and TV services to the car in Japan.


Neale Foster: "We remove headaches."

"The in-car entertainment market is full of potential for OEMs who are keen to uncover new after-sales revenues in data-powered services," said Neale Foster, CEO of Access in Europe. "We remove the headaches for OEMs to build those all-important customer relationships in one of the biggest automotive markets in the world today."

TV services for automotive in Japan are provided by terrestrial or antenna TV-based ISDB-T. This standard, which requires a BML browser for display, is also present in a number of South American countries and the Philippines. It facilitates the delivery of services containing news, sports, weather forecasts or emergency warnings such as early warning for earthquakes.

The browser supports the Arib standards. By making it available for Android, Access lets OEMs support BML in legacy and new head units for the Japanese market.

An accompanying conformance test suite, which is available from the Association for Promotion of Advanced Broadcasting Services, is entirely in Japanese and consists of almost 6000 test cases, many of which need to be completed manually. Access' experience of executing these tests means OEMs can be confident their vehicles will provide access to the services expected by Japanese consumers.

"Having a knowledgeable partner, with a proven BML, that is experienced in the automotive industry and the Japanese broadcast world removes a big headache for car manufacturers exporting to Japan," said Foster.

Vicor and Delta pioneer boost for touring car race

Vicor is collaborating with Delta Motorsport to pioneer a 48V lithium-ion-based battery pack and electronics for a tactical boost in the world's first hybrid touring car championship.

The British Touring Car Championship (BTCC) has been a tradition since 1958 and sees more than 30 highly engineered road cars battling to win. In 2022, the championship will become the world's first major touring car championship to feature mild-hybrid vehicles.

The BTCC has specified that an electric motor can be used tactically by drivers to boost the internal combustion engine performance and enhance vehicle acceleration.

This contract was awarded to Cosworth Electronics, which subcontracted the endeavour to Delta Motorsport. Due to its multidisciplinary engineering reputation and expertise in electronics, Delta Motorsport agreed to design a battery pack and associated electronics for the tactical boost.

The 48V lithium-ion-based battery pack has an intelligent power management and high-power-density DC-DC converter



Vicor and Delta boost hybrid touring car

and regulation system. The pack powers the inverter-motor combination and accepts regenerated power from it, while the high-power-density converter powers all the car's electrical circuits and devices.

The power density and power management achieved by this architecture allowed the alternator system to be removed, improving weight, performance and reliability.

The DC-DC converter power system uses four Vicor DCM3623 isolated, regulated DC-DC converter power modules to deliver a regulated 13.8V output from the battery pack with current levels up to 92A, approximately 1.2kW of power. Due to their low profile and small footprint, they are mounted in direct thermal contact with the micro-bore cooling plates that extend between the battery cells.

The load is shared by the four converters, although it can be fully supported by just three for redundancy purposes.

The hybrid's three-phase brushless motor connects to the battery through a bidirectional inverter that routes battery power to the motor and regenerated power from the motor to the battery.

The motor drives the vehicle in pure-EV mode during its initial, speed-limited journey down the pit lane, then in mild-hybrid mode when the driver demands a performance boost during the race.

The battery pack includes a battery management system that controls all the cell voltages and ensures the battery handles the maximum possible charge and discharge voltages at all times while communicating with the motor-inverter controller. It continuously calculates and updates the controller on how much current the battery can supply or accept, based on its state of charge.

The system monitors the temperatures of all available cells in real time and feeds the results into the power calculations. Additionally, it can open contactors to isolate the battery pack safely if a problem arises.

The battery management system supports data logging and diagnostics to log the DC-DC converter's performance. This checks fault status and provides feedback on the amount of current being delivered on all vehicles.

Delta also used a Vicor PI3105, a small 60W isolated converter for an uninterruptable power supply, which supplies power to the battery pack electronics to maintain the safety systems when isolated from the vehicle power supply. This allows the electronics to be powered independently of the vehicle, enabling remote connection for systems checks.

Dana acquires stake in Pi Innovo

Dana has acquired a non-controlling stake in Pi Innovo, a specialist in embedded software and electronics control units for the light vehicle, commercial vehicle and off-highway markets.

The investment should help Dana enhance its in-house electric-vehicle capabilities by providing turnkey software for its technologies.

"Software and controls are essential in the functionality of increasingly complex e-powertrain architectures, playing a critical role in maximising efficiency and managing the systems used throughout the vehicle," said James Kamsickas, Dana CEO. "Pi Innovo's exceptional team of engineers leverage more than 25 years of experience to meet the growing demand for automotive embedded controls in the e-mobility market and beyond."

When combined with Dana's complete systems capabilities for e-propulsion, the companies should be able to enhance the flexibility, robustness and efficiency of entire vehicles, while meeting the latest functional safety requirements.

"Pi Innovo has developed advanced software and controls and production ECUs to enable the efficiency and safety of electric vehicles," said Walter Lucking, CEO of Pi Innovo. "Dana's capabilities across the entire mobility spectrum will give Pi Innovo further access to a growing customer base."

Headquartered near Detroit, Pi Innovo has a track record for delivering modular software and controls for a wide variety of applications, including electric and hybrid vehicles, while adhering to functional safety requirements.

In 2019, Dana reported sales of $8.6bn with 36,000 associates in 34 countries across six continents. Founded in 1904, it is based in Ohio.

Pi Innovo designs and develops electronic systems and control software for the automotive, transportation, military, industrial and aviation industries. Its engineering teams can develop vehicle electronic systems from concept to production and have applied this capability in recent years to vehicle electrification.

Open ECU is Pi Innovo's range of adaptable, modular, reusable field-ready products that are implemented to volume production standards, and are open to custom configuration, adaptation and further development. The family includes ECUs, prototyping accessories, electronic circuit libraries, platform base software, model-based control strategies and application software.

- Dana is to purchase a portion of the thermal-management business of Modine Manufacturing's automotive segment. The transaction strengthens Dana's power technologies business. The agreed purchase price is $1 with the assumption of certain financial liabilities.

Phiar lets Panasonic expand navigation

Phiar, a developer of edge spatial-AI technology and augmented reality navigation, is helping Panasonic expand driver safety and navigation support.

Phiar's deep learning AI runs on automotive infotainment systems, detects and analyses the driver's surroundings in real time, and combines it with 3D localisation to provide augmented guidance and safety information.

Phiar uses map and navigation data from map platforms to offer live visual navigation with traffic and other data.

"Panasonic looks for products that have the flexibility to integrate multiple technologies depending on our OEM customer requirements, and we liked that Phiar can work with any map or routing," said Andrew Poliak, Panasonic CTO . "Phiar's technology provides the glue that links Panasonic's key technologies to deliver object and pedestrian detection, scene understanding and AI-driven AR navigation, a perfect fit for OEMs looking to make advances in the in-vehicle user experience."



Panasonic and Phiar augmented navigation

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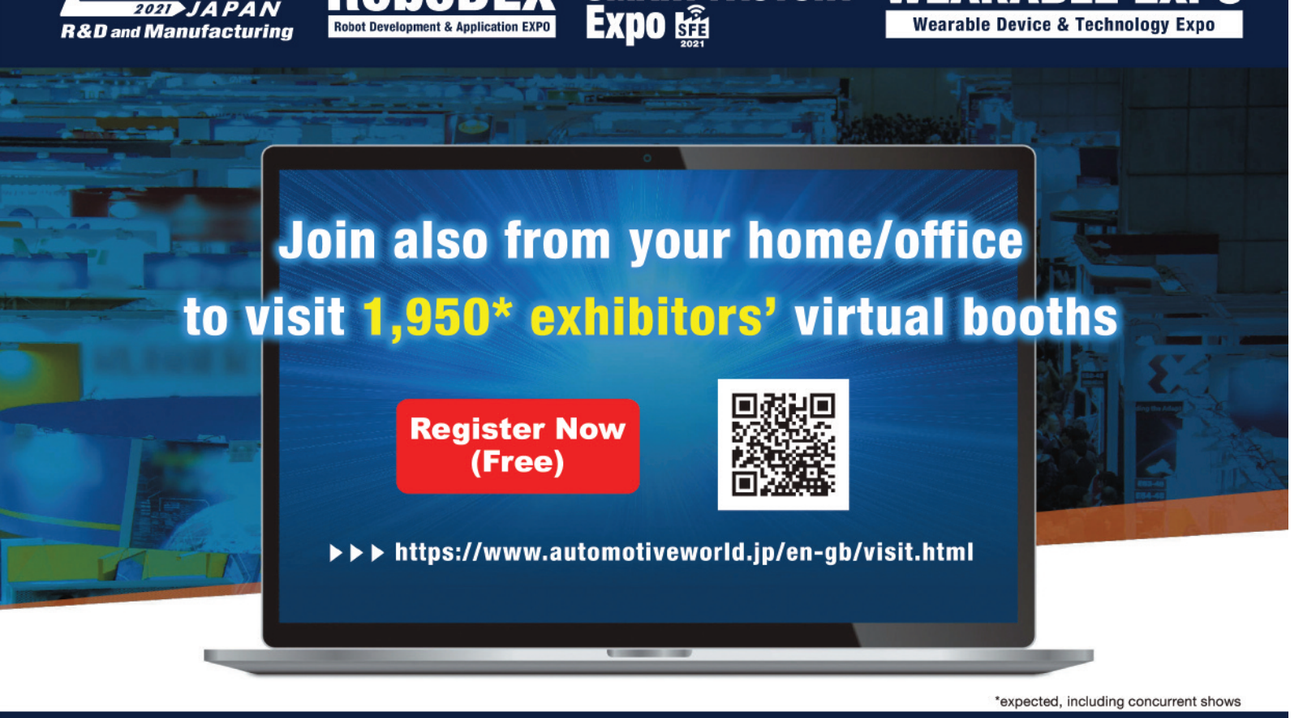
Concurrent Shows

NEPCON JAPAN 2021 R&D and Manufacturing

RoboDEX Robot Development & Application EXPO

SMART FACTORY Expo SFE 2021

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NXP partners AWS, GuardKnox and Green Hills

NXP is working with Amazon Web Services (AWS) to extend the opportunities of connected vehicles.

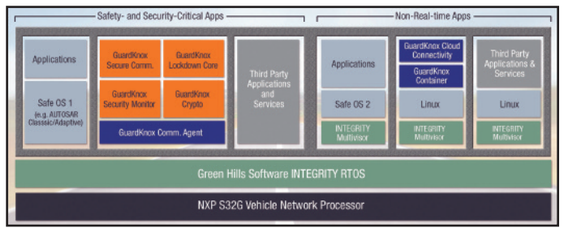
The electronics company is also working with automotive cyber-tech supplier GuardKnox and Green Hills Software to develop a secure automotive platform targeting zonal E/E architecture, enabling commercial deployment for software-defined and service-oriented vehicles.

The goal is to overcome technological problems such as integrating the hardware and software.

The unified platform targets zonal vehicle architectures that consolidate services traditionally performed by multiple, dedicated functional domain platforms. This will simplify wiring harnesses and enable enhancements through software over-the-air updates.

"NXP's collaboration with GuardKnox and Green Hills addresses key challenges of the automotive industry's dramatic shift from horsepower to compute power to drive future software-centric vehicles," said Brian Carlson, marketing director at NXP.

Based on NXP's S32G vehicle network processor and the Green Hills Integrity separation kernel and secure hypervisor, GuardKnox will expand its offerings for automotive ECU connectivity. This will retain GuardKnox's mixed-criticality features of service-oriented architecture.



GuardKnox vehicle server reference design

The platform suits vehicle services such as in-vehicle app stores, vehicle personalisation, immersive infotainment and adas. It can also serve as a domain controller.

"New architectures and robust networking are essential for the next generation of vehicles to function safely, securely and with greater speeds," said Chris Tubbs, director of Emea business development at Green Hills.

NXP's partnership with AWS aims to deliver secure, edge-to-cloud compute so cloud-powered services can benefit car makers, their business partners and consumers.

This will integrate AWS edge and cloud services with the S32G for service-oriented gateways.

Project aims to cut energy use through V2X

BorgWarner is partnering with Michigan Technological University (MTU) and four other industry organisations on a project aimed at reducing energy consumption through the expansion of meshed vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications.

Using a combination of simulated, closed-track and real-world fleet testing, the project will involve multiple vehicle types from light- to heavy-duty powered by different propulsion systems with varied levels of connectivity and driving automation.

The aim is to develop, assess and demonstrate energy optimisation opportunities through connected intersections, arterial corridors and highways.

The 27-month project was awarded $2m in funding by the US Department of Energy. It is one of 55 projects that was recently awarded federal funding as part of a strategy to boost the USA's position in energy storage technology.

"We have collaborated successfully with Michigan Tech in various capacities throughout the years and believe this joint effort will have a significant impact on energy optimisation in the future," said Frédéric Lissalde, CEO of BorgWarner.

BorgWarner plans to work on propulsion system modelling for vehicles and development of the control system architecture to support analysis work for energy reduction.

While much of the project will be done remotely, BorgWarner expects to assist with vehicle testing and demonstrations at the American Center for Mobility in Ypsilanti, Michigan.

"Being able to leverage BorgWarner's propulsion know-how is critical to the success of this project," said Darrell Robinette, assistant professor at MTU.

Traffic Technology Services, American Center for Mobility, AVL Powertrain Engineering and Navistar will also participate in the project.

DESIGN & DEVELOPMENT

CUTTING COMPLEXITY



Steve Rogerson talks with Michael Ziganek from Mentor about helping car makers with the design of cockpits and infotainment

Cars are becoming more complex. And while the large manufacturers have the resources to deal with that, it becomes increasingly difficult for smaller OEMs to deliver the sophisticated systems car buyers these days expect.

This is not more clear than with the interface the driver has with the car – the instrument cluster and infotainment system. Here, drivers expect the type of functionality they have become used to on mobile phones, yet in a car these systems have to meet far more stringent cyber-security and functional safety requirements. Nobody gets killed when an app on a phone crashes.

"Some smaller OEMs and commercial vehicle makers rely on their mother companies for starting points, and even then it is costly to go to market," said Michael Ziganek, general manager of Siemens-subsidiary Mentor's automotive business unit.

This is why the company has introduced VCO2S to help automotive OEMs and their suppliers design and develop cockpits on a single high compute ECU. The goal is to help engineering systems reduce cost and speed time to market while still giving drivers the user experience they desire. And this needs to be done without compromising safety and security.

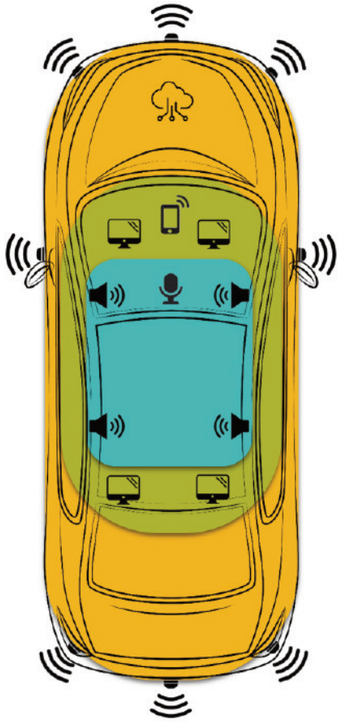
The software, systems and hardware service looks to help car makers integrate instrument cluster and in-vehicle-infotainment (IVI) on the same ECU to save space and cost. The fusion of instrument cluster and IVI functionalities running separate operating systems within one ECU eliminates latencies associated with data sharing between distributed ECUs, while supporting multiple safety domain levels (Asil and QM) and offering features such as graphics, video and audio sharing.

"Automotive engineers often deploy instrument cluster and IVI systems on separate ECUs to isolate domains and boost functional safety," said Ziganek. "Moreover, in traditional supply chains, teams often focus on distinct feature sets with minimal interaction between groups. Today, engineering teams can seamlessly collaborate in real time across the globe. Meanwhile, the rich features and extreme performance of today's highly integrated systems-on-chip support multiple safety integrity level domains on the same device. As a result, integrating instrument cluster and IVI systems on the same ECU is not only possible, but in fact a critical architectural advantage as engineering teams consolidate more systems into fewer on-board ECUs."

But not all car makers have the same needs and come with different levels of experience and expertise. For this reason, Mentor has created VCO2S in three versions – Base, Flex and Unique.

Base delivers basic features including software IP and services for a consolidated cockpit design. It is delivered as a reference design that can be ported to the user's target hardware,

"We are looking at an entry segment where we can accelerate



Vehicles become more complex

to market with something off the shelf," said Ziganek. "We can reduce the time to market to 12 months compared with 36 months without this. This is available right now and is the starting point of our offering."

Flex, as its name suggests, is more flexible, delivering up to a fully customised cockpit consolidation system with IP, systems, software and hardware engineering services, all optimised to run on the target hardware.

"The next step is the Flex offering, where we can take the Base and add some features the customer wants," said Ziganek. "We can provide exactly what they are looking for including some services for hardware development."

And that brings us to Unique, which extends the Flex offering with technical management and integration services between SoC vendors and tier-one hardware suppliers, with Mentor serving as a tier-one software supplier. This is intended for automotive OEMs.

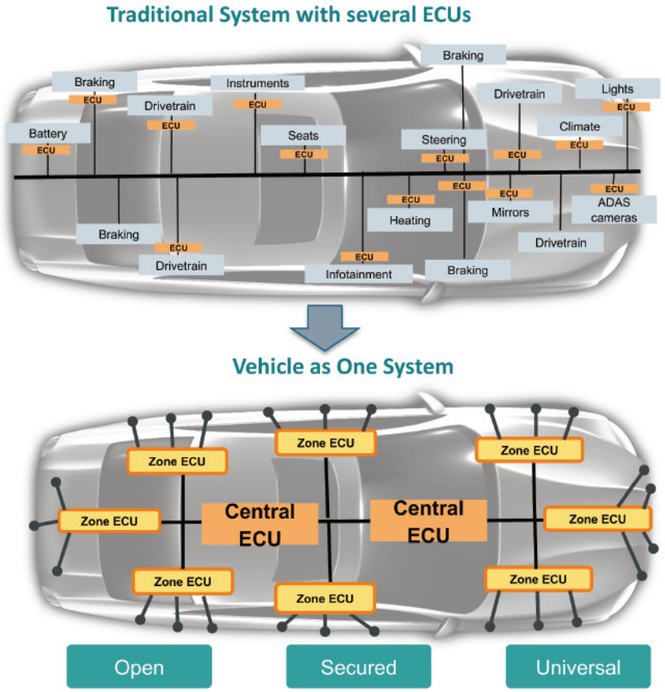
"OEMs want to be more independent of their suppliers," said Ziganek. "They want to be in charge. We take over the role of the software tier one and work directly with the OEM. This lets the OEM have more control."

All three versions include Asil-B safety libraries, safety features and architectures for shared graphics, as well as video and audio between Asil and QM domains. All versions also incorporate Can and Ethernet connectivity to the vehicle, as well as support for Bluetooth, wifi, FM and dab radio, four cameras, and automotive audio.

QM to Asil-B domain communication is implemented by Mentor's communications framework including safety certification processes. Additional features can be added to the Flex and Unique options on request.

Looking to the future, Mentor is planning Base and Flex versions for VCO3S, which adds compute to cockpit consolidation. This is in response to a change in vehicle architecture.

"You can have 50 to 60 ECUs in a car all talking to each other," said Ziganek. "That is why Autosar came in. But a more platform approach will be needed for levels three and higher. A central ECU can link different



A central ECU can link different domains



Michael Ziganek: "OEMs will have to put a lot of effort into changing the way they are working."

domains in a more centralised approach. We will see this type of approach in the next three to five years. OEMs will have to put a lot of effort into changing the way they are working."

Because of latency requirements, especially with the move to more adas functions and automated driving, some compute functionality will still be needed at the edge.

"You will need a clever consolidation of edge computing, pre-processing and central computing," said Ziganek. "You need reactive edge computing. This should not be a problem if you do a proper design."

But the complexity is going up with different domains, different requirements and different Asils.

"These all need to go hand in hand," he said.

This is being made more difficult because of a lack of the standardisation that has been seen in all other industries. Part of the problem is that every car maker wants to do something different.

"In mobile, you have Android and iOs, but there is no functional safety needed there," he said. "With automotive, you need to make sure no lives are endangered. We are seeing some use of Android, but not in functional safety areas."

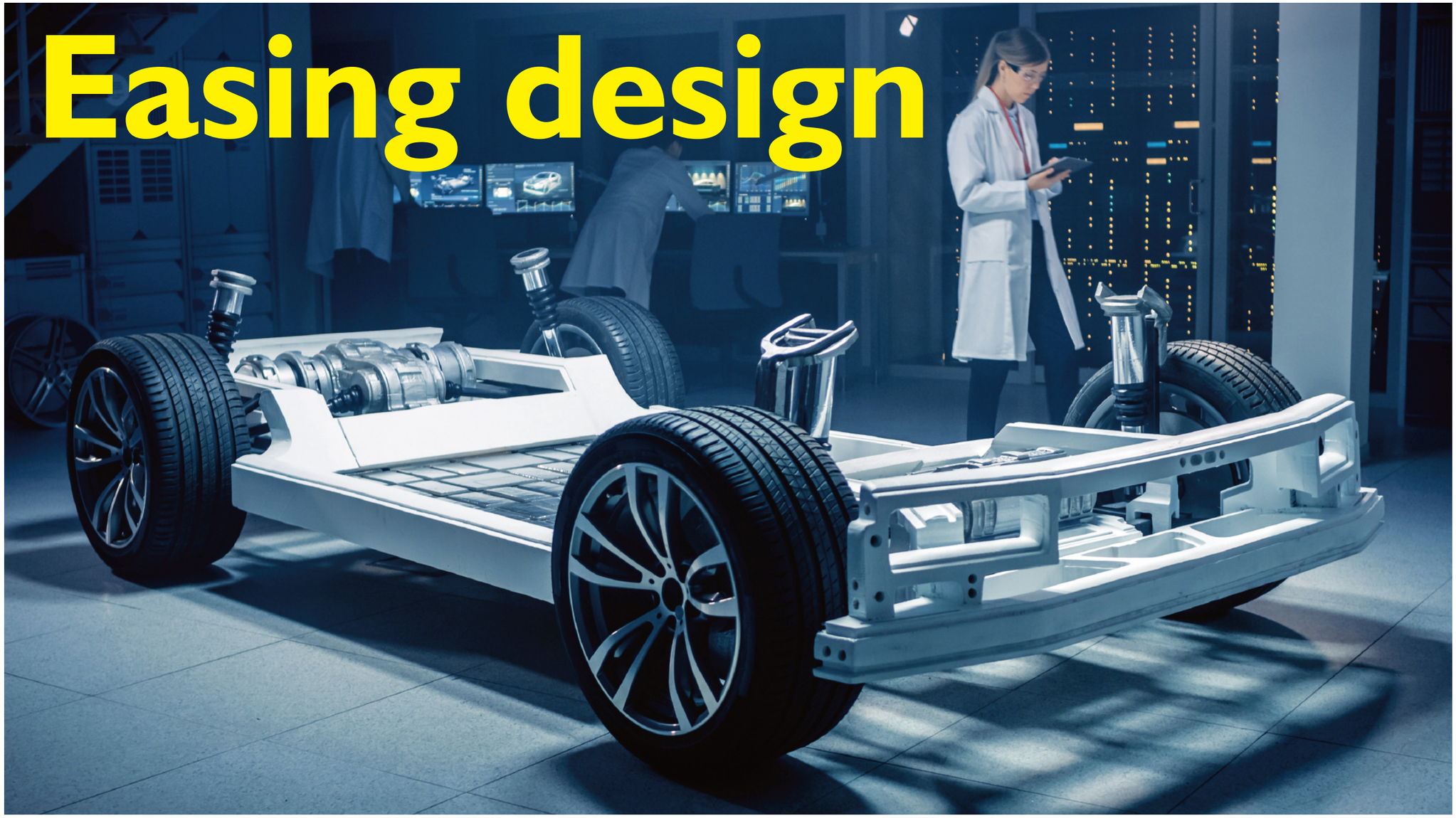
He said the industry was still far away from full autonomy and thus is concentrating on improving what is happening at level three.

"The target to go to full autonomy is a little too high with the costs associated with that," he said. "So, they have pulled back a bit and there is more collaboration going on."

He said full standardisation would always be difficult to achieve as companies were looking for perfect platforms.

"We will only succeed if there is collaboration and we agree on certain standards," he said. "Otherwise there will be isolation and we will still have problems."

Easing design



Tony Armstrong explains how an IC can ease the design of 48V/12V dual battery automotive systems

The future of 48V/12V battery systems in automobiles is just around the corner. Most of the major automobile manufacturers across the globe have been working on proving out their systems for the past few years and it is evident that their implementation will be relatively near term.

This is a necessary and crucial step in the long and arduous journey to the fully autonomous passenger vehicle that does not require a human at the controls and has true autonomous driving. Nevertheless, this doesn't mean the 12V battery is going away; there are far too many legacy systems in the installed vehicle base for this to occur. Autonomous cars will have both a 12V and a 48V battery.

Vehicles' internal systems will either run off the 48V lithium-ion (Li-ion) battery or the 12V sealed lead-acid (SLA) battery, but not both.

Nevertheless, in addition to having two separate charging circuits for these individual batteries due to their respective chemistries, there must also be a mechanism that allows charge to move between them without causing any damage to the batteries or any of the systems within the vehicle. Moreover, having two batteries also allows for redundancy should one of them fail during operation.

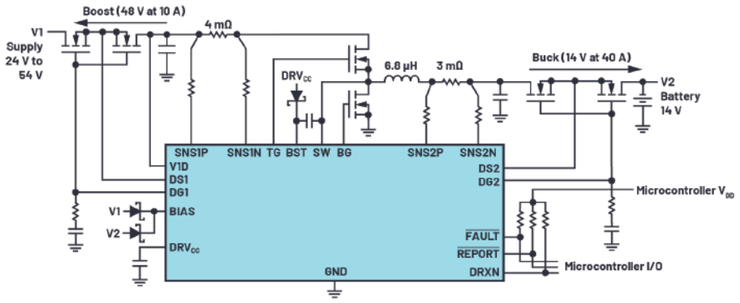
While this certainly complicates the design of the various electrical subsystems within the vehicles, there are some advantages to be gained. According to some auto manufacturers, a 48V-based electric system results in a 10% to 15% gain in fuel economy for internal combustion engine vehicles, thereby reducing CO_2 emissions. Moreover, future vehicles that use a dual 48V/12V system will let engineers integrate electrical booster technology that operates independently of the engine load, thereby improving acceleration performance.

Such compressors are already in the advanced stages of development and will be placed between the induction system and the intercooler, using the 48V rail to spin-up the turbos.

Globally, fuel economy regulations have been tightening, while autonomous driving capability with connectivity continues to proliferate in new automobiles. Accordingly, the 12V automobile electric system has reached its usable power limit. Simultaneously, as if these changes are not already enough, there has been a significant increase in automotive electronic systems. These changes, coupled with related demands for power, have created a new spectrum of engineering opportunities.

Clearly, the 12V lead-acid battery automotive system with its 3kW power limit must be supplemented.

Furthermore, there are new automobile standards that impact how these systems need to work. A newly proposed automotive standard, known as LV148, combines a secondary 48V bus with the existing automotive 12V system. The 48V rail includes an integrated starter generator (ISG)



Bidirectional DC-DC controller configured in a simplified, bidirectional battery backup system

or belt start generator, a 48V Li-ion battery, and a bidirectional DC-DC converter, which can deliver tens of kilowatts of available energy from the 48 and 12V batteries.

This technology is targeted at conventional, internal combustion automobiles, as well as hybrid electric and mild hybrid vehicles, as auto manufacturers strive to meet increasingly stringent CO_2 emission targets.

DC-DC

This standard requires the 12V bus to power continuously the ignition, lighting, infotainment and audio systems, whereas, the 48V bus will power active chassis systems, air conditioning compressors, adjustable suspensions, electric superchargers, turbos and even regenerative braking.

The implementation of an additional 48V supply network into vehicles is not without significant impact. ECUs will be affected and will need to adjust their operational range to the higher voltage. This will necessitate that manufacturers of DC-DC converters will also need to introduce specialised ICs to enable this high power transfer.

There are a few DC-DC converters that can enable this energy transfer with very high efficiency to conserve energy while simultaneously reducing the thermal design aspects.

The need for a bidirectional step-down and step-up DC-DC converter that goes between the 12 and 48V batteries is clearly required. Such converters could be used to charge either of the batteries while simultaneously allowing both batteries to supply current to the same load if required in the system.



The bidirectional feature allows the battery to be charged from either a higher or lower voltage supply

From a legacy perspective, these initial 48V/12V, dual battery, DC-DC converter designs used different power components to step-up and step-down the voltage.

However, a bidirectional DC-DC controller can use the same external power components for step-up conversion as it does for step-down conversion.

The device shown in the diagram is a 100V bidirectional constant-current or constant-voltage synchronous buck or boost controller with independent compensation networks. The direction of the power flow is automatically determined by the device or is externally controlled. The input and output protection mosfets protect against negative voltages, control inrush currents, and provide isolation between terminals under fault conditions such as switching mosfet shorts.

In step-down mode, the protection mosfets at the V1 terminal prevents reverse current.



Next-generation cars will be powered by a 12V and a 48V battery

In step-up mode, the same mosfets regulate the output inrush current and protect themselves with an adjustable timer circuit breaker. Furthermore, the device has a bidirectional input and output current limit as well as independent current monitoring.

Masterless, fault-tolerant current sharing lets any such device in parallel be added or subtracted while maintaining current sharing accuracy. Internal and external fault diagnostics and reporting are available via the fault and report pins.

The controller provides a step-down output voltage, V2, from an input voltage, V1, when in buck mode or a step-up output voltage, V1, from an input voltage, V2, when in boost mode. The input and output voltage can be set as high as 100V. The mode of operation is externally controlled through the DRXN pin or automatically selected. In addition, it has protection mosfets for the V1 and V2 terminals.

The protection mosfets provide negative voltage protection, isolation between the input and output terminals during an internal or external fault, reverse current protection, and inrush current control. In applications such as battery backup systems, the bidirectional feature allows the battery to be charged from either a higher or lower voltage supply. When the supply is unavailable, the battery boosts or bucks power back to the supply.

To optimise transient response, there are two error amplifiers: EA1 in boost mode and EA2 in buck mode with separate compensation pins VC1 and VC2, respectively.

The controller operates in discontinuous conduction mode when reverse inductor current is detected for conditions such as light load operation.

The device provides input and output current limit programming in buck and boost mode operation using four pins: ISET1P, ISET1N, ISET2P and ISET2N. The controller also provides independent input and output current monitoring using the IMON1 and IMON2 pins. Current limit programming and monitoring is functional for the entire input and output voltage range of 0 to 100 V.

Furthermore, masterless, fault-tolerant output current sharing



The 12V battery is not going away

among multiple devices in parallel enables higher load current, better heat management and redundancy. Each device regulates to the average output current eliminating the need for a master controller.

When an individual device is disabled or in a fault condition, it stops contributing to the average bus, making the current-sharing scheme fault tolerant.

Conclusion

A bidirectional DC-DC controller can bring a new level of performance, control and simplification to 48V/12V, dual battery, DC-DC automotive systems by allowing the same external power components to be used for step-down and step-up purposes.

It operates on demand in buck mode from the 48V bus to the 12V bus or in boost mode from 12 to 48V.

When starting the car or when additional power is required, it allows both batteries to supply energy simultaneously to the same load. This gives power conversion designers a bidirectional converter that can easily configure 12 and 48V battery systems, which will be required for the fully autonomous vehicles of the near future.

Tony Armstrong is the product marketing director for Analog Devices' Power by Linear group



TIME FOR A CHAT

Nottingham University researchers study driver behaviour for level-three automated driving

Researchers at the UK's University of Nottingham and the RAC Foundation have found that behavioural training for drivers is paramount for the transition into level-three automated vehicles.

Researchers from the university's Human Factors Research Group studied two groups of experienced drivers in a high-fidelity driving simulator to observe their behaviour while driving a car with level-three automation.

The study found drivers who received behavioural training were more measured in their behaviour and better understood the car's capabilities and limitations.

The behavioural training included the provision of a checklist known as chat (for





Overview of the chat procedure

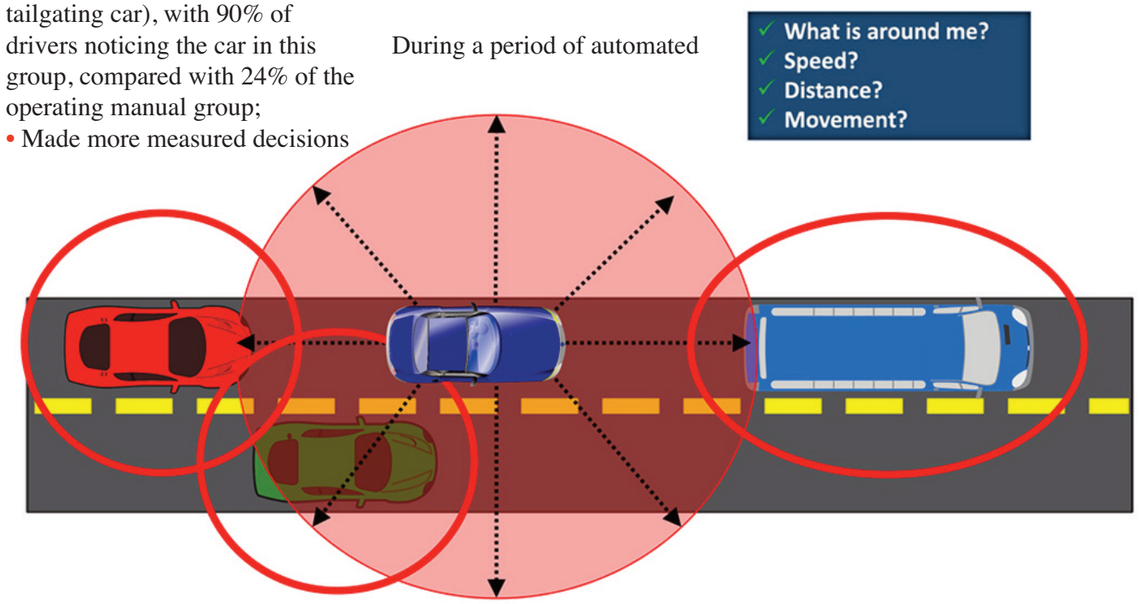
CHeck, Assess, Takeover), pioneered by Emily Shaw in the university's Faculty of Engineering. The other group trained by reading an operating manual.

Key findings found in the behavioural training group were:

- Significantly more likely to notice a potential hazard during the transition from automated to manual driving (in this case, a tailgating car), with 90% of drivers noticing the car in this group, compared with 24% of the operating manual group;
- Made more measured decisions in lane change manoeuvre shortly after taking back manual control;
- Spent more time preparing (acquiring knowledge of the road environment through mirror checks) before physically making the lane change;
- Made more mirror checks in the run up to and during the lane change manoeuvre; and
- Checked their mirrors more frequently, even while the car was driving autonomously.

During a period of automated driving, participants in both groups could decide whether to engage in a non-driving task, such as looking at their phone, tablet, laptop or reading materials, or nothing at all. When notified by the vehicle to take back control and transition from automated driving, the group who were trained with only an operating manual took almost ten times longer to pay full attention to driving, continuing glances at their non-driving task for an average of 11.2 seconds, compared with 1.8 seconds in the behavioural group.

The behavioural group was also markedly faster at making their first glance at the road when notified to take over – on average 7.3 seconds compared with 21 seconds in the other group.



The driver's tasks when resuming control

Transforming role

"This research demonstrates that the complex and changing nature of the role of the driver in an increasingly automated car should not be underestimated," said Shaw. "It's clear that behavioural training has a positive effect on the driver's behaviour and their understanding of the car's capabilities."

The chat training procedure can be used to help drivers understand their shared role and responsibilities with automated vehicle technology, so they develop the right state of mind for interacting with these vehicles.

"The chat procedure's unique messaging is designed to support and motivate drivers to rapidly recall the checks and assessments they need to undertake before making a controlled transition from automated to manual control," said Shaw.

David Large, senior research fellow with the Human Factors Research Group, added: "While future vehicles will deliver more automation than ever before, these vehicles are likely to remain visually the same as the current cars we are used to, and therefore may not present an obvious step-change in development. Drivers, as well as those responsible for delivering driver training — and, indeed, those who manufacture and sell these vehicles — may therefore be forgiven for assuming that no new skills are required to use them."

However, he said the research clearly showed there was a lot of work to be done around preparing drivers for this next stage of automation.

"Without this, drivers are more likely to form inaccurate or inappropriate mental models of automation capability and competence, which can lead to misuse or incorrect use of driving automation," he said.



Emily Shaw: "Behavioural training has a positive effect on the driver's behaviour."

The research was funded by the RAC Foundation and led by researcher Shaw, working with Large and Gary Burnett, a professor in the Human Factors Research Group's Faculty of Engineering.

"Many of us have been uncomfortable with the very concept of a partially automated car suddenly seeking to thrust control on a human driver whose mind, understandably, will have been on other things," said Steve Gooding, director of the RAC Foundation. "The good news in this report is that there are ways drivers can be trained to handle the take-over safely. The challenge is going to be in making that training happen. The risk is that we leave it up to drivers to read their new car user manuals and when was the last time you met someone who'd done that?"

Shaw developed the chat driver behaviour training as a proof of concept to test during the study, designed as a standardised operating procedure, to motivate and support drivers in remembering and applying explanatory knowledge acquired about level-three automated vehicles.

"To date, driver training for automated vehicles is no different to that provided for manual vehicles," said Shaw. "The



David Large: “Drivers need to learn how to interact with these vehicles safely.”

assumption being that prior manual vehicle training and experience, alongside instruction from the dealer and/or the vehicle’s operating manual, is more than sufficient. However, the introduction of intermediate levels of automation into vehicles means that the driving task is shared between the driver and system, fundamentally changing the role of the driver.”



Driving simulator at the University of Nottingham

The letters in chat represent the actions required and help to guide the driver in making the appropriate checks and assessment of their internal and external environments prior to taking over operational control of the vehicle.

“The use of chat provides a way of standardising this procedure, similar to ‘mirror, signal, manoeuvre’, which drivers are already accustomed to as a result of driving lessons,” said Shaw. “We chose the acronym carefully to ensure the procedure was easy to remember, as well as the semantic association with the word chat, giving a purposeful nod to the necessary communication that needs to take place whenever control is being passed between members of a team, as a further reminder of the shared control drivers have with the automated systems.”

Limitations

Cars on the road at present are equipped with levels one and two of vehicle automation, meaning several simultaneous activities that assist steering or acceleration are partially automated. This includes lane centring, adaptive cruise control, blind spot warning and automatic emergency braking.

At level three, automation capability extends to the monitoring task, allowing drivers to switch their attention towards non-driving related tasks. However, the human driver remains responsible for the vehicle’s actions and must be ready to intervene in the event of a system failure or where the boundary of the automated system’s operational design has been reached.

Planned takeovers – when a vehicle issues a takeover request to the driver because the boundaries of automated driving capability have been reached – will become a normal part of the driving task with level-three vehicles.

“In a takeover scenario, drivers need to be aware that having their eyes on the road and their hands on the wheel is not enough, their minds need to be back on the driving task,” said Shaw. “If and when a driver is issued with a planned takeover request, they need to be making observations in order to orient themselves, making those checks and assessments, so they can start engaging their mind on the driving task, making decisions on what actions they may need to take, over and above controlling the steering and speed of the car, before they take back manual control.”

Large added: “The upshift in automation capability at level three introduces a new task to driving where the driver will be required to transition in and out of the driving control loop. This brings additional challenges where driver attention is divided between the non-driving related tasks, such as using a mobile phone, and the driving task, which can lead to missed information and error when it comes to switching from automated driving mode back to the driver being in manual control. Drivers, therefore, need to learn how to interact with these vehicles safely and effectively to be able to smoothly transition in and out of the loop of the driving task.”

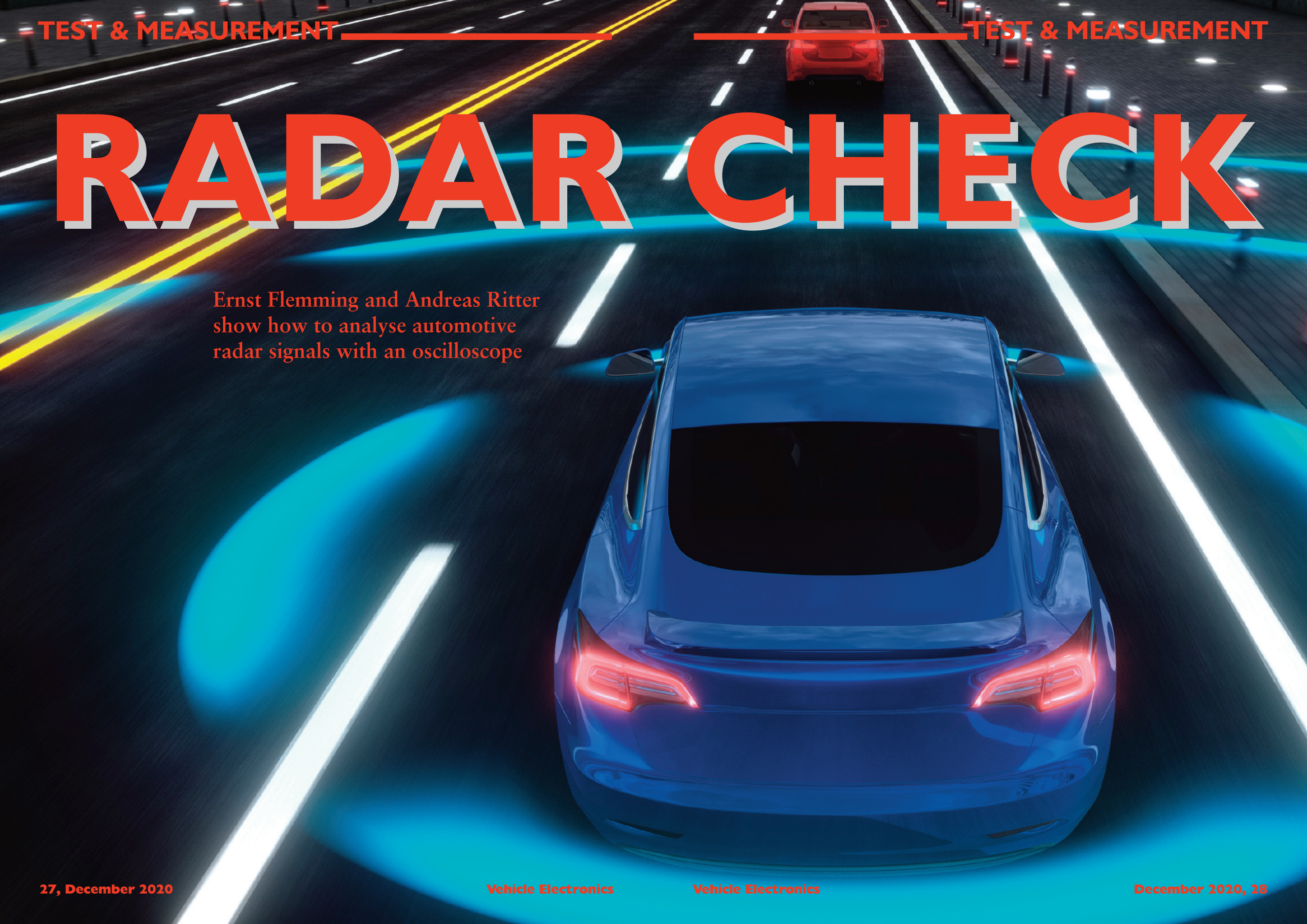


Split screen video recordings showing participants doing non-driving related tasks during automation (top) and following request to resume manual control (bottom)

TEST & MEASUREMENT

RADAR CHECK

Ernst Flemming and Andreas Ritter
show how to analyse automotive radar signals with an oscilloscope



Vehicle Electronics

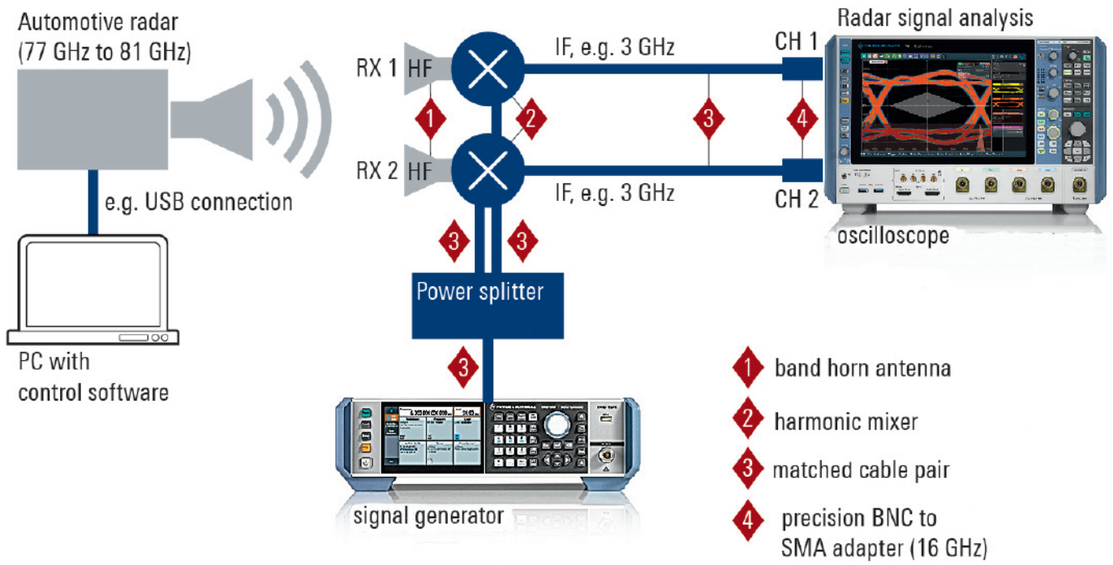


Fig. 1: Test setup for multichannel radar analysis with an oscilloscope. The radar signal is down converted to an IF frequency of 3GHz by the harmonic mixers and fed to the oscilloscope. The power splitter and one mixer are not needed for a test setup with only one channel.

Automotive radar sensors require detailed characterisation in the lab. Oscilloscopes are ideal for this because they can simultaneously analyse multiple signals and precisely compare them.

Compact radar sensors with long range and high resolution are being developed for driver assistance systems and future fully autonomous vehicles. Operating in the frequency range 76 to 81GHz, these sensors use phased array antennas to obtain location information. The accuracy of the obtained data is directly correlated to the accuracy of the relative phase angles of the emitted signals, making precise adjustment of the antenna system a crucial factor for precision.

Characterisation of these sensors in the development phase requires sophisticated test and measurement equipment due to the high frequencies. For many of these measurements, a spectrum analyser with a large measurement dynamic range and sophisticated analysis features is excellent, but some such instruments have only one input channel and are thus not able to measure the phase differences of multiple signals.

Oscilloscopes have an advantage here. A four-channel oscilloscope can act as a phase coherent receiver and simultaneously analyse and compare up to four signals.

Test setup

External mixers can be used to down convert the radar signals to the oscilloscope's frequency range (Fig. 1). The mixers in this example use the sixth harmonic of a local oscillator (LO) to generate the desired output frequency. A generator serves as the LO, while the evaluation board of a commercial radar sensor acts as the radar signal source.

The radar uses a chirp sequence signal consisting of several high frequency pulses in direct succession. Each of these pulses is a chirp with a bandwidth of approximately 4GHz. The sensor is configured so the frequency of the radar signal rises linearly from 77 to nearly 81GHz (up chirp).

The end of the sequence is followed by a break of several milliseconds (interframe time). During this time, the radar processor calculates the locations and speeds of the detected objects.

The IF signals from the mixers are fed to the oscilloscope inputs. The attenuation and S-parameters of the individual components in the signal path can be taken into account by the hardware and software de-embedding functions of the instrument. The impact of de-embedding is seen in Fig. 2.

The received signal is attenuated over the entire frequency range and detected with decreasing amplitude as the frequency increases (upper screenshot). De-embedding compensates for these losses (lower screenshot), enabling the oscilloscope to analyse the actual signal.

Trigger

Stable trigger conditions are essential for reliable signal analysis with an oscilloscope. Oscilloscopes usually offer advanced trigger options in addition to traditional edge triggering. However, these options can only be used up to a certain bandwidth, depending on the manufacturer. An instrument with digital triggering can use the entire range of trigger options up to the maximum bandwidth.

Simple edge triggering is not useful for these measurement tasks since the oscilloscope will trigger on virtually any point of the signal due to the nature of the radar pulse. A pulse width trigger, which can be used to trigger on the interframe time between pulses, is more useful because it allows individual pulses or entire pulse sequences to be detected and analysed.

The trigger condition can be configured for specific radar signal parameters, for example to display only pulses with a specific duration.

Demodulation

For the best spatial resolution, current automotive radars operate with bandwidths up to 4GHz. An instrument is needed that meets the associated test requirements.

With a high sampling rate and large memory, the down-converted radar signal can be captured with a sufficiently high sampling frequency. Analysis tools can be used to check the modulation in the radar signal. The signal used starts at 1GHz and rises linearly to 5GHz. An initial check of these frequencies starts with a frequency measurement that is configured to perform many frequency measurements within one acquisition (frequency tracking).

The result is a display of the down-converted frequency versus time fIF(t).

At higher frequencies, the data points are closer, making the measurement more difficult. Noise often increases, but can be filtered by the scope's low-pass filter maths function. It is possible to change the scaling of fIF(t) (increase the frequency axis) to display the radar signal in its original frequency fHF(t) (Fig. 3).

Other measurement functions help users quickly determine important parameters such as the

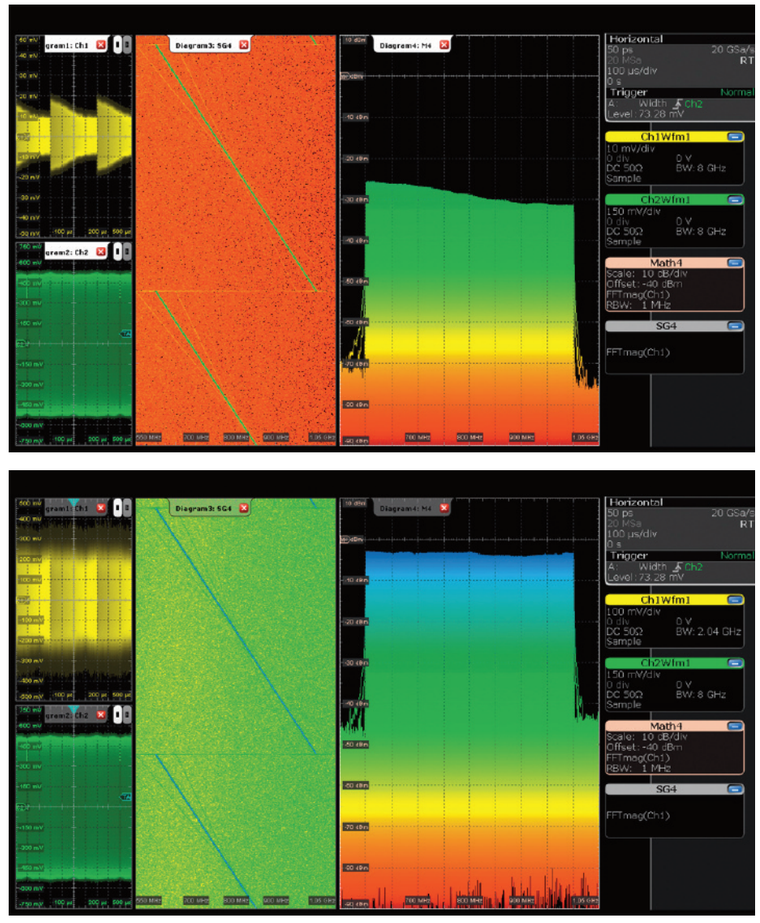


Fig. 2: An FMCW signal with de-embedding disabled (top screenshot) and enabled (bottom screenshot). The frequency response correction reconstructs the signal in its original frequency range.

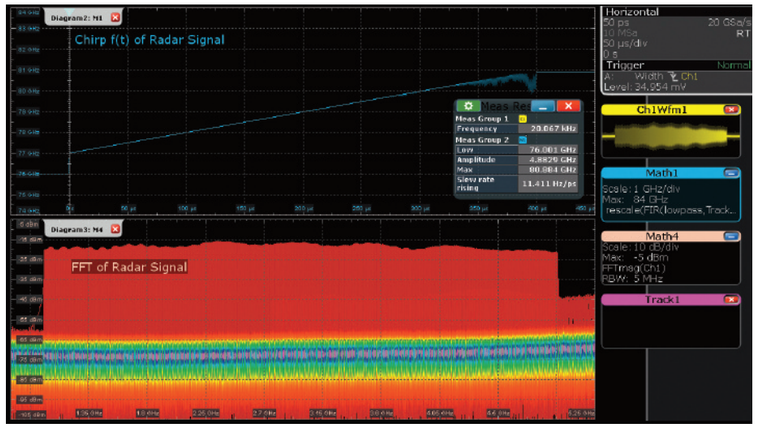


Fig. 3: Top: With suitable scaling and filtering, the radar signal can be displayed in its original frequency range fHF(t). Measurement functions provide important parameters, such as the slew rate of the chirp. Bottom: The FFT shows the power profile of the chirp.

rise time of the linear frequency modulation. For example, an oscilloscope's FFT function creates a spectrogram that shows how the radar signal changes over time. These two analysis methods (Figs. 2 and 3) allow users to perform an initial check of the bandwidth and the modulation.

Pulse analysis

Sometimes more advanced analysis tools are needed for investigating radar signals, for example to check the linearity of a frequency modulated continuous wave (FMCW) radar signal, which has a large influence on the Doppler properties of a target.

Vector signal explorer with transient analysis functionality performs this measurement with high accuracy (Fig. 4).

Such a tool can display the frequency response fIF(t) and calculate the deviation from the ideal linear phase. Such software can either be installed directly on the oscilloscope or on an external PC. In this case, the data need to be transferred, for example via Ethernet, for analysis.

Multichannel analysis

Many automotive radars are equipped with multiple transmit and receive antenna arrays. These determine the directivity of the antenna and allow beamforming and detection of the direction of the target. To investigate the transmit properties specifically, multiple mixers can be operated simultaneously on the scope. The setup is similar to that for single-channel analysis; the LO signal simply has to be distributed to all the mixers (Fig. 1).

When used as a phase coherent receiver, the oscilloscope analyses multiple signals relative to each other. Typically, the phase differences and difference between the two spectra are analysed. An FFT function is helpful here to calculate the amplitude spectra of the signals in the two channels. The difference is then calculated with another maths function and displayed.

For the phase measurement, the analysis range is limited to a narrow time corridor, and the

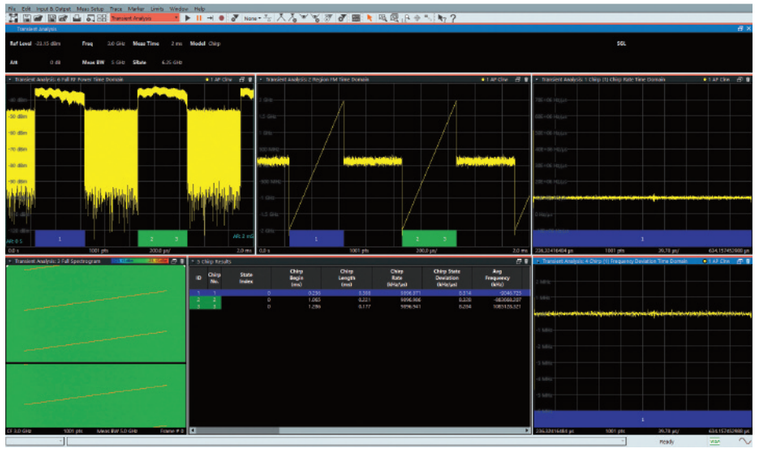


Fig. 4: Transient analysis of a chirp sequence signal with transient analysis option. The pulse power versus time is shown at the top left. The linear frequency response can be seen in the top middle and in the spectrogram on the bottom left. The software lists the properties of the detected pulses in a table (bottom middle). The properties can also be investigated in detail in graphical form. The chirp rate and frequency deviation are shown on the right.



Fig. 5: Multichannel measurement of a chirp sequence. The pulses are shown in the time domain (top), the spectra of the individual channels in the middle, and the amplitudes and phase difference are shown on the bottom left and bottom right, respectively.

phase difference of the two input channels is calculated from the phase properties determined by FFT (Fig. 5). The advantage of the indirect method using FFT is the larger time analysis range. Whereas a single measurement of the phase difference in the time domain can be strongly dominated by noise, in the frequency domain multiple signal periods are compared with each other, resulting in a significantly smaller measurement uncertainty.

To investigate radar signals further, for example to check the linearity of a frequency modulated continuous wave (FMCW) radar signal, which has a large influence on the Doppler properties of a target, vector signal explorer software is required.

Transient analysis functions might perform this measurement with high accuracy (Fig. 4).

Debugging

A suitable oscilloscope can measure the amplitude and phase differences of multiple antenna paths simultaneously and correlate the radar signals with other signals, such as the supply voltage or digital bus signals (Fig. 6). Simultaneously acquiring Can bus or Automotive Ethernet signals with radar signals is helpful during development and debugging. The analysis time of the radar sensor can be determined from the delay between the radar and the bus protocol signal. If the measured delay exceeds a specified time, deployment in autonomous vehicles is not acceptable.

Summary

An oscilloscope with the features and performance described above is an ideal instrument for characterising the new generation of radar sensors. The radar signals are either acquired directly from the radar sensor as baseband signals or down converted by a mixer to the oscilloscope's bandwidth. An oscilloscope with advanced trigger and analysis tools and the powerful pulse analysis software facilitates characterisation and debugging.

Ernst Flemming is product manager and Andreas Ritter application engineer at Rohde & Schwarz



Fig. 6: Measurement of the delay between the radar signal (left) and the Can protocol frame (right). The oscilloscope triggers on the radar signal and, using the trigger-to-frame function, measures a delay of 9.54ms from when the radar signal is transmitted to when the protocol transfer starts (bottom).

BRAIN surgery

Lee Bauer believes it is time to rethink vehicle architectures



The automotive industry is experiencing some of the most interesting technology-driven transformations ever. These include advancements in software, compute and sensors that are enabling a wide array of innovations in advanced safety systems on the path to fully autonomous driving.

Further to this, consumers are demanding new features for in-cabin safety, comfort and convenience with increasing frequency. The shift towards 5G and wireless technologies will further create opportunities to connect vehicles with high bandwidth. The automotive industry is working hard to meet consumer preferences, market regulations and improving costs of vehicle parts as they move towards electric vehicles.

The challenge, of course, is that all these trends are happening at once and space within a vehicle's chassis is finite, as is the driver's wallet. It's not sustainable to continue the traditional approach of adding a new ECU for each new feature, as each requires its own power, its own processing, and its own data and connectivity. It won't scale, and it's too complex.

OEMs realise this. They see that the incremental, monolithic approach to delivering features and functions is driving unmanageable complexity in all phases of the vehicle life cycle. In the development phase, where speed to market is critical to competitiveness, complexity increases development times.

And a monolithic approach to development, where software and hardware are inextricably linked, limits reuse and makes any engineering changes difficult. In the manufacturing and assembly phase, complexity leads to components that are difficult to assemble manually and don't lend themselves to automation. In postproduction, complexity reduces the ability to update features during the vehicle's life.

What's needed is a simpler approach. Here are three core vehicle architecture design elements that will enable a software-defined architecture that is sustainable well into the future: abstraction of hardware from software; separation of IO from compute; and serverisation of compute.

Abstraction

First, the architecture should abstract the hardware from the software.

While such separation is already common on today's IT platforms, this concept is now gaining momentum in the automotive industry. Separating hardware from software allows continuous release cycles, not only for the software but also for the hardware.

Just as apps on today's smartphones regularly receive incremental updates and improvements, the software in a vehicle should be able to update more frequently than the hardware it runs on.

This separation also allows developers to reuse software more easily as they move it to different platforms, rather than port it.

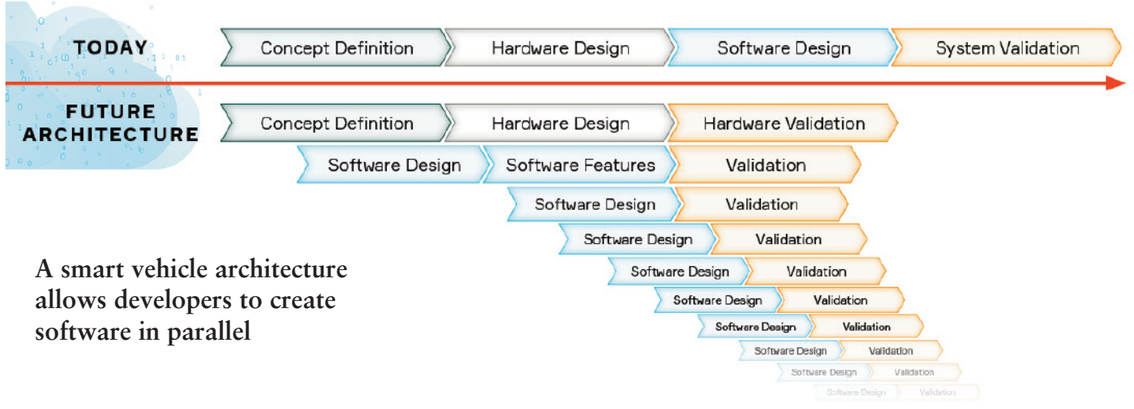
Separation

Secondly, the vehicle's IO should be separated from compute. That is, the architecture should take all of the physical connections to peripheral sensors and devices and place this functionality into zone controllers that are separate from the computers in the domain controllers.

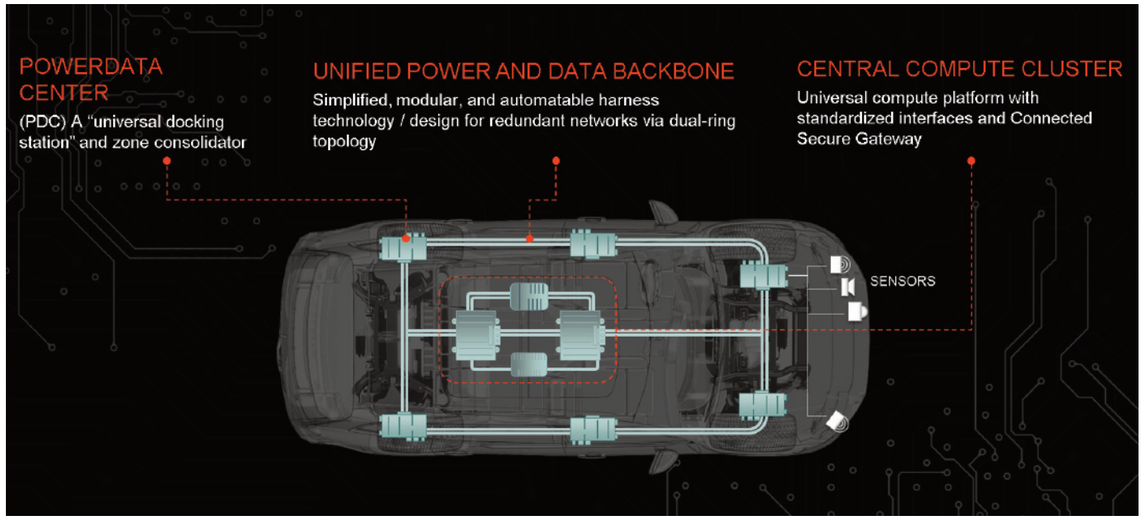
The zone controller would deliver power and data connections to the sensors and other devices, with just a backbone connection to the domain controllers. This approach improves scalability and reduces physical complexity.

Serverisation

And, finally, the architecture should serverise compute. Once the IO is separated from the compute, the approach can allocate the computing resources



A smart vehicle architecture allows developers to create software in parallel



How a smart vehicle architecture works

in a vehicle among various software applications dynamically, as needed, much like a cloud computing model.

A vehicle with this architecture can allocate the necessary compute power, ram, graphics processing and so on to applications based on priority and need.

Serverisation can even allow sharing of resources among physically separate domain controllers, so they can operate logically as one.

Additionally, this approach supports mixed criticality with full freedom from interference; that is, a critical safety feature that requires more processing power, for example, has priority and will have no interference from less critical functions such as infotainment.

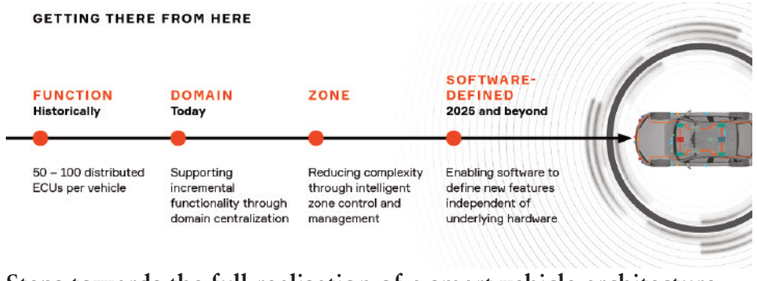
Sustainable

This point of view represents a holistic vehicle-level architecture approach, and it allows OEMs to take incremental steps to get there.

The first step is to break the vehicle up into more manageable zones. This allows an OEM to manage the power distribution and data communications better while providing a landing zone to up-integrate currently distributed functionality.

The next step is to transition today's multi-domain controllers from a monolithic software structure to a more flexible abstracted and open platform. From there, OEMs can consider even more consolidation of compute and introduce higher-performance server architectures that feature full abstraction, freedom from interference and dynamic allocation of compute that will ultimately allow multiple domains – such as advanced safety, user experience and infotainment – to run safely side by side.

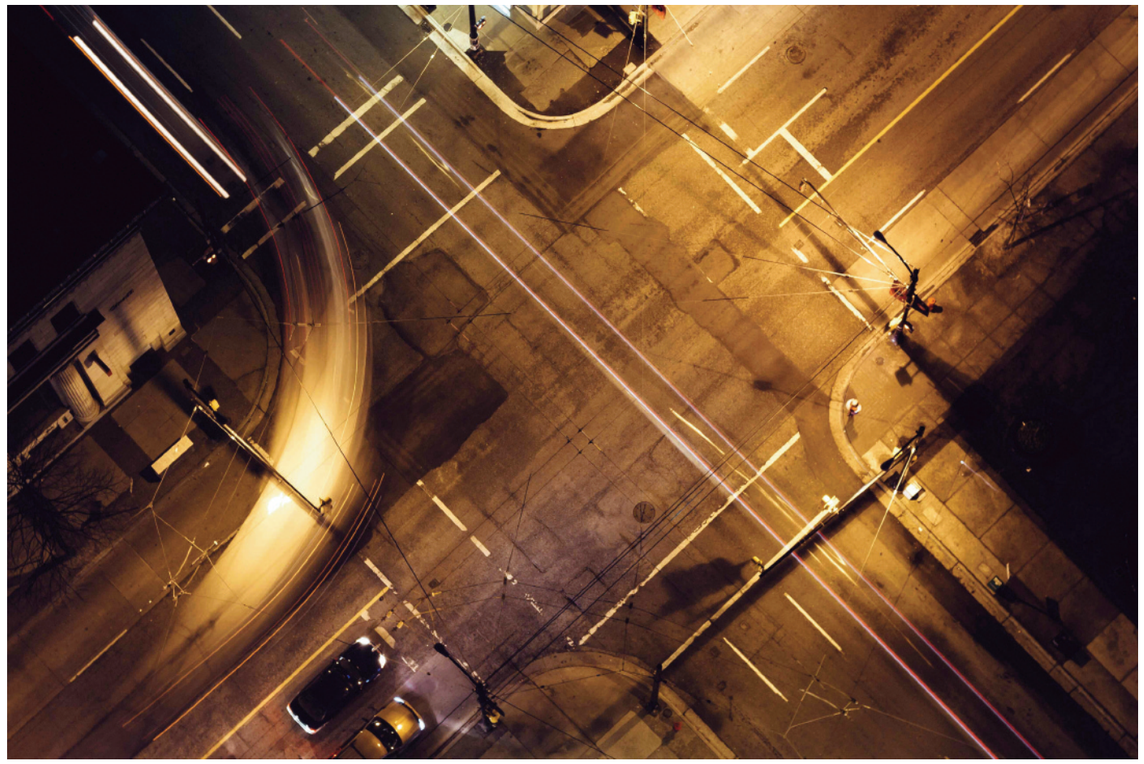
With those pieces in place, an OEM has the necessary building blocks, and will be able to take advantage of their ability to enable advanced features and high degrees of automation through a software-defined architecture that is sustainable well into the future.



Steps towards the full realisation of a smart vehicle architecture



Lee Bauer is VP for advanced engineering at Aptiv



AT THE CROSSROADS

Derek Bryan explains how a digital tachograph works

Once a mainstay of HGVs, and now increasingly found in smaller commercial vehicles, a tachograph is an essential tool for every vehicle in a fleet. It collects important information regarding the hours drivers have spent on the road. Most importantly, tachographs help improve driver safety by ensuring drivers take adequate rest breaks.

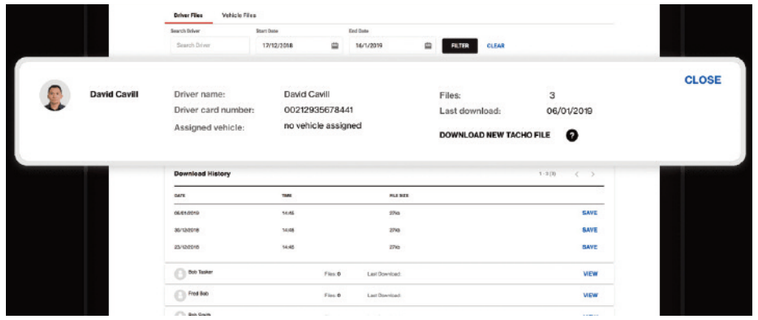
But for fleet managers, compliance processes associated with tachographs can take up a lot of time. Last year, a survey of over 200 fleet managers in the UK found that they lose an average of 14 hours per week – the equivalent of nearly two working days – downloading, sorting and correcting tachograph data.

Nonetheless, getting an accurate picture of what happens on the road is still absolutely essential, given the same research found that one in five drivers regularly exceed the legal limit for hours driven without a break.

The tachograph has been part of fleet operators' lives for many years now. But while it may be an old fixture, the way it is used has transformed dramatically. Since the introduction of the digital tachograph, what was once a time-consuming chore is now a fast and automated process, potentially helping fleet managers and business owners make informed decisions, plan smart schedules and manage compliance with less fuss.

Understanding

The primary purpose of the digital tachograph is to help enforce maximum daily and fortnightly driving hours, as well as tracking daily and weekly minimum rest



Digital tachograph data feed directly into integrated fleet management platforms

periods, for commercial drivers. The modern tachograph, however, can do much more.

While traditional tacho systems were known to be cumbersome and at times inconvenient, a modern live digital system allows users to simplify compliance while staying productive. By removing the need for physical access to a vehicle to download the latest tachograph reading, users can grab the files they need without disrupting the driver and causing vehicle downtime.

Integrating tachograph data with a fleet management systems also lets users view drivers and their tacho status in a live map. Information shown includes start time, drive time remaining, next break due and next rest due.

With this information, drivers can be encouraged to take breaks and managers can assess who is nearing limits before assigning jobs. For a more proactive approach, managers can set up driving hours alerts and receive direct warnings when a driver is at risk of an hours violation.

Visibility

Integration of all fleet data such as location, speed, job arrival or departure time, fuel consumption, and idle time, along with tachograph information, gives total visibility of fleet operations. These data, analysed and presented by a fleet management system, can help spot trends and discrepancies in a fleet to drive efficiency, productivity and safety across the board.

With the data being streamed in near real time from the in-cab fleet management system, fleet managers can empower their colleagues and customers with a range of innovative use cases. Some examples include seeing the status of the drivers in a fleet with live map integration, seeing vehicle location and driving hours to assess who is within safe limits for the next job, and providing customers and supply chain partners with precise status updates based on a driver's location.

In addition, driver ID functionality also makes it easy to determine who was driving when, allowing managers to coach, incentivise and, if necessary, reprimand drivers based on individual performance and compliance requirements.

Once integrated into a fleet management system, digital tachographs help improve and automate business operations, as well as close gaps on competitors, promote safety, grow revenues and react fast to customer needs.

Access

As digital tachographs can collect and stream data back to the central base of operations, fleet managers can access the status of drivers, the vehicle and the engine



Accelerate decision-making for efficient routing and scheduling



Getting a driver's eye view of what's happening behind the wheel

virtually at any time and any place.

This means vehicles no longer need to be physically present to download the most recent tachograph data.

This provides fleet managers with near real-time access to a complete overview of the tachograph status of every driver. Not only does this information accelerate important decision-making processes, but allows fleet managers to plan routing and scheduling much more precisely.

Just one look at the remaining driving hours and it's easy to work out to whom to assign new tasks and deliveries.

Most importantly, proactive alerts inform fleet managers and drivers on upcoming and late breaks, making fleets not only more efficient, but safer too.

Future

Those who research fleet management technology for any length of time will likely already be aware of the headline benefits. They can help make business work smarter, save money, and improve efficiency and profitability.

When it comes to making the decision to implement such technology, however, what really counts is keeping drivers safe and compliant with health and safety regulations.

Research from the European Road Safety Observatory shows that fatigue contributes to 10 to 20% of road crashes globally, while separate 2018 research from the AA revealed that 13% of drivers have fallen asleep at the wheel while driving.

A digital tachograph not only helps fleet managers take proactive measures to prevent tiredness from becoming a hazard, but does so in a way that is low-touch, fast and immediately actionable. All other benefits aside – improved customer service, streamlined supply chain management or smarter routing and scheduling – this alone is reason enough to invest in the latest tachograph technology.



Derek Bryan is vice president for Emea at Verizon Connect

SiC diodes improve ruggedness of EVs



AEC-Q101-qualified 700 and 1200V silicon carbide (SiC) Schottky barrier diodes from Microchip could help electric vehicles improve reliability and ruggedness.

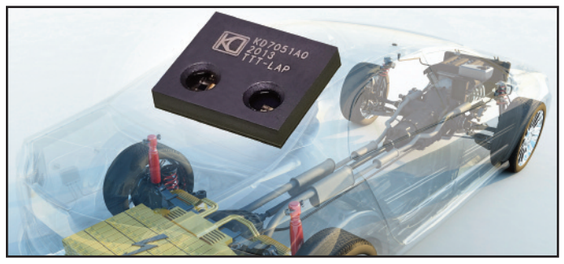
Power technologies such as SiC are used in high-voltage automotive systems from motors to on-board charging and DC-DC converters.

These power devices meet automotive quality standards across a range of voltage, current and package options.

The devices' avalanche performance allows designers to reduce the need for external protection circuits, reducing cost and complexity.

They have demonstrated no degradation in performance, increasing application life. Ruggedness testing has shown a 20 per cent higher energy withstand in unclamped inductive switching.

The devices are supported with Spice and Plecs simulation models and MPLab Mindi analogue simulator. Also available is a Plecs reference design model that uses the 1200V, 50A diodes as part of the power stage. This is the Vienna three-phase power factor correction reference design.



Optical in-vehicle connectivity

An integrated fibre optic transceiver from KDPOF for optical in-vehicle connectivity incorporates the transceiver IC, optoelectronics and optics.

The KD7051 has a 100Mbit/s optical port. The asic IC, photodiode and LED have been constructed as one device to reduce cost and footprint for Automotive Ethernet.

The decreased number of parts can reduce effort in testing and qualification, cutting costs compared with STP.

Applications include battery management systems, and links for camera, sensors, fast Ethernet and smart antennas.

It reuses low cost mems encapsulation and allows SMD reflow assembly with 8 by 7mm LGA components. The transceiver is shielded against EMI.

Fibre connection is done with a plastic connector placed on top.

The temperature range is from -40 to +105°C.

With a vibration class of V2, it withstands motor conditions. Additionally, the device endures water without sealing.

IC cuts AC-DC converter volume

An IC from Power Integrations can reduce input bulk capacitor size, cut in-rush current by up to 95%, and eliminate NTC thermistors and associated losses.

The MinE-Cap is for high power density, universal input AC-DC converters. By halving the size of the high-voltage bulk electrolytic capacitors in offline power supplies, this type of IC enables a reduction in adapter size of up to 40%.

It uses the small size and low R_{DSon} of PowiGaN gallium nitride transistors to connect and disconnect segments of the bulk capacitor network automatically depending on AC line voltage conditions.

Designers can select the smallest high-line rated bulk capacitor for high AC line voltages, and allocate most of the energy storage to lower voltage capacitors that are protected by the device until needed at low AC line.

This approach shrinks the size of input bulk capacitors without compromising output ripple and operating efficiency, or requiring redesign of the transformer.

Applications include automotive, smart mobile chargers, appliances, power tools and lighting.



Development tools gain position-independent code

The latest version of IAR Embedded Workbench for the Renesas RH850 can strengthen automotive embedded applications development through added support for position-independent code.

The C/C++ compiler and debugger toolchain can optionally generate position-independent code and/or position-independent data.

This functionality can be useful in systems where applications are loaded dynamically. When using position-independent code and read-only data, the compiler will generate code that uses PC-relative references for addressing code and read-only data.

Even though the linker places the code and read-only data at fixed locations, the application will still be executed correctly when the image is placed at a different address.

Typical use cases for dynamically loaded applications within the automotive industry include when using the capability of the application to upgrade its own firmware over Can.

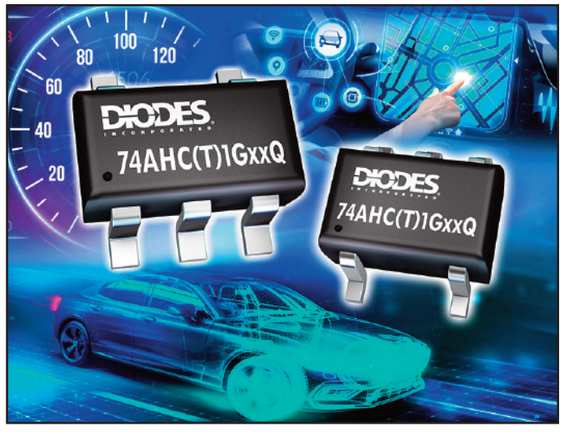
It includes a functional safety edition certified by TÜV SÜD according to IEC 61508, ISO 26262 and EN 50128.

This flexibility is extended to the build environment as the build tools support implementation in Linux-based frameworks for automated application build and test processes. The tools enable large-scale deployments of critical software building and testing and are suitable for installations ranging from a few licences on a small build server, to massive installations with several hundreds of parallel builds active at the same time.

The toolchain is compliant with the latest C language standard ISO/IEC 9899: 2018 and the latest C++ standard ISO/IEC 14882: 2017.

To simplify peripheral setup, it supports the Renesas smart configurator tool, which enables automatic generation of control programmes for peripheral modules, and pin setting from the gui with built-in cross-checks to avoid potential contention with multiplexed functions.

Single-gate logic devices



Single-gate logic devices from Diodes target automotive applications including infotainment and adas.

The 74AHC1GxxQ standard cmos and 74AHCT1GxxQ TTL compatible devices are AEC-Q100 grade-one qualified, manufactured in IATF 16949 certified facilities and PPAP capable.

Single-gate logic is used in automotive where a signal needs to be gated, buffered or inverted. The devices offer two-input single-gate options for AND, OR, XOR, NAND and NOR gates as well as inverters and buffers.

The inverters are available with and without Schmitt trigger inputs while the buffers have three-state outputs with active-high or active-low output enable.

The cmos compatible devices operate from a supply voltage between 2.0 and 5.5V, while the TTL devices operate between 4.5 and 5.5V. Propagation delays are typically between 4.5ns for the cmos inverter and 5.9ns for the TTL compatible Schmitt trigger inverter.

The devices use die dedicated to automotive-compliant devices, removing circuitry under the bond pad and using gold bond wires.

They are available now in sot-25 and sot-353 packages.

Log records adas data



The Canape log from Vector is available for recording adas data. Users can record all data from sensors, networks, complex protocols and internal ECUs.

It scales with requirements and can be operated intuitively.

Preconfigured logging is started, stopped and monitored via a mobile device, with one click.

Most data loggers do not collect sensor data from different manufacturers; Canape records large amounts of data from different sources synchronously.

Using the scalable VX1161 measurement hardware and the VN network interfaces, users can connect sensors, ECUs and networks, such as Automotive Ethernet, to the logger. Raw data from video streams as well as radar data are recorded quickly and reliably.

In stand-alone mode, the user monitors and controls the logger via a browser-based interface. In interactive mode, a laptop with Canape is coupled to the logger hardware. In this way the full range of Canape functions is available without having to change the wiring in the vehicle.

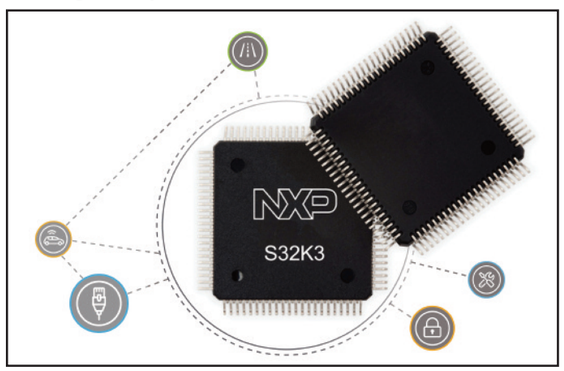
Different logger platforms are available depending on the required computing power and data rate. The VP7400 processes data at up to 1Gbyte/s, the VP6400 up to 500Mbyte/s, and the VN8911 up to 15Mbyte/s.

A multi-PC option with additional hardware modules tuned by one Canape log allows recording rates to be increased at will.

Microcontroller simplifies software development

For automotive body electronics, battery management and emerging zone controllers, NXP has announced the S32K3 microcontroller to simplify software development spanning security, functional safety and low-level drivers.

It expands the firm's S32 automotive platform from gateway and domain control into zone control and edge nodes. Plus, it enables software reuse among multiple applications to reduce the complexity of vehicle software development and ease the burden for tier-ones and car makers.



A hardware security engine is designed to anticipate the ISO/SAE 21434 standard and future OEM requirements. Beyond the hardware, firmware and a crypto driver aim to reduce the cost and complexity of engaging with third party providers.

The firmware increases the performance of the hardware security engine, blocks rogue access to protect the integrity of the security subsystem, and is field upgradable to address evolving cyber security threats.

A system-level approach to functional safety includes safety framework software, a core self-test library and hardware including lockstep cores, and clock, power and temperature monitors to ease compliance with ISO 26262.

It is being announced with the FS26 safety power management IC. The combination includes software driver, reference design and safety documentation to accelerate development timelines.

The package combines low-level drivers for Autosar and proprietary software architectures. This provides platform reuse to tier-ones and car makers who no longer need to maintain separate architectures. The package is production grade and will comply with ISO 26262 to reduce the time for user code validation.

Scalability is from 512kbyte to 8Mbyte of flash with up to three Arm Cortex M7 cores.

Mosfets reduce adas and ECU design size



Controller allows LED features

A sequential LED controller from Maxim can allow the easy and cost-effective addition of automotive sequential LED lighting features.

The Max 25605 can save development time and reduce design complexity by eliminating the need for a microcontroller or software. In addition, it reduces design space by up to half and can cut bill-of-materials costs by up to a quarter.

By simplifying designs, it allows more mid-range and economy models to adopt their own animation signatures. It controls LED current up to 750mA to provide flexibility in the lighting design.

The device integrates six switches, manages up to three LEDs per switch and can be daisy-chained up to 16 devices without the need for a microcontroller or software.

This lets designers accurately programme sequence timing, direction and linear or log dimming, while detecting fault conditions.

Compact AEC-Q101-qualified mosfets from Rohm deliver automotive-grade reliability for high-density applications such as adas and automotive ECUs.

The RV8C010UN, RV8L002SN and BSS84X achieve high solder mounting reliability during AOI in automotive systems that require high quality.

In addition, the bottom electrode package simultaneously provides miniaturisation and high heat dissipation.

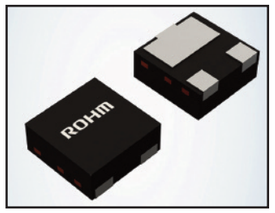
With conventional bottom electrode packages, the sides of the lead frame cannot be plated, making it difficult to conduct AOI to verify the solder height required for automotive applications.

In contrast, these mosfets leverage proprietary wettable flank technology to ensure a side electrode height of 125μm in the 1.0 by 1.0mm size. This enables stable toe fillet formation even with bottom electrode packages, allowing the solder condition to be verified by AOI after mounting.

They achieve the same performance as 2.9 by 2.4mm sot-23 packages but in the smaller DFN1010 packages, reducing mounting area by about 85%.

In addition, adopting a high heat dissipation bottom electrode structure improves heat dissipation, which normally decreases with size, by up to 65% over sot-23.

They are suitable for switching and reverse connection protection applications such as autonomous driving control ECUs, infotainment, engine control ECUs, drive recorders and adas. They are in mass production.



GaN fets can double power density

Texas Instruments has introduced 650V GaN field-effect transistors (fets) for automotive use.

With a 2.2MHz integrated gate driver, they can help double power density, achieve 99% efficiency and reduce size.

They were developed on a GaN-on-Si substrate.

The devices can help reduce the size of electric vehicle onboard chargers and DC-DC converters.

They integrate a fast-switching driver, plus internal protection and temperature sensing. This can let engineers eliminate more than ten components typically required for discrete designs.

Each 30mΩ fet can support up to 4kW of power conversion in a half-bridge configuration.

In PFCs, ideal diode mode reduces third-quadrant losses by up to 66% compared with discrete GaN and SiC mosfets. The mode also eliminates the need for adaptive dead-time control, reducing firmware complexity and development time.

Offering 23% lower thermal impedance, the packaging lets engineers use smaller heat sinks while simplifying thermal designs. Designers can choose from a bottom- or top-side-cooled package.

Integrated digital temperature reporting enables active power management to optimise thermal performance under varying conditions.

LED lamp cures UV adhesives



An LED lamp from Delo is for curing UV adhesives during high-speed production in the electronics and automotive industries where small areas need to be irradiated and equipment integrated into existing systems.

The spot light source Delolux 504 has an intensity up to 4000mW/cm² at a wavelength of 365nm.

This intensity can make UV adhesives cure faster, reducing cycle times. In addition, the lamp can be placed farther away, since the intensity compensates for the physically induced power reduction that occurs with increasing distance.

Longer working distances provide more flexibility for integration into production lines.

Thermal management ensures the heat generated by the LEDs is quickly dissipated by a direct connection to the heat sink, increasing the lifetime of the LEDs. This passive cooling allows the lamps to be used in clean rooms.

The light exit area is elliptical, which makes it possible to irradiate selectively only certain areas.

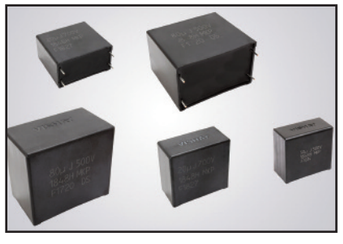
Fixing points, geometry of the emitted light and light distribution characteristics are the same as those of its Delolux 502 predecessor. Existing systems can thus be easily converted.

Because it has a separable connecting cable, the lamp head can be replaced, for example at the end of its lifetime, with no need to disassemble an entire production line.

Capacitors take high humidity

Automotive-grade DC-link metallised polypropylene film capacitors from Vishay are optimised for high humidity environments.

The Roederstein MKP-1848H DC-link is Vishay's first series of AEC-Q200 qualified DC-link film capacitors to withstand temperature humidity bias (THB) testing – 85˚C, 85% relative humidity for 1000 hours at rated voltage – without alteration of its electrical characteristics.



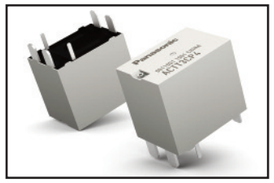
The radial capacitors can ensure stable capacitance and ESR values over a long service life under harsh environmental conditions during operation.

The devices are suitable for output filtering in automotive on- and off-board chargers and DC-DC converters; power converters for solar farms; auxiliary power supplies in wind energy generators; industrial power supplies and motor drives; welding equipment; and UPS.

Rated capacitance is from 1 to 80μF and ESR down to 3mΩ.

Ripple current capabilities are up to 25.1A and rated voltages are 500, 700, 800, 920 and 1200V DC at +85˚C.

The capacitors are RoHS-compliant, halogen-free and Vishay Green. Samples are available now. Production versions are available with a lead time of 20 weeks.



Relay small

With the 60A-rated TT series, Panasonic says it meets the increasing demand for PCB miniature relays in modern automotive applications.

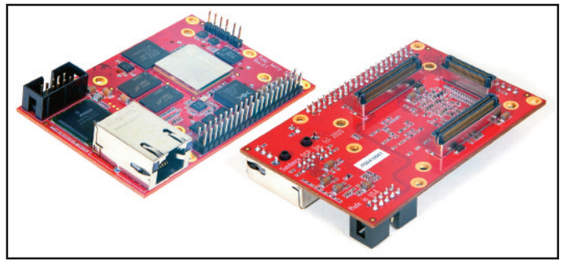
When it comes to switching, contemporary automotive application design resorts more and more to PCB mounted products. The primacy of miniaturisation and efficiency without compromises in reliability and performance render THT or PiP mounted relays suitable for multiple high current loads.

The series supports 60A at 14V DC with a double make two Form A (one Form U) contact configuration, and is tailored to smart junction boxes in applications throughout the vehicle.

With 17.8 by 13 by 16mm housings, the relays are expected to save between 15 and 29% board space.

With available heat-resistant (+110˚C) or pin in paste soldering compatible types, they suit high capacity switching in car applications such as defoggers, head lamps, seat heaters, fog lamps and fan motors.

SoM aids embedded development



A production and deployment-ready system on module (SoM) from Sundance has a hardened 64bit, multicore real-time, Linux-capable Risc-V MPU subsystem to combine defence-grade security, low power consumption and thermal efficiency for embedded systems development.

With Microchip's PolarFire SoC FPGA providing a deterministic, coherent 64bit Risc-V CPU cluster and a deterministic L2 memory subsystem enabling the implementation of secure Linux and real-time applications, PolarBerry suits the development of embedded computing and real-time applications based on Risc-V processors.

As well as automotive, applications are in military, aerospace, AI, communications, industrial automation, imaging and IoT markets.

The compute engine delivers up to 50% lower power than FPGAs and 250k logic elements, and has four high-speed, low-power transceivers from 250Mbit/s to 12.7Gbit/s.

The PolarFire SoC FPGA's power consumption is 12W maximum and power is provided directly from the PolarBerry SoM to enable embedded applications.

The SoM is said to have all the important attributes for strong SoC and FPGA design security including anti-cloning protection, device-level anti-tamper features, bitstream protection, key management, FPGA hardware access control, secure boot and physical memory protection, as well as supply chain assurance.

It also has a 40-pin Raspberry Pi (RPI) interface to allow standalone operation and quicken application development by providing up to 26 GPIOs, 20 of which can be assigned to SPI, uart, Can or other interfaces. All RPI signals are 3.3V logic.

Onboard SoM peripherals include 4Gbyte of 32bit wide DDR4 memory, 128Mbyte SPI serial NOR flash for storing the boot image, and programmable clocks to provide flexible clocking to the FPGA and high-speed transceivers.

There is also an RJ45 Ethernet socket with 100/1000baseT interface, two Can 2.0 physical layers, a JTag interface for programming and 4Gbyte of eMMC non-volatile storage.

Samtec connectors provide high-speed communication to a carrier board for peripheral customisation.

Editor and Publisher:
Steve Rogerson
editor@vehicle-electronics.biz

Advertising Manager:
Diane Trotman
diane@vehicle-electronics.biz

Web Site Manager:
Martin Wilson
admin@vehicle-electronics.biz

Published by: Vehicle Electronics Magazine, 72 Westwood Road, Nottingham NG2 4FS, UK

Web site: vehicle-electronics.biz
Twitter: @velectronicsmag

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ISSN 2055-1177

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