VEHICLE electronics

The monthly magazine for automotive electronics engineers

California suspends Cruise autonomous vehicle licence

California has suspended Cruise's driverless permit after an autonomous vehicle dragged a pedestrian for around six metres following a collision.

The decision only affects General Motors subsidiary Cruise's licence for fully autonomous vehicles and not its licence to test autonomous vehicles with a safety driver.

The decision follows an incident in late October in San Francisco when a Cruise AV was stopped at a red light. A Nissan Sentra was in the next lane.

When the lights changed, the pedestrian crossed the road against a red light, was struck by the Nissan and thrown into the path of the Cruise AV, which braked but still hit the pedestrian.

The AV detected the collision and stopped. It then tried to pull over to avoid blocking the road and dragged the pedestrian for about six metres.

A statement from Cruise said: "Shortly after the incident, our team proactively shared information with the California Department of Motor Vehicles (DMV), California Public Utilities Commision and National Highway Traffic Safety Administration, including the full video, and have stayed in close contact with regulators."

The driver of the Nissan fled the scene.

Nevertheless, the California DMV suspended Cruise's autonomous vehicle deployment and driverless testing permits, effective immediately.

"The DMV has provided Cruise with the steps needed to apply to reinstate its suspended permits, which the DMV will not approve until the company has fulfilled the requirements to the department's satisfaction," said a DMV statement.

The Cruise statement added: "This incident will be included in future suites of simulation tests to allow the vehicle to better determine if it should pull over safely or stay in place, and to validate that the AV's behaviour remains safe and reasonable."

The AV, said Cruise, responded to the pedestrian deflected into it path within 460ms, faster than most human drivers, and braked aggressively.



Cruise autonomous vehicle (AV)

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Renesas and OnSemi collaborate on automated safety

OnSemi and Renesas are collaborating to improve safety in semi-automated driving.

OnSemi's Hyperlux image sensor family has been integrated onto Renesas' R-Car V4x platform to enhance the vision system and improve safety of semi-automated vehicles.

With a 2.1μm pixel size, 150dB high dynamic range and LED flicker mitigation across the full automotive temperature range, Hyperlux image sensors are being combined with the R-Car flexible software platform to equip OEMs and tier-ones with computing to address adas and up to level-three automated driving.

"Out-of-the-box compatibility of the OnSemi Hyperlux image sensors on our R-Car V4x platform and continued collaboration on the next generation offerings are testament to the quality of our products and long-standing relationship," said Takeshi Fuse from Renesas.

This builds on a portfolio between Renesas and OnSemi products that have been deployed together in automotive applications for many years.

"With its deep understanding of automotive applications and extensive experience in SoCs, Renesas is uniquely positioned to meet customers' current and future requirements," said Chris Adams, vice president at OnSemi.

• OnSemi has completed the expansion of its silicon carbide (SiC) fabrication facility in Bucheon, South Korea. At full capacity, this fab will be able to manufacture more than one million 200mm SiC wafers per year.

The Bucheon SiC line is starting with 150mm wafers and will be converted to 200mm in 2025 upon qualification of the process.

Foxconn Project X from A to B



At October's Japan Mobility Show, the Foxconn-initiated MIH Consortium unveiled the much-anticipated Project X concept car, alongside Project Y's strategy for smart logistics.

Together, these projects address the shifting landscape of urban transport, catering to both commuters and logistical operations. This encompasses options for car-sharing, ride-hailing, food delivery and goods transport.

"Our vision transcends the journey from point A to B," said Jack Cheng, CEO of MIH Consortium, pictured with Project X. "We're dedicated to delivering a seamless, convenient and sustainable urban experience. Our initiatives, especially in assisting B2B customers transition from gasoline to electric vehicles, are a testament to our commitment to operational efficiency and value creation."

The Project X concept car supports autonomous driving with customisation from L2 to L4 and has 2+1 adaptive seating, swappable battery system, sliding doors, compact design, and durable and resilient interiors.

Project Y encompasses the development of electric trucks and vans, fleet and energy management software, energy infrastructure consulting, and a carbon tracking platform.

Trumpf and KDPOF show 980nm connect



Clean room production at Trumpf

Trumpf Photonic and KDPOF showed the first 980nm multi-gigabit interconnect for automotive systems at October's European Conference for Optical Communication (ECOC) in Glasgow.

"After a long-term cooperation, it's great to have entered the stage where we can prove to end-users the true strength of 980nm optical interconnects," said Ralph Gudde, vice president at Trumpf.

Due to the push in the automotive sector towards autonomous driving, a large amount of data must be processed in cars. Consequently, optical interconnects must manage the data flow as a nervous system, connecting sensors and electronic brains, while tight EMI requirements are met.

Trumpf and KDPOF entered a partnership in 2022 to combine their knowledge in components and networks for data communication. Now, significant progress is made with the first implementation of IEEE 802.3cz, consisting of a transceiver that integrates electronics, photonics and optics in a single IC.

Evaluation kits will soon be ready for OEMs to test.

"Automotive is a very demanding industry," said Rubén Pérez-Aranda, CTO at KDPOF. "IEEE 802.3cz is therefore focusing on highly reliable conditions that enable lifetimes of 15 years and more, with low cost and high-volume implementations. Having suppliers like Trumpf in the 802.3cz working group enriched the discussion with their deep manufacturing and design knowledge of VCSEL and photodiode components, which in turn enabled the production of a serious and dependable standard."

The partnership is targeting optical networks to become an indispensable part of future cars.

Automotive applications require not only a much wider range of operating temperatures, from -40 to +125˚C, but also an interconnect length of less than 40m.

For robustness against wear and random failures, 980nm VCSEL was approved as the wavelength to become the new standard. Besides its performance characteristics, 980nm suits the existing OM3 fibres with low dispersion loss.

Hyundai, Kia and Infineon sign SiC supply deal

Hyundai, Kia and Infineon have signed a multi-year supply agreement for power semiconductors.

The agreement covers silicon carbide (SiC) and silicon semiconductors.

Infineon will build and reserve manufacturing capacity to supply SiC as well as Si power modules and chips to Hyundai and Kia until 2030. Hyundai and Kia will support the capacity build-up and capacity reservation with financial contributions.

"Infineon stands as a valued strategic partner, boasting steadfast production capabilities and distinct technological prowess within the power semiconductor market," said Heung Soo Kim, executive vice president at Hyundai Motor Group. "This partnership not only empowers Hyundai Motor and Kia to stabilise its semiconductor supply but also positions us to solidify our leadership in the global EV market, underpinned by our competitive product lines."

Power semiconductors are key enablers for the transition to electromobility. This should lead to strong market growth for power semiconductors, especially those based on wide bandgap materials such as SiC.

With the expansion of its Kulim fab in Malaysia, Infineon will build what it says is the world's largest 200mm SiC power fab and strengthen its role as a high-volume supplier to the automotive industry.

The Kulim facility will complement Infineon's manufacturing capacity in Villach, Austria, and further capacity expansions in Dresden, Germany.

"The future car will be clean, safe and smart and semiconductors are at the heart of this transformation," said Peter Schiefer, president of Infineon's automotive division.

TrustInSoft receives ISO 26262 thumbs up from TÜV SÜD

C/C++ software source code analysis firm TrustInSoft has received ISO 26262 qualification from TÜV SÜD.

Combined with its analyser's static analysis capabilities, this qualification gives automotive manufacturers and suppliers support in meeting the industry's safety standards throughout the product development process via an independent validation of the tool's capacity to guarantee mathematically the absence of undefined behaviour.

"With increasing complexity and scale of automotive electronics, manufacturers are looking for new ways to meet functional safety requirements without compromising release schedules," said Fabrice Derepas, CEO of TrustInSoft. "To help eliminate the most critical safety risks in automotive software – undefined behaviour – and reduce compliance efforts, we give our customers a competitive advantage through a mathematical guarantee of the absence of CWE vulnerabilities, analysis of software behaviour on different hardware target platforms, visualisation of variable values at every step of the execution path, and support the root cause location of bugs."

The analyser examines automotive source code using mathematical models proven to achieve 100 per cent coverage of code and inputs. Unlike traditional test methods and static analysis tools, this guarantees all functions are tested across the entire range of input values.

With software structural coverage and code coverage strongly recommended by the ISO 26262 standard, exhaustive static analysis provides a combination of breadth, depth and speed for developers to prove their code is free from issues and functional safety risks.

In addition to existing support for the Misra C guidelines, the analyser gives automotive manufacturers massive-scale testing and compliance capabilities in much shorter timeframes than do traditional tools.

"Automotive software developers can't afford to anchor themselves to the testing techniques of the past," said Derepas.



U-Blox and GMV enable safe positioning for vehicles

U-Blox has combined its A9 Asil-B chipset and modules technology with GMV's PointSafe software to provide GNSS-based vehicle positioning for adas and autonomous driving applications.

Called U-Safe, it combines proven automotive driver navigation systems to offer tier-one suppliers and OEMs an adas positioning system that already has a track record of reliability and safety.

"The hardware is already embedded in a vehicle that is running in Europe," said Stefania Sesia, a senior director at U-Blox. "PointSafe takes the information from the GNSS receiver and from sensors and the cloud and puts it together to create the position with 10 to 20cm accuracy. It is already in use in a different vehicle to the hardware. We are putting these together."

GMV recently announced that BMW had again chosen its positioning technology for automated driving applications.

Typical use cases include level-three and above applications requiring integrity and functional safety. Level 2+ applications can also benefit by being made future proof and ready for a transition into higher levels of automation.

PointSafe uses GMV's accuracy and safe correction service and on-board safe position engine. The U-Blox Thingstream IoT platform delivers services to the OEM backend, as well as customised integration support.

GMV's correction service uses fixed location base stations to analyse potential errors from satellite positioning and correct the data.

"It tells you the true position of the vehicle," said Sesia. She added that this could then be combined with camera, radar and lidar information to give the level of positioning needed for autonomous driving.

"This is available for design-in by customers," she said. "It will depend on how the OEM wants to use it, but we can supply the support, the integration and the certification. It is not plug and play."

U-Blox has been working with GMV to bring functional safe positioning to the automotive industry for mass-market applications. Years of research and development have culminated in this mature offering for highly automated and autonomous driving.



Stefania Sesia: "Safety is a key word."

"Autonomous driving is the biggest revolution in the automotive industry," said Sesia. "It is very challenging. Safety is a key word."

She added that the technology had already been shown to customers and she was confident its deployment would "happen quite rapidly".

Vishay and Key secure mosfet supplies

Key Foundry, a 200mm pure-play foundry in South Korea, has signed a long-term supply agreement with Vishay for multiple power mosfets.

Vishay's power semiconductors are widely applied to automotive DC-DC converters, battery management systems, hvac control and LED lighting, as well as consumer and industrial products such as TVs, refrigerators, washing machines, and VR and AR.

Key Foundry and Vishay signed this long-term foundry service agreement for multiple power mosfets, with a plan to start mass production in 2024. In addition, the parties have begun discussions for other product development.

With this agreement, Vishay secures a reliable source of foundry services for mosfet production, while Key Foundry engages with a large customer for automotive power discretes.

"With this agreement we are taking another step forward in our plan to expand capacity, both internally and externally," said Joel Smejkal, CEO of Vishay.

Derek Lee, Key CEO, added: "We are pleased to collaborate with Vishay, a leading automotive power semiconductor company. Key Foundry will continue to improve process technologies as well as strengthen capabilities in marketing, quality and production to expand supply of automotive semiconductors and grow into a leading specialty foundry."

Microchip expands Detroit automotive lab

Microchip has added high-voltage and e-mobility laboratories to its 2200m^2 Detroit automotive technology centre.

The Novi, Michigan, facility also includes technical training rooms for automotive clients to develop and optimise designs

Microchip has been part of the Detroit community since 1999, when it first opened its doors as an application and sales office. With the recent completion of phase three of its expansion project, Microchip has more than doubled its lab space, including the addition of labs that focus on high-voltage and e-mobility applications.

This larger facility should also bring more technology-related jobs to the region.

"Microchip's automotive business is a cornerstone of our company's legacy," said Rich Simoncic, executive vice president of Microchip. "We remain focused on developing total systems, and this expansion provides our customers with immediate access to state-of-the-art resources."

Microchip also has automotive technology centres in Munich, Shanghai, Tokyo and Texas.

"The centre demonstrates our commitment to the automotive industry by providing a destination for them to develop, test and refine applications in the design phase," said Matthias Kaestner, corporate vice president at Microchip.

With OEMs, suppliers and start-ups operating in the region, Novi is a key location for the centre and easily accessible to help OEMs with their design problems.

The high-voltage lab is for demonstrating reference designs featuring Microchip's MSiC silicon carbide offerings, DSPic digital signal controllers, and analogue and mixed-signal products.

"The new high-voltage lab will help our automotive customers develop systems using our reference design platforms," said Clayton Pillion, vice president of Microchip. "As more OEMs transition to our e-mobility offerings, we are ready to support them from the design phase to implementation."

There is support for central compute and zonal networks in adas platforms using Microchip's PCIe switching hardware, single-pair Ethernet devices and development tools.

The HMI lab supports the development of full-width cockpit displays, touchscreens, knob-on-displays, buttons, sliders and wheels with EMC testing.

USB and networking development resources help pre-certifify multimedia infotainment systems and media hubs for USB Type-C 3.2 protocol applications.

Die- and product-level characterisation of automotive mems resonators and oscillators include vacuum and wafer-scale probe and test, long-term aging, frequency stability, phase noise and jitter test capability.

For those developing automotive security using Microchip's CryptoAutomotive TrustAnchor ICs, there is onsite security training to learn how to implement secure elements in applications such as secure boot, and message and hardware authentication.



Microchip Detroit automotive technology centre



Volvo software testing centre in Gothenburg

Volvo grows software testing in Sweden

Volvo has opened a software testing centre in Sweden.

The centre in Gothenburg amplifies the car maker's capacity for integrated software testing at all levels.

The firm's fully electric cars are hardware designed, but software-defined. This creates models such as its flagship EX90 SUV and the small EX30 SUV that become better over time thanks to regular, over-the-air software updates.

At a size of around 22,000m^2 and representing an initial investment of around SEK300m, the centre becomes the flagship in its network of engineering centres and tech hubs around the world.

It also operates software test centres in Lund, Sweden, and Shanghai, China, but the Gothenburg facility is by far the largest in terms of size and capacity.

"This is a state-of-the-art facility that will be the hub for our global software testing and validation activities," said Anders Bell, Volvo's global head of R&D. "Developers from all our global engineering sites and tech hubs can run software tests here remotely, 24 hours a day, 365 days a year."

The facility will initially employ around 100 people, a figure that is expected to grow to 300 once the testing centre is running at full capacity. Eventually the site will house around 500 testing rigs and digital test environments, up from almost 200 right now.

The Gothenburg site will work closely together with Volvo's other engineering centres around the globe that play a role in software development.

It recently established a technology hub in Singapore, and plans for another software-focused tech hub in Krakow, Poland, in February.

"Our growing ranks of software engineers work on a wide variety of exciting challenges," said Alwin Bakkenes, Volvo's global head of software engineering. "The aim is to boost our innovation speed by developing software for key areas for Volvo, from core safety technology based on our deep understanding of what causes accidents, to our perception and driver-assistance algorithms and software for future autonomous driving."

Other software engineering challenges include developing connected features and supporting development through data analytics.

The firm is recruiting software engineers at locations around the globe. It also operates tech hubs in Stockholm and Lund, as well as Bangalore, India. There are engineering centres in Shanghai and Gothenburg.

Horiba Mira to reduce test costs

Horiba Mira, Polestar, IPG Automotive, Connected Places Catapult and Coventry University are collaborating to reduce the testing costs of automated driving systems by 40%.

The Certus project, aims to break the link between the growth in complexity of automated systems and the speed and cost of verifying the technology.

While traditional methods involve clocking up millions of kilometres to validate systems in all circumstances, Certus will use AI-driven search space optimisation techniques to reduce testing time by targeting scenarios most likely to challenge the automated systems operation.

The £2.7m project aims to reduce the cost of testing automated driving.

Why cars are like living rooms

Cars are turning into second living rooms with entertainment systems using high-definition audio, according to Yipeng Liu, director of product marketing at Cadence.

She was speaking during the announcement of the company's expanded line of Tensilica hifi and vision DSP families with four products based on the recently announced Tensilica Xtensa LX8 processor platform.

The DSPs are addressing increasing system-level performance and AI requirements for an expanded range of applications.



Yipeng Liu

"People are no longer satisfied with MP3," said Liu. "Streaming services are demanding high-definition audio, and that includes automotive audio where they need high definition."

The Tensilica HiFi 1s and HiFi 5s DSPs are for audio, voice, lightweight imaging and AI applications and the Tensilica Vision 110 and Vision 130 DSPs are for image sensor, camera, radar and lidar applications.

The DSPs use the Xtensa LX8 platform, including native Amba AXI support for lower latency and L2 cache for increased system performance.

They are supported by Cadence's NeuroWeave software development kit and can be paired with the Cadence Neo neural processing units to offload AI inference workloads.

The HiFi DSPs add capabilities for lightweight imaging and AI to serve as additional compute resources beyond just audio, either standalone or complementing the Vision DSPs and Neo NPUs.

The 128bit Vision 110 and 512bit Vision 130 DSPs offer performance improvements to address growing sensor and AI workloads, offloading from the CPU or GPU.

Automotive applications include in-cabin audio, adas, AR, VR, mobile, and smart and IP cameras.

"Next-generation automotive audio drives higher demand for audio subsystem capabilities and innovations," said Liu.

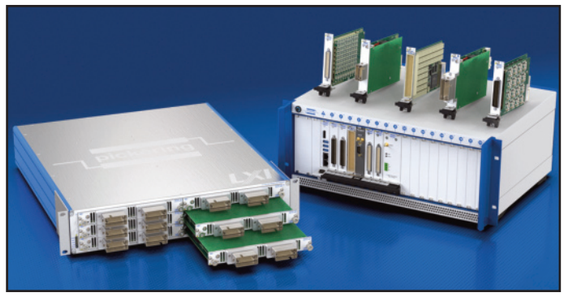
Pickering demonstrates PXI-based BMS

Pickering Interfaces demonstrated PXI-based switching and simulation in a flexible battery management system (BMS) at October's Automotive Testing Expo in Novi, Michigan.

"With the increasing adoption of electric vehicles, one significant challenge to be tackled is the effective testing and validation of BMS," said Paul Bovingdon, simulation product manager at Pickering. "Using modular, PXI-based switch and simulation modules offers many advantages in BMS test, including flexibility to optimise the test system to meet exact requirements, simple modification to address evolving needs, and an open, industry-standard architecture that promotes system longevity and mitigates obsolescence while providing seamless integration of multi-vendor instrumentation modules."

The BMS test demo included the 41-752A-011 PXI battery simulator that simulates batteries in a stacked architecture, 40-190B-002 PXI fault insertion for simulating cell shorts and broken wires, 40-297A-050 PXI precision resistor to simulate battery load, 42-297A-150 PXIe programmable resistor for the BMS isolation resistance check, 41-743-001 PXI programmable power supply to simulate the battery charger, 43-920-001 PXI embedded controller and 42-925-001 PXIe 18-slot chassis.

Pickering also highlighted PXI, PXIe and LXI products for automotive applications.



BMS test demonstration from Pickering

Anritsu and DSpace digital twin protects vulnerable road users

Anritsu and DSpace have developed a digital-twin simulation environment to provide improved protection for vulnerable road users (VRUs).

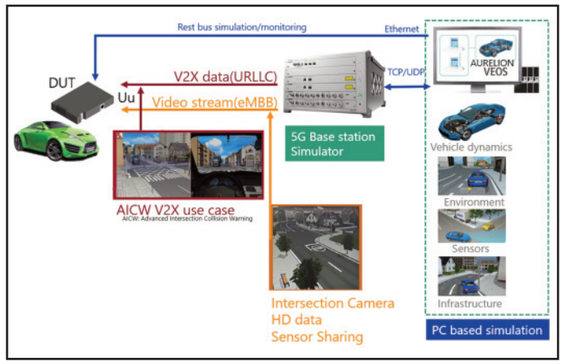
At October's 5GAA Meeting Week event in Detroit, the two companies demonstrated a road safety use case using the C-V2X 5G network for cooperative communications.

VRUs include pedestrians and cyclists, and there is growing interest in using C-V2X to prevent accidents with vehicles. VRU protection is being developed for roads and intersections to ensure safety and improve accident prevention.

To support this, there has been direct detection of VRUs by installing adas sensors in vehicles.

The 5GAA has been investigating accident prevention methods by the use of 5G-network-based communication, which is based on cooperative communications to and from VRUs.

Unlike in-vehicle-based methods, it is expected that protection in blind spots such as outside the effective detection range of vehicle-mounted sensors and building shadows will also be possible via 5G network communication.



Digital-twin demo at 5GAA Meeting Week

To achieve this, the 5G communication to cooperative VRUs must be reliable, and the evaluation of QoS management and fault tolerance at the IP layer is critical.

The demo provided a digital-twin environment for real-world scenarios, so VRU protection testing could be started virtually when features were not yet available on the real vehicle.

This demonstration attracted the attention of vehicle makers, auto parts suppliers and mobile network operators.

Anritsu will continue to develop this to improve the protection of VRUs and contribute to the development of smart cities by setting up a simulation environment using digital twins.

"Today almost 40% of fatalities on the road are people outside the vehicles: pedestrians, cyclists, road workers, children and more," said Maxime Flament, CTO of 5GAA. "It is a priority for the 5GAA members to leverage C-V2X technologies to protect these VRUs."

This demo used DSpace's PC-based simulator that reproduced the University of Michigan's M City automotive test course used at the 5GAA Meeting Week, together with smart cameras and different road users.

V2X data messages generated by communication devices such as smartphones carried by VRUs as well as sensor information from intersection cameras were transmitted to an OEM application that displayed VRU protection results on the vehicle side via 5G communication using Anritsu's 5G base station simulator.

The test platform provided network simulation compatible with 5G radio access technology and a development evaluation and certification test environment for automotive use cases such as telematics, infotainment and V2X.

Delta completes TB&C acquisition

Delta has completed the acquisition of TB&C, which develops hybrid technologies for mechanical components in automotive, industrial and medical applications.

The transaction is expected to generate synergies by leveraging both companies' R&D and manufacturing resources to accelerate their overall EV business expansion.

Delta has developed EV powertrains for global automotive companies, as well as automotive magnetic components, passive components and thermal management products.

"E-mobility is the key strategic segment of our hybrid components and drives our sustainable growth going forward," said Robert van der Weck, CEO of TB&C.

TB&C will still operate under its existing management. As a subsidiary of Delta, it is expected TB&C's technologies will be integrated with Delta's automotive components to expand its EV offerings.

Interplex sets up Ennovi to handle EV connectivity

Interplex has spun out its automotive connector business into a new company called Ennovi.

Both Interplex and Ennovi will still be owned by parent company Blackstone Private Equity.

This is in response to growing electrification of vehicles and will see Ennovi involved more in the design side.

"We started as a business unit focussed on the automotive market," said Ennovi CEO Stefan Rustler. "We used to do less design because the ICE market was very mature. With EVs, they are coming out with new products completely. This lets us co-design with the customer."

The move has seen the company employ "significant numbers" of design engineers in the past year.

"We need engineers for the design part and engineers to get it production ready," he said. "It is one thing to build ten products in a lab, but you need to scale that, which is where the legacy Interplex business comes into play."

The mobility business now designs, develops and engineers interconnects for battery, power and signal systems for EVs.

It designs and engineers battery, power platforms and signal interconnects.

Interplex will continue in the datacom and industrial market with mechanical and busbar technologies.

Ennovi has its headquarters in Singapore plus four R&D centres and 15 manufacturing sites. It employs more than 7000 people.

Whereas the company once saw itself as a tier-two supplier with its main customers being the likes of Continental and Bosch, it now sees itself in tiers one, two and three, working on one hand directly with the car makers to design EVs and on the other with battery makers and semiconductor companies.

"We are building on what we have and expanding," said Rustler, "to be a tier one ourselves but still being a tier two and going to the battery pack makers. It is a reposition because the market is changing. The rebrand is a message that we have changed."

This, he said, also involved a change in the mindset of the company.

"We once got involved a year or less before the start of production," he said. "Now we start with the product development and that is new to a large part of the company."



Stefan Rustler: "Building on what we have."

Tasking and Synopsys partner to improve ECU safety

Integrating Tasking's debugging tools into Synopsys' virtual ECU platforms could lead to safer ECUs and speed time to market.

The debugging tools support the Synopsys VDK virtualiser development kit and Silver virtual ECU platforms.

Developers can access tools that increase efficiency while improving vehicle safety and reliability. This should cut time to market and increase software quality.

The tools provide debugging, timing and coverage analysis for in-depth insights into ECUs and embedded rtos, with a focus on Autosar.

The Synopsys software environments allow for simulation of ECUs on different hardware abstraction levels from level four to abstractions on levels one to three according to the prostep virtual ECU categorisation.

Furthermore, the Synopsys tooling enables co-simulation with models of different tools such as Matlab, Simulink, Dymola, Simulation X, MapleSim, AMEsim, GT-Power and Axisuite, and it integrates into automotive workflows to frontload integration, validation and debugging.

DRI opens K&C test facility

Automotive test consultancy DRI has opened a kinematics and compliance (K&C) test facility at its headquarters in California.

This provides the full suite of K&C tests alongside centre of gravity (CoG) and moment of inertia (MoI) measurements.

The K&C machine will let manufacturers create and correlate accurate virtual vehicle models for the simulation toolchain.

At its centre is the SPMM test machine made by sister company AB Dynamics.

The facility has been purpose-built for testing and developing vehicles and will be used by OEMs, suppliers and motorsport teams to measure and evaluate vehicle suspension systems.

"Using the AB Dynamics SPMM as a basis, we plan to expand our capabilities to become a virtual one-stop-shop for vehicle dynamics measurement and testing," said Joe Kelly, chief engineer at DRI. "Coupled with our existing vehicle dynamics area and full-scale test capabilities and instrumentation, the SPMM will enable us to serve our clients with unmatched flexibility and depth of experience across a wide range of vehicle dynamics related topics."

K&C services include standard tests such as bounce, bounce-pitch, roll, longitudinal compliance, lateral compliance, aligning torque and steering. The company will also develop bespoke tests to meet specific R&D requirements.

The SPMM uses a moving centre table that manipulates a vehicle's body to generate the necessary movement and force to the suspension. This design means the ground plane (road) remains fixed when simulating vehicle cornering and braking to replicate on-road vehicle behaviour.

The measurement equipment connected to the vehicle's wheels remains relatively static.

Compared with traditional K&C systems, the travel being measured is an order of magnitude less and the loads being received to the cells are direct, resulting in accurate measurements.

The table is controlled in six degrees of freedom by electromechanical actuators, which enable a combination of roll, pitch, bounce and yaw to be applied to the vehicle body. As a closed-loop system, it requires no iteration to reach the desired drive commands.

The measurement data can be directly exported into CarSim, CarMaker and MathWorks.

Further developments are planned including the addition of a 3D coordinate measuring machine to calculate the exact coordinates of the pivot points as well as the locations of key components, such as inboard bushings and damper mountings.

These data are important to assess manufacturing tolerances on pre-production vehicles.

DRI will also offer high-resolution video synchronised with the test programme to playback and review any anomalies in the data.

K&C testing can be used to generate accurate digital vehicle models, benchmark competitor vehicles, monitor early series production vehicles and accelerate vehicle development sustainably.



SPMM test machine made by AB Dynamics

Bos licenses Tenstorrent cores

Bos Semiconductors, a South Korean start-up, is partnering Tenstorrent, a North American AI semiconductor firm, to develop SoCs for automobile part makers.

Bos will license Tenstorrent's AI Tensix core technology to incorporate into its automotive SoCs. Tensix cores are a key element of Tenstorrent's proprietary AI accelerator chips that are optimised for handling high performance workloads for complex features required for future mobility.

Combining Bos' expertise in automotive SoC design with Tenstorrent's AI technology should provide a foundation that both companies can build on together.



NXP's S32K3 automotive MCUs are ready for AWS cloud services

NXP integrates AWS into microcontrollers

Automotive OEMs will have the flexibility to build AWS cloud connectivity into their vehicles regardless of the vehicle architecture.

This follows NXP integrating Amazon Web Services (AWS) cloud into its S32K3 automotive microcontroller for body, zone control and electrification applications.

The end-to-end vehicle data offering now spans the S32K3, S32Z/E, S32G2 and S32G3 automotive processors, enabling new in-vehicle and secure cloud services.

Using Free RTOS libraries supporting AWS IoT Core, the S32K3 with integrated cloud connectivity can speed up the development time for software-defined vehicles (SDVs) to connect securely to the cloud and deliver vehicle data-driven insights and services and over-the-air (OTA) updates.

The software libraries also enable seamless connectivity between the S32K3 and devices running AWS Greengrass.

Access to and processing of real-time, vehicle-wide data with secure access to cloud services and machine learning can enable intelligent vehicles that continually improve with OTA updates. Car makers can gain insights into vehicle performance and health, driver behaviour, traffic patterns and more.

Similarly, consumers can benefit from the extended longevity of their vehicles and added features. Mobility businesses can exploit the streamlined cloud connectivity support to innovate and offer new applications. For example, the data collected and analysed can lead to revenue streams with services such as usage-based insurance.

In 2020, NXP announced its work with AWS that resulted in the integration of AWS IoT services with NXP's S32G vehicle network processor for service-oriented gateways. The S32 devices' software with AWS cloud supports a range of communication technologies, and can be used with wireless connectivity technologies such as 4G and 5G cellular and wifi.

Now S32K3 devices can connect directly to AWS cloud services or a more powerful S32G device using AWS cloud services such as AWS IoT Core, IoT Greengrass or IoT FleetWise.

Extending AWS connectivity to S32K3 gives OEMs the flexibility to build AWS cloud connectivity into their vehicles regardless of the vehicle architecture used and supports the vehicle architecture transition.

This includes architectures in which the S32K3 acts primarily as an end node or zonal controller and supplements an S32G vehicle network processor, as well as configurations with multiple S32K devices without an S32G processor, with at least one S32K3 acting as a gateway to access AWS cloud services.

The direct connection of the S32K3 devices to the cloud is suitable for smaller vehicles such as electric bicycles and scooters. Here, the S32K3 devices act as the aggregator or main controller.

- NXP has combined a digital instrument cluster and connectivity reference platform for mass-market two-wheelers, such as motorcycles, electric scooters and commuter bikes.

The platform combines the i.MX RT1170 crossover MCU with the integrated AW611 single-chip Wifi 6 and Bluetooth and Bluetooth Low Energy audio connectivity and the KW45 secure wireless access MCU.

SOFTWARE TOOLS

COMPILER VERIFICATION

Marcel Beemster discusses faster functional-safety compiler qualification with automated use-case analysis

Vehicle Electronics November 2023, 14

The compiler is a critical tool in the software development chain. It can also be somewhat enigmatic. The developer must place great trust in the conversion from human-readable source code into machine-ready object code.

The compiler can potentially introduce nonconforming behaviour in the programme, which may only become apparent after the software has been deployed.

This is clearly not satisfactory when developing safety-critical software. Functional-safety standards such as IEC 61508 that covers industrial applications and ISO 26262 in the automotive arena call for the compiler to be explicitly qualified for the intended application's use case.

The use case is important because the compiler needs to be specifically configured; the options specified change the generated object code. Fig.1 provides an example, showing the different ways a loop in source code can be transformed using different compiler optimisation levels.

Although popular test tools can ensure both code efficiency and correct behaviour are maintained, automotive safety standards require that the compiler is verified with the same configuration that is used for application development. Any changes to the use case are assumed to change the compiler behaviour and will therefore invalidate the qualification.

Compiler qualification is a laborious task that demands attention to detail and can impose harsh penalties for errors. Repeatedly reconfiguring and compulsorily re-qualifying the compiler invites unwanted extra labour and potential project delays, along with cost overrun. Hence, it is important to be precise about the use case.

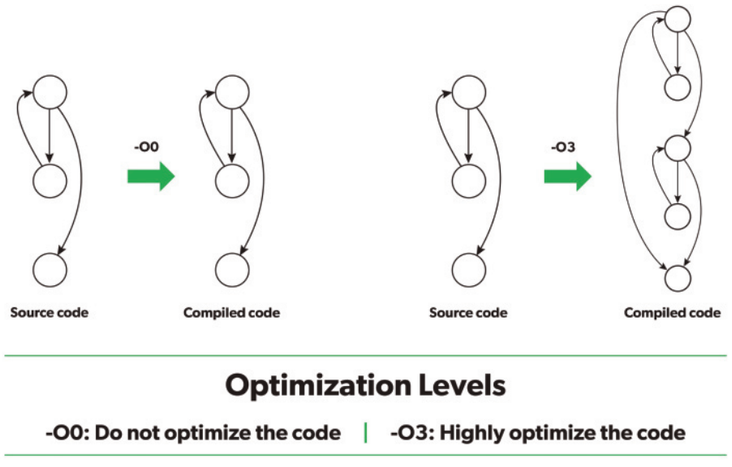


Fig. 1: Changing optimisation settings is not acceptable when developing safety-critical applications, despite maintaining code efficiency and correct behaviour

Ideally, the correct configuration should be identified at the beginning to avoid errors.

The first step in the qualification methodology is to analyse the use case and define the compiler requirements.

Next, tests must be selected to verify these requirements and then performed, and the results must then be analysed. The final stage is to prepare the documentation needed to satisfy the safety standard.

There is a learning curve associated with the methodology and the applicable tools. In addition, developers must consider overheads such as the costs of licensing test suites, interacting with certification bodies and dealing with any test failures.

Help

It can be smart for developers of safety-critical software to seek help from a partner company such as a supplier of safety embedded processors. Some can offer a compiler qualification kit that provides a proven methodology with resources such as test cases, tools for generating documentation and a framework for running validation tests.

If there is no qualification kit, using a compiler test and validation suite to verify the compiler or library for qualification can provide an alternative approach. Neither is easy, however.

The compiler configuration is defined according to numerous parameters. Even basic settings such as the compiler version and programming language version

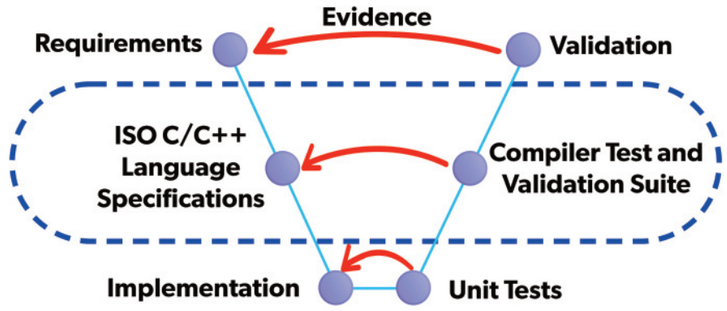


Fig. 2: The traceability overview report, depicted using the V-model, demonstrates the testing coverage achieved by the compiler test and validation suite, which in this case operates at the level of the compiler specification

are extremely important, as even a small change can have a large effect on compiler behaviour. Moreover, there can be many hundreds of option settings changing behaviour, analysis, optimisations, diagnostics and other effects. Additionally, diagnostics and other settings govern linking, treatment of headers and handling of output files.

Once these options are selected and the compiler is qualified, software developers can use only the qualified use case. Compilers are notoriously sensitive to configuration. The effects of a small change in one setting can be amplified as the compiler works through the multiple stages involved in generating object code from the input source code.

The smallest configuration change can have a significant impact on the generated code and invalidate the qualification. If a change is necessary, the compiler must be retested and requalified.

Use-case analysis is a critical aspect of qualifying a compiler and is especially complex for safety-critical applications. Great care is needed to ensure the compiler conforms to the required safety standard and will perform as expected. Selecting the right options at the beginning is critical for the project.

However, manually analysing the compiler use case and determining option settings is difficult, time consuming, and carries many risks. Getting expert assistance has usually been the best way forward. Until now.

New tools now entering the market permit automated use-case analysis, which relieves major risks and accelerates qualification. Additional benefits include greater repeatability and a reduction of manual steps.

Automated use-case analysis can be easy to use and lets developers perform their own use-case analyses independently and so qualify their compilers in-house. Moreover, automation now makes it feasible for any necessary updating of the compiler options, and subsequently retesting and re-qualifying with the new settings, to be included as part of the nightly build process.

This is a routine aspect of the continuous integration (CI) and continuous delivery (CD) pipeline that ensures the build includes all recent changes made by developers. The build system retrieves the latest code from the source-code repository to be compiled into executable software.

Regularly updating the compiler as a part of this process, to accommodate changes in chosen options and use cases, keeps the codebase compatible with the latest compiler version and so reduces the risk of compatibility issues.

Conclusion

As automating error-prone manual processes can help enhance the robustness and reliability of software for any purpose, it is extremely valuable in safety-critical applications. Automated use-case analysis could revolutionise functional-safety software development and remove many of the risks of errors and the potentially high costs and delays incurred to fix them.

It is a valuable step forward that significantly eases the challenge of ensuring compliance with functional-safety standards in the automotive and industrial markets.



Marcel Beemster is CTO at Solid Sands

RESEARCH & DEVELOPMENT



ACCELERATING CHANGE

Steve Rogerson visits Analog Devices' Catalyst research centre in Ireland

Vehicle Electronics November 2023, 18

Some eighteen months ago, Analog Devices (ADI) opened its Catalyst research and design accelerator, a 9200m² centre on its Limerick campus in Ireland. Out of the one third of the building so far used, the automotive industry has been one of the major occupiers.

The idea behind the centre is that companies can co-create with ADI on everything from smart buildings to factories, from robotics to healthcare, and, yes, automotive.

Such has been the interest that Mike Morrissey, Catalyst director, believes the two thirds so far unused will not stay idle for long.

"Catalyst has let us show the world how collaborative we are," he said. "This is an open door. We are expanding rapidly and we want to fill it out in the next nine to twelve months."



Mike Morrissey: "Catalyst has let us show the world how collaborative we are."



Martin Cotter: "Automotive is seeing a doubling of semiconductor content."

Afterwards, he said there were plans to open other catalysts around the world, starting probably in Japan.

"We thought we would have to go after customers and invite them in, but the opposite is happening," said Martin Cotter, ADI's president in Emea.

Much of the initial interest has come from the industrial and automotive sectors, with Johnson & Johnson and German firm Munich Electrification being two of the early entrants that ADI can name.

Batteries

Munich Electrification designs and produces automotive battery management systems (BMSs). It was founded in 2014 and has around 140 employees.

"Many companies are building their own batteries," said Stefan Goede, chief technology officer at Munich Electrification. "We design boards and we have a lot of software development in house, for tasks such as monitoring battery state of charge."

The first product it launched into production was its 400V Monaco BMS. It followed that in 2020 with the Bologna BMS for 800V passenger cars, trucks and coaches. The latest product is the Barcelona BMS that can be used in energy storage systems as well as vehicles.

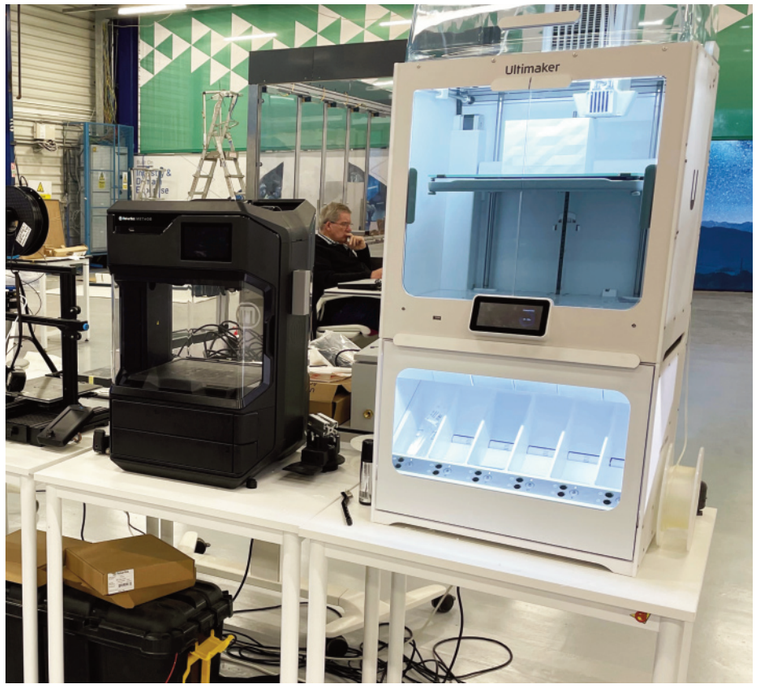
"There has been a jump to 800V and many are going to higher voltages," said Goede. "We are partnering with ADI to be at the top in BMS innovation."

ADI has a good track record with battery management and brought in extra technology when it acquired Linear Technology and Maxim. As such, its battery management technology is in seventeen million vehicles on the road today, including in sixteen of the top twenty electric vehicle makers.

"That is testament to the strength of the technology," said ADI marketing director Vincent Troy.

The interest from the automotive sector was no surprise to Cotter. "Automotive is seeing a doubling of semiconductor content," he said. And ADI corporate vice president Shalini Palmer added that forty per cent of the cost of an electric vehicle was the battery.

"So we have to bring more intelligence to create more efficient designs," she said. "In every area, we are going to need more intelligence."



Inside the Catalyst centre



Stefan Goede: "Every single cell has to be measured."



Vincent Troy: "Getting rid of the cable transforms manufacturing."

She said automotive was one of the drivers for moving this intelligence from the cloud to the edge.

"The challenge is latency," she said. "Pushing data to the cloud doesn't work with automotive. You can't afford to wait for the data to go to the cloud and be analysed. The data have to be dealt with at the edge. There is a big shift from the cloud to bringing intelligence to the edge. We are seeing it not just in vehicles but in every area."

She said adding wireless communications to BMS gave users a fast way to reconfigure what they had and look even deeper into the cells.

"Our customers are pushing us to the edge," she said. "That is where the data are born."

Troy added: "The future is the intelligent edge, so now we are advancing a lot to understand what is happening deep inside the battery. That is really important to what we are doing now."

Goede said in a lithium-ion battery, every cell was important.

"Every single cell has to be measured," he said. "We are using ADI's chipsets to build the boards that do that."

ADI can take the user's data at the Catalyst and prepare a prototype to evaluate their technology. This software can be ready within a day to produce an emulation of the battery.

Making the BMS wireless can lead to a massive reduction in weight, saving space and development time.

"And putting that cable in is a human job," said Troy. "It is virtually impossible for a robot to do it. Getting rid of the cable transforms manufacturing."



Shalini Palmer: "Our customers are pushing us to the edge."

Rather than use Bluetooth, as happens with some wireless battery management, ADI uses its own proprietary protocol. When an OEM or battery pack maker wants to design a product, ADI can help them do that.

The first step is doing a detailed RF analysis on the pack to see how well the signal propagates. ADI will then suggest small changes in the design to improve the RF performance.

General Motors is already using ADI's wireless battery management technology and some of the other OEMs are in the design stage. "We can't say how many," said Troy, "but we are being kept very busy."

Cabin

ADI is also very active in the vehicle cabin with technology for the likes of road noise cancellation, immersive 3D audio, automated driving modes and integrated digital cockpits. In doing this, it is embracing the move towards a more zonal architecture where the controller in each zone handles what is happening in that zone rather than having dedicated controllers for the audio, video, adas and so on.

"This is helping the move towards software-defined vehicles," said Andrew Lanfear, general manager for premium audio at ADI.

He said people were used to downloading apps for their phones and that is now being extended to downloading updates to vehicles.

"The car makers are looking at doing this to add more to the cars so they can have an ongoing revenue stream," said Lanfear.



Fionn Hurley: "It makes sense to extend Ethernet all the way to the edge."

The switch to electric vehicles is making road noise more noticeable. Thus, cancelling that noise is becoming more desired.

"To cancel the noise, you need to send a reverse of the noise that arrives at the ear at the same time as the original noise," said Lanfear. "Time sensitivity is critical. If you get that wrong, you can make the noise worse not better."

This is where ADI A^{2}B (automotive audio bus) technology comes in to play. This is already in vehicles from 35 OEMs around the world.

The company's GMSL (gigabit multimedia serial link) has the ability to connect multiple displays and cameras. And its E2B Ethernet to the edge bus is allowing the connection of everything by Ethernet, another step towards the software-defined vehicle.



Andrew Lanfear: "This is helping the move towards software-defined vehicles."

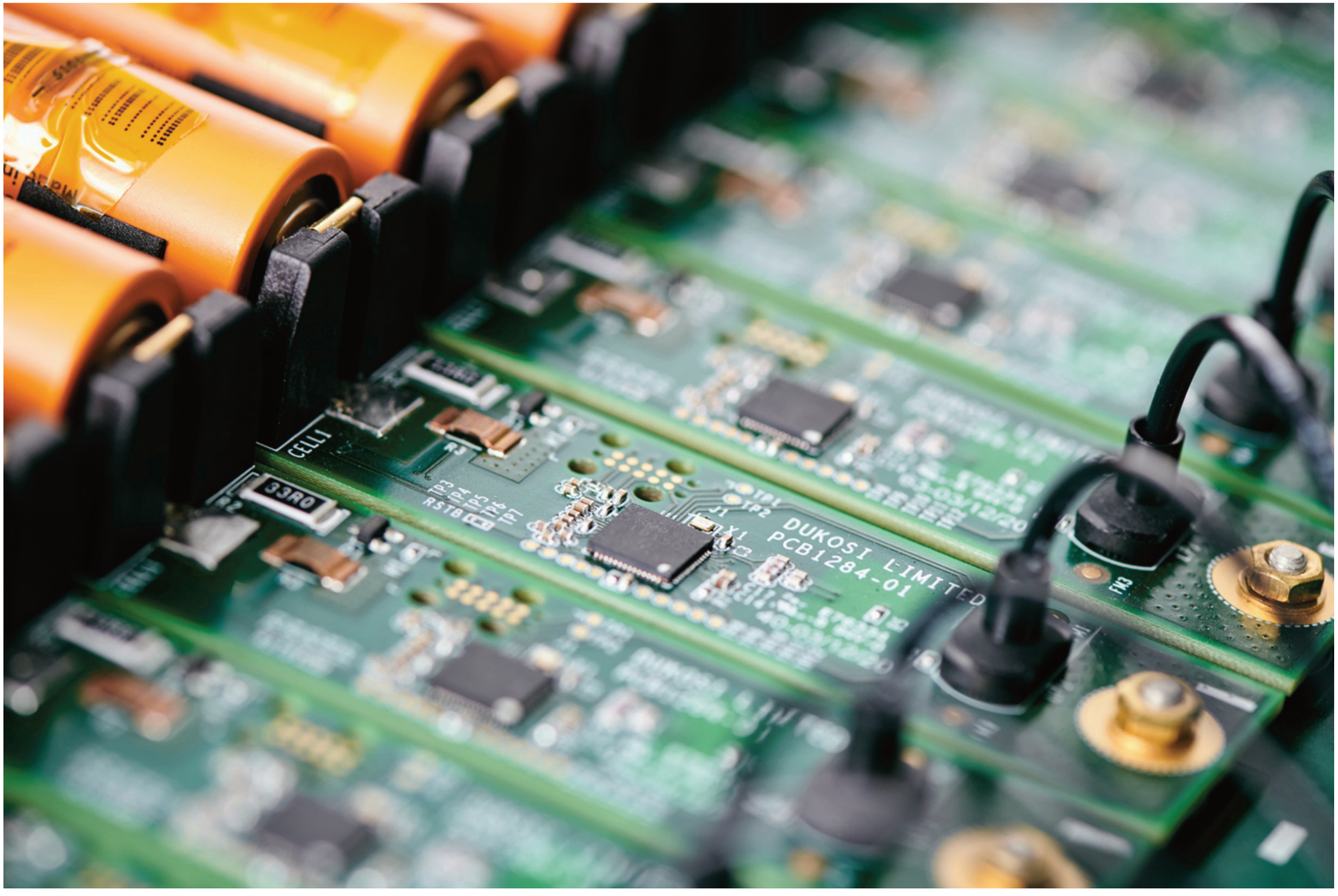
"We are working with OEMs that are looking to change their architecture by centralising their software," said Fionn Hurley for ADI. "With a zonal-based architecture, the goal is to reduce the number of controllers and the amount of cable in the car. This is why it makes sense to extend Ethernet all the way to the edge."

Conclusion

So that is Catalyst, a new resource for those that want to tap into ADI's knowledge and experience for designing automotive and other systems. With so much to do on the road to autonomous vehicles, no company can do it alone, and collaborative environments such as this could well be the way forward.

POWER TECHNOLOGIES

Steve Rogerson talks with Dukosi vice president Joseph Notaro about the firm's chip-on-cell technology



ROUND IN CIRCLES

Scottish firm Dukosi hopes to bring its chip-on-cell wireless battery monitoring technology to the automotive market within the next two years.

"We are already in discussions with automotive tier-ones and OEMs in all regions of the world," said vice president Joseph Notaro. "We have one OEM doing final validation. Others are doing evaluation."

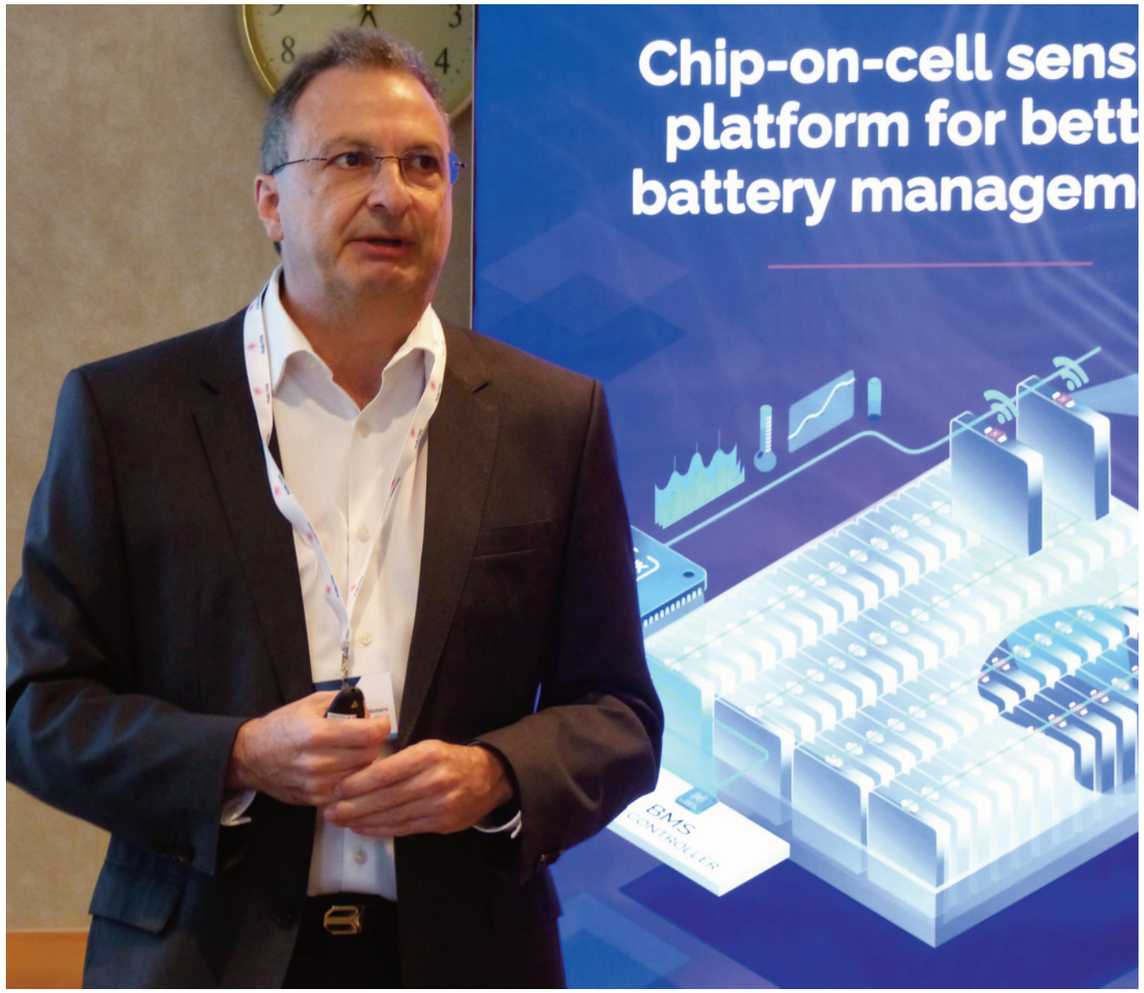
The chip-on-cell battery monitoring platform is enabling a circular economy by helping reduce, reuse and recycle throughout the battery value chain.

A key element is it uses near-field communications rather than far field, as seen in traditional wireless battery monitoring systems.

"With far field you have to propagate the signal through the air," said Notaro. "It requires a line of sight and there can be complications with reflections and dead spots. With near field, you can get very reliable communications within a small space."

Each cell will have the IC and antenna that can form a snake around a bank of cells.

It will send alerts to the battery monitoring system if it detects



Joseph Notaro: "There is a record of the lifetime of the cell."

something wrong.

With a chip on every cell, it continuously measures cell parameters, such as temperature and voltage. In addition, on-cell storage provides lifetime traceability with a unique ID, materials provenance and round-the-clock data and event logging from when the cell monitor IC is installed.

It does not make cell balancing decision, but leaves that to the battery management system, but will help implement the balancing.

Initial markets will be in energy storage and industrial transportation such as robotics and construction equipment.

Electric vehicles will follow within two years.

The IC helps provide safety and performance throughout the life of the battery from first life applications such as electric vehicles (EV) to second and third life use in energy storage systems to end of life and recycling.

During cell manufacturing, the IC captures provenance data and starts round-the-clock monitoring and lifetime data logging of the cell's voltage and temperature. The data are stored on the cell.

"This means there is a record of the lifetime of the cell on the cell itself," said Notaro.

For pack builders, the cell monitoring and lifetime event logging provides safer cell storage and transport, pack manufacturing and warehouse handling, and improved aging predictions.

This allows a flexible pack design and improved maintenance by simply replacing the cells not meeting requirements.

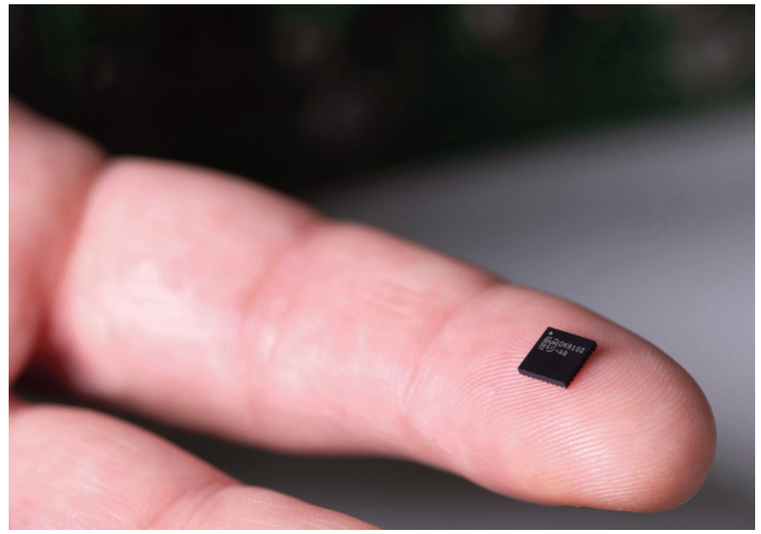
For OEMs and battery owners, more granular and accurate data stored on cell can provide improved battery safety and performance, warranty and liability protection, and better residual value assessment.

As provenance and lifetime data including event logging stay with the cell, battery use and safety can be improved in second and third life use, such as in in energy storage systems, to end of life and recycling.

Dukosi will move to volume production of the cell monitoring technology and contactless communications by the end of the year.

Silicon wafer fabrication is being carried out by GlobalFoundries in Singapore and packaging, assembly and testing by Amkor in the Philippines.

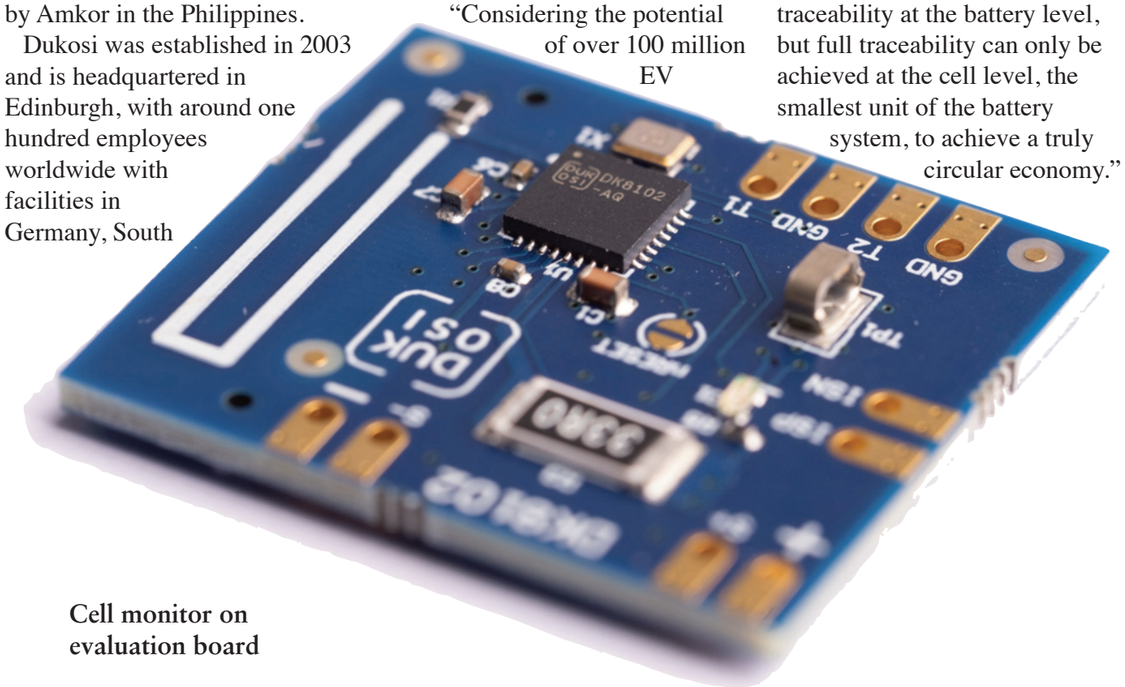
Dukosi was established in 2003 and is headquartered in Edinburgh, with around one hundred employees worldwide with facilities in Germany, South Korea and the USA..



Battery monitor IC

"Consumer adoption of electric vehicles continues to grow as the world moves towards greater electrification and transition to net-zero emissions," said Nat Edington, CEO of Dukosi.

"Considering the potential of over 100 million EV batteries coming to end of life in the next decade, designing batteries for sustainability is an economic, social and environmental imperative. We are already seeing adoption of regulatory requirements for traceability at the battery level, but full traceability can only be achieved at the cell level, the smallest unit of the battery system, to achieve a truly circular economy."



Cell monitor on evaluation board

TRANSPORTATION

DIGITISING LOGISTICS

Stephan Sieber asks how the logistics industry can unlock its true potential

Image by Pexels from Pixabay

Vehicle Electronics

Transportation serves as the lifeblood of today's modern economy, binding together businesses, streamlining supply chains and championing eco-friendly initiatives on the path to achieving net-zero emissions. However, it also harbours the potential to disrupt these pivotal strategies if they are not managed appropriately.

Nowadays, many industries have seamlessly embraced and thrived from incorporating digitisation into their businesses. However, transportation has seemingly lagged behind and it has been that way for some time. In fact, the lack of any meaningful evolution predates events such as the war in Ukraine, the energy crisis and even the pandemic.

Yet, these events have only highlighted the importance of seamless transportation to continue delivering goods globally. So why is it being neglected?

In the current landscape, numerous inefficiencies mar the transportation market. Idle assets, empty runs, static capacity, unwarranted waiting times and isolated operations cast a shadow on economic prosperity. In addition, the lack of investment in digitisation perpetuates administrative burdens such as manual labour overload, emotionally driven decision-making and a scarcity of actionable insights.

And compounding these issues is the looming ecological threat of untracked and unrestrained CO_2 emissions.

At both micro and macro levels, there is no denying that transportation appears sluggish in adapting to the demands of reality.

However, it's not all bad news, and there is an array of options available to help reverse this trend. For instance, synchronising transportation with the world by leveraging digital technology to usher in efficiencies that positively impact the economy, businesses and the environment can continue to thrive. This transformation of transportation hinges on three fundamental components – collaboration, automation and real-time insights.



Shippers and carriers should forge connections with one another (Image by Sabine from Pixabay)

Collaboration

Enterprises must unite and work stronger together to unlock operational benefits. For example, there's no reason for lorries to travel hundreds of empty kilometres when a similar truck, equipped for the task, is more than likely unloading nearby. It's time for shippers and carriers to forge connections with one another, establish common business standards, foster collaboration and embrace a platform that facilitates network-wide interoperability.

Connecting shippers, load recipients, service providers, brokers, forwarders and asset-based carriers is integral to creating a collaborative transportation community. By adhering to common standards and promoting interoperability, all stakeholders can uncover business opportunities while achieving economies in their operations. This spirit of collaboration will grant the transportation market the resilience and agility, both critical components.

Automation

Excel spreadsheets, manual searches, and endless route and rate browsing have become relics of the past. This inefficient administrative burden is burning through valuable resources and failing to deliver optimum outcomes.

Now is the time for enterprises to pivot from mere data collection and embark on the process of generating transactions with the data at their disposal. Automated, data-driven decision-making within a collaborative and interconnected network, leveraging historical patterns, real-time data and future predictions, will enhance transportation operations.

Real-time insights

Finally, in the logistics business, having real-time insights is vital to success. This allows the business to control multiple ongoing operations, whether that entails monitoring CO_2 emissions, accessing spot rates, evaluating capacity or receiving transport ETAs.

Equipped with these real-time insights and the ability to act upon them, logistics companies can anticipate future developments, swiftly address issues and assert control over operational efficiency.

The past two years witnessed a rush for outcomes at nearly any price, a trend likely driven by necessity rather than desire. Nevertheless, this approach threatens the industry's sustainability unless addressed.

In conclusion, synchronising transportation with the world requires a shift in approach and mindset, a challenge that spans the entire industry. It's clear that only through the implementation of digital tools, adoption of a culture of collaboration, automation of the decision-making processes, and the harnessing of real-time insights, can the necessary steps be taken in establishing the connectivity and interoperability required to bring logistics businesses together.

The time for change and digitisation is upon us and companies should look to modernise their infrastructure or risk getting left behind.



Stephan Sieber is CEO of Transporeon



Logistics businesses need real-time insights (Image by Sabine from Pixabay)

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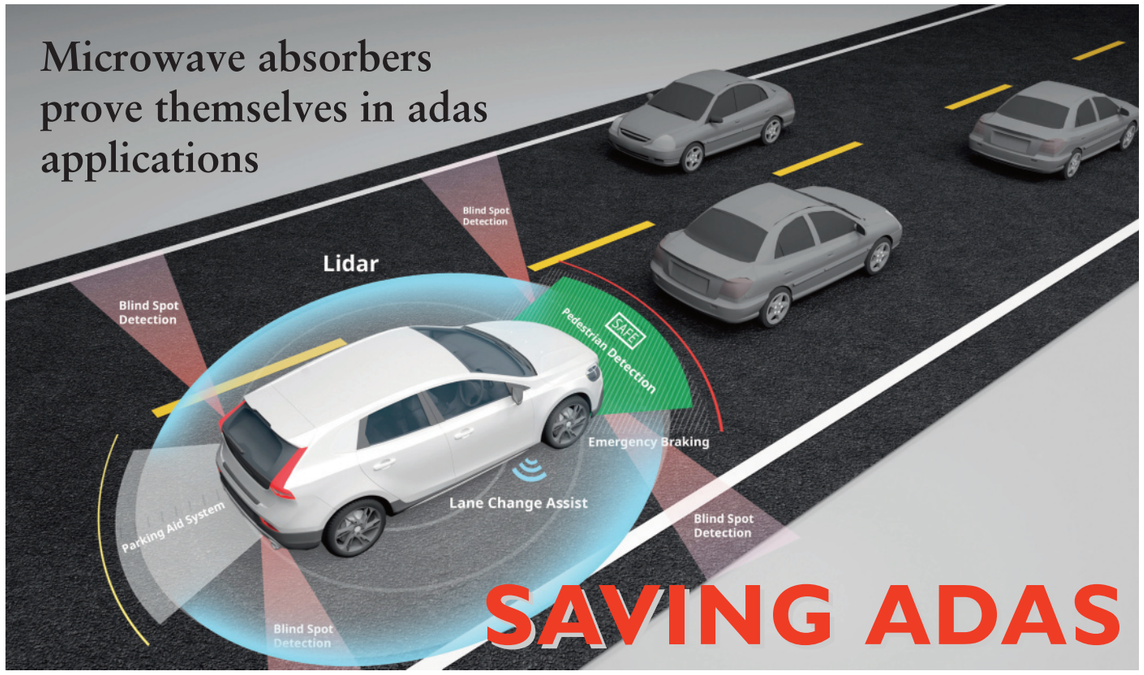
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Adas must work effectively 100% of the time, as any failure in blind-spot detection or adaptive cruise control could have tragic results. Meeting the performance and design demands, elastomer-based microwave absorber materials can absorb EMI radiation to ensure data integrity.

Process-essential adas components, such as lane-detection warning and back-up cameras, have become a critical element of driving. However, while this technology helps avoid accidents or lessens the severity of those that are impossible to avert, it also introduces several engineering problems.

Sensor and radar assemblies can experience severe EMI from surrounding electronics, as well as EMI radiation from the device itself. These effects can lead to data inaccuracies and compromise safety and reliability.

EMI shielding materials are a crucial component of ensuring these systems function properly every time, without fail. For example, Parker Hannifin's Chomerics Cho-Mute 9005 and 9025 can protect adas installations from EMI.

The materials must offer high performance characteristics and design flexibility, as requirements during development are frequently ambiguous and expansive; engineers should always anticipate a manufacturing modification. While there are various options for EMI protection, absorbers are suitable for the higher frequencies found typically in automotive devices.

Cho-Mute 9005 and 9025 elastomer-based microwave absorber materials present a user-friendly approach to the reduction of unwanted electromagnetic radiation from electronic equipment, while reducing cavity-to-cavity cross coupling and microwave cavity resonances.

Comprised of a silicone elastomer matrix with ferrous filler material, they provide RF absorption performance over a broadband frequency range from 500MHz to 18GHz.

The absorbers are suitable for use on top of EMI-radiating components or in cavities that house components causing EMI disturbances.

They provide automotive supply chain manufacturers with many customisation options, helping them meet engineering specifications. The materials are available in sheet stock of various thicknesses with or without pressure-sensitive adhesive.

Users can die-cut them for the empirical testing of absorption options or assembly into cavities.

Both materials have been tested and certified to the UL 94 V-0 flammability standard.

Package boost for n-channel mosfets

Two automotive grade 40V n-channel power mosfets are based on Toshiba's U-Mos IX-H process and use a new S-TOGL (small transistor outline gull-wing leads) package that offers advantages in automotive applications.

Automotive safety-critical applications such as steering, braking and autonomous driving systems generally require more devices than other systems to meet redundancy requirements.

Here, a power mosfet with high current density is required due to the size constraints within automotive equipment.

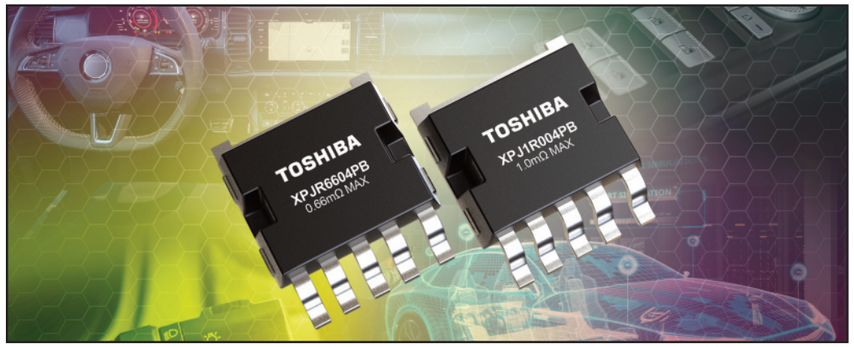
The XPJR6604PB and XPJ1R004PB have a V_{DSS} rating of 40V and continuous drain current of 200 and 160A, respectively.

Both devices are rated for pulsed current at three times this value, 600 and 480A, respectively.

The 200A rating is higher than that achieved by Toshiba's 6.5 by 9.5mm DPak+ package.

The S-TOGL package measures 7.0 by 8.44 by 2.3mm.

The products are postless and have a multi-pin structure for the source leads that decreases package resistance.



Combining the S-TOGL with the U-Mos IX-H process gives the XPJR6604PB an on-resistance of 0.66mΩ and the XPJ1R004PB 1.0mΩ, representing an around 11% reduction compared with Toshiba's existing TO-220SM(W) packaged TKR74F04PB.

The mounting area has reduced by around 55% while retaining the channel-to-case thermal resistance characteristics.

This is 0.4°C/W for the XPJR6604PB and 0.67°C/W for the XPJ1R-004PB.

The package uses gull-wing leads that reduce mounting stress, improving the reliability of the solder joint.

Suited to harsh temperature environments, the mosfets are AEC-Q101 qualified and capable of operating at channel temperatures as high as +175°C.

Toshiba offers matched shipments for the devices, in which the gate threshold voltage range does not exceed 0.4V for each reel. This facilitates designs with small characteristic variations for applications requiring parallel connectivity for high-current operation.

Mass production and shipments of the devices has started.

LDOs handle battery connections

Two low dropout (LDO) voltage regulators from Diodes have 300mA maximum output and 320mV dropout voltages.

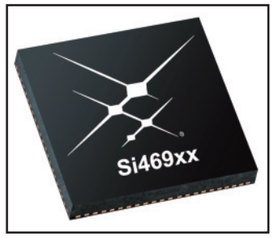
The AP7583AQ and AP7583Q are for battery-connected applications. They support the microelectronics hardware used in body control modules, in-vehicle networking transceivers, electric vehicle battery-management systems, exterior lighting infrastructure and instrumentation clusters.



The power-good indicator output on the AP7583AQ enables ongoing supply monitoring. It provides fault reporting capabilities and facilitates power sequencing.

Both devices come in fixed output 3.3 and 5V versions, as well as with adjustable outputs. They support an input voltage from 3 to 42V. This lets them support cold-cranking and handle load dumps.

Quiescent current is 3μA at light loads. They are AEC-Q100 grade-one qualified, manufactured in IATF 16949 certified facilities, and support PPAP documentation.



Digital radio

Automotive digital radio coprocessors from Skyworks combine integration, flexibility and cost.

They are designed to operate with the firm's Si479xx family of hybrid software-defined radio (SDR) tuners to achieve a complete digital radio receiver.

The Si469xx family can demodulate and decode up to four digital radio channels supporting HD Radio, Dab, Dab+, DRM for AM and FM, and CDR, for in-vehicle infotainment (IVI) systems.

They support maximal ratio combining (MRC) and seamless linking of digital radio, analogue radio and IP content. With its integrated customer-programmable MCU, the Si469xxC can reduce costs by eliminating the need for an external MCU and its support components.

Software design is simplified through improvements such as a demod and tuner manager that relieves system developers from having to programme low-level radio control functions.

Tyre sensor relies on MEMS

A tyre pressure monitoring sensor combines Infineon's automotive skills with its patented glass-silicon-glass MEMS sensor.

The Xensiv SP49 sensor integrates MEMS sensors and asic and provides features that enable tyre pressure monitoring.

It uses a 32bit Arm M0+ core, a large flash memory and ram, low-power monitoring (LPM), and optimised fast acceleration sensing.

The device is suitable for intelligent tyre functions such as on-tyre auto-position sensing, tyre inflation assistance, tyre blowout detection and load detection.

The pin-to-pin replacement for Infineon's SP40 TPMS products has a hardware master-slave I²C interface and software-simulated uart, SPI and PWM interfaces.

Suitable for sub-1GHz and scalable for Bluetooth LE TPMS, it is available at Asil A. The sensor offers high integration and is optimised to perform required functions to implement a modern TPMS module.

With its integrated microcontroller, sensors and peripherals, it requires a few passive components to form a complete TPMS sensor unit. The device is designed for low power consumption, making it suitable for battery-powered applications.

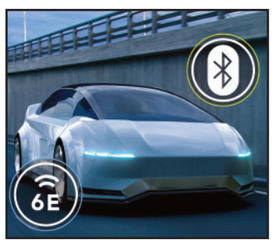
In addition to the ability to generate a wake-up from the integrated interval timer, the product is suitable for stand-alone remote pressure sensing that requires low power consumption. In these applications, the LF receiver with wake-up capability and sensitivity enables on-demand measurements.



Device enables wifi and Bluetooth

An automotive-qualified wireless connectivity device from NXP enables concurrent dual Wifi 6E and Bluetooth 5.3 connections.

The AW693 is protected by the firm's integrated Edgelock secure subsystem to deliver many secure connections in the car.



Targeting telematics and in-vehicle infotainment, it supports connectivity across multiple automotive platforms when combined with the firm's i.MX 8 and 9 series of applications processors.

This enables secure delivery of over-the-air software updates to deliver features and safety enhancements to software-defined vehicles. It also facilitates secure connections between various systems and mobile devices inside the car.

It has integrated 2.4GHz and 5-7GHz TX power amplifiers, RX low noise amplifiers, Tx/Rx switches and a full Bluetooth radio.

The EdgeLock secure subsystem supports hardware crypto-accelerated secure boot, key management, firmware authentication, secure life cycle management and anti-rollback protection.

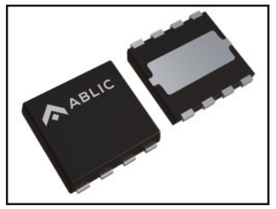
The device is AEC-Q100 grade-two compliant. It is part of a portfolio of wireless connectivity products that includes the AW692, AW690, AW611 and Q9098.

Manual reset improves detector safety

A window voltage detector from Ablic has a manual reset function that improves the safety of adas and autonomous driving systems

The S-191A has a typical 10μs response time from detection of an undervoltage or overvoltage anomaly to output, and is equipped with a manual reset function that enables diagnosis of non-safe IC faults.

Misinterpreting a voltage fault as normal voltage would be a non-safe fault for a voltage detector.



The product forcibly sets detection status in the IC when manual reset is enabled. This makes it possible to determine a failure that could lead to incorrect release is occurring when the output does not switch to detected and remains released when manual reset is enabled.

It is PPAP capable and planned for compliance with AEC-Q100 grade one.

Undervoltage and overvoltage detection can be set separately. This allows for more flexibility than with systems where detection voltage is set according to monitored voltage and vertically equalised window width.

The device is housed in an HSNT-8(1616)B package measuring1.6 by 1.6 by 0.41mm, making it 70% smaller than Ablic's conventional products.

Operating voltage is 2.5 to 6.0V.

Undervoltage detection voltage is 0.6 to 4.9V and overvoltage detection 0.7 to 5.5V. Accuracy for both is ±1.5%.

Current consumption is 1.5μA typical. Operating temperature is -40 to +125°C.

It is lead and halogen free.

Applications include voltage monitoring of automotive ECUs, adas and other systems that require failure detection.

Adhesive aids camera alignment

With Dualbond OB6799, Delo is launching an adhesive that has been optimised to meet the high optical requirements of modern driver assistance systems.

With it, the manufacturer says it is setting process speed and alignment accuracy standards for automotive cameras.

It is designed for bonding and active alignment of adas cameras. The epoxy adhesive has a linear curing shrinkage that is reproducibly below one per cent.

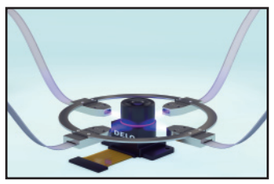
In addition, the product exhibits low swelling behaviour, even under changing temperature and humidity conditions, so camera focus remains optimally adjusted and can permanently fulfil its safety functions.

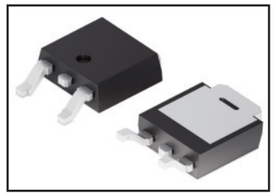
Since high-resolution cameras are primarily made of aluminium, the coefficient of thermal expansion was adapted to this material.

Application-relevant aging tests – for example +85°C/85% rh, 2000h – confirm the adhesive's bonding strength to aluminium substrates.

It is optimised for active alignment processes. Image sensor data are read to determine the optimal sensor alignment to optics.

Due to the adhesive's rapid light fixation, the aligned components are precisely fixed within a few seconds.





Power mosfet

An AEC-Q101-qualified PolarP p-channel power mosfet from Littelfuse is rated at 500V and 2A.

The IXTY2P50PA's qualification ensures the mosfet meets the automotive industry's quality and reliability standards.

It has low conduction loss and a maximum on-state resistance of 4.2Ω.

Reduced power dissipation decreases heat generation to boost efficiency in the end applications.

Switching performance sees a low gate charge of 11.9nC, allowing for fast and efficient operation.

With its dynamic dv/dt and avalanche rating, this mosfet can withstand harsh conditions and deliver reliable performance.

It enables a power-dense PCB design, thanks to its TO-252 DPak footprint in surface mount form factor.

Uses include automotive ECUs, sensor circuits, high-side switches, push-pull amplifiers, automatic test equipment and current regulators.

Busbar seal protects EV electronics

An impermeable rectangular busbar overmould from Freudenberg Sealing Technologies seals reliably and helps prevent damage to an electric vehicle's power electronics.

This also reduces assembly complexity by combining the busbars, seal and guide in one package that is ready for installation on the vehicle assembly line.

Oil-cooled electric motors are commonly employed in various electric vehicles. To maintain reliable vehicle operations, it is crucial to protect sensitive power electronics within the inverter from exposure to motor oil by sealing around the busbar motor-inverter interface.

However, achieving tight seals with busbars having rectangular geometries is difficult. Traditional busbars are die-cut from copper or aluminium sheets and then bent to the desired shape. The resulting rectangular busbar is not ideal for standard sealing, as the corners prevent effective compression of the sealing material.

Even attempts to enhance the contact surface with partially embossed edges or press-on structures do not yield satisfactory sealing results.

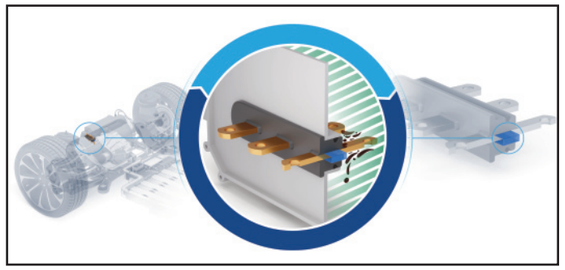
Post-processing methods such as potting can be used but are time-consuming and impractical for large-scale applications. They also require additional space, limiting busbar design flexibility.

The recently patented, sealed, rectangular busbar overmould includes an elastomeric layer that is applied to the rectangular busbar and bonds firmly with the metallic conductor and the surrounding plastic later in the manufacturing process.

The busbar seal configuration enables an impermeable bond to be created by chemically pre-treating the conductor surface with a primer and applying an elastomeric coating. This creates a firmly bonded intermediate layer, which is followed by thermoplastic injection moulding.

The elastic material should preferably be based on vulcanisable elastomers such as FKM, AEM, ACM, HNBR, NBR and EPDM, but thermoplastic elastomers (TPE) can also be used.

At the same time, the flexible coating reduces stress on the threshold between the copper and the thermoplastic matrix. The elastic coating reduces the notch effect at the conductor edges, which reduces the susceptibility of the electronic component to stress cracking.



3D magnetic position sensor

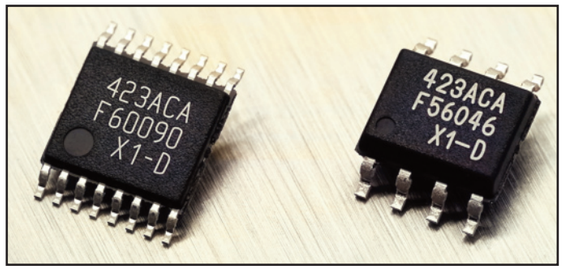
A 3D magnetic position sensor from Melexis blends accuracy for long strokes up to 30mm, stray field immunity (SFI) and ISO 26262 Asil-D integration.

It suits adas applications with space constraints, such as braking systems.

Incorporating the firm's Triaxis Hall technology, the MLX90423 is dedicated to linear displacement (absolute linear) up to 30mm where stray field rejection is needed.

It is a single die Asil C device; a dual die option supports up to Asil D.

The monolithic magnetic position processor IC consists of a magnetic front end, analogue-to-digital signal conditioner, DSP and a programmable output stage driver.



By sensing the three components of the magnetic flux density applied to the ICs (Bx, By and Bz), the device decodes the absolute position of a magnet moving linearly. This enables engineers to control applications such as brake rod travel, pedal position or park lock actuators.

It provides ratiometric analogue output, PWM output or Sent frames encoded according to a secure sensor format.

Piezo strain sensor improves touching

A piezoelectric strain sensor from UltraSense is designed to bring a better touch experience to automotive interfaces.

Automotive tier-suppliers are integrating TouchPoint Q to augment their solid-state capacitive touch systems for centre and overhead consoles, steering wheels, and door panels for an enhanced user experience.

Traditional capacitive touch systems have suffered from oversensitivity, causing false triggers, or from lack of sensitivity, creating a poor user experience.

TouchPoint Q solves the problems with its patented QuadForce architecture that uses a mems process to etch four microscopic strain sensors per chip into a piezoelectric film material applied to the surface of an asic processor wafer.

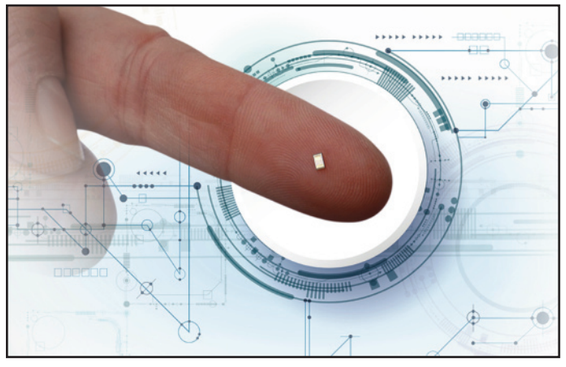
The strain sensors, using the piezoelectric effect and an inherent AC sensor, detect surface deflection down to the 100nm level.

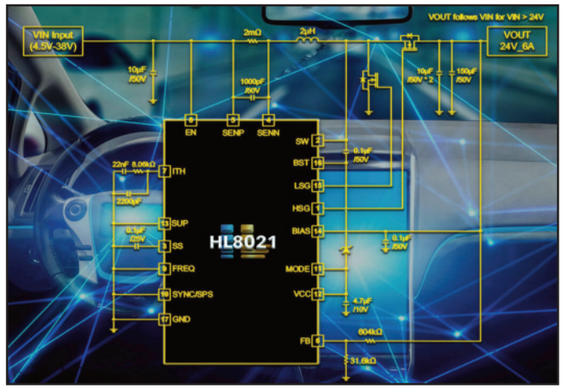
Placing one under a touch surface of one or more buttons produces a solid-state interface with no visual movement of the surface. There is no residual stress from manufacturing assembly or aging over time.

The sensor is immune to temperature sensitivities that can cause signal saturation. It needs a one-time system calibration in the manufacturing process, and allows a wider adhesive selection due to limited material thermal coefficient mismatch.

Accurate touch and gesture detection uses pattern recognition with machine learning.

Samples are shipping. Mass production has started to global tier-suppliers. It is available in a 3.0 by 3.0 by 0.6mm 24-pin QFN package.





Spread spectrum boost controller

An AEC-Q100 grade-one qualified low-IQ synchronous boost controller from Halo Microelectronics uses spread spectrum technology.

The HL8021 is a boost controller driving the n-channel mosfet synchronous boost power stage, operating from an input supply from 4.5 to 40V.

When the controller derives bias from the output voltage, it can operate from an input supply as low as 1V after start up.

The switching frequency can be programmed by a resistor on the frequency programming pin and its constant-frequency current mode control architecture allows the device to synchronise with an external clock on the external synchronisation input.

To optimise the light load efficiency, it has three distinct operation modes – burst mode, pulse skipping mode and continuous inductor current mode. These modes can be selected and controlled through the light load mode selection pin.

Spread spectrum operation reduces the peaks of the radiated and conducted EMI noise and makes it easier for the system to comply with EMI standards.

This operation mode is controlled by the spread spectrum selection pin.

A separate supply pin, the external supply input pin, is available to power the internal LDO that supplies to V_{CC}. This feature provides one more option to reduce power loss and improve overall efficiency.

It comes in a 16-pin 3 by 3mm QFN package and is suitable for automotive, industrial and telecommunication applications.

PMIC integrates Can-FD and Lin

An automotive power-management IC from ST Microelectronics' is said to have a Swiss army knife of features.

These include a main fixed-voltage low-drop-out regulator (LDO), secondary programmable LDO, four high-side drivers, a Can-FD transceiver and an optional Lin transceiver.

The SPSB081 IC provides multiple standby modes with low quiescent current and programmable local or remote wake-up to help reduce power consumption.

The power sources and transceivers available on-chip help simplify the design of car-body controllers for a sunroof, seats, tailgate, doors and lighting modules. Highlighting their adaptability, the controllers are also used in gateways, hvac controllers, passive keyless entry systems, telematic control units and control panels.

Variants include the SPSB081C3 and SPSB-081C5, which contain a 3.3 or 5V fixed LDO, respectively, with one Can transceiver. The SPSB-0813 and SPSB0815 contain the additional Lin transceiver.

The secondary LDO, included in all variants, can be programmed through the IC's SPI port to operate as an independent 3.3 or 5V regulator, or to track the main LDO. The four high-side drivers can source up to 140mA to power LEDs and sensors, with current monitoring and a 10bit PWM timer for each channel.



Built-in protection is provided, as well as a diagnostic output pin for fail-safe signalling.

These features support use in applications that must satisfy functional safety requirements to ISO 26262, even if not designed as a safety hardware element.

All outputs have overcurrent protection and open-load fault indication. The primary fixed LDO has overvoltage protection and thermal protection circuity, while the secondary programmable LDO has overload, overtemperature, short-circuit and reverse-bias protection. Both monitor short-to-ground at start-up and continuous regulator-failure.

The family is AEC-Q100 qualified, specified from -40 to +150°C, and can operate up to +175°C.

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