VEHICLE electronics

The monthly magazine for automotive electronics engineers

Cars drive innovation at Embedded World

The automotive industry is set to shine at this month's Embedded World in Nuremberg.

Leading the way is Mips, which will make a corporate announcement highlighting its commitment to application-specific compute powering physical AI for autonomous automotive.

Mips teased it would make a major Risc-V announcement.

NXP will announce its latest automotive MCUs, details of which it is keeping under wraps until the first morning of the show. However, it says it will discuss how important are wide-ranging zonal architecture implementations for software-defined vehicles, as well as problems car makers face such as ECU consolidation and the diverse needs of zonal locations.

Renesas will have several automotive demos, including one of a product to be announced shortly after the show. There will be a low-cost car computer, enabling infotainment and adas mixed-criticality applications on a single SoC.

Arm will explain how it is helping OEMs accelerate automotive development cycles and meet the growing needs for more electrification, greater autonomy and redefined driving experiences, and how it is accelerating AI for connected vehicles.

TrustInSoft says it will preview its support for the Rust programming language, plus news on the latest version of its Analyzer, including Autosar and cyber-security enhancements.

Göpel's developments for testing camera, display and video applications as well as for ECU testing and residual bus simulation in automotive will be on show.

LDRA, recently acquired by Tasking, will talk about advancements in worst-case-execution time and multi-core standards for high-reliability applications, especially in automotive and avionics.

Automotive is the big focus this year for Tuxera, which plans to share innovations around what it is doing in this industry.

• Embedded World runs from 11 to 13 March in Nuremberg.



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Tokyo taxis collect data for self-driving AI

Tokyo taxi company Nihon Kotsu is collecting driving data using taxis equipped with a data recording system (DRS) developed by Tier IV.

The aim of the project is to create generative AI to enhance the safety and ride quality of autonomous driving.

Large-scale data captured during taxi operations will be shared with partners to compile optimised datasets for autonomous driving AI, contributing to Japanese government initiatives to advance the deployment of level-four autonomous driving technologies.

Since 2018, Nihon Kotsu and Tier IV have conducted experimental data collection for autonomous driving, formalising their partnership in July 2024. Tier IV has also led a robotaxi proof of concept, integrating autonomous driving systems into vehicles and validating services such as ride-hailing apps, mapping technologies and operational support centres.

These efforts recently gained support from Japan's Ministry of Economy, Trade, & Industry under a subsidy programme to promote digital transformation in the mobility sector.

Tier IV's Co-MLOps platform builds datasets from large-scale driving data collected globally. By enabling efficient sharing of datasets among autonomous driving developers, the platform aims to accelerate AI innovation and overcome the problems often faced by individual companies working in isolation.

In this project, DRS-equipped taxis featuring sensors critical for autonomous driving AI development will collect data across Tokyo and those data will be shared with partners in automotive and beyond.

While previous data collection efforts relied on Tier IV test vehicles, Nihon Kotsu taxis are being used for this initiative, which started with five vehicles in February 2025, and will eventually increase to about 20.

Looking ahead, they will also conduct pilot tests to accelerate the roll-out of robotaxi services.

The companies plan to develop level-four-equipped autonomous vehicles and gradually introduce services in multiple regions, with a focus on Tokyo.

In the initial phase, robotaxi services will be tested under a mobility hub model, with drivers in the vehicles for safety.

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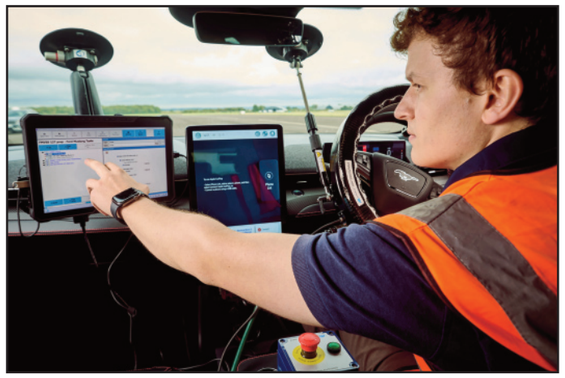


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AB reduces complexity for adas testing



AB automates testing for latest protocols

Automotive testing supplier AB Dynamics has added automation capabilities that help OEMs and test houses reduce the time and complexity of testing the latest adas protocols from Euro NCap and NHTSA.

The update to AB's Track Applications Suite expands its special groups library to include automation for Euro NCap's heavy-vehicle adas test scenarios and NHTSA's FMVSS 127 standard.

The pre-defined test scenario library, available within the robot controller application, automates the creation, set-up, variation, execution and verification of standard active safety protocols when combined with AB's driving robots, adas targets and other track test equipment.

"The introduction of new industry-standard test scenarios is good news for the continued improvement in road safety but it does place a significant resource burden on OEMs and test houses," said Andrew Pick, director of track testing at AB Dynamics. "Our latest update addresses this by automating complex calculations and synchronisation tasks that would otherwise demand hours of manual preparation."

The update adds 611 test scenarios, including 400 Euro NCap heavy vehicle tests and 211 tests to support FMVSS 127. This brings the total number of pre-defined, automated active safety test scenarios in the library, which also covers Euro NCap, China NCap, Japan NCap, NHTSA EU and UN test protocols, to more than 3100.

Euro NCap's heavy vehicle adas test programme includes the heavy goods bicycle nearside turn across path. It requires the vehicle to be driven at a consistent speed to a precise path cutting across the bicycle target.

AB's software simplifies the synchronisation and ensures consistent repeatable results.

The heavy vehicle protocol also includes sensitivity scenarios, which aim to assess the robustness of a vehicle's adas in more non-ideal situations to ensure they perform well in the real world, not just in test conditions. They require accurate and precisely timed steering inputs before the vehicle's AEB is activated. Steering inputs and timings are automatically calculated.

NHTSA's FMVSS 127 is a regulation mandating that passenger vehicles and lorries in the USA must be fitted with AEB as standard by 2029. This regulation has the highest speed requirements in the industry at 145kmph. During testing, this presents a heightened risk of test vehicle or equipment damage.

AB's software mitigates this by incorporating customisable abort procedures, which stop tests automatically when specific triggers are met, helping prevent or mitigate collisions.

AB's post processor software provides real-time, trackside results within minutes of test completion. This helps test engineers optimise test programmes and adjust sensor systems based on actual performance data while in the field.

Further enhancements include a network that allows large fleets of AB test equipment to be updated in bulk.

Pioneer opens R&D centre in Germany

Pioneer has opened an R&D centre in Wetzlar, Hessen, Germany.

Pioneer has stepped up efforts to develop products to make mobility safer, smarter and more comfortable for drivers.

The new facility is focused on developing sound products for European automakers. The R&D team aims to develop value-added auto sound systems tailored to European drivers.

The group is expanding its global network of R&D, engineering and sales operations as it tries to provide mobility experiences in collaboration with automakers, tier-one suppliers and retailers.

STM and HighTec aim to make SDVs safer

ST Microelectronics and HighTec EDV-Systeme are collaborating to make software-defined vehicles (SDVs) safer.

STM's Stellar MCUs, certified to ISO 26262 Asil D, are now supported with the same safety level by HighTec's Rust compiler.

The aim is to accelerate the development of safety-critical systems to make SDVs safer and more affordable.

Rust is gaining momentum in the automotive industry for its strong safety and reliability features.

"Software-defined principles are transforming vehicle design and ownership experiences, replacing traditional hardwired ECUs," said STM's Davide Santo. "This is the future for vehicles with any type of powertrain, letting automakers easily differentiate their product ranges and dynamically update vehicle features. The collaboration with our longstanding partner HighTec, ensures automotive manufacturers can leverage the power of Rust while meeting the highest safety standards in the industry."

Mario Cupelli, CTO at HighTec, added: "Our engineers created the industry's first software compiler to support Rust, the modern safety-ready programming language, and achieve qualification to the highest level of the automotive functional-safety standard, ISO 26262 Asil D. STM's Stellar automotive microcontrollers are the first 28nm components certified according to ISO 26262 Asil D. This makes them a natural fit with our compiler."

The integration of the Asil-D qualified Rust compiler into the Stellar MCU family should accelerate the development of safety-critical systems, reducing time to market while maintaining compliance with automotive safety requirements.

Rust contains provisions to protect the safety of memory, process threads and data types.

Alef releases flying car video



Brave, confident or both, Jim Dukhovny, CEO of Alef Aeronautics, gets close to his firm's flying car during a recent test in California. The company says it has now conducted a flight test in a city environment.

Alef has released the video of the test, showing it driving and vertically taking off. The test was conducted with safety measures, ensuring the road was closed during the flight, no people were under or near the flight path, the area around was not densely populated, and all safety equipment and personnel were present. The test was completed without any safety issues.

A special ultralight version of the Alef Model Zero was used. In the past year, Alef achieved a reduction in weight and enhancements in structural integrity.

"This drive and flight test represents an important proof of technology in a real-world city environment," said Dukhovny. "We hope it will be a moment similar to the Wright Brothers' Kitty Hawk film, proving to humanity that new transportation is possible."

Alef's flying car is 100% electric, drivable on public roads, and has vertical takeoff and landing capabilities.

Troubled Manz sells German factory to Tesla

Tesla is buying parts of bankrupt German engineering and electronics group Manz in a move that could save more than 300 jobs.

Insolvency proceedings for Manz started in February in Stuttgart after the company announced it was no longer possible to maintain the business.

Tesla will take over the firm's Reutlingen site for an undisclosed amount. About 100 jobs will not transfer to Tesla and be lost.

"We are gaining qualified employees with a high level of expertise in high-tech mechanical engineering," said Lothar Thommes, managing director at Tesla Automation. "The Reutlingen site is an ideal complement to the continued successful implementation of our global automation projects in the Tesla group. We are very pleased to be realising future innovations there."

Tesla Automation is a subsidiary of electric vehicle maker Tesla and already runs three sites in Germany.

Insolvency administrator Martin Mucha said: "We are pleased to have successfully concluded the negotiations with Tesla, to have saved many jobs and thus to have enabled the employees to have a professional future in what is probably the best-known automotive group in the field of electric mobility."

Manz announced in January that it would extend the sales process to all business units. The economically independent subsidiaries and other holdings of Manz that continue to operate in the market are also to be sold.

"The structured sales process for the further assets is being driven forward with the highest priority in a very challenging market environment," said Mucha. "We are currently holding promising talks with several interested parties."

Bridgestone tests tyres with VI-Grade simulator

Bridgestone is installing a VI-Grade dynamic driving simulator at its R&D centre near Rome, Italy, enhancing its virtual tyre development capabilities and enabling a more sustainable and efficient approach to tyre innovation.

With this investment, Bridgestone aims to scale up its ability to design, test and validate tyres virtually using simulation and AI technologies.

By combining VI-Grade's high-fidelity simulator with its existing simulation and AI technologies, Bridgestone can simulate complex tyre-to-vehicle interactions adopting a fully virtualised process.

This approach can accelerate time to market, save physical prototypes and improve collaboration with OEMs by enabling simultaneous tyre and vehicle development through iterative virtual testing.

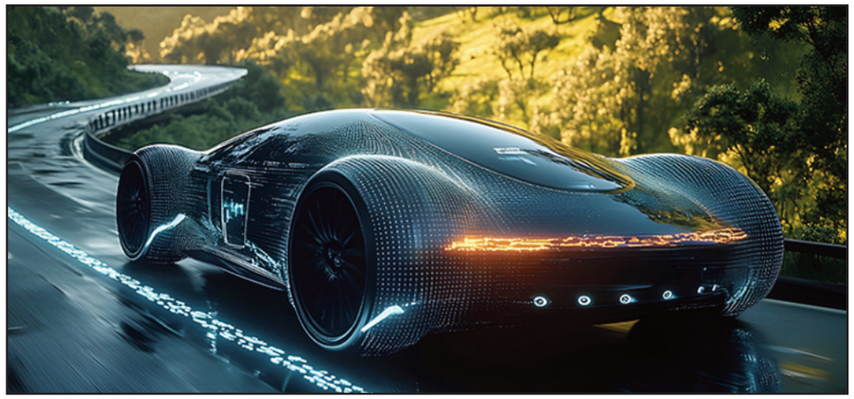


Bridgestone adopts VI-Grade dynamic simulator

Additionally, the simulator will help Bridgestone achieve sustainability goals by reducing physical testing and material waste. The company projects that up to 12,000 experimental tyres will be saved annually, contributing to a reduction in CO_2 emissions and raw material consumption.

"This investment in our internal driver-in-the-loop simulation capabilities is a major milestone as we build a comprehensive ecosystem for accurately predicting tyre performance in the virtual world," said Emilio Tiberio, chief technology officer at Bridgestone. "It also gives us the capabilities to experiment with new and innovative combinations of designs and materials in a fully virtual environment."

Guido Bairati, managing director at VI-Grade, added: "Widely recognised as the industry standard and used extensively by OEMs and tier-one suppliers worldwide, our state-of-the-art dynamic driving simulator is the perfect tool for Bridgestone to enhance its virtual tyre development capabilities, reduce time to market and achieve its ambitious sustainability goals."


Qualcomm and Qorix target integration at software-defined vehicles

Qualcomm puts Qorix middleware into SoCs

Qorix, a provider of modular and integrated automotive middleware, is cooperating with Qualcomm to help drive the future of software-defined vehicles (SDVs).

The goal is to help OEMs and tier-one suppliers develop vehicles quickly and efficiently.

Through the technology cooperation, Qorix's middleware will be integrated on Qualcomm's Snapdragon Digital Chassis, which includes the Snapdragon Ride and Cockpit platforms.

The technology cooperation is focused on addressing critical integration difficulties in system development by leveraging their respective strengths in systems-on-chip (SoCs) and middleware.

The integration of Qorix's middleware on Snapdragon Cockpit and Ride platforms is aimed at enabling high-performance scalability. Pre-integrated SoCs can help reduce the integration difficulties for OEMs and tier-one suppliers, lowering complexity and accelerating development timelines.

The technology collaboration is designed to support the transition to SDVs with optimised performance, long-term adaptability and robust system capabilities.

"Our alliance with Qorix solidifies our commitment to innovation in the automotive industry," said Laxmi Rayapudi from Qualcomm.

This technology cooperation is designed to provide automotive OEMs and tier-one suppliers with integrated hardware and software stacks that are scalable and supported by the combined expertise of Qorix and Qualcomm. This ready-to-use platform is designed to enable seamless progression from proof-of-concept to series production, accelerating development timelines.

Users should benefit from a unified ecosystem where Qualcomm delivers hardware and Qorix provides middleware expertise.

The collaboration aims to bring verified, pre-integrated products that simplify development and enable faster deployment of automotive systems.

Qorix middleware is designed to enable abstractions for application development, deterministic behaviour and mixed criticality, and includes functional safety and security.

"Our collaboration with Qualcomm represents a significant step forward in addressing the growing complexity of automotive systems," said Markus Schupfner, CEO at Qorix. "Together, we are redefining possibilities for next-generation vehicles by integrating cutting-edge middleware and hardware technologies."

Mouser helps engineers with online resource centre

Distributor Mouser Electronics is helping engineers with an online automotive resource centre to equip engineers with the tools to design applications as the industry undergoes a rapid transformation, driven by technological advancements such as reaching SAE level three.

The automotive content hub is a one-stop source for engineers. It has articles, blogs, ebooks and products from Mouser's technical team and manufacturing partners.

For simple navigation, the hub is separated into sub-sections, including EV and HEV, autonomy, infotainment, and engine and drivetrain. Plus, there are articles on innovations in commercial vehicles and lorries, with choices from autonomous trucks to drones.

Intron and eSol aid SDV development in China

Real-time embedded software developer eSol is working with automotive electronics provider Intron Technology to realise software-defined vehicles (SDVs) in China.

ESol supplies rtos products that offer safety and scalability together with development tools.

This partnership will make these eSol products available to Chinese customers and automotive OEMs as part of Intron's automotive electronics, backed by technical support and other services.

The goal is to encourage innovation and the establishment of an application ecosystem for automotive software in China, fostering the development of SDVs.

ESol provides the automotive industry with scalable embedded software, technical support and services covering the entire development cycle from concept to design, specification and engineering.

This full-stack engineering ensures support for the development of SDVs by simplifying the development process, building a stable and open electrical and electronic architecture, and improving development quality.

Intron has built a service platform for the automotive electronics industry in China that integrates upstream and downstream ecological resources based on the philosophy of openness and innovation, collaboration and inclusiveness, and value co-creation.

It has also established an interconnected and collaborative industrial ecosystem with international suppliers and tech companies involved in components, embedded software and toolchains. This facilitates the integration of software and hardware in the automotive electronics industry.

By focusing on intelligent driving software, toolchains and embedded system platforms, the partners hope to promote the development of applications and the establishment of an industrial software ecosystem.

This will include working together to address the fast-growing market opportunities in China's automotive industry for EVs and other new energy vehicles.

"It is no exaggeration to say that the Chinese automotive market leads the world in EVs and autonomous driving, and that its technologies in these fields are at the forefront globally," said Masaki Gondo, CTO at eSol.



DeepRoute is providing AI for Smart vehicles

Smart goes smart with DeepRoute partnership

AI company DeepRoute is working with car maker Smart to develop end-to-end models and application in the field of intelligent driving.

With the latest intelligent driving technology, the vehicle will be capable of handling complex scenarios, including parking-to-parking, roundabouts and missing lane markings.

DeepRoute's AI technology is gaining traction, with over 30,000 vehicles already equipped with its DeepRoute IO intelligent driving platform in just four months. This number is expected to surge to 200,000 this year, as more than ten vehicle models are in progress.

The collaboration with Smart will enhance training and algorithm validation, optimising the technology for smoother and more reliable driving across diverse scenarios in various countries.

Smart operates in 31 countries and regions.

"Smart is actively enhancing the R&D of intelligent driving technologies, aiming to strengthen our position in the AI era," said Yang Jun, CTO of Smart. "DeepRoute has been a pioneer in autonomous driving and frontier technology development. We believe this partnership will bring better, safer and more effortless driving experiences."

Chinese firm DeepRoute.ai is an artificial intelligence company dedicated to the research, development and application of smart driving.

"This partnership is significant as it enables us to expedite the development of latest intelligent driving technology while accelerating overseas road testing and deployment," said Maxwell Zhou, CEO at DeepRoute.

Nino Romano takes over as CTO of Continental's automotive group

Continental's automotive group, already in the process of becoming an independent listed company, has appointed its former head of quality and operations, Nino Romano, as chief technology officer.

"With his extensive experience and expertise, Nino Romano is the ideal person to merge the key areas of technology and operations as CTO," said Philipp von Hirschheydt, head of Continental's automotive group. "This will not only create additional added value for our customers and investors as we prepare for independence, but will also enable us to drive innovation even more efficiently and effectively."

Romano has worked at Continental since 1993 and has developed an extensive knowledge of research, development and quality management over his career.

After holding various positions in research and development and as director of the customer centre, he took over as head of development for electronic brake systems in the vehicle dynamics business in 2011.

Romano has been a member of the automotive management board since 2020, initially as head of quality and environment and, since 2024, as head of quality and operations.

He takes over the position of CTO from Gilles Mabire, who left the company at his own request last year. In his new role, Romano will be responsible for key areas of technology and operations. The quality area will in the future be organised as an independent function within automotive.

"I am grateful for the trust placed in me and look forward to the challenge of developing automotive's business as an independent company and supporting the entire product life cycle through technology and innovation, from initial idea to production," said Romano.

The automotive group employs around 96,000 people and generated sales of around €20.3bn in 2023.



Nino Romano, Continental CTO

Dirac and Black Sesame sign digital audio MoU

Dirac is trying to integrate its digital audio software onto Black Sesame's automotive-grade SoCs.

Swedish digital audio pioneer Dirac and Hong Kong-based Black Sesame Technologies have signed a memorandum of understanding (MoU) to explore the integration.

The demand for premium, immersive in-car audio is growing exponentially as more consumers expect the same audio experience in their cars as they enjoy in home listening environments.

Dirac is building software-defined automotive audio by developing technologies that enable speakers to work in unison to increase fidelity and create a clear, fully-immersive sound experience for every occupant.

Dirac has accelerated its automotive industry growth through partnerships with semiconductor and framework companies such as NXP, Analog Devices and QNX.

Black Sesame's proprietary automotive-grade products and technologies empower intelligent vehicles with mission-critical capabilities, such as autonomous driving, smart cockpit, imaging and interconnection. It offers full-stack autonomous driving capabilities through SoCs powered by its in-house developed IP cores, algorithms and support software.

This is the company's first MoU with a digital audio company.

SkyWater buys Infineon fab in Texas

US semiconductor manufacturer SkyWater Technology has bought Infineon's 200mm fab in Austin, Texas, and a corresponding long-term supply agreement.

SkyWater will operate the fab as a foundry, increasing available capacity in the USA for foundational chips on nodes from 130 to 65nm that are critical for many industrial, automotive and military applications.

The fab will also increase SkyWater's scale as a foundry and provide additional capabilities such as 65nm infrastructure, expanded copper processing scale and high-voltage bipolar-cmos-dmos (BCD) technology.

The long-term supply agreement will enable Infineon to maintain a scalable manufacturing footprint in the USA.

Infineon and SkyWater believe this will enhance the long-term viability and use of the fab.

The transaction also affirms the long-term perspective for nearly 1000 manufacturing jobs, since all employees at the fab will become SkyWater employees as part of the agreement.

SkyWater believes the transaction will allow it to realise significant economies of scale, bring high-value manufacturing services to its customers and support dual sourcing strategies for critical industries.

It plans to transition the fab's business model from integrated device manufacturer to foundry.

"The transaction fully aligns with Infineon's manufacturing strategy to create synergies with strategic foundry partners when in-house manufacturing does not offer competitive advantages," said Alexander Gorski, executive vice president at Infineon. "The partnership with SkyWater creates mutual benefits and synergies, supports our profitable growth and provides us with a strong and trusted foundry partner, thereby safeguarding our long-term supply base in the USA."



Austin fab will move from Infineon to SkyWater

TrustInSoft and Ferrous integrate support for Rust

TrustInSoft is integrating support for Rust code analysis using Ferrocene, Ferrous' qualified Rust compiler toolchain.

This brings together TrustInSoft's expertise in mathematical software verification with Ferrous' knowledge of Rust to help organisations enhance the security and reliability of their software.



Benjamin Monate

Memory safety vulnerabilities remain a cybersecurity problem, in industries such as automotive, aerospace, telecoms, IoT and medical.

Recognising this, the Cybersecurity & Infrastructure Security Agency (CISA) released revised guidance in January urging software vendors to eliminate memory safety risks by 2026.

While Rust's ownership model and borrow checker provide a compelling option for memory safety, many organisations continue to rely on C and C++ due to a historic lack of safer alternatives with comparable performance. This partnership is designed to help companies transition to more secure software development practices, whether they are modernising existing codebases or developing new applications.

"Security and reliability are fundamental in software development, but achieving them requires more than just choosing a memory-safe language," said Benjamin Monate, CTO of TrustInSoft.

Kia integrates SmartThings into vehicles

Kia is integrating Samsung SmartThings Pro into its Platform Beyond Vehicles (PBVs) offerings to enable automated connectivity between vehicles and business spaces.

This integration allows B2B users to configure business routines, activating the appropriate routine based on the destination entered in the PBV's in-vehicle infotainment (IVI).

This allows for seamless and secure management and monitoring of external business operations, even while on the road.

Kia and Samsung have signed a memorandum of understanding to redefine the in-vehicle and out-of-vehicle experience for PBV customers.

The collaboration aligns with Kia's strategy to expand the role of PBVs beyond transportation into customised business options that can be integrated into broader digital ecosystems.

"We anticipate that our business collaboration with Samsung, leveraging its AI B2B SmartThings Pro, will extend the vehicle user experience for our business customers beyond PBVs into the broader IoT ecosystem," said Sangdae Kim, head of Kia's PBV division.

The integration will enable wireless control of connected devices and technologies through a plug-and-play service, allowing businesses to integrate and manage IoT-enabled appliances without complex installations, simply by attaching a smart connector.

"By integrating SmartThings Pro into Kia PBV, we plan to present an intelligent new way for businesses to be connected to their customers," said Chanwoo Park, executive vice president at Samsung Electronics.

Kia and Samsung plan to develop specialised IoT offerings tailored to the unique needs of PBV businesses across various industries.

The two companies will first launch pilot services for small business owners and self-employed users as part of this partnership.

Moving forward, they will work on developing IoT products specifically for PBVs and bundles tailored to the needs of B2B clients.

They aim to create business models and extend their services to B2B customers globally.



SmartThings will enable monitoring and control

LDRA and Dassault simplify software verification

LDRA has partnered Dassault Systèmes to simplify verification and certification of safety and security-critical software.

The LDRA TBManager integration package integrates into Dassault's No Magic Teamwork Cloud, extending model-based systems engineering and enabling engineers to achieve the low-level and high-level software requirements-based testing that is mandatory for compliance with functional safety standards across aerospace, defence, space and automotive markets.

Traditionally, modelling systems, software and hardware architectures and behaviour are spread across disconnected tools and documents. These disparate systems made it difficult to trace from requirements into models, to source code and to verification activities and artefacts.

Complicating matters was the inability to perform comprehensive impact analysis of requirements changes, model changes or code changes on the entire process.

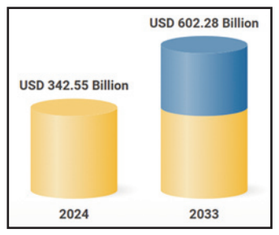
"Integrating our LDRA tool suite into the Dassault No Magic Teamwork Cloud solves the complex problem of system change management and impact analysis by automatically and bi-directionally linking requirements, models, code, tests and the resulting artefacts," said Ian Hennell, operations director at LDRA. "By extending the digital thread between software artefacts and software certification, any changes in the process or assets are easily traced and managed both upstream and downstream. This intelligent automation results in dramatic cost savings versus traditional disconnected activities and the manual production of development and testing artefacts."

Automotive electronics set for 5.8% CAGR

The global automotive electronics market will exhibit a CAGR of 5.8% from 2025 to 2033, according to Research & Markets.

The market was valued at $342.5bn in 2024, and is forecast to reach $602.3bn by 2033.

Asia Pacific dominates the market, holding a market share of over 41.7% in 2024. The escalating demand for advanced safety features in automobiles, the transition to electric and hybrid vehicles, and the proliferation of connected vehicles and the IoT are primarily driving the market growth.



Automotive electronics market

The market is influenced by increasing consumer demand for safety features, such as collision avoidance systems and autonomous emergency braking, and the growing adoption of electric and hybrid vehicles.

Additionally, government regulations focusing on emissions reduction and vehicle efficiency are pushing automotive manufacturers to implement electronics for better compliance.

Furthermore, the rise of AI and machine learning (ML) is enhancing features such as adaptive cruise control and driver assistance.

Burgeoning investments in user interface technologies and personalised in-car entertainment and inflating consumer expenditure power are contributing to the growth.

The rise in autonomous driving technologies has spurred demand for sensors such as lidar, radar and cameras.

The transition to electric and hybrid vehicles is boosting the current carrying devices segment, comprising wiring and connectors for efficient energy flow. The growing demand for cleaner and more sustainable transport supports this growth.

OEMs are maintaining strong relationships with component suppliers, facilitating access to the latest technologies and enabling efficient procurement. Brand reputation plays a crucial role, and consumers often associate quality and innovation with OEM-fitted electronics.

Infotainment's prominence in the automotive electronics market is due to changing consumer preferences that demand a seamless blend of entertainment, connectivity and navigation.

Features such as real-time navigation and over-the-air updates are playing a vital role in enhancing the driving experience.

Rapid adoption of EVs in countries such as China is propelling the demand for EV-specific electronics, including battery management systems and power electronics.

Supportive government policies and investments in R&D contribute to technological innovations, solidifying Asia Pacific's position as a global hub for automotive electronics.

Cognizant integrates Elektrobit Autosar to speed SDV development

Cognizant and Elektrobit are collaborating to accelerate software-defined vehicle development.

Cognizant's accelerator powered by Elektrobit's Adaptive Autosar is designed to meet increasing demands by accelerating SDV development cycles.

Elektrobit's software development kit (SDK) for EB Corbos AdaptiveCore has been integrated into Cognizant's SDV accelerator. This helps OEMs and tier-one suppliers create scalable, flexible, and cost-efficient SDV architectures.

Cognizant's SDV accelerator built with genAI elements helps automotive companies speed product development and testing, improve quality, and reduce development costs with limited resources.

It integrates signal-based and service-oriented applications into EE architectures, including vehicle computers and zonal controllers.

This collaboration aims to make development smoother by using continuous testing and validation. By addressing safety and security early, it reduces the time to add features and manages the complexity of different software platforms.

"The pre-built accelerator is intended to help reduce costs and improve time to market," said Elektrobit director Wolfgang Thieme.

Aditya Pathak, Cognizant VP, added: "We intend to streamline development, enhance vehicle functionality, identify defects early and integrate genAI in the software lifecycle to meet the demand for customisation and personalisation."


R&S SMBV100B-based GNSS simulator

R&S validates U-Blox GNSS modules for China

Rohde & Schwarz has validated U-Blox automotive GNSS modules in accordance with the recently published Chinese GB/T test requirement for automotive on-board GNSS positioning systems.

The validation was done using an automated SMBV100B based GNSS simulator. This is being be demonstrated at this month's Mobile World Congress in Barcelona.

China's national automotive standardisation technical committee created the requirements and test methods for on-board positioning system guidelines. Rohde & Schwarz contributed to the drafting of the standard.

These requirements were released in November with an implementation date of June 2025. While the test specification is only recommended, it is expected to become mandatory within the upcoming Chinese ecall standard.

The standard requires on-board positioning systems to pass a range of requirements for tracking sensitivity, acquisition sensitivity, time to first fix, location accuracy and velocity accuracy, in different multi-constellation and Beidou-only modes.

The standard also defines special events such as week number rollover tests, leap second handling, radio frequency interference and unexpected pseudo range errors to test the overall robustness of the positioning system. To pass the test cases, the GNSS receiver must be able to process signals from two frequency bands simultaneously.

Many of the tests cannot be performed in a real-world environment with live GNSS signals since they are difficult to implement, time-consuming, costly and impossible to reproduce.

These tests can though be performed with the SMBV100B GNSS simulator in the lab under controlled and repeatable conditions.

Renesas and Nullmax collaborate on adas

Nullmax and Renesas have forged a partnership to deliver competitive adas products globally.

Autonomous driving AI technology company Nullmax and Renesas Electronics signed the partnership agreement in Shanghai.

Under this agreement, the two companies will engage in collaboration on adas applications.

By integrating Nullmax's platform-based AI software algorithms with the Renesas R-Car V4 and R-Car X5 chips, the partnership aims to develop reliable and user-friendly mass-production products for intelligent driving.

"This collaboration will maximise Nullmax's expertise in autonomous driving AI algorithms while capitalising on Renesas' robust chip performance," said Zhe Sun from Nullmax. "Together, we are committed to advancing breakthroughs and commercialisation in autonomous driving technology. Through our close cooperation, we believe we can provide more efficient and reliable adas for the global automotive industry, accelerating the widespread adoption and commercialisation of smart driving technologies."

Takeshi Fuse from Renesas added: "Nullmax's proven perception enables fast implementation of AD and adas products built on Renesas SoCs. We will together bring more advanced and more competitive products to support our customers making cars safer and smarter."

Nullmax was established in 2016 to develop autonomous driving applications through AI algorithms and proprietary platform-based technology, driving the transformation of mobility.



Zhe Sun (left) and Takeshi Fuse

SOFTWARE-DEFINED VEHICLES

Mike Thoeny explains how to transform the automotive supply chain for future mobility

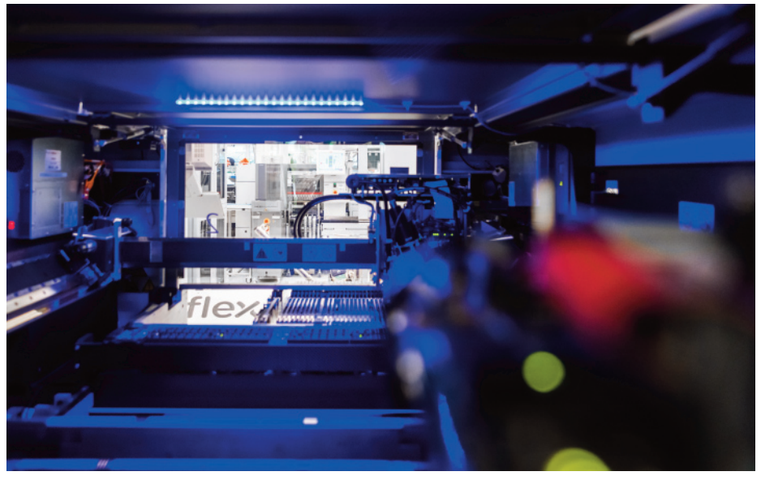
LEARNING FROM OTHERS

Rapid technological advancements in software-defined vehicles are transforming today's automotive industry, creating exciting opportunities that benefit both automakers and consumers. Automakers can capitalise on the enormous business opportunity that the software transition presents, while consumers reap the benefits of more feature-rich vehicles that continuously improve over their lifecycles.

However, the automotive industry must address one major challenge to realise the full potential of the software-defined vehicle – the readiness of the global supply chain.

In recent years, the automotive industry's global supply chain has faced significant disruption, with semiconductor shortages among the most critical issues, resulting in the loss of millions of vehicles and billions of dollars in revenue. Against this backdrop, semiconductor availability is only increasing in importance due to the rise of the software-defined vehicle, with BCG estimating that chip content per vehicle will grow by approximately 7% annually, reaching 1.5 to 2 times its current level by 2030.

Yet, according to KPMG's 24th Annual Global Automotive Executive Survey, 45% of automotive OEM executives outside of China expressed extreme concern about access to semiconductors today. Additionally, data from Avnet reveal that, on average, semiconductor lead times have not yet recovered to pre-pandemic levels. These concerns also extend to other critical areas such as battery components and rare earth elements.



Surface mount technology line machine checking solder quality

Hyperscale

The industry can look to global companies in other industries to gain a better understanding of supply chain management both within and outside of the automotive industry. By analysing supply chain trends and cross-industry data via an in-house joint risk management application – which uses AI, machine learning and insights from five million components – it was found that the automotive industry has a risk score that is twice as high as other industries.

To better understand the challenges faced by the automotive industry, it's worth looking at the hyperscale data centre industry. Both industries are undergoing technology transitions that are transforming their landscapes.

The rapid adoption of generative AI is driving demand for hyperscale data centres in the cloud industry in the same way that the rise of the software-defined vehicle is changing the game for the automotive industry.

For both the hyperscale data centre and automotive industries, new architectures are needed to address ever-increasing power and compute challenges these technology transitions demand. By reviewing cross-industry supply chain data, it is possible to identify several critical areas where the automotive industry is falling behind hyperscale data centres.

Data show the automotive industry is 25% more likely to experience components being out of stock, 15% more likely to see future component shortages, and 10% more likely than the communications, enterprise and cloud sector to experience long lead times. To improve, the industry must embrace supply chain resiliency initiatives at scale.

Supply chain

To address this and build a more resilient supply chain, the automotive industry can learn from the hyperscale data centre industry's supply chain management approach by embracing regionalisation, multi-sourcing, industry wide collaboration and supply chain digitisation. While these are not new to automotive, data show the auto industry is not executing at the speed needed to build the resilient supply chain required to scale software-defined vehicles.

Regionalisation has become a well-established tactic to mitigate risk and ensure business continuity.

According to a recent McKinsey survey of supply chain leaders, almost two-thirds of respondents said they were currently regionalising their supply chains. Manufacturing in-region could empower the automotive industry to avoid the risks arising from tariffs, geopolitical tensions and supply chain disruptions, while delivering other benefits, such as improving responses to regional customers and reduced carbon footprint.

Multi-sourcing for key components that are higher risk increases agility and resilience, resulting in fewer line stoppages, competitive pricing and faster time to market.

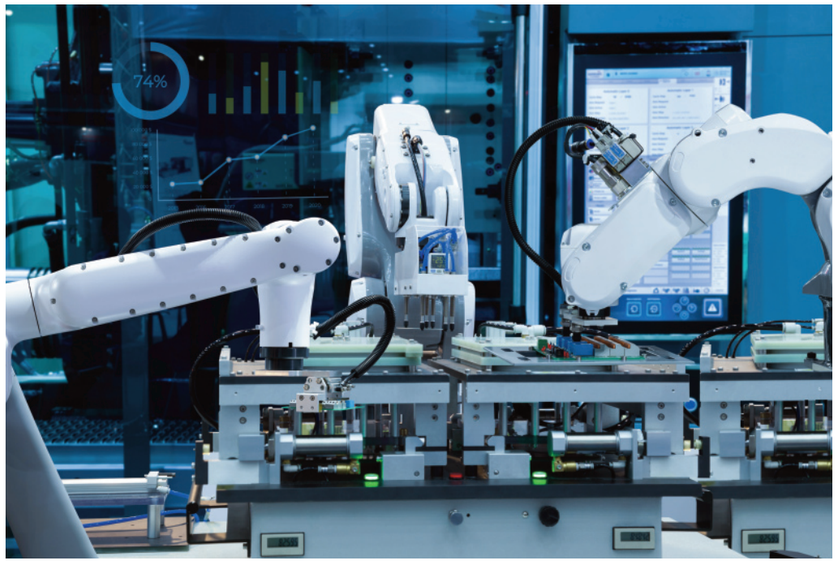
According to the data, multi-sourcing is a critical area that automotive must improve upon, with this industry multi-sourcing at less than half the rate of other industries today.

While it may involve upfront costs and work, the benefits far outweigh any concerns.

As the automotive industry continues to move faster, collaboration across the ecosystem early in the product lifecycle will enable automakers to align roadmaps, define desired features and secure supply continuity. Just as hyperscale data centre companies have accelerated their innovation cycles through an evolved partnership model with their networks for suppliers, automakers must do the same to enable faster response to changing market conditions.

Finally, supply chain digitisation is vital when it comes to evaluating, managing and making informed decisions.

Sophisticated data applications can enable teams to identify supply chain risks early in the product lifecycle and make changes that eliminate costly issues further down the line. Using artificial intelligence and machine learning-driven analytics allows high-risk score industries such as automotive to analyse quality and capability of suppliers, demand from other companies for components, and end-of-life risk.



Automatic robot assembly of electronic circuit board

Future

The automotive industry is at a critical point of rising to the challenge of advancing mobility. To deliver on this market opportunity, the industry must work together to build a more resilient automotive supply chain, since future mobility's full potential can only be achieved if experts have the chips and hardware to support it.

By adopting best practices from other industries such as regionalisation, multi-sourcing, collaboration and supply chain digitisation, teams can overcome shared problems and respond faster to evolving market conditions while driving innovation.



Mike Thoeny is president of Flex's automotive business group

SOFTWARE-DEFINED VEHICLES

ON THE BALL



Christian Cruz looks at the relevance, benefits and essentials in 48V applications

The 48V supply voltage has received a lot of attention in recent years. While 48V may not appear innovative at first glance, it is relevant, has numerous benefits and has become an important component in various system-level automotive, industrial and communication applications.

Because of its versatility and compatibility with existing infrastructure, the 48V supply voltage has become critical in various applications. Historically, power distribution systems depended heavily on the standard 12 or 24V levels. However, the increasing power requirements of modern devices and electronics, along with the desire for a more effective system and greater energy economy, have prompted the use of higher supply voltages.

Energy-efficient options are in high demand in data centres, for example, where huge supercomputer power is concentrated.

The 48V supply voltage is also beneficial to the automotive industry, especially in electric vehicles (EVs). The desire for more power-efficiency grows as EVs add features and electrically driven subsystems.

The 48V architecture improves energy recovery during regenerative braking and makes it easier to integrate high power components such as electric power steering and adas.

Benefits

The benefits of using a 48V supply voltage range from improved efficiency to greater design choice, and include reduced I^2R losses, which in power distribution systems can have a major impact on efficiency. When compared with lower voltage systems, the current is lower with 48V for a given power level. As a result, I^2R losses during transmission are decreased, resulting in greater efficiency.

Compared with lower voltage systems, 48V allows for the use of smaller conductors and

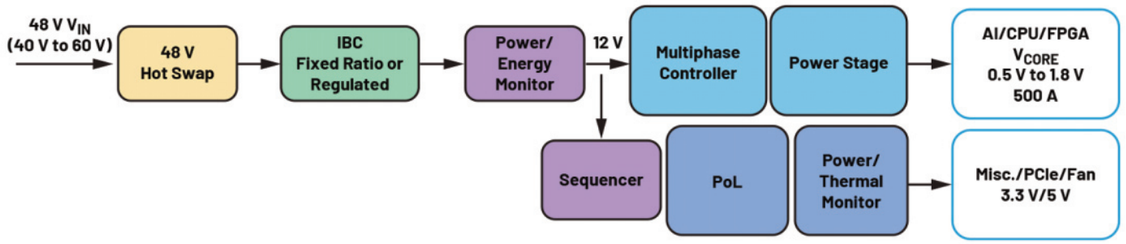


Fig.1: Efficient voltage conversion within a system

components for the same power transfer. This corresponds to increased power density, which allows for more compact designs, particularly in applications where space is limited.

Higher voltage levels provide greater voltage regulation by definition, which is critical in applications sensitive to fluctuations. To maintain reliable operation, industrial automation and communication systems frequently demand steady and well-regulated voltage levels.

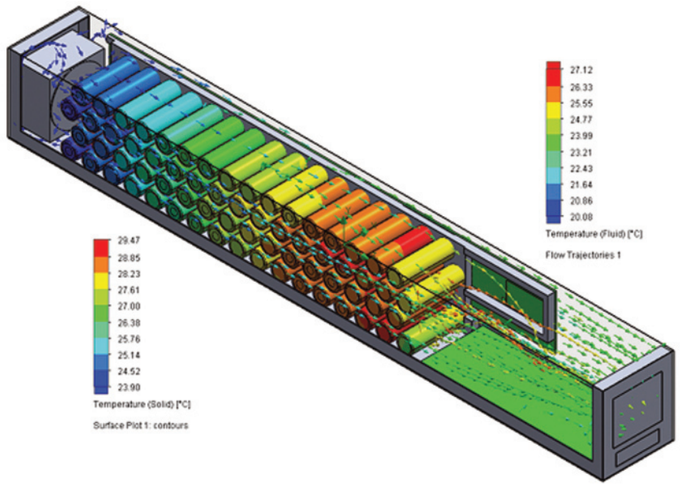
The 48V supply opens up additional design choices. It permits the integration of numerous subsystems with varying voltage needs. Motors, sensors and communication interfaces can all coexist in the same system.

And it matches nicely with the voltage output of solar panels in renewable energy systems such as solar installations.

Essentials

Certain aspects must be considered during implementation to reap the benefits of 48V. While 48V is becoming more popular, not all devices and components handle this voltage level directly. Voltage conversion methods that are efficient, such as DC- DC converters, need to step down the voltage for subsystems that require lower supply voltages, see Fig. 1.

Higher voltage levels in the battery backup unit (BBU) module in Fig. 2 and the quarter brick reference design approach may generate greater heat. Thermal management methods



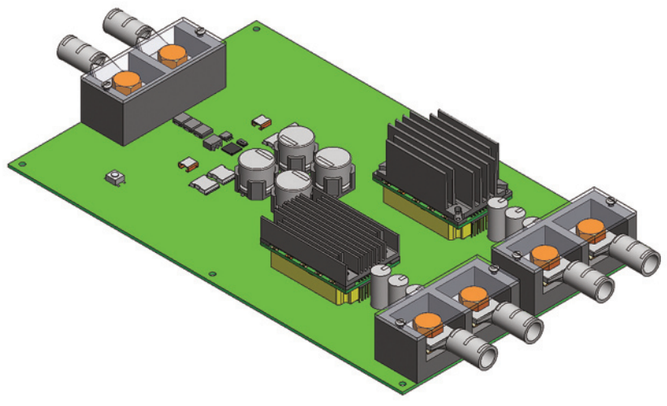


Fig. 2: Module and quarter brick reference design

such as heatsinks, fans and thermal design considerations are crucial to the longevity and dependability of 48V components.

In every electrical system, safety is of the utmost importance. While 48V is not exceptionally high, it still necessitates adequate safety precautions such as circuit protection, isolation barriers and grounding to avoid the risks connected with electrical breakdowns.

One example of an isolated barrier is the galvanic isolation shown in Fig. 3 between 48 and 12V applications.

In modern industrial and communication applications, interoperability is key. Implementing standard communication protocols ensures seamless data exchange between subsystems operating at 48V, enhancing overall system efficiency. The Open Compute Project (OCP) is leading the adoption of new data centre architecture. The organisation provides a complete architecture design for the 48V system's power rectifier network, storage and servers, see Fig. 4.

Monitoring

Ensuring peak system performance requires constant monitoring of voltage levels, current flows and temperature in real time. The adoption of intelligent control systems, on the other hand, allows for the proactive management of these factors.

By seamlessly coordinating real-time adjustments, these systems not only anticipate faults but also pave the way for preventative diagnosis, raising system

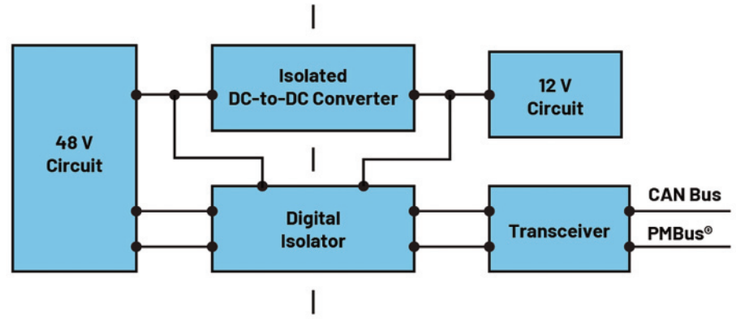


Fig. 3: Galvanic isolation between 48 and 12V in mild hybrid EV

efficiency and dependability.

The 48V supply is used in various sectors and technologies. Telecoms networks, for example, rely on a consistent and reliable power supply. The 48V architecture emerges as a cornerstone of dependability and efficiency in this domain, altering the landscape of telecom power systems, see Fig. 5.

Precision and efficiency are critical in industrial automation. Within this landscape, 48V shines brightly, fuelling a wide range of critical components, from electric motors and conveyor belts to robotic arms. This voltage level serves as the foundation of power density and control, coordinating flawless operations while simultaneously reducing energy losses and propelling industrial automation.

The introduction of hybrid power systems has changed energy access in rural and off-grid areas where connecting to the conventional power grid is difficult. These systems seamlessly combine renewable energy sources, primarily solar panels, with modern energy storage banks to provide dependable and sustainable energy.

In this scenario, the compatibility of 48V with solar outputs is critical, efficiently bridging the gap between the energy provided by solar panels and the demands of various applications.

Electric vehicles

The use of the 48V design in EVs demonstrated in Fig. 6 is a step that provides numerous benefits. This voltage paradigm is critical in improving power distribution across the vehicle's subsystems. Aside from its role in power distribution, the 48V architecture provides access to a slew of novel features, such as regenerative braking, which allows energy to be recovered during braking manoeuvres.

Furthermore, its integration enables various auxiliary systems vital to occupant comfort and enjoyment, including hvac and multimedia.

The 48V architecture enables this approach to EV design, which not only improves energy economy but also improves the whole driving experience by optimising power use, resource management and in-cabin amenities.

While using a 48V supply

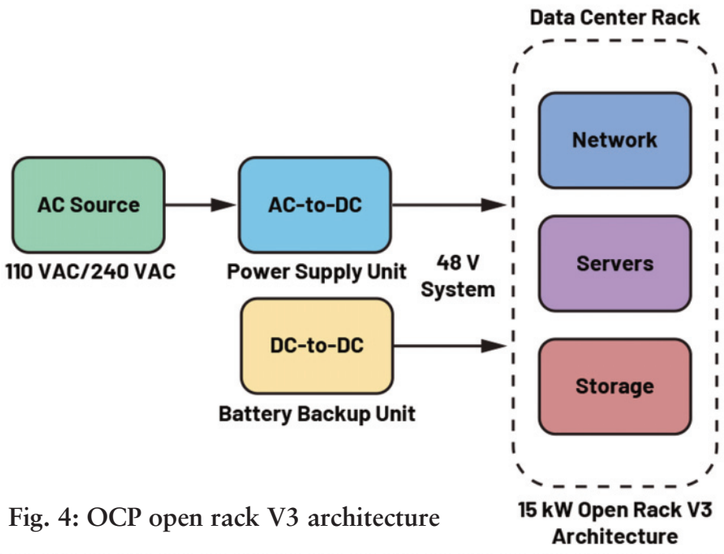


Fig. 4: OCP open rack V3 architecture

voltage in system-level applications has several advantages, it is important to understand some of the potential downsides of this system.

Disadvantages

Making the switch to a 48V demands careful evaluation of existing components. Certain pieces may need to be replaced or adjusted as a result of this change. However, one potential issue is the scarcity of components that are compatible with the specified voltage rating.

This scenario could result in increased procurement prices and probable delays in the system's smooth integration, underlining the importance of planning and sourcing.

Incorporating a 48V supply voltage frequently ushers in a period of increased design complexities. The implementation phase typically warrants the cautious navigation of complicated design issues, such as precise voltage regulation, thorough heat management strategies and robust safety standards.

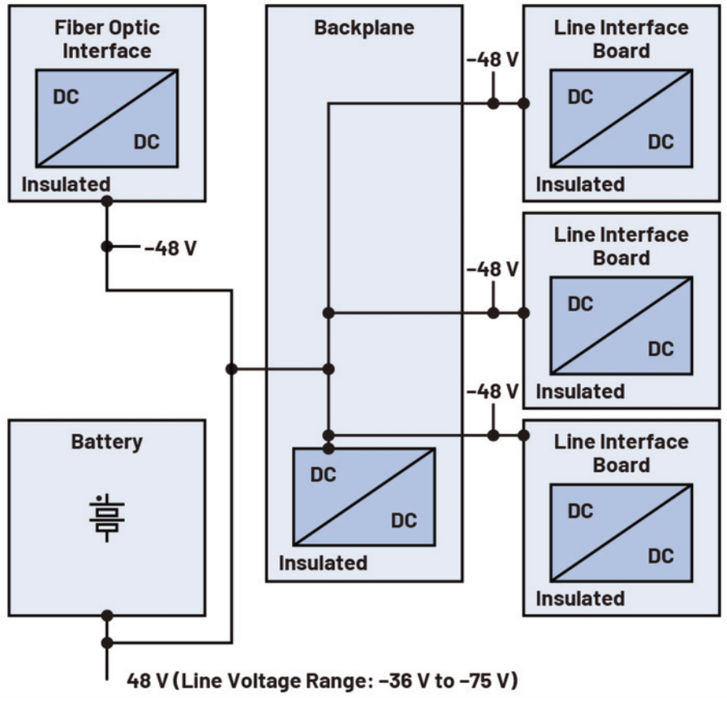


Fig. 5: Telecoms 48V distribution system

This increased complexity has the potential to lengthen development cycles and increase the demand for detailed technical skills, emphasising the importance of a well-prepared and skilled design team to traverse these complexities efficiently.

While 48V is not exceptionally high, it nevertheless poses possible safety issues, especially if basic safety precautions are not adequately implemented. The increasing voltage level may raise the risk of electrical shock and other hazards, demanding strict safety precautions.

Additional conversion steps might result in larger energy losses in systems when voltage conversion is required to power components that need lower voltage levels, such as sensors or low power devices. This reduces some of the energy efficiency improvements made possible by using a 48V supply voltage.

For legacy systems designed for lower voltage levels, the switch to a 48V supply voltage necessitates a realistic assessment. This change may face obstacles that make it impractical and financially prohibitive. Overhauling existing infrastructure to support the 48V standard smoothly can be a complex and time-consuming task, requiring adjustments and planning to ensure compatibility and optimal performance.

While 48V allows for higher power density due to lower current levels, it may not be appropriate for applications with strict size and space constraints. The requirement for additional insulation and safety precautions may demand greater component sizes.

Elevated voltage levels provide a significant problem in the form of increased EMI. This interference can disrupt the smooth operation of delicate components and complex communication networks. As a result, the adoption of additional shielding and rigorous filtering techniques becomes necessary to counter and alleviate the negative effects of EMI, ensuring the ongoing performance of key systems.

While 48V is a reasonable choice for many applications, it may not be the best scalable option in all cases. Some applications, particularly those requiring much greater power levels, may necessitate the use of alternative voltage designs to satisfy their specific needs.

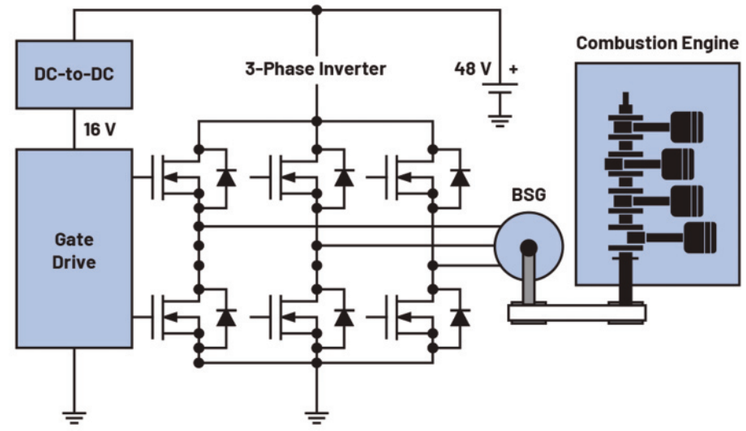


Fig. 6: 48V mild hybrid EV

Adopting a 48V supply voltage demands careful consideration of upfront costs such as component replacement, system development coordination and the implementation of critical safety measures.

These initial expenses have the potential to impact noticeably the overall project budget, a dynamic that depends on the individual application and sector being addressed.

Conclusion

The 48V supply voltage has progressed from a niche option to a critical component in system-level, industrial and communication applications. Its importance arises from the growing demand for energy efficiency, and its advantages include increased efficiency, power density and design flexibility. However, effective power conversion, rigorous thermal management, robust safety precautions, standardised communication protocols, and sophisticated monitoring and control systems are required for successful application.

As the technological environment evolves, the 48V supply voltage remains a critical enabler of innovation across multiple sectors, providing a future powered by efficiency and dependability.

Furthermore, the designer or application engineer should examine the benefits of using a 48V supply voltage in system-level applications that are significant, therefore it's critical to be aware of the potential drawbacks.

To make an informed decision about applying this voltage level in a specific application, consider component compatibility, design complexity, safety precautions, energy conversion losses and associated costs.



Christian Cruz is a staff applications development engineer at Analog Devices

ON THE ROAD

TO THE HILLS

A look at how Volvo has refreshed its XC60 SUV

ON THE ROAD

For the upcoming model year, Volvo has refreshed its XC60 SUV with updates in user experience, design and comfort along with a faster and more responsive infotainment system. The broader model range also gets a number of enhancements.

Since its introduction in 2017, the XC60 has been Volvo's top-selling model and one of the best-selling plug-in hybrids in Europe. More than one and a half million XC60s have been sold across the globe, and 2024 marked a sales record.

"With its cutting-edge user experience, modernised Scandinavian design, improved comfort and even more luxurious interior, the XC60 sets the standard even higher for mid-size SUVs," said Erik Severinson, chief product and strategy officer at Volvo Cars. "The improvements focus on what we believe matters most to our customers. These upgrades ensure a more enjoyable and exclusive experience, with the car set to get better over time thanks to over-the-air updates."

The refreshed XC60 is available to order in certain countries. The availability and timing of the 2026 model year versions will differ from market to market.



Bowers & Wilkins speaker mesh design



Free-standing central touchscreen enhances experience

Screen

The refreshed XC60 comes with Volvo's latest new-look user experience, designed to be a safe and enjoyable way to interact with the car's central infotainment screen, more focused and personalised than its predecessor, with several Google services built-in.

As previously announced, this year all Volvo cars will come from the factories with this UX. In addition, around 2.5 million customers around the globe will get it on their cars built as early as 2020 via a simple over-the-air-update happening later this year.

A larger 28.5cm, free-standing central touchscreen further enhances the experience in the XC60, opening a world of features, apps and over-the-air updates. The pixel density is increased by 21 per cent, resulting in an even crisper display.

Infotainment

Thanks to the Snapdragon Cockpit platform from Qualcomm, the infotainment system with Google built-in is more than twice as fast as the outgoing system, with ten times faster graphics generation.

The result is a more responsive infotainment system that displays the right information at the right time to reduce driver distraction and enhance safety.

Design

The exterior brings a more contemporary look to the premium five-seater. The new air intake, with Volvo's iconic iron mark, reflects recent updates. It also comes with more wheel options and darker rear lights.

The model year introduces two more colours, Forest Lake and Aurora Silver, both available on the refreshed XC60. In addition, Mulberry Red will be available on the XC60 for the first time.

In terms of materials, a mix of refreshed interior decors, inlays and premium materials such as Quilted Nordico and Navy Herringbone Weave offers a more exclusive and contemporary experience. With smart storage, new cupholders, improved wireless phone charger and flexible and roomy load compartment, the interior is versatile and practical.

Thanks to a quieter cabin and seat comfort as standard, riding in the XC60 is more comfortable. For an even more luxurious ride, there is the optional air suspension and laminated windows. The refreshed XC60 is also equipped with Volvo's air purification technology for enhanced well-being.

Audio

For car audio, the XC60 is available with the Bowers & Wilkins High Fidelity system – with new speaker mesh design – which faithfully replicates music just as the artist intended, making it one of the best-sounding car audio systems.

DRIVER ASSISTANCE

How cloud-based method can help test driver assistance features

VIRTUAL TEST DRIVE

Software plays an increasing role in vehicle design, enabling innovations that deliver convenience and safety, but today's SDVs are putting more pressure on the automotive teams delivering adas features. As vehicles integrate more sensors, adopt advanced chips and operating systems, and apply increasingly complex AI and software algorithms, software development and testing creates bottlenecks that delay vehicle launches and feature deployment.

Safety and compliance are paramount, but the business impact is also tangible; underperforming adas features frustrate users and vehicle recalls significantly impact brand loyalty and profits.

Ensuring the quality and safety of adas software development is very cost and time intensive, but critical because the cost of fixing defects when a vehicle is ready for production is fifteen times greater.

Hexagon's manufacturing intelligence division believes it can solve these problems with a cloud-native method that simplifies and accelerates adas and autonomous vehicle software testing.

Called Virtual Test Drive X (VTDx), it uses hyperscale cloud computing to automate testing against thousands of real-world scenarios simultaneously, addressing delays and costs while

DRIVER ASSISTANCE

improving safety.

Built on Hexagon's Nexus digital reality platform with Microsoft Azure, it supports open standards such as OpenScenario and OpenDrive, making it scalable and compatible with existing workflows.

With photorealistic simulations powered by Unreal Engine and consumption-based pricing, VTDx can help automakers manage the increasing complexity of software-defined vehicles (SDVs) and meet regulatory requirements.

The cloud offering simplifies adas software testing by integrating comprehensive real-world vehicle environment and safety scenarios into automated continuous software integration and testing workflows.

This lets it test, train and validate adas and autonomous vehicle systems.

Using hyperscale computing and automation, it lets automotive engineers validate the quality and function of software against thousands of real-world scenarios automatically, accelerating the time to market for safe mobility innovations.

VTDx is a comprehensive consumption-based service that makes it easier to scale up virtual prototyping and mitigate the delays, high cost and safety risks associated with physical testing. The software-as-a-service (SaaS) is built from the bottom up to use the cloud computing power and automation of Hexagon's Nexus digital reality platform, so software teams can build rigorous testing into their continuous test and integration workflows for adas and autonomous vehicles.

From an intuitive web interface, adas engineers can create and configure their system under test (SUT) such as adas algorithms. They can validate their SUT with highly accurate physics-based simulations from Hexagon's environment simulation engine that leverages its 15 years of domain expertise.

When developers run a test, VTDx executes the OpenDrive and OpenScenario standard compliant software-in-the-loop (SIL) test programmes. By orchestrating tens or thousands of simulations of as many scenarios as needed automatically and simultaneously, engineers can significantly reduce delays in configuration and computing time for their standardised SIL test programmes.

VTDx addresses the dramatic change in adas as electrical and electronic (EE) architectures are centralised and regulations become more stringent. It enables SDV testing strategies that align with modern software development practices and embeds vital physical safety testing practices that are unique to the adas component of the vehicle codebase.

Its high-productivity, highly scalable code test and integration approach provides:

- Continuous integration and testing: Enables continuous development, integration and testing, allowing for faster software iterations and releases.
- Seamless workflow integration: Easily integrates with existing adas development toolchains, embedding into existing workflows with modern, well-defined APIs and open environment simulation standards.
- Ease of use: Intuitive configurations of sensors and test scenarios with user-friendly operation.
- Scalability: Supports parallel scenario execution and real-time collaboration among global teams, making it scalable for various adas development needs.
- Cloud availability: Available as a public or private SaaS, VTDx can be easily deployed by small and large organisations with consumption-based pricing and round-the-clock availability.
- Accessibility: Users can share a project with globally-spread team members, making scenario setups and results available in real time through an intuitive web-based user experience.



Photorealistic simulations help automakers manage SDV complexity

Available publicly for the first time, VTDx has been well received throughout Hexagon's automotive OEM and tier-one user base for its intuitive high-productivity user experience, hands-off automation of thousands of code-test simulations and the provision of consumption-based pricing. It was developed in collaboration with the Microsoft Azure team, realises photorealistic visualisation via the Unreal Engine, and provides full support for the OpenScenario and OpenDrive standards.

"We embarked on a journey to build our cloud-based adas simulation software from the ground up with continuous integration and testing processes in mind, addressing the software development challenges our automotive customers face today," said Mahesh Kailasam, general manager at Hexagon's manufacturing intelligence division. "Whether aiming to increase test coverage, shorten test cycles or automate workflows, our VTDx offers significant benefits."

VTDx enables automakers to test and validate their adas and autonomous vehicle systems rigorously in a SIL environment, ensuring safety and performance. It is available as a public SaaS with consumption-based pricing on Nexus, with private cloud deployments available on request.

Application module for digital cockpits

An automotive application processor module from LG Innotek targets adas and digital cockpits.

The AP module measures 6.35 by 6.35cm and contains more than 400 components, including a memory, PMIC and integrated SoC, to control data and graphics processing, display output, and multimedia.

This should make it possible to shrink the size of existing motherboards, enhancing design flexibility. It also shortens the signal distance between the integrated components in the module, improving the module's control performance.



This year, LG aims to increase the module's heat dissipation performance, enabling it to operate at up to +95°C, and shorten the module development period by predicting warpage through virtual simulation.

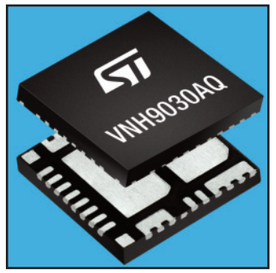
The plan is to start mass-producing the module later this year.

DC motor driver handles functional safety

An integrated full-bridge DC motor driver from ST Microelectronics can handle diverse automotive uses including functional-safety applications.

As well as integrating diagnostics, the VNH9030AQ driver has a dedicated pin for real-time output status that saves external circuitry and slims the bill of materials.

With an $R_{DS(on)}$ of 30mΩ per leg, it can handle mid- and low-power DC-motor driven applications such as door-control modules, washer pumps, powered lift gates, powered trunks and seat adjusters.



AEC-Q100 qualified, it has an output current up to 35A and 5 and 3V cmos compatible inputs.

Contributing to the driver's overall efficiency, and saving external components, integrated non-dissipative current-sense circuitry monitors the current flowing through the device to distinguish each motor phase.

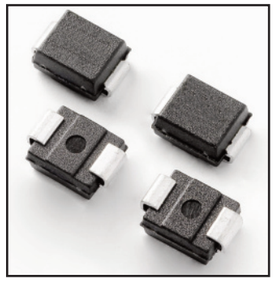
The standby power consumption is low over the full operating-temperature range, easing use in zonal controller platforms.

The device integrates the high- and low-side mosfets with gate drivers, diagnostics and protection against overvoltage transients, undervoltage, short-circuit conditions and cross conduction.

Flexibility to configure the mosfets either in parallel or in series allows use in systems involving multiple motors or to meet other requirements.

The driver is part of a family of common-pinout devices that leverage STM's VIPower M0-9 technology, which permits monolithic integration of power and logic circuitry.

It comes in a 6 by 6mm thermally enhanced triple-pad QFN package designed for optimal underside cooling.



TVS diodes

Automotive TVS diodes from Littelfuse have a low clamping voltage for 800V EV battery management systems.

The TPSMB-L diodes can protect sensitive components such as analogue front end (AFE) and battery management ICs.

With a focus on safety and reliability, these diodes meet ISO 26262.

AEC-Q101 qualified with PPAP level-three compliance, they ensure safety and longevity of AFEs and BM ICs in 14- to 20-cell designs.

They have a 600W peak pulse power capability in an SMB DO-214AA package.

A fast response time protects against ESD and transient voltage surges.

AFE ICs process analogue signals, such as battery cell voltage and temperature.

Battery management ICs go a step further, managing critical battery performance functions.

The diodes safeguard these components by limiting transient voltages to safe levels.

PMIC integrates multi-rail power supply

Infineon is expanding the Optireg PMIC family with an integrated multi-rail power supply device for demanding automotive systems.

The TLF35585 provides a power supply for Aurix and other microcontrollers and enables robust systems with high functional-safety requirements.

The power supplies are suitable for functional-safety applications in harsh automotive environments, particularly in the chassis, powertrain, domain control and transmission areas.

The PMIC includes a boost buck pre-regulator that supplies the post-regulator rails for the microcontroller supply, communication supply and a precise voltage reference. It also provides two trackers that follow the voltage reference to supply off-board sensors.

The main supervision functions include a configurable window watchdog time-based trigger, a function watchdog question and response-based trigger, error pin monitoring and voltage monitoring.

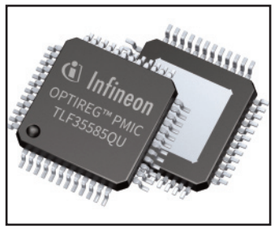
For the interaction with microcontrollers, a 16bit SPI, interrupt and reset function are available.

The device complies with ISO 26262 Asil D and supports an extended junction temperature range of up to +175°C.

The switching frequency range enables optimisation of efficiency and the use of small filter components. In addition, the IC integrates a flexible state machine, the wake-up concept with timer and a stand-by regulator, making the device suitable for a wide range of applications.

It is available in either a VQFN-48 or TQFP-48 package.

Both are thermally enhanced and AEC-Q100 Grade 0 qualified.



Four-channel isolators provide EV protection

Four-channel high-speed standard digital isolators from Toshiba are for automotive applications.

The DCM34xx01 series has ten devices that support stable operation with common-mode transient immunity (CMTI) of 100kVμs typical and data transmission rate of 50Mbit/s maximum.

All conform to AEC-Q100 and shipments have started.

Ensuring the safety and reliability of the on-board chargers and battery management systems used in electric vehicles requires devices that ensure isolation and prevent noise-propagation.



The isolators use a proprietary magnetic coupling type isolated transmission method to achieve the high CMTI.

This delivers high level resistance to electric noise between input and output in isolated signal transmission, enables stable control signal transmission, and contributes to stable equipment operation.

Pulse-width distortion is 0.8ns typical.

The products are suitable for multi-channel high-speed communication applications such as IO interfaces with SPI communications.

Quad-channel support means there are either four forward channels and no reverse channels, three forward channels and one reverse channel or two forward channels and two reverse channels.

Operating temperature is -40 to +125°C.

Controllers bring touch to large displays

Touchscreen controllers from Microchip are targeting automotive HMI designers.

The ATMXT-3072M1 and -2496M1 single-chip touchscreen controllers feature up to 112 reconfigurable touch channels or 162 equivalent touch channels in ultra-wide mode, enabling the support of large, curved and free-form touch displays up to 51cm in 16:9 format and 86cm in 7:1 format.

Large thin displays, such as on-cell OLED, embed touch electrodes with higher capacitive loads and stronger coupling of display noise, increasing the risk of false or missed touch detections.



As part of the MaxTouch touchscreen controller family, the devices employ the proprietary smart mutual touch acquisition method and algorithms to increase the touch signal-to-noise ratio by up to +15dB compared with the previous generation.

The controllers comply with Asil-A and B standards and are developed according to the firm's ISO 26262 functional safety management system, which is certified by TÜV Rheinland.

Failure modes, effects and diagnostic analysis, and safety manuals are available to help users achieve certification for their systems' touch functionality.

The controllers' firmware is upgradable by the automobile's main computer and can be verified using the integrated firmware authentication feature, which implements the SHA-512 cryptographic hash function.

This cyber-security function enables over-the-air updates in compliance with ISO 21434: 2021.

Knob-on-display technology allows for the addition of intuitive physical knobs on the touchscreen, improving safety while preserving the sleek look of modern vehicle displays.

The controllers have dedicated functions, such as the shape event trigger combined with automated pattern pulse width modulation to achieve low-latency haptic control. This transfers the decision-making and generation of haptic waveforms from the main application host processor to the touchscreen controller.

The EV01S50A development PCB was designed for the controller family to help users more easily evaluate and test the devices in their applications. The EV13B92A evaluation kit includes an ITO touch sensor.

AEC-Q200 MLCC in 1005 size

An MLCC from Samsung comes in a 1005 size for autonomous driving.

The CL05Y-225KP-66PN has a capacity of 2.2μF and operates at 10V, with dimensions of 1.0 by 0.5mm. The voltage is approximately 60% higher than the previous standard of 6.3V, making it the first to be AEC-Q200 qualified.

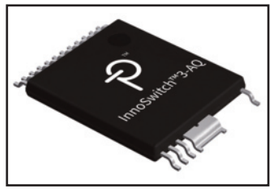
This product provides suitable performance in lidar systems, one of the key devices for autonomous driving.

Generally, it is difficult for MLCCs to satisfy voltage and capacitance characteristics simultaneously. To achieve high voltage, the dielectric used for storing electricity must be made thicker, which reduces the number of internal dielectric layers that can be stacked, making it difficult to increase capacitance.

Samsung has developed proprietary additives and a manufacturing method that reduces empty spaces within the dielectric, allowing stable operation even at high voltages.

It is suitable for applications such as adas, body, chassis and infotainment systems.





Switcher ICs

AEC-Q100 qualified InnoSwitch3-AQ flyback switcher ICs come with a wide-creepage option.

The 5.1mm wide drain-to-source-pin spacing eliminates the need for conformal coating in 800V EV applications.

The 1.7kV-rated IC in Power Integrations' InSOP-28G package simplifies manufacturing and increases system reliability while meeting the IEC60664-1 isolation standard for 800V EVs.

Applications include battery management systems, μDC-DC converters, control circuits and emergency power supplies in main traction inverters.

The increased primary-side spacing, realised by the package, allows 1kV DC to be delivered to the IC while maintaining safety isolation in pollution degree two environments. It also enhances durability against shock and vibration.

Incorporating a silicon carbide primary switch, the IC delivers up to 80W output, achieves up to 90% efficiency, and consumes less than 15mW at no-load.

Package provides upgrade path for magnetic sensing

A dual mould package (DMP) variant of the Melexis MLX90425 magnetic sensing IC maintains packaging consistency with the established MLX90364 and MLX90421 ICs.

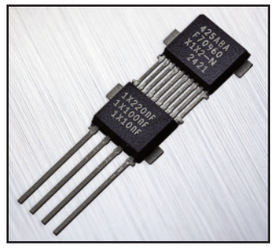
This device offers a straightforward upgrade path for tier-one suppliers and OEMs needing 360° magnetic rotary detection with stray field immunity (SFI).

When manufacturers transition from existing internal combustion engine (ICE) vehicles to more sustainable high-voltage hybrid powertrains, the added electronic elements demand robust SFI to ensure accurate sensing feedback from magnetic sensing ICs.

By leveraging the established DMP design and pin layout of the previous ICs, the MLX90425 provides the automotive market with a seamless and cost-effective path free from significant redesigns of assemblies or tooling.

The IC provides robust magnetic flux measurement, featuring 5mT SFI and a programmable linear transfer function with up to 17 points. System integration is simplified by the device's operating temperature of -40 to +160°C and versatile data output options, including analogue ratiometric and PWM signals.

It complies with ISO 26262 Asil B safety element out of context (SEooC), making it suitable for safety-critical automotive applications.

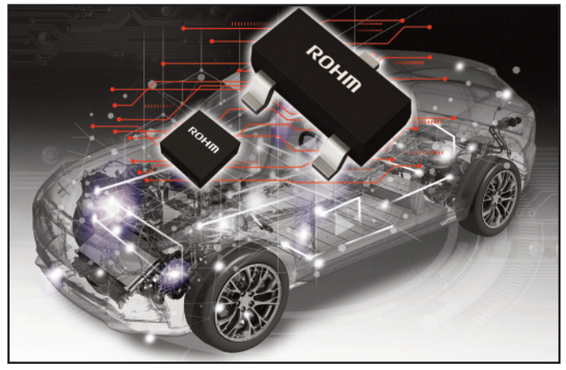


Diodes protect Can-FD communications

Bidirectional TVS ESD protection diodes from Rohm are compatible with Can-FD in-vehicle communications.

The products achieve high-quality in-vehicle transmission by protecting electronic devices such as ECUs from surges and ESD while maintaining signal integrity in high-speed communication systems.

The ESDCanxx units combine low terminal capacitance with surge tolerance.



Two package types are available – 2.9 by 2.4mm sot23 and 1 by 1mm DFN1010, both supporting standoff voltages of 24 and 27V. Each package has four models, totalling eight in the line.

An optimised element structure reduces terminal capacitance to up to 3.5pF, preventing signal degradation during high-speed communication. High surge tolerance is achieved, improving the protection of devices.

Applications include autonomous driving, adas, electric powertrains and infotainment.

Compilers add Risc-V CPU IP support



HighTec EDV-Systeme has added support for Nuclei's Risc-V CPU IP.

HighTec's automotive-grade LLVM open-source-based C/C++ compiler tools are safety-qualified to ISO 26262 Asil D.

Automotive software developers working on Risc-V architectures can benefit from these tools seamlessly supporting Nuclei's functional safety-certified Risc-V cores, resulting in compact and reliable code for demanding automotive applications with high performance and safety requirements.

Nuclei has received two Exida Asil-D product certifications for NA300 and NA900 in the past two years, which confirm the security and reliability of its automotive-grade products and capabilities in developing CPU IP.

This is significant not only for Nuclei, but also for the entire Risc-V ecosystem in the field of automotive electronics.

With this certification, Nuclei is the first Risc-V CPU IP vendor to achieve Asil-D product certification.

The HighTec C/C++ automotive compiler is designed to meet all the technical requirements to take advantage of the performance and safety features of Nuclei's Risc-V cores. The compiler is based on the modern LLVM (low level virtual machine) open-source technology and is known for its fast build times and code optimisations.

The functional-safety certified C/C++ compiler comes with a qualification toolkit, which speeds up development and certification of automotive applications.

Current sensor ICs in 40% smaller package

Two current sensor ICs from Allegro Microsystems provide low internal conductor resistance, high operating bandwidth and reliability across automotive, industrial and consumer applications.

The ACS37030MY and ACS37220MZ are for precise current sensing in a compact and durable package. Featuring a widebody design, they deliver higher isolation in a 40% smaller footprint compared with existing 16-pin packages.

The designs also incorporate lower resistance, which helps reduce power dissipation.



The ACS37030MY is a fully integrated current sensor IC with fast response time for protecting wide bandgap GaN devices. It uses a combination of Hall-effect and inductive coil signal paths to sense current over a wide frequency range.

This package enables a product that is both five times faster than existing products, but also 40% smaller. It is also available in a narrow-body package for lower isolation requirements.

The ACS37220MZ integrated Hall-effect current sensor has a 150kHz bandwidth and fault pin. This device is for value-line current sensing applications as a successor to the ACS724/5 products.

The package offers a 40% smaller size and lower resistance for lower power dissipation.

LDOs generate stable voltage under cold-crank

AEC-Q100 qualified general-purpose low-dropout (LDO) voltage regulators from Nexperia have low quiescent current.

This series includes LDOs with high tracking accuracy and protected outputs, capable of direct connection to vehicle batteries thanks to their wide input voltage tolerance.

Thermally enhanced, they can generate a stable voltage source under cold-crank conditions for ripple-sensitive loads in applications including infotainment, adas, telematics and lighting.

Output protection enables their use in body control modules, zone controllers and powertrains, even in scenarios involving off-board loads such as sensors.

Consuming 5.3μA typical quiescent current at light load and 300nA shut-down current under disabled mode, these LDOs are for always-on components such as MCUs, Can or Lin transceivers in standby and Can-wake systems.

Tracking LDOs address off-board or off-PCB powered scenarios, such as powering sensors. These often require protection, including against short-to-ground, short-to-battery and reverse current. These are addressed by protection features.

For ratiometric sensing or measurement applications, they deliver output accuracy, tracking supply voltages of ADCs or MCUs within ±5mV.

The general LDOs generate a stable (±2% accuracy) 3 or 5V output from an input voltage of 3 to 40V, allowing them to be connected directly to a car battery.

Integrated protection includes short-circuit, overcurrent and thermal shutdown and they can operate from -40 to +125°C ambient and -40 to +150°C junction.

There are devices with a power good output voltage status monitor.

The Nex90x30-Q100 LDOs provide 300mA output and are available in thermally enhanced, bottom-side cooled eight-pin htssop packages measuring 3 by 3mm and a DFN6 package measuring 2 by 2mm.

For lower loading current, NEX90x15-Q100 devices with 150mA output have package choices of sot23-5, sot223-4 and HWson6 (DFN-6).

The tracking LDO NEX91207-Q100 has a 70mA output and comes in sot23-5 and sot23-5S packages.



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