VEHICLE electronics

The monthly magazine for automotive electronics engineers

Continental and NVidia bringing AI to vehicles

Continental and NVidia are partnering to create artificial intelligence (AI) self-driving vehicle technology based on the NVidia Drive platform, with a planned market introduction in 2021 for level-three features.

The partnership aims to produce AI systems that scale from automated level-two to full level-five self-driving, where the vehicle has no steering wheel or pedals.

Engineering teams from each company will work together to develop self-driving technology based on the Drive platform, including the Xavier SoC and operating system, as well as autonomous vehicle software stacks.

"We now have all the key elements in place to take AI self-driving cars from development to mass production," said Jensen Huang, founder and CEO of NVidia.

They will use Continental's experience in system and software engineering for Asil D rated safety and integrate a range of Continental sensors, including radar, camera and high-resolution 3D lidar.



Elmar Degenhart (left) and Jensen Huang are partnering to create AI for self-driving vehicles

"The vehicle of the future will be a sensing, planning and acting computer on wheels," said Continental CEO Elmar Degenhart. "The complexity of autonomous driving requires nothing less than the full computational horsepower of an AI supercomputer."

Xavier can deliver 30 trillion operations per second for deep learning, while consuming only 30W of energy. This is necessary to handle the massive amount of data processing that self-driving vehicles must perform. These include running deep neural nets to sense surroundings, understanding the environment, localising the vehicle on an HD map, predicting the behaviour and position of other objects, as well as computing vehicle dynamics and a safe path forward.

They will develop automated driving features, including 360˚ perception and automatic lane changing on highways, plus the ability to merge in traffic. In addition, they will integrate HD maps.

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NEC and Sumitomo collaborate on mobility

Japanese companies Sumitomo Electric Industries and NEC have begun collaborating in the mobility business, including planning and development of automotive components.

In December, the collaboration started with the vehicle connectivity support business using networks. The two companies will now plan, develop, demonstrate and commercialise hardware and software for in-vehicle and transportation infrastructure systems by capitalising on their artificial intelligence (AI) and IoT technologies, while expanding the business in stages.

Recent advancements in IoT have accelerated the creation of business opportunities by seamlessly connecting networks in and outside of vehicles. Moreover, autonomous driving and car sharing have increased the demand for safe, secure and efficient services using AI.

Sumitomo has been developing and manufacturing products that support an advanced society and its stable growth, such as vehicle mobility, including in-vehicle components and traffic control systems for traffic infrastructure. Sumitomo views its role in connecting these products to the internet and enhancing their security as a social responsibility.

NEC has a portfolio of AI technologies under the brand NEC the Wise, as well as IT infrastructure and cloud platforms. The company also develops software for these products and services, in addition to technologies to achieve high levels of security.

The two companies will take advantage of their strengths to develop AI- and IoT-based connectivity products with security in the mobility business.

They intend to plan and develop products and services to cater to the expansion of the connected car market.

Flying cars to land in Geneva



At the Geneva Motor Show in March, Pal-V will unveil the world's first flying car production model – the Pal-V Liberty.

"The production model is the moment of truth," said Robert Dingemanse, CEO of Pal-V. "The moment where the wall between fiction and facts is torn down. A production model is the last stage in the R&D process before starting full production and delivery. All certifications required for commercialisation will be granted on the basis of this production model. It is the pivotal point that separates pioneers from dreamers."

The certification not only guarantees the safety of the flying car but also is the approval that the vehicle can be driven on the roads and flown in the air.

"Once full certification is granted in 2019, we will hand over the keys of the Pal-V Liberty to our first customers," Dingemanse said.

Aurora to take Byton to level four

Electric vehicle maker Byton is using Aurora self-driving technology to bring level-four autonomous-driving capabilities into its vehicles.

In the next two years, Byton and Aurora will jointly conduct pilot deployment of Aurora's L4 autonomous driving systems. Additionally, they will explore the use of self-driving systems in production vehicles.

"Aurora is supremely focused on a mission to deliver the benefits of self-driving vehicles safely, quickly and globally," said Carsten Breitfeld, CEO of Byton.

In January at CES in Las Vegas, Byton premiered its Byton Concept and announced plans to design and build smart premium electric cars for the Chinese, US and European markets.



Byton Concept vehicle

Sales are set to begin in China in 2019, and sales in the USA and Europe to start in 2020.

"We are excited to partner with Byton, an innovator in the electric vehicle industry, to further advance our goal of delivering self-driving vehicles quickly, broadly and safely," said Chris Urmson, CEO at Aurora. "We look forward to piloting this technology in California."

TomTom API reports traffic by voice

Satnav firm TomTom has introduced as an application programming interface (API) for developers. Called Audio Traffic, it brings personalised and relevant traffic reports over voice to drivers in a non-intrusive way.

Although personalised traffic information is one of the most requested features by commuters driving known routes, they don't necessarily want to use turn-by-turn navigation, which typically includes traffic information about the route ahead.

TomTom Audio Traffic solves this by delivering an accurate traffic news bulletin that is relevant to the route that is being driven. And because it's delivered via voice, drivers can keep their hands on the wheel and eyes on the road.

It was developed with Duel, a provider of smart multimedia applications, and is based on TomTom Live Traffic. Using the API, developers can integrate it into applications such as music streaming services, internet radio and voice assistants.

"TomTom Audio Traffic is the next generation of radio traffic bulletins, offering an incredible opportunity for companies that want to capture the ears of the driver," said Ralf-Peter Schäfer, vice president at TomTom.

Sakor steers Hyundai Mobis

Sakor Technologies has provided a complete dynamometer tester for electric steering made by tier-one supplier Hyundai Mobis. It will be used by the engineering group in South Korea for validation and performance evaluation of electric motors and ECUs that directly control the motor during electric steering.

The system has a 1.5kW four-quadrant AC motoring dynamometer. Also included is a high-voltage battery simulator that provides repeatable testing results for electric steering components. The tester communicates with the ECU via the Can bus.

The tester validates the operation of motors and ECUs in electric steering, ensuring that steering operates smoothly, with no perceptible torque ripple felt by the driver.

"We are very pleased to provide Hyundai Mobis with this very precise system for conducting vibration and resonance testing on designs for the entire line of electric steering systems," said Randal Beattie, president of Sakor. "With this system they can be assured that motors and controls will operate over their full performance range with absolutely minimal torque ripple."

Denso invests in MaaS start-up

Denso has invested in start-up company ActiveScaler, a developer of managed MaaS (mobility-as-a-service) powered by artificial intelligence.

The investment will help expand ActiveScaler's platform and technologies, which simplify and customise shared mobility experiences. The agreement also will help accelerate deployment of managed MaaS systems for mobility operators and fleet service providers.

"Denso's focus is to develop technologies that advance the future of mobility, and enable connected and automated driving," said Yoshifumi Kato, senior executive director at Denso. "ActiveScaler will help fleet operators accelerate new business opportunities by integrating the emerging MaaS ecosystem with higher performance and faster time to market."

Abhay Jain, CEO of ActiveScaler, added: "We want to be the engine behind the future of MaaS."

He said traditional fleet management services were quickly becoming obsolete because of issues such as high upfront software and hardware costs, poor ecosystem integration, and lack of flexibility, which were limiting the type and quality of services.

"Our new AI-powered technology and fresh approach provides the ability to build end-to-end MaaS businesses featuring advanced analytics and automation, high security, and regulatory compliance while reducing environmental impact," said Jain.

- Denso has developed a standard vision sensor that detects pedestrians at night, cyclists, road signs, driving lanes and other road users. Working with a millimetre-wave radar sensor, the sensor lets automobiles automatically activate emergency braking when obstacles are identified, helping reduce accidents and improve overall vehicle safety. It is in the 2018 Toyota Alphard and Vellfire, which were released in January.

Haylion and Scania connect on autonomous driving in China

Scania and Haylion Technologies are collaborating in the areas of autonomous driving, electrification and connectivity.

"For Scania, this partnership provides unique opportunities to contribute to as well as to learn from the rapid technology development now taking place in China in these strategic areas," said Mats Harborn, executive director for Scania in China. "We look forward to combining our knowledge and global perspective with the expertise and ambitions of Haylion Technologies."



Haylion and Scania agree to collaborate

Scania and Haylion will join forces in the fields of non-fossil fuel powered, mainly electrified, vehicles, autonomous driving and urban bus transport. The common aim is to expedite the commercialisation of autonomous driving applications and sustainable transport.

"Gaining excellence in skills through collaboration has always been our principle," said Jimmy Hu Jianping, founder and chairman of Haylion Technologies. "We recognise Scania's leading position in the world's commercial vehicle industry. I believe that our cooperation will further promote and accelerate China's development of intelligent vehicles and the internet of vehicles."

Haylion has with Gortune Investment established a team of specialists in artificial intelligence, automotive manufacturing, communications and public transport. This team focuses on autonomous driving technology, concept verification and its industrialisation.

Haylion's main focus is developing technology for public transport by electrified, autonomous and connected buses.

Since the end of 2017, Haylion has conducted trials with intelligent buses on public roads with the Shenzhen Bus Group, also known as AlphaBa.

New Holland pilots autonomy on vineyard tractors

New Holland Agriculture is partnering E&J Gallo Winery in a pilot testing its NH Drive autonomous technology applied to vineyard tractors.

This collaborative programme is focused on gathering agronomic and operator feedback on the use of the technology in everyday vineyard activities, with the objective of delivering autonomous vehicles that are driven by the real-world requirements of winegrowers.

The pilot is the latest step in the New Holland's autonomous vehicle programme and its exploration of the various applications that can benefit the most from this technology.

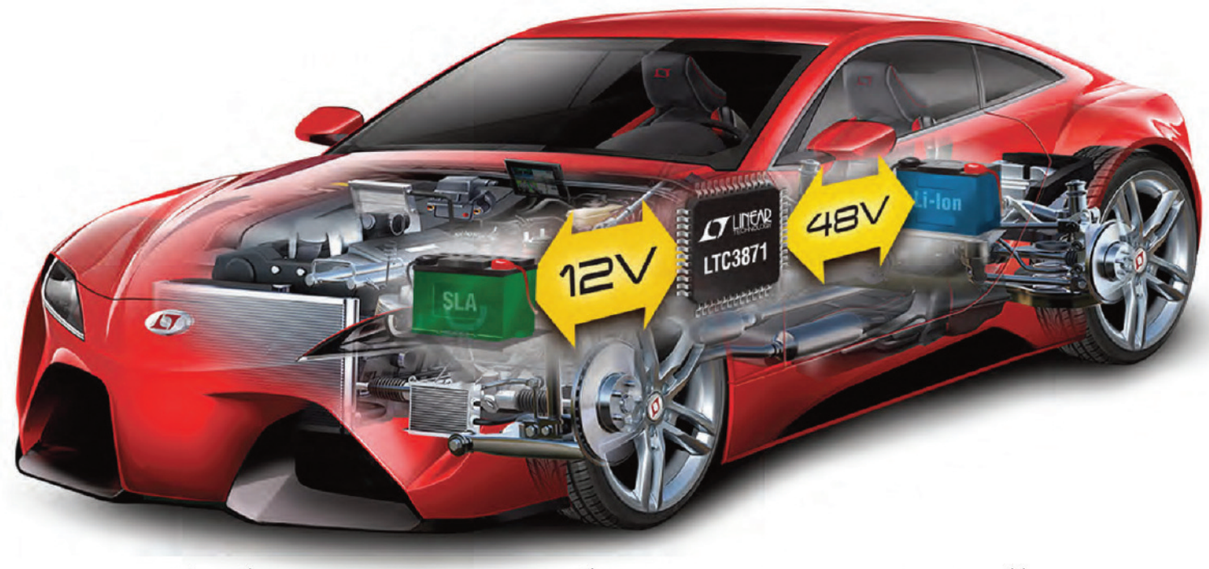
The brand unveiled its NH Drive autonomous system in 2016 at the Farm Progress Show, and has since previewed it on the T7 Heavy Duty and T8 tractor series to illustrate possible row crop applications. The latest pilot demonstrates it is applicable to all the brand's tractors.

"Sustainability and innovation are in New Holland's DNA," said Carlo Lambro, New Holland Agriculture brand president. "That's how we help our customers farm efficiently and profitably today, and anticipate the way their needs will change.

"We believe specialty operations, and in particular those in the vineyard environment, could significantly benefit from the introduction of autonomous technology."


Vineyard tractor

Multi-kW Bidirectional Power Transfer



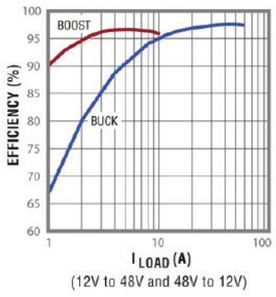
Single IC 48V/12V Dual Battery Power Controller

The LTC3871 bidirectional two-phase synchronous buck or boost controller brings a new level of performance and simplicity to 12V/48V automotive dual battery systems. Using the same external components for buck and boost modes significantly reduces complexity and solution size. Up to 97% efficiency can be achieved, and the maximum current delivered in either direction is controlled. Four control loops, two for current and two for voltage, along with overload protection in either direction provide a robust solution. 6kW to 8kW can be supplied in either mode with a 12-phase design.

Features

- Buck or Boost on Demand
- Regulation of V_{IN}, V_{OUT} or Current
- 48V Nominal Bus, Up to 100V
- 12V Nominal Bus, Up to 30V
- Up to 97% Efficiency
- Up to 12-Phase Operation
- AEC-Q100 Compliant
- Engineered for Diagnostic Coverage in ISO 26262 Systems

Efficiency Buck & Boost Modes



(12V to 48V and 48V to 12V)

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X-Fab sites meet IATF-16949

Five of X-Fab Silicon Foundries' six manufacturing sites have been certified for automotive manufacturing according to the IATF-16949: 2016 automotive quality management standard.

The labs are at Erfurt, Dresden and Itzehoe in Germany, Kuching in Malaysia, and Lubbock in Texas, USA. The firm's most recent manufacturing site in Corbeil Essonnes, France, will be qualified in the second quarter of 2018.

The firm says it is the first semiconductor foundry whose manufacturing sites meet the standard.

Until now, its manufacturing sites were qualified



Frank Lorenz: "Our organisation is enthusiastically behind this."

according to ISO TS16949, which is now superseded by IATF-16949 and is implemented as a supplement to ISO 9001.

Among the enhancements are additional requirements for business procedures, cleanliness, ethics, training, supplier and customer communications, and detailed record keeping.

"Process orientation, interdisciplinary work and continuous improvement combined with intensive customer collaboration are the key elements in achieving our goal of zero incidents throughout the automotive supply chain," said Frank Lorenz, vice president at X-Fab." The IATF-16949 quality certification is an important milestone in our 25 years of foundry experience, demonstrating our commitment to quality and reliability. Our entire organisation is enthusiastically behind this effort, and with this new IATF certificate we can move forward with further improving our offering to provide greater value for our customers."

Almost half of the company's business is related to the automotive market and on average there are now ten ICs produced by X-Fab in every newly manufactured vehicle worldwide.

Certification for IATF 16949 requires automotive suppliers throughout the entire supply chain to perform and record all processes and activities in a common standard format, as well as documenting all process changes and events in a timely manner.

Visteon and GAC partner on autonomous technology

Visteon is cooperating with Chinese vehicle maker Guangzhou Automobile Group's GAC Engineering to develop and deploy autonomous driving and other cockpit electronics.

The companies will collaborate on the development of autonomous driving technology using Visteon's DriveCore platform, introduced at January's CES in Las Vegas, on a vehicle programme that is planned to be launched in 2020.

They will also explore potential commercial engagements in instrument clusters, displays, augmented reality head-up displays and domain controllers using Visteon's SmartCore technology.

Sachin Lawande, president and CEO of Visteon, said that GAC's "development efforts in intelligent and automated vehicles are fully aligned with those of Visteon, which has a major presence in China".

Initial engagement will focus on development of level three and higher autonomous driving and cockpit domain controllers.

"We believe that this cooperation with Visteon will play an important role in promoting the rapid development of autonomous driving and cockpit electronics systems," said Wang Qiujing, president of GAC Engineering.

Renesas and Maxim

Renesas has denied reports that it is talks to take over Maxim Integrated. Maxim, however, has refused to comment. The acquisition was rumoured to have been in the region of $20bn but was not imminent.

Audi partners OnSemi to push early innovation

On Semiconductor has become part of Audi's Progressive Semiconductor Programme (PSCP) with the goal of fostering innovation for Audi models early on.

Automotive innovations have increasingly been enabled by semiconductors, a trend set to continue due to powertrain electrification, adas and autonomous driving.

Also, applications such as those related to comfort and convenience, infotainment, and vehicle connectivity are driving semiconductor use in the automotive sector.

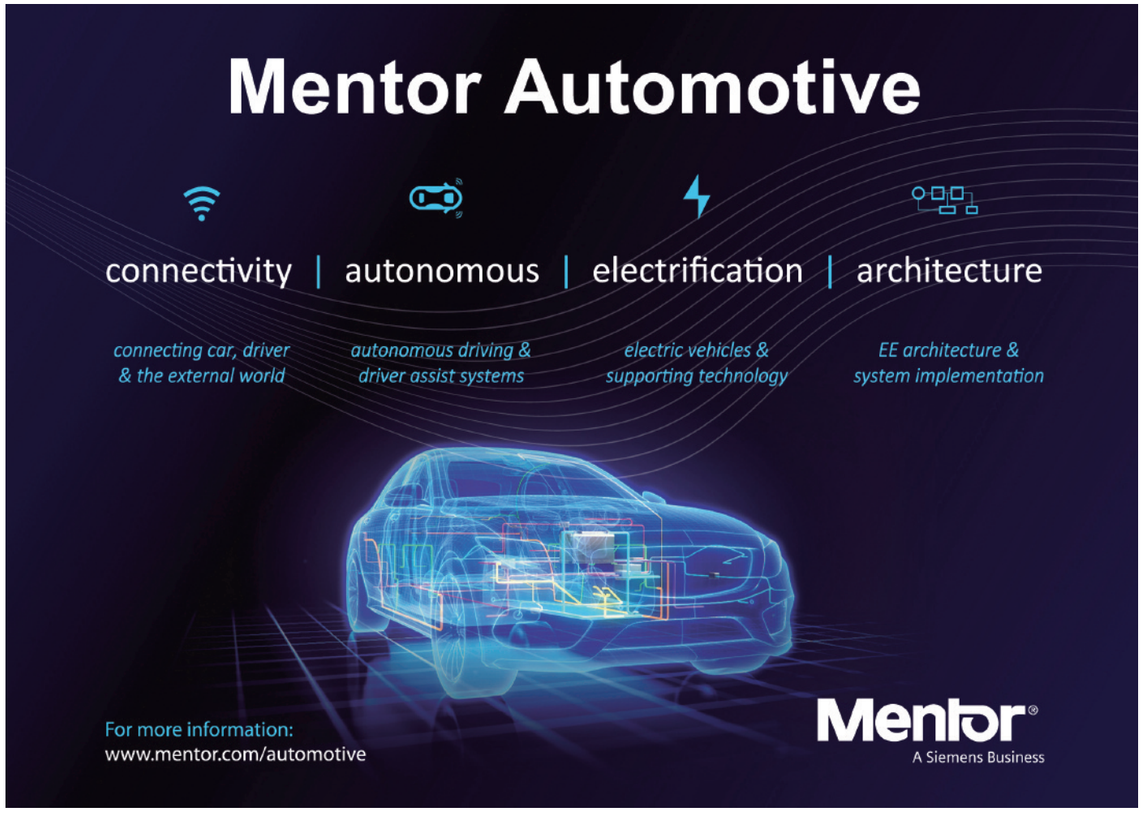
OnSemi specialises in image sensors, power management and connectivity for automated driving. The company has a portfolio of power products including modules and SiC and GaN wideband gap devices.

The collaboration aims to help advance mobility by enabling accelerated development and new capabilities in automated driving systems and vehicle electrification.

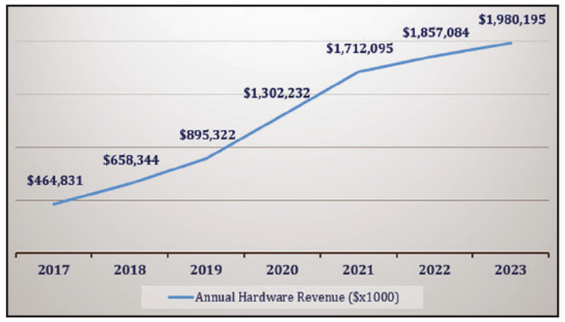
"We are looking forward to forging even closer and more productive working relationships between our engineers and the teams at Audi to accelerate the development of innovative, high-quality throughout the vehicle," said David Somo, SVP at OnSemi.

The PSCP is designed to make the latest semiconductor technologies available in cars, while increasing reliability. The aim is to transfer progress in microelectronics more effectively to the car. This involves being in direct contact with the semiconductor manufacturers.

"With semiconductors being so vital to recent and future developments on our vehicle platforms, we recognised that traditional automotive innovation cycles were no longer appropriate for keeping pace with consumer demand for exciting new technologies in all areas of the vehicle," said Thomas Müller from Audi.



Consumers show little interest in connected cars



Cellular telematics hardware from 2017 to 2023

Consumers have little interest in connected cars, according to Rethink Research. It found that fewer than 16 million owners out of the 105 million plus cars that could buy services from a connected car have shown interest. And fewer than 16% have actually committed monthly cash to the provision of services.

Typically these spend between $99 and $200 a year and the big four brands that have recruited the bulk of these are General Motors, Toyota, Volkswagen and Hyundai.

The services they offer are mostly a packaged bundle of emergency assistance, stolen vehicle locator, roadside assistance and automatic collision notification.

The rationale for the major 20 car manufacturers tracked in the report is to sell data. The primary purchaser of data is seen as insurance companies, but also anyone, such as retailers interested in drive-past data and in car demographics.

Manufacturers are expected to absorb physical costs in the region of $2bn a year to build connectivity into cars. But the biggest cost will be connectivity itself. Here car makers are expected to absorb a further $11bn in connectivity costs, making the price of entry for the major car makers into the connected car just shy of $13bn.

A different hardware BoM for V2X communications is expected to reach an additional $1.8bn to underpin safety services, bringing the total for BoM plus connections to $14.7bn.

The payback in 2017 came in driver acquired services revenues, of some $2.6bn, but this could fall to just over $1bn by the end of the forecast in 2023, with 75% of that being spent in the USA.

The real payback is sale of data, but even by 2023 this will not bring in quite enough fresh revenue to pay for all the costs and it will not be until 2024 at the earliest that car manufacturers can look at this market and breathe a sigh of relief.

Panasonic and Trend Micro cyber-security alliance

Panasonic and Trend Micro are jointly developing security to detect and prevent cyber attacks against autonomous and connected cars.

The partnership aims to develop ways to detect and prevent intrusions into ECUs that control driving behaviour such as acceleration, steering and braking, as well as in-vehicle infotainment (IVI) devices such as automotive navigation systems and telematics.

The risks of hackers taking control of steering and braking in connected cars are real. New security vulnerabilities are discovered every day and they pose a risk for remote exploitation. It is therefore more important than ever not only to implement security in each vehicle but also to analyse new attacks by constantly monitoring in-vehicle systems from the cloud and use the results to implement countermeasures against cyber attacks to all vehicles.

This partnership will leverage Panasonic's Can intrusion detection and prevention technology and Trend Micro's IoT security. Panasonic's technology will be able to detect any unauthorised commands sent to ECUs that control driving operation, while Trend Micro IoT security, which uses Trend Micro's security intelligence and expertise such as malware analysis, will be implemented on IVI devices such as automotive navigation systems to detect attacks that seek to exploit vulnerabilities through the internet.

Through this partnership, events identified by both technologies will be collected and sent to an analysis platform in the cloud to detect and block suspicious traffic.

The goal is to provision in-vehicle and cloud systems to prevent cyber attacks against autonomous and connected cars.

BMW and Daimler team up with Here

BMW and Daimler have both teamed up with Here to deploy is HD Live Map technology. BMW is planning to switch on HD Live Map for future models capable of highly automated driving. And Daimler plans to make it an integral part of its autonomous driving technology.

Daimler is laying the ground work for upcoming generations of highly automated and autonomous Mercedes-Benz vehicles, a logical step as the current E and S Class models are already using maps from Here.

HD Live Map is planned to feature in BMW models from the beginning of the next decade, enhancing safety and comfort for drivers and passengers.

This is the first commercial contract Here has signed with a car maker to bring the technology into production models, and follows several years of research and development with BMW.

"We are very excited about this inaugural commercial agreement for HD Live Map," said Ralf Herrtwich, SVP at Here Technologies. "BMW's trust in our map reinforces our view that with our innovative product, long-term development strategy and sustained investment programme we are well-placed to meet the needs of automakers as they introduce more automation into their vehicles."

By the end of this year, HD Live Map will have grown to a million kilometres of roads across North America and Europe charted to sub-metre accuracy. This includes lane configurations with lane markings, lane centrelines, speed limits and shoulders, as well as a complete layer of roadside objects and 3D obstacles for vehicle localisation.

The technology is self-healing. This means it can reflect dynamic changes in the road environment and update itself accordingly in near real time. This enables vehicles to adjust proactively to changing road conditions, for example, switching lanes and adjusting speed ahead of time in the case of an upcoming lane closure.

Here is already receiving vehicle sensor data from multiple car makers, including Daimler, to produce near real-time map updates.

"The map of the future is one that's self-healing, constantly updating to mirror what is happening across the road network," said Herrtwich. "Together with Daimler, we are mastering this powerful mapping technology and are truly excited to make it available for the next generations of Mercedes-Benz vehicles."



A vehicle's environment with Here HD Live Map

Molex partners Blackberry

Molex has teamed up with Blackberry to develop a 10Gbit/s Ethernet automotive networking platform to increase data bandwidth in intelligent connected vehicles. It integrates high-speed data transmission, prioritisation, scalability and embedded security.

"Secure high-bandwidth Ethernet represents the future of in-vehicle and V2X connectivity," said Eric Scott, advanced technology manager at Molex. "The industry-leading 10Gbit/s Ethernet automotive network supports secure and reliable data transmission between multiple hardware and embedded software systems enabling end-to-end data integration and data prioritisation for intelligent vehicles."

Vesa display SIG

Standards body Vesa has formed a SIG for automotive display connectivity to discuss display interface requirements and the potential for new standards addressing automotive display applications.

Automotive is a fast-growing space for high-resolution video displays and content.

Both DisplayPort and embedded DisplayPort (eDP) are already gaining attention in the automotive industry.

Many popular SoCs support the output of DisplayPort and eDP, and eDP is the main input interface on display panels used in notebook PCs, supporting up to 4K resolution with a low wire count.

POWER TECHNOLOGIES



LAB WORK

Steve Rogerson visits Rohm Semiconductor's recently opened European Power Lab

With increases in complexity and growing pressures on time to market, the life of the automotive electronics engineer is becoming harder. On top of that, the wide variety of applications in which semiconductor components have to be used means that traditional datasheets often do not cover every possible use case.

The result is that both car makers and their suppliers have to work more closely with the component makers throughout the design stage.

This was the thinking behind Japanese company Rohm Semiconductor opening its Power Lab testing laboratory at its European headquarters at Willich near Dusseldorf in Germany late last year.

"Engineers are facing a lot of challenges," said Aly Mashaly, manager for power systems at Rohm Semiconductor. "It is a lot more complex, they have limited resources and little time. They want to find the easiest way to design their circuits, they need better data and they need evaluation boards because there is no time to test new devices."

For example, one the biggest challenges engineers face is thermal management. Here is where the difference between the datasheet and the application really stands out.

"The semiconductor suppliers cannot cover every application," said Mashaly, who is also head of the new laboratory. "There will be points in the final application that are not covered in the datasheet. Power semiconductors are used in different applications with different loads. They are also used everywhere in the world, so environmental conditions and grid performance have to be considered."

To help engineers tackle these problems, Rohm decided to provide local technical support at the application level in Europe, and so the Power Lab was born. The engineers employed there will look at how its customers are using the devices and provide support for them through all phases of the project with the focus being at the system rather than component level.

"We can perform special tests for a customer at the application level," said Mashaly. "With the Power Lab, we can show how the parts work together."

The 300m² lab's purpose is the analysis of power components and systems to provide support at the application level. To that end, it is equipped with several test benches with a separate high-voltage area.

"We set up test benches with state-of-the-art technologies," said Mashaly.

The power test bench enables tests on AC-DC, DC-DC, DC-AC and AC-AC converters under real application conditions up to

15kVA. Additionally, precision measurements of efficiency and losses can be performed with power analysers.

Among this test bench's special features are an AC power supply (grid emulator) and AC and DC electronic loads. Maximum voltages under test are 1500V DC and 400V AC.

The calorimetric test bench is for analysing the thermal behaviour of the power discrete devices, modules, electronic boards and complete power electronics systems. This test bench can test at very high current supplies with hundreds of amps and has a climatic chamber for tests under special temperature conditions from -40 to +180˚C. Humidity can be set between 10 and 98%.

The high-voltage test bench for voltages up to 8kV is in a separate room to protect the tester during the operation.

The lab can also investigate and test the insulation sections – so-



The test benches use the latest technologies

called clearance and creepage distances – on board and at system level up to 6kV.

"We designed the test benches ourselves," said Mashaly. "This ensures the quality and it also makes it easier to make modifications in the future."



Christian André: "Customer curiosity is growing."

Formula E

One company that has benefitted from the way Rohm likes to work closely with its customers is Formula E team Venturi. The company has been the official technology partner of the racing team since the 2016-17 season and the team's engineers have been using Rohm's silicon carbide (SiC) power devices to improve the effectiveness of the power electronics.

"We are pushing all the components to the limit and beyond the limit," said Franck Baldet, CTO for Venturi.

To do this, he said, it was important for the team to work closely with its suppliers.

"It is a technology partnership we have with Rohm," he said. "Rohm produces the power modules that have to be integrated and that process can involve redesigning the modules. It is team work. We perform all the tests together. If we find weaker

points, then Rohm works hard to solve the problems. That is why we end up with reliable parts."

Conclusion

The speed of innovation in the automotive world is the main driver for companies such as Rohm to set up these types of facilities to help customers integrate the devices that they supply. And this is a situation that is going to be amplified as more automation and hence more electronics are integrated into vehicles.

"Within less than ten years we will have autonomous driving," said Christian André, president for Rohm in Europe, " though the driver will still have the choice of whether to use this or not."

This time frame will also see an increase the electrification of vehicles as car makers strive to meet ever more stringent emissions regulations.

"The electric vehicle market is being driven by lower emission targets," said André.

However, he said drivers had their own expectations, the top one being the technology had to be affordable. The design also has to be good. They have to be easy to recharge and be able to do this anywhere.

"Customer curiosity is growing but product availability is limited," said André.

From a technology point of view, there is a requirement for more power density. Components have to work at high temperatures. They have to be lighter and compact. Electric vehicles must have a driving range up to 500km and there has to be a fast charging



Aly Mashaly: "Engineers are facing a lot of challenges."



Franck Baldet: "It is a technology partnership."

infrastructure.

He said Rohm was well placed to meet these challenges and as such was seeing an increase in automotive revenue, which accounted for just 11% in 2004 but was now nearly a third of the company's revenue.

"By the end of 2021, the target is 35% of revenue in automotive," he said. "But we also have to balance our revenue geographically. We want our business outside of Japan to grow from 40% currently to 50%."

The company thus has an investment plan to spend $540m to increase its overseas revenue including building a new plant for resistors, capacitors and, later, transistors in the Philippines and increasing capacity in Germany. To do this, it also needs to work more closely with its customers and the Power Lab is an important step to achieving that goal.



The electric vehicle market is being driven by emission targets

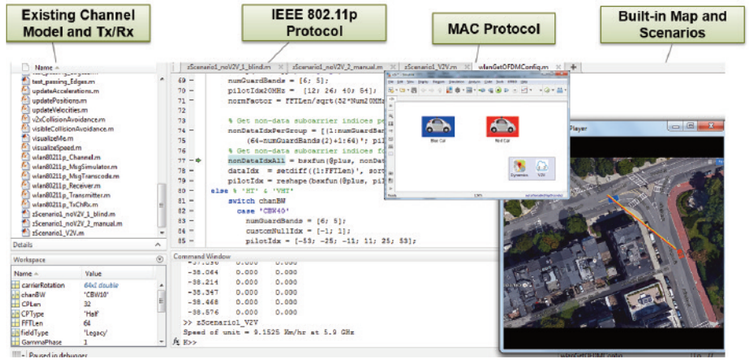
WIRELESS

SAFE DRIVING

Houman Zarrinkoub compares the options for V2X wireless technology

Connected car technology can make roads safer (Photo: Nira Dynamics)

Vehicle Electronics



Intersection movement assist case study with DSRC using IEEE 802.11p based V2X

To make roads safer, improve autonomous driving and further the aims of the smart city, one particularly important field is vehicular communications, a cooperative communications technology. This technology enables continuous, high-speed, authenticable interactions between moving vehicles.

Vehicular communications are typically categorised into four use cases: communications of vehicles with other vehicles (V2V); vehicles to the roadside infrastructure (V2I); vehicles to pedestrians (V2P); and vehicles to the cellular network (V2N). These use cases together are known as vehicles to everything (V2X) and have the potential to change roads significantly for the better.

Safer roads

Transportation safety is set to improve considerably with the arrival of V2X technology. A report by the US Department of Transportation's National Highway Traffic Safety Administration says: "If V2X technologies alone are widely deployed, they have the potential to address 81 per cent of light-vehicle crashes."

Indeed, V2X technology will provide safety features above and beyond what is offered in other advanced driver assist systems (adas) of today.

Most of these are reliant on computer vision, radar or lidar technologies. The issue with such technologies is that their signals cannot penetrate through vehicles and no information is available about vehicles that are outside the line of sight.

By contrast, V2X provides critical information about vehicles that are inside and outside the line of sight, provided that they are within a certain communications range. Therefore, V2X makes both semi-autonomous driver-based systems and fully automated systems much more situationally aware. Increased situational awareness means vehicles can cooperate and reduce accidents in various traffic scenarios.

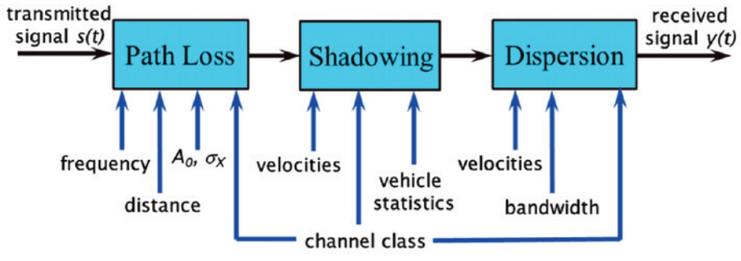
Better adoption

Automotive V2X technology has a large potential market. According to Juniper Research, the V2X market is anticipated to reach $3bn by 2022 with a 26% annual rate of growth. It is expected that half of new vehicles will have V2V hardware by 2022. Three sectors make up the market:

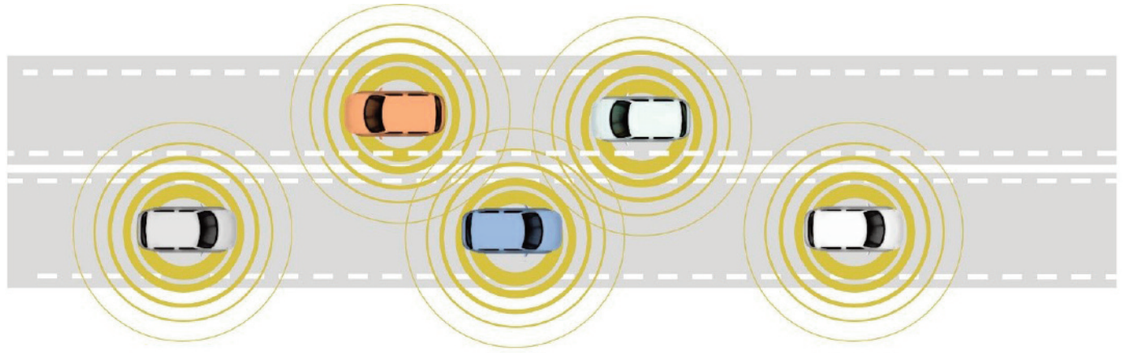
- **Devices and semiconductors:** RF transceivers and V2X chipset makers such as Denso, Continental, Delphi, Qualcomm and Infineon;
- **Cellular infrastructure:** manufacturers (Huawei, Nokia and Ericsson) and carriers (AT&T, NTT and Docomo); and
- **Automobiles:** manufacturers such as Toyota and Honda (Japan), GM and Ford (USA), and BMW, Daimler and Audi (Germany).

Options

For the implementation of V2X technology, two candidate



Typical V2V conventional terrestrial channel model



V2X technology on the roads

technologies are being put forward: dedicated short range communications (DSRC) and cellular vehicle-to-any-device (C-V2X) communications. Both are made to operate at the 5.9GHz band and must adhere to strict reliability and delay requirements: communications latency of less than 100ms delay;

communications range of at least 300m; and supported vehicular speeds of typical highway velocities.

DSRC is a derivative of wifi technology. In DSRC, communications protocols – phy and mac layers – are specified by the IEEE 802.11p standard. Automotive companies such as Toyota, Honda and GM are among the proponents of this technology.

The work on DSRC started in 2009, and its communications protocols were fully characterised by 2010. Its supporters say that all aspects of DSRC standards from application layer to phy layer and all safety considerations have been addressed in the past eight years of development. They believe the technology is ready for deployment on a large scale from 2017.

DSRC has known limitations, including support only for the V2V and V2I applications and an upper bound of reliability for vehicle density and communications range.

C-V2X is based on 4G-LTE cellular technology. It is part of the device-to-device (D2D) communications protocol of the sidelink (proximity server) mode of the LTE-Advanced standard. Therefore, it allows every device to detect every other device in its proximity directly.

Unlike DSRC, it supports the V2N and V2P vehicular communications use cases. Compared with DRSC, it supports higher speeds (up to 250km/h) and higher density (thousands) of vehicles.

The proponents of C-V2X technology are in a consortium of automotive and wireless device manufacturers known as the 5G Automotive Association (5GAA). These include Intel, Ericsson, Nokia, Audi, BMW, Qualcomm and Denso. According to the 5GAA, the cost of developing a DSRC-based service is far more than that of those based on C-V2X. Moreover, the gap in technology advantages between C-V2X and DRSC will increase after 5G cellular networks are introduced.

So far, neither of these technologies has been selected as the mandated V2X technology in any country. It is likely that both will be adopted; vehicles will be equipped with a smart way to understand and decode data transmitted and received through each of these technologies.

Pain points

Practitioners of V2X technology include software and hardware developers, integrators and service providers, and testers and performance monitors. The main problems in developing V2X technologies are visualisation, prototyping and model evolution.

Practitioners must be able to achieve the following:

- Visualise, update and monitor vehicular dynamics and wireless sensor networks, including position, velocity and acceleration of vehicles in network; vehicles entering and exiting the network; RF signal strength at each vehicle; status of links between each vehicle; and other system elements.

• Prototype different collision avoidance and traffic resolution algorithms on V2X chips. This involves wireless modem operations handling transmission and reception of basic safety messages, and also collision avoidance algorithms and traffic control messages that the vehicle processes in real time.
• Evolve their models and monitor the effect of V2X techniques on overall traffic (status of collision avoidance manoeuvres, overall communications metrics such as delays and throughput, algorithms to reroute traffic, and dynamics of V2X nodes to optimise a given set of criteria) and continuously search for more optimised techniques based on a huge amount of actual field data.

It is critical to ensure that safety-critical applications and devices such as V2X work exactly as they were intended.

Using computer simulations, a model of the system, its components and its environment can be built and be subject to rigorous testing. Model-based design tools enable the visualisation, analysis and testing of various traffic scenarios and vehicular dynamics and can test that the V2X system provides collision avoidance as expected.

Tomorrow

Vehicular transportation and urban safety is transforming radically through automation. Intelligent transportation systems such as autonomous cars are designed to be aware of the events happening around them. These situationally aware systems can respond to movements of other vehicles and pedestrians in real time.

With more and more cars on the roads using these types of automated driving features, including V2X, the safety and security of driving in general can be significantly improved. These steps are in the right direction towards reducing automotive collisions. It is indeed an exciting time for vehicle electronics.



Houman Zarrinkoub is senior wireless product manager for Mathworks

DSRC comes in cheaper than C-V2X

Analysis of V2X conducted by ABI Research finds that the cost of implementing DSRC above cellular communications is expected to be $13.50 to $15 lower per telematics control unit (TCU) than implementing C-V2X.

The global automotive industry has been involved in extensive discussions comparing DSRC and C-V2X as technology alternatives for enabling V2X in vehicles to prevent accidents. Up until now, the added cost of V2X, which constitutes a significant parameter, was hardly compared between DSRC and C-V2X. As vehicle manufacturers are increasingly integrating V2X in TCUs, an ABI Research study analysed the cost of adding V2X to the TCU using both technologies.

"We estimate that in the initial years of deployment, C-V2X plus LTE will carry a system cost between $13.50 and $15 higher than DSRC plus LTE," said James Hodgson, senior analyst at ABI Research. "DSRC, being the longer established and incumbent technology, has cost advantages typically associated with deployments in the field and a more competitive ecosystem."

The cost analysis indicates that C-V2X's complexity and challenging requirements add cost over DSRC when taking into account that V2X is safety-critical technology. The key architectural differences that impact cost according to ABI are LTE ruggedisation and automotive qualification, the need for a high accuracy clock source, the cellular royalty scheme, and the use of wifi that is bundled with DSRC for free; DSRC is part of the wifi standards family.

Since both DSRC and 4G cellular are available technologies with mature products on the market, ABI says the findings strengthen the industry view that the hybrid model of DSRC plus cellular is not only simpler to design and deploy but is more affordable as well.



TURNING FORTE

Kia unveiled its 2019 Forte at NAIAS with enhanced powertrain and adas technologies

At January's North American International Auto Show in Detroit, Kia Motors debuted the all-new 2019 Forte, which enters its third generation with a more sophisticated design and technology that transforms one of the car maker's best-selling vehicles into something more than a compact car meant for getting people from one point to another.

Thanks to a number of improvements, Forte now provides drivers with a higher level of comfort, fuel efficiency and advanced driver assistance technologies that are aimed to make the journey – whether a short commute or long haul – a more rewarding and decidedly upscale experience.

The Forte has evolved with a number of visual and feature enhancements, inside and out. The cabin is now more comfortable and integrates driver assistance technology. In addition, it has an all-new powertrain that uses Kia's first intelligent variable transmission (IVT), set to deliver an estimated 15km/litre combined.

"The compact sedan segment is highly competitive, but with all the improvements the new Forte brings to market for the 2019 model year, it is more than prepared to take on the toughest the segment has to offer," said Orth Hedrick, vice president at Kia Motors in America. "As one of our top-selling models, the all-new Forte follows some large footsteps, but enhancements in styling, packaging and content make it even more attractive to drivers seeking a compact sedan that can accommodate their versatile lifestyle."

While the vehicle retains its sporty and youthful image, it has graduated to a more sophisticated appearance thanks to a number of sleek and dynamic styling cues inspired by the Stinger fastback sport sedan. The Stinger is said to be a product fuelled by Kia's bold and adventurous spirit, and Peter Schreyer's global team of designers translated elements of the Stinger's design language onto the compact to give it a commanding road presence. Forte's long bonnet and short deck lend it an overall fastback-like shape. The cowl point was moved back 12.7cm, creating a more athletic stance that makes the Forte appear well-planted to the ground.

Creases in the bonnet contribute to the Forte's muscular appearance and distinctive design

traits on the front fascia, including a fresh approach to Kia's signature tiger nose grille and an aggressive black lower valance, enhance its presence and individual character.

The front clip is flanked by a Stinger-esque headlamp design and layout. Separate turn signal indicators are mounted below on the front bumper, where air curtains improve aerodynamic performance and enhance the Forte's technical appeal. Around back, the rear bumper gets the same treatment with separate reverse and turn signal indicators beneath available LED taillights. Similar to the Sportage compact crossover, a sleek horizontal trim piece connects the taillights.

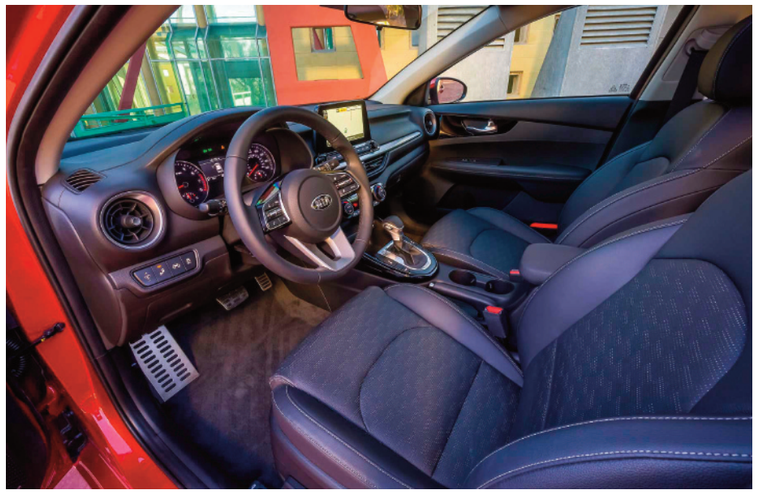
Cabin

Creating the fastback shape strengthened the Forte's exterior appearance, but it also gave engineers an opportunity to expand the occupant compartment in several key areas so passengers are treated to a comfortable space no matter how long the journey.

Overall length has increased by 8cm to 464cm, allowing for more legroom and additional cargo in the boot. With 0.4m^3, cargo room is among the largest in the segment and generous enough for a group of friends on a road trip or a growing family managing a busy schedule. Additional headroom results from increasing the overall height by nearly 1.2cm to 144cm, while the overall width has grown to 180cm.

While the extra 1.8cm of width may not be noticeable to the naked eye, the layout of the dashboard paints a picture of a wide interior space. Again drawing inspiration from the Stinger, a horizontal theme creates a sense of openness and avoids clutter with clean lines and minimal buttons that are intuitively placed below a 20.3cm colour touchscreen.

Aeronautically inspired spoked circular vents adorn the dash and increased soft-touch points create a comfortable and visually appealing cabin.



Drivers gain a higher level of comfort, fuel efficiency and adas technologies that are aimed to make the journey – whether a short commute or long haul – more rewarding

Safety

Building on an already solid structure that helped the current 2018 Forte sedan achieve an Insurance Institute for Highway Safety (IIHS) Top Safety Pick Plus rating, the 2019 Forte strengthens its bones with additional hot-stamped components and 54 per cent advanced high-strength steel. Stronger seat frames are lightweight and provide a more comfortable seating position with increased lumbar support and denser seat foam for more pleasurable long-distance drives. It has projection or full LED headlights and is targeted to receive the highest ratings from the National Highway Traffic Safety Administration (NHTSA) and IIHS.

Because body stiffness plays a major role in noise, vibration and harshness (NVH) performance, engineers worked to increase rigidity for a quieter cabin and better handling tuned to match the sporty and dynamic exterior appearance, resulting in a 16 per cent stiffer body in white. New subframe designs help to improve lateral responsiveness, while steering feel is upgraded compared with its predecessor's thanks to enhancements within the motor driven power steering that reduces artificial steering feel and friction.

Reworked suspension geometry provides a quick and nimble behind-the-wheel feel and evolutionary improvements were made to throttle and brake feel

performance, yielding a smoother initial response at tip-in and a shorter stopping distance than the previous model.

Powertrain

Housed underneath the longer bonnet is a second-generation 2.0-litre Nu four-cylinder engine that benefits from Atkinson Cycle technology and a cooled EGR system. Typically applied to hybrid and electric vehicles, the Atkinson Cycle and cooled EGR technologies are designed to help boost fuel efficiency. The powerplant can be paired with either a six-speed manual or Kia's all-new IVT. The engine and in-house-built IVT are the first of a line of efficient Smart Stream powertrains that will make their way into the Kia line in the future.

Waiting before developing Kia's own continuously variable transmission (CVT) allowed engineers to research issues often associated with CVTs and apply their findings in the application used in the Forte. One of the main criticisms is that they can create a rubber-band-like feel and, to address this, engineers built the IVT with adaptive style shift logic with a chain-type belt instead of push belt, a first in the compact class. This results in smooth and linear acceleration and, for a more enjoyable and sporty driving experience, a step-shift-like feel mimics a conventional automatic at wide-open throttle or when more acceleration is needed.

Noise is another issue CVTs can sometimes face and engineers worked hard to reduce this by wrapping the transmission case in a sound-insulating cover to help quieten the typical drone associated with this technology. In doing so, NVH levels are also reduced by 5dB.



The 2.0-litre engine and Kia's first in-house designed and built IVT introduces a line of Smart Stream powertrains designed to help increase fuel efficiency

Horsepower and torque are expected to remain unchanged from the 2018 Forte, delivering an estimated 109kW and 179Nm of torque. Efficiency was the top priority and the IVT, together with the 2.0-litre engine, is estimated to return up to 15km/litre combined, about a 1.3km/litre improvement over the current vehicle. Official EPA fuel economy ratings will be announced closer to the Forte's arrival in the USA later this year.

Connectivity

Staying connected with advanced technology and infotainment features allows drivers to dedicate their attention to the road ahead. In that regard, the Forte comes standard with a 20cm colour touchscreen with Android Auto and Apple CarPlay integrated neatly on the dash and within the driver's line of sight. With select smartphone devices, the system also has the capability to read SMS texts aloud through Bluetooth.

Eliminating the need for a charging cord is an available wireless charging tray perched up on the centre stack for compatible Android devices, as well as Apple iPhone 8 and iPhone X.

Another surprising feature in this segment is an available 320W premium sound system developed with Harman Kardon that pumps out music through a unique speaker hole pattern on the door panels and throughout the cabin.

Kia's suite of adas offered in many of the car maker's more expensive vehicles makes its way down to the Forte. As well as blind-spot collision warning and lane keeping assist, the car has forward collision-avoidance assist and smart cruise control. Smart cruise control is designed to maintain a pre-set distance between the vehicle in front and can slow the vehicle in line with traffic in certain circumstances.

DRIVER ASSISTANCE



PROTECTING ADAS

Tony Armstrong discusses why automotive adas need low EMI and EMC emission switching converters

The adas market is expected to reach $60bn globally by 2020, according to Allied Market Research. This represents a CAGR of 22.8% from 2014 to 2020. Clearly, this is a significant opportunity for semiconductor content.

Adas is an acronym for advanced driver assistance systems commonly found in many of today's new automobiles. These usually facilitate safe driving and can provide the driver with an alert if the system detects risks from surrounding objects such as errant pedestrians, cyclists or even other vehicles on an unsafe trajectory.

Furthermore, they typically provide dynamic features such as adaptive cruise control, blind spot detection, lane departure warning, driver drowsiness monitoring, automatic braking, traction control and night vision. As a result, it is the increasing focus of consumers on safety, demands for comfort while driving and the continued increase of government safety regulations that are main growth drivers of adas in automobiles for the latter half of this decade.

This growth does not come without challenges for the industry, which include pricing pressure, inflation, complexity and difficulty in testing. Moreover, it should come as no surprise that the European automotive industry is one most innovative automotive market and, as such, it has seen major market penetration and adoption of adas from its customers.

Nevertheless, both the American and Japanese car makers are not far behind. The ultimate goal is an autonomous driving machine without the need for a human being behind the wheel.

Challenges

Generally speaking, adas incorporate some kind of microprocessor to gather all the input from the numerous sensors within the vehicle and then process them so that they can be presented to the driver in a way that can be easily understood. Moreover, these systems are usually powered directly from the vehicle's main battery that is a nominal 9 to 18V, but could be as high as 42V due to voltage transients within the system, and as low as 3.5V during a cold-crank condition. Thus, it is clear that any DC-DC converters within these systems must be able to handle the wide input voltage range of 3.5 to 42V, at a minimum.

Many adas use a 5 and 3.3V rail to power their various analogue and digital IC content; however, the processor IO and core voltages that are typically used will have operating requirements in the sub-2V realm, and could be as low as 0.8V. Furthermore, the system is usually mounted in a part of the vehicle that is both space and thermally constrained, thereby limiting the heat sinking available for cooling purposes.

While it is commonplace to use a high voltage DC-DC converter to generate a 5 and 3.3V rail directly from the battery, in today's adas a switching regulator must also switch at 2MHz, or greater, rather than the historical switching frequency of sub-500kHz. The key driving force behind this change is the need for smaller footprints while also staying above the AM frequency band to avoid any potential interference.

Finally, as if the designers' task is not already complicated enough, they must also ensure that the adas comply with the various noise immunity standards within the vehicles. In an automotive environment, switching regulators are replacing linear regulators in areas where low heat dissipation and efficiency are valued.

Moreover, the switching regulator is typically the first active component on the input power bus line, and therefore has a significant impact on the EMI performance of the complete converter circuit.

There are two types of EMI emissions; conducted and radiated. Conducted emissions ride on the wires and traces that connect up to a product. Since the noise is localised to a specific terminal or connector in the design, compliance with conducted emissions requirements can often be assured relatively early in the development process with a good layout or filter design.

However, radiated emissions are another story altogether. Everything on the board that carries current radiates an electromagnetic field. Every trace on the board is an antenna and every copper plane is a resonator. Anything other than a pure sine wave or DC voltage generates noise all over the signal spectrum. Even with careful design, a power supply designer never really knows how bad the radiated emissions are going to be until the system gets tested. And radiated emissions testing cannot be formally performed until the design is essentially complete.

Filters are often used to reduce EMI by attenuating the strength at a certain frequency or over a range of frequencies. A portion of this energy that travels through space (radiated) is attenuated by adding metallic and magnetic shields. The part that rides on PCB traces (conducted) is tamed by adding ferrite beads and other filters. EMI cannot be eliminated but can be attenuated to a level that is acceptable by other communications and digital components. Moreover, several regulatory bodies enforce standards to ensure compliance.

Modern input filter components in surface-mount technology have better performance than through-hole parts. However, this improvement is outpaced by the increase in operating switching frequencies of switching regulators. Higher efficiency, low minimum on- and off-times result in higher harmonic content due to the faster switch transitions. For every doubling in switching frequency, the EMI becomes 6dB worse while all other parameters, such as switch capacity and transition times, remain constant. The wideband EMI behaves like a first order high pass with 20dB higher emissions if the switching frequency increases by ten times.

Savvy PCB designers will make the hot loops small and use shielding ground layers as close to the active layer as possible. Nevertheless, device pin-outs, package construction, thermal design requirements and package sizes needed for adequate energy storage in decoupling components dictate a minimum hot loop size. To complicate matters further, in typical planar PCBs, the magnetic or transformer style coupling between traces above 30MHz will diminish all filter efforts since the higher the harmonic frequencies are, the more effective unwanted magnetic coupling becomes.

Dual converter

The application constraints described led to the development of high input voltage capable, dual output monolithic synchronous buck converters, such as shown in Fig. 1, that also have low EMI and EMC emissions. The 3 to 42V input voltage range makes it suitable for

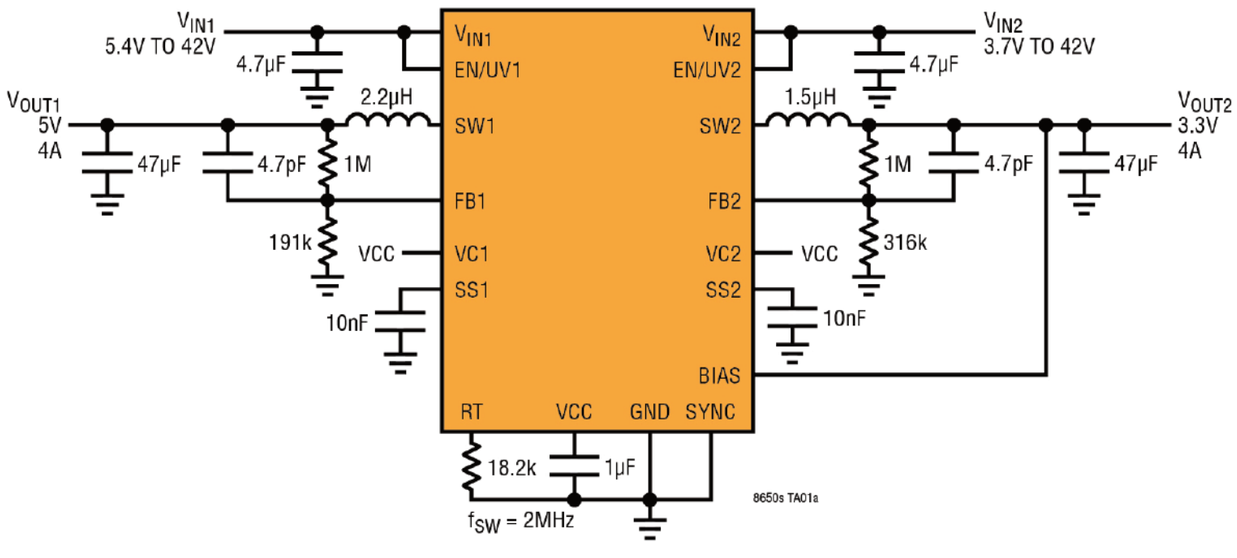


Fig. 1: Schematic delivering 5V at 4A and 3.3V at 4A outputs, at 2MHz

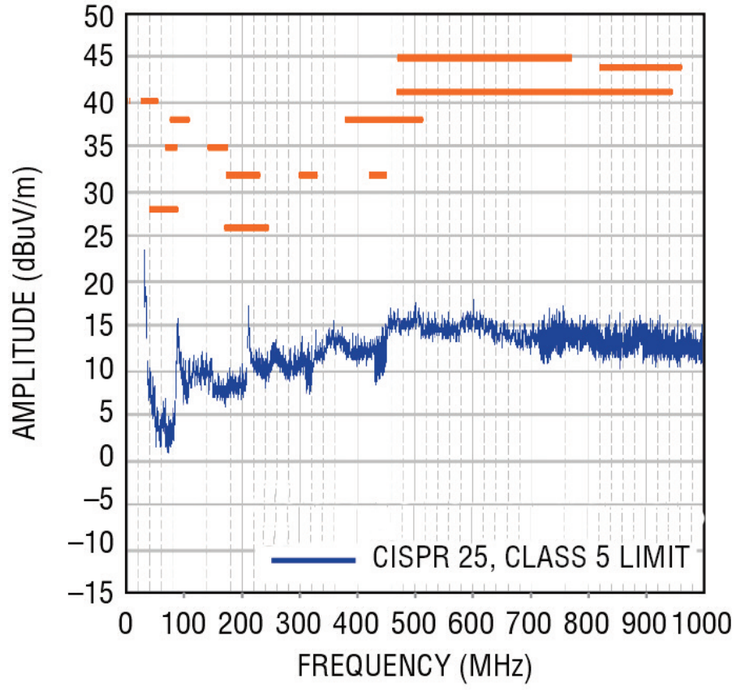


Fig. 2: Radiated EMI performance versus Cispr 25, class five peak EMI limits

automotive applications, including adas, which must regulate through cold-crank and stop-start scenarios with input voltages as low as 3V and load dump transients in excess of 40V.

As can be seen in Fig. 1, this dual channel design consists of two high voltage 4A channels, delivering voltages as low as 0.8V, enabling it to drive the lowest voltage microprocessor cores available. Its synchronous rectification topology delivers up to 94.4% efficiency at a switching frequency of 2MHz, while burst mode operation keeps quiescent current under 6.2μA (both channels on) in no-load standby conditions, making it suitable for always-on systems.

The switching frequency can be programmed from 300kHz to 3MHz and synchronised throughout this range. Its 40ns minimum on-time enables 16Vin to 2.0Vout step-down conversions on the high voltage channels with a 2MHz switching frequency. Its architecture uses two internal input capacitors as well as internal BST and INTVCC capacitors to reduce the area of the hot loops.

Combined with well controlled switching edges and an internal construction with an integral ground plane and the use of copper pillars in lieu of bond wires, the design reduces EMI and EMC emissions. Fig. 2 shows emissions output characteristics.

This improved EMI and EMC performance is not sensitive to board layout, simplifying design and reducing risk even when using two layer PCBs. As Fig. 2 shows, it can easily pass the automotive Cispr 25, class five peak EMI limits with a 2MHz switching frequency over its entire load range. Spread spectrum frequency modulation can lower EMI levels further.

The internal top and bottom power switches with the necessary boost diode, oscillator, control and logic circuitry can be integrated into a single die. Low ripple burst mode operation maintains efficiency at low output currents while keeping output ripple below 10mV p-p. This can all fit into a thermally enhanced 4 by 6mm 32-pin LGA package.

Conclusion

There can be no doubt that the proliferation of adas in automobiles is not going to end anytime soon.

Furthermore, it is also clear that finding a power conversion device that meets all the necessary performance metrics so as not to interfere with the adas is not a simple task. Fortunately for the designers of these systems there are now power converters that simplify their task while simultaneously delivering the performance they need without requiring sophisticated layout or design techniques.

Tony Armstrong is director of product marketing for the power products group at Analog Devices



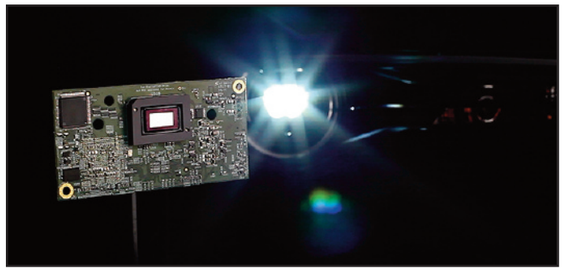
Chipset handles light distribution

A chipset from Texas Instruments for high-resolution headlight systems combines programmability and more than one million addressable pixels per headlight, exceeding the resolution of existing adaptive driving beam (ADB) technologies by more than 10,000 times.

Car makers and tier-one suppliers can use it to design headlights that increase brightness while reducing the glare to oncoming traffic or reflections from retro-reflective traffic signs.

The DLP5531-Q1 device works with any light source, including LED and laser illumination, and gives engineers a way to control light distribution on the road with customisable beam patterns.

Designers can create headlight systems that pair with programmable software and smaller optics to increase performance without sacrificing style. System engineers also have the capability to dim – partially or fully – individual pixels, paving the way for the creation of headlight systems that allow drivers to keep their high beams on while operating their vehicle in all conditions without impacting other drivers.



Headlights can also be transformed into a communications channel by projecting relevant information on the road. On-road light projection can enhance communications between drivers, pedestrians and other vehicles and provide designers with a way to address future communications requirements needed for autonomous and self-driving vehicles.

ICs control fans

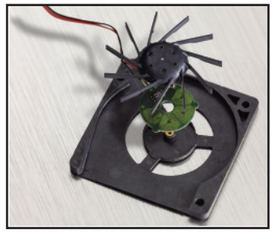
The Melexis US168KLD and US169KLD are automotive grade single chips for driving single-coil brushless DC fans and motors.

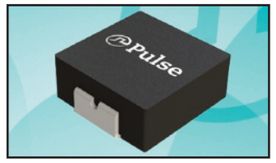
Because of their soft-switching characteristics, the ICs ensure low levels of EMI and acoustic noise, making them suitable for in-cabin automotive applications such as sensor fans as well as other applications such as cooling fans for wireless chargers, computing, audio and multimedia.

Configured as a full-bridge driver with the ability to drive motor currents up to 300mA and a supply range from 1.8 to 5V, the devices include a sensitive integrated Hall effect sensor. Built-in reverse voltage, locked rotor and thermal protection ensure the drivers are robust, even in difficult applications.

Both devices are housed in a UTDFN6 package that is 0.4mm tall and occupies 3mm^2 of PCB area.

The US168 includes a tachometer (FG) output signal and the US169 includes an alarm (RD) output signal. These fan drivers will be qualified to AEC-Q100.





Moulded inductors

Pulse Electronics has released the PA434x series of automotive grade moulded inductors and extended its industrial grade moulded inductors by adding the PA4346 and PA4349.

Production lead time is eight to ten weeks, and samples are available on request.

The automotive series can handle high transient current spikes without saturation, with no thermal aging.

The SMT inductors are RoHS compliant, and AEC-Q200 qualified. They are built with shielded construction to reduce flux leakage for better EMI with a corrosion resistant surface. and are sealed for low audible noise.

Operating temperature range is -55 to +155°C.

They suit applications such as battery management systems, DC-DC converters, on-board chargers, and various motor control and filtering uses.

Automotive and commercial grade moulded inductor designer kits are also available.

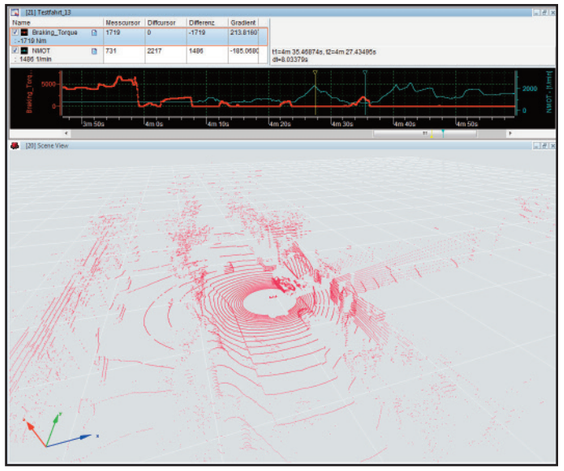
Tool simplifies ECU calibrations

The latest version of Vector's Canape measurement and calibration tool integrates functions so calibration engineers can simplify their work and interactions with ECUs.

The aim is to make the day-to-day exchange of Canape projects with colleagues, customers and suppliers faster and more secure. The user saves the relevant information and files in a data container at the touch of a button, so nothing is left out when projects change hands.

The vCDM option assists calibration data management tasks to improve data handling efficiency and reliability. Every user works with up-to-date data sets and change tracking data. Users benefit from the functionality of the vCDM server-based management system, for example when submitting revised calibration data or retrieving work packages, directly in Canape without opening an additional tool.

Measurements often lead to sequential measurement files. However, for analysis and interpretation, these files must be displayed as a continuous measurement. Canape 16.0 automatically loads a sequence of files and joins them into one contiguous measurement that can be visualised and analysed as a whole. As a result, the laborious manual alignment and merging of the files by the user is a thing of the past.



The tool captures lidar data at the same time as other adas and displays these data as an informative point cloud. Alongside the available capture of raw radar data, lidar sensors from Velodyne, Ibeo and Quanergy are also supported. The scene window provides various views, as well as rotation and zoom mechanisms. These permit rapid access to optimised object recognition algorithm analyses and the results of multi-sensor data fusion.

To manage measurement data reliably and analyse it efficiently, Canape can be linked to Vector's vMDM measurement data management system via the vMDM option. The measurement data are transferred from the user's PC to the vMDM server manually or automatically, for example directly after a measurement in Canape. If there is no IP connection to the server during the test drive, it buffers the upload and performs it as soon as an active connection is available again.

Another option – thermodynamic state charts – allows air conditioning and cooling system developers to view thermodynamic state charts such as pressures at specific volumes. It is possible to select the thermo-physical properties from a materials data library.

Image sensor combines sensitivity with low power

A 2.4Mpixel image sensor from Omnivision Technologies is for applications such as rear-view and 360° surround-view automotive cameras. The OX03A10 uses the company's BSI-2 and Deep Well technologies.

It provides low-light sensitivity, making it suitable for viewing applications that demand image quality in all lighting conditions. It also suits blind-spot detection, e-mirrors and lane-departure warning applications.

The HDR can deliver high quality images at up to 90dB with single exposure and no motion artefacts, and up to 120dB with double exposure. Additionally, the BSI-2 technology allows the sensor to combine low power consumption with image quality.

Incorporated are functional-safety features that have an ISO 26262 Asil B-rating, allowing it to be used in safety-critical applications.

There are two package types, a-CSP and a-BGA, both of which are AEC-Q100 grade two qualified.

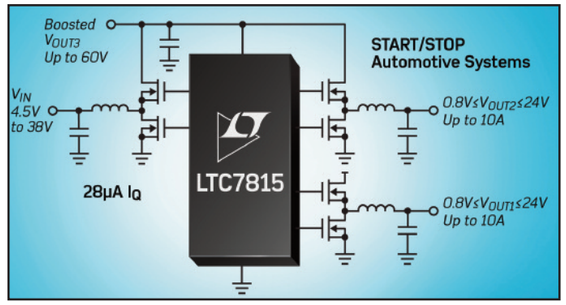
Triple-output controller maintains output in cold crank conditions

An up to 2.25MHz, triple output – buck, buck, boost – synchronous DC-DC controller from Analog Devices maintains all output voltages in regulation during automotive cold crank conditions.

A 12V automotive battery can droop to less than 4V during engine restart or cold crank, causing reset of infotainment systems and other electronics that operate from 5V and higher.

The Power by Linear LTC7815 converter feeds the two step-down converters, avoiding output voltage dropout when the car battery voltage droops, useful in automotive start-stop systems.

Alternatively, the buck controllers can be powered from the input for a general-purpose triple output controller.



The device operates from an input voltage of 4.5 to 38V during start-up and maintains operation down to 2.5V after start-up. It can produce output voltages up to 60V and can run with the synchronous switch fully on at 100% duty cycle to pass through the input voltage when it is high to reduce noise and increase efficiency.

The two step-down converters can produce output voltages from 0.8 to 24V with the entire system achieving efficiency as high as 95%. Its 45ns minimum on-time enables high step-down conversions while switching at 2MHz, avoiding critical noise-sensitive frequency bands such as AM radio and allowing for smaller external components.

In burst mode operation, it reduces quiescent current to 28µA per channel (38µA for all three on) while regulating the output voltage at no load, useful for preserving battery run times in always-on systems.

The 1.1Ω onboard all n-channel mosfet gate drivers reduce switching losses and provide output current of more than 10A per channel, limited only by external components. Furthermore, the output current for each converter is sensed by monitoring the voltage drop across the inductor or by using a separate sense resistor.

The constant frequency current mode architecture enables a selectable frequency from 320kHz to 2.25MHz or it can be synchronised to an external clock over the same range.

Additional features include an onboard LDO for IC power and gate drive, output voltage tracking or adjustable soft-start, a power good signal, and an external Vcc input. The reference voltage accuracy is ±1% over a -40 to +125˚C operating range.

The device is available in a 38-lead 5 by 7mm QFN package. Two temperature grades are available, with operation from -40 to +125˚C for the extended and industrial grades and an automotive range of -40 to +150˚C.

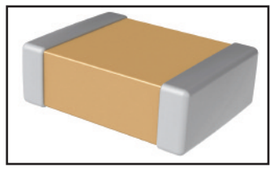
In-vehicle computer handles roughness

The ComSys-5301 is a rugged version of Elma's Cisco-enabled embedded computing system for SWaP-constrained, harsh environments. Based on Com Express and mini PCIe form factors, the modular computer can be configured and upgraded with application-targeted IO, CPU and storage.



The integration of computing with a rugged, compact design makes the unit suit use in ground vehicles, unmanned systems and vehicles, drilling and mining operations, command centres and other mission critical applications.

The fanless unit uses passive conduction cooling and a fourth generation Intel Celeron CPU, solid-state storage, dual Gigabit Ethernet ports and flexible IO. MIL-38999 connectors ensure the IO interfaces can withstand severe environmental conditions.



Ceramic capacitors

Kemet has expanded its automotive grade high-voltage C0G ceramic capacitors as increasing use of wide band semiconductors drives forward inverter and DC-DC designs with more power density, voltage, current and frequency.

Available in Europe through TTI, these capacitors suit power electronics for alternative energy applications, while the automotive grade units meet AEC-Q200.

The patented base metal electrode dielectric is 100% Pb-free, RoHS compliant and Reach compliant without exemptions. The devices are claimed to have industry-leading CV values, high volumetric capacitance with low leakage current and high thermal stability.

Low inductance and ESR versus frequency allow for high ripple current capability.

Available case sizes are 2824, 3040, 3640 and 4540 available to increase capacitance up to 150nF with voltages up to 2kV. An SnPb-plated termination finish option is available (5% Pb minimum).

Package integrates wheel speed sensor IC

A single over-moulded package for Allegro Microsystems' wheel speed sensor family includes an optimised Hall-effect IC, rare-earth pellet and high-temperature ceramic capacitor.

The integrated package aims to reduce the need for external EMC protection and integration of a magnetic circuit, reducing manufacturing complexity.

The ATS688LSN suits true zero-speed digital gear tooth sensing in two-wire applications, such as automotive or two-wheeler braking systems.

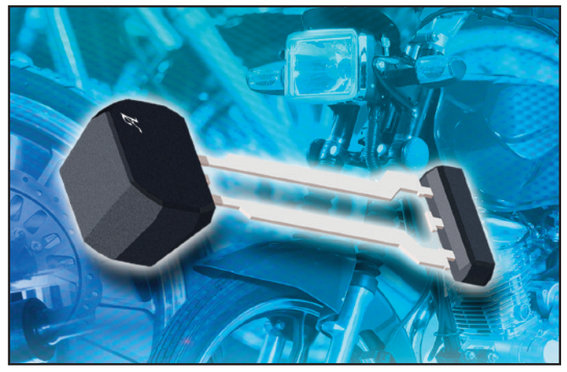
The single integrated circuit and magnet combination incorporates a dual element Hall-effect sensor IC and signal processing circuitry that switches in response to differential magnetic signals created by a rotating ferromagnetic target.

A compensating circuit eliminates magnetic and system offsets.

Digital tracking of the analogue signal is used to achieve true zero-speed operation.

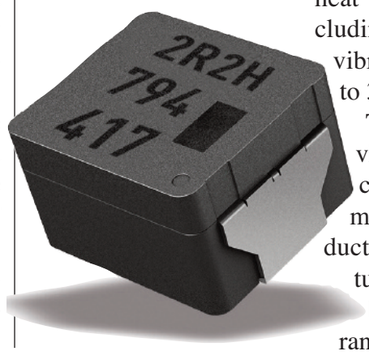
Calibration algorithms adjust the device gain and offset at power-up, resulting in air gap independent switch points, which improves output accuracy and mitigates the effect of anomalies such as target vibration and sudden changes in air gap. The regulated current output is configured for two-wire operation.

The device is provided in a lead (Pb) free three-pin back-biased sip with tin lead-frame plating. Package integrates wheel speed sensor IC



Power inductors take stress

Power inductors from Panasonic are for automotive and other strenuous applications requiring heat up to +150˚C, including self-heating, and vibration resistance up to 30G.



The ETQ-P3M devices have a shielded construction, 3mm maximum height, inductance and temperature stability over a broad temperature range, and low audible noise. They can be designed into systems switching at over 2MHz.

Using a metal composite core, the power choke coils are AEC-Q200 compliant and suit applications such as noise filters for drive circuitries, DC-DC converters, buck converters, boost converters and LED drivers for high frequency switching systems.

Mass production for 256Gbyte embedded flash

Samsung Electronics has begun mass production of 256Gbyte embedded universal flash storage (eUFS) with features based on automotive specifications from the Jedec UFS 3.0 standard.

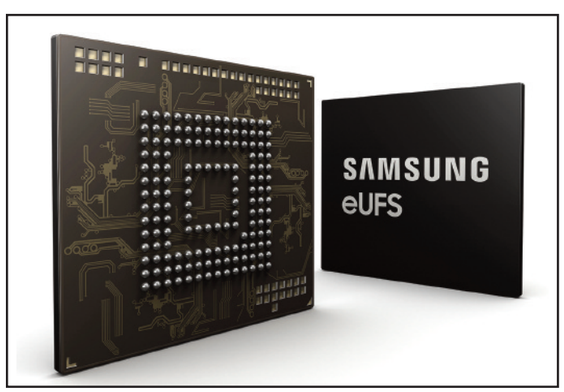
Following the memory breakthrough of the automotive industry's first 128Gbyte eUFS in September 2017, the 256Gbyte memory is being shipped to automotive manufacturers preparing the market for adas, infotainment systems and new-age dashboards in luxury vehicles.

As thermal management is crucial for automotive memory applications, the memory extends the temperature range to between -40 and +105˚C for operational and power-saving modes.

Through its temperature notification feature, a sensor will notify the host application processor when the device temperature exceeds +105˚C or any pre-set level. The processor would then regulate its clock speed to lower the temperature to an acceptable level.

Sequential reads for the memory can reach 850Mbyte/s, which is at the high end of the Jedec UFS 2.1 standard, and random read operations come in at 45,000 IOPS. In addition, a data refresh feature speeds up processing and improves system reliability by relocating older data to other less-used cells.

The temperature notification and data refresh features are included in UFS v3.0, which was announced this year by Jedec.





Cmos image sensors for adas

A scalable family of cmos image sensors from On Semiconductor addresses the spectrum of applications for adas and autonomous driving.

The sensors have resolutions from 8.3 down to 1.2Mpixel. Additional features include functional safety up to Asil C, high-dynamic range, cyber-security option, and wafer stacking technology that reduces package size.

The family comprises the AR-0820AT, 0220AT and 0138AT.

The 4.2μm pixel suits low-light scenarios such as night-time emergency braking for pedestrians and cyclists that are being added to safety tests defined by Euro NCap.

The cyber-security technology helps ensure reliable and secure operation when multiple cameras around the vehicle are connected to a central system where data and commands must travel by wires between the sensor and the processor.

For imaging capabilities, software and algorithm testing is typically the longest task in the development programme. With these scalable sensors, users can start early development with one sensor to adapt their algorithms to the pixel performance and system features, and then extend to additional resolutions with further testing.

Circular connectors provide waterproof sealing

Circular multi-pole connectors from Camden-Boss can provide IP68 waterproof sealing for applications including automotive and motorsport.

The CamCirc range features options encompassing body sizes and styles as well as configurations from two to 19 poles.

With a rugged interconnection, they will not disconnect when the cable is put under stress or load. They are marked for ease of locating a connection.

Push-pull technology creates a vacuum seal when plugged together to ensure cables cannot be disconnected even if the cable is pulled. Disconnection is only achieved by pulling back the outer sleeve of the connector. All are keyed so only correctly matched halves can be mated.

There are six types of receptacle sockets – four fixed (types B, E, L and M) and two cable mounting (types S and T). These offer equivalents for Fischer connector types D, DBEU, DEE, DEU, K and KE, respectively.

Any plug will fit any socket style provided they are correct in size and number of poles. Cable mounting receptacle styles let in-line connections be quick and easy. Flat or protruding receptacle panel styles enable a choice of easier location in harsh or low light conditions or a more compact finish for tight spaces.

Four size options offer alternatives to Fischer 102, 103, 1031 and 104.

Cable mount plugs have a cable clamp to hold cables and wires in place when the pluggable half is assembled and the contacts soldered. The clamp creates the seal on the plug side of the connection if the environmental version is used, and these are supplied in sizes to accommodate various cable diameters. Cable clamps, sold separately from receptacles and plugs, are available in three types – shielded, unshielded and environmental, the latter being required for IP68 rating.

Housing material throughout the range is chrome-plated brass to resist corrosion, with contacts of gold-plated brass to improve reliability.



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