VEHICLE electronics

The monthly magazine for automotive electronics engineers

Renesas and Microsoft partner on connected car development

Microsoft and Renesas are collaborating to accelerate the development of connected vehicles.

Renesas' starter kit based on its R-Car automotive SoC is now available as a development environment for the Microsoft Connected Vehicle Platform (MCVP).

MCVP combines a partner ecosystem with a horizontal platform of Azure cloud, AI and edge services on top of which mobility companies can build customer-facing products.

Renesas has also been certified for Azure IoT Hub and Azure IoT Edge.

"The burden of software development has become a major issue for connected systems and services developers," said Naoki Yoshida, vice president at Renesas. "Using our Azure IoT-certified R-Car starter kit as the development environment for MCVP will allow customers to focus resources on software development that will deliver their own value-add services."

MCVP helps mobility firms accelerate the delivery of digital services across vehicle provisioning, two-way network connectivity and continuous over-the-air updates. Within the Renesas development environment, designers can use MCVP components, the Renesas board support package and a multimedia package for R-Car.

The R-Car starter kit is certified as an Azure IoT Edge device.

The Renesas development environment allows users to develop software in the cloud or on a PC, and install it on an R-Car SoC to perform verification before implementing it in applications for vehicles or embedded mobility devices. Identifying potential implementation issues early in the development of connected vehicles makes the design process more efficient.

"Our collaboration with Renesas will help our mutual customers speed up their system development and enable them to deliver innovative mobility experiences more quickly," said Tara Prakriya, general manager for Azure at Microsoft.



Microsoft and Renesas collaborate

Issue 86
February 2021

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GWM turns to Qualcomm for intelligent driving

Great Wall Motor (GWM) will use the Qualcomm Snapdragon Ride platform to build an intelligent driving system that will be used in premium production vehicles from 2022.

The Snapdragon Ride platform aims to address the complexity of autonomous driving and adas by leveraging its artificial intelligence (AI) and autonomous driving stack for multiple classes of vehicles.

The platform is built on scalable and modular heterogenous multi-core CPUs, AI and computer vision engines, and GPU.

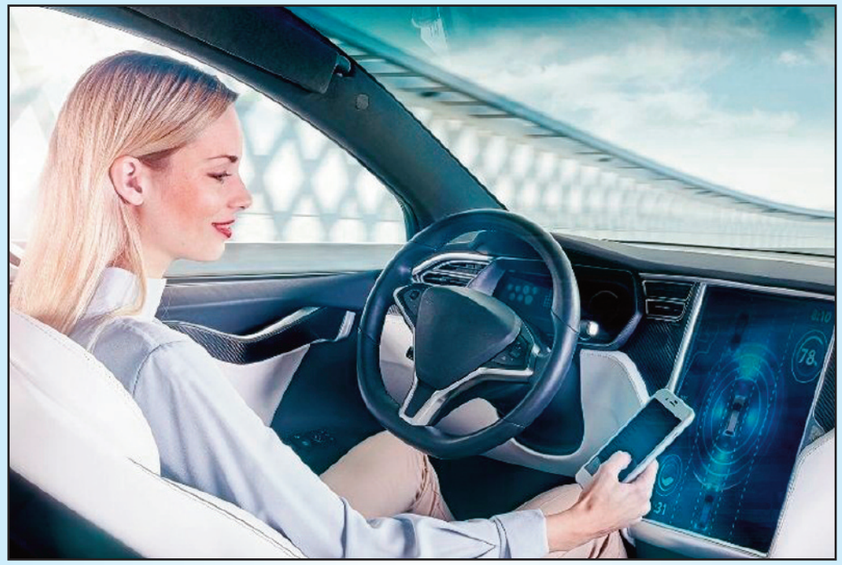
The GWM Coffee Intelligence system based on the platform supports multiple high-resolution cameras and offers users L2+ and L3 intelligent driving capabilities with multi-source heterogenous sensors.

Paired with two standard high-computing power platforms, this intelligent driving system can deliver computing power of more than 700Tops and reserve hardware capabilities and computational redundancy for L4 and L5.

"GWM and Qualcomm have deep and longstanding relationship across many technology areas," said Lei Xian, vice president of Qualcomm in China. "The Snapdragon Ride platform brings Qualcomm's deep expertise in computing, AI, connectivity and security, and is designed for demanding automotive safety."

Kai Zhang, GWM's head of intelligent driving, added: "Data explosion in the era of AI has driven a huge demand for data processing throughput and computing power. Thanks to the high computing capabilities and scalability of Snapdragon Ride, GWM will be able to offer comprehensive multi-segment capabilities in our future vehicles, from driver assistance system to high-level autonomous driving."

TÜV puts V2X to test



TÜV Rheinland is working on testing and security standards for digitalised road traffic as part of a working group of the 5G Automotive Association (5GAA).

The working group is clarifying what V2X secure data exchange will look like, and what the devices – from driving assistants and infotainment systems – have to bring with them as well the connection outside to roadside and vulnerable units.

Security test specifications are being developed accordingly. These specifications are important for all manufacturers that develop devices or software for road traffic communications.

"In our laboratories, we are looking into the question of what safety and security tests must look like for all devices that will exchange data with each other on our roads in the future," said Bircan Taslica, head of technical process optimisation at TÜV Rheinland.

The working group's recommendations are expected to be passed on to the standardisation committees in China, Europe and the USA in summer 2021, when they will be evaluated and then incorporated into standards.

Rohm builds factory to expand SiC production

Rohm has built a factory at its Apollo Chikugo plant in Japan to increase the production capacity of SiC power devices.

The building will start in operation in 2022 with full-scale operation scheduled for 2023. Products for automotive will account for more than half of the production.

The building is an environmentally friendly factory that introduces a number of energy-saving technologies, with 100% of its electricity coming from renewable energy sources.

In addition, Rohm has strengthened its business continuity management with various disaster countermeasures.

The firm has started to install production equipment and build a manufacturing system that can meet the medium- to long-term increases in demand for SiC power devices.



The Rohm plant will start operation in 2022

Rohm has been mass-producing SiC power devices including SiC SBDs and mosfets since 2010.

SiCrystal, a Rohm subsidiary that manufactures SiC wafers, is scheduled to start operating with 100% renewable energy from the next fiscal year, reducing CO_2 emissions from purchased power at the plant to zero.

R&S and AVL partner on testing radar-based adas

Rohde & Schwarz has integrated a radar test system into the AVL DrivingCube toolchain, creating possibilities for testing radar enabled adas features and validating autonomous driving (AD) functions with a vehicle-in-the-loop test bed.

This means complex driving scenarios can be generated and tested in a safe and reproducible environment.

The validation of complex adas and AD functions such as emergency braking, adaptive cruise control and highway chauffeur in all driving scenarios and environmental conditions needs huge amounts of functional and non-functional validation and can be risky if done on roads.



R&S integrates radar test into AVL toolchain

Additionally, automated driving means that conducting conventional real-world tests is often not feasible on roads. Instead, test methods are virtualised using an x-in-the-loop approach such as the DrivingCube.

The DrivingCube combines simulation and real vehicles on a chassis dynamometer and powertrain testbed. It can speed up the validation and approval process of adas and AD systems. The key concept is operating the real vehicle in a virtual environment, considering all parts of the sense, plan and act chain.

Connecting the virtual environment to the real built-in sensors requires simulation technology. The conditions are completely different to those of an isolated sensor lab, particularly for test beds.

Following their work together on GNSS simulation, AVL and Rohde & Schwarz are now collaborating on radar target simulation.

The radar test system opens up possibilities for testing radar-enabled adas features and ensuring the safety of AD functions with vehicle-in-the-loop test beds.

Blackberry extends mapping partnership with Baidu

Blackberry has expanded its partnership with Baidu, whose high-definition maps will run on the QNX Neutrino rtos and will be mass-produced in the GAC New Energy Aion models from Guangzhou Automobile.

This builds on the 2018 agreement to make Blackberry QNX's ISO 26262 Asil-D certified operating system the foundation for Baidu's Apollo autonomous driving open platform.

Baidu is one of the few high-definition map vendors with an Automotive Spice certification from TÜV Rheinland. With data granularity, Baidu's high-definition maps provide a critical component for automakers looking to launch connected and autonomous vehicles in China.

The QNX Neutrino foundation for Baidu's maps is a real-time microkernel operating system that provides deterministic performance as well as flexibility to address the limited resources of the embedded system.

"With Blackberry QNX's embedded software as its foundation, Baidu has made significant progress as part of its Apollo platform in establishing a commercial ecosystem for innovative technologies that OEMs can leverage for their next generation vehicles," said Dhiraj Handa, vice president at Blackberry.

Blackberry QNX provides OEMs and tier-ones with foundational software and cyber-security technologies. QNX technology is used in more than 175 million vehicles on the road in adas, digital instrument clusters, connectivity modules, hands-free systems and infotainment.

"We aim to provide car manufacturers with a clear and fast path to the production of autonomous vehicles, with safety and security as the top priority," said Wang Yunpeng, senior director at Baidu. "The Blackberry QNX software performs well in functional safety, network security and reliability, while Baidu has achieved long-term development in artificial intelligence and deep learning."



AR module could provide head-up display breakthrough

A module designed by TDK for augmented reality (AR) applications could prove to be a breakthrough for automotive head-up displays.

The module has red, green and blue lasers and is about half the size of a one cent coin, with the idea being it could allow AR glasses to be smaller and more stylish.

"This device in glasses uses a direct retinal approach," said Michael Chinn, SVP at TDK. "But you can also project it onto a surface, which is what you would do with a head-up display. This will let the user produce an image similar to other head-up technologies. And it will provide some AR for environmental context."

When the three colours are combined, they can create a palette of colours across the spectrum, including yellow and purple, and even white.

To demonstrate, TDK has mounted the module in the Retissa Display 2, which is a pair of AR glasses from QD Laser. In addition to AR and VR glasses, other applications are femto projectors and head-up displays for automobiles.

More directly focused on automotive is the firm's InWheelSense, a multi-faceted power generation and sensor that attaches to the wheel of an automobile to convert the force of tyre rotation into piezoelectric power. This can be used to generate battery-less sensing and data collection and transmission from the wheel.



TDK AR module could be used for head-up displays

The module enables sensing of road-surface conditions, wheel alignment, tyre pressure and other conditions in real time, and can connect to roadside infrastructure to help empower smart mobility.

"The wheel is the last part of the car that has not been digitised or electrified substantially," said Rakesh Sethi, TDK vice president.

Piezoelectric elements generate electric power from mechanical motion or force. By placing the device at the boundary between the tyre and wheel, the module generates electricity using the force received from the road surface as the tyre rotates.

It enables scalable power generation according to the load of the driving system by allowing multiple device connections along the wheel's circumference, and achieves an average continuous power output of 1mW when driving at 105km/h.

Because speed, turning and other changes in operating conditions can cause variations in the electromotive force characteristics of the device, the module can sense various driving conditions using those power changes through analysis of the waveforms from the piezoelectric effect.

Waveforms are output when the tyres contact the road surface, so they are continuously generated as the car begins driving. As the speed increases, the frequency of the waveforms also increases, and when the direction of travel changes, the load on the tyres will change, creating different waveforms that reflect the driving characteristics.

Because one waveform is outputted for each wheel revolution, the module can detect not only the speed during driving, but also road surface conditions based on the shape of the output waveform.



Byton's production line

Foxconn aids Byton in EV production

Apple iPhone maker Foxconn Technology is helping Byton bring its M-Byte electric vehicle to production in early 2022. This has fuelled speculation that Apple is preparing to launch its own EV.

Foxconn will provide its expertise in manufacturing technology and operational management and will share industrial resources to support the production of the car. The series version of the electric SUV had its premiere at the IAA Frankfurt in 2019, featuring seamless connectivity.

"We are pleased to work with Byton to advance the production of the M-Byte," said Young Liu, chairman of Foxconn Technology. "This will allow us to contribute towards the further growth of the EV industry, a demonstration of our commitment in the transformation of the traditional automotive industry."

The construction of Byton's Industrial 4.0 manufacturing base in Nanjing, China, has been completed with all facilities for stamping, welding, painting, general assembly and battery packing being installed and commissioned. The first batch of pre-production vehicles rolled off the production line and completed safety tests in the first half of 2020. Byton was granted with a new energy vehicle production licence in June 2020.

"We are excited to be back," said Ding Qingfen, co-CEO of Byton. "The partnership with Foxconn will bring us the expertise of precision manufacturing and profound resources, enabling us to deliver the promise of next-generation smart mobility experience."

Cox acquires computer vision company Fyusion

Cox Automotive has acquired Fyusion, a computer vision company specialising in immersive vehicle imaging for automotive and other industries.

This acquisition will deepen the collaboration between Cox brand Manheim and Fyusion, which have worked together for years to give the wholesale industry's mobile imaging and condition capture tools in the Manheim Express app.

"Anywhere a car can be imaged, we believe the new technologies that Cox Automotive and Fyusion create together will translate to big benefits for our clients across the auto industry," said Steve Rowley, president of Cox Automotive. "By bringing Fyusion into the Cox Automotive family, we will be able to deliver innovations to our clients faster and help fuel their continued success."

Founded in 2013 and based in San Francisco, Fyusion has more than 60 employees across 16 countries. In addition to its 3D, 360° imaging capabilities, Fyusion plans to develop ways to enhance vehicle inspections and deliver greater consistency and accuracy.

"Cox Automotive's commitment to giving clients every advantage through technology made our decision to join forces with them an easy one," said Radu Rusu, CEO of Fyusion.

Cox and Fyusion began working together in 2018 on creating imaging capabilities for Manheim Express to simplify and improve the wholesale vehicle listing process. This included allowing dealers to walk a car and create a wholesale listing in minutes with 360° and moveable images. Since then, the companies have collaborated on 360°interior imaging, as well as audio and video tags to highlight a vehicle's condition.

- Cox Automotive has acquired Dickinson Fleet Services, a mobile maintenance provider for medium and heavy-duty lorries and trailers in North America.
- Cox Automotive and driverless technology firm Motional have announced a partnership to deploy Cox's Pivet as Motional's premier fleet service provider.

The collaboration begins with Motional's self-driving fleet in Las Vegas, and lays the foundation to support Motional as it paves the path to market for robotaxis in major US cities.

Panasonic graphite material improves thermal dissipation

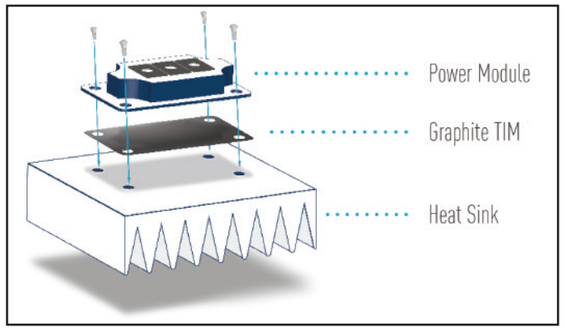
Panasonic has developed a graphite thermal interface material (TIM) for efficient thermal dissipation on power modules.

Handling heat is a major challenge when operating power modules in harsh industrial or automotive contexts.

Mounted on dedicated heat sinks, heat dissipation is traditionally achieved with a layer of grease that has to be replaced from time to time. This is a labour-intensive task and grease naturally doesn't stay only where it is applied. This counteracts effective thermal dissipation.

This is addressed by the graphite TIM.

It reduces the thermal resistance by filling the gap and the unevenness on the surface of both power module and heat sink, thus enhancing the thermal dissipation.



Graphite TIM fits between module and heatsink

With a thermal resistance of 0.2K·cm²/W at 600kPa and a thermal conductivity in x-and y-direction from 200 to 400W/m·K, and 28W/m·K in z-direction, the material can be used for reliable cooling from -55 to +400˚C for power modules in many electronic devices.

These include inverters, converters, automotive control units, medical equipment or server infrastructures.

Anritsu collaborates for ecall certification

Anritsu has released a functional tester for in-vehicle systems using the Russian emergency call system.

Anritsu collaborated with Russian certification body Svyaz-sertificat and software development company BI Zone to release the automated functional test tool (AFTT), a suite of certification test software for use with Anritsu's MD8475A/B signalling tester.

Svyaz-sertificat and BI Zone developed the AFTT certification test software for use with the MD8475A/B and have already used it for Gost 33467 certification tests at Svyaz-sertificat. Until now, the test system has been available only at Svyaz-sertificat's facility in Russia, requiring users wanting to sell vehicles to the Eurasian Economic Union to perform the test at their site.

With the MD8475A/B and AFTT, functional testing in conformity to Gost 33467 can now be performed in users' own laboratories. This enables in-house conformity assessment in parallel with product development, reducing the risk of failing certification tests in Russia and reducing the cost of rework such as adjustments or re-inspections.

The MD8475B is an all-in-one base station simulator.

Software firm Oxbotica raises $47m

Autonomous vehicle software firm Oxbotica has raised $47m in a series B round led by BP Ventures.

The funding will accelerate Oxbotica's commercial deployment of its autonomy software platform across key markets before rolling out in urban passenger transportation applications.

Oxbotica was founded in 2014 by Oxford University professors Paul Newman and Ingmar Posner.

"We have a vision, we have the technology, we have the team, we see the markets and we have the customers," said Newman. "Adding these high quality investors to this mix, means we can continue to accelerate Oxbotica, and change the way bits (software) move atoms (people and goods)."

Erin Hallock, BP Ventures managing partner, added: "We believe its software could accelerate the market for autonomous vehicles."

Other investors included BGF, Halma, HostPlus, IP Group, Tencent, Venture Science and funds advised by Doxa Partners.

Autotech researchers check how self-driving cars handle rural roads

Autotech in Hong Kong has finished a two-year research project exploring how autonomous cars handle rural roads.

The Theia AI project, which started in October 2018 in the eastern region of Hong Kong, tested how autonomous vehicles could deal with less inhabited suburban and rural areas.

The project involved two key trials. The first saw Autotech create an on-demand and shared car service using autonomous Theia AI electric cars that would provide a link between Lohas Park train station and Kowloon Bay east of the city.

The autonomous cars were tested in several different situations.

The second trial was a shuttle service that stopped at predetermined stops around the region to see how autonomous cars could be used to provide accurate and efficient transport.

"Rural and more remote areas have previously posed a challenge to autonomous cars as roads often lack markings and road signs, while narrow streets, roundabouts and tunnels can make things tougher for the car," said Cheng Jun, chief executive officer at Autotech. "Also, these challenges are not consistent as they are in urban environments."

The goal was for an autonomous car to drive the 10km journey from the train station to the suburban area, following a route that had all of these obstacles.

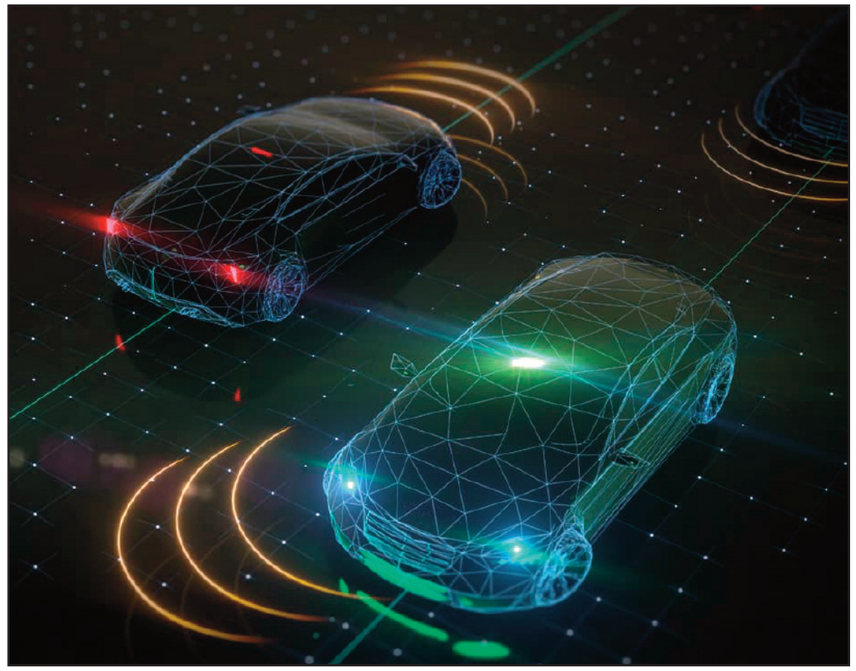
Engineers were also able to track and control the autonomous cars with 100mm precision to ensure they continued on the right route, handling restricted roads and remaining on course including through roads without painted road markings.

"We have now completed the research project which has allowed our engineers to further enhance our Theia AI autonomous cars with even more ability to view the areas surrounding the vehicle in its 360-degree field," said Yuan Wuhan, chief technology officer at Autotech. "It now means our cars can observe more objects and obstacles in real time."

The autonomous cars were also able to handle occasional loss of the GPS signal during testing and operated at speeds that are considered safe by regular drivers, according to Autotech.

The team also evaluated featured infrastructure components such as linked traffic signals and road cameras, which connected to the autonomous cars and allowed them to view obstacles beyond their regular field of vision.

Established in 2012 with headquarters in Shenzhen, China, Autotech is developing an open-source product that supports the future of autonomous driving.



Autotech is exploring how autonomous cars handle rural roads

GaN replaces silicon for motorsport converters

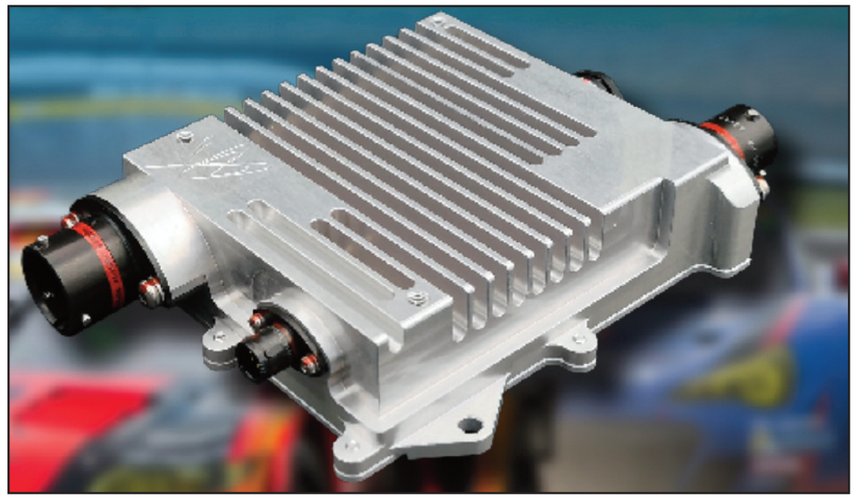
Efficient Power Conversion (EPC) and BrightLoop Converters have combined design expertise to produce smaller, lighter converters for motorsport vehicles.

BrightLoop has reduced the size and cost and improved reliability of its latest BB SP DC-DC buck converters thanks to the EPC2029 enhancement-mode gallium nitride (eGaN) fets.

By switching from silicon transistors to gallium nitride, BrightLoop increased the switching frequency from 200 to 600kHz, while keeping the same efficiency. This change increased the power density by a factor of two and let a smaller enclosure be used.

The EPC2029 is an 80V, 48A eGaN fet with a 1mm ball pitch. The wider pitch allows for placement of additional and larger vias under the device to enable high current carrying capability despite the 2.6 by 4.6mm footprint.

Compared to a modern silicon power mosfet with similar on-resistance, the EPC2029 is smaller and has many times the switching performance.



EPC and BrightLoop combine design expertise

BrightLoop's converters are used primarily in motorsports and supercars with other applications including commercial and off-highway vehicles. Future higher power versions are coming next year to address the mild hybrid applications such as electrical starting assistance.

"Using EPC products has allowed us to design best-in-class for automotive applications with converters that are drastically smaller and lighter than the competition," said Florent Liffran, CEO of BrighLoop Converters.

The BB SP is relevant in any dual voltage architecture (14V/48V or 14V/24V), or where a certain load is available only with a voltage that is different from the regular network such as a 48V pump on a 14V car, in which case the conversion can be done by the BB SP locally, just in front of the load.

To make the use of BB SP interesting, it needs to have negligible losses and weight compared with the rest of the system. This is possible thanks to EPC's eGaN fets. For example, a 48V actuator plus BB SP using GaN can be lighter weight than the equivalent 12V actuator.

Another feature is the ability to implement a closed control loop at 600kHz, the same as the switching frequency. The resulting bandwidth is so high, that very little capacitance is required. This has meant that electrolytic capacitors could be avoided, and only ceramic capacitors were used in the BB SP, reducing the size and cost further, while improving reliability.

"This is a great example of where our eGaN fets demonstrate real advantage over silicon fets by delivering performance in a significantly smaller package and the extreme reliability needed in these ultra-fast supercars," said Wolfram Krueger, EPC's VP of sales.

Sense 940nm lidar hits 200m detection

Sense Photonics claims an industry first by demonstrating 200m detection with its global shutter flash lidar.

It leverages the company's proprietary emitter and spad sensor technologies. Sense Silicon, a backside illuminated cmos spad (single-photon avalanche diode) device with more than 140,000 pixels, is designed to work seamlessly with the Sense Illuminator, a distributed 940nm laser array of more than 15,000 VCSELs (vertical-cavity surface emitting lasers).

Together, they are the core building blocks of Sense's camera-like architecture enabling high-resolution eye-safe global shutter flash lidar that can detect 10% reflective targets at 200m in sunlight outputting tens of millions of points a second.

This removes the need for complex motion blur correction while allowing pixel-level, frame-by-frame fusion with RGB camera data.

"We have delivered what industry experts thought was impossible due to our 940nm wavelength, and have created a revolutionary new architecture," said Hod Finkelstein, CTO of Sense Photonics.

Geared for mass-market automotive adoption, Sense uses mature manufacturing and cost-effective assembly processes used in consumer technology industries.

Via and King Long partner on 5G for mobility

Via Technologies and Xiamen King Long United Automotive have entered an agreement to promote 5G and autonomous vehicle innovation for mobility applications.

The two companies will leverage their complementary experience and expertise in the development of vehicle safety and driver assistance AI technologies and the design and manufacturing of commercial passenger and goods delivery vehicles.

Key initiatives the two companies will work on include development of 5G, AI, AV and cloud intelligence technologies to enable new use cases for diverse passenger transportation, goods delivery and industrial scenarios.

This will include optimising Via's Mobile 360 AI safety and driver assistance systems for diverse vehicle types and commercial usage models, as well as creating autonomous vehicle educational and training programmes for vocational schools and colleges to enable students to pursue career opportunities in the AV industry.

"Through this partnership with Via, we plan to accelerate the development of leading-edge autonomous vehicles for myriad commercial applications and use cases," said Chen Weiqiang, general manager of King Long Bus. "By harnessing our mutual strengths, we are committed to making a significant contribution towards the overall development of the China EV and AV industry."

Richard Brown, vice president at Via, added: "King Long Bus is on the cutting-edge of the development and manufacturing of smart passenger and delivery vehicles, with an inspiring vision for the future of mobility. We are extremely excited to be working closely with King Long to deliver on this vision by creating innovations that meet the emerging needs of this fast-growing market."

China's coastal city of Xiamen provides a high-connectivity environment for the incubation of these innovations and their initial commercial deployment, with over 1.2 million 5G subscribers and nearly 5000 5G base stations already installed across the city and its surroundings.

Educational programmes will teach university and vocational students how to design, build and maintain autonomous EVs. Based on a Via platform, these programmes provide students the opportunity to learn core autonomous driving technologies and gain hands-on experience in AI applications and integrating them into vehicles.



Signed deal: Chen Weiqiang (left) with Liu Guancheng from Via Technologies



Qualcomm digital cockpit vision

Qualcomm and Amazon mix Alexa with Snapdragon

Report from Qualcomm Automotive Redefined technology showcase

Qualcomm and Amazon are increasing efforts to pre-integrate the Alexa Custom Assistant with the Snapdragon automotive cockpit platforms.

This was one of a number of announcements made at Qualcomm's Automotive Redefined technology showcase at the end of January.

The Amazon system is designed to support automotive OEMs and tier-one suppliers building customisable, in-vehicle intelligent assistants and is offered as an extension module to the Alexa automotive software development kit.

It will soon be available on third-generation Snapdragon platforms and the recently announced fourth generation.

The digital cabin assistance is enhanced with voice-based capabilities for natural, conversational interactions with driver and passengers.

General Motors (GM) and Qualcomm extended their relationship for upcoming vehicles. Building on the companies' relationship spanning multiple cellular technology generations, the companies will use their expertise on upcoming vehicles.

Qualcomm is working with GM to power digital cockpits, telematics systems and adas.

Automotive Redefined is a virtual event focussing on the digital cockpit, which is evolving to a zonal electronic and electrical compute architecture, driven by the complexity, cost and need for a central compute consolidation.

The fourth-generation Snapdragon is engineered as homogenous and multipurpose to address this transition to a zonal architecture, serving as a central hub for high-performance compute, computer vision, artificial intelligence and multi-sensor processing with flexible software to address the compute, performance and functional safety needs for that zone or domain.

Fully scalable, the digital cockpit platforms support all Snapdragon automotive performance tiers.

Also announced was that Veoneer and Qualcomm have signed an agreement under which the companies will collaborate on the delivery of scalable adas, and collaborative and autonomous driving.

The platform will address the needs of the automotive ecosystem for scalable and upgradable products, which require power-efficient compute, connectivity and cloud service capabilities across all vehicle tiers.

Qualcomm is also working with Alps Alpine to deliver a camera-based sensing and positioning device called ViewPose, to support absolute lane-level vehicle positioning in virtually all environments.

In creating this device, Alps Alpine is leveraging the Snapdragon automotive 5G platform, which supports multi-frequency GNSS and the Snapdragon automotive cockpit platform for processing and stitching multiple camera images.

With this combination and integrated heterogenous computing capabilities, as well as Qualcomm VEPP vision positioning software, Alps Alpine developed ViewPose to provide accurate position and attitude in virtually all environments at an update rate as high as the camera frame rate.

BF1Systems acquires KA Sensors

BF1Systems, a provider of electronic and electrical products for the motorsport and automotive industries, has acquired KA Sensors.

Founded in 1994, BF1Systems designs, manufactures and distributes steering wheels, tyre pressure and temperature monitoring systems, force measurement components, and wiring harness assemblies.

Its components are used in every major motorsport series around the world, including Formula One, GT Racing and Formula E, as well as by performance road cars such as Bugatti, Ferrari, Porsche, Aston Martin and McLaren.

KA Sensors produces sensors and has expertise in supplying the motorsport and automotive testing industry. The business was founded in 2006 by Peter Trevor.

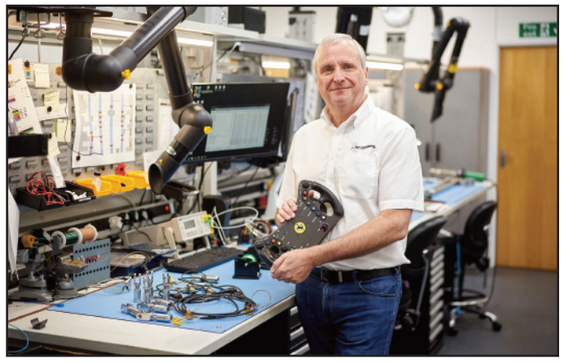
"We are very excited about the future working with BF1Systems," said Trevor. "I have followed them for many years and respect the professionalism that has always been at the heart of the company. We complement each other really well; together our expertise and experience will give a unique offering to the market."

BF1Systems has partnered KA Sensors for three years, acting as a reseller of its products within the sector.

"KA Sensors is a well-known player in the motorsport industry," said Graham Peel, managing director of BF1Systems. "We've worked with them for a number of years and they were a natural fit for our business given their size, product set and industry expertise. The acquisition will seamlessly add to our product offering, while also supporting our growth strategy. In the coming months we will be completing more acquisitions as we look to gain further market share within the sector."

BGF backed BF1Systems with £2.4m in 2019 to support its long-term growth strategy, through the expansion of its product offering and the development of new partnerships.

"This deal is a significant milestone in BF1Systems' continued expansion in the UK and across international markets," said Matthew Simcox, investor at BGF. "The business is a real success story for UK manufacturing and innovation, and I have every confidence that, through this deal and future acquisitions, it will continue to grow its operations and cement its position as the supplier of choice for so many in the motorsport and automotive sectors."



Graham Peel: "The acquisition will seamlessly add to our product offering."

Renesas and LeddarTech develop adas reference platform

LeddarTech and Renesas are jointly developing an adas reference platform combining LeddarTech's raw data sensor fusion stack and lidar technology with Renesas' R-Car V3U Asil D SoC for adas and AD systems.

LeddarTech has joined the R-Car Consortium.

Renesas is investing in LeddarTech SoC development and production for the LeddarEngine, consisting of integrated lidar SoCs, the LCA2 and LCA3, and accompanying lidar measurement software. These SoCs power lidars for mass deployment of levels two and three passenger car adas and some mobility and industrial uses.

This reference platform expands the companies' collaboration to the system level with sensor fusion applicable to the camera and radar sensor-based systems plus systems that add lidar to deliver higher safety and performance. These improvements are achieved with a software-centric and extensible architecture compatible with the Renesas R-Car V3U processor and roadmap.

"The expanded collaboration with LeddarTech on this project introduces a higher performance adas optimised for power and cost compatible with high volume deployment to the market," said Tomomitsu Maoka, senior vice president at Renesas.

UNREAL



Despite being virtual only, this year's Consumer Electronics Show was still the event of choice for many

Mobileye lets self-driving vehicles fulfil promises

Intel subsidiary Mobileye previewed the strategy and technology that it believes will enable autonomous vehicles (AVs) to fulfil their lifesaving promise globally.

During two sessions at the show, Mobileye president Amnon Shashua explained how Mobileye was set up to win globally in the AV industry.

"The backing of Intel and the trinity of our approach means Mobileye can scale at an unprecedented manner," Shashua said. "From the beginning, every part of our plan aims for rapid geographic and economic scalability, and this news shows how our innovations are enabling us to execute on that strategy."

Shashua explained the importance of delivering sensing that was orders of magnitude more capable than human drivers. He described the firm's technology including REM road experience management mapping, rules-based responsibility-sensitive safety driving policy and two separate, redundant sensing subsystems based on camera, radar and lidar.

Mobileye says its approach solves the scale problem. Getting the technology down to an affordable cost in line with the market for future AVs is crucial to enabling global proliferation.

The firm starts with an inexpensive camera as the primary sensor with a secondary redundant sensing system enabling safety-critical performance that is said to be at least three orders of magnitude safer than humans.

Shashua explained the company envisioned a future with AVs achieving enhanced radio- and light-based detection-and-ranging sensing, which was key to raising the bar for road safety.

Mobileye's software-defined imaging radar technology with 2304 channels, 100dB dynamic range and 40dBc side lobe level lets the radar build a sensing state good enough to support autonomous driving. With fully digital signal processing, different scanning modes, rich raw detections and multi-frame tracking, the software-defined imaging radar can enable a leap in performance.

Shashua explained how Intel's silicon photonics fab could put active and passive laser elements on a silicon chip.

"This is really game-changing," Shashua said of the lidar SoC expected in 2025. "And we call this a photonic integrated circuit, PIC. It has 184 vertical lines, and then those vertical lines are moved through optics. Having fabs that are able to do that, that's very, very rare. So this gives Intel a significant advantage in building these lidars."

Shashua also explained the thinking behind crowd-sourced mapping, which can map the world automatically with nearly eight million kilometres tracked daily and nearly a billion kilometres completed to date.



Amnon Shashua with the silicon photonics lidar SoC



Panasonic deploys AI for AR head-up display

Panasonic is using advances in optics and AI technology in its latest augmented reality (AR) head-up display (HUD).

The company is deploying optics, volume optimisation and imaging technology, combined with AI from its Spydr cockpit domain controller, to render near-field and far-field content for vehicle information such as speed, object and pedestrian detection, and mapping and route guidance, for a seamless, more engaged and informed driver experience.

"The HUD market is one of the fastest growing categories in mobility, but traditional HUDs only cover a small section of the road," said Scott Kirchner, executive director of Panasonic Smart Mobility. "Panasonic's AR HUD covers more of the roadway, with traditional cluster content like speed and fuel in the near field as well as 3D overlays in the far field, showing navigation and other critical driver data mapping spatially to the road ahead."

The HUD projects 3D, AI-driven information into the driver's line of sight to help reduce driver distraction and potentially increase road safety.

Eye tracking technology projects information at driver's level of sight based on driver's eye position, eliminating potential mismatch between the projected image when the driver moves their head

Optical design techniques provide expanded field-of-view beyond ten by four degrees for virtual image distance of 10m or greater; detects pedestrians and objects through enhanced low light and night-time view; tilted virtual image planes adjust object visibility in the driver's field of view; embedded camera allows discrete monitoring of driver's eye location.

AI-driven AR navigation technology detects and provides multi-colour 3D navigation graphics that adjust with moving vehicle's surroundings, displaying information such as lane markers and GPS arrows where turns will occur and sudden changes such as collisions or cyclists.

A proprietary camera image stability algorithm enables AR icons to lock onto the driving environment regardless of the bumpiness of the road.

Driving environment updates occur in real time; adas, AI and AR environment information updates in less than 300ms.

The 3D imaging radar captures full 180° forward vision up to 90m and across approximately three traffic lanes.

The dual plane, high-resolution laser holography comes from Envisics, a developer of a patent-protected, dynamic holographic platform that enables true holography across multiple mobility applications.

The 3D localisation technology and AI navigation and situation awareness analytics are from Phiar, a developer of a spatial-AI, AR navigation platform.

- Panasonic, Klipsch and Dolby Atmos Music announced a proof of concept featuring immersive sound technology to bring technology-driven sound performance into Panasonic's in-vehicle premium branded audio offerings.

Panasonic also announced two variants of in-vehicle wireless charging technology – moving coil and static coil. Both will provide efficient in-vehicle charging that is said to meet or exceed most current in-vehicle charging systems.

BMW previews display and operating system

BMW previewed the next chapter in its display and operating system, which is set to transport driver-vehicle interaction into a digital and intelligent age.

BMW used the virtual forum at the event to give a preview of its upcoming all-new iDrive system, which will be officially launched later in 2021.

The car maker also showed a teaser video that visualised the development of the user experience inside a BMW over the past two decades leading up to the BMW iX, which will come onto the market in 2021 and in which the latest display and operating system will be available to experience for the first time.

The iDrive operating system introduced for the first time in the the BMW 7 Series in 2001 swept away old habits and purged the cockpit of the growing number of buttons and controls. In their place came a colour screen in the instrument panel and the iDrive rotary dial on the centre console.

This allowed drivers to control a large number of vehicle settings, entertainment, navigation and telecoms functions.

The 7 Series was also the first to feature voice control technology.

The iDrive paved the way for the introduction of digital services, which have enabled a consistent progression of the relationship between user and car.

The BMW Connected app allowed users to integrate their car into their digital lifestyle. Destinations inputted into a navigation app could be imported directly from a smartphone into the car, while information on the status of the car was also accessible on a mobile phone or other digital device. This service now offers a wider range of functionality via the My BMW app.

The next stage of iDrive takes the relationship between a BMW and its driver to a new level. The system neatly bridges the gap between analogue and digital technology. And this, in turn, heralds another shift, as the number of available functions in a car and their complexity continue along an upwards curve.

Digital intelligence has been introduced into cars, optimised sensors now allowing them to perceive and analyse their surroundings.

As a result, elements of driving and parking can be automated to an increasing degree. And cloud-based services dip into a growing pool of real-time data.

This means that, in many situations, the vehicle has access to a greater supply of information than the driver. For example, it can receive and display hazard warnings from other BMW vehicles and make predictions on the availability of parking spaces at a destination.

Developments will continue in this direction, presenting the car's display and operating system with fresh challenges now and in the future. The next iDrive is set to use the potential of an intelligently connected vehicle more extensively and so make the mobility experience safer, more comfortable and convenient, and richer in variety.



BMW gave a glimpse of the future



Maxim IC checks for genuine parts

Maxim's automotive-grade secure authenticator checks for genuine parts to enhance vehicle safety and security.

The DS28E40 DeepCover is a parasitically powered AEC-Q100 grade-one authenticator to enable the verification of genuine components in adas, EV batteries and other electronic systems

It uses its 1-Wire interface for connectivity and reduces software vulnerability to ensure only genuine components are used in many systems.

The fixed-function device gives OEMs a targeted algorithm and command toolset to meet security needs, while reducing design complexity and associated code development efforts.

Its public-private key asymmetric ECDSA and other key authentication algorithms are built in, so OEMs can skip development of device-level code. This and other algorithms defend against unauthorised components that could compromise performance, safety and data integrity.

The 1-Wire interface combines power and communication on a single pin and thus requires only two interconnects including the ground pin.

It comes in a 4 by 3mm TDFN pack and works from -40 to +125˚C.

It has built-in symmetric key SHA-256 secure hash algorithm support; secure storage of ECDSA and SHA-256 keys; one-time programmable non-volatile memory for storing digital certificates and manufacturing data; and hardware security.

"The parasitically powered 1-Wire authenticator really opens up automotive endpoints that can be secured and properly authenticated by adding just one chip," said Michael Haight, Maxim director.

Morai simulation for autonomous vehicles

South Korean start-up Morai has added features and innovations to its autonomous vehicle simulation technology, by recreating roads, sensors and even vehicles within a virtual 3D simulation environment.

This means users can freely test how their algorithms and software will react to difficult or dangerous scenarios without risk to drivers or other vehicles. Simulation also grants full control of the scene to the test operator, enabling tests for drastic, diverse weather conditions and edge cases not commonly seen while driving.

One feature highlighted at the show was data-based scenario creation, where pre-recorded traffic data for a specific region can be used to recreate a test scenario identical to the recorded data. Instead of relying on the user to create test cases manually, real-world data can be used directly to enhance scenario realism and accuracy.

Real-world data are also key to building simulation environments, which are digital twins of specific regions of interest, based on a combination of detailed geospatial map data and satellite imagery. Simulation environments can range from single city blocks or small highway segments to entire city districts.

The company raised around $2m in series A funding last November. Now, it plans to grow its network of over 50 partners and clients internationally.

"Last year's CES was a valuable experience that helped to introduce our products and technology to a global audience," said Jiwon Jung, Morai co-founder and CEO. "During CES 2021, we showed how much Morai's core simulation has matured."



Morai simulation recreates complex scenes in 3D

V2X will take longer than expected

V2X will happen but it will take far longer than most people are expecting. That was the message from Syed Zaeem Hosain, CTO of Aeris, speaking at the V2X is the Future of Connected Automotive panel.

However, he believes V2V will lead the way and become normal more quickly even though it is still in the design stage because fewer players are involved.

The problem, he said, would be the vehicle-to-infrastructure (V2I) part of the equation as this would involve public funds, which have been stretched beyond limits during the past year dealing with Covid-19.

This he said meant it could be a couple of decades before there was any serious infrastructure deployment. It would thus be a long time before levels four and five connected vehicles became a majority of cars being delivered let alone on the roads.



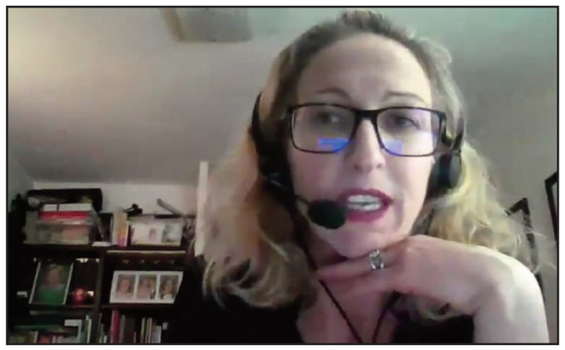
William Yan

That said, he stressed it was still a question of when and not if.

Nathan Wade, regional sales manager at Digi, agreed that V2I would involve public funds, and said one of the big areas of concern was how this would be deployed. He said wired communications for intersections and so on were not going to be viable because they were too expensive and too difficult to deploy. Private cellular deployment was likely to be the answer.

"We have to eliminate the idea that wired communications at the infrastructure was the best way," he said, pointing out that just moving a wired connection from one side of the street to the other was a huge task.

The panel, part of the IoT M2M Council (IMC) IoT Infrastructure conference at CES, was opened by Matt Hatton, a founding partner at Transforma Insights, who pointed out that connected cars were not new and that fleet management had been around for decades, but said the pace of change was now accelerating. Cars were hitting the headlines in ways they haven't been for years.



Stefania Sesia



Nathan Wade

Stefania Sesia, U-Blox's global head of automotive marketing, said the industry was facing a transformation from a vehicle that was a pipe for the user's communications to one where a vehicle would create data itself and share those data autonomously.

She said we were moving from pure infotainment to adas and improving safety. But she said to get the best out of this, a certain level of penetration was needed.

William Yan, president in the Americas for AV System, said 5G would be the driver for V2X, but there were concerns about security, privacy and reliability. However, 5G was showing a lot of promise for this. Cellular, he said, was the way to go. The pieces were fitting together but there was still a long way to go.

"Vehicles are becoming giant computers on the move," he said.

Thus over-the-air updates and security patches would be fundamental for success.

"You can't take vehicles back to the dealership to update firmware," Yan said. "That is not conceivable any more."

A driver for 5G was connected cars, he said, and connected cars needed 5G to enable fully what they wanted to do.

"It is a chicken and egg," he said.

Though everyone had an expectation of what 5G would deliver for connected cars and would affect the industry in ways not yet seen, Hosain pointed out that a lot of the functionality for connected cars today could be served by 4G.

He believed though that as each connected car would not stay on the road for fifty years, 5G would provide breathing room for a long time.

Another problem of 5G was coverage, said Wade. Even though it will be deployed in metropolitan areas, it would be a long time before it was seen in suburbs and the countryside. Nobody drives vehicles just within city limits.

"The reason we have vehicles is to go to other places," he said.

Without 5G everywhere it would be difficult to run a true V2X ecosystem and 4G would be needed for some connectivity.

D3 works with Stradvision on front camera systems

AI-based camera perception software firm Stradvision is working with D3 Engineering on an automotive front camera.

It integrates a D3 DesignCore platform for product development with Stradvision's SVNet deep-learning based front-camera software.

In this collaboration, Stradvision provided six perception features of SVNet. These were lane, traffic sign, traffic light, vehicle, pedestrian and free space detection.

"SVNet is one of the most efficient for vision processing and offers ground-breaking AI-based recognition performance with less consumption of computing power, and we believe will accelerate when autonomous driving comes to our daily lives," said Junhwan Kim, CEO of Stradvision.

SVNet is AI-based object recognition software. It can be customised and optimised to any SoC thanks to its patented deep neural network. The software also works seamlessly with other sensors such as lidar and radar to achieve surround vision.

"We are excited to continue working together with Stradvision to offer market-leading automotive front cameras on our DesignCore platform," said Jerome Barczykowski, business development operations manager at D3 Engineering. "The DesignCore platform incorporates proven collections of hardware, software, applications and testing. Combined with Stradvision algorithms, it accelerates time to market while reducing the cost and risk of production product development."

SVNet is used in mass production models of adas and autonomous driving vehicles that support safety function levels two to four, and will be deployed in more than 8.8 million vehicles worldwide.

AImotive and Sony integrate adas in prototype

AImotive is working with Sony to advance its automated driving software stack with Sony's Vision-S prototype.

Vision-S was conceived to re-imagine mobility by integrating adas and automated driving with electric vehicle technology and entertainment.

Sony disclosed an update of Vision-S at the show, highlighting that prototypes are already being tested on public roads. AImotive and Sony are working together to ensure that AImotive's technologies provides targeted L2+ adas capabilities to ensure high safety standards.

"AImotive brings excitement to the automated driving industry, creating scalable and reliable automated systems," said Izumi Kawanishi, senior vice president at Sony. "Working with them to further develop technology for the Vision-S concept is a decision that we believe will contribute to the future of mobility."

AImotive announced enhanced versions of its production-ready AI-Drive software stack for levels two to four automated driving, as well as its AISim development, simulation and validation tools.

László Kishonti, CEO of AImotive, said: "This is a great collaboration for us, helping us better understand the key challenges in developing and integrating adas technologies from well-respected industry leaders. "

Omnivision asic monitors drivers

Omnivision announced the OAX8000 AI-enabled, automotive asic optimised for entry-level, stand-alone driver monitoring systems (DMS).

The device uses a stacked-die architecture to provide the DMS processor with 1Gbyte on-chip DDR3 sdram. It integrates a neural processing unit (NPU) and image signal processor, which provides dedicated processing speeds up to 1.1Tops for eye gaze and eye tracking algorithms.

These processing speeds with 1K mac of convolutional neural network acceleration, along with integrated sdram, enable a power consumption for the OAX8000 and automotive image sensor of 1W combined.

"Most DMS processors on the market today are not dedicated to this application, requiring added circuitry to perform other system functions that consumes more power, occupies more board space and doesn't allow room for on-chip sdram," said Brian Pluckebaum, product marketing manager at Omnivision.

The on-chip NPU is supported by the TensorFlow, Caffe, MXNet and Onnx tool chains. Additionally, the device embeds quad Arm Cortex A5 CPU cores with Neon technology for accelerated video encoding, decoding and on-chip video analytics algorithms, along with hardware for image processing and video encoding.

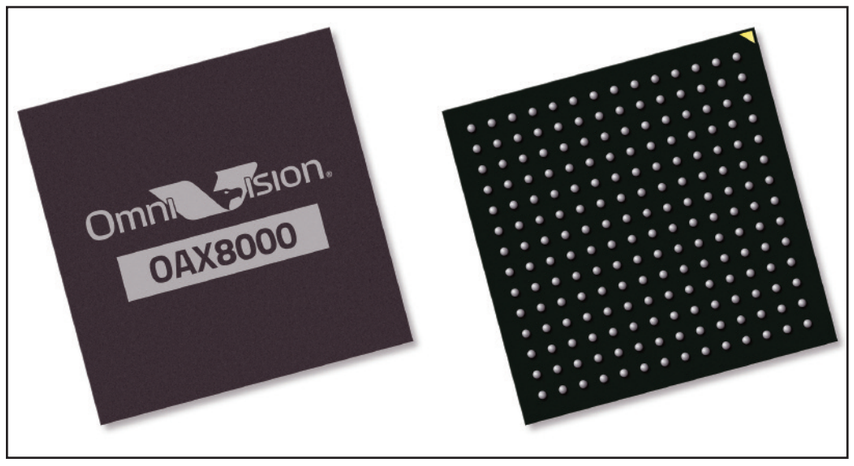
Its high dynamic range processing capability allows the asic to accept input from RGB and IR image sensors and support high quality output, for videos taken during the day or at night, in conditions with widely contrasting bright and dark images.

The integrated video encoder accepts up to 5Mpixel captures from automotive image sensors, and outputs up to 2K resolution video at 30 frames per second.

Rapid start-up reduces delay between ignition and activation of the DMS camera. Additionally, it supports secure boot features to provide cyber security.

Other applications include processing occupant detection algorithms, such as distinguishing a baby from a grocery bag, and providing alerts when objects are left behind in the vehicle.

Samples are available in a BGA196 package. It is AEC-Q100 grade two certified.



Omnivision OAX8000 AI-enabled, automotive asic

Evolution of intelligent cockpit

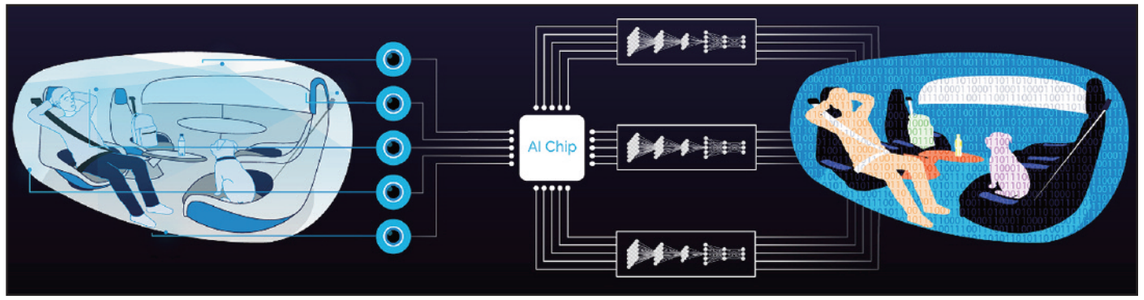
Thundercomm introduced E-cockpit 4.5 for smart vehicles.

With the advent of software-defined automobiles, the intelligent cockpit has been gradually evolving into the brain of the vehicle and the pivot of HMI.

E-cockpit 4.5 is built on the third-generation Qualcomm Snapdragon automotive digital cockpit, and uses QNX Hypervisor 2.1, running QNX 7.0 and Android P operating system.

It is a fusion cockpit platform based on SOA, which enables developers to complete the development, changes or upgrade services more efficiently. It also contains an intelligent engine and AI assistant that can cater to individual demands from different users.

Version 4.5 of E-cockpit supports autonomous driving functions, such as autonomous parking, through reusing the computing power of the chip built in the cockpit.



Computer vision software uses 2D RGB-IR sensors to provide real-time visuospatial data analytics

Eyeris and TI collaborate on in-cabin occupant sensing

Eyeris Technologies has developed an in-cabin sensing artificial intelligence (AI) system using Texas Instruments' Jacinto TDA4 processors and 2D RGB-IR image sensors.

The TDA4 SoC processor enables efficient inference of the Eyeris deep neural network (DNN) portfolio from multiple RGB-IR cameras simultaneously.

This complete in-cabin monitoring is for rugged, field-deployable and production-intent units.

In addition, RGB-IR image sensors are becoming an industry requirement because of their ability to capture the in-cabin space under a wide range of lighting conditions.

Eyeris DNNs are designed for functional safety standards, flexible camera placements and efficient inference on low-power edge processors. The in-cabin sensing portfolio of AI algorithms includes driver monitoring system (DMS) and occupant monitoring system (OMS) features that adhere to global NCap requirements.

"As we continue to expand our hardware partnerships, teaming up with a well-established automotive processor company provides our automotive OEM customers with another compelling option for mass production," said Modar Alaoui, chief executive officer of Eyeris. "Collaborating with TI is another step forward where Eyeris continues to raise the bar for complete in-cabin sensing."

TI's TDA4VM processors include embedded analytics acceleration to enable deep learning performance within a low-power envelope.

Additionally, these processors can perform safety-critical operations up to Asil D compliance while performing non-safety critical operations on one chip and function at an automotive operating junction temperature of +125°C.

The SoC has built-in ISP and vision processing accelerators that help achieve more efficient system performance and can reduce development costs.

"Leveraging specialised machine-learning software, such as Eyeris' in-cabin sensing AI algorithm, on our TDA4 processor enables our customers to bring high-performance computing inside the vehicle cabin," said Curt Moore, general manager of Jacinto processors at Texas Instruments. "Our Jacinto processors enable both machine vision and deep learning capabilities to help customers more easily develop their adas."

Car makers and tier-one suppliers such as Toyota, Jaguar Land Rover, Honda, Hyundai Mobis, Karma Automotive, Panasonic, Bosch, Veoneer and Mitsubishi Motors have licensed Eyeris in-cabin sensing AI. Eyeris expects its in-cabin sensing AI software portfolio to go into vehicle mass production in late 2022.

Headquartered in Palo Alto, California, with an R&D laboratory nearby in Mountain View, Eyeris is a pioneer in vision AI for automotive in-cabin sensing.

EyerisNet is the company's vision AI portfolio of deep neural networks, which includes DMS and OMS.

ELECTRIC VEHICLES

FROM TRACK TO ROAD

Dave Priscak considers the opportunities and limitations that Formula E provides for on-road electric vehicles

Over the years, technologies developed in the high-performance, big-budget sporting arena of Formula One have later propagated to mass volume passenger vehicles. This knowledge transfer supports the evolution of better, safer, more efficient cars that everyone drives today.

The same potential now exists with Formula E as the proving ground for everyday electric vehicles (EVs). Innovations around battery technology, power management, charging and regenerative braking, for example, could all transfer across.

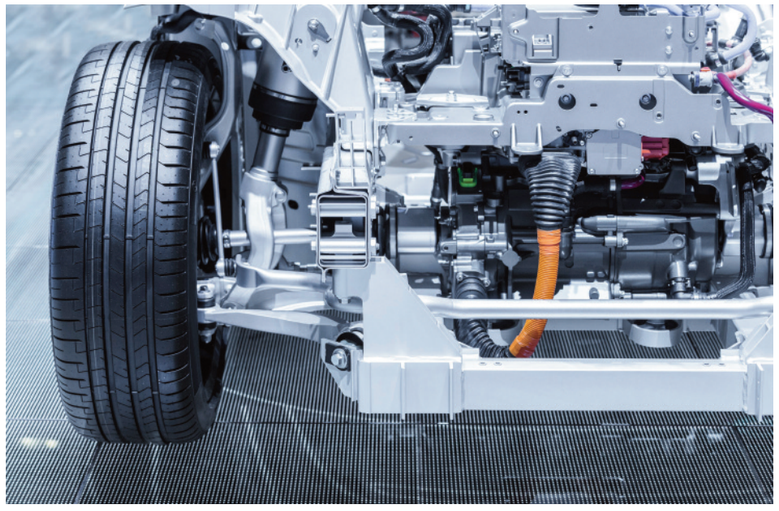
Battery

One of the main barriers to achieving large-scale adoption of EVs is consumer concern over how far they can travel on battery power alone; this is known as range anxiety, a fear of not being able to reach a destination on one charge. However, consider this, how long are most journeys in reality?

Thanks to modern battery technologies and efficient drivetrains, there are numerous production volume EVs available with ranges beyond 320km per full charge. This distance can comfortably accommodate most of our daily journeys, such as school runs, work commute and local shopping trips. Having said that, there is still plenty of scope and desire to improve battery performance.

Because battery design is an electrochemical science, it has the potential to be very volatile. Formula E works with companies that focus on architecting batteries that provide high power density, while at the same time making them safe to use in harsh racing environments.

Having a standard battery system reduces the hazards under extreme acceleration-regeneration and ensures a safe disconnect in case of a crash. Race car design teams also have a level playing field with a known battery impedance and characterised charge-discharge profiles.



Typical powertrain system in an electric vehicle

Powertrain

The powertrain, however, is not regulated. Each team adds its secret sauce to increase acceleration, improve the efficiency of regeneration, and manage the power budget to ensure the car finishes the race. It also allows each team to focus on the electro-mechanical powertrain, borrowing from the mechanical design of Formula One and the kinetic energy recovery systems used there.

Improvements

Due to the extreme nature of Formula E, race teams use many more embedded components than current production volume EVs for monitoring, controlling and optimising the car on the fly. During a race, the devices transmit real-time data to the control room for processing and analysis. Recorded data, such as power transfer efficiency, temperature rise, percentage of recaptured energy and more, enable the team to improve the software running the powertrain from the battery to the wheels.

After the race, teams share these data with industry partners to optimise how the powertrain operates and improve performance. These data also help with new product development, which, in turn, enhances the performance of components for the next powertrain design.

This continuous improvement process not only keeps race team partners competitive on the track, but EV designs benefit too from an ever-increasing level of knowhow and real-world application experience. Semiconductor manufacturers can



Formula E is pushing boundaries for EV design

then design better performing, higher efficiency and more reliable components for use throughout the powertrain.

Software

Electronics in both hardware and software form dominate new vehicle innovation nowadays and software is a significant element of the powertrain. There are already numerous software configurations operating in today's EVs.

Traction control algorithms, for example, adjust and balance drive to the wheels to make for safe progress in icy road conditions or to trigger regenerative braking when drivers lift their foot off the accelerator.

Modern EVs are becoming more complex, with additional drive motors and higher levels of autonomous operation. Drivers can select their preferred drive modes, such as opting for performance over range for their daily commute or all-wheel drive (AWD) for off-road or wintery weather conditions.

Performance selection technologies transferred from Formula E include slip during cornering controlled by acceleration profiles. The transfer of these software algorithms will continue to customise, differentiate and improve EV characteristics.

Similarities

While Formula E cars can reach speeds of up to 280kmph, the race itself lasts for just 45 minutes – they are optimised for speed, not range. On the other hand, consumer EVs are designed for maximum range and a much lower speed. However, both powertrain applications are much the same.

The similarities are that both powertrains strive for the highest power transfer efficiency and use regenerative braking to feed power back to the battery to extend range. They also use motor algorithms, which are essential for different modes of operation.

Formula E pushes the boundaries in terms of power conversion, thermal dynamics and control software. EVs will undoubtedly benefit from what has been learned and tested on the circuit.

Using silicon carbide (SiC) elements in the powertrain,

designers are meeting the heights of efficiency, safety and reliability in the harsh environments of Formula E. The use of SiC components, in turn, will enable EVs to travel further, be safer and more reliable.

Bus voltages

Today's EV main power bus is typically 400V, but there are 800V powertrains in development, which is fast approaching Formula E's own 900V bus. High voltage, wide bandgap components, such as SiC, increase power density and allow smaller motors to be used; this will speed up the realisation and adoption of higher voltage busses.

Higher battery voltages also help in the volt-amp problem of fast charging. However, for the installed base of EV chargers, changing battery voltages may be problematic. Future chargers will likely be digitally controlled to accommodate multiple voltages. Also, EVs will have to be flexible on charging rates, as it will be based on the charger's output capabilities.

The 12V bus system will be around for the foreseeable future for both Formula E and EVs. This is because 12V provides power to everything from sensors to infotainment systems to comfort and convenience. However, this does not necessarily imply a need for 12V batteries. High voltage DC-DC converters, such as 400 or 800V to 12V and 48V to 12V can solve this problem.

The 48V bus systems are becoming more of a requirement. Many motors, such as those driving the park assist and e-turbo, need a higher voltage to satisfy increased torque requirements. One way to get to 48V is to use two 12V batteries and then boosting one to 48V. In the future, there is a likelihood there will be one high voltage battery with multiple voltage rails to support the different requirements of each of the electronic loads around the vehicle.

Fast charging

Consumers have expectations that commercial EVs should have a similar charging time to that which it takes to fill a regular petrol-powered car at the pump. Although Formula E charging for third-generation cars will be 600kW, delivering 4kWh in 30s, it is unlikely these speeds will be available to consumers in the foreseeable future.

Most electrical grids are not designed for massive power transfers such as this. Other limiting factors to the charging speed include the current capacity of the charger and cable, the impedance of the battery, and battery balancing.



Range anxiety: How far will the car go on one charge?



Designing for Formula E makes the learning curve steep and rapid

As higher voltages reduce the charge currents and transmission loss, there will likely be higher battery voltages in the future. It is reasonable to envisage charging stations, similar to petrol stations or collocated with petrol stations, connected to 1200V mains capable of delivering a full charge in minutes and therefore replicating the traditional petrol vehicle experience.

Regenerative braking

The driving style in Formula E requires fast acceleration and exceptionally hard braking as the cars travel around winding circuits. This environment is ideal for regeneration as the ratio of brake to run is high. However, the time it takes to generate energy from a hard brake is not long enough to store back into the battery, which is an issue.

Using technologies such as Li-ion capacitors or supercapacitors can temporarily store the recovered energy and transfer it to the battery or be consumed upon the next acceleration. This methodology can be expensive to implement, however, and the return on investment may not justify the expense if the brake to run ratio is low.

Regeneration, therefore, is a critical differentiator between Formula E and consumer EVs. However, with continued research into the best ways to capture and reuse regenerative energy, this knowledge will eventually transfer into more effective and cost-optimised systems for consumer EVs.

Summary

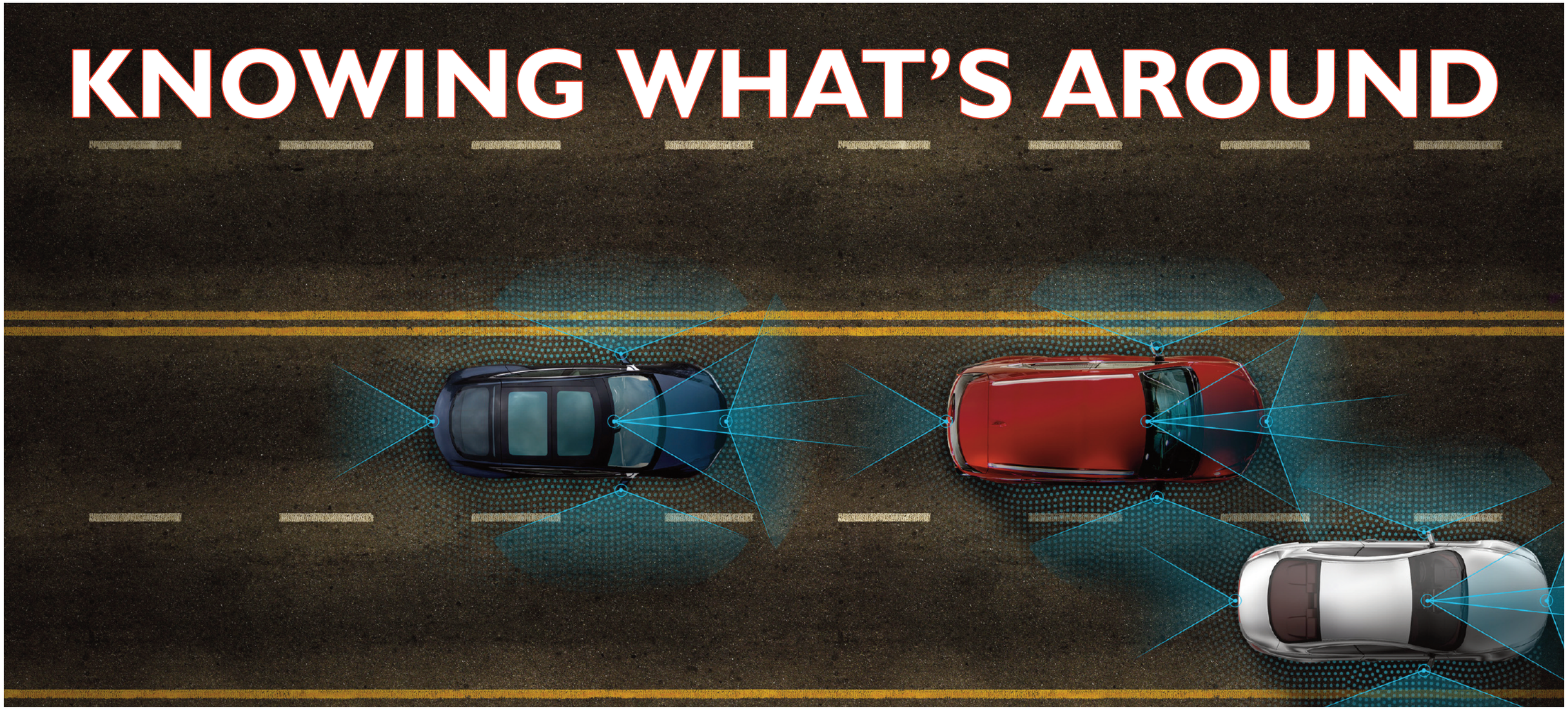
Racing environments continue to be an invaluable proving ground for consumer vehicle developments. The benefits and knowledge gained help both car manufacturers and component developers alike. There is no better way to understand how devices and systems will work than in the real world – not lab-based environments. And when that environment is as challenging and extreme as Formula E, then the learning curve can be steep and rapid.



Dave Priscak is vice president for engineering at On Semiconductor

LIDAR

KNOWING WHAT'S AROUND



Sarven Ipek and Ron Kapusta look at the design requirements for object classification and detection in lidar for autonomous use

The promise of a fully autonomous tomorrow no longer seems like a pipe dream. Today, the questions around autonomy centre on the underlying technologies and the advancements needed to make autonomy a reality.

Lidar has become one of the most discussed technologies supporting the shift to autonomous applications, but many questions remain. Lidar systems with ranges greater than 100m and 0.1˚ of angular resolution continue to dominate autonomous driving technology headlines. However, not all autonomous applications require this level of performance.

Applications such as valet park assist and street sweeping are two such examples.

There are plenty of depth sensing technologies that enable these applications, such as radar, stereo vision, ultrasonic detection and ranging, and lidar.

However, each of these sensors has a unique trade-off between performance, form factor and cost. Ultrasonic devices are the most affordable, but are limited in range, resolution and dependability. Radar is much improved in range and dependability, but also has angular resolution limitations, while stereo vision can have a large computational overhead and limitations in accuracy if not calibrated properly.

Thoughtful lidar system design helps bridge these gaps with precision depth sensing, fine angular resolution and low complexity processing, even at long ranges. However, lidar systems are typically viewed as bulky and costly, which needn't be the case.

Lidar design begins with identifying the smallest object the system needs to detect, the reflectivity of that object, and how far away that object is positioned. This will define the system's angular resolution. From that, the minimum achievable signal-to-noise ratio (SNR) can be calculated, which is the true-false positive or negative detection criteria needed to detect the object.

Understanding the perception

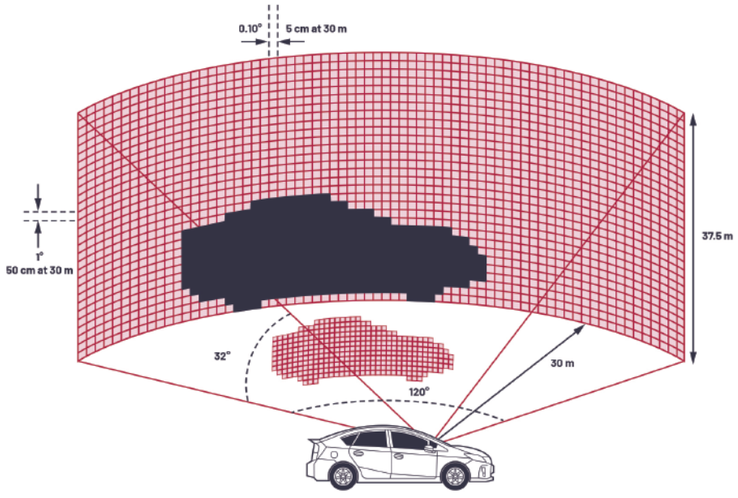


Fig.1: Lidar system with 32 vertical channels scanning the environment horizontally at an angular resolution of 1˚

environment and amount of information necessary to make the appropriate design trade-offs enables the optimal development relative to cost and performance.

For example, consider an autonomous automobile traveling down a road at 100km/h as compared with an autonomous robot moving around a pedestrian space or warehouse at 6km/h. In the high-speed case, it may be relevant to consider not only the vehicle moving at 100km/h, but also another vehicle driving at the same speed in the opposite direction. To a perception system, this equates to an object approaching at a relative speed of 200km/h.

For a lidar sensor that detects objects at a maximum distance of 200m, the vehicles would have closed the distance between them by 25% in just one second. It should be emphasised that the vehicle's velocity or the nonlinear closing speed to the object, stopping distance, and dynamics involved in performing evasive manoeuvres are complexities unique to every situation.

In general, it can be stated that longer range lidar systems are needed for high speed applications.

Resolution is another important characteristic of lidar design. Fine angular resolution enables the lidar system to receive return signals in multiple pixels from a single object.

As shown in Fig. 1, angular resolution of 1˚ translates to pixels 3.5m per side at a range of 200m. Pixels this size are larger than many of the objects that need to be detected, which presents several challenges.

For one, spatial averaging is often used to improve SNR and detectability, but with only one pixel per object, it is not an option. Further, even if detected, it becomes impossible to predict the size of an object. A piece of road debris, an animal, a traffic sign and a motorcycle are all typically smaller than 3.5m.

By contrast, a system with 0.1˚ angular resolution has pixels ten times smaller and should measure approximately five adjacent returns on an average width car at 200m distance. The dimensions of most cars are typically wider than they are tall; thus, this system could likely distinguish a car from a motorcycle.

Detecting whether an object can be safely driven over requires much finer resolution in elevation as compared to azimuth. Now, imagine how different the requirements of an autonomous

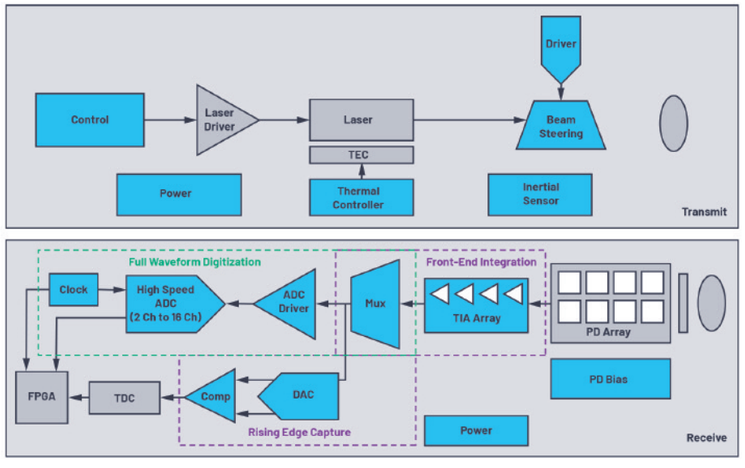


Fig. 2: Discrete components of a lidar system

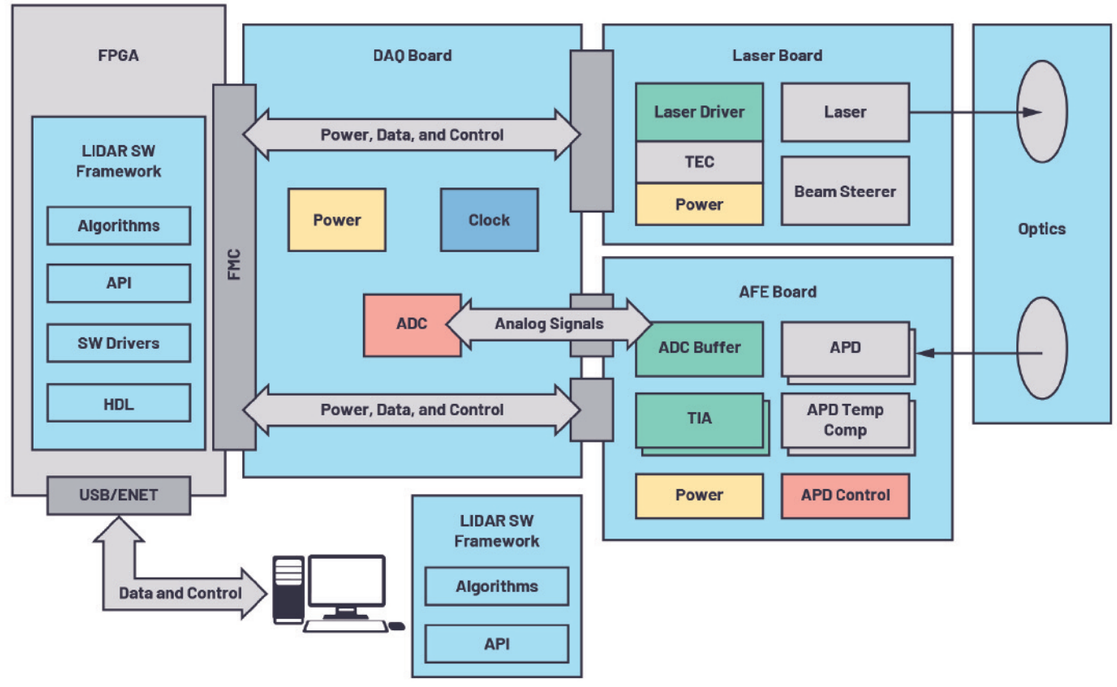


Fig. 3: Lidar development system architecture

vacuum robot could be as it travels slowly and needs to detect narrow but tall objects such as table legs.

With distance and speed of travel defined, as well as the object and subsequent performance requirements established, the architecture of the lidar design can be determined. There are a multitude of choices to be made, such as scanning versus flash, or direct time of flight (ToF) versus waveform digitisation, but their trade-offs are beyond the scope of this article.

No matter which architecture is chosen, there are high performance signal chain and power management components, highlighted in blue in Fig. 2, to provide the building blocks needed to help design systems of different constraints such as form factor and cost. A lidar prototyping platform is shown in Fig. 3.

There will continue to be a need to increase bandwidth and sampling rates, which help with overall higher frame rates and improved range precision. At the same time, it is important to reduce power consumption, as less heat dissipation simplifies thermal and mechanical design and permits a reduced form factor.

Range, or depth, precision is related to the ADC sample rate. Range precision allows the system to know exactly how far away an object is, which can be critical in use cases that necessitate close-quarters movement, such as parking or warehouse logistics.

Additionally, the change in range over time can be used to calculate velocity, and this use case will often require even

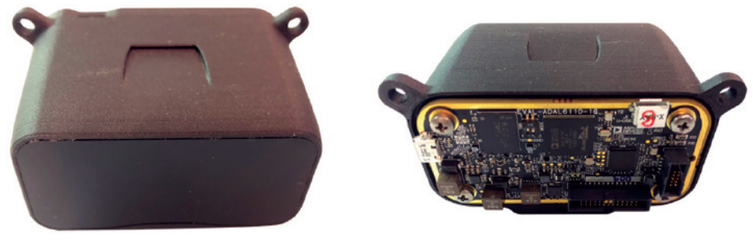


Fig. 4: Evaluation module using 16-channel lidar signal processor

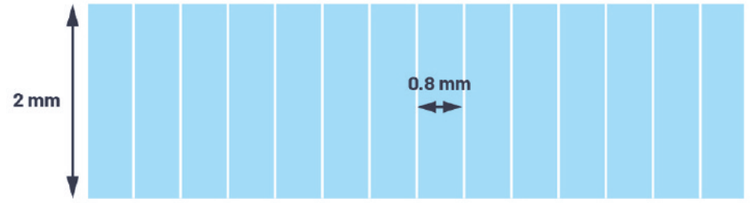


Fig. 5: Dimensions of the pin photodiode array

better range precision.

With a simple thresholding algorithm such as direct ToF, the range precision achievable is 15cm for a 1ns sample period, that is, with a 1GS/s ADC.

This is calculated as c(dt/2), where c is the speed of light and dt is the ADC sample period.

Given that an ADC is included, however, more sophisticated techniques, such as interpolation, can be used to improve range precision. As an estimate, the range precision can be improved by roughly the square root of the SNR. One of the highest performance algorithms for processing data is a matched filter, which increases SNR, followed by interpolation to yield the best range precision.

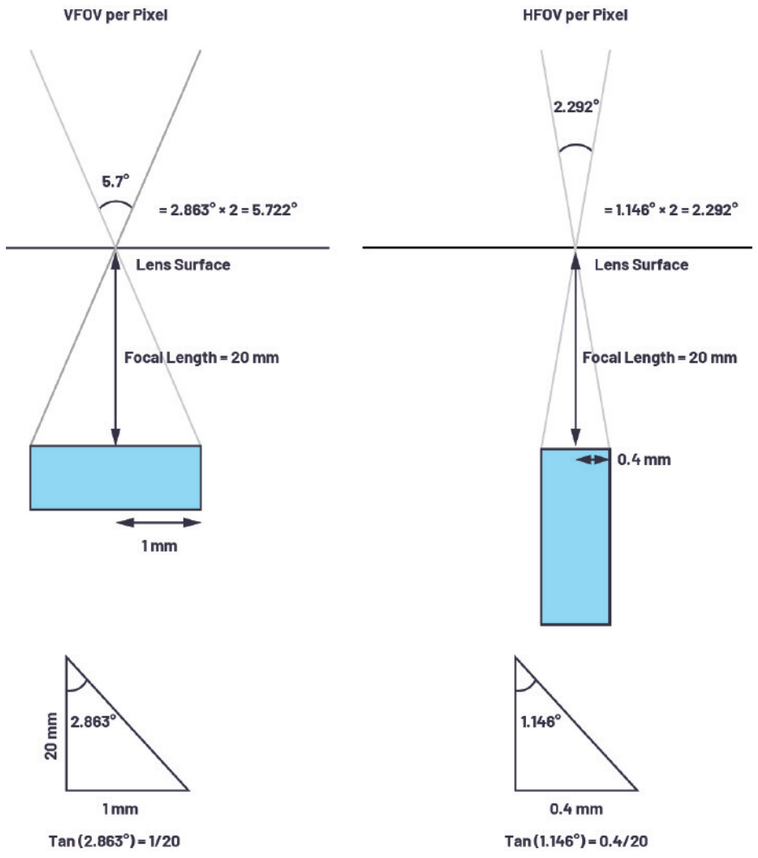


Fig. 6: Basic calculation of angular resolution using simple optics

A tool to aid in lidar design is a highly configurable evaluation system. This can provide a simplified, yet configurable, 2D flash lidar depth sensor for applications needing real-time (65Hz) object detection and tracking, such as collision avoidance, altitude monitoring and soft landing.

The optics used in the reference design result in a field of view (FoV) of 37° azimuth by 5.7° elevation. With a linear array of 16 pixels oriented in azimuth, the pixel size at 20m is comparable to an average adult, 0.8m (azimuth) by 2m (elevation).

Different applications may need different optical configurations. If the existing optics do not meet the application needs, the printed circuit board can be easily removed from the housing and incorporated into a new optical configuration.

The evaluation system in Fig. 4 is built around a low power, 16-channel, integrated lidar signal processor. The device provides the timing control for illuminating the field of interest, the timing to sample the received waveform, and the ability to digitise the captured waveform. Its integration of sensitive analogue nodes reduces the noise floor, enabling the system to capture very low signal returns as opposed to implementing the same signal chain with discrete components of similar design parameters where the RMS noise can dominate the design.

Further, the integrated signal chain allows for lidar designs that reduce size, weight and power consumption.

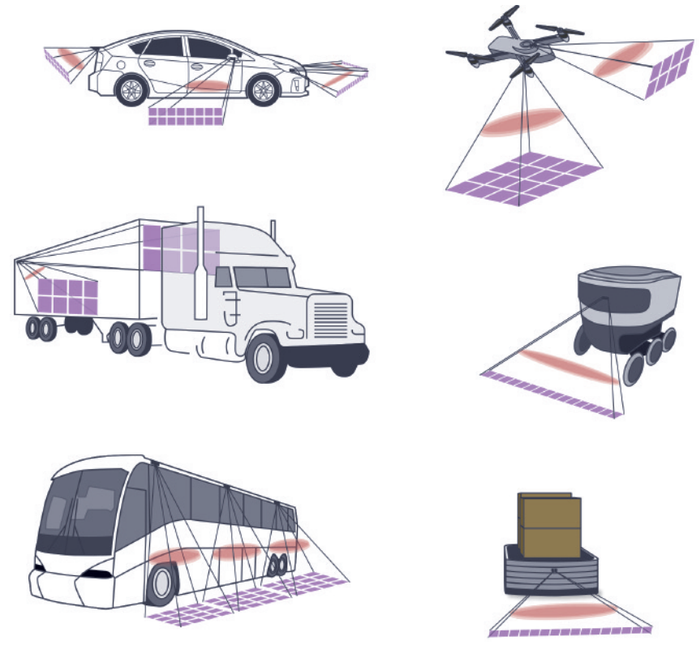


Fig. 7: Various optical implementations of a lidar system that can help enhance application safety

The system software enables fast uptime to take measurements and begin working with a ranging system. It is fully standalone and operates off a single 5V supply over USB, and can also be easily integrated into an autonomous system with robot OS (ROS) drivers. Users need only create a connector for the header to interface with their robot or vehicle and communicate via one of the four available communication protocols – SPI, USB, Can or RS232.

The reference design can also be modified for different receiver and emitter technologies.

The reference design's receiver technology can be modified to create different configurations. The reference design is supplied with a 16-element photodiode array.

For example, let's review the pin photodiode array in Fig. 5 with its 16 pixels arranged in a line.

After selecting a 20mm focal length lens, the vertical and horizontal FoV per pixel can be calculated by using basic trigonometry, as shown in Fig. 6. Of course, lens selection can involve additional, more complex considerations, such as aberration correction and field curvature. For lower resolution systems such as this, however, straightforward calculations are often sufficient.

The one by 16 pixel FoV selected can be used in applications such as object detection and collision avoidance for autonomous vehicles and autonomous ground vehicles, or to enable simultaneous localisation and mapping (slam) for robots in constrained environments such as warehouses.

A unique application involves configuring the array in a 4x4 grid to detect objects around a system. This application under development will be mounted on motor coaches as a safety bubble around the vehicle that can warn the driver if distracted individuals are walking within bus proximity. The system could detect the direction in which an individual is walking and warn the driver to act by stopping the vehicle or alerting the pedestrian with their horn to prevent hitting the individual or cyclist.

Remember, not every application calls for a 0.1° angular resolution and 100m range. Take time to consider what the application truly needs from a lidar design, then clearly define the key criteria, such as object size, reflectivity, distance to object, and the speed at which the autonomous system is traveling. This will inform the component selection for a balanced design of optimal performance and cost relative to the functionality the system needs, ultimately increasing the likelihood of a successful design the first time around.

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Ron Kapusta a fellow, both for Analog Devices



Where are we going?

Kishor Kanade considers major trends in automotive electronics

Remember 1968? That was the year when a computer was used for the first time in the car as an engine control unit. Today, cars are equipped with around 50 computer systems devoted to several tasks from controlling and monitoring everything including ride management to built-in entertainment and communication arrangements.

The progress in technological advancements in all these years has proliferated the role of automotive electronics in cars. And, in the present, the electronics serve as an added feature not just for entertainment but for riding and safety as well.

Electronic systems are used in automobiles to smooth operations such as driving, convenience and fuel efficiency. Almost every element in the vehicle is a modern electronic appliance. All that is required to enjoy a comfortable ride nowadays is to have an updated knowledge of the latest technologies being used.

Unlike the cars in the 1980s, today electronic engines with computer control have astonishingly transformed the automobile design, serving its focus on various other aspects along with transportation. Moreover, along with massive advancements, automotive electronics have undergone a number of trends.

Adas

Adas, based on embedded technology, was basically introduced to lessen the human workload. The vision systems under this create a protective space for the automobile to secure it against factors such as human error, road obstacles, other vehicles and pedestrians.

Furthermore, with the help of visual processing abilities, these systems provide detection and tracking information to the on-board safety systems in situations such as warning for lane departure, accident avoidance and driver drowsiness detection.

Embedded vision systems furthermore are capable of identification and immediate tracking. Compared with the traditional, modern resources have simplified the advancement of these multifaceted vision systems.

In addition, the vision capabilities have been refined with the combination of vision processors, vision software libraries and multicore CPUs. At the same time, the advent of development kits has offered an endorsement of hardware, software and testing abilities that has dropped the barriers in vision-based systems.

Motor control

Other than a primary drive motor, advanced automobiles are equipped with motor-control systems such as compressors, driving pumps, fans, actuators, servomechanisms and rotators. On the other hand, in cases with the aspiration of high efficiency as well as control, the engineers have moved further with digital vector control procedures over the conventional scalar control systems, as they deliver full torque through acceleration and deceleration along with making it accurately manageable.

Other than this, sensorless control methods have unfurled the potential for cost efficiency, thereby offering the high motor capability for engineers.

Engine management

The importance of kilometres-per-litre rating in automobiles for a more effective digital engine management system has been augmented with the desire for extended range and low fuel costs. Furthermore, the management systems offer a level of engine monitoring, examination and control that are required to optimise the use of fuel or battery to provide safety-critical supervisory features to the batteries of electric and hybrid automobiles.

The drift in motor control lies in the diffusion of control systems in a vehicle. Engine management, on the other hand, aims to gather evidence from the borderline into the central controller. However, the management systems meet the challenge to combine the concurrent data of sensor measurement from powertrain performance with refined models of fuel and engine cell usage to improve overall actions.

Graphical edges

Other than technical requirements, automobile manufacturers have increasingly focused on meeting the growing demand of the consumers regarding enhanced entertainment and information systems.

The latest automobiles offer a wide range of such modules



Engine management systems for monitoring, examination and control



Advanced control systems can boost efficiency

including touchscreen displays built in to seatbacks and the dash, and LCDs with high resolution and different sizes.

The manufacturers have almost introduced graphical edges with features similar to the smartphone that have complemented the infotainment system in the vehicle as well as control systems.

In addition, this advancement has offered third party apps to extend the range of in-vehicle services. At the same time, the semiconductor manufacturers have retorted to the growing adoption of LCDs with highly unified support for display management.

Future

Based on the present trends followed by the industry players, the future of automotive electronics seems to be something unimagined. Compared with the past, the present changes in the automobiles have not only given an idea of its super-advanced future but also introduced the fact that automobiles in another 40 years would be completely different. Perhaps the option with cars won't be limited to just driving.

The adoption of artificial intelligence (AI), on the other hand, for automotive electronics has already unfurled numerous potentials and is anticipated to introduce more prospects with further advancements. The global automotive electronics market is projected to garner $382.16bn, at a CAGR of 7.30% by 2026.

The adoption of IoT and AI in automobiles and vehicles with in-built automated driving system and growth in demand for in-vehicle safety features has augmented the growth of automotive electronics all across the globe. In addition to this, the surge in demand for features related to entertainment and information in automobiles further propels the growth of the market.

Nevertheless, the initiatives to develop smart autonomous transportation systems along with smart cities in the emerging countries have provided the industry with huge opportunities. At the same time, the growing investments for automotive electronics for autonomous driving and the advent of the latest sensors and technologies are anticipated to enhance the prospects for the industry. Moreover, the automotive electronics industry is estimated to grow exponentially in the approaching time.

Kishor Kanade is a digital marketing specialist at Allied Market Research

Sensor platform enhances motion-tracking accuracy

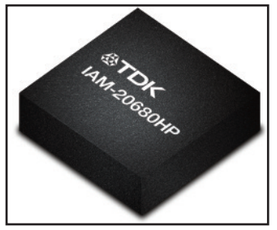
TDK has announced worldwide availability of the InvenSense IAM-20680HP automotive monolithic six-axis motion-tracking sensor platform for non-safety relevant automotive applications.

The platform includes the IAM-20680HP IMU mems sensor and the DK-20680HP developer kit.

It combines a three-axis gyroscope and a three-axis accelerometer in a 3 by 3 by 0.75mm 16-pin LGA package, and is qualified to AEC-Q100 grade two.

The platform shares pin-to-pin and register compatibility with the full automotive non-safety product family from InvenSense: IAM-20680 six-axis IMU, IAM-20380 three-axis gyroscope and IAM-20381 three-axis accelerometer.

An extended fifo up to 4096byte can lower the traffic on the serial bus interface and reduce power consumption by allowing the system processor to burst read sensor data and then go into low-power mode. In addition, it provides sensitivity tolerance and temperature stability combined with robustness by supporting 10,000g shock reliability.



The platform can enhance positioning accuracy to enable telematics features and stabilise the vision system by delivering precise inertial data up to +105˚C.

It also provides low noise performance, on-chip 16bit ADCs, a three-axis gyroscope with user-programmable full-scale range of ±250 to ±2000dps, and a three-axis accelerometer with user-programmable full-scale range of ±2 to ±16g.

Features include programmable digital filters, embedded temperature sensor, programmable interrupts, and factory calibration of both sensors.

The device has I²C and SPI serial interfaces and a voltage operating range of 1.71 to 3.6V.

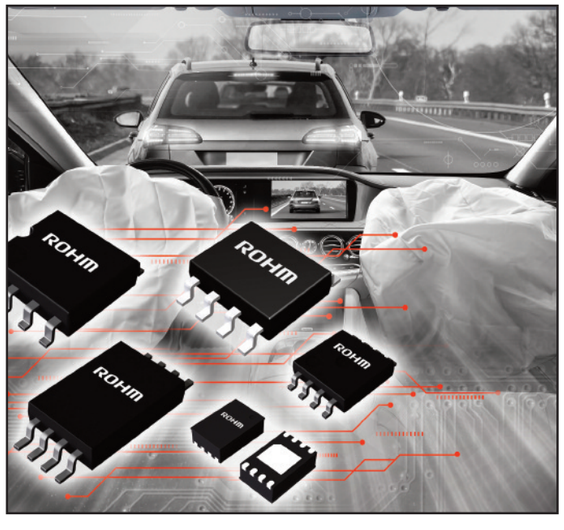
Eeproms store airbag history

I²C bus +125˚C operation compatible eeproms from Rohm target applications that require data storage under harsh environments, such as airbag operating history.

The BR24H-5AC devices achieve a writing time of 3.5ms by implementing original data writing and reading circuit technology.

They guarantee up to four million writing cycles by data endurance, which extends application service life and suits data loggings requiring frequent data rewrites.

In the automotive and industrial equipment sector, safety and traceability requirements make it necessary to store the operating history in non-volatile memory in the system. Among these, eeproms are typically adopted over other types of non-volatile memory such as flash in applications that require high reliability, including on-board cameras and airbags, due to their ability to write and store data reliably under harsh conditions.



Application examples include storing factory settings in on-board cameras for adas, ignition on-off history, cluster mileage display, operating history for airbags, emergency data logging, retaining settings for car navigation and audio, and data logging for industrial automation systems.

Three hybrid capacitors increase power density

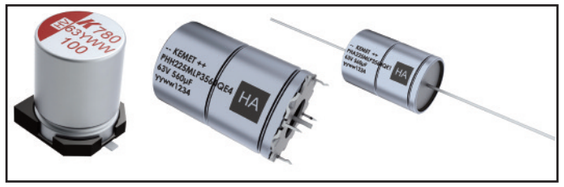
Hybrid aluminium polymer capacitors from Kemet are for automotive and industrial applications. The A780, PHA225 and PHH225 are said to provide high power density and low leakage.

These AEC-Q200 qualified capacitors combine highly conductive polymer technology and liquid electrolytic material in a hybrid design, resulting in better electrical performance.

This launch aligns in part with a rising need for 48V architecture in mild hybrid electric vehicles.

The A780 series is the firm's first release of a surface mount (V-chip) hybrid aluminium polymer capacitor. Both liquid aluminium electrolyte and solid polymer materials are housed in a cylindrical aluminium can and, when combined, provide higher ripple current, lower equivalent series resistance, lower leakage current and self-healing capability.

These capacitors can withstand vibrations up to 30g, meeting the design requirements for automotive powertrain and industrial applications, including engine control



units, DC-DC converters, 48V inverters, switched-mode power supplies and computer voltage regulator modules.

The PHA225 and PHH225 with an axial and radial crown design also combine highly conductive polymer and liquid electrolytic material. These capacitors can withstand temperatures up to +140˚C, provide high ripple current capability and self-healing performance.

The hybrid construction of polymer and liquid electrolytic provides low and stable ESR across all temperature ranges.

By using smaller, high power density hybrid aluminium capacitors in parallel for an existing 48V automotive inverter design, engineers can reduce the number of required components and still maintain high ripple current performance.

The PHA225 and PHH225 hybrid series is suitable for designing in high-power automotive applications, including DC-Link for 48V inverters, cooling fans, water pumps, power steering, and braking and injection systems.

Motor driver IC reduces port count

A 10A H-bridge motor driver IC from Toshiba for automotive can enable microcontroller port reduction via a daisy-chain connection function.

There are two versions for brushed DC motors. The TB9054FTG and TB9053FTG use d-mos-fet technology to achieve a low RDS_{ON}. The devices are AEC-Q100 grade-one qualified and support up to +150˚C junction temperature.

Thanks to functional integration and streamlining of interfaces – no external capacitor is necessary for charge-pump operation – the ICs can contribute to the downsizing of automotive ECUs.

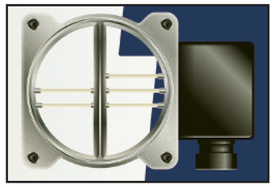
Precision motor control can be executed via the SPI interface or through direct PWM control. This enables port reductions in the host microcontroller to be realised.

In addition, built-in diagnostics allow on-going performance and functional observation. Current monitoring and current limiting features are also incorporated.

The TB9053FTG is available in a QFN40 thermally enhanced power package with an Rth of 0.67K/W. Over-current, over-temperature and open load protection mechanisms are included.

Applications include ETC, EGR, power mirror folding, small fans, grill shutter, camera or OBC lid operation, plus soft power door opening and closing systems.





Air-flow sensors

Mass air flow sensors from WAI measure air flow entering a vehicle's engine to help maintain vehicle fuel efficiencies in any environment.

The patented flexible design uses microcontroller base circuitry. Digitally calibrated at all OE operation ranges, the circuit design can correct the measurements at all operating temperatures.

They are designed and manufactured with high-quality materials, robust automotive grade electronic components, dual aluminium wire bonding and vibration resistance, encapsulated with high temperature epoxies and corrosion resistant mounts.

The sensors maintain ±5 per cent of output over temperatures from -20 to +70˚C.

Designed with US OEM manufacturing equipment, the sensors are said to have the precision to match OE benchmark calibrations. All products are tested to OEM specifications before shipment.

The company offers both a complete assembly and probe only sensors programme.

Kit simulates Can, Can-FD and Lin

A kit from Warwick Control Technologies lets users simulate Can, Can-FD and Lin devices and networks.

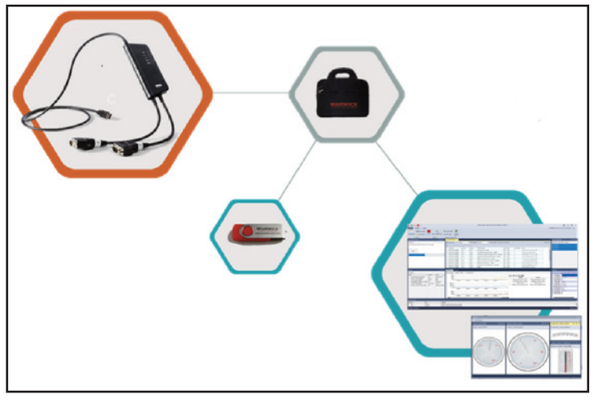
It can also be used to simulate devices and networks for the SAE J1939 for buses and lorries, NMEA2000 for marine, and CanOpen higher layer protocols.

The kit includes the Kvaser Hybrid Pro two-channel interface and can be used to test Can, Can-FD and Lin systems via one interface. The two channels of the Kvaser interface can be mapped to the X-Analyser software in any combination of these network protocols, for example channel one can be Lin and channel two can be Can-FD.

Can and Can-FD networks can additionally be simulated on one interface channel using the T-Script programming language while network monitoring can take place on the second interface channel in X-Analyser.

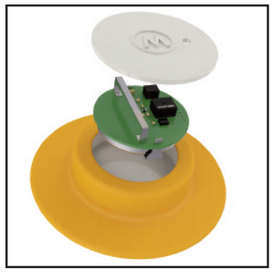
The Kvaser TRX IDE provides a compiler for T-Script as well as a console in which status messages can be fed back by language commands such as printf.

The kit contains: X-Analyser Professional software; Kvaser Hybrid Pro interface; four-channel hub with external power; programming examples for network simulation in Kvaser T-Script programming language; and carrying case.



Sensor combines tyre functions

A combined sensor from Melexis permits tyre status and loading monitoring, in addition to pressure sensing.



The MLX91805 can help OEMs prepare for the extension of mandatory tyre-pressure monitoring to include commercial vehicles.

Designed to be embedded in the tyre, it integrates an 800g xz-axis accelerometer that senses up to 10,000 sample/s. It also integrates a pressure sensor as well as temperature and voltage sensors.

Integrating a 16bit microcontroller and 315 and 433MHz RF transmitter that draws 5mA at 5dBm output, and with a 90nA sleep current, the device can run from a tiny battery for the life of the tyre.

In addition to built-in diagnostics and fault detection, a maths coprocessor provides digital signal processing.

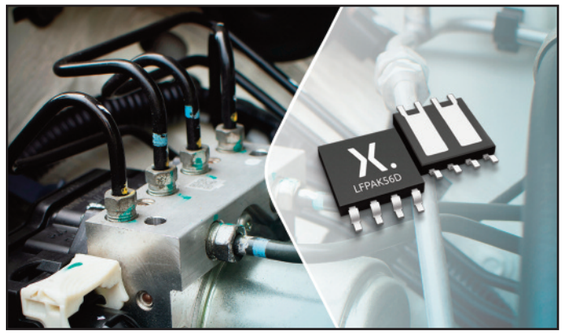
Repetitive avalanche mosfets for powertrain applications

AEC-Q101-qualified repetitive avalanche application specific fets from Nexperia are focused on powertrain applications.

The technology has been tested to one billion avalanche cycles and can be used to control automotive inductive loads such as solenoids and actuators. In addition to providing a faster turn-off time, designs can be simplified through a reduced BoM count.

Mosfet-based power schemes for solenoid and actuator control in automotive powertrains are typically built around boost, free-wheel diode or active clamp topologies.

A fourth option is a repetitive avalanche design that dissipates energy from the inductive load by making use of the mosfet's ability to handle current repeatedly from the inductive load during switch off.



Offering comparable efficiencies to active clamp alternatives, such designs eliminate the need for diodes and other devices to reduce component count and circuit complexity.

They also support faster switch-off times, a factor that can extend the reliability of electromechanical components such as solenoids and relays.

Until now this has only been possible using outdated planar technology. The Asfet products have been developed to address this issue by guaranteeing repetitive avalanche functionality tested up to one billion cycles.

When compared with boost topologies, they can simplify designs by providing up to 30% component footprint efficiency due to a possible reduction of up to 15 board components.

Automotive qualified to AEC-Q101 at +175˚C, the mosfets are available in 40 and 60V options with typical RDS(ON) from 12.5 to 55mΩ.

All the devices are supplied in the company's LFPAK56D dual-power SO8 copper-clip package. The package has gull wing leads for increased board level reliability, and improved manufacturability including automated optical inspection.

MLCCs deliver low loss and stabilty at high temperature

Two metal terminal type multilayer ceramic capacitors (MLCCs) from Murata have temperature compensating U2J characteristics.

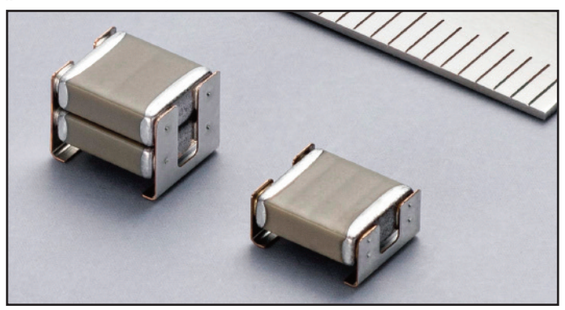
The KCM line for automotive delivers low loss and stability at high temperatures, voltages and frequencies. Similarly, the KRM was developed for general use, with units rated at 1250V DC.

Both are primarily for IGBT snubber circuits used in automotive and industrial equipment.

A snubber circuit protects power supply equipment by preventing the occurrence of high-voltage spikes during switching. The capacitor component in the circuit absorbs surge voltage generated by the inductance of the transformer or wiring and protects switching elements and peripheral components.

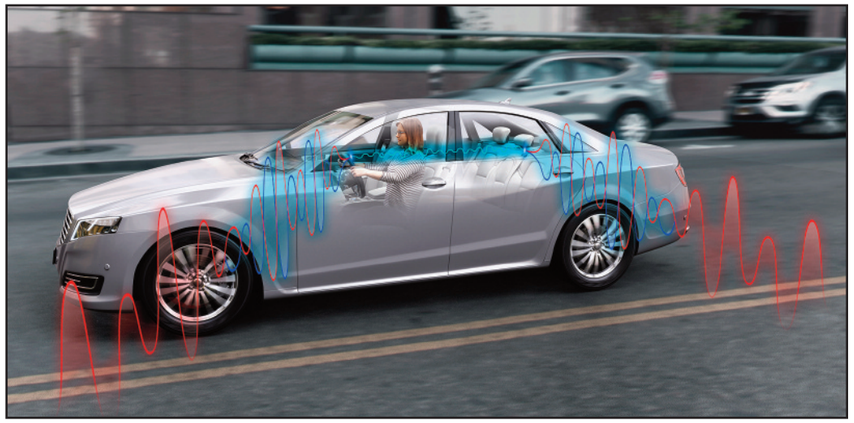
As the use of compact internal modules becomes more widespread in automotive, there is a growing need for small electronic components that can withstand high temperatures.

The MLCCs are said to provide lower loss and produce less heat when compared with similar products using ceramic with a high dielectric constant. Because Murata used temperature compensating ceramic with low capacitance variation, these can handle large voltages during switching.



Sensor combats road noise to reduce driver fatigue

An accelerometer-based road noise cancelling (RNC) sensor from Molex is the first in a family of automotive active noise cancellation (ANC) sensors for combatting unwanted road, wind and hvac car noise while reducing low-frequency sounds that increase driver fatigue.



ANC technology, more commonly associated with high-end headphones, can transform how car manufacturers address road-based noises. Instead of installing heavy sound-absorbing materials to insulate car interiors, ANC sensors can be installed on the chassis for more accurate and efficient results. Devices mounted to wheel wells and car frames, however, must be built to withstand harsh conditions.

The sensors use Analog Devices' Automotive Audio Bus (A²B) technology to ensure high-fidelity audio while reducing cabling. By pairing with the A²B network, the sensor transmits noise signals to the processing unit in less than 2ms.

The sensors include integral connectors and are daisy chained to simplify integration while providing up to a 30% reduction in cable weight. Derived from the firm's Mini 50 family, the connectors take up to half the space of Uscar 0.64 connectors.

The sensors are available in different housings, including an IP6K9K enclosure, to increase protection from harsh conditions while enabling placement close to the road noise.

Detecting the sound at its source speeds processing of the noise-cancelling signal; A²B technology also allows a higher number of signals per chain to be processed. They are sensitive enough to measure and cancel road noise at slower vehicle speeds, increasing flexibility in sensor placement while simplifying engineering.

Molex also has tested and validated the use of its RNC sensor with Silentium's active acoustics software, which removes up to 90% of unwanted noises across frequencies from 20Hz to 1kHz to improve driver and occupant comfort, safety and wellbeing. In particular, the elimination of frequent humming or droning noises coming from roads and tyres can be critical to decreasing highway hypnosis and driver fatigue.

Software streamlines architecture development

Software from Elektrobit can streamline the development of automotive electronics architectures based on high-performance computing (HPC).

Xelor software provides car makers and tier-ones with a secure, stable and upgradable foundation for connected vehicles.

It brings together production-proven software from EB, open-source and third-party software, plus tools and services for HPC environments.

It integrates a functional safety software stack based on Linux and Adaptive Autosar using the EB Tresos hypervisor plus software for HPC updates and platform health management capabilities. Tools and services automate builds and facilitate integration.

The platform uses SoCs from NXP and Renesas. Car makers can add vehicle-specific software on top of these stacks.

Protection provided for USB type-C ports

The automotive-compliant, AEC-Q100 qualified and PPAP capable DPO2039DABQ four-channel device from Diodes is for the protection of USB type-C ports.

Applications include automotive head units, rear seat entertainment units and in-car charging.

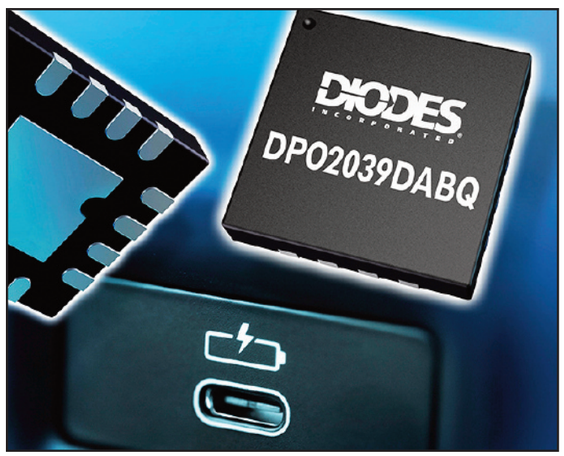
There has been increasing adoption of the USB type-C interface, particularly by automotive manufacturers keen to provide future-proof ports for smart devices and other peripherals. As a result, many design engineers are looking for simple but effective ways to provide in-line protection for the data lines.

Part of the firm's discrete data-line protection series, the device is used in line with the CC1, CC2, and D+ and D- or SBU signals of a type-C port to protect the device from ESD faults caused by the presence of an excessive voltage or short circuit to Vbus on any of the four data lines, or an over-temperature event.

It has low insertion loss, with an on-resistance of typically 300mΩ and equivalent capacitance of 50pF or less, meaning it has no negative impact on the bandwidth of the data lines. The ESD protection also removes the need for external transient voltage suppressors.

The device integrates mosfets, gate drivers and control logic to isolate the data lines if a fault condition is detected. The typical overvoltage fault detection response time is 100ns.

Thermal shutdown is preconfigured with a threshold of +150˚C and +20˚C hysteresis.





Multicoax unit tests to 90GHz

With the automotive, semiconductor and mobile communication sectors increasingly developing applications that require the E-band spectrum range, Huber + Suhner has announced its MXPM90 tester for frequencies up to 90GHz.

As testing of Pam 4/400G Ethernet, 5G mobile communication systems and automotive radar sensors becomes more urgent, so too does the demand for testers for higher frequencies.

The MXPM90 is the latest expansion to the established MXPM70 multicoax product, offering an extended bandwidth from DC to 90GHz. This allows for accurate results through high-speed digital, bench-top and system testing, as well as internal wiring in automated test systems.

It provides integrity for data analysis up to 112Gbit/s, 90GHz and beyond, making it efficient for precise, repetitive measurements with its tight phase matching of single assemblies and broadband return and insertion loss characteristics across the entire bandwidth.

The tester has a high-density pitch down to the board, measuring 2.54-mm centre-to-centre, which positions it as close as possible to the chip to keep traces short, giving manufacturers more efficiency during the test process.

Meanwhile, the plug-and-play functionality is said to guarantee a trouble-free, user-friendly experience.

Its magnetic mount connection facilitates a transition between assembly and PCB socket.

Automatic interface protection safeguards every channel from mechanical damage when disconnected.

Force is with proximity sensors for steering wheel controls

Two integrated automotive-grade proximity sensors from Vishay have resolution up to 20μm for force sensing applications.

They each combine a photodiode, amplifier and ADC circuitry in a 4 by 2.36mm surface-mount package with a 0.75mm profile.

The VCNL3030X01 has an on-board infra-red emitter while the VCNL-3036X01 is for use with up to three external infra-red emitters, for which an on-board driver with internal logic is provided.

For use in automotive, consumer, smart home, industrial, office and toy products, the AEC-Q101 qualified devices can be used for force sensing applications in steering wheel controls, laptop smart power buttons and multi-force trackpads, and touchpads for IoT devices and kitchen appliances.

They prevent false triggers and allow users to wear gloves.

The devices support the I²C bus communication interface, while their programmable interrupt function allows designers to specify high and low thresholds, which reduces the continuous communication with the microcontroller.

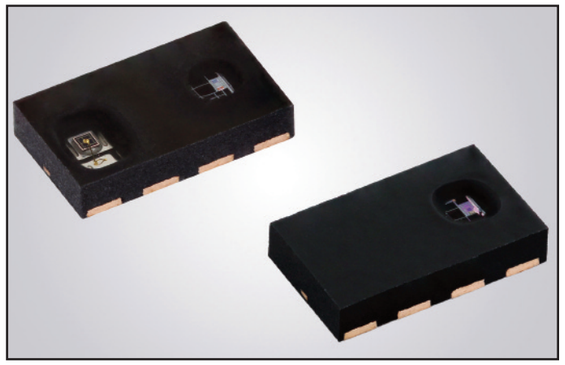
Featuring selectable 12 and 16bit outputs, the proximity sensors use intelligent cancellation to eliminate crosstalk, while a smart persistence scheme ensures accurate sensing and faster response time.

The VCNL3030X01's emitter wavelength peaks at 940nm and has no visible red-tail.

They have infra-red emitter and LED pulse current of 200mA, a supply voltage of 2.5 to 3.6V, and an I²C bus range from 1.8 to 5.5V.

For force sensing, the sensors offer the flexibility to fine-tune the current for short displacements. The devices are RoHS-compliant, halogen-free and Vishay Green.

Samples and production quantities are available with lead times of six to 12 weeks for large orders.



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72 Westwood Road, Nottingham NG2 4FS, UK

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ISSN 2055-1177

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