



Automotive Solutions for ADAS



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Smart Mobility

It is estimated that 80% of all innovations in the automotive industry today are directly or indirectly enabled by electronics. With vehicle functionality improving with every new model this means a continuous increase in the semiconductor content per car.

With over 30 years' experience in automotive electronics, ST is a solid, innovative, and reliable partner with whom to build the future of transportation.

ST's Smart Mobility products and solutions are making driving safer, greener and more connected through the combination of several of our technologies.

80%
of all innovations
in the automotive
industry today
are enabled by
electronics



SAFER

Driving is safer thanks to our Advanced Driver Assistance Systems (ADAS) – vision processing, radar, imaging and sensors, as well as our adaptive lighting systems, user display and monitoring technologies.

GREENER

Driving is greener with our automotive processors for engine management systems, high-efficiency smart power electronics at the heart of all automotive sub-systems and devices for hybrid and electric vehicle applications.

MORE CONNECTED

Vehicles are more connected using our infotainment and telematics processors and sensors, as well as our radio tuners and amplifiers, positioning technologies, and secure vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2X) connectivity solutions.

ST supports a wide range of automotive applications, from Powertrain for ICE, Chassis and Safety, Body and Convenience to Telematics and Infotainment, paving the way to the new era of car electrification, advanced driving systems and secure car connectivity.

ADAS

Advanced Driver Assistance Systems



Advanced Driver Assistance Systems (ADAS) aim to drastically reduce road accidents and the associated casualties by helping drivers avoid collisions altogether. These systems react faster than any human, are constantly vigilant, and are already being adopted and deployed across various car segments, from premium to economy models. ADAS systems constantly monitor the vehicle surroundings, alert the driver of hazardous road conditions, and take corrective actions, such as slowing or stopping the vehicle. These systems use inputs from multiple sensors, such as cameras and radars. The fusion of these inputs is processed and the information is delivered to the driver and other parts of the system. The same sensor technologies can be used both in the current ADAS systems and in the upcoming fully autonomous driving systems (levels 4 and 5).

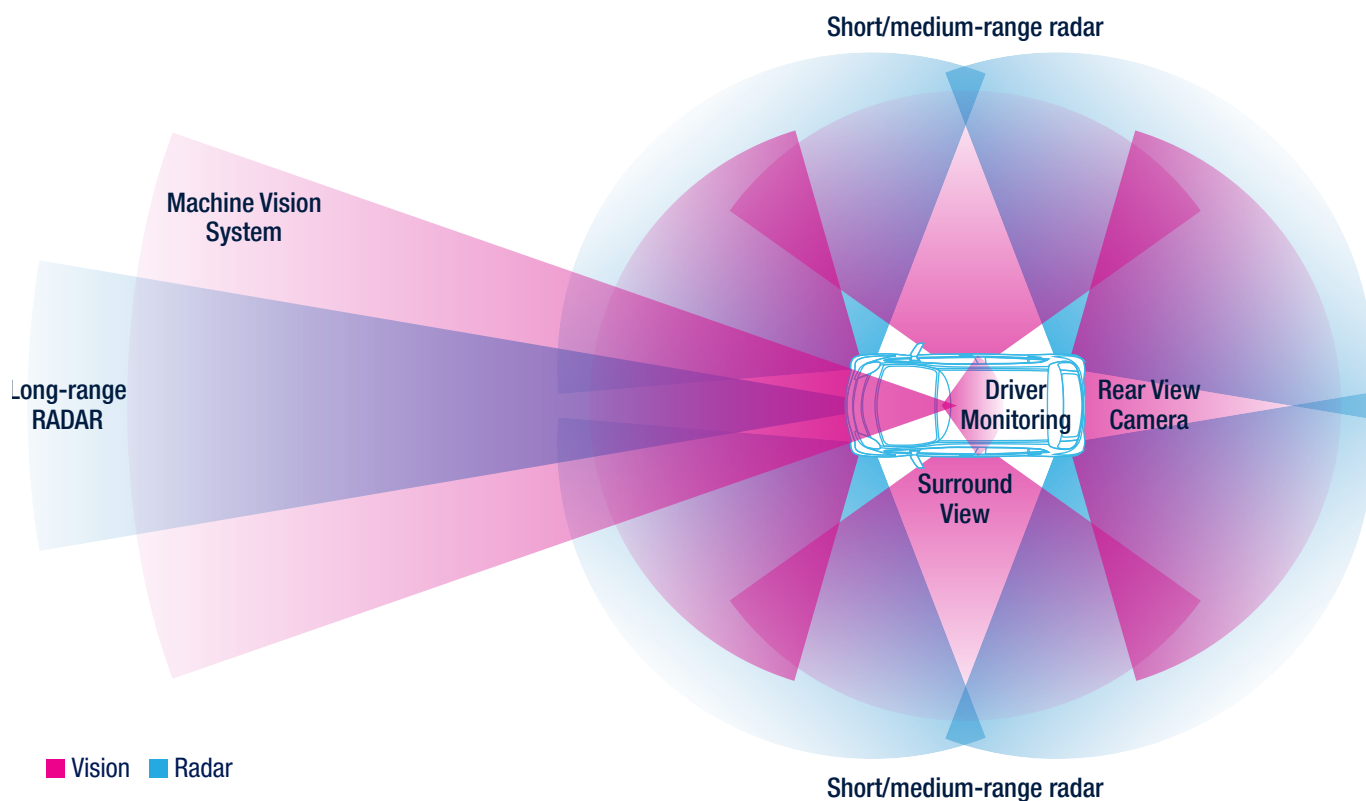
Camera-based technologies provide high-reliability and adaptability for a wide-range of driver assistance applications, for example lane keeping, pedestrian detection, traffic sign recognition, rear view camera, driver and passenger monitoring, electronic mirror. Radar-based ADAS uses two different carrier frequencies, 24 GHz for narrowband and 77 GHz for wideband applications, to support features such as blind-spot detection, automatic emergency braking and adaptive cruise control.

ST has a leading-edge product portfolio including Monolithic Microwave Integrated Circuits (MMIC), CMOS High Dynamic Range (HDR) image sensors and advanced Image Signal Processors (ISP) with dedicated HW engines for video analytics and lens correction. ST also has a wide range of Automotive Microcontrollers, Security ICs and Power Management ICs to ensure the reliability of the mission-critical ADAS systems.

ADAS

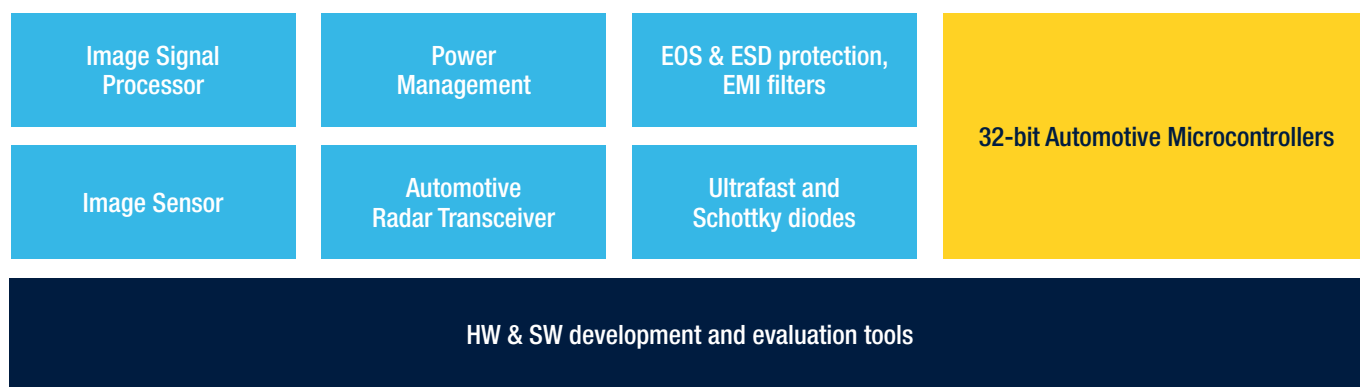
systems constantly
monitor the vehicle
surroundings,
alert the driver of
hazardous road
conditions,
and take corrective
actions

KEY APPLICATIONS



SOLUTIONS

ST's key products and solutions for ADAS applications include:



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www.st.com/adas

24 GHz and 77 GHz Radar
Rear View Camera
High Resolution Thermal Camera

Driver Monitoring System (DMS)
In-Vehicle High Speed Network

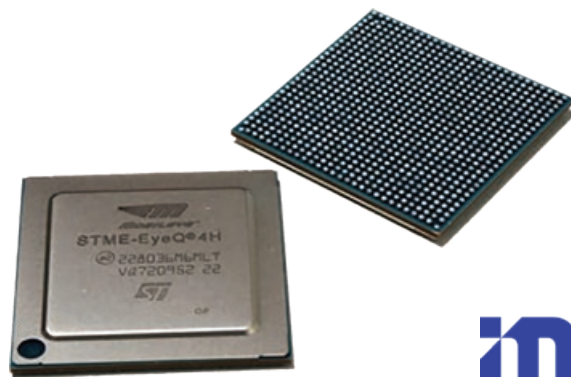
Machine Vision Systems



The evolution of Advanced Driver Assistance System (ADAS) technologies represents a significant step towards the realisation of fully connected and autonomous driving vehicles. These rely heavily on machine vision systems that run sophisticated algorithms to attain a surroundings perception level equivalent to or exceeding that of a human being.

In the long-standing cooperation between MobileEye and STMicroelectronics, ST provides extensive design resources as well as expertise in automotive quality and reliability standards compliance.

Further information about Mobileye can be found at: www.mobileye.com



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www.st.com/machine-vision

Automotive Radar solutions



ST

comes with 24-GHz
MMIC-based
radar solution

Automotive radar is an essential component of Advanced Driver Assistance Systems (ADAS). Short- and long-range radar sensors monitor a vehicle's surroundings in real-time, providing critical data to ADAS systems in order to improve driver safety and comfort.

From short- (SRR) to long-range (LRR) applications, automotive radars offer high versatility and precision, being indispensable building blocks for the Assisted (SAE Automation Levels 0 to 2) up to Autonomous (SAE Automation Levels 3 to 5) levels of driving automation.

SOLUTIONS FOR AUTOMOTIVE RADAR SYSTEM DESIGNS

According to the level of assistance required, radar systems enable today ADAS features such as:

- Adaptive Cruise Control (ACC)
- Autonomous Emergency Brake (AEB)
- Blind Spot Detection (BSD)
- Front and Rear Cross Traffic Alert (FCTA, RTA)
- Lane Change Assist (LCA)
- Exit Assist Function (EAF)
- Rear Pre-Crash Assist (RPCA)

ST supports automotive engineers with its extensive experience and a comprehensive portfolio of 24 GHz Automotive Radar Transceiver and Power Management ICs specifically designed to meet the stringent Automotive Safety Integrity Level (ASIL) requirements. Our portfolio also features a wide selection of automotive protection ICs to complete the design's BOM.



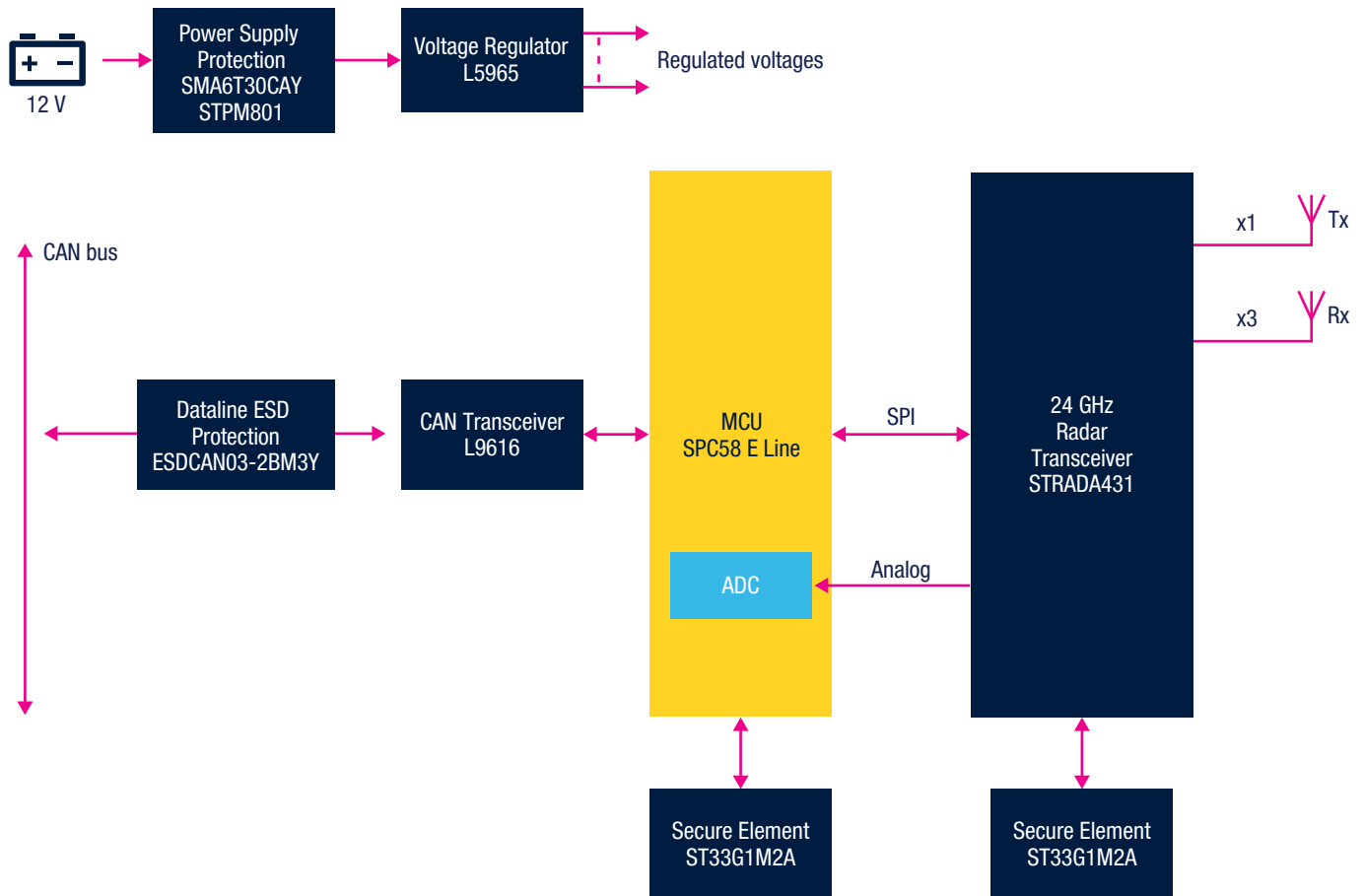
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www.st.com/radar

24 GHz RADAR

24 GHz radar is used to sense the environment around the vehicle and offer a proven and cost effective solution. These radar systems are aimed at features such as blind-spot detection, front and rear cross traffic alerts and exit assist function.

Our STRADA431 24 GHz transceiver Monolithic Microwave Integrated Circuit (MMIC) includes one transmitter and three receivers and is specifically designed for use in Advanced Driver Assistance Systems (ADAS). It integrates voltage regulators to supply the internal core to simplify system design and is fully configurable via a simple SPI interface.



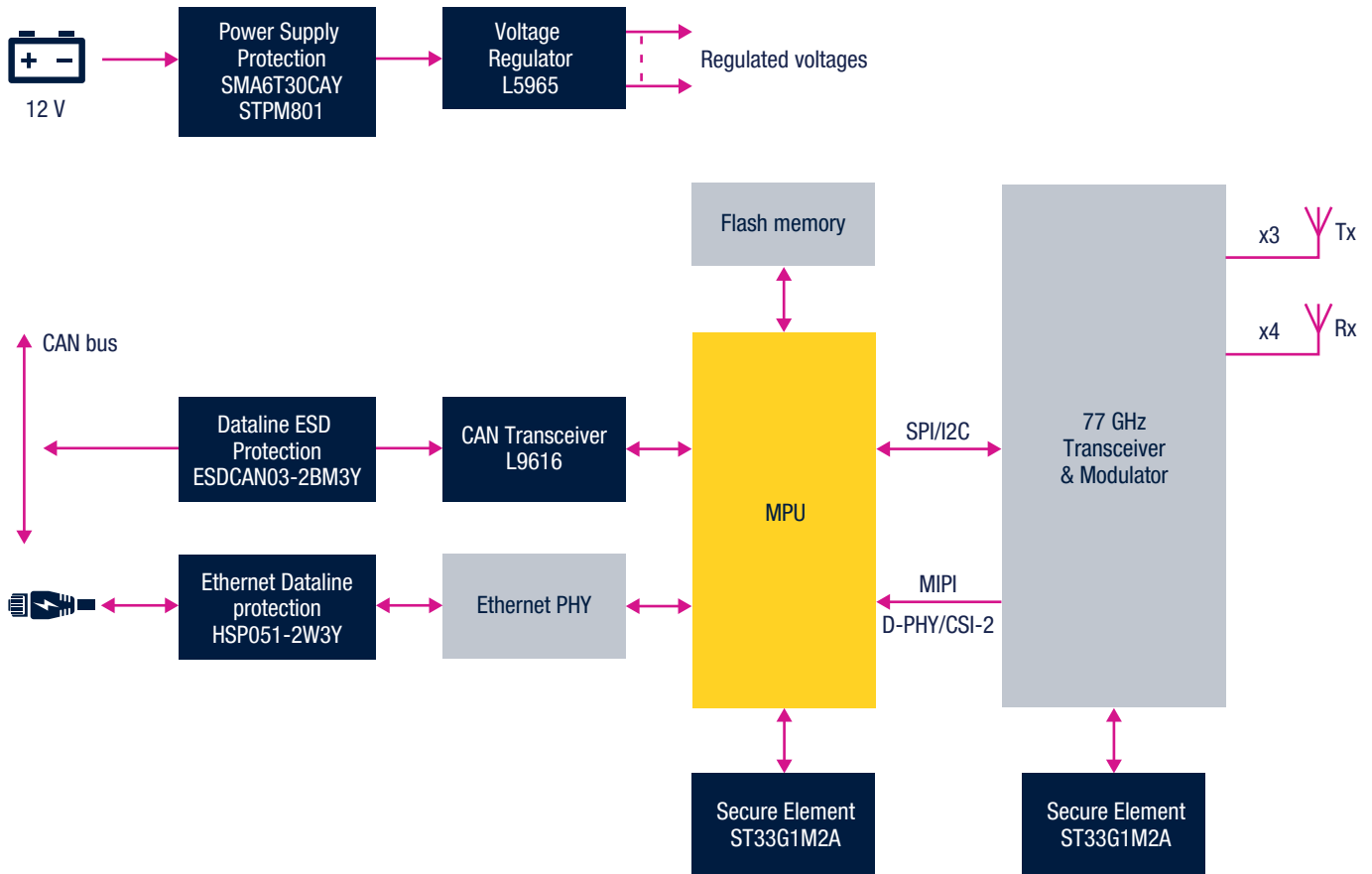
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www.st.com/24-ghz-radar

77 GHz RADAR

77 GHz radar enhances automotive safety by enabling vehicles to identify dangerous situations and prevent crashes. They are used to detect different kinds of obstacles such as other vehicles and pedestrians in the 30 to 250 meters range, even in low visibility conditions.

The information provided by the radar is used in ADAS system responsible for multiple applications including Adaptive Cruise Control (ACC) and Autonomous Emergency Braking (AEB).



FIND OUT MORE

www.st.com/77-ghz-radar

Automotive Camera solutions



ST
offers cutting-
edge solutions
for Automotive
Cameras

When embedded with advanced computer vision algorithms to create a complete machine vision system, automotive cameras offer a disruptive solution for Advanced Driver Assistance Systems (ADAS). The increasingly stringent government regulations are boosting the adoption of automotive cameras both in light and heavy commercial vehicles, segmenting the current market into various system solutions such as Rear View Camera, Surround View Camera, e-Mirror and Driver/Occupant Monitoring System (DMS/OMS).

ST offers the cutting-edge solutions for Automotive Cameras, thanks to its comprehensive portfolio including state-of-the-art HDR CMOS image sensors, versatile Image Signal Processors (ISP) with dedicated hardware engines for video analytics and lens correction and multiple voltage regulators specifically designed to have a flexible and configurable power scheme and to support applications that must comply with Automotive Safety Integrity Level (ASIL) requirements.

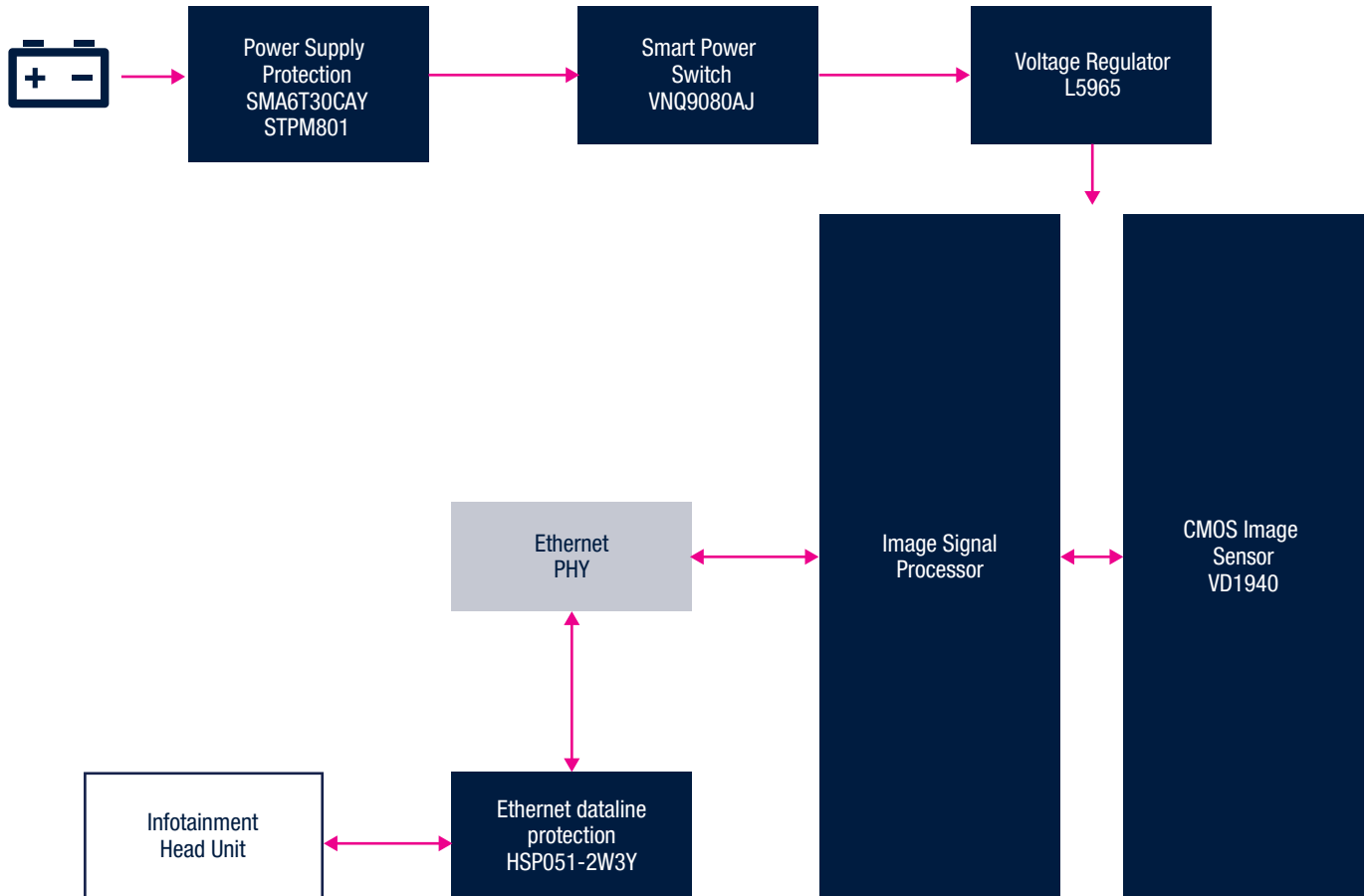


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www.st.com/automotive-cameras

REAR VIEW CAMERA

ST smart cameras enable ADAS applications like rear or surround view systems and electronic mirrors. Our chipsets include state-of-the-art HDR image sensors and versatile image signal processors that provide excellent flicker-free image quality at HD resolution. Real-time processing eliminates the need for costly external memory. Dedicated functions are available for fish-eye correction, detection of moving objects, trajectory and obstacle overlays, H264 or JPEG compression and a variety of interfaces including Ethernet.



FIND OUT MORE

www.st.com/rear-camera

HIGH-RESOLUTION THERMAL CAMERA

Driving assistance and autonomous driving systems need to be able to operate even in low visibility conditions or complete darkness.

Thermal sensors provide an advantage in such situations due to their independence from ambient light levels and their passive nature (no need to illuminate the scene). Used with other sensors, they enable accurate detection and classification of surrounding objects such as vehicles, people, animals and other obstacles. Moreover, thermal sensors improve the reliability and redundancy required for self-driving cars.

STMicroelectronics and AdaSky have collaborated on a silicon solution. Using ST's proprietary 28nm FD-SOI technology delivering high-performance processing capabilities, AdaSky designed the chip in-house and then worked with ST for implementation and testing. Viper is a complete sensing solution from AdaSky combining a FIR (Far Infrared) thermal camera with computer-vision algorithms to enable vehicles to sense and analyze their surroundings in any weather or lighting condition.

Further information about Adasky can be found at: www.adasky.com



FIND OUT MORE

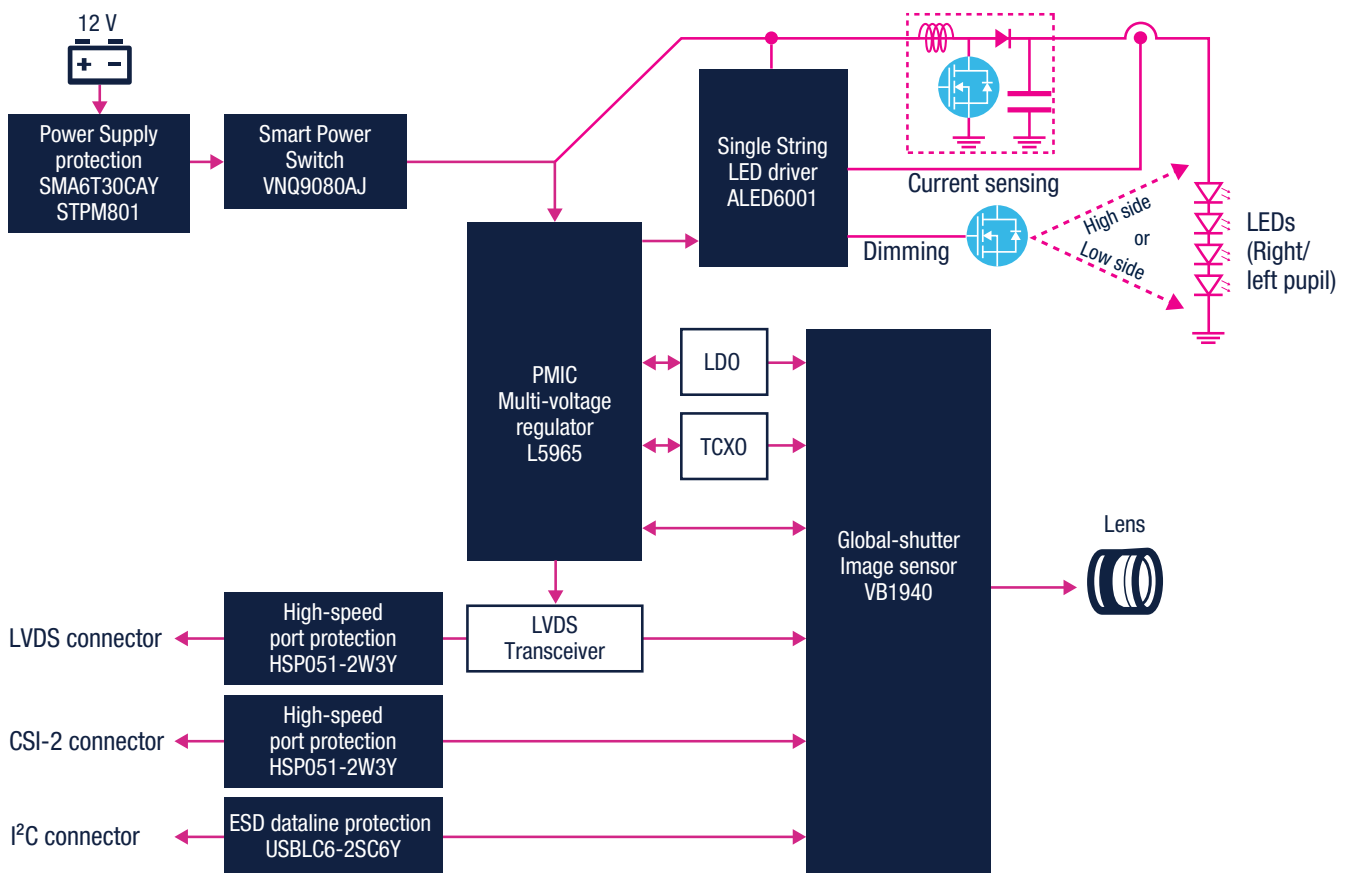
www.st.com/thermal-camera
www.adasky.com

DRIVER MONITORING SYSTEM (DMS)

Designed for vehicle in-cabin monitoring, the Driver Monitoring System (DMS) is critical for supporting highly autonomous driving functions, not only by recognizing the driver, but also monitoring their level of vigilance and detecting drowsiness signals as early as possible.

Suitable also for detecting cabin passengers, child seat occupancy or posture analysis, this technology can further enhance the Infotainment interface by enabling touch-free gesture control functions, bring the safety concept to its highest level and encouraging a smarter adoption of driver assistance functions.

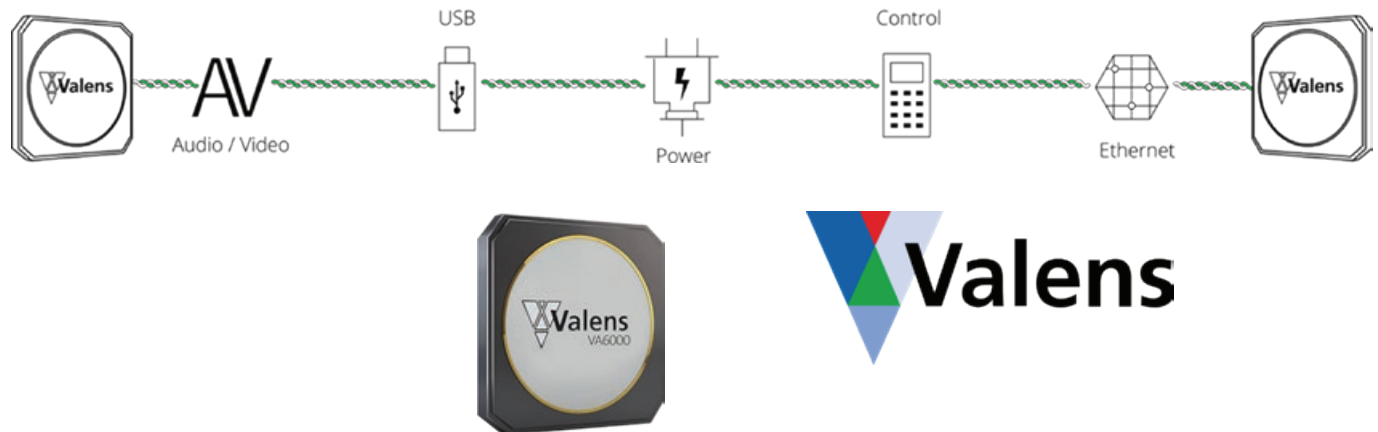
ST comes with a scalable solution for Driver Monitoring System (DMS) applications, thanks to its HDR Global Shutter sensor (1.6 and 2.3 Mpixel versions available). Together with an ASIL-D compliant Multichannel Voltage regulator, automotive LED drivers, and MEMS sensors, ST's DMS solutions ensure the best flexibility for high-end computer vision applications in very critical environments.



FIND OUT MORE

www.st.com/dms

In-Vehicle High-Speed Network



Smarter vehicles have become an extension of our ever-connected lives: cameras, sensors, controls and entertainment, all form part of today's driving experience.

The evolution towards more advanced and sophisticated ADAS features and higher levels of driving automation is creating heavy data bandwidth demands on the on-board communication network. Traditional communication protocols are struggling to meet the bandwidth requirements of the multitude of sensors and subsystems needed for ADAS.

The HDBaseT Automotive technology is the solution to the in-vehicle connectivity challenges. It is a derivative of HDBaseT, a mature, proven and standardized technology for the transmission of high-definition audio and video, controls, Ethernet, USB and even power in the consumer electronics and professional audiovisual markets. This combination of high bandwidth, high performance, feature-rich capabilities, and an existing infrastructure makes an HDBaseT solution ideal for in-vehicle networking.

STMicroelectronics and Valens have worked closely to enable HDBaseT Automotive technology to be built into the next-generation of connected cars. The highly efficient technology optimizes in-vehicle connectivity by enabling the transmission of reliable 6 Gbps high-throughput infotainment, road safety, and automotive-control content over a low-cost infrastructure with near-zero latency. Valens, as the inventor of HDBaseT and founder of the HDBaseT Alliance, brings the technology and expertise to accomplish the goal of commercializing HDBaseT-enabled vehicles; STMicroelectronics contributes with its extensive design and manufacturing experience and in-depth knowledge of compliance with the strict automotive quality and reliability requirements.



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www.st.com/valens

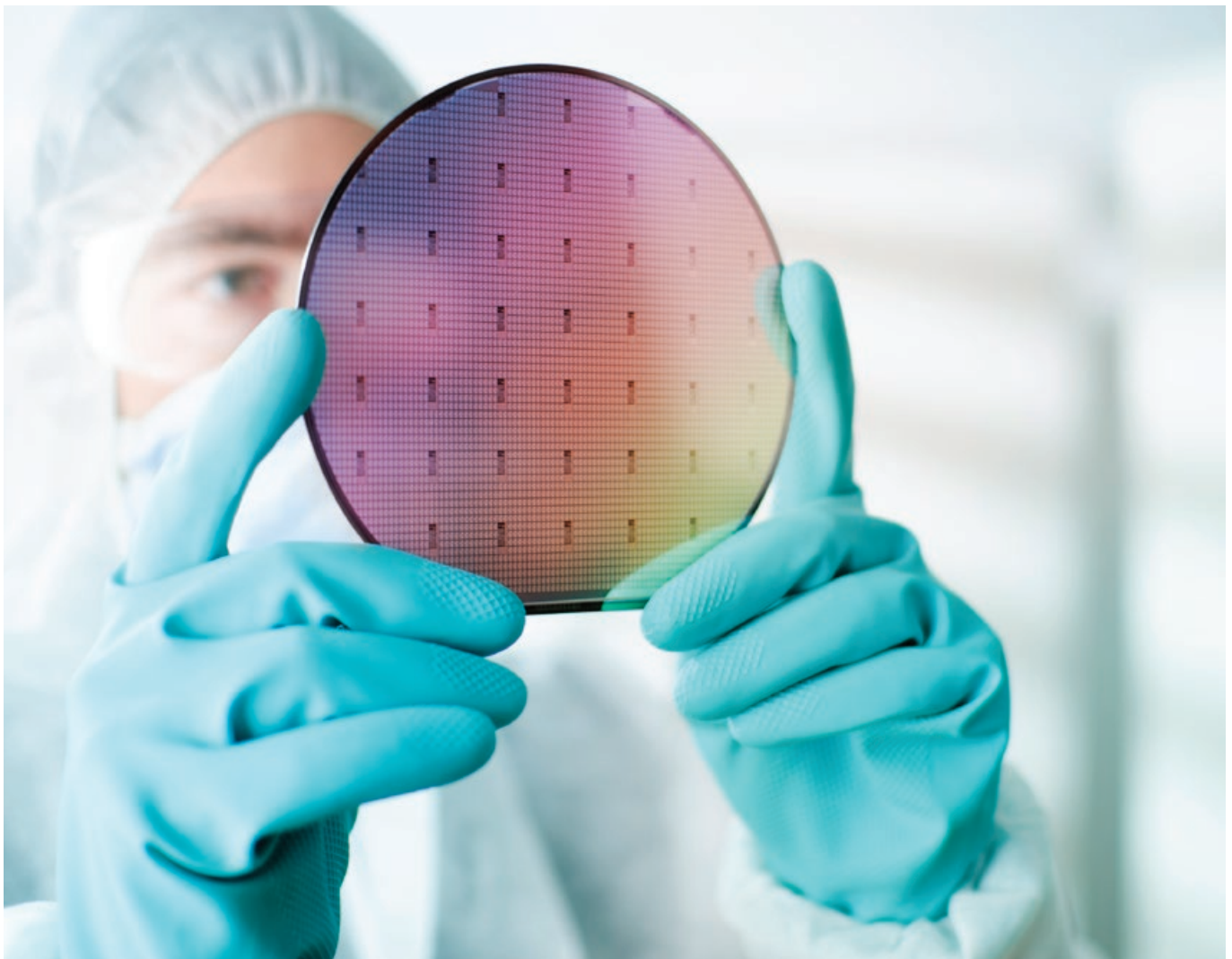
Key Technologies

RESEARCH & DEVELOPMENT AND MANUFACTURING

To keep its technology edge, ST maintains a strong commitment to innovation, with approximately 9,000 people working in R&D and product design and spending about 12% of its revenue in R&D. Among the industry's global technology leaders, ST owns and continuously refreshes a substantial patent library with over 19,500 active and pending patents. The company also uses its over 200 R&D partnerships to further foster its innovation.

ST draws on a rich pool of chip-manufacturing technologies, including advanced FD-SOI (Fully Depleted Silicon-on-Insulator) CMOS (Complementary Metal Oxide Semiconductor), differentiated Imaging technologies, RF-SOI (RF Silicon-On-Insulator), BiCMOS, BCD (Bipolar, CMOS, DMOS), Si MOSFET, SiC MOSFET, Si IGBT, VIPower, Transil, Trench Schottky Diodes, and MEMS technologies.

ST believes in the benefits of owning manufacturing facilities and operating them in close proximity to its R&D operations. ST has a worldwide network of front-end (wafer fabrication) and back-end (assembly and test and packaging) plants. ST's principal wafer fabs are located in Agrate Brianza and Catania (Italy), Crolles, Rousset, and Tours (France), and in Singapore. These are complemented by assembly-and-test facilities located in China, Malaysia, Malta, Morocco, the Philippines, and Singapore.



KEY TECHNOLOGIES FOR AUTOMOTIVE PRODUCTS

CMOS (Complementary Metal Oxide Semiconductor)

CMOS (Complementary Metal Oxide Semiconductor) is a pure digital technology invented in the 60's. It is largely used in digital products for processing purposes. Starting from CMOS, other technologies have been set up including BCD (Bipolar-CMOS-DMOS) used for mixed signal products, FD-SOI that allows to reduce silicon geometries below 28nm, and embedded NVM at the heart of MCUs. The robustness and versatility of this technology, present in billions of devices, makes it very suitable for all automotive applications.

FD-SOI / RF-SOI

Fully Depleted Silicon-on-Insulator, or FD-SOI, is a planar process technology that delivers the benefits of reduced silicon geometries while actually simplifying the manufacturing process. The buried oxide layer, specific to FD-SOI MOS, lowers the parasitic capacitances and efficiently confines the electrons flowing from the source to the drain, dramatically reducing performance degrading for leakage currents. This is a key advantage for pure digital products, especially when required to operate at high temperature, allowing very innovative power management techniques. The advanced ADAS platforms are based on this technology and produced in Crolles 300 facility on a 28nm node. Moreover, thanks to the tight electrostatic control of the transistor, FD-SOI is recognized as a leading technology for low-power, RF and millimeter-wave applications.

Associated with the high-density PCM embedded non-volatile memory, ST offers a unique platform for automotive applications.

Key application include ADAS, RF switches and tuners, low-noise amplifiers, power amplifiers, monolithic integrated RF and FEMs (switches, LNAs, PAs and passives).

FD-SOI

NON-VOLATILE MEMORIES (eNVM)

ST has a strong background in non-volatile memories (NVM) and has developed embedded NVM technologies to enable real-time MCUs and other products that benefit from real-time access to NVM. Today, automotive volumes are at 90 nm and 40 nm technology nodes, and the new Stellar MCU family uses phase-change memory (PCM) to exploit the features of CMOS FD-SOI technology. This evolution to PCM places ST at the forefront of automotive MCUs.

ST standalone non-volatile memories (NVM) are also highly regarded in the industry, especially our automotive serial EEPROM, which is ideal for high-quality and flexible parameter storage, with a wide portfolio ranging from 1 Kbit to 4 Mbits. The automotive Serial EEPROM is robust, high-performance, and designed for intensive operation at high temperatures, making it suitable for all high-reliability applications. The EEPROM is AEC-Q100 qualified, screened through a specific high-reliability testing flow, and PPAP Level 3 compliant. The EEPROM is manufactured in 150 nm technology nodes and is progressively extending to 110 nm. The I²C, SPI, and Microwire buses are supported for three packages: SO8N, TSSOP8, and DFN8 up to 150°C.



EEPROM

BCD (BIPOLAR-CMOS-DMOS)

BCD (BIPOLAR-CMOS-DMOS) is a key technology for power ICs. BCD combines the strengths of three different process technologies onto a single chip: Bipolar for precise analog functions, CMOS (Complementary Metal Oxide Semiconductor) for digital design and DMOS (Double Diffused Metal Oxide Semiconductor) for power and high-voltage elements.

This combination of technologies brings many advantages: improved reliability, reduced electromagnetic interference and smaller chip area.

BCD has been widely adopted and continuously improved to address a broad range of products and applications in the fields of power management, analog data acquisition and power actuators.

VIPower

Vertical Intelligent Power (VIPower) is a technology developed by ST and in production since 1991. VIPower technology provides control, protection and diagnostics for medium/high power automotive loads. The technology combines Vertical Double Diffused MOS Power devices with their own temperature and current sensors and CMOS and HV components for power, analog, and mixed-signal designs.

VIPower technology plays a key role in the move towards electric vehicles. The smart 48 V networks used in mild- and full-hybrid cars require intelligent power switches to drive high- and low-sided loads and electric motors, with very low losses and high current sense accuracy, all monitored via the connections to the ECU microcontroller.

The new VIPower M0-9 SPI drivers feature full digital diagnostics with embedded ADC for load current sensing. These new devices implement sophisticated software logic that also simplifies AUTOSAR compliance.

Designed to replace standard melting fuses in automotive power distribution systems, our new STi²Fuse smart switches feature wire harness protection on top of the typical high-side driver functions for additional savings on component and production costs, while extending EV range and reducing the carbon footprint of vehicles.



TRANSIL

TRANSIL is a key planar technology for our Automotive transient voltage suppressors (TVS) designed to protect automotive sensitive circuits against surges as defined in ISO 7637-2 and ISO 16750 also called load-dump (battery lines), ISO 7637-3 (data lines) and ESD as defined in ISO 10605. Protection is also provided against other perturbations generated by elements like ignition, relay contacts, alternators, injectors, SMPS, etc.

This technology is compatible with high-end circuits where low leakage current and high junction temperatures are required to provide reliability and stability over time.



Data line ESD protection

ST's automotive data line ESD protection devices include transient voltage suppressors (TVS) and application-specific discrete devices that provide system level protection against ESD surges according to standard IEC 61000-4-2. ESD protection devices are manufactured using automotive-grade processes and qualified to AEC-Q101 standards. As such, they can address all automotive applications and domains including advanced driver-assistance systems (ADAS), vehicle-to-everything (V2X), CAN-FD, SerDes (serializer/deserializer), and Ethernet Base-T standards to name just a few, in order to achieve immunity with the very low clamping voltage. Moreover, ST offers innovative, miniature wettable flank DFN packages to ease Automatic Optical Inspection (AOI).

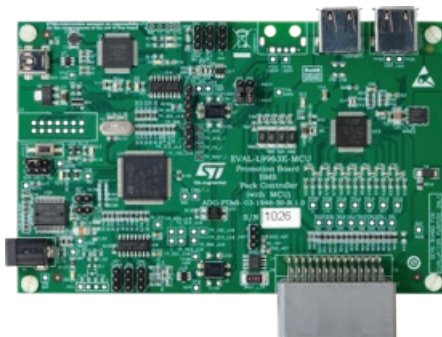
Development Tools

EVALUATION BOARDS, eDESIGN SUITE, AND SOFTWARE TOOLS

ST provides a set of eDesign suites tuned to the needs of the Automotive Industry. Once the appropriate products have been selected, a wide range of samples and evaluation boards are available to help you get started and reduce your development times. In addition to boards, ST provide schematics, BOM and Gerber files to facilitate your hardware design and demonstration software packages are also available.

Evaluation kits

Product evaluation kits help you design, test, and calibrate your automotive application. A wide range of boards is available to evaluate the specific features of products and solutions in their applications. A complete set of documents and resources including circuit diagrams and bills of material as well as reference guides is available. Additional software including ready-to-use example code and user-friendly GUIs complete our offer.



FIND OUT MORE
www.st.com/automotive-evalboards

eDesignSuite

eDesignSuite is a comprehensive set of easy-to-use design-aid utilities ready to help you streamline the system development process with a wide range of ST products.



TwisterSIM

TwisterSIM is an off-line Electro-Thermal simulator for our VIPower automotive power devices. It helps shorten design solution cycle by enabling complex evaluations including load-compatibility, wiring harness optimization, fault condition impact and diagnostic behavior analysis and Dynamic Thermal performance.



STPOWER Studio

The STPOWER Studio dynamic electro-thermal simulation software offers comprehensive power and thermal analysis for a growing number of STPOWER devices. It helps users select the best power device for the specific application mission profile and predicts device behavior under given operating conditions.



Rectifier diode simulator

With just a few clicks our on-line FERD & Schottky diode simulator lets you estimate power losses based on application waveforms and select the best components for your solution.



AC switch simulator

Our AC switch simulator provides graphs of estimated temperature and voltage blocking capabilities to so you can quickly determine the best switch for your solution.



TVS simulator

Simply specify the surge input waveform and system ratings to be protected and this intuitive simulator lets you sort and select the best TVS protection for your design.



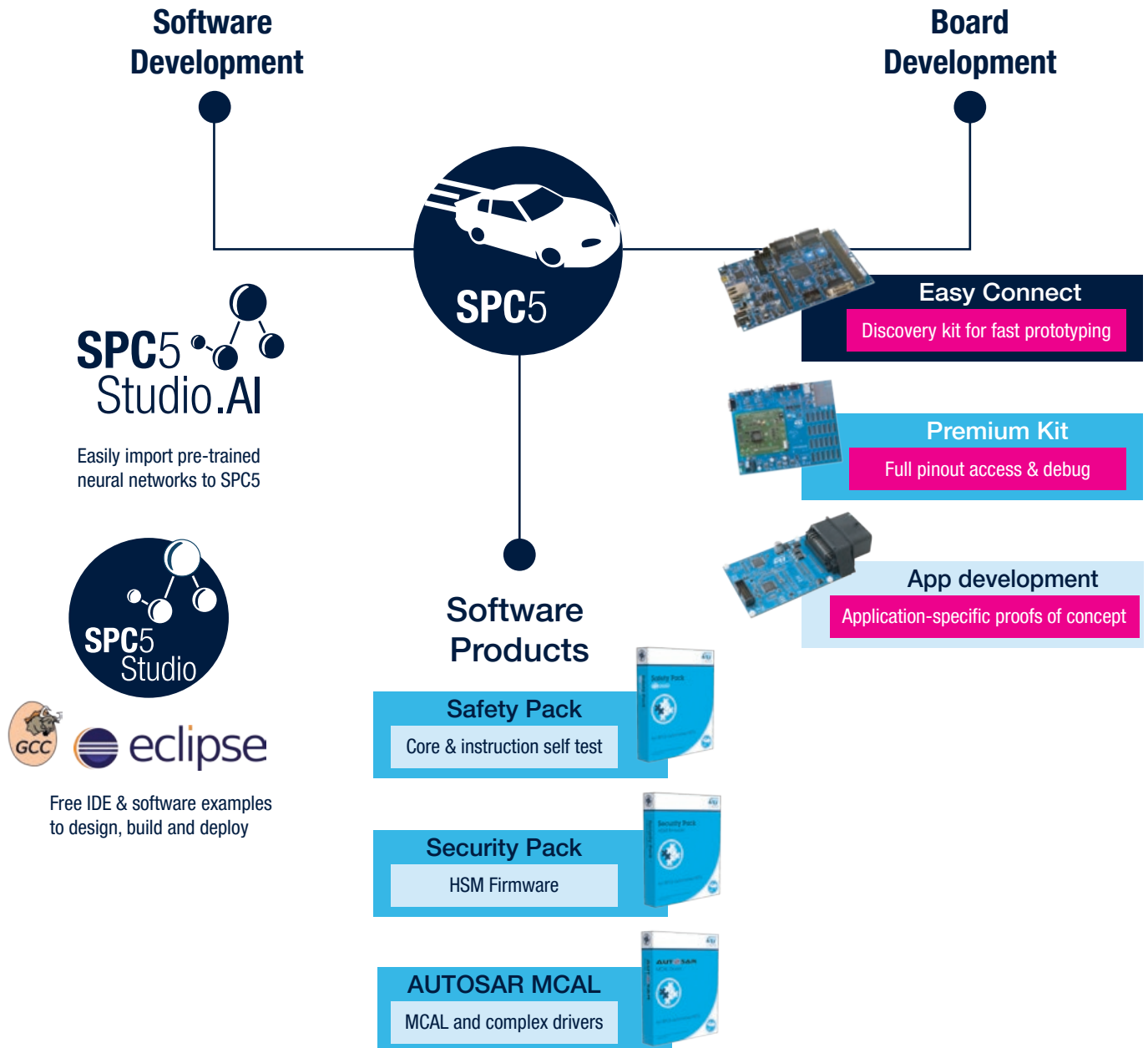
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www.st.com/edesign

COMPREHENSIVE SPC5 AUTOMOTIVE MCU DEVELOPMENT ECOSYSTEM

A rich ecosystem with a full set of hardware and software tools allows developers to save time, simplify implementation, quickly prototype their application and benefit from ready-to-use boards and example code. ST offers a wide set of hardware kits ranging from quick evaluation tools to modular and professional boards for developing final proofs-of-concept.

Together with free downloadable SPC5Studio Integrated Development Enviroments (IDE), engineers can easily set up application projects in a short time. SPC5Studio contains a wide selection of example code for starting projects. Additionally, ST offers a set of licensed software packs addressing Safety, Security and AUTOSAR MCAL components.

ST's network of 3rd parties and partners complement the offer with hardware, such as debugger probes, and software tools including compilers and other services.



FIND OUT MORE
www.st.com/auto-sp5-mcu-evaltools

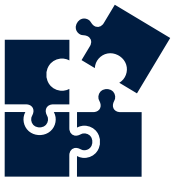
STELLARLINK FAST PROTOTYPING FOR AUTOMOTIVE MCUs

StellarLINK is a USB to JTAG passive debugger dongle for Automotive MCUs. It supports SR5, SR6, and SPC5 automotive microcontrollers and their evaluation boards. StellarLINK is Integrated into StellarStudio and SPC5Studio

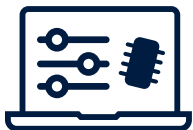
ST programmer & debugger



Supporting Stellar SR5, SR6, and SPC5 MCUs



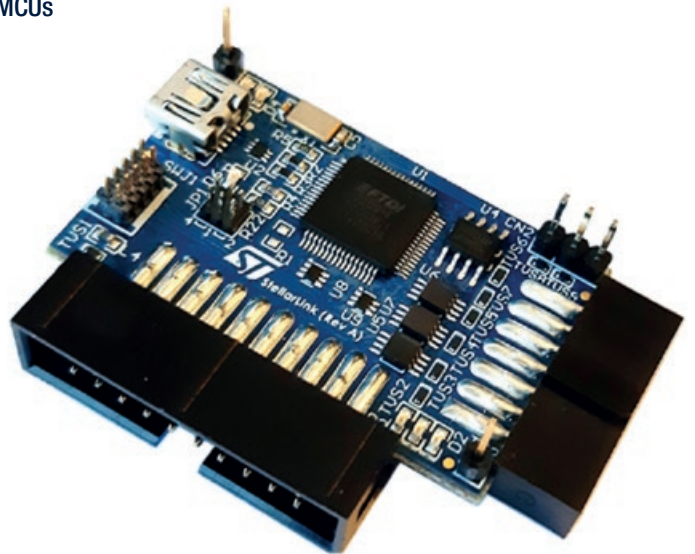
Plug & Play with evaluation boards



Extending Stellar & SPC5 ecosystem



Eco-friendly packaging



FIND OUT MORE

www.st.com/en/development-tools/stellarlink.html

SPC5 SOFTWARE TOOLS



SPC5Studio is a built-on Eclipse plug-in development environment offering a very intuitive and customizable framework to build and deploy embedded applications for SPC5 Power architecture 32-bit microcontrollers.

Integrating software development tools, device configuration tools and examples, SPC5Studio is a complete solution to speed up project development.

Available free for download on the [st.com](https://www.st.com) website.



SPC5Studio includes **SPC5Studio.AI**, a plug-in for Artificial intelligence-based applications, a seamless way to generate, execute and validate pre-trained NN models on automotive MCUs.

Pre-trained neural networks can be automatically generated into an efficient “ANSI C” library that can be compiled, installed and executed.

Pre-trained neural networks can be easily imported by SPC5Studio.AI from the most widely used deep learning frameworks, such as Keras, TensorFlow Lite, Lasagne, Caffe, ConvNetJS, and ONNX.



SOFTWARE PRODUCTS



SPC5 Security Pack provides basic capabilities to support root-of-trust (RoT) where private encryption keys are kept secret during the microcontroller lifetime using a dedicated location inside the OTP space. To further ensure application security, encryption and decryption functionalities are fully executed on the HSM core.



SPC5 Safety Pack is a comprehensive software package rigorously developed according to an ISO 26262-compliant development process, and helps developers achieve the required safety target, up to the most rigorous ASIL-D level. It includes a Safety kit for the Microcontroller Abstraction Layer (MCAL) as well as Core self-test programs that implement safety counter-measures to ensure compliance with MCU ASIL level requirements.



SPC5 AUTOSAR MCAL Driver offers a full set of Microcontroller Abstraction Layer software components in addition to Complex Device Drivers (CDD) to support specific hardware peripherals. MCAL software components are developed in house, through an ISO 26262-certified development process. ST's CDD and MCAL drivers are integrated by 3rd party partners with all the components required for the AUTOSAR architecture including basic software layer and OS, offering a complete off-the-shelf AUTOSAR solution.

ST Security Pack, Safety Pack and AUTOSAR MCAL Pack are licensed products.

life.augmented



Order code: **BR2311AUTOADAS**

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