



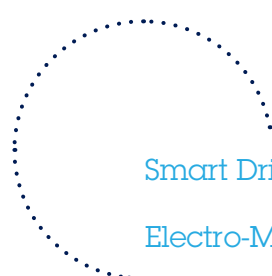
life.augmented

Solutions for Smarter Driving Electro-Mobility

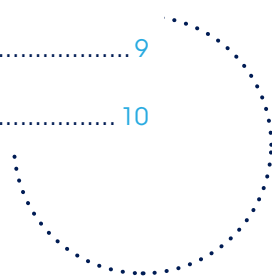




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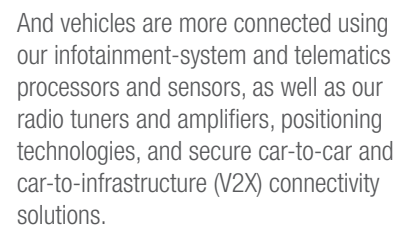
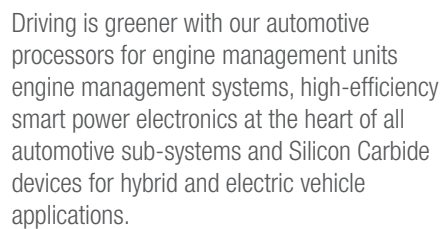
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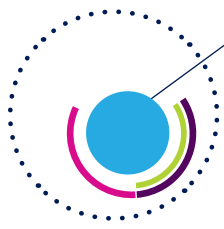
ST's Smart Driving products and solutions are making driving safer, greener and more connected through the combination of several of our technologies.

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



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.





Electro-Mobility



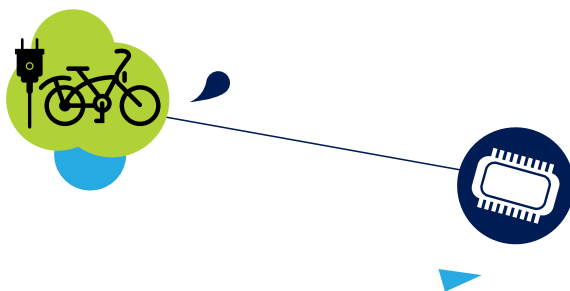
The electrification of vehicles is increasing rapidly, driven by the availability of higher-performance and more cost-effective battery technologies, and improved mileage vehicles as well as ecological awareness, and government incentives and regulation.

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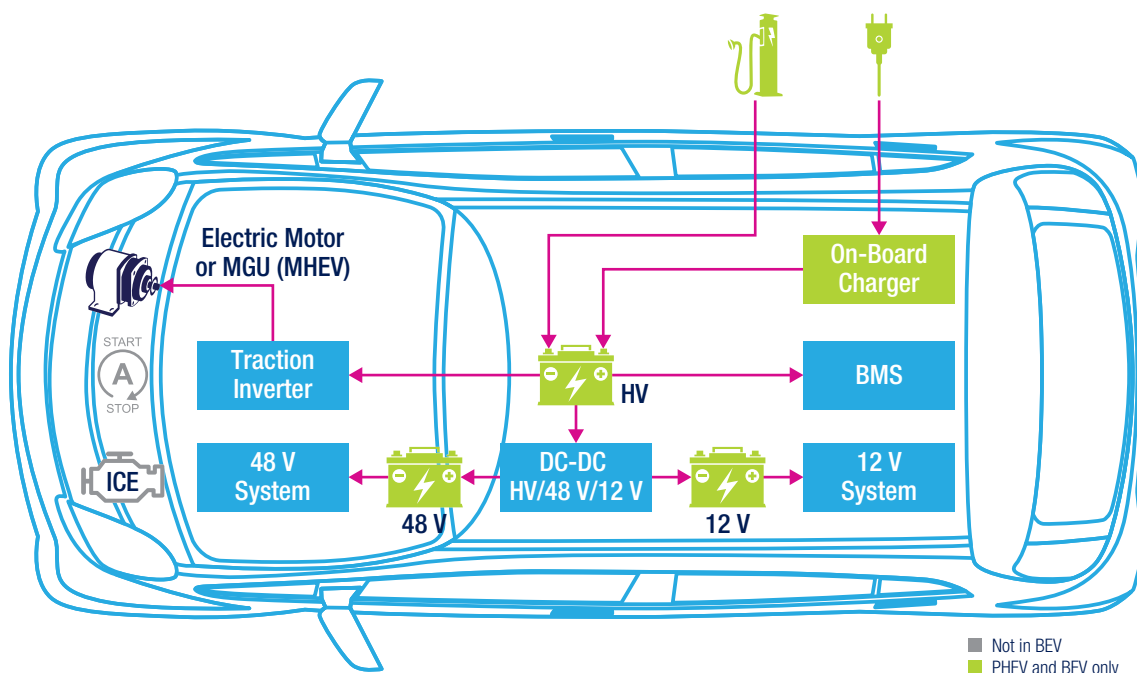
ST provides leading-edge solutions for hybrid (HEV), and battery electric vehicles (BEV) based upon proven and innovative technologies and backed up with our extensive power management experience.

Best-in-class, silicon and SiC (Silicon Carbide) MOSFETs and diodes, IGBTs, protection components, isolated gate drivers and microcontrollers make up an unrivalled offer for electric vehicle power management. They are available as discrete components, or as part of dedicated system solutions, all in accordance with the AEC-Q100 and AEC-Q101 standards.

Whether you are looking the cost-effective, yet emission reducing first step on the electrification ladder with silicon solutions for 48V systems for mild hybrids, or for the traction inverter, battery management system and on-board charger for a fully electric vehicle ST have the products you need.



KEY APPLICATIONS



SOLUTIONS

ST's key products and solutions for Electro-Mobility applications include:

SiC MOSFETs and Diodes	Transceivers	Signal Conditioning	Power Management	32-bit Automotive Microcontrollers
Power MOSFETs and IGBTs	Power Diodes and Thyristors	EOS and ESD Protection	BCD Integrated and Isolated Drivers	
HW & SW Development Tools – Sample Kits, Evaluation Kits, Product Selectors				



FIND OUT MORE

www.st.com/electro-mobility

Battery Management System (BMS)
 Charging Station
 DC-DC Converter
 Electric 2-wheelers

Electric Traction (Main Inverter)
 Mild Hybrid 48 V Systems
 On Board Charger (OBC)



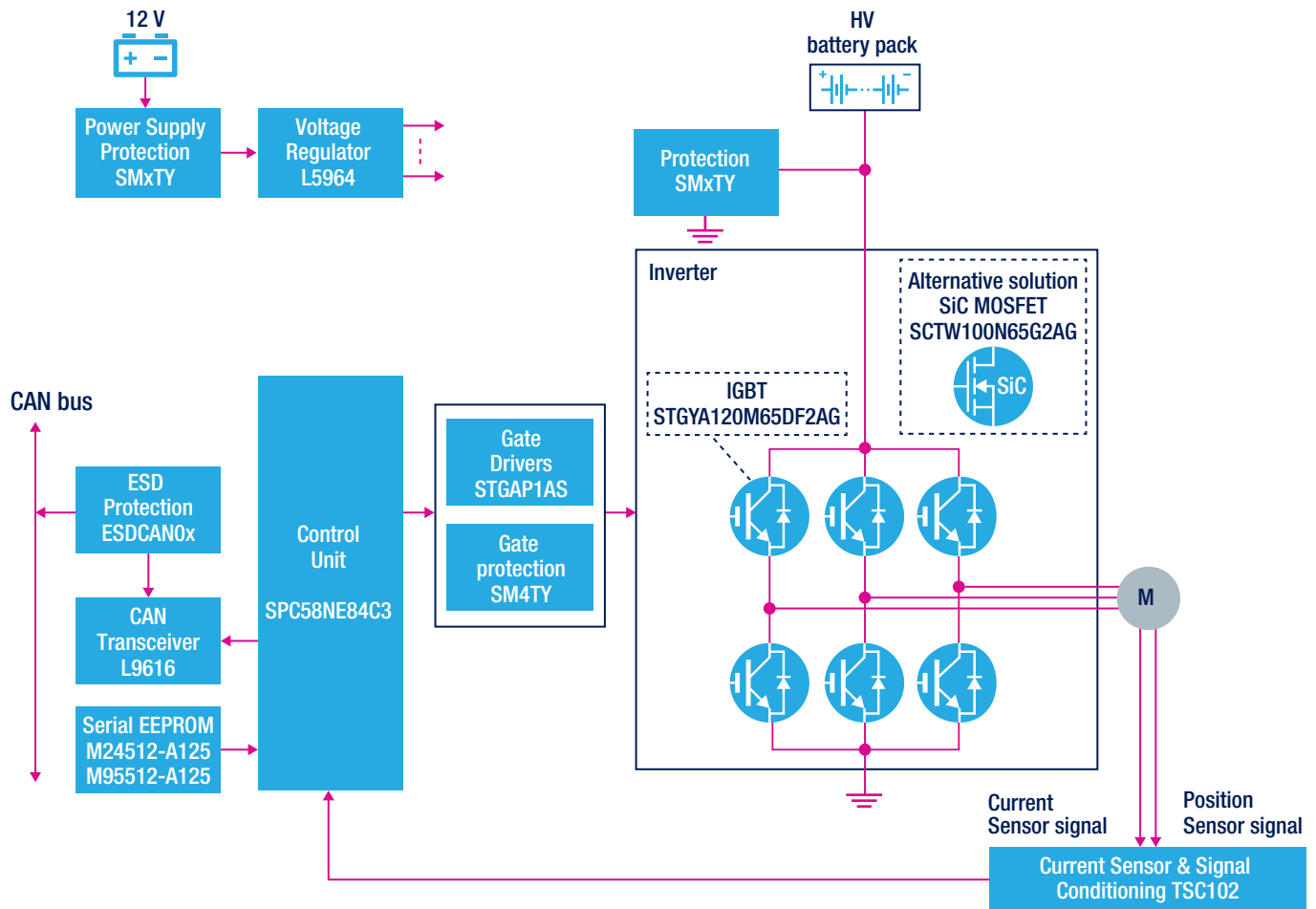
TRACTION MAIN INVERTER

The traction inverter converts energy from the vehicle's battery to drive the motors in the drivetrain. This key component has a direct impact on road performance, driving range and reliability of the vehicle also as a consequence of their weight and size.

Subject to intense heat and vibration of the automotive environment, these converters must be able to handle high power and currents along with associated Electro Magnetic Compatibility (EMC) challenges. Fail-safe operation needs to be assured to ensure reliability and safety for the driver and passengers.

To help developers increase the inverter's power efficiency and reduce size and weight, ST has a wide offer of discrete semiconductors including AEC-Q101 qualified silicon and silicon-carbide (SiC) MOSFETs and diodes as well as IGBTs. These are complemented by AEC-Q100 qualified galvanically isolated IGBT and MOSFET gate drivers and SPC5 32-bit automotive microcontrollers for implementing scalable, cost-effective and energy-efficient solutions.

Main Inverter



FIND OUT MORE

www.st.com/main-inverter-electric-traction



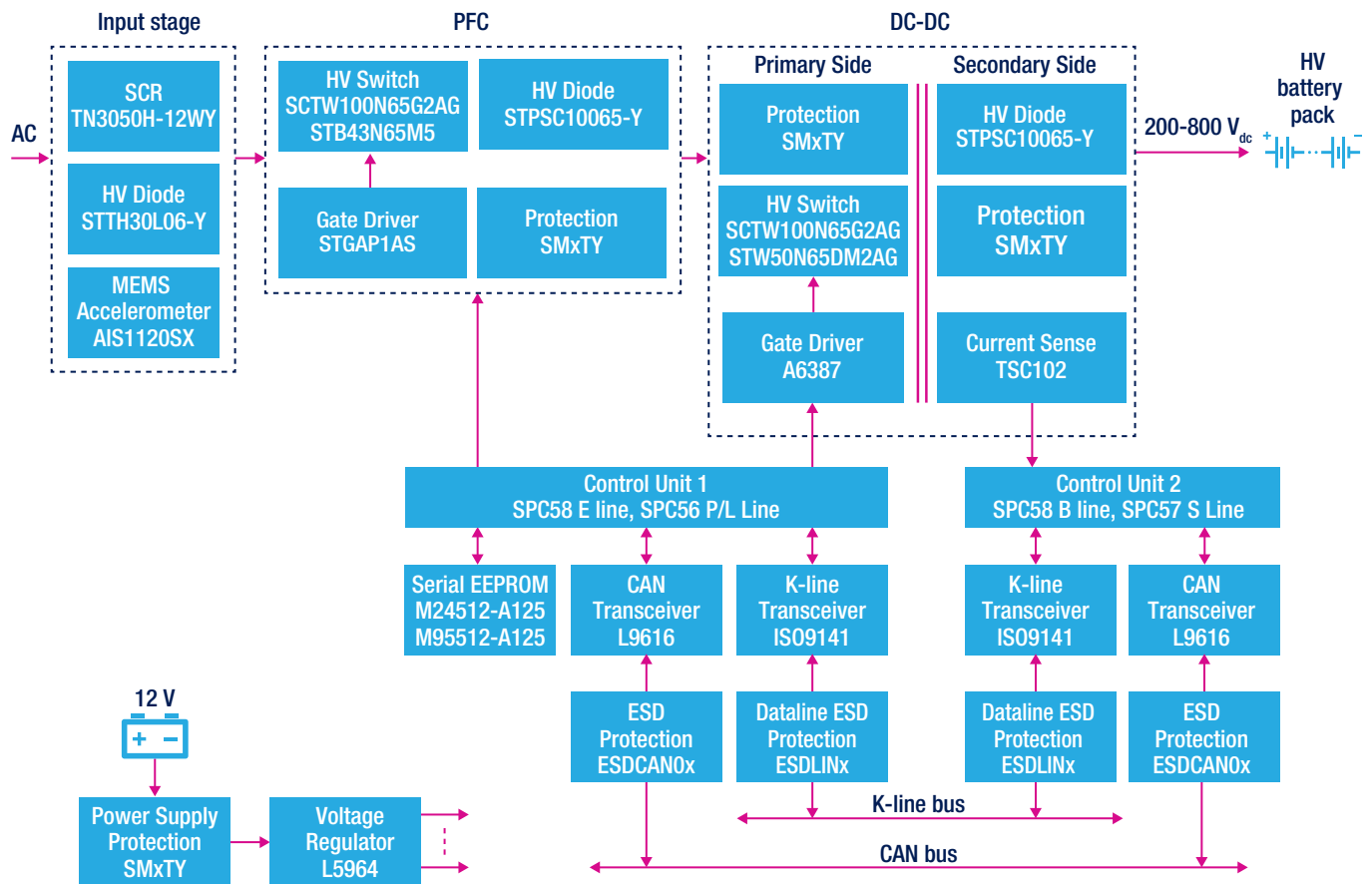
ON-BOARD CHARGER (OBC)

At the heart of any electric (EV) or plug-in hybrid (HEV) vehicle lies the high-voltage (200 to 800 Vdc) battery and its associated charging system. The on-board charger (OBC) provides the means to recharge the battery from the AC mains either at home or from outlets found in private or public charging stations.

From a 3.6 kW single-phase to a 22 kW three-phase high-power converter, today's OBCs must have the highest possible efficiency and reliability to ensure rapid charging times as well as meet the limited space and weight requirements.

ST has a wide offer of discrete semiconductors including AEC-Q101 qualified silicon and silicon-carbide (SiC) MOSFETs and diodes as well as IGBTs. These are complemented by AEC-Q100 qualified galvanically isolated IGBT and MOSFET gate drivers and SPC5 32-bit automotive microcontrollers for implementing these challenging converters.

OBC



FIND OUT MORE

www.st.com/on-board-charger



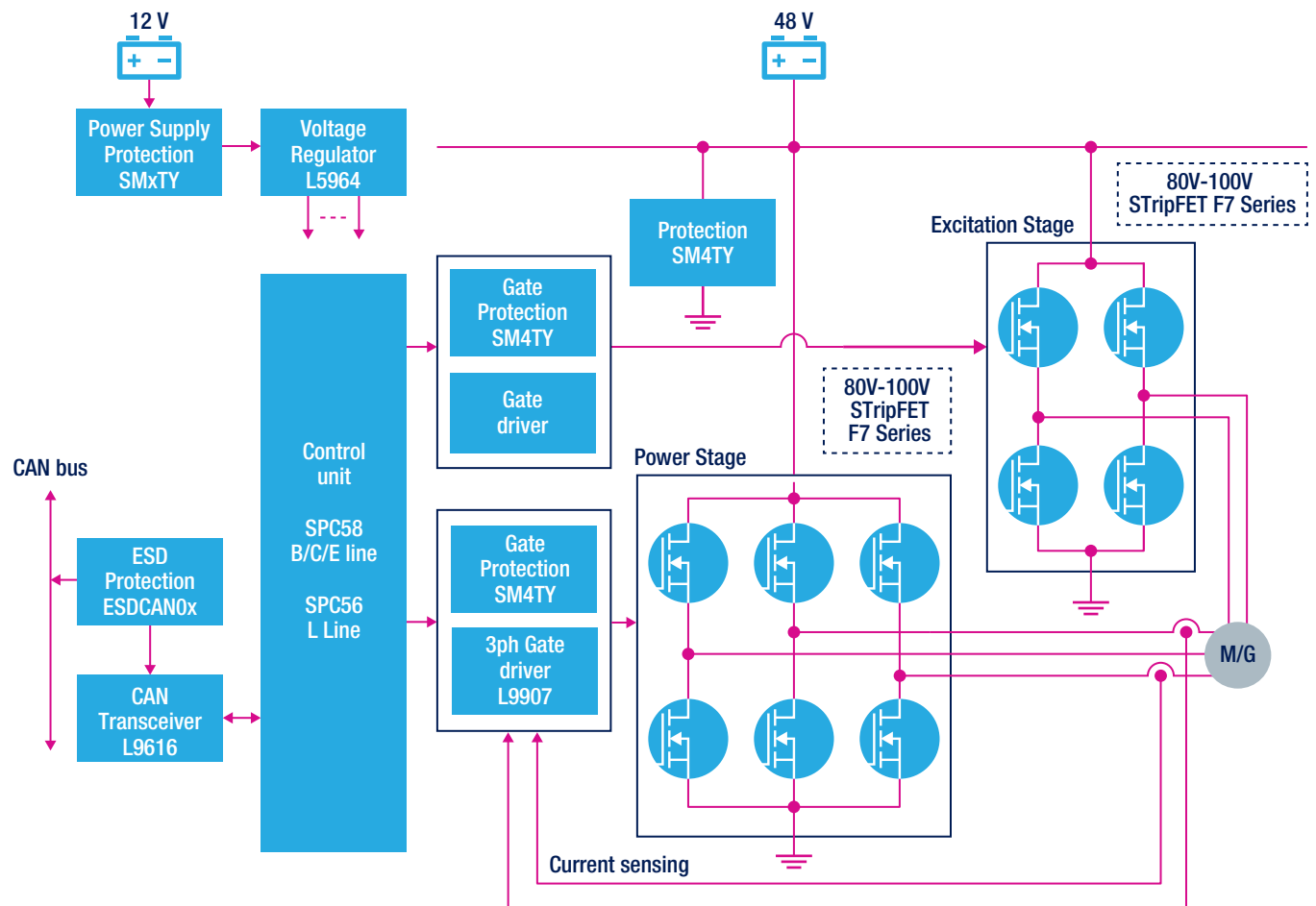
48V START-STOP SYSTEM

A Start-Stop system automatically shuts down and restarts the internal combustion engine to reduce the amount of idle time, thereby improving fuel economy and reducing CO₂ emissions. This is especially useful in urban traffic environments where vehicles can spend significant amounts of time in traffic.

This requires power electronics that can handle high current during cranking and ensure reliability during engine cycles operating on/off at high temperatures.

ST's solutions include silicon power MOSFETs, protections, gate drivers and microcontrollers, in accordance to AEC-Q100 and AEC-Q101 standards.

Start-Stop system



FIND OUT MORE

www.st.com/48v-start-stop-system

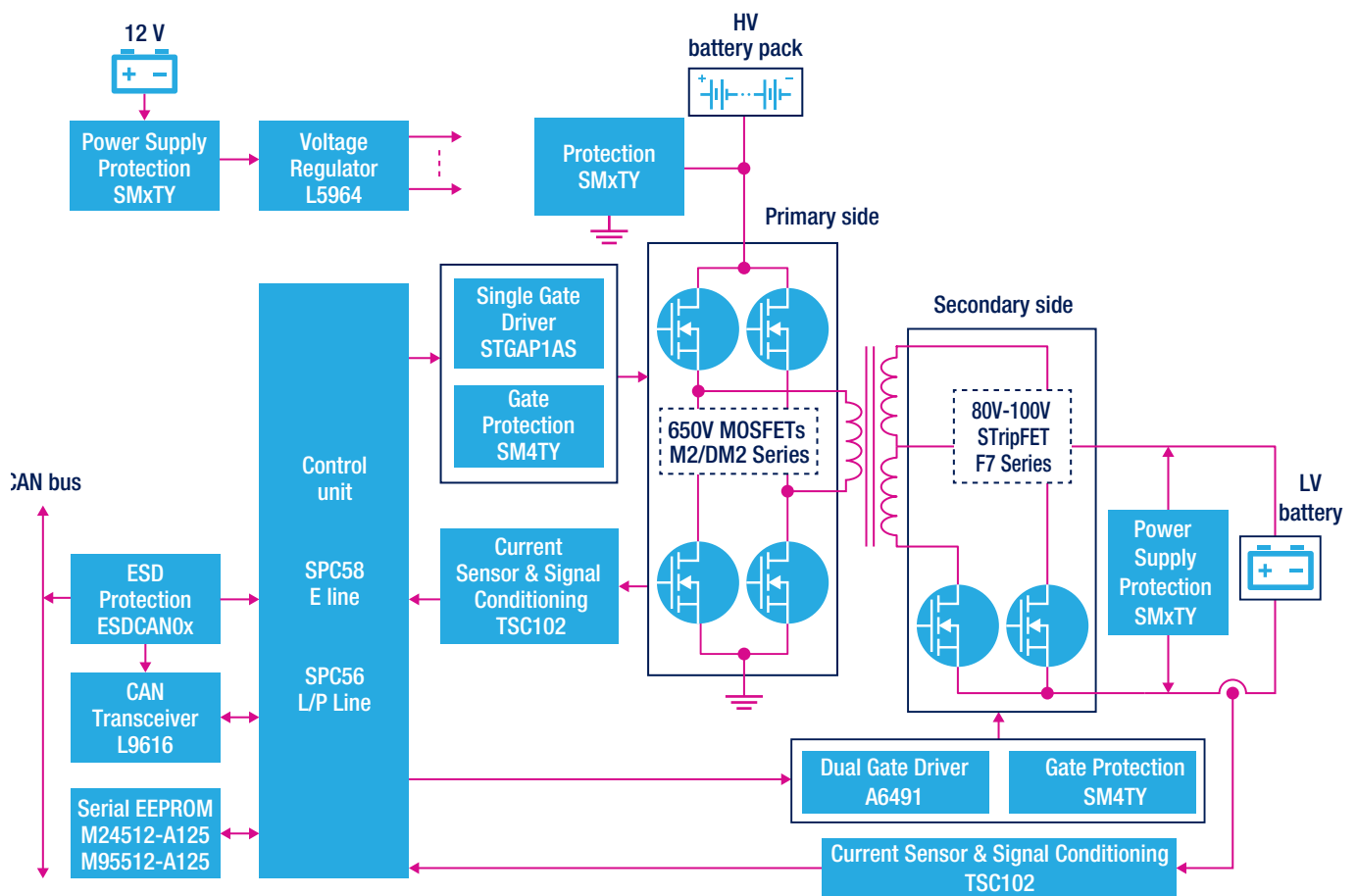


BIDIRECTIONAL DC/DC CONVERTER

Electric vehicles (EV) use two different power systems; a high-voltage battery (200 to 800 Vdc) for traction and a low-voltage (12/48V) one for supplying all the electric appliances in the vehicle. Traditionally, the low-voltage battery was charged from the alternator, but in today's vehicles it gets its power from the high-voltage battery pack. However, in specific electric car architectures, this low voltage battery should be ready to help recharge the high-voltage battery pack in order to provide energy for cranking the car. This means that the on-board DC-DC converter must be bi-directional and very efficient as well as highly reliable in order to run the complex control algorithms needed to ensure an energy-efficient solution.

ST has a wide offer of discrete semiconductors including AEC-Q101 qualified silicon and silicon-carbide (SiC) MOSFETs and diodes as well as IGBTs. These are complemented by AEC-Q100 qualified galvanically isolated IGBT and MOSFET gate drivers and SPC5 32-bit automotive microcontrollers to enable scalable, cost-effective and energy-efficient solutions for implementing these challenging converters.

Bidirectional DC/DC Converter



FIND OUT MORE

www.st.com/bidirectional-dc/dc-converter





Key Technologies

RESEARCH & DEVELOPMENT AND MANUFACTURING

To keep its technology edge, ST maintains a strong commitment to innovation, with approximately 7,400 people working in R&D and product design and spending about 16% of its revenue in R&D. Among the industry's global technology leaders, ST owns and continuously refreshes a substantial patent library (~17,000 patents; ~9,500 patent families and ~500 new patent filings per year).

The Company 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), Silicon Carbide, VIPower™, 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

Silicon Carbide

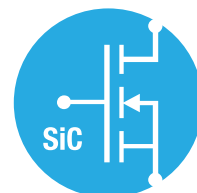
Silicon Carbide (SiC) is a wide bandgap material, with many advantages compared to silicon in the field of power electronics. Operating temperatures are higher, heat dissipation is improved and switching and conduction losses are lower making it an ideal technology for vehicle electrification. Silicon Carbide based traction inverters can increase electric vehicle range and SiC based chargers reduce the charge time.

ST produces the automotive-grade SiC power devices, in a dedicated 6" front-end wafer fab, that are becoming the key enabler in the automotive industry for vehicle electrification.

VIPower™

VIPower™ is a technology developed by ST and in production since 1991. Vertical Intelligent Power technologies provide 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- Mixed design.

VIPower™ technology will play a key role in the move towards electric vehicles. The smart 48 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 ECUs microcontroller.



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. For EV charging BCD is ideal for battery management systems.

1200V AEC-Q101 qualified technologies for EV charging

High voltage rectifier and thyristor technologies are the keys to develop robust, immune AC line connected systems exhibiting high power density. ST has developed a set of automotive grade technologies for full rectification functions in the low frequency (AC line) or high frequency ranges (DC-DC conversion). AEC Q101 qualified, this rectifier diode and thyristor series are available to design robust converters compatible most stringent electromagnetic norms such as burst or surge voltages.

TRANSIL™ :

TRANSIL™ is a key planar technology for Automotive TVS series designed to protect automotive sensitive circuits against surges as defined in ISO 7637-2 and ISO 16750 tests A and B also called load-dump (battery lines), ISO7637-3 (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.

STPOWER

Leading-edge power technologies for both high-and low-voltage applications combined with a full package range and innovative die bonding technologies exemplify ST's innovation in power transistors of the STPOWER™ family. ST offers a wide portfolio of power MOSFETs ranging from -100 to 1700 V, IGBTs with breakdown voltages ranging from 300 to 1250 V and power bipolar transistors ranging from 15 to 1700 V. Improved thermal design of ST's power electronics systems, and our silicon-carbide (SiC) MOSFETs ensure automotive robustness with the industry's highest temperature rating of 200 °C. Our extensive STPOWER™ product portfolio combined with state-of-the art packaging and protection solutions enable designers to create products with high reliability, efficiency and safety.



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