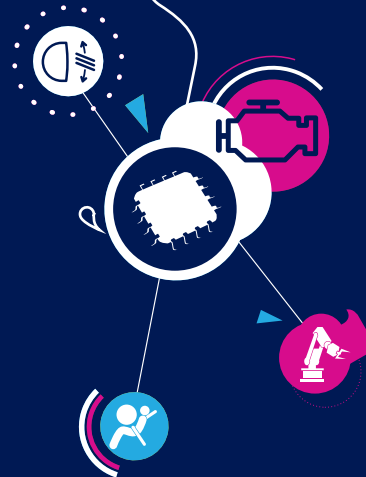


All you need... to drive SPC56 32-bit Power Architecture[®] MCUs





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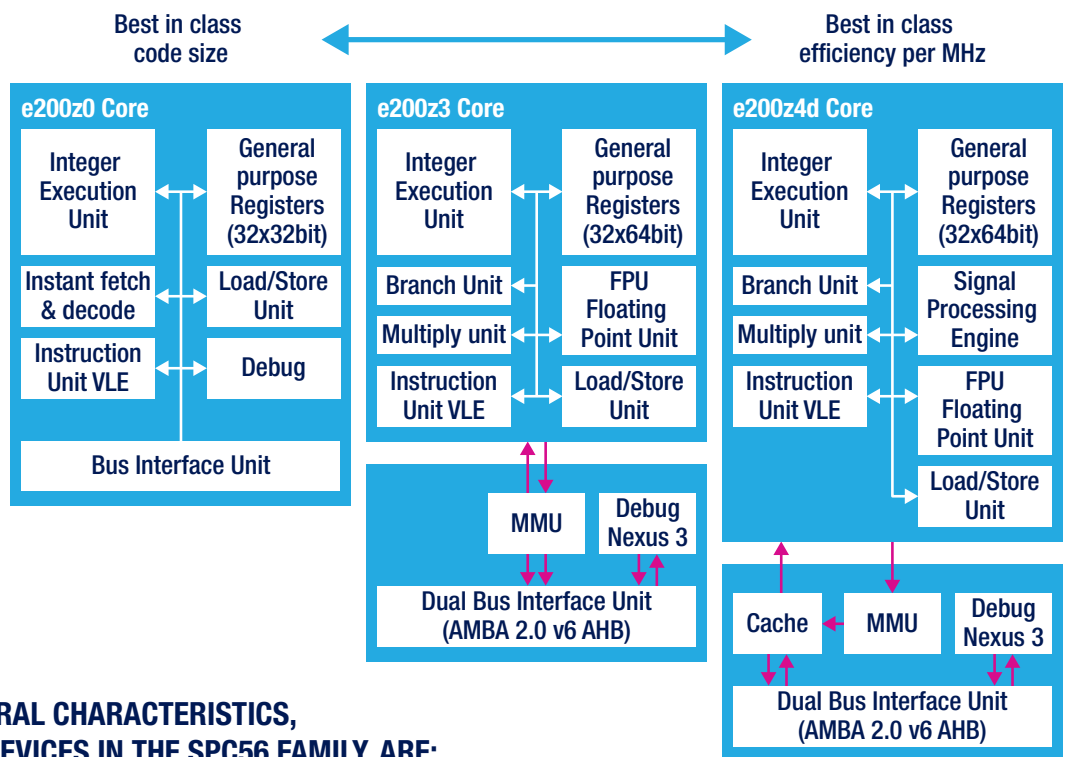




SPC56 Family architecture

The SPC56 family, of 32-bit MCUs, is based on the e200 series of Power Architecture® cores. Developed to satisfy the different requirements for automotive applications, it provides a variety of processing power and peripherals. For this reason, the SPC56 family ranges from code-efficient e200z0 single-core, to e200z4d dual-issue cores for applications requiring higher processing capabilities. However, since all devices share the same instruction set and the same main architectural features, porting an application from a device to another is a low effort activity. Beyond the MCU core, even though designed with automotive applications in mind, the SPC56 family can provide efficient solutions for almost all transportation and highly demanding industrial applications.

Core	e200z0	e200z3	e200z4d
Pipeline	4	4	5
Issue (instructions/cycle)	Single	Single	Dual
MMU	-	8 pages	16 pages
CPU cache	-	-	Instructions + Data
CPU MHz range	32 to 80 MHz	80 MHz	Up to 150 MHz



THE MAIN ARCHITECTURAL CHARACTERISTICS, COMMON TO ALL THE DEVICES IN THE SPC56 FAMILY, ARE:

- The crossbar switch with advanced microcontroller bus architecture enabling multi-master capability.
- The enhanced DMA controller.
- The interrupt controller with a unique 9-bit vector address for each interrupts source, and supporting up to 475 interrupts. It also supports 8 software-configurable interrupt sources with 16 different priorities, as well as pre-emptive prioritized interrupt requests to the microcontroller.
- The system integration unit that includes a centralized GPIO control, a pad configuration control and a system reset generation and monitoring system.
- The Boot-assist module, from power-on reset to the user code stored in Flash. This system offers a censorship protection for customer Flash memory sectors, as well as the detection of user boot code in Flash using a valid signature.

LINES KEY FEATURES



D-Line

Base element of the family that addresses automotive applications migrating from an 8-bit to 32-bit solution.

- Core z0h - 48 MHz
- Code 128 to 256 Kbytes Flash memory
- Data 64 Kbytes data Flash memory
- RAM 12 to 16 Kbytes SRAM
- Timer eMIOS, 16-bit counter timed I/O units
- Other PWM, 16-ch. eDMA
- Comm. Up to 2xSPI, 3xLIN, 1xCAN
- ADC 12-bit
- Package 64 - 100 pins



B-Line

Dedicated to the specific needs of body and convenience applications. It offers excellent interfacing and a solution for real-time car lights, generic load diagnostics and low-power standby mode with fast wake-up capability

- Core z0h - 64 MHz or z4d - 120 MHz
- Code 256 Kbytes to 3 Mbytes Flash memory
- Data 64 Kbytes data Flash memory
- RAM 24 to 192 Kbytes SRAM
- Timer eMIOS, 16-bit counter timed I/O units
- Other PWM, 32-ch. eDMA, CSE
- Other MPU, DMA
- Comm. Up to 8xSPI, 10xLIN, 6xCAN, I2C, FlexRay, Ethernet
- ADC 10-bit or dual 10/12-bit
- Package 64 - 208 pins



C-Line

Dedicated to the specific needs of gateway applications that require connections to multiple in-vehicle networks supporting various protocols

- Core z0h - 64 MHz or dual-core z0h+z4d up to 120 MHz
- Code 256 Kbytes to 3 Mbytes Flash memory
- Data 64 Kbytes data Flash memory
- RAM 32 to 256 Kbytes SRAM
- Timer eMIOS, 16-bit counter timed I/O units
- Other MPU, PWM, 32-ch. eDMA, CSE
- Comm. Up to 8xSPI, 12xLIN, 6xCAN, I2C, FlexRay, Ethernet
- ADC 10-bit or dual 10/12-bit
- Package 100 - 256 pins

KEY BENEFITS

Efficient and safe processing of application data

- High-performance, 32-bit Power Architecture® cores: SPC56 P-Line e200z0h with VLE for best code efficiency SPC56 L-Line, e200z4d dual issue, cache memory, DSP and vector floating point.
- The SPC56 P-line offers low-cost functional safety addressing ASIL-B requirements and variants providing optimized peripherals for electric motor control & airbag systems.
- The SPC56 L-line is an enhanced solution with increased safety implementations such as dual-core architecture working both in Lock Step and Decoupled Parallel modes addressing ISO 26262 requirements. Its safety concept, based on hardware implementation, offers a certified ASIL-D turnkey solution easily extensible to SIL3 compliance.

Improved time to market

- Compatibility across families through modular peripheral sets
- AUTOSAR compliant, maximizing software and tools reuse
- Memory/pin-out/performance scalability
- SPC56EL proven safety integrity

Reduced system cost

- SPC56 L functional safety turnkey SIL3/ASIL-D solution based on HW measures – no need for external MCU
- Field-oriented three-phase control for best efficiency and EMI performance
- Sensor-less implementation supported with dedicated library and 32-bit processing performance

Focus on quality

- Zero defects strategy from design to production
- Internal manufacturing for supply assurance
- Latest 90 nm automotive-focused technology

LINES KEY FEATURES



P-Line

Flexible cost-competitive solution to cover a wide range of motor-control and safety-oriented applications. Key functions including an advanced timer with programmable cross triggering unit for easy development of real-time, sensor-less field-oriented control solutions and airbag applications

- Core z0h - 64 MHz or z0h+z0h - 64 MHz dual-core
- Code 192 Kbytes to 1 Mbytes Flash
- Data 64 Kbytes data Flash
- RAM 12 to 80 Kbytes SRAM
- Comm. Up to 5xSPI, 2xLIN, 3xCAN, FlexRay
- ADC dual 10-bit
- Package 64 - 144 pins



L-Line

Designed to cover a wide range of automotive applications that must meet ISO 26262 standards, up to the most stringent ASIL-D level with a single MCU. Key safety features include lock-step mode, crossbar, eDMA, MPU, temperature sensors, centralized fault collection and control unit, built-in logic and memory self-test, CRC unit, ECC protected memories, voltages and clock-failure detection

- Core z4h - 120 MHz or z4d+z4h - 120 MHz dual-core
- Code 768 Kbytes to 2 Mbytes Flash memory
- Data 64 Kbytes data Flash memory
- RAM 96 to 192 Kbytes SRAM
- Other Lock Step and Decoupled Parallel modes
- Comm. Up to 3xSPI, 2xLIN, 3xCAN, FlexRay
- ADC dual 12-bit
- Package 100 - 144 pins

LINES KEY FEATURES



M-Line

Entry level for engine propulsion control and automotive transmission control applications. High performance time processing unit (eTPU) with DSP capability.

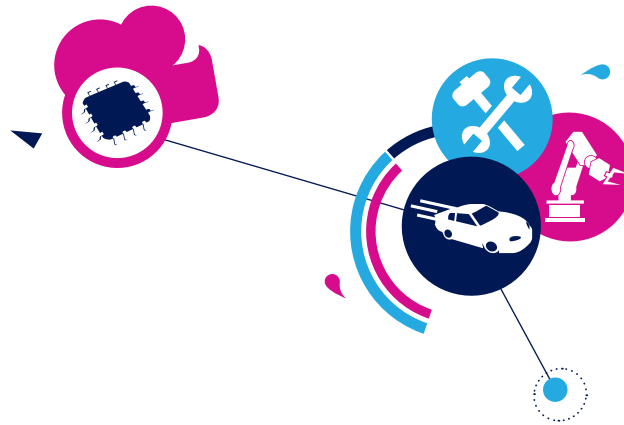
- Core z3 - 80 MHz
- Code 1 to 1.5 Mbytes Flash memory
- RAM 64 to 94 Kbytes SRAM
- Comm. Up to 2xSPI, 2xLIN, 2xCAN
- ADC dual 12-bit
- Package 144 - 176 pins



A-Line

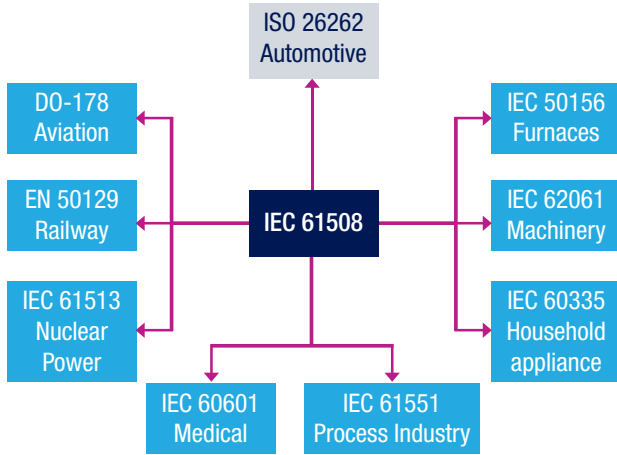
Dedicated to specific needs of propulsion control and transmission control applications. High performance time processing unit (eTPU) with DSP capability

- Core z4d - 150 MHz
- Code 2 to 4 Mbytes Flash memory
- RAM 128 to 192 Kbytes SRAM
- Other Lock Step and Decoupled Parallel modes
- Comm. Up to 3xSPI, 3xLIN, 3xCAN, FlexRay
- ADC dual 12-bit
- Package 176 - 324 pins





SPC56 Functional safety



The choice of products and solutions for real-time critical systems, both in automotive and industrial applications, cannot escape from the growing request of functional safety and a facilitated achievement of the desired safety integrity level.

The IEC 61508 standard (or its specific application field adaptation including the automotive standard ISO 26262), defines functional safety for any equipment applicable throughout the lifecycle of all electronic and electrical safety-related systems.

It is a risk-based safety standard requiring a quantitative risk assessment (taking into account the severity of potential injury and the probability of its occurrence) and a consequent risk reduction through the definition of appropriate safety functions (avoiding, controlling or mitigating the risk effects).

The safety functions are usually implemented through a single system or with a set of subsystems when there are critical parts whose failing would cause a failure of the safety function. The level of risk-reduction, provided or required by a safety function, is specific to the standard and is mainly characterized by the Probability of Dangerous Failure per Hour (PFHD). The Safety Integrity Level (SIL), used for industrial applications, ranges from 1 to 4, while the Automotive Safety Integrity Level (ASIL), used for automotive applications, ranges from A to D. The table shows a general correspondence between the two standards.

SIL	ASIL	PFH ₀
4	-	<10 ⁻⁸
3	D	³ 10 ⁻⁹ ...<10 ⁻⁷
2	B/C	³ 10 ⁻⁷ ...<10 ⁻⁶
1	A	³ 10 ⁻⁶ ...<10 ⁻⁵

SAFETY COMPLIANCE AND COST SAVINGS WITH THE RIGHT IC SELECTION

Requiring safety integrity level compliance for ICs in isolation, in addition to the safety integrity level for the module or system, might lead to the design of extra diagnosis features which will increase cost, without improving safety.

For this reason, all ICs selected for a specific safety function implementation requires safety integrity level compliance only when it is a subsystem of the safety function and in this case it requires the same safety integrity level of the safety function. In the other case, it just requires the availability of the Mean Time Between Failures and the Safe Failure Fraction (SFF), for the calculation of the safety integrity level of the system or subsystem in which is used.

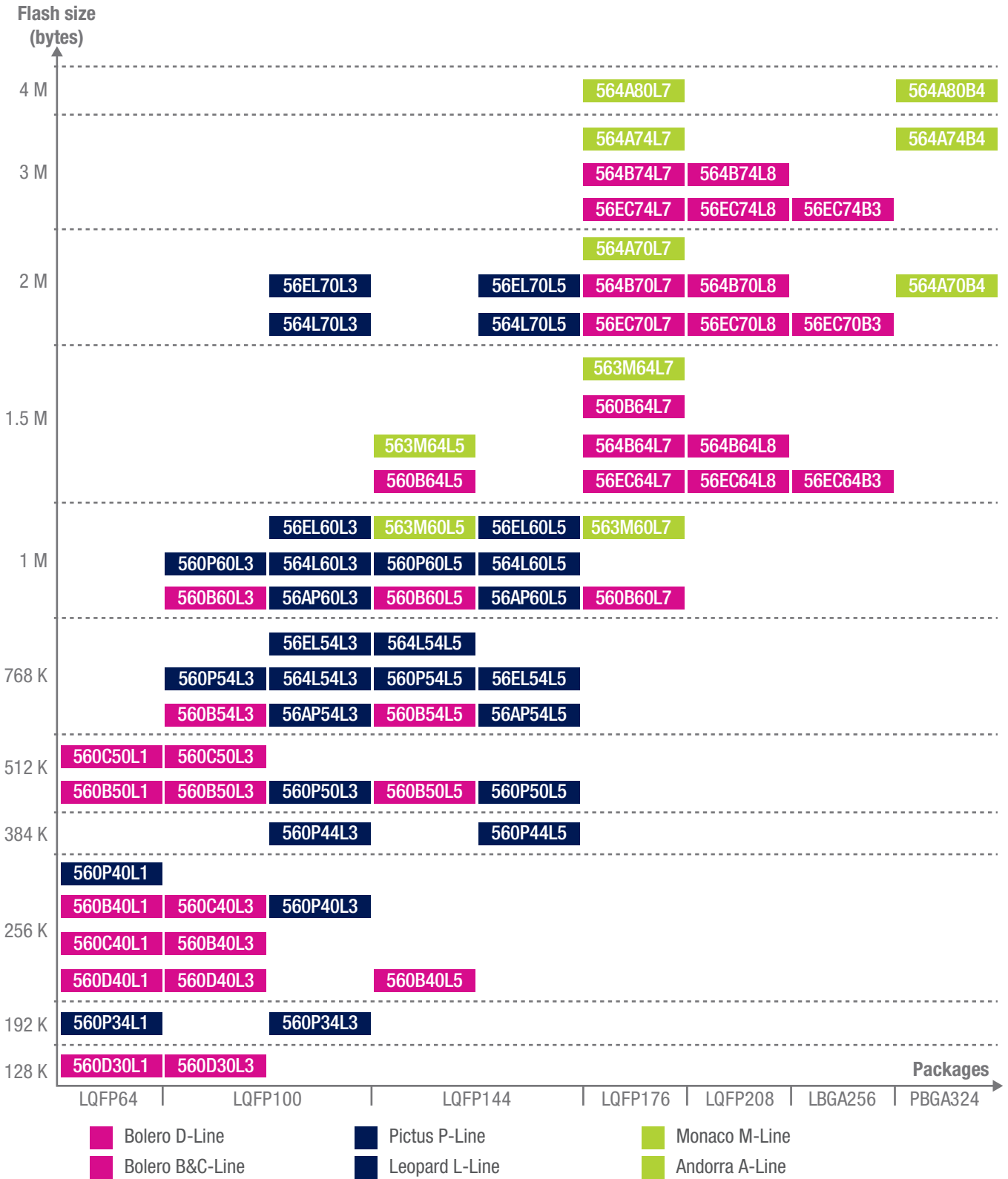
ST help customers make the right choice through the different scenarios and provide the best solution when a either safety-certified or safety-ready device is required and in both cases supply all the required safety documents (for example certification, FMEDA, etc.).

The SPC56 family provide the right device to simplify the implementation of customer applications with the desired functional safety level compliance, even for the demanding ASIL D or SIL 3 levels.

For example, if two MCUs are required for fail-safe operation, with one monitoring the other, today, a single SPC5 dual-core MCU, such as the SPC56 L-line, offers the possibility to run the two cores simultaneously in fail-safe mode. This means a single MCU can offer dual-core lock-step operation, with one core operating as the redundant fail-safe for the other. This type of device permits applications to attain ASIL-D / SIL3 compliancy with a single MCU, offering substantial system development and certification cost savings.



SPC56 Leading portfolio



DEVELOPMENT TOOLS AND PROVIDERS

Evaluation boards	 <i>life.augmented</i>
RTOS, middleware, libraries (also Autosar compliant)	    <i>life.augmented</i>
Compiler tools/ IDE	   
Debugging and emulation tools	    
Training consulting	 <i>life.augmented</i>  
Calibration tools	 

HARDWARE TOOLS

SPC5-UDESTK

The SPC5-UDESTK is a low-cost USB/JTAG interface for debugging and programming SPC56 MCUs. It is developed by PLS for the ST tool-chain. The Universal Design Engine (UDE) Starter Kit offers a collection of tools including source file management, project building and a powerful HLL debugger with high-speed communication paths to the customer's hardware target system with target monitor:

- Supports both the SPC5-UDESTK stand-alone version and the equivalent version embedded in the Discovery board.
- Supports SPC56 MCUs
- Supports multicore, eTPU and GTM debugging

• Provides Flash programming of the on-chip Flash memory featuring Erase / Program / Verify

There are two software licenses and three kit versions available including the SPC5-UDESTK USB/JTAG adapter and the UDE software license.

- SPC5-UDEDEBG is a perpetual, full-feature, unlimited code-size UDE Starter Kit license
- SPC5-UDEDEBG-TL is a time-limited (1 year), full-feature, unlimited code-size UDE Starter Kit license
- SPC5-UDESTK-EVAL includes a perpetual, full-feature, limited code-size (256 Kbytes) license
- SPC5-UDESTK-FULL includes a one-year, full-feature, unlimited code-size license.
- SPC5-UDESTK-PLUS includes a perpetual, full-feature, unlimited code-size license

SPC5-UDESTK can be ordered directly from ST or authorized distributors.

Other third party debugger solutions are available from: Lauterbach, PLS Development Tools, iSystem, Keolabs/Raisonance, P&E Microcomputer Systems.



PREMIUM EVALUATION BOARD

The Premium evaluation kit is a full evaluation platform supporting the SPC56 family of microcontrollers. The complete system consists of a motherboard and a mini-module which plugs into the motherboard. Different mini-modules are available for evaluating powertrain, body, chassis and safety applications with different target devices of the family. The evaluation system allows full access to the CPU, all of the CPU's I/O signals and motherboard's peripherals such as CAN, SCI, LIN, Flex-Ray and Ethernet.



Note: Discovery Kits and Premium Evaluation Boards are supported by specific SPC5Studio Components to immediately start customizing your project.

SPC5-CONNECT

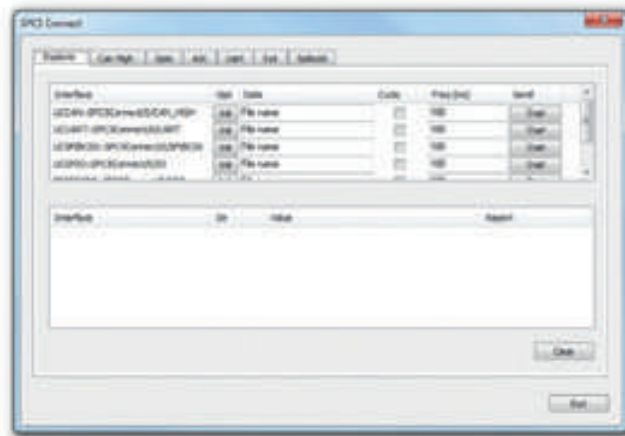
SPC5 Connect is a programmable USB interface designed to connect a PC to development hardware or integrated modules via automotive communication channels such as CAN, SCI, LIN and K-Line.

Based on the 32-bit SPC563M64 microcontroller, the SPC5 Connect offers full access to integrated microcontroller features such as I/O signals, analog channels, external interrupts input and automotive communication buses such as CAN, UART, K-Line, LIN and SPI.

The hardware features, also accessible through the Script Engine firmware, makes the SPC5 Connect a powerful, low-cost and easy-to-use tool for rapid development of small scripts in lab applications. The included extension flat cable with a 14-pin header connector and DB9 connector makes it possible to easily connect a daughter board or wrapping board for a specific application.

SPC5 Connect is supported by a specific set of software tools which allows easy programming of the device as well as basic control and monitoring features of target signals.

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EMULATION BOARDS

Thanks to the cooperation with premium third-party suppliers, ST offers calibration and emulation solutions for the entire range of powertrain, chassis and body applications. Available solutions go from compact calibration hardware modules with integrated debug and memory modules to the standardized VertiCal solutions. The offer is integrated with software and hardware interfaces from ATI, dSPACE, ETAS and Vector Informatik.

SPC5- FLASHER

SPC5-Flasher is a tool for serial programming microcontrollers of the SPC56 family. It is developed to manage the Flash (erasing, programming, verification, reading and checksum functions) on different targets via SCI, CAN, K-line and JTAG in the same tool. The application GUI is a Windows user friendly interface that allows the user to connect the tool with the target using a USB dongle and to perform the tool's functionalities.

The application board should have at least one of the interfaces available.

SOFTWARE LIBRARIES

Available for download at no charge from ST website

- Flash drivers
They include highly portable Flash drivers for run-time and off-line device programming
- Communication protocols
Main automotive protocols are supported directly by ST or in collaboration with Vector Informatik GmbH. In particular ST offers solutions for LIN and MSC (Micro-second-bus) protocols while Vector supports CAN, LIN and J1939 protocols for all SPC56 product lines.
- Cryptography Software Library
The cryptography library can run on the whole SPC56 microcontroller family. It provides software algorithms and examples for symmetric and asymmetric encryption/decryption, message authentication and random number Generation. The SPC564B/EC versions include a cryptographic engine, for which ST offers, for easy integration and use, a CSE hardware function abstraction view and software library extensions for extending hardware capabilities. It is delivered as SPC5Studio plug-in.
- RTOS/Kernel
RTOS is the root component to share time between several tasks on a single core. It ensures task switching within a known and limited duration. Several solutions for the SPC56 are available, both open-source and commercial versions are available, including ChibiOS, Intecs, ETAS, Vector and Green Hills products.

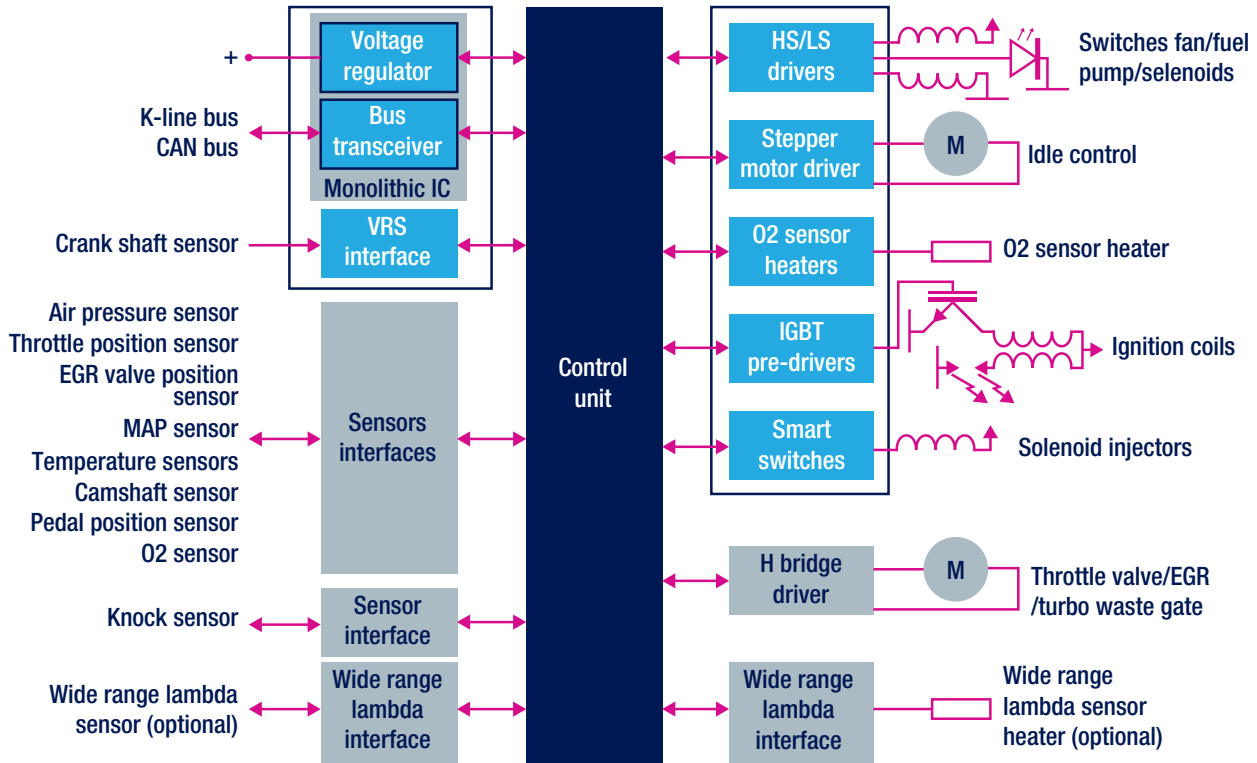
Available under license (contact ST sales office for more details)

- Safety-oriented libraries
- ST offers solutions to increase the system functional safety level and integrity of the microcontroller:
 - Core Self-Test: Fault graded Core Self-Test library for SPC56 featuring e200z0h or e200z4d cores
 - Instruction Self-Test: Instruction Self-Test library to validate the correct execution of all instruction (VLE, BookE, SPE) ensuring the full functionality of e200z0h or e200z4d cores in SPC56 products.
- Software components for AUTOSAR enabled systems
The Automotive Open System Architecture (AUTOSAR) is a worldwide development partnership of car manufacturers, suppliers and other companies from the electronics, semiconductor and software industries to facilitate the exchange and update of software and hardware over the service life of the vehicle. STMicroelectronics is an AUTOSAR Premium Partner, and committed to support the development of standardized software infrastructures for automotive applications.
ST's MCAL Suite, based on proprietary HAL drivers, is an optimized and comprehensive set of AUTOSAR-compliant drivers featuring top performance with the smallest memory footprints. The suite is developed and validated in accordance with CMMI and AUTOSPICE level 3 framework to guarantee high quality standards and is complemented by Complex Device Drivers and libraries, to support SPC56 standard / non-standard microcontroller peripherals.
The MCAL Suite and full AUTOSAR solutions are available with multiple licensing options (evaluation, development and production licenses/project, product and company licenses) to fulfill challenging technical and cost targets.

Note: Contact your ST sales office for more details on ST's software offer. Other information including a detailed availability matrix are available on www.st.com.



Gasoline Port injection



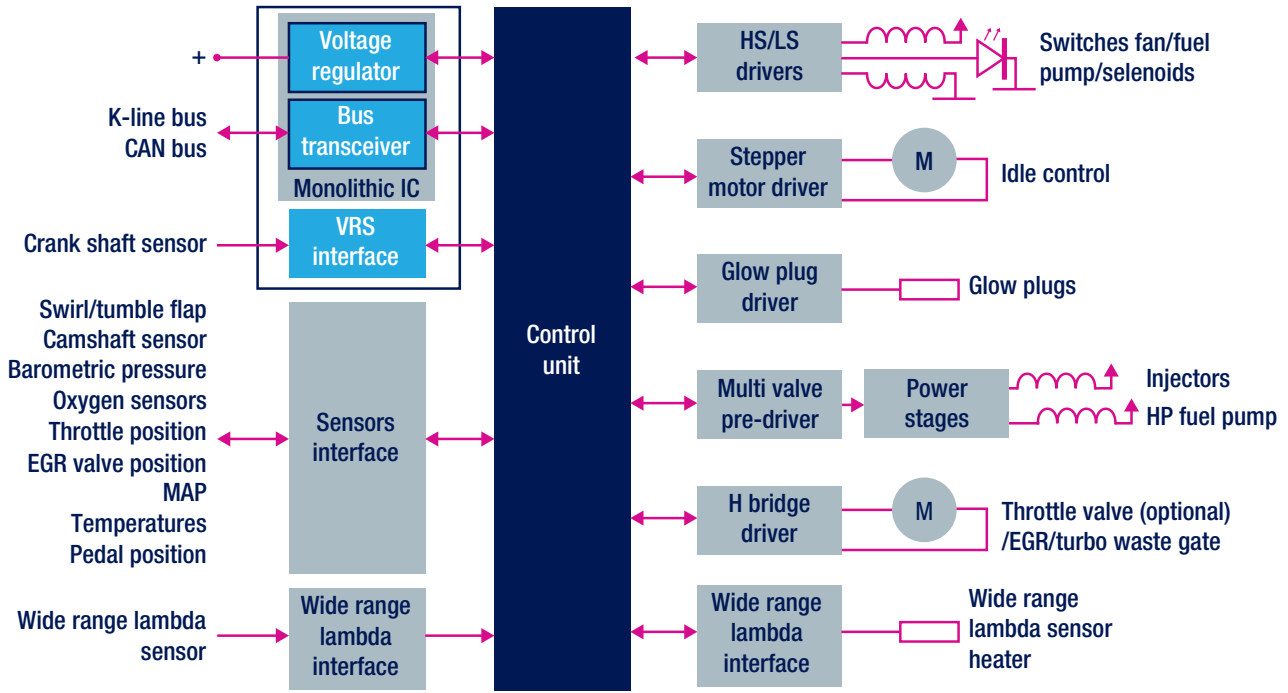
Governmental regulations and energy concerns are driving the automotive industry to develop very high performing gasoline-engine control systems. These improvements enhance electronic throttle control, gasoline direct injection and variable valve timing applications, just to mention a few. ST offers a strong portfolio of advanced technologies (BCD for combining precision analog, power, digital and non-volatile memory functions; embedded Flash 32-bit microcontrollers for real-time control), coupled with an extensive standard product offering to meet market demands.

SUGGESTED PRODUCTS

- **SPC56 M-Line, SPC56 A-Line:** 32-bit SP56 MCU family
- **L9758:** Multi-voltage regulator
- **L9615, L9616:** Can bus transceiver
- **L9637:** ISO9141 transceiver
- **L9733:** Octal configurable low-/high-side driver
- **L9826:** Octal low-side driver
- **L9942, L9935:** Stepper motor driver for bipolar motors
- **VBG08H:** Single-channel driver, with IGBT power stage internally assembled using Chip –On-Chip (COC) hybrid technology
- **L9651:** Smart quad switch (Injectors)
- **L9959, L9960:** H-bridge motor control
- **L9779:** It provides all basic function for standard engine management control units (voltage regulator, switches, pre-drivers, drivers)



Diesel Direct injection



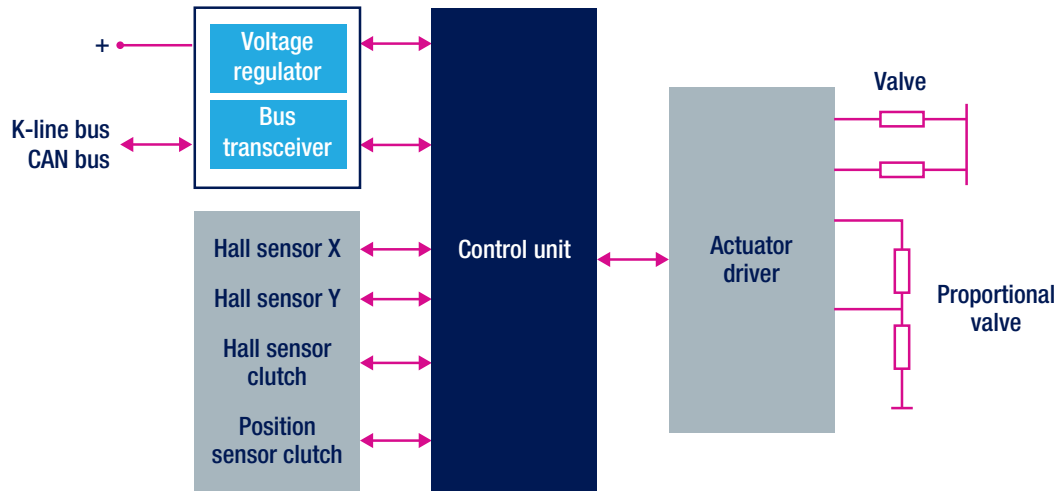
Governmental regulations and energy concerns are driving the automotive industry to develop very high performing diesel-engine control systems. These improvements enhance electronic throttle control, high voltage injectors and glow plugs applications, just to mention a few. ST offers a strong portfolio of advanced technologies (BCD for combining precision analog, power, digital and non-volatile memory functions; embedded Flash 32-bit microcontrollers for real-time control), coupled with an extensive standard product offering to meet market demands. An example of this enhanced EMS is shown in the block diagram above.

SUGGESTED PRODUCTS

- **SPC56 M-Line, SPC56 A-Line:** 32-bit SP56 MCU family
- **L9758:** Multi-voltage regulator
- **L9615, L9616:** Can bus transceiver
- **L9637:** ISO9141 transceiver
- **L9780:** Wide range air fuel lambda sensor control interface.
- **L9733:** Octal configurable low-/high-side driver
- **L9826:** Octal low-side driver
- **L9524:** Glow plug system control IC
- **L9781:** Multi-valve pre-driver capable of driving 11 external N-channel logic level MOSFETs, controlling up to 5 inductive loads through peak and hold (DI injectors)
- **L9959, L9960:** H-bridge motor control
- **L9942, L9935:** Stepper motor driver for bipolar motors



Automated Manual transmission



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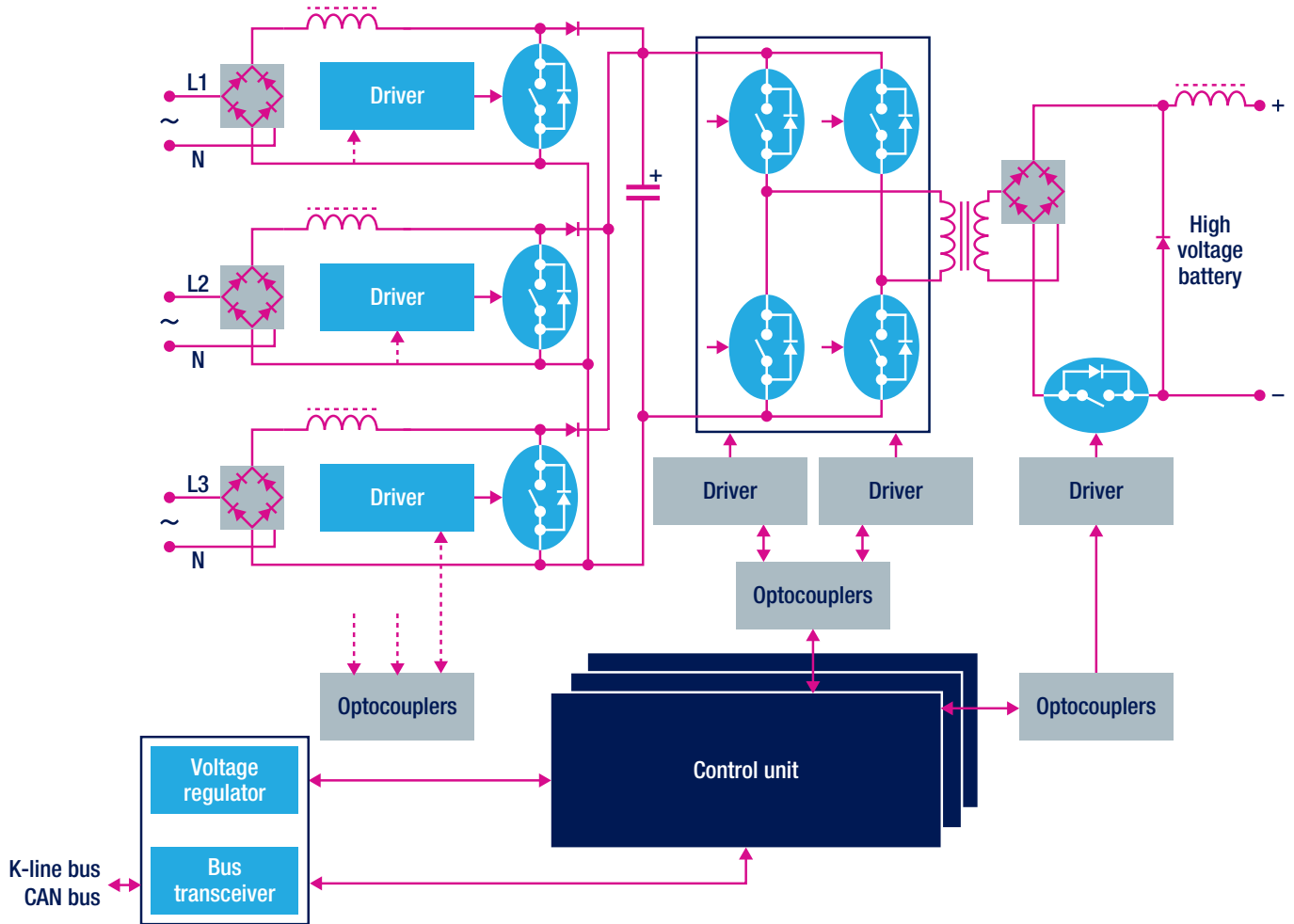
The Automated Manual Transmission (AMT) electronic system is an advanced control system for gear shifting. This electronically-actuated and synchronized clutch and gear-box improves the driving experience, especially in city traffic, thanks to its capacity to complete the clutch and gear-shift operations much more quickly and precisely than a human driver.

SUGGESTED PRODUCTS

- **SPC56 M-Line, SPC56 A-Line:** 32-bit SP56 MCU family
- **L9758, L9396:** Multi-voltage regulator
- **L9615, L9616:** Can bus transceiver
- **L9637:** ISO9141 transceiver



Battery Charger system



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Recharging the battery from the mains supply is mandatory for electric vehicles and optional for hybrid electric vehicles. Mains converters are thus devices that are going to become much more common. The one shown above is a conversion system from a standard mono-phase and industrial three-phase mains supply to the DC high-voltage of the battery pack.

SUGGESTED PRODUCTS

- **SPC56 M-Line, SPC56 A-Line, SPC56 L-Line, SPC56 P-Line:** 32-bit SP56 MCU family
- **L99PM:** Power management IC with LIN and high speed CAN
- **A6986:** Switching regulator
- **L4925, L4995:** Linear voltage regulator
- **L9615, L9616:** Can bus transceiver
- **L9637:** ISO9141 transceiver
- **L6384:** Half H-bridge driver, high-voltage (V400)
- **A6387:** 600V high- and low-side driver for Power MOSFETs and IGBTs
- **STGAP1S:** 4kV galvanically isolated single-gate driver for Power MOSFETs and IGBTs with advanced protection



SPC56 Chassis and safety applications



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Today cars are more and more equipped to minimize the occurrence and consequences of accidents improving driving experience and safety. Active and passive safety systems as well as suspension control to optimize the comfort/road-holding compromise have led to a dramatic increase of electronics sophistication, compliant with the highest safety standard (ISO 26262).

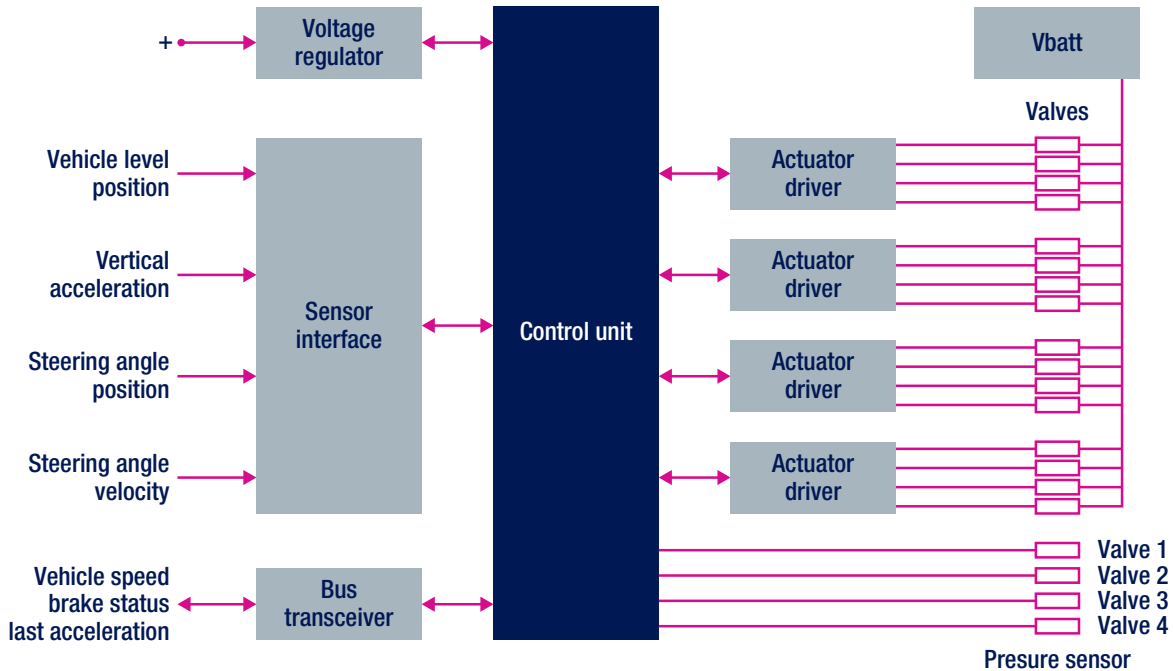
STMicroelectronics has developed dedicated devices to facilitate the design of such systems and the achievement of the required functional safety level certification (Automotive Safety Integrity Level from ASIL-A to ASIL-D).

SPC56 DEDICATED LINES

STMicroelectronics SPC56 P-Line and SPC56 L-Line are dedicated to the specific needs of chassis and safety applications, with a specific focus on functional safety and advanced three-phase motor control. The unique modularity and scalability of the architecture provides compatible devices covering the wide range of chassis and safety applications with optimum cost, safety and performance trade-offs.



Active Suspension



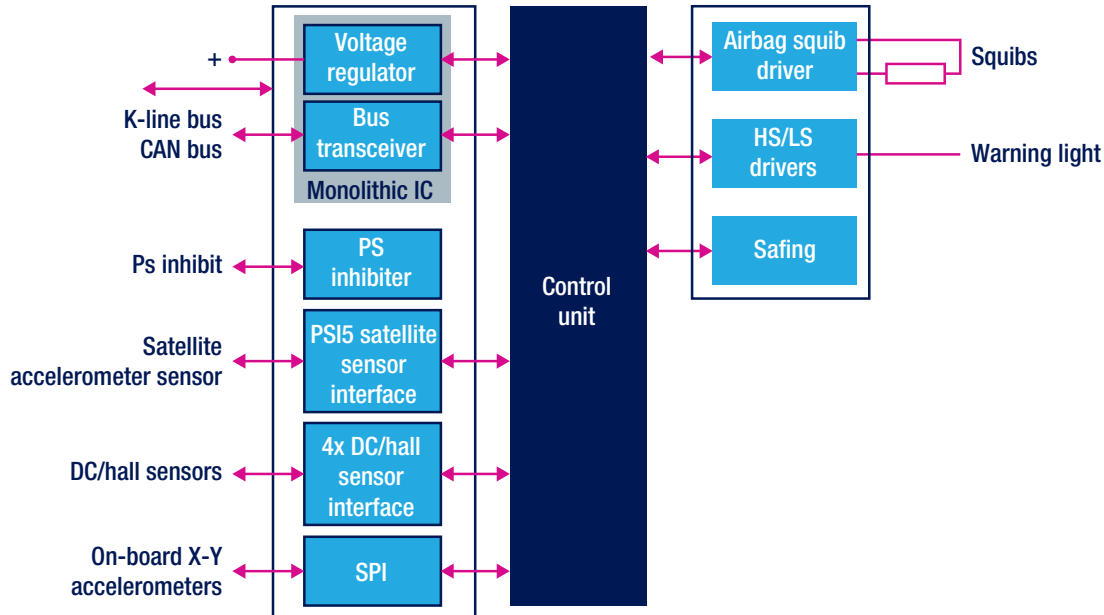
Active suspension is a high-end vehicle electronics solutions and ST is ready to meet the needs of this demanding application by providing everything from high-end embedded microcontrollers to sophisticated valve drivers for precision control and fast response time. Providing solutions from the embedded microcontroller to the power switches, from voltage regulation to the serial communications physical layer, ST has the answer for your active suspension needs.

SUGGESTED PRODUCTS

- **SPC56 L-Line, SPC56 P-Line:** 32-bit SP56 MCU family
- **L99PM:** Power management IC with LIN and high speed CAN
- **A6986, L9758:** Switching regulator
- **L9663:** The peripheral sensor interface (PSI5)
- **L4925, L4995:** Linear voltage regulator
- **L9615, L9616:** Can bus transceiver
- **L9332:** Quad intelligent power low-side switch
- **L9301:** SPI-controlled octal channel with 4 high-/low- and 4 low-side driver with the possibility to use four integrated power MOS as recirculation diodes for PWM load driving



Airbag Systems



Airbag systems increase passenger safety in all vehicles from small city cars to luxury SUVs. To serve these different market segments, the automotive industry is focusing in three main areas:

- Cost effectiveness (low-end vehicles)
- System complexity (advanced features and increasing number of squibs and satellites)
- High reliability standards

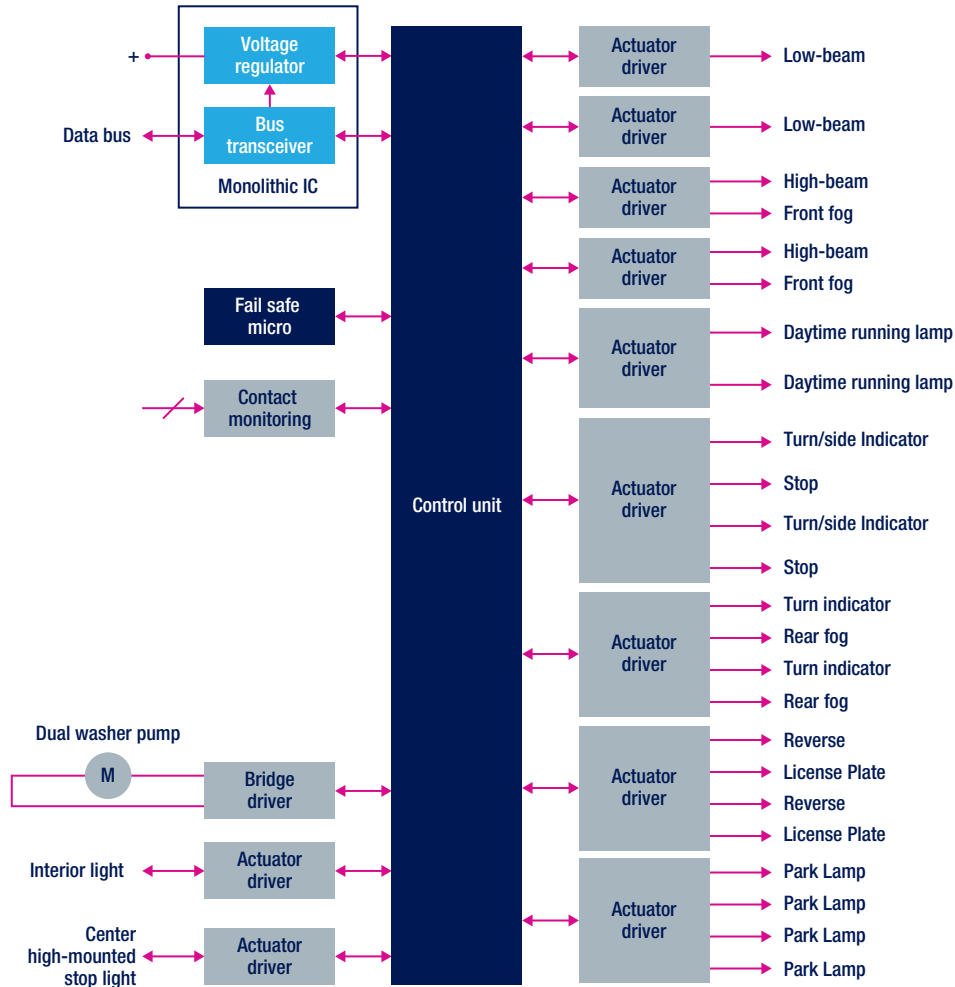
ST is the ideal partner to achieve these goals through proprietary silicon technologies (BCD – Bipolar, CMOS, and DMOS) and a wide range of products covering full custom ICs and very flexible open-market solutions. The block diagram above illustrates the application system based on ST products, starting from the sensor interface, power supply, and microcontroller up to squib drivers.

SUGGESTED PRODUCTS

- **SPC56 L-Line, SPC56 P-Line:** 32-bit SP56 MCU family
- **L9758:** Multi-voltage regulator
- **L9615, L9616:** Can bus transceiver
- **L9680, L9678, L9679, L4999:** System basis IC for Airbag
- **L9643:** SPI-bridge for multi SPI masters
- **AIS1200PS:** Peripheral acceleration sensor with a single-axis sensing element with PSI5 point-to-point interface
- **L9663:** PSI5 transceiver



Body Control module



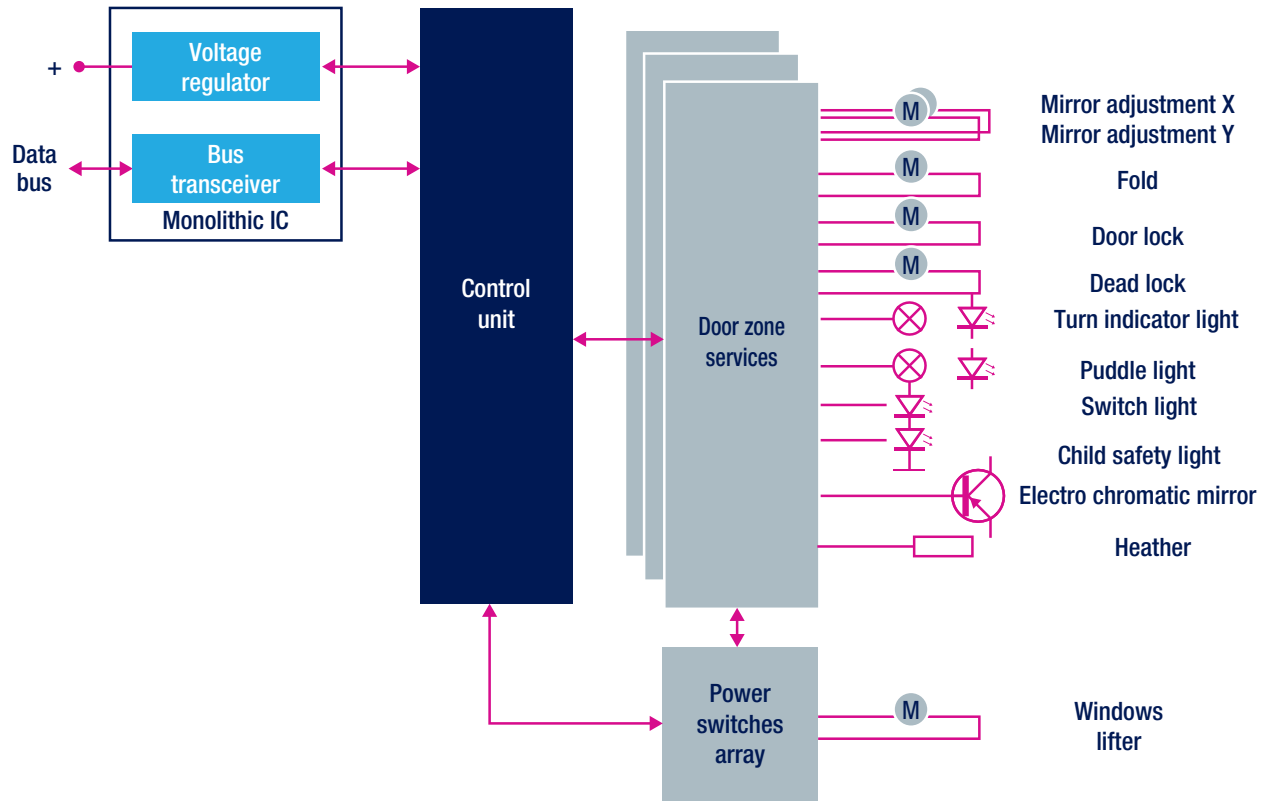
Today's body control modules require high reliability electronic components to ensure safe and proper operation under all conditions. Most modern systems drive a large variety of loads: from lamps (incandescent, HID, Xenon) with advanced diagnostics (bulb outage detection, overload, etc.) and drive features (PWM, DC) to motors substituting existing electromechanical relays. From bridge, high-/low-side drivers and advanced regulators to low-cost, high-performance microcontrollers, coupled with an extensive standard product offering, ST has a broad range of solutions to choose from regardless of where the unit is mounted in the vehicle (cabin, rear, underhood). An example of ST products that are applicable to junction box systems are shown in the block diagram above.

SUGGESTED PRODUCTS

- **SPC56 B-Line, SPC56 C-Line , SPC56 D-Line:** 32-bit SP56 MCU family
- **L99PM:** Power management IC with LIN and high-speed CAN
- **A6986:** Switching regulator
- **L4925, L4995:** Linear voltage regulator
- **L9615, L9616:** Can bus transceiver
- **MO-5, MO-6, MO-7 family:** Single-, double- and quad-channel high-side switches



Door Zone system



The actuator drivers designed by ST for automotive door zone applications are characterized by a scalable actuator driving concept, compatible with package and software, to satisfy the multiplicity of door electronics systems. The drivers support all regular door zone loads such as door lock motors, mirror folder and leveling, defroster, and several lighting functions using LEDs.

SUGGESTED PRODUCTS

- **SPC56 B-Line, SPC56 C-Line , SPC56 D-Line:** 32-bit SP56 MCU family
- **L99PM:** Power management IC with LIN and high-speed CAN
- **A6986:** Switching regulator
- **L4925, L4995:** Linear voltage regulator
- **L9615, L9616:** Can bus transceiver
- **VNH50:** H-bridge DC motor control
- **L99DZ:** Door actuator driver



SPC56 Transportation



HIGH-PERFORMANCE, ENVIRONMENT-FRIENDLY SOLUTIONS

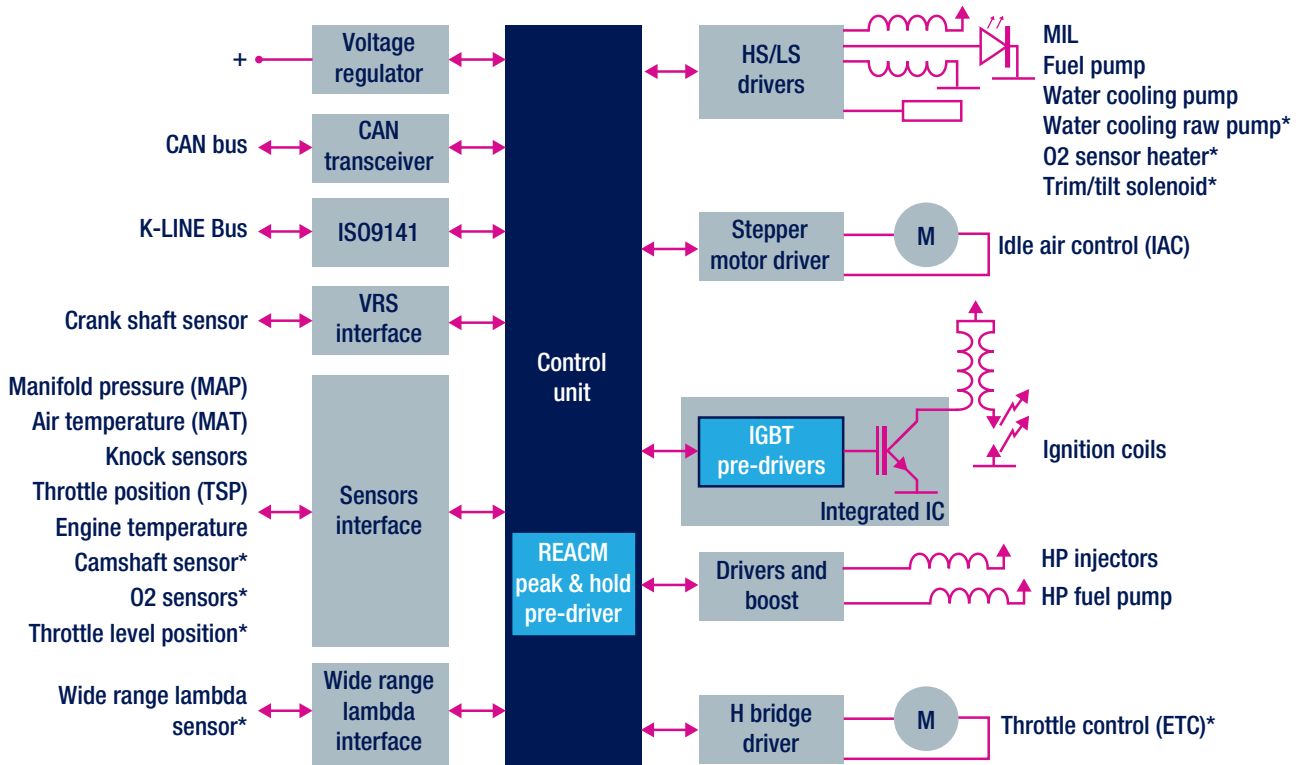
STMicroelectronics supports all kinds of transportation with sustainability in mind, constantly finding ways to reduce emission and fuel consumption, using cutting-edge electronics technologies to meet the most demanding requirements in terms of performance, safety and security.

Whether for leisure, commercial or industrial transportation, the ST's wide SPC56 MCU portfolio, including single- and dual-core architectures, with rich connectivity, will provide the most appropriate solution for any control or communication system.





Marine Engine management system



* If used

42

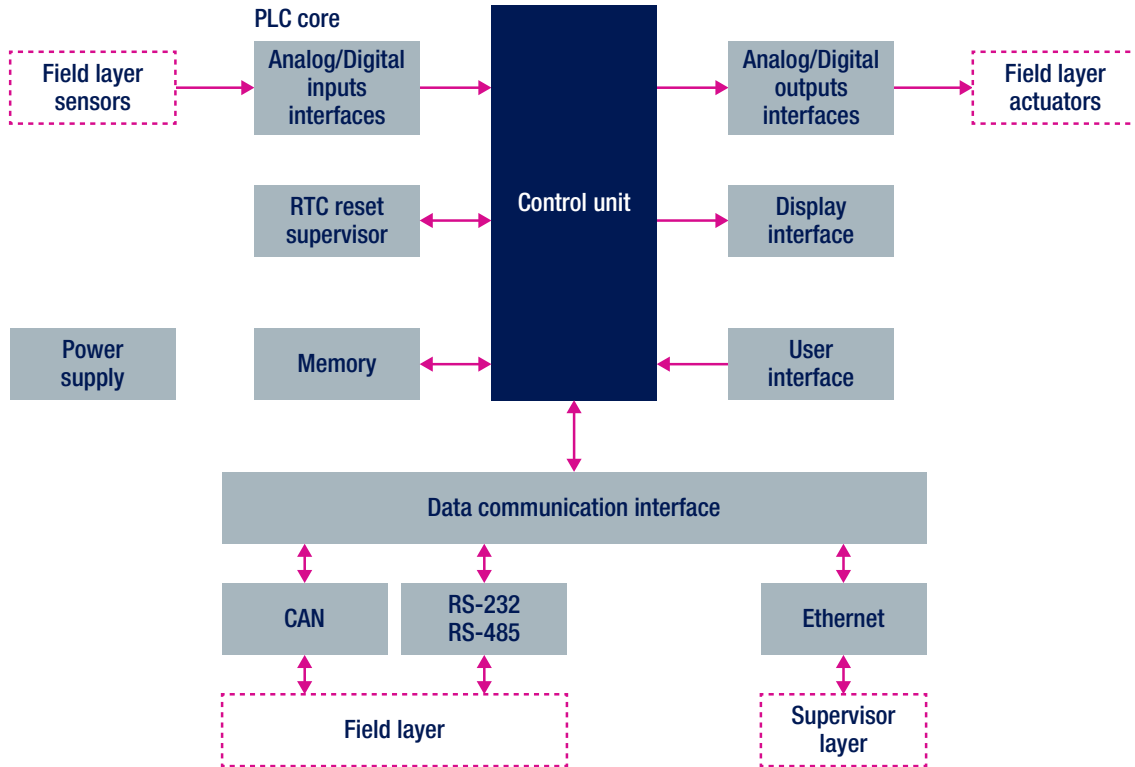
The emissions reduction required by the new legislation, enacted by the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) as well as EU Recreational Craft Directive, it has imposed a technologies change on marine engines. The electronic injection has been the key for more clean and efficient engines (especially for the two-stroke engines).

SUGGESTED PRODUCTS

- **SPC56 A-Line:** 32-bit SP56 MCU family
- **L9758:** Multi-voltage regulator
- **L9615, L9616:** Can bus transceiver
- **L9637:** ISO9141 transceiver
- **L9733:** Octal configurable low-/high-side driver
- **L9826:** Octal low-side driver
- **L9942, L9935:** Stepper motor driver for bipolar motors
- **VBG08H, VB525, VB526:** Single channel driver, with IGBT power stage internally assembled using Chip-On-Chip (COC) hybrid technology
- **L9780:** Wide range air fuel lambda sensor control interface
- **L9959, L9960, L9958:** H-bridge motor control



Factory Automation – PLC



Factory automation is a highly demanding market in which safety, standardization and performance are recognized by customers as key assets. Probably the most important device representing factory automation is the PLC (Programmable Logic Controller).

Introduced in the late 1960s, PLCs are designed for the real-time processing of a large number of I/Os in industrial plants. What differentiate a PLC in the market are its I/O capacity (identified by the number of I/Os and related scan rate) and computational performances.

STMicroelectronics has a strong background in the industrial automation and process control market and is committed to long product life-cycles and high-end technology development. STMicroelectronics provides an extensive portfolio of technologies and devices to be used in factory automation systems, such as the SPC56 families.

Our comprehensive (hardware and software) system solutions are supported with development tools, evaluation boards and rich documentation.

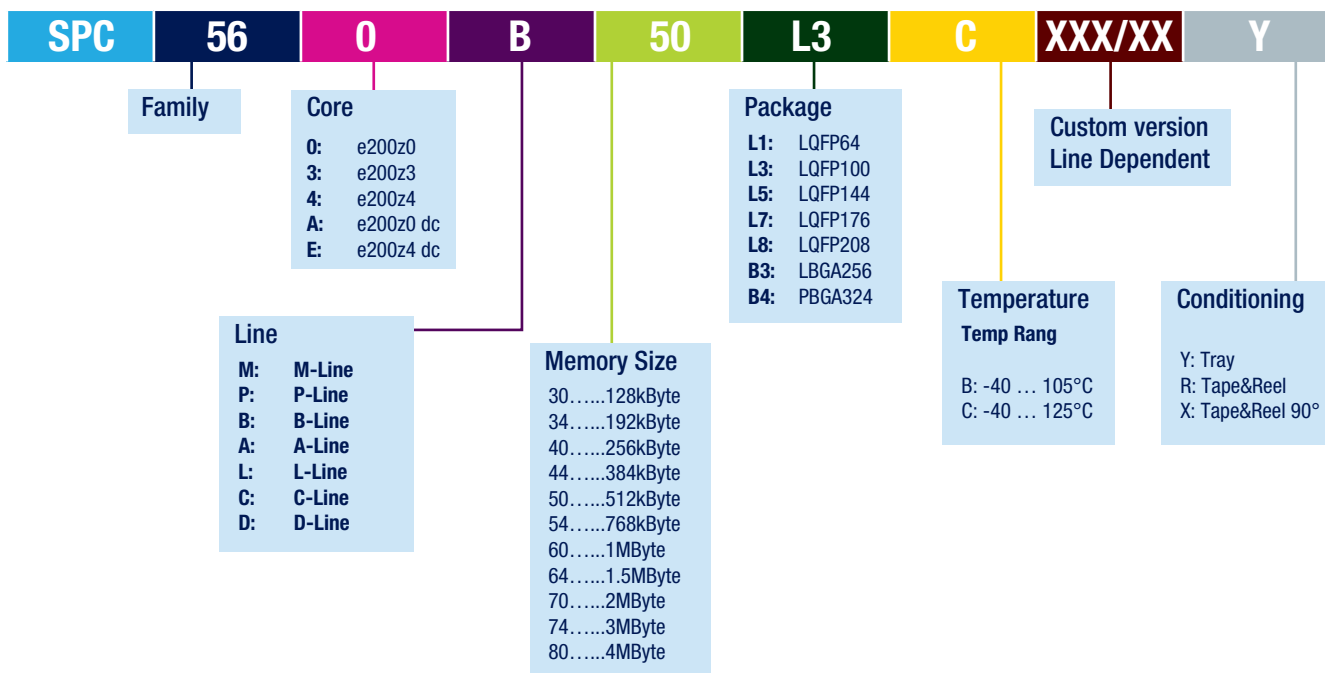
SUGGESTED PRODUCTS

- **SPC56 A-Line, SPC56 M-Line, SPC56 P-Line, SPC56 B-Line, SPC56 L-Line:** 32-bit SP56 MCU family
- **VN808, VNI4140, VNI2140, IPS160:** Single-, double-, quad- and octal-channel high-side switches in parallel mode
- **IPS4260:** Quad-channel low-side switches
- **VNI8200:** Octal-channel high-side switches in parallel & SPI mode
- **ISO8200:** Octal-channel high-side switches with on chip galvanic isolation
- **MO-5, MO-6, MO-7 family:** Single-, double- and quad-channel high-side switches (low $R_{DS(on)}$)

DEVICE SUMMARY

	Part Number	Core	CPU Clock Frequency max (MHz)	Package	FLASH Size (Prog)	FLASH Size (Data)	Internal RAM Size	Serial Interface						Timed I/Os	A/D Channels	A/D Resolution	Cryptography	Number Of I/O Ports nom ()
								SPI	LIN	CAN	PC	FlexRay	Ethernet					
D-Line	SPC560D30L1	e200z0	48	LQFP 64 10x10x1.4	128	64	12	2	3	1	-	-	-	14ch eMIOS (16-bit)	16	1x12-bit	-	45
	SPC560D30L3	e200z0	48	LQFP 100 14x14x1.4	128	64	12	2	3	1	-	-	-	28ch eMIOS (16-bit)	33	1x12-bit	-	79
	SPC560D40L1	e200z0	48	LQFP 64 10x10x1.4	256	64	16	2	3	1	-	-	-	14ch eMIOS (16-bit)	16	1x12-bit	-	45
	SPC560D40L3	e200z0	48	LQFP 100 14x14x1.4	256	64	16	2	3	1	-	-	-	28ch eMIOS (16-bit)	33	1x12-bit	-	79
B-Line	SPC560B40L1	e200z0	64	LQFP 64 10x10x1.4	256	64	24	2	3	2	1	-	-	12ch eMIOS (16-bit)	12	1x10-bit	-	45
	SPC560B40L3	e200z0	64	LQFP 100 14x14x1.4	256	64	24	3	3	2	1	-	-	28ch eMIOS (16-bit)	28	1x10-bit	-	79
	SPC560B40L5	e200z0	64	LQFP 144 20x20x1.4	256	64	24	3	3	2	1	-	-	56ch eMIOS (16-bit)	36	1x10-bit	-	123
	SPC560B50L1	e200z0	64	LQFP 64 10x10x1.4	512	64	32	2	4	3	1	-	-	12ch eMIOS (16-bit)	12	1x10-bit	-	45
	SPC560B50L3	e200z0	64	LQFP 100 14x14x1.4	512	64	32	3	4	3	1	-	-	28ch eMIOS (16-bit)	28	1x10-bit	-	79
	SPC560B50L5	e200z0	64	LQFP 144 20x20x1.4	512	64	32	3	4	3	1	-	-	56ch eMIOS (16-bit)	36	1x10-bit	-	123
	SPC560B54L3	e200z0	64	LQFP 100 14x14x1.4	768	64	64	3	4	6	1	-	-	37ch eMIOS (16-bit)	31	1x10-bit; 1x12-bit	-	77
	SPC560B54L5	e200z0	64	LQFP 144 20x20x1.4	768	64	64	5	8	6	1	-	-	64ch eMIOS (16-bit)	39	1x10-bit; 1x12-bit	-	121
	SPC560B60L3	e200z0	64	LQFP 100 14x14x1.4	1024	64	80	3	4	6	1	-	-	37ch eMIOS (16-bit)	31	1x10-bit; 1x12-bit	-	77
	SPC560B60L5	e200z0	64	LQFP 144 20x20x1.4	1024	64	80	5	8	6	1	-	-	64ch eMIOS (16-bit)	39	1x10-bit; 1x12-bit	-	121
	SPC560B60L7	e200z0	64	LQFP 176 24x24x1.4	1024	64	80	6	10	6	1	-	-	64ch eMIOS (16-bit)	53	1x10-bit; 1x12-bit	-	149
	SPC560B64L5	e200z0	64	LQFP 144 20x20x1.4	1536	64	96	5	8	6	1	-	-	64ch eMIOS (16-bit)	39	1x10-bit; 1x12-bit	-	121
	SPC560B64L7	e200z0	64	LQFP 176 24x24x1.4	1536	64	96	6	10	6	1	-	-	64ch eMIOS (16-bit)	56	1x10-bit; 1x12-bit	-	149
	RPC560B64L7	e200z0	64	LQFP 176 24x24x1.4	1536	64	96	6	10	6	1	-	-	64ch eMIOS (16-bit)	56	1x10-bit; 1x12-bit	-	149
	SPC564B64L7	e200z4d	120	LQFP 176 24x24x1.4	1536	64	128	8	10	6	1	1	-	64ch eMIOS (16-bit)	51	1x10-bit; 1x12-bit	CSE;SHE	147
	SPC564B64L8	e200z4d	120	LQFP 208 28x28x1.4	1536	64	128	8	10	6	1	1	-	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	177
	SPC564B70L7	e200z4d	120	LQFP 176 24x24x1.4	2048	64	160	8	10	6	1	1	-	64ch eMIOS (16-bit)	56	1x10-bit; 1x12-bit	CSE;SHE	147
	SPC564B70L8	e200z4d	120	LQFP 208 28x28x1.4	2048	64	160	8	10	6	1	1	-	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	177
	SPC564B74L7	e200z4d	120	LQFP 176 24x24x1.4	3072	64	192	8	10	6	1	1	-	64ch eMIOS (16-bit)	56	1x10-bit; 1x12-bit	CSE;SHE	147
	SPC564B74L8	e200z4d	120	LQFP 208 28x28x1.4	3072	64	192	8	10	6	1	1	-	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	177
C-Line	SPC560C40L1	e200z0	64	LQFP 64 10x10x1.4	256	64	32	2	4	5	1	-	-	12ch eMIOS (16-bit)	8	1x10-bit	-	45
	SPC560C40L3	e200z0	64	LQFP 100 14x14x1.4	256	64	32	3	4	6	1	-	-	28ch eMIOS (16-bit)	28	1x10-bit	-	79
	SPC560C50L1	e200z0	64	LQFP 64 10x10x1.4	512	64	48	2	4	5	1	-	-	12ch eMIOS (16-bit)	8	1x10-bit	-	45
	SPC560C50L3	e200z0	64	LQFP 100 14x14x1.4	512	64	48	3	4	6	1	-	-	28ch eMIOS (16-bit)	28	1x10-bit	-	79
	RPC560C50L3	e200z0	64	LQFP 100 14x14x1.4	512	64	48	3	4	6	1	-	-	28ch eMIOS (16-bit)	28	1x10-bit	-	79
	SPC56EC64B3	e200z4d / e200z0	120	LBGA256 17x17x1.7	1536	64	192	8	10	6	1	1	1	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	199
	SPC56EC64L7	e200z4d / e200z0	120	LQFP 176 24x24x1.4	1536	64	192	8	10	6	1	1	1	64ch eMIOS (16-bit)	51	1x10-bit; 1x12-bit	CSE;SHE	147
	SPC56EC64L8	e200z4d / e200z0	120	LQFP 208 28x28x1.4	1536	64	192	8	10	6	1	1	1	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	177
	SPC56EC70B3	e200z4d / e200z0	120	LBGA256 17x17x1.7	2048	64	256	8	10	6	1	1	1	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	199
	SPC56EC70L7	e200z4d / e200z0	120	LQFP 176 24x24x1.4	2048	64	256	8	10	6	1	1	1	64ch eMIOS (16-bit)	51	1x10-bit; 1x12-bit	CSE;SHE	147
	SPC56EC70L8	e200z4d / e200z0	120	LQFP 208 28x28x1.4	2048	64	256	8	10	6	1	1	1	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	177
	SPC56EC74B3	e200z4d / e200z0	120	LBGA256 17x17x1.7	3072	64	256	8	10	6	1	1	1	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	199
	SPC56EC74L7	e200z4d / e200z0	120	LQFP 176 24x24x1.4	3072	64	256	8	10	6	1	1	1	64ch eMIOS (16-bit)	51	1x10-bit; 1x12-bit	CSE;SHE	147
	SPC56EC74L8	e200z4d / e200z0	120	LQFP 208 28x28x1.4	3072	64	256	8	10	6	1	1	1	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	177
	RPC56EC74L8	e200z4d / e200z0	120	LQFP 208 28x28x1.4	3072	64	256	8	10	6	1	1	1	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	177
	SPC564B64L7	e200z4d	120	LQFP 176 24x24x1.4	1536	64	128	8	10	6	1	1	-	64ch eMIOS (16-bit)	51	1x10-bit; 1x12-bit	CSE;SHE	45
	SPC564B64L8	e200z4d	120	LQFP 208 28x28x1.4	1536	64	128	8	10	6	1	1	-	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	79
	SPC564B70L7	e200z4d	120	LQFP 176 24x24x1.4	2048	64	160	8	10	6	1	1	-	64ch eMIOS (16-bit)	56	1x10-bit; 1x12-bit	CSE;SHE	45
	SPC564B70L8	e200z4d	120	LQFP 208 28x28x1.4	2048	64	160	8	10	6	1	1	-	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	79
	SPC564B74L7	e200z4d	120	LQFP 176 24x24x1.4	3072	64	192	8	10	6	1	1	-	64ch eMIOS (16-bit)	56	1x10-bit; 1x12-bit	CSE;SHE	45
SPC564B74L8	e200z4d	120	LQFP 208 28x28x1.4	3072	64	192	8	10	6	1	1	-	64ch eMIOS (16-bit)	62	1x10-bit; 1x12-bit	CSE;SHE	79	

ORDERING INFORMATION



Custom Version												
P-Line: X1X2X3			D,B & C-Lines : X1X2X3			A-Line: X1X2		M-Line : X1X2		L-Line X1X2X3		
X1	X2	X3	X1	X2	X3	X1	X2	X1	X2.	X1	X2	X3
E: On Chip Data Flash O: No Data flash	F: Full Featured A: Airbag	A: 5V, 64MHz B: 3.3V, 64MHz C: 5V, 40MHz D: 3.3V, 40MHz	3: 32MHz 4: 48MHz 6: 64MHz 8: 80MHz 9: 120MHz	E: On Chip Data Flash	O: no option E: Ethernet C: Ethernet+CSE	F: FlexRay O: No FlexRay	A: 150Mhz B: 120Mhz C: 80Mhz	O: Standard	A: 80Mhz B: 64Mhz	B: 120MHz C: 80MHz	F: FlexRay O: No FlexRay	Q: Quality management safety level S: ASILD/SIL3

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[PIC32MX230F064D-IML](#) [PIC32MX154F128D-I/PT](#) [PIC32MX154F128B-V/SO](#) [AT32UC3L0128-AUT](#) [PIC32MX254F128B-I/SO](#)
[PIC32MX230F128H-I/MR](#) [PIC32MX150F128D-50I/TL](#) [PIC32MZ1064DAB288-I/4J](#) [PIC32MZ1064DAB169-I/HF](#) [ATUC64D4-Z1UT](#)