S12 MAGNIV®
MIXED-SIGNAL MCUs
## FOR AUTOMOTIVE
AND INDUSTRIAL

NXP

When building automotive and industrial controls, it is crucial to consider design complexity, cost and system-level expertise. Mixed-signal systems help build robust and reliable solutions because they are cost-effective and offer higher performance, low power and compact design.

NXP's S12 MagniV® portfolio of microcontrollers provide a comprehensive solution built on proven S12 technology. With the integration of high-voltage (HV) analog features into a standard automotive MCU, the S12 MagniV family simplifies system design by helping to improve manufacturing efficiency and reduce bill of materials costs.

EMBEDDED S12Z CORE

- Provides improved code efficiency and core performance with enhanced mathematic capabilities and linear address space.
- Enables sophisticated motor control algorithm: sensorless Field Oriented Control (FOC)
- Offers MCUs in several package options and a range of on-chip flash memory sizes
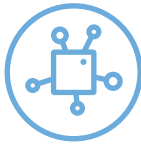
INTEGRATED PHYSICAL INTERFACES

- Integrates CAN or LIN physical interfaces to save space, design and test time as no external LIN or CAN interfaces are needed
- Delivers reduced system cost and physical footprint by integrating low- and high-side drivers for up to 6 power-MOSFET, relays or LEDs
- Offers built-in voltage regulator directly operating from battery between 3.5 to 40 V
- Provides double battery, crank voltage or load dump conditions

DESIGNED FOR SAFETY AND RELIABILITY

- Many follow ISO 26262 development process for Safety Element out of Context (SEooC) components
- Offers up to ASIL B compliance, AEC-Q100 Grade 0: -40°C to 150°C ambient temperature
- Provides high reliability using Error Code Correction (ECC)
- Meets automotive and industrial OEM specifications for EMC/ESD
- Support customer achievement of Functional Safety by providing FMEDA, Safety Manual, FIT rate data, and Dynamic FMEDA.
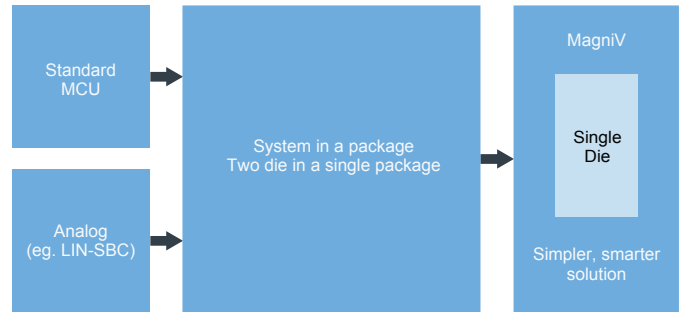
COMPREHENSIVE ENABLEMENT ECOSYSTEM

- Offers a complete tools and software portfolio
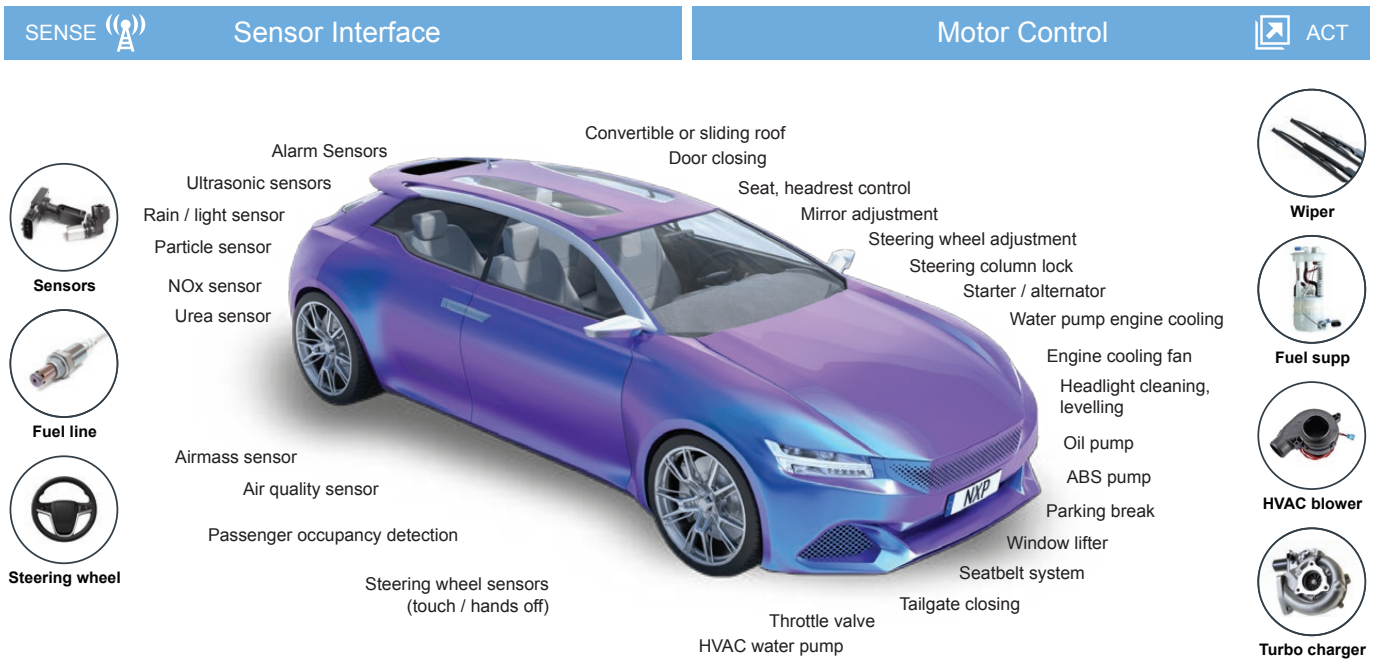- Provides technical support with its dedicated engineering community

S12 MagniV MCUs combine 16-bit S12 and S12Z MCU cores with HV analog peripherals to provide a simpler and smaller solution. A single MagniV device replaces a standard MCU, voltage regulator, physical layer communications interface and (in some versions) motor control gate drive functionality helping engineers to shrink automotive and industrial designs containing motor control and interface nodes.

S12 MagniV MCUs help with system integration and miniaturization, leading to small printed circuit boards (PCBs) by minimizing the overall size module (fewer components and reduced complexity) and decreasing weight (less material and fewer solder joints and test points). S12 MagniV MCUs benefit costs and readiness to market while improving quality, testability, reliability and system efficiency.

S12 MagniV MCUs have one of the biggest portfolios of integrated solutions for motor control and interface nodes in the industry, resulting of the more than 20 years of experience in integrated solutions:

| Standard MCU | → | System in a package Two die in a single package | → | MagniV
Single Die
Simpler, smarter solution |
| Analog (eg. LIN-SBC) | → | | | |

MOTOR CONTROL				SENSOR INTERFACE		CLUSTER
S12ZVM	**S12ZVMB**	**S12ZVMA**	**S12VR**	**S12ZVC**	**S12ZVL**	**S12ZVH**
3-phase Motors	H-Bridge Driver	Half-bridge Driver	Relay-Based Motors	CAN Nodes	LIN Nodes	Entry Level Clusters
CAN/LIN/PWM-PHY	LIN-PHY	LIN-PHY	LIN-PHY	CAN-PHY	LIN-PHY	CAN/LIN-PHY Segment LCD

SENSE Sensor Interface

Motor Control ACT

Sensors

Fuel line

Steering wheel

Alarm Sensors
Ultrasonic sensors
Rain / light sensor
Particle sensor
NOx sensor
Urea sensor

Airmass sensor
Air quality sensor
Passenger occupancy detection
Steering wheel sensors (touch / hands off)
Throttle valve
HVAC water pump

Convertible or sliding roof
Door closing
Seat, headrest control
Mirror adjustment
Steering wheel adjustment
Steering column lock
Starter / alternator
Water pump engine cooling
Engine cooling fan
Headlight cleaning, levelling
Oil pump
ABS pump
Parking break
Window lifter
Seatbelt system
Tailgate closing

Wiper
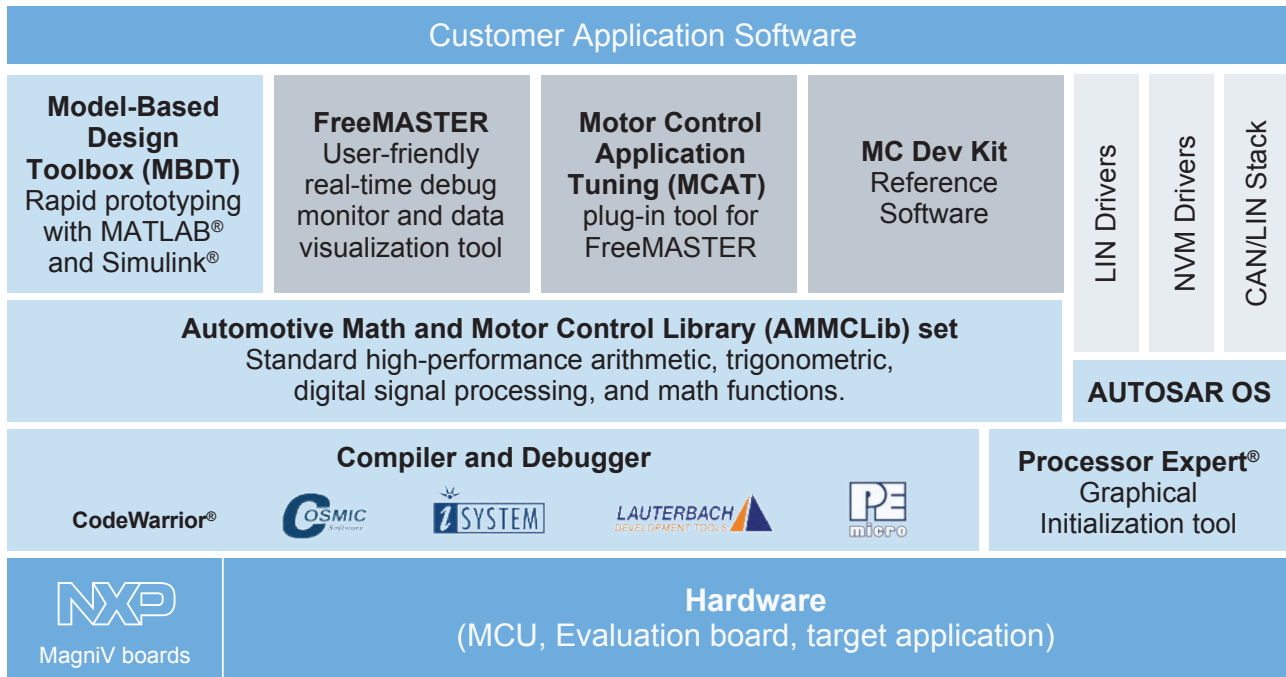
Fuel supp

HVAC blower

Turbo charger

MagniV® INTEGRATED SOLUTIONS:
MCU + VREG. + CAN PHY / LIN PHY / GATE DRIVE UNIT SUPPORTING ASIL B SAFETY

Device	Bus Frequency	Flash	RAM	EEPROM	ECC	CAN	CAN-PHY	LIN-PHY	SPI	High-Voltage Input	Packaging Options
S12ZVCA	32 MHz	64-192 KB	4-12 KB	1-2 KB	Flash+RAM	1	1		1-2	2-ch. HVI, VSUPSense	48 LQFP, 64 LQFP-EP
S12ZVC	32 MHz	64-192 KB	4-12 KB	1-2 KB	Flash+RAM	1	1		1-2	2-ch. HVI, VSUPSense	48 LQFP, 64 LQFP-EP
S12ZVLA	32 MHz	64-128 KB	4-8 KB	1-2 KB	Flash+RAM	1		1	1	1-ch. HVI, VSUPSense	48-LQFP,32-LQFP, 32-QFN
S12ZVL	32 MHz	8-128 KB	1-8 KB	0.1-2 KB	Flash+RAM	0-1		1	1	1-ch. HVI, VSUPSense	48 LQFP, 32 LQFP, 32 QFN
S12ZVLS	32 Mhz	16-32 KB	1 KB	128 KB	Flash+RAM			1	1	1-ch. HVI, VSUPSense	32 QFN
S12ZVMC256	50 MHz	256 KB	32 kB	1KB	Flash+RAM	1	1		1	1-ch. HVI, VSUPSense	80 LQFP-EP
S12ZVML	50 MHz	32-128 KB	4-8 KB	0.1-0.5 KB	Flash+RAM	0-1		1	1	VSUP Sense	48 LQFP-EP, 64 LQFP-EP
S12ZVMC	50 MHz	64-128 KB	4-8 KB	512 B	Flash+RAM	1			1	VSUP Sense	64 LQFP-EP
S12ZVM	50 MHz	16-32 KB	2-4 KB	128 B	Flash+RAM				1	VSUP Sense	64 LQFP-EP, 48 LQFP-EP
S12ZVMB	32 MHz	48-64 KB	4 KB	512 B	Flash+RAM			1	1	VSUP Sense	64 LQFP, 48 LQFP
S12ZVMA	32 MHz	16-32 KB	1-2 KB	128 B	Flash+RAM			1	1	VSUP Sense	32 LQFP, 48 LQFP
S12VR	25 MHz	16-64 KB	2 KB	0.1-0.5 kB	Flash			1	1	4-ch. HVI, VBATSense, VSUP Sense	32 LQFP, 48 LQFP
S12VRP	25 MHz	48-64 KB	6 KB	2 - 4 KB	Flash			1		4-ch. HVI, VBATSense, VSUP Sense	32 LQFP, 48 LQFP
S12ZVH	32 MHz	64-128 KB	4-8 KB	4 KB	Flash+RAM	1	1		1	VBAT Sense, VSUP Sense	100 LQFP, 144 LQFP
S12ZVHY	32 MHz	32-64 KB	2-4 KB	2 KB	Flash+RAM	1			1	VBAT Sense, VSUP Sense	100 LQFP, 144 LQFP
S12ZVHL	32 MHz		4 KB	2 KB	Flash+RAM	1		1	1	VBAT Sense, VSUP Sense	100 LQFP, 144 LQFP
S12ZVFP	32 MHz		4 KB	2 KB	Flash+RAM	1		1	1	VBAT Sense, VSUP Sense	100 LQFP, 144 LQFP
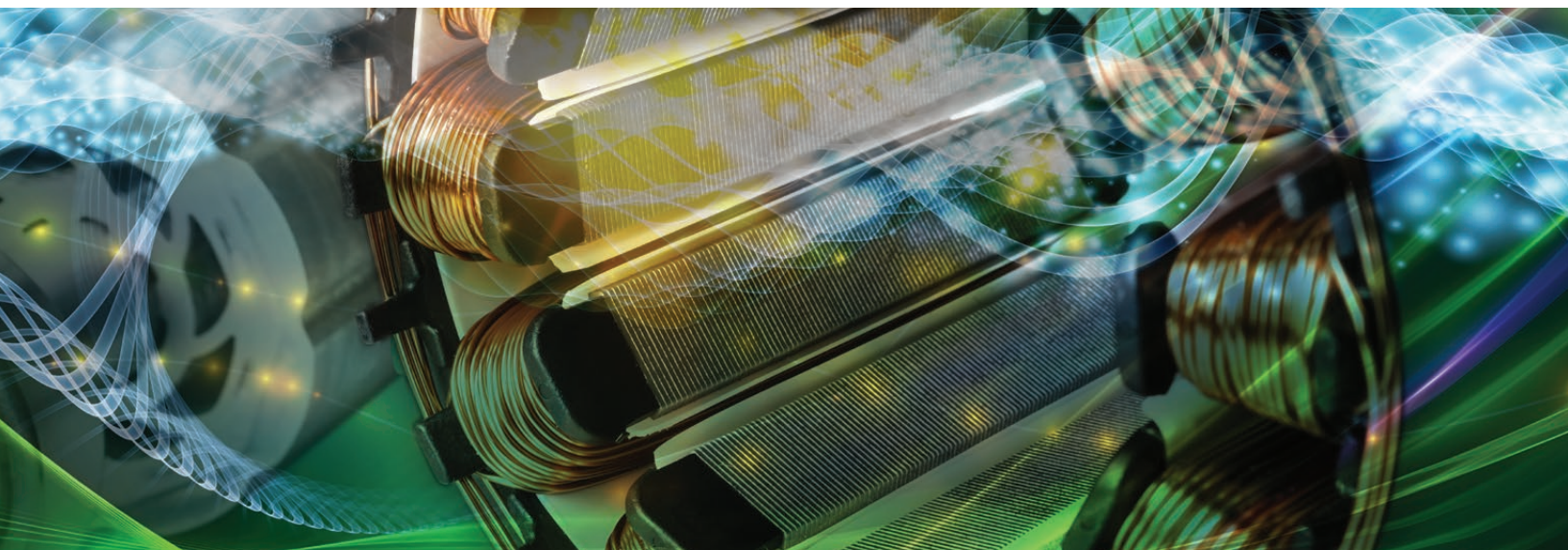
ENABLEMENT SOFTWARE ECOSYSTEM

Customer Application Software							
Model-Based Design Toolbox (MBDT) Rapid prototyping with MATLAB® and Simulink®	**FreeMASTER** User-friendly real-time debug monitor and data visualization tool	**Motor Control Application Tuning (MCAT)** plug-in tool for FreeMASTER	**MC Dev Kit** Reference Software		LIN Drivers	NVM Drivers	CAN/LIN Stack

Automotive Math and Motor Control Library (AMMCLib) set
Standard high-performance arithmetic, trigonometric, digital signal processing, and math functions.

AUTOSAR OS

Compiler and Debugger

CodeWarrior®   COSMIC Software   iSYSTEM   LAUTERBACH DEVELOPMENT TOOLS   PE micro

Processor Expert®
Graphical Initialization tool

NXP MagniV boards

Hardware
(MCU, Evaluation board, target application)

▇ NXP Technology

MODEL-BASED DESIGN TOOLBOX (MBDT)

A comprehensive collection of tools that plug into the MathWorks MATLAB® Software and Simulink® model-based design environment to support fast prototyping, verification and validation on NXP microcontroller-based real targets.

FREEMASTER RUNTIME DEBUGGING TOOL

A user-friendly, real-time debug monitor and data visualization tool that enables runtime configuration and tuning of embedded software applications.

MOTOR CONTROL APPLICATION TUNING (MCAT)

An HMTL-based user-friendly graphical plug-in tool for PMSM FOC and BLDC motor control applications and real-time control structure parameter tuning through the FreeMASTER debugging tool.

AUTOMOTIVE MATH AND MOTOR CONTROL LIBRARY (AMMCLIB) SET

A precompiled, off-the-shelf software library with building blocks for motor control, digital signal processing and general mathematical applications.

MOTOR CONTROL DEVELOPMENT KIT

Enables rapid prototyping and evaluation of BLDC and PMSM six-step motor control applications without having to wait for the final hardware design. The kit contains motor control development board and 3-phase Permanent Magnet motor on the frame, power supply and cables. The application software takes advantage of the AMMCLib and provides a complete reference implementation for both 3-phase BLDC and PMSM motor control.

AUTOSAR® (CLASSIC) SOFTWARE

Supports the development of standardized electronic systems that improve quality, performance, safety and environmental friendliness. It also helps to simplify the process of updating software over the lifetime of a vehicle.

ENABLEMENT HARDWARE ECOSYSTEM

MOTOR CONTROL

MTRCKTSPNZVM128
3-phase PMSM
Motor control kit

MTRCKTSBNZVM128
3-phase BLDC
Motor control kit

S12ZVML-MINIXXX
3-phase PMSM
Motor control kit

MCSXSR1CS12ZVM
3-phase BLDC and PMSM

S12ZVML128 High-current evaluation board

S12ZVMC256EVB
3-phase BLDC and
PMSMS12ZVMC256
evaluation board

S12ZVMEVB
3-phase BLDC and PMSM

S12ZVM(L/C)128 evaluation board

S12ZVM32EVB
3-phase BLDC and PMSM

S12ZVM32 evaluation board

S12ZVMBEVB
Reversible DC
S12ZVMB evaluation board

S12ZVMAEVB
Unidirectional DC
S12ZVMA evaluation board

DEVKIT-S12VRP
Relay-based DC
S12VRP64 evaluation board

DEVKIT-S12VR64
Relay-based DC
S12VR64 evaluation board

S12VR64EVB3
Relay-based DC
S12VR64 evaluation board

S12VR32EVB
Relay-based DC
S12VR32 evaluation board

S12ZVM-EFP
Electrical Fuel Pump
S12ZVML128 reference design

S12ZVM-EWP
Electrical Water Pump
S12ZVML64 reference design

SENSOR INTERFACE + CLUSTER

DEVKIT-S12ZVC
CAN node
S12ZVC192 evaluation board

VLG-MC9S12ZVC
CAN node
S12ZVC192 evaluation board

DEVKIT-ZVL128
LIN node
S12ZVL128 evaluation board

DEVKIT-S12ZVL
LIN node
S12ZVL32 evaluation board

KIT9Z1J638EVM
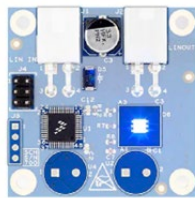battery monitoring
MM912J638 evaluation board

TRK-S12ZVH128
Instrument cluster
S12ZVH128 evaluation board

TRK-S12ZVHY64
Instrument cluster
S12ZVHY64 evaluation board

TRK-S12ZVFP64
Instrument cluster
S12ZVFP64 evaluation board

S12ZVL32-LED
RGB LED Lighting with LIN
S12ZVL32 reference design

RD9Z1-638-12V
12 V battery monitoring
MM912J638 reference design

RD9Z1-638-4Li
14.4 V battery monitoring
MM912J638 reference design

RD9Z1-638BJBEVM
Battery junction box
MM912J638 reference design

S12 MAGNIV RESOURCES

nxp.com/MagniV

SafeAssure® program
nxp.com/SafeAssure

Product Longevity program
nxp.com/ProductLongevity

S12 MagniV community
nxp.com/MagniVcommunity

SafeAssure community
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X-ON Electronics

Largest Supplier of Electrical and Electronic Components

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