NXP S12 MAGNIV OVERVIEW

TONY ZHANG / 张剑龙
FILED APPLICATION ENGINEER
MAY. 04, 2017

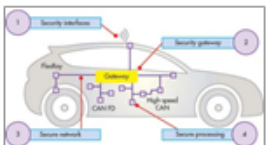


EXTERNAL USE

SECURE CONNECTIONS
FOR A SMARTER WORLD

NXP AMP Product Lines

C&S
(Connectivity & Security)



Gateway

- #1 in Vehicle Networking with leading networking and security IP
- #1 in Automotive HW Security with Strong IP and broad portfolio
- End to end portfolio of networking devices (MCU/MPU, TX/RX)

Products:
MPC564xB/C
MPC574xG

ADAS
(Advanced Driver Assistance Systems)



Radar, LIDAR Vision Sensor Fusion

- #1 in Radar with strong IP and system knowledge
- High performance low power accelerators
- Scalable high performance roadmap for central processing

Products:
- S32R - Radar
- S32V - Vision

VDS
(Vehicle Dynamics & Safety)



Chassis & Safety Powertrain & Hybrid/EV

- Long term Innovator in Chassis and Powertrain Control.
- Significant Growth in Safety as Autonomous Control Drives Robust Fault Tolerant Systems

Products:
MPC56xx
MPC57xx

GPIS
(General Purpose & Integrated Solutions)



Body Electronics Edge Nodes

- 500+ customers
- Broadest portfolio of integrated MCU+HV mixed-signal solutions
- Complete Tools & Software enablement

Products:
S08/S12/PPC → ARM
KEA – S32K
S12 MagniV – S32M

General Purpose and Integrated Solutions

Target Markets

General Purpose

Body Electronics

Lighting



HVAC



Other



Integrated Solutions

Motor Control

Window Lift



Pumps, Fans



Sensor Interfaces



Products

KEA - S32K
The First Automotive MCU
Designed for Software Engineers

S08 - S12 - MPC56xxB/C(Bolero)
- Shipping ~500Mu in 2016
- 8/16/32bit proven architectures

S12 MagniV
Shrink your application with MCU
+ HV analog integration

General Purpose

Integrated

Technology

Software and Tools

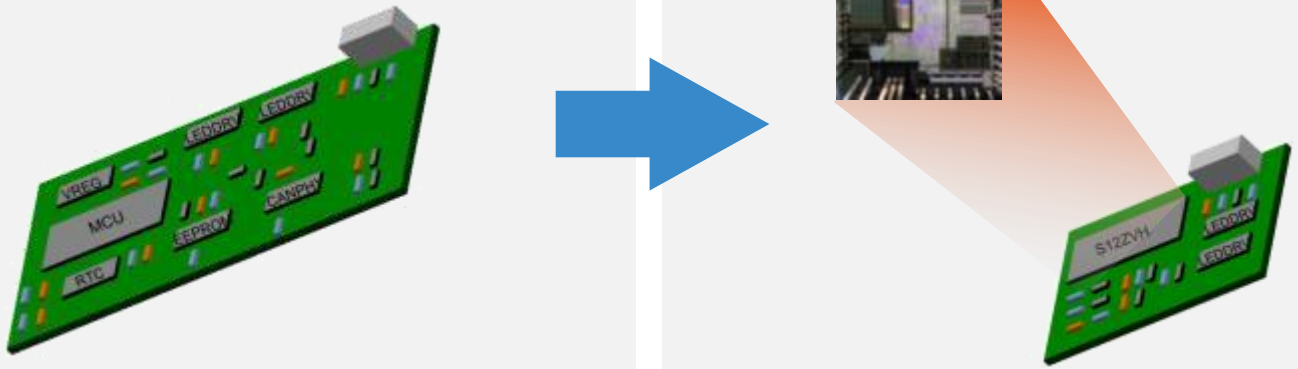
Moving to ARM Cortex Architecture

HV Analog integration ASSP

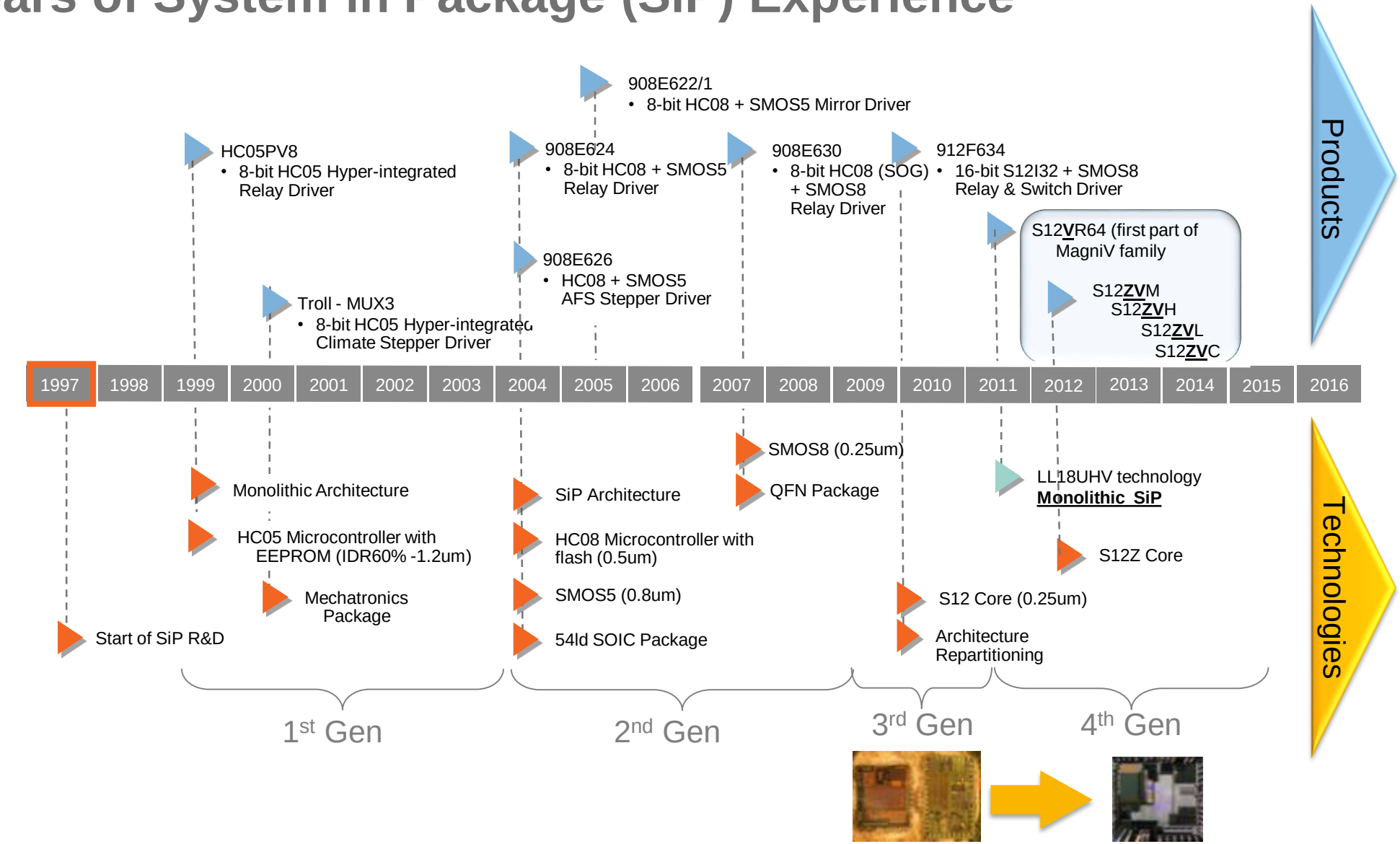
MagniV Concept: Shrink Your Application

Integration of High-Voltage (HV) Analog Features into a Standard Automotive MCU

Traditional Solution	MagniV
• Standard MCU • Multiple analog ICs	• Single device • Reduced space



15+ Years of System in Package (SiP) Experience



A Technology Sweet-spot for Sensor and Actuators



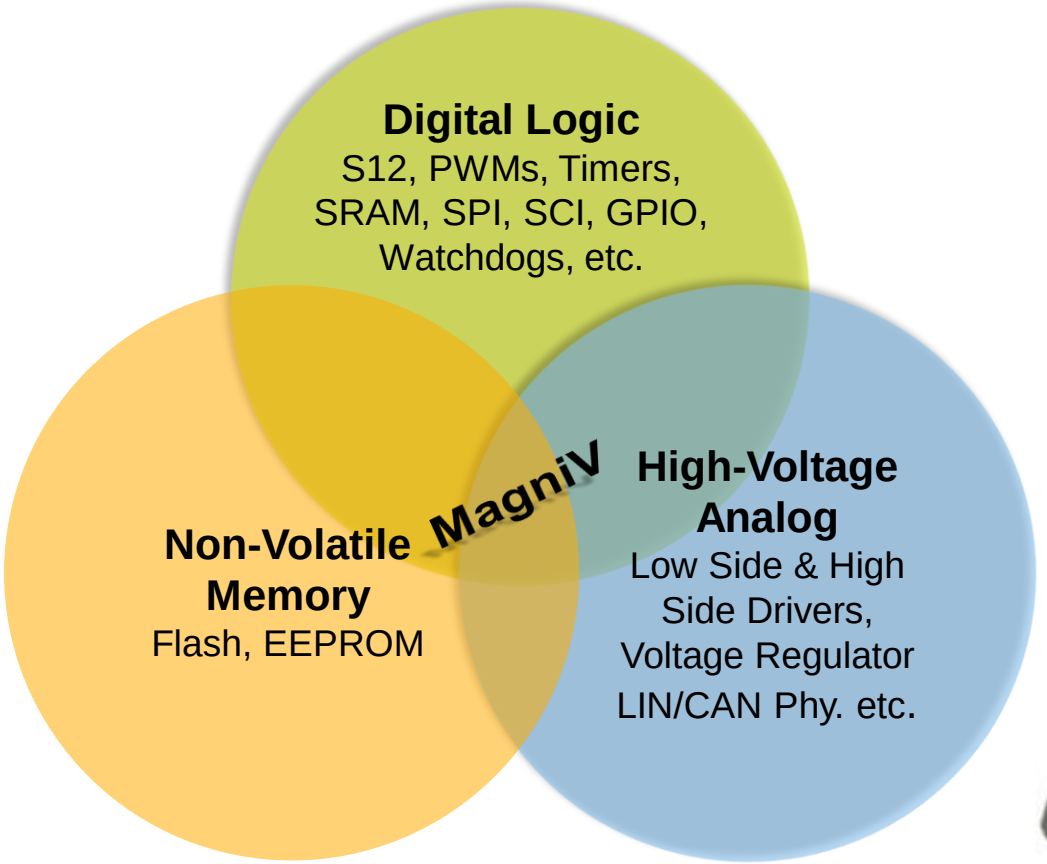












Existing
Low Leakage 180nm CMOS+NVM

40V UHV Devices

MagniV building blocks

High-Voltage Components

- **VREG for tot. supply:**
  - 70mA w/o ext comp. or
  - 170mA with ext. ballast
- **LIN-PHY**
- **CAN-PHY**
- **V-BAT SENSE**
- **V-SUP SENSE**
- **1-4ch HVI** (12V-input with wake-up and ADC)
- **LS-drivers**
- **HS-drivers**
- **Charge Pump**
- **4-6ch Gate Drive Unit for FET Qg=50-150nC**

Digital Components

- **MSCAN**
- **Sent**
- **SCI**
- **SPI**
- **IIC**
- **GPIO**
- **PGPIO 20mA**
- **NGPIO 25mA**
- **BDM/BDC**
- **Key Wakeups**
- **Win Wdog**
- **RTC**
- **Timer** 16Bit (25-64MHz)
- **PWM** 8/16Bit (25-64MHz)
- **Motorcontrol PWM With Fault protection**
- **Programmable Trigger Unit**
- **Sound Generator**
- **Segment LCD (4x40)**
- **Stepper Motor Driver with SSD**

MCU Core and Memories

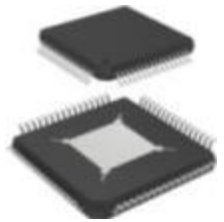
- **S12- or S12Z-CPU 25/32/50MHz bus**
- **Flash (ECC) 8kB – 192kB**
- **EEPROM (ECC) 128B – 4kB**
- **RAM (ECC) 512B - 8kB**

5V Analogue Components

- **List Based ADC** 10-12Bit resolution, 1-2 S/H-units, Up to 16ch total
- **Temp Sense**
- **Current Sense** (2 x Op-Amp)
- **2ch ACMP** With 1x6-Bit-DAC
- **Pierce Osc.**
- **32kHz low power Osc**
- **RCosc. +/-1.3%**
- **PLL**

Packaging

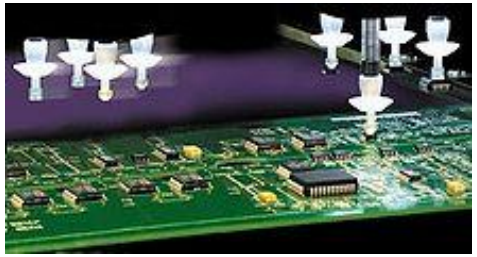
- **LQFP:** 32/48/64/100/144-pin
- **LQFP-EP:** 48/64-pin (150° C T_A)
- **QFN:** 32-pin (5x5mm)





MagniV: Integration Benefits

- **Reduced size**
  - Smaller PCB
  - Smaller housing
  - Increased design flexibility
- **Fewer components**
  - Fewer devices to pick and place
  - Fewer solder joints
- **Fewer test points**
  - Integration offers a pre-tested subsystem
- **Quality**
  - Fewer points of failure
- **Simplified Logistics**
  - Fewer parts to qualify, source, store, track





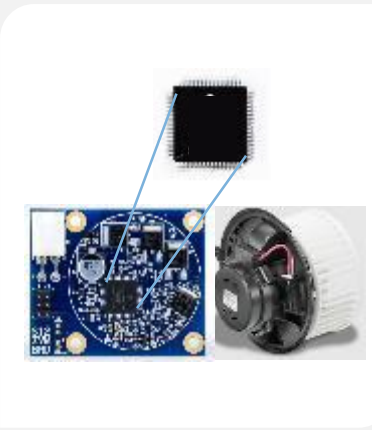
S12 MagniV: A Way To Shrink Your Automotive Application

S12 MagniV simplifies system design with the integration on High-Voltage (HV) analog features onto MCUs for automotive applications

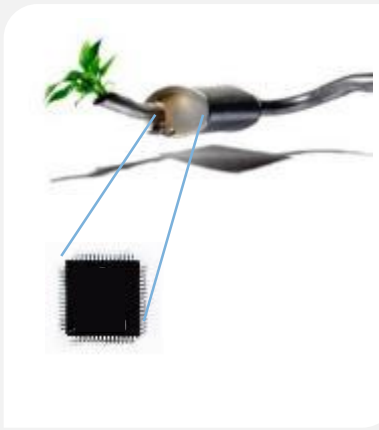
S12VR
Relay driven motors



S12ZVM
BLDC/DC motors



S12ZVC
Small CAN nodes



S12ZVL
LIN Nodes



- **Reduced PCB Space**
- **Reduced Bill of Material**
- **Improved manufacturing efficiency and quality**
- **Simplified development**

SafeAssure™ Program: MagniV

Safety Hardware

Common safe hardware platform for application software:

- Voltage/clocks monitoring
- Memories w/ error correction
- Window Watchdog...

Safety Process

- ISO26262 development process for most products
- Safety-Element-Out-Of-Context



Safety Support

- FIT rates
- Dynamic FMEDA
- Safety manual
- Technical support as required

Safety Software

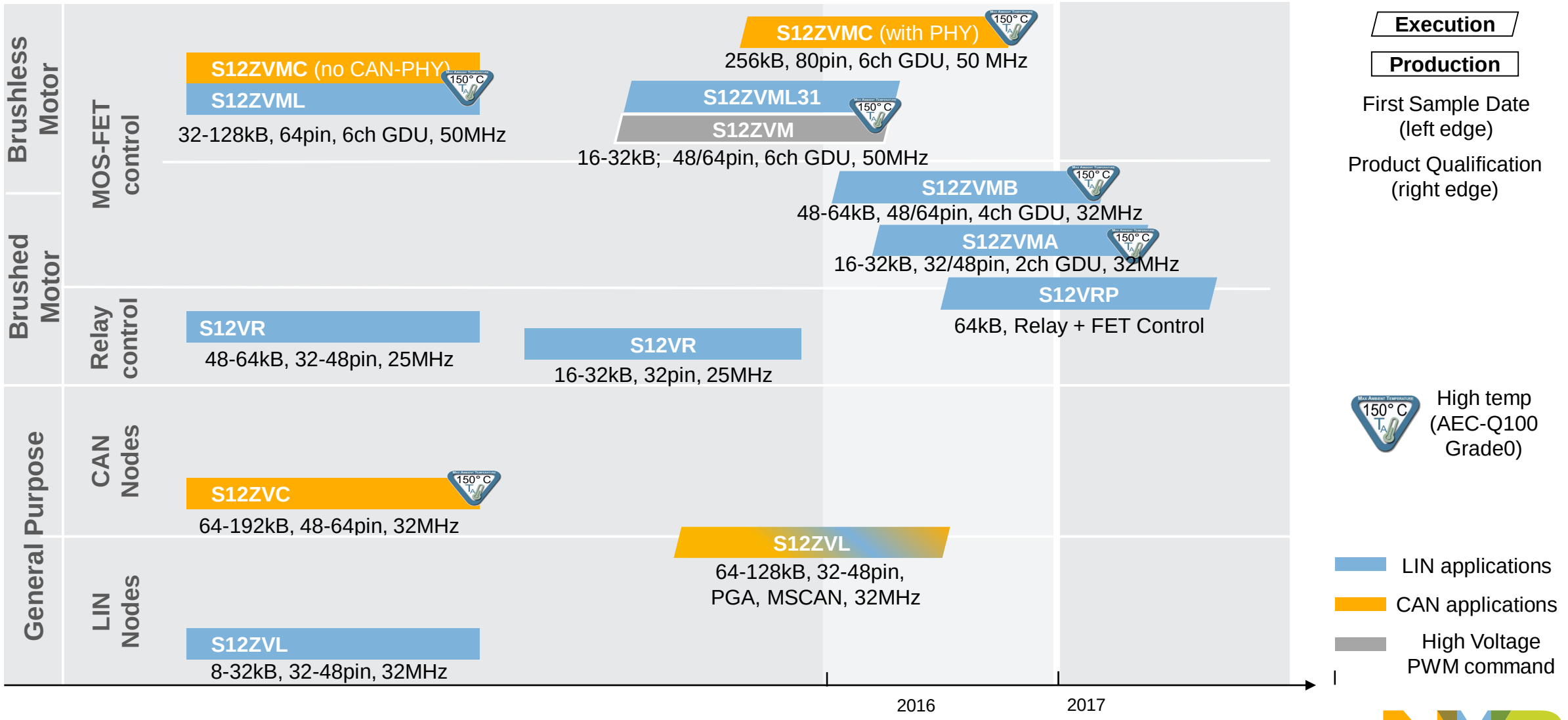
S12Z core self-test available to complement the built-in hardware safety features

Product families	Development Process	FMEDA Report Availability	Dependant Failure Analysis	Safety Manual	Core Self test and User Guide
S12VR	Standard	Upon request	Yes	No	No
S12VR	Standard	Upon request			
S12ZVM	Standard	yes		Yes (www)	Yes
S12ZVM	ISO 26262	Q4 2014			
S12ZVL	ISO 26262	yes			
S12ZVC	ISO 26262	yes			

MagniV Conformance Testing

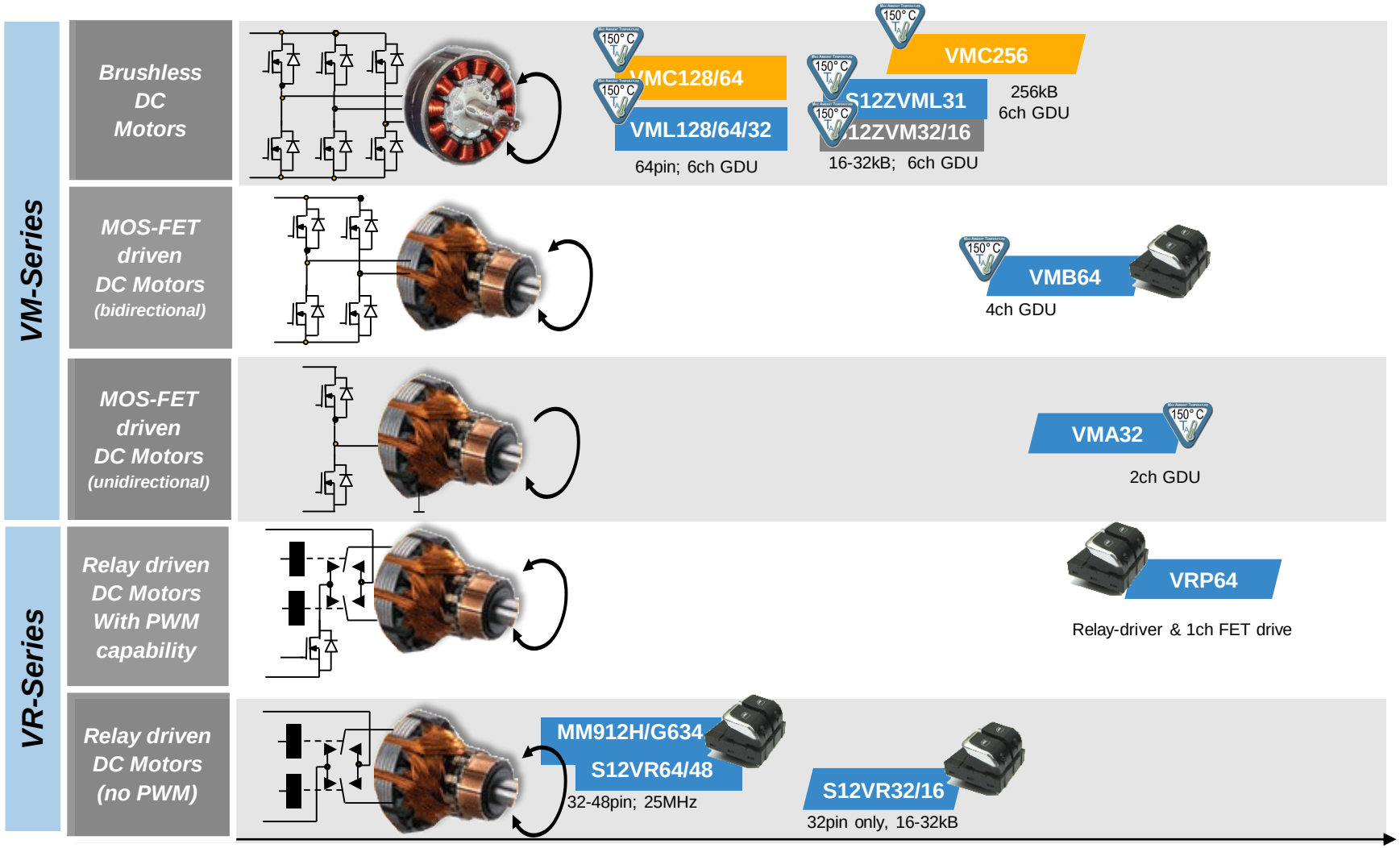
Device	S12VRxx	S12ZVMxx	S12ZVLxx	S12ZVCxx
Interface	LIN	LIN	LIN	CAN
CAN / LIN conformance C&S	LIN 2.2: PASS SAE J2602-2: PASS	LIN 2.2: PASS SAE J2602-2: PASS	LIN 2.2: PASS SAE J2602-2: PASS	CAN PL: PASS
EMC/ESD IBEE Zwickau German OEMs	PASS	PASS	PASS	PASS
EMC/ESD ULLabs / Mooser US OEMs	PASS	PASS	PASS	PASS
CAN Conformance Velio Japanese OEMs	n/a			PASS

MagniV Integrated Solutions Roadmap



PUBLIC USE

S12 MagniV: Motor Control / Actuator Lineup



Proposal

Planning

Execution

Production

LIN applications

CAN applications

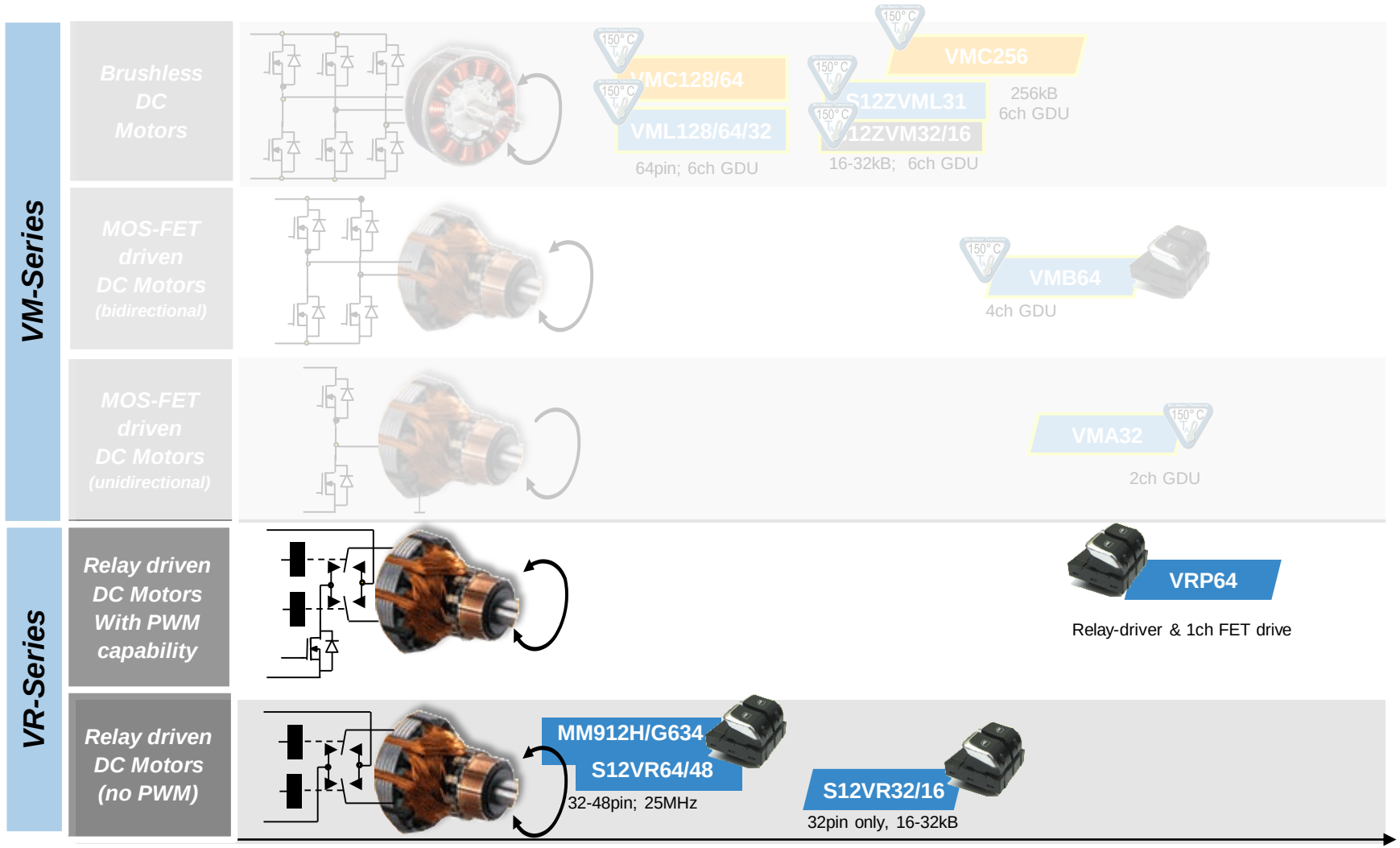
High voltage PWM controlled applications

High temp option (AEC Grade 0)

Switch panel interface (HS-drivers & HVIs)

Main usecase:
- window lift
- sun roof

S12 MagniV: Motor Control / Actuator Lineup



Proposal

Planning

Execution

Production

LIN applications

CAN applications

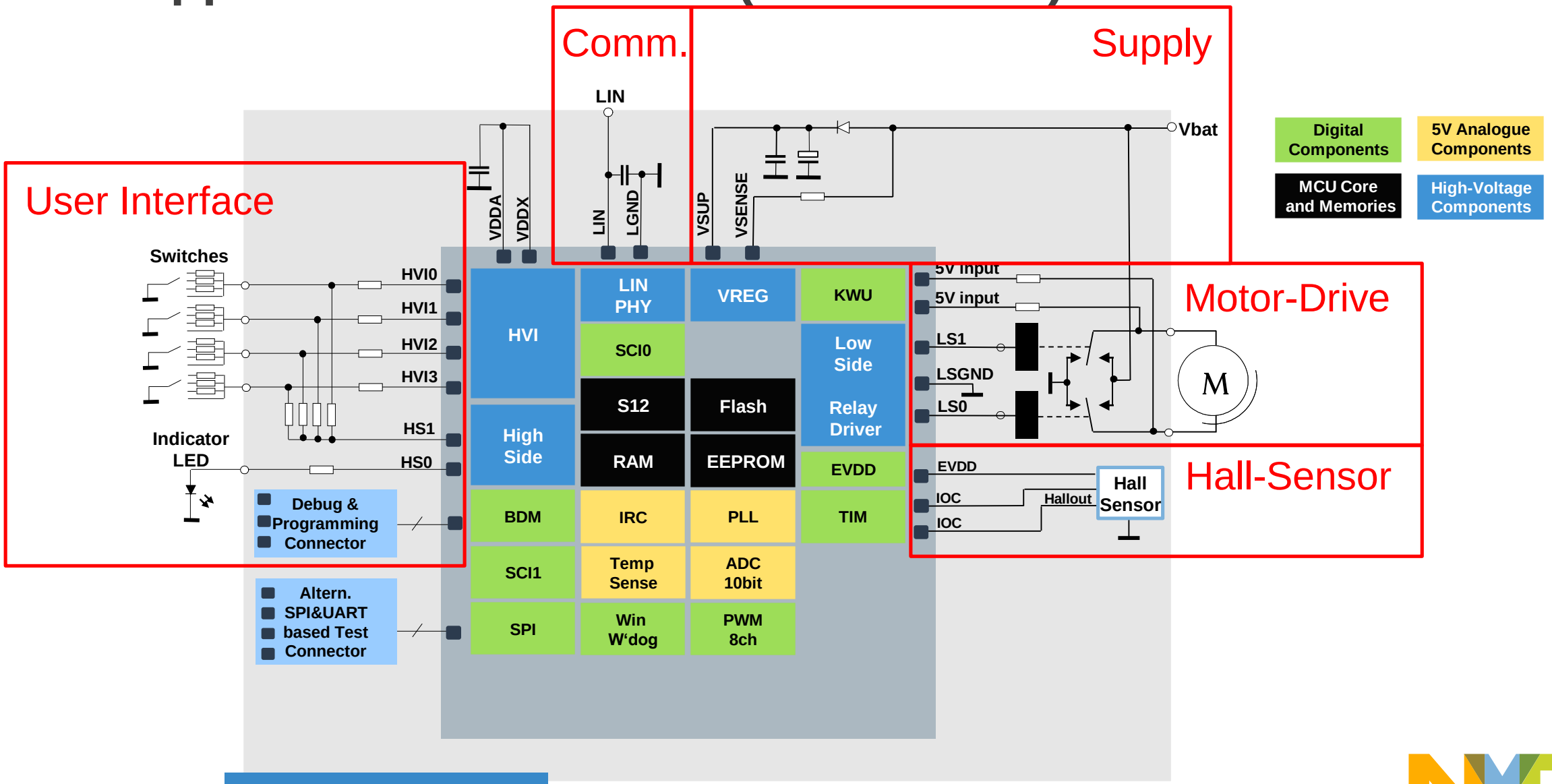
High voltage PWM controlled applications

High temp option (AEC Grade 0)

Switch panel interface (HS-drivers & HVIs)

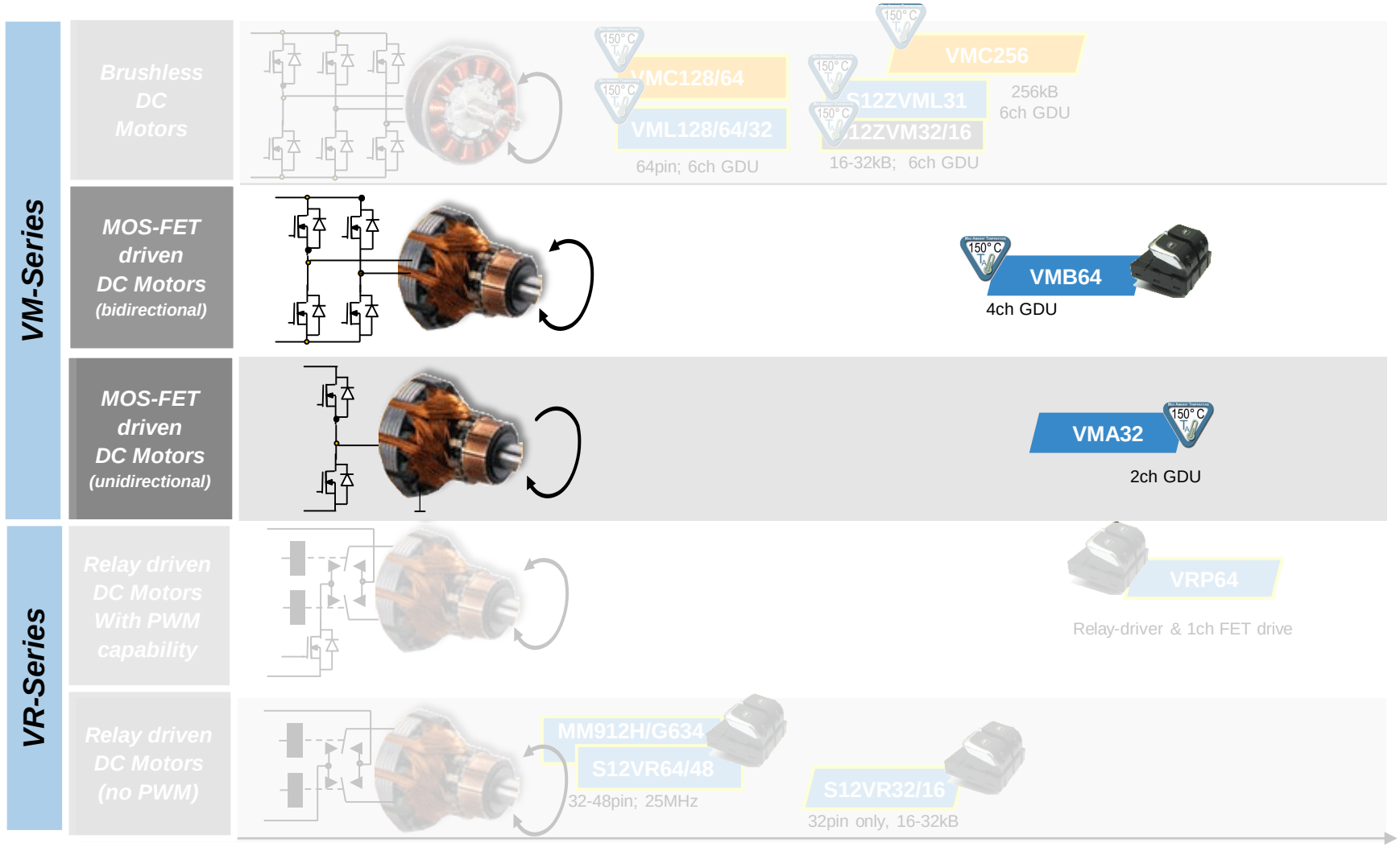
Main usecase:
- window lift
- sun roof

S12VR Application Schematics (Window Lift)



Pinout representing functionality, Physical pins location is different

S12 MagniV : Motor Control / Actuator Lineup



Proposal

Planning

Execution

Production

LIN applications

CAN applications

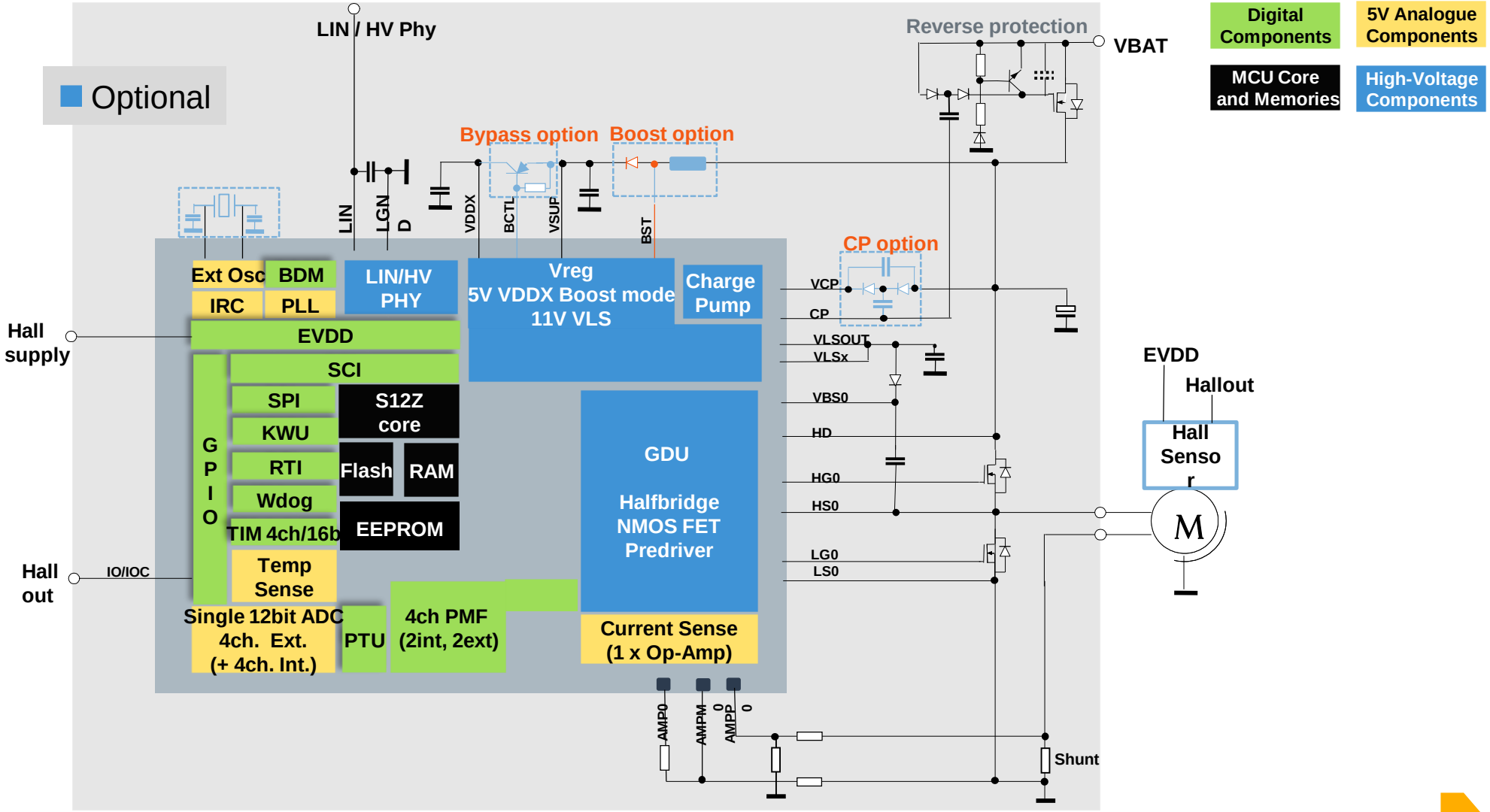
High voltage PWM controlled applications

High temp option (AEC Grade 0)

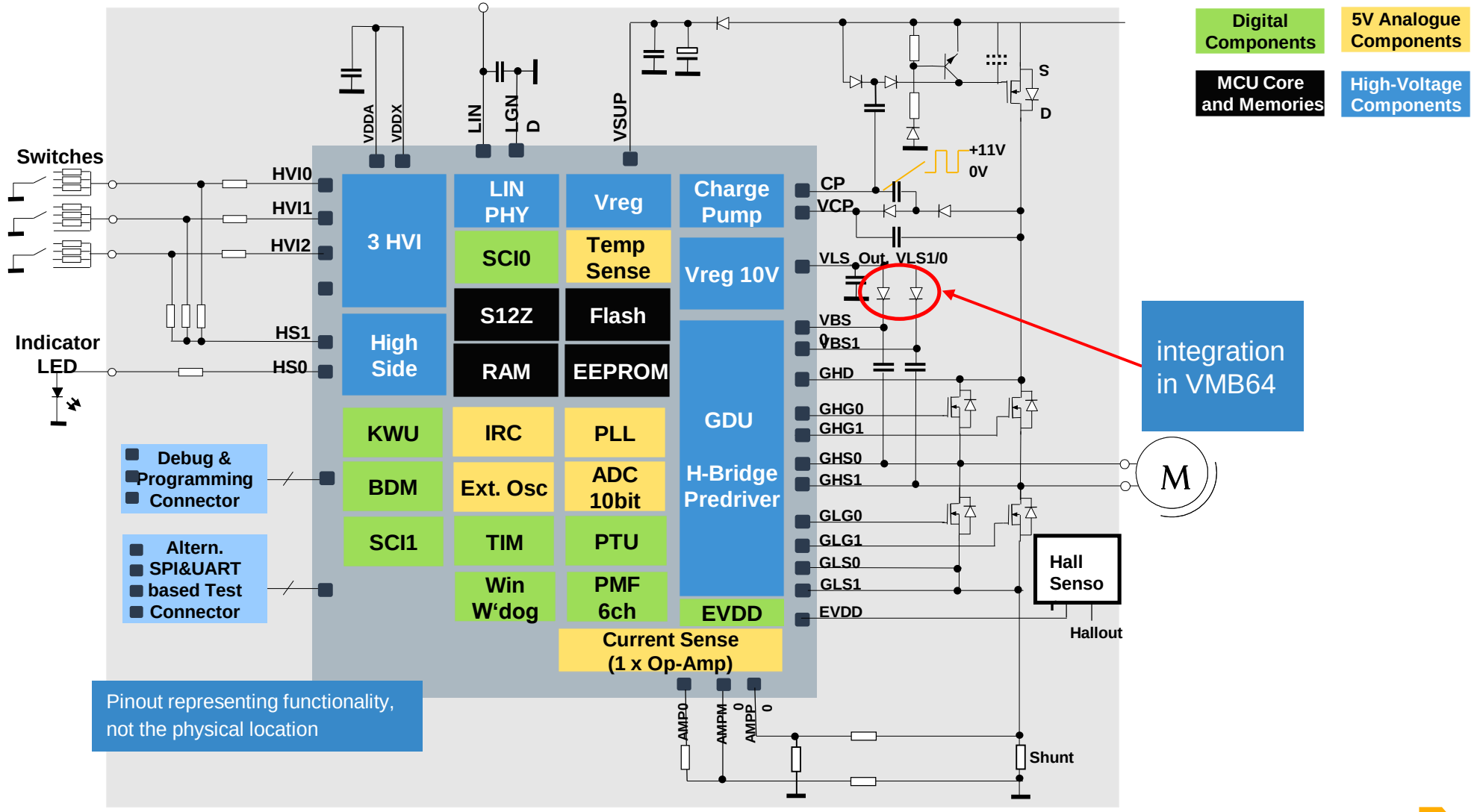
Switch panel interface (HS-drivers & HVIs)

Main usecase:
- window lift
- sun roof

S12ZVMA Application Schematic

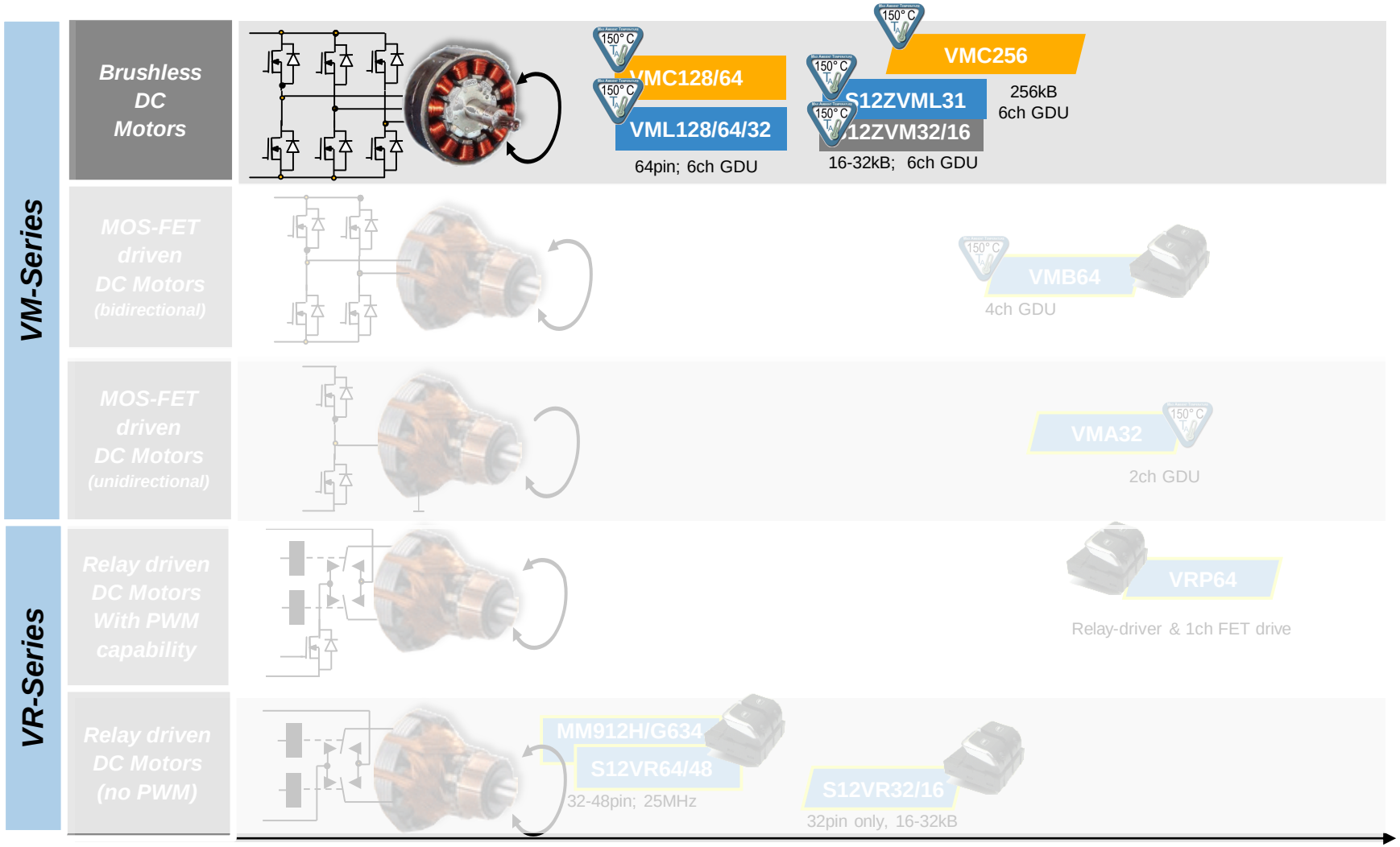


S12ZVMB Application Schematic (Window Lift)



PUBLIC USE

S12 MagniV: Motor Control / Actuator Lineup



Proposal

Planning

Execution

Production

LIN applications

CAN applications

High voltage PWM controlled applications

High temp option (AEC Grade 0)



Switch panel interface (HS-drivers & HVIs)

Main usecase:
- window lift
- sun roof

3-Phase BLDC / PMSM Motors – Market Segmentation

200+W motors



HVAC Blower



Powered Liftgate

Cooling Fan



Sliding doors



Fuel pump



Water pump



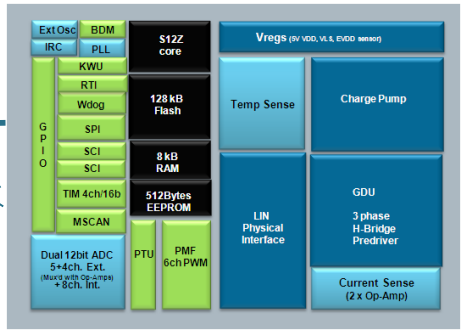
50-200W motors

Reduced GDU drive

Oil pump



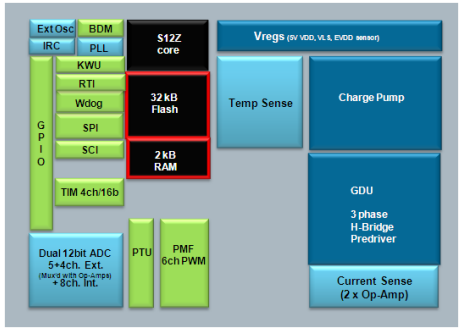
S12ZVML/C (64/128/256kB) Carcassonne



LIN

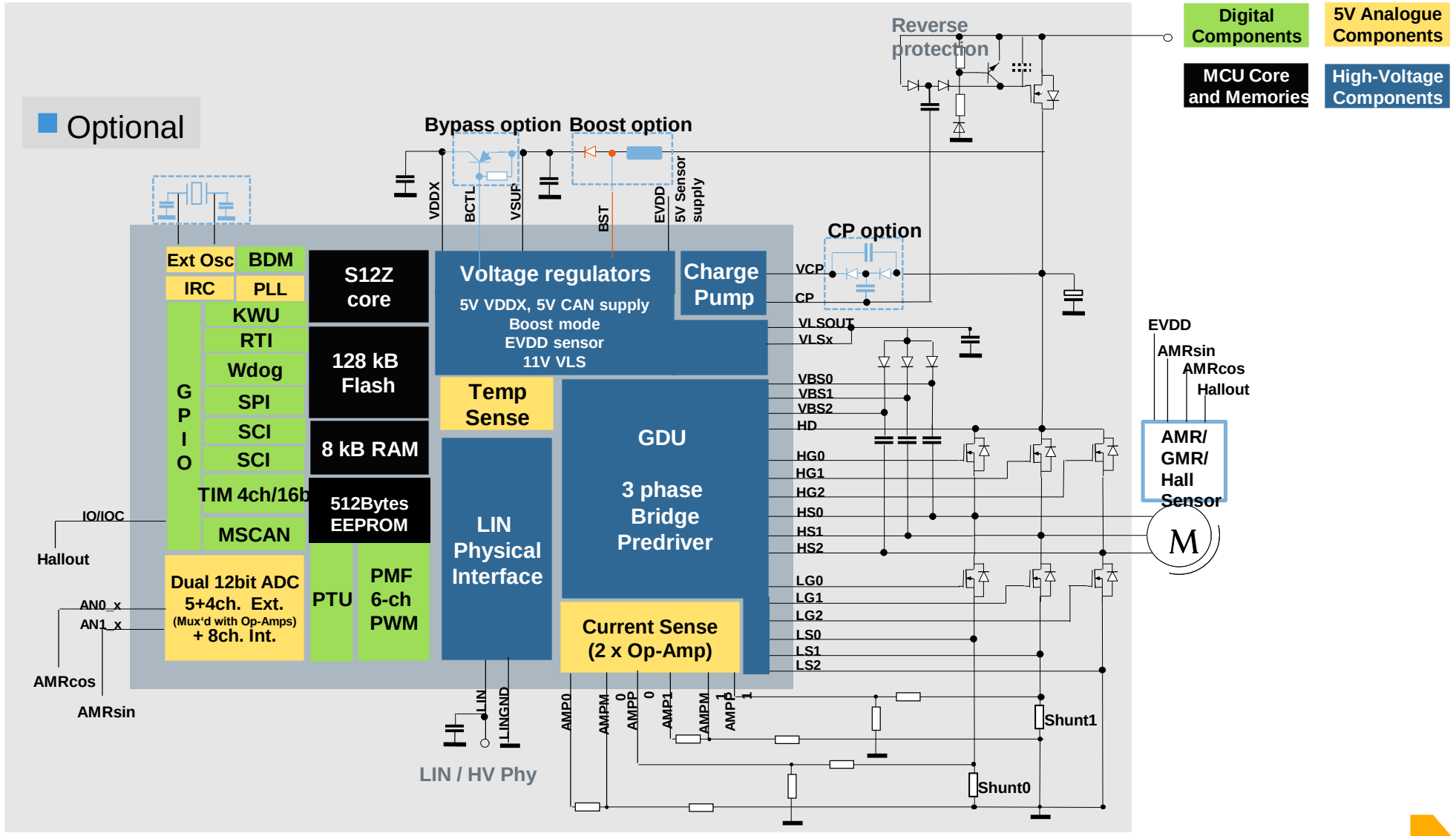
CAN

S12ZVM (32kB) Obidos



PWM

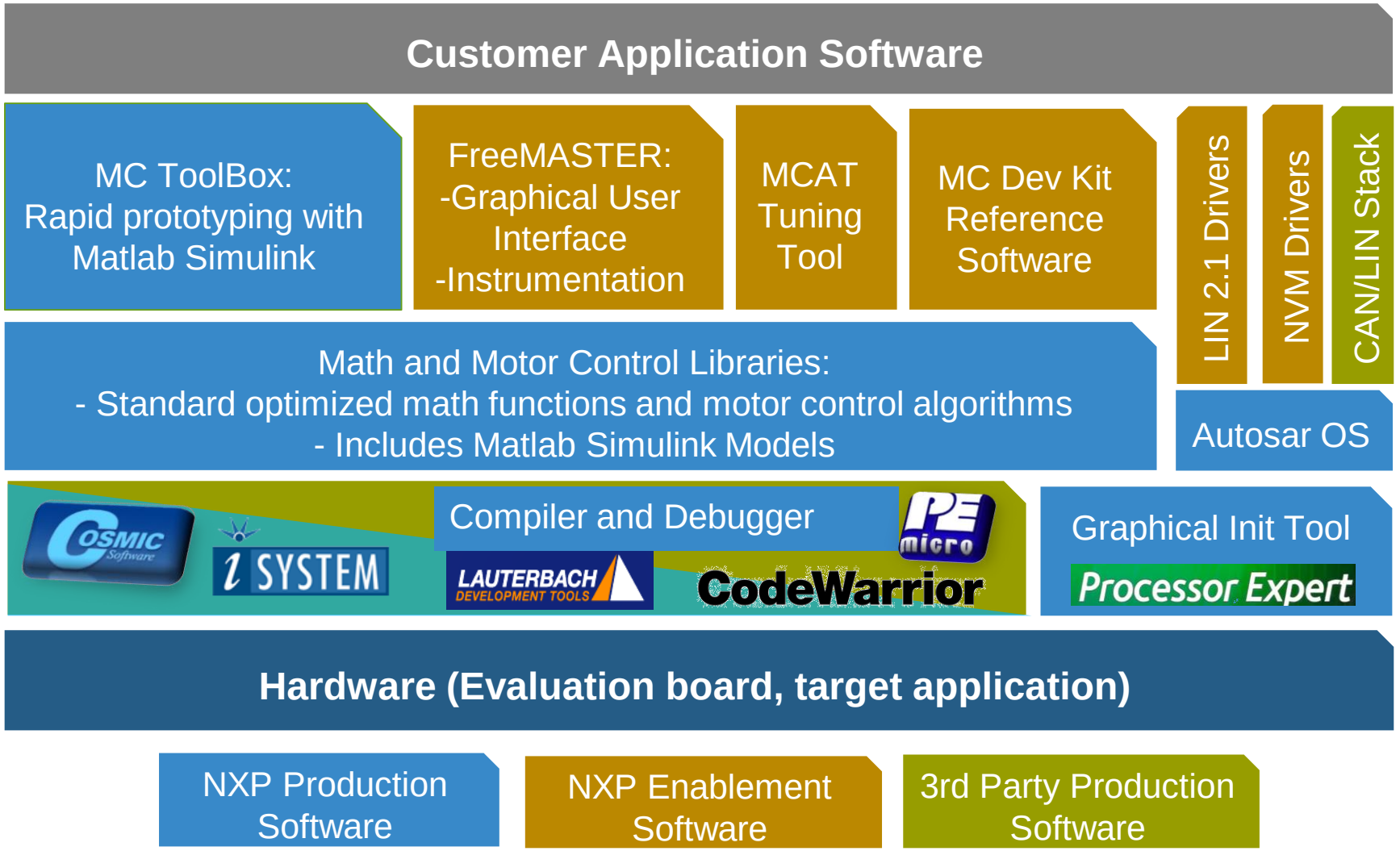
S12ZVML Application Schematic



PUBLIC USE

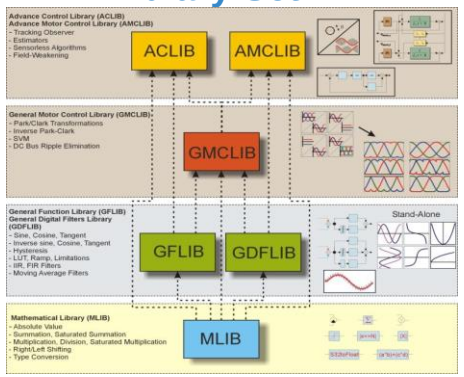
MOTOR CONTROL SOLUTIONS OFFERING

S12ZVM Development Ecosystem



The Complete Solutions Offering For Motor Control

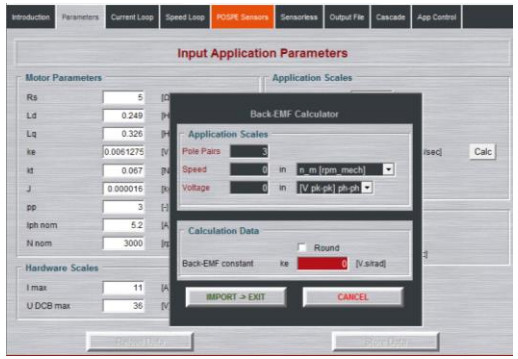
Automotive Math & Motor Control Library Set



Automotive Motor Control Development Kit Series

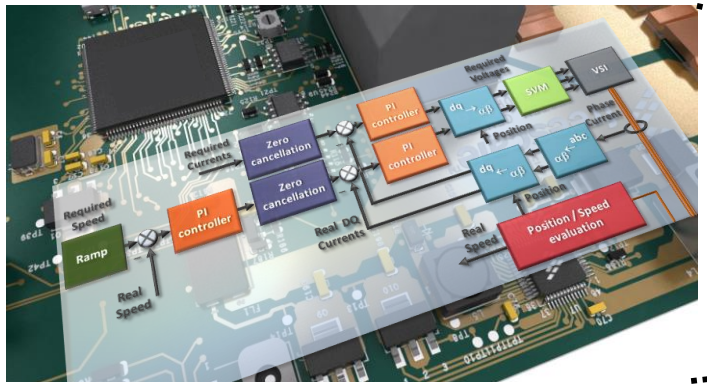


FreeMASTER & Motor Control Application Tuning (MCAT) Tools



NXP Electric Motor Control Know-how



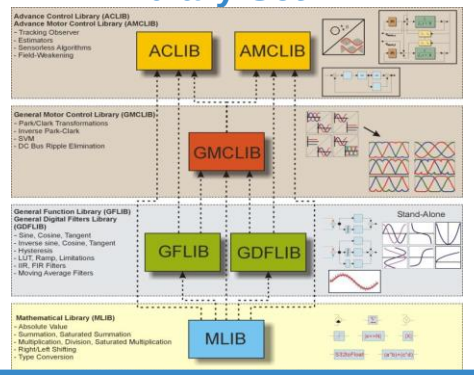




Final customer applications, based on S12 MagniV / MPC / S32K MCU

The Complete Solutions Offering For Motor Control

Automotive Math & Motor Control Library Set



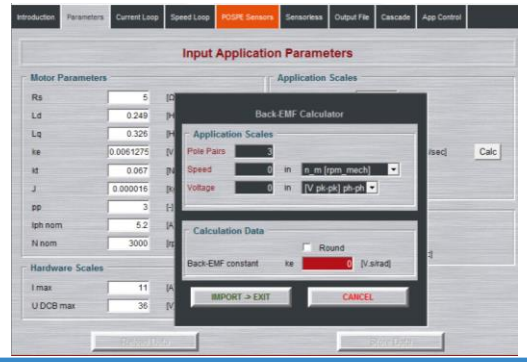
www.nxp.com/AutoMCLib

Automotive Motor Control Development Kit Series



www.nxp.com/AutoMCDevKits

FreeMASTER & Motor Control Application Tuning (MCAT) Tools

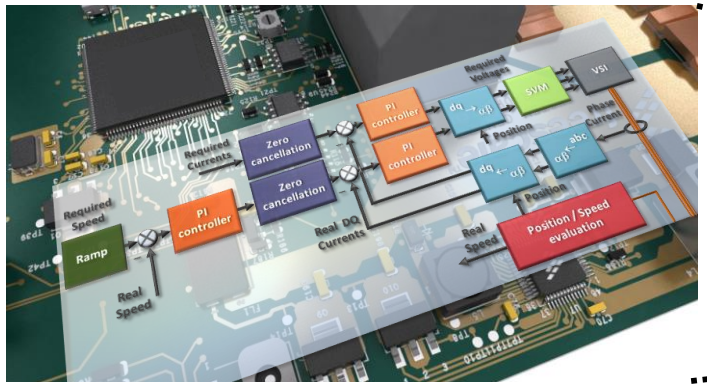


www.nxp.com//FreeMASTER, MCAT

NXP Electric Motor Control Know-how



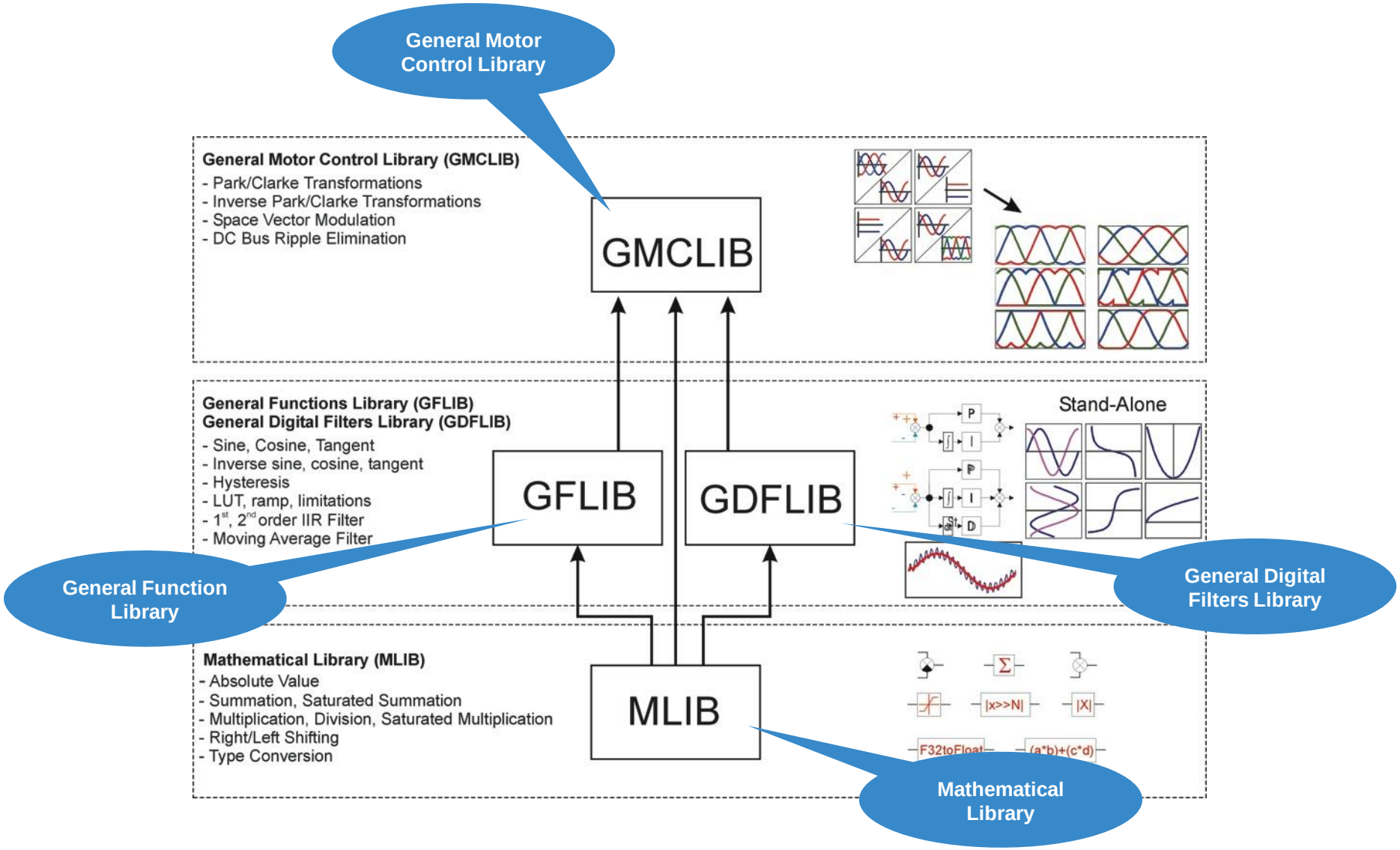
www.nxp.com/MotorControl





Final customer applications, based on S12 MagniV / MPC / S32K MCU

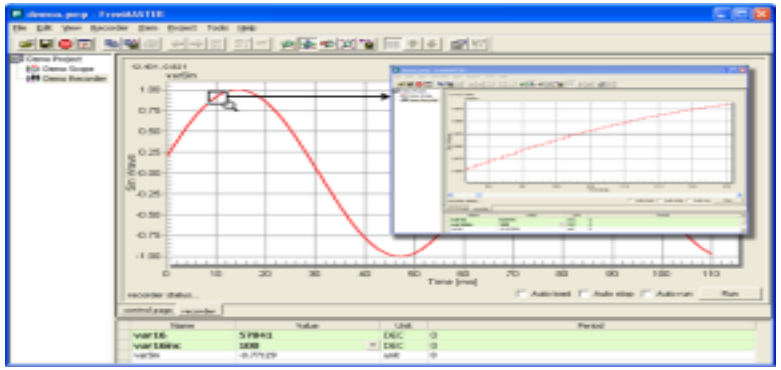
AMMCLib – Building Blocks for Your Motor Control SW



FreeMASTER – “Debugger for Real-Time Applications”

- **Real-Time Data Monitor Tool**
  - Read / modify your variables run-time
  - Oscilloscope / recorder capability





- **Scriptable Graphical User Interface**
  - Build your own GUI using sliders, gauges, buttons

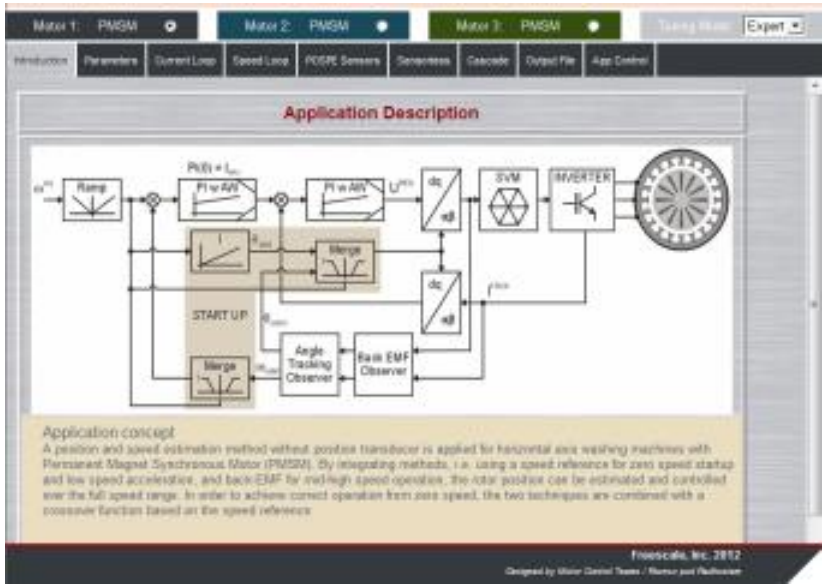


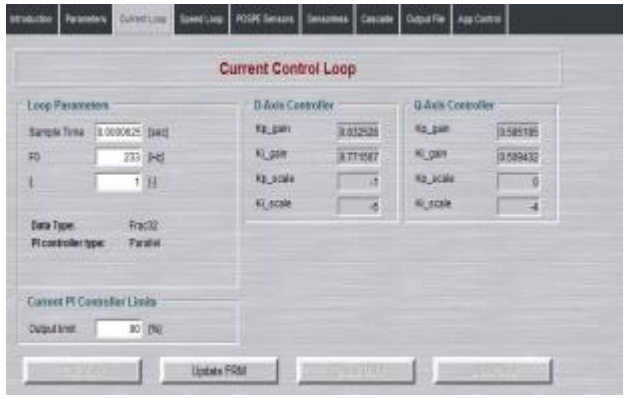
- **Demonstration Platform**
  - Create a comprehensive support package for your product

www.nxp.com/FreeMASTER

Make Any Motor Spin w/ MCAT Tool

- Tool guiding the user step by step to tune the control parameters of their MC application
- Run-time tuning of control parameters
- Generation of header file w/ resulting parameters
- NXP MCU independent

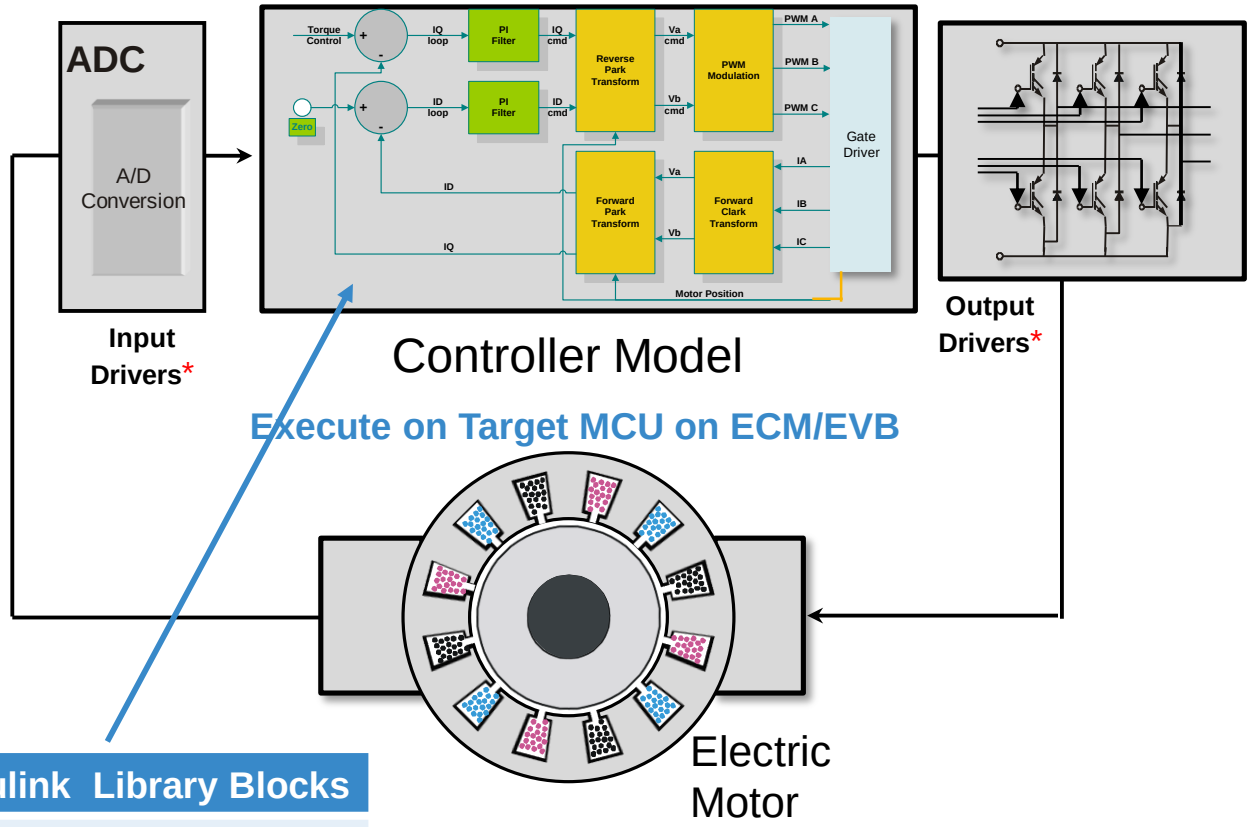


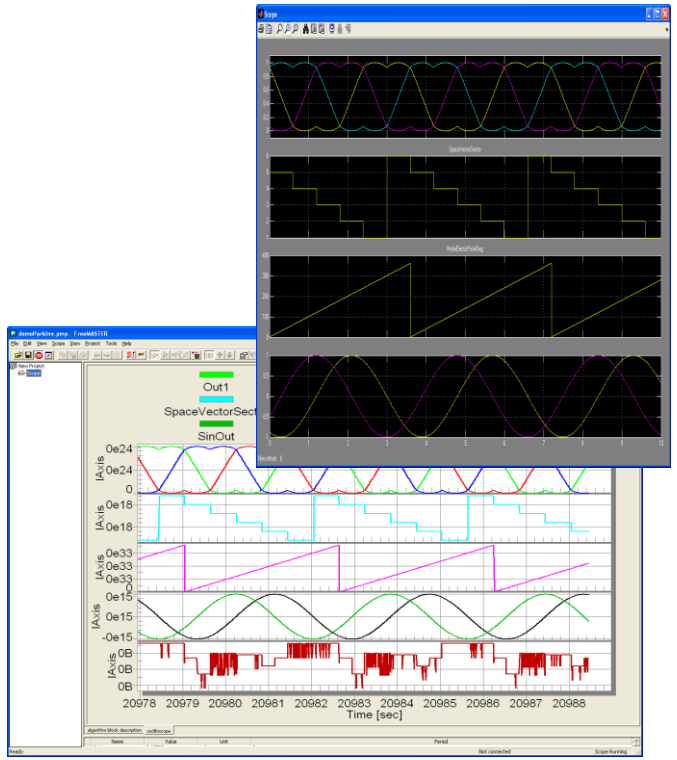




www.nxp.com/MCAT

Model Based Design Steps





S12ZVM Simulink Library Blocks

- Peripherals: PMF, Timer, ADC, PTU. etc.
- Math & Motor Control Library blocks: Clark, Park, PI, Mul, Atan, ..etc.

Step 1: Simulation in PC environment
Step 2: (SIL) Generated code executes as atomic unit on PC
Step 3: (PIL) Executes generated code on the target MCU
Step 4: Execute on Target MCU on ECM/EVB

S12 MagniV Benefits

S12 MagniV solutions deliver optimal system cost and physical footprint for sensor and actuator applications.

- Reduced PCB Space
  - Up to 30%
- Improved manufacturing efficiency
  - Replacing typically 3 IC by 1 MagniV reduces assembly and test cost while quality improves
- Reduced Bill Of Material (BOM)
  - Fewer components to purchase, handle, store and qualify
- Simplified motor control that speeds up time-to-market
  - Save up to 6 months on development, validation and ISO26262 implementation
  - Abstract the complexity of 3-phase motor control software development
  - Production-ready Automotive quality SW and Tools
  - SafeAssure program

S12ZVM Family Feature Set Summary

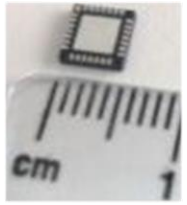
Connectivity	CAN	LIN	CAN	LIN	CAN	LIN			PWM			
Product Name	VMC256	VML128	VMC128	VML64	VMC64	VML32	VML31	VML31	VM32		VM16	
Package	80LQFP-EP	64LQFP-EP	64LQFP-EP	64LQFP-EP	64LQFP-EP	64LQFP-EP	64LQFP-EP	48LQFP-EP	64LQFP-EP	48LQFP-EP	64LQFP-EP	48LQFP-EP
EEPROM (bytes)	1K	512	512	512	512	512	128	128	128	128	128	128
PHY	CAN	LIN	0	LIN	0	LIN	LIN	LIN	HV	HV	HV	HV
Separate VREG	1+1	0	1	0	1	0	0	0	0	0	0	0
GDU (HS / LS)	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Bootstrap Diodes	0	0	0	0	0	0	3	3	3	3	3	3
Op Amp	2	2	2	2	2	2	2	1	2	1	2	1
ADC (ext. channels)	8 + 8	4 + 5	4 + 5	4 + 5	4 + 5	4 + 5	4 + 5	1 + 3	4 + 5	1 + 3	4 + 5	1 + 3
MSCAN	1	1	1	1	1	1	0	0	0	0	0	0
SCI	2	2	2	2	2	2	2	1	2	1	2	1
SPI	1	1	1	1	1	1	1	0	1	0	1	0
TIM (IC/OC channels)	4	4	4	4	4	4	4	3	4	3	4	3
PWM channels	6+4	6	6	6	6	6	6	6	6	6	6	6
Internal timers	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API	RTI+API
External FET Nominal Total Gate Charge (nC)	100-150	100-150	100-150	100-150	100-150	100-150	50-80	50-80	50-80	50-80	50-80	50-80
Package Size	12mm x 12mm	10mm x 10mm	10mm x 10mm	10mm x 10mm	10mm x 10mm	10mm x 10mm	10mm x 10mm	7mm x 7mm	10mm x 10mm	7mm x 7mm	10mm x 10mm	7mm x 7mm
Samples	Now	Now	Now	Now	Now	Now	Now	Q2 2015	Now	Q2 2015	Now	Q2 2015
Production release	H2 2016	Q1 2014	Q1 2014	Q1 2014	Q1 2014	Q1 2014	Q1 2016	Q3 2016	Q1 2016	Q3 2016	Q1 2016	Q3 2016

S12ZVL Family

Integrated General Purpose LIN Node

Key Features:

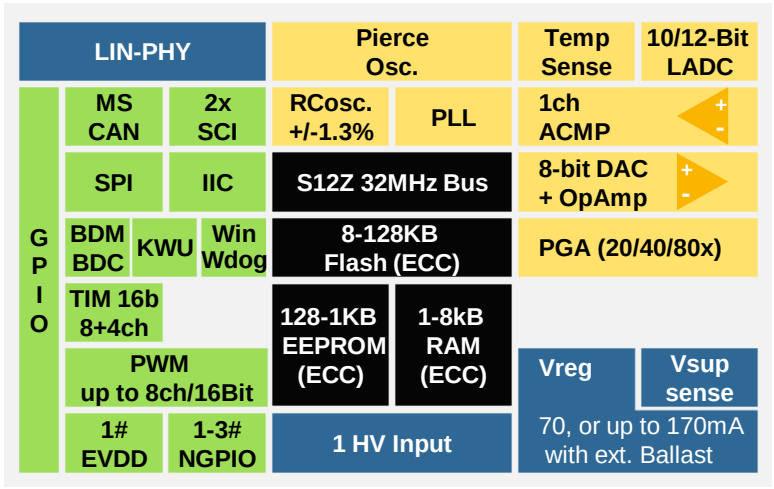
- S12Z core (32MHz)
- 12V VREG (device + ext comp)
  - 70mA total (170mA with ext. Ballast)
- LIN-PHY, LIN2.x / J2602 compliant
- On chip RC Oscillator (trimmed to +/- 1.3% over full temp range)
  - No need for ext Xtal on LIN
- High Voltage Input (HVI)
  - internal tied ADC for 12V analog measurements
- Evdd 5V/20mA (switchable output overcurrent protected)
- List-based 10-Bit ADC (LADC)
- Optional S12ZVL**A** : enhanced analog
  - 12-Bit LADC, PGA, Analog Comparator, and DAC
- 1-3x N-GPIO (25 mA sink capability)
- Small 32QFN 5x5mm footprint option
- ISO26262 support (FMEDA, safety guide)











Family Options:

- Flexible Memory Options: 8kB to 128kB Flash version
- Optional Analog Enhancement (S12ZVL**A**64/96/128) with 12 Bit ADC, ACMP, DAC & PGA
- 32-LQFP , 48-LQFP or 32QFN Packaging
- C / V / M Temperature options (up to 125°C Ta)

Target Applications:

Space-constrained LIN slave nodes

- Sensors / actuators
- Switch panel / user interface
- Interior RGB LED lighting
- Ultrasonic sensors

Target Applications



LIN Sensors

Product Function

- Connect sensors to LIN-Network (with signal pre-conditioning)

Market Requirements

- LIN-PHY, 12V-Vreg, MCU
- Small formfactor (QFN)
- ADC, SPI



LIN Switch Panels

Product Function

- Read multiple switch-positions and feed into LIN-network

Market Requirements

- LIN-PHY, 12V-Vreg, MCU
- Multiple GPIOs
- ADC



LIN Actuator

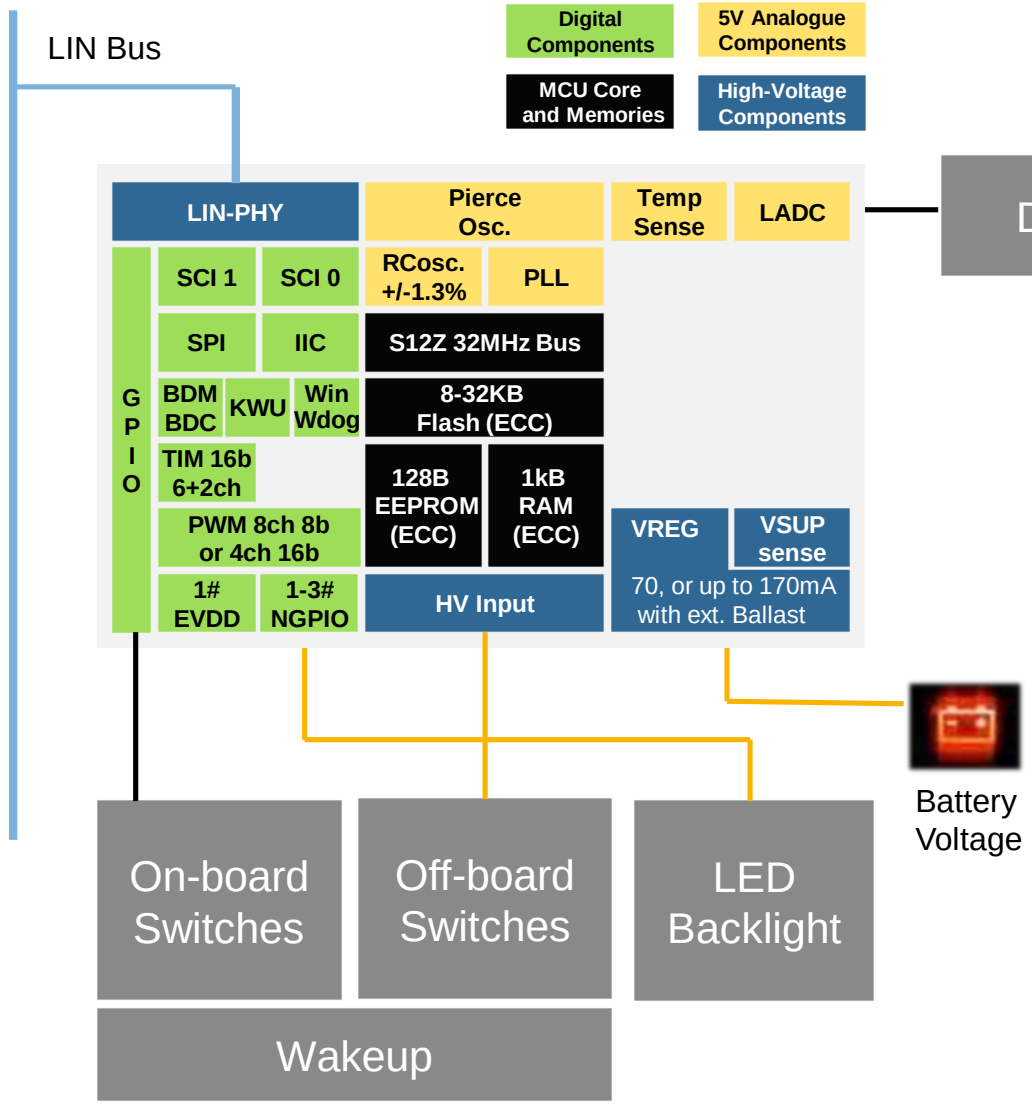
Product Function

- Convert LIN-command into an activity (eg driving LEDs)

Market Requirements

- LIN-PHY, 12V-Vreg, MCU
- Drivers (3x25mA drive strength in case of RGB-LED)
- ADC

S12ZVL for Switch Panel Applications

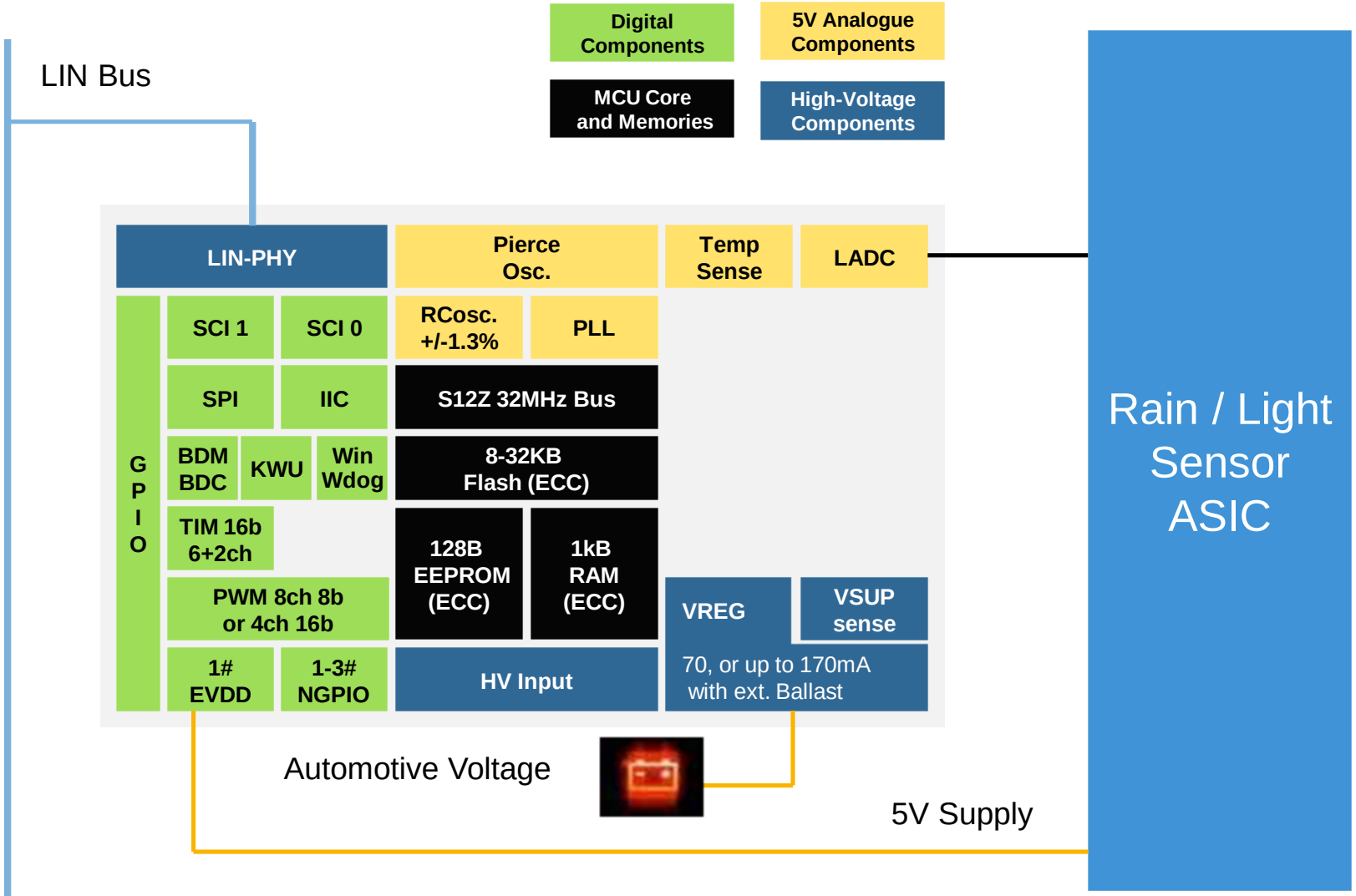








S12ZVL for Sensor Applications

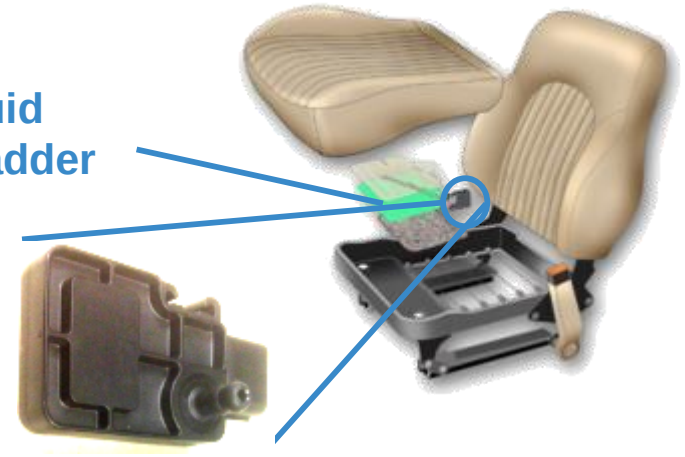


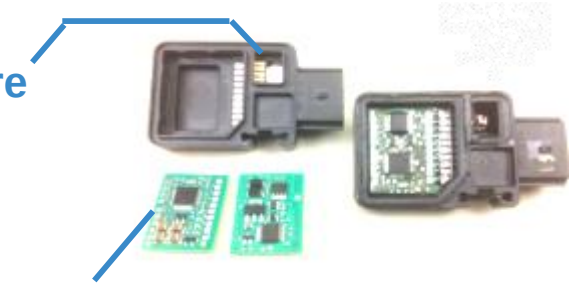




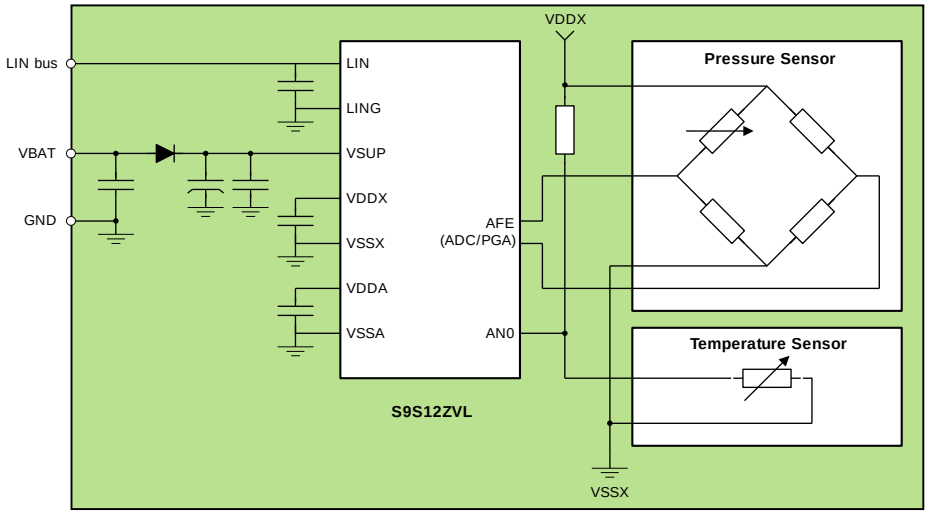
http://www.bmw.com/com/en/insights/technology/technology_guide/articles/rain_sensor.html

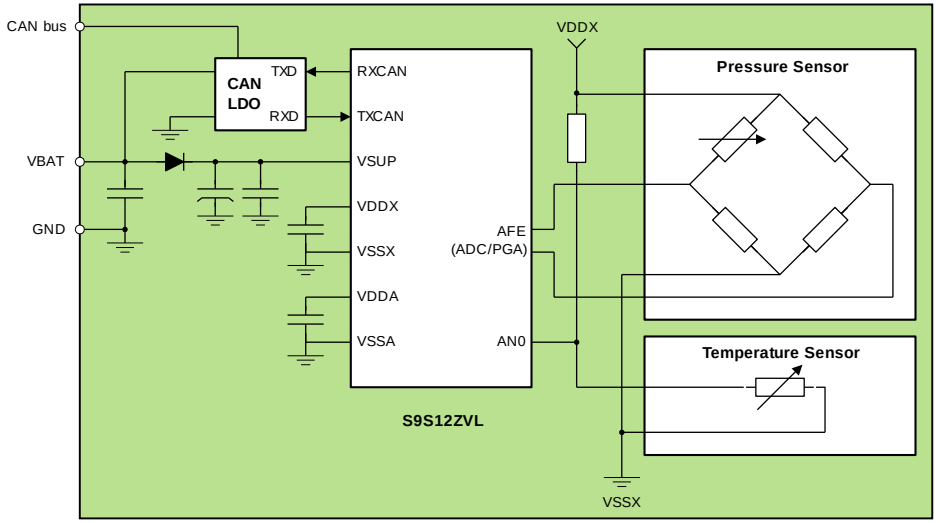
S12ZVL128 in Occupant Detection System





MCU doing signal-preprocessing &
LIN (CAN) communication





S12ZVL64/96/128 (VL128) – Key Features

2 UARTs
One linked to LIN Phy, 2_{nd} as independant Test Intf.

MSCAN
Eg. CAN/LIN-gateway

SPI, IIC - Serial link to other Ics (sensors, ASICs) or indep. test Interface

Up to 23 Wakeup pins
Combined with Analog Input pins and HV pins

2 Timer modules
8ch / 16Bit + 4ch / 16 Bit

8ch 16Bit PWM
Eg. LED-dimming

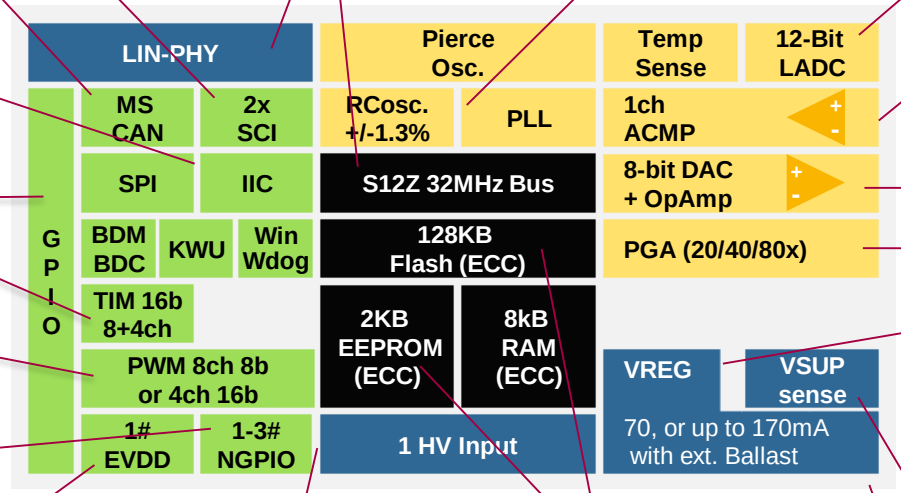
NGPIO (PP1/3/5)
1-3# 5V / 25mA sink
Eg. for RGB-LED

External Supply
5V or 3.3V / 20mA switch-able for local (same PCB), over current protected. Eg. Sensor supply

LIN Physical Layer
LIN2.2 and SAE J2602 compliant
+/- 8kV ESD capability

S12Z CPU
16-bit, 32b MAC, linear addressing Harvard architec. compatible within MagniV

On chip RC OSC
factory-trimmed to +/- 1.3% , meets LIN - needs



12Bit list based ADC
up to 10 ext. Ch.+7 int. Ch (temp sense, supply mon., HVI, int. Ref. Voltages)
Executes command list & write result directly to RAM (DMA)

Analog Comparator
With rail to rail input; fast reaction to analog values

Digital/Analog Converter
Inc. Op-Amp. Feed ACMP

Programable Gain Amp.
measuring few mV-signals

Voltage Regulator
5V or 3.3V 70mA total supply (up to 170mA with ext. ballast for more current and lower power dissipation)

Supply sensing
Monitoring supply voltage (sense after protection)

Packaging Options
32-LQFP and 48-LQFP
32-QFN 5x5mm

High Voltage Input
12V Input for Switch Monitoring
Routable to ADC

EEPROM
4 byte eraseable 100k program/ erase cycles

Flash (64-128k)
512B erasable 10k p/e cycles Can be used for Data (parameter, config, calibr.)

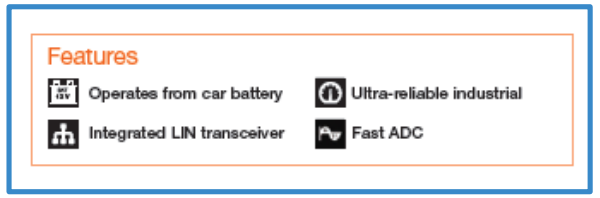
Digital Components | 5V Analogue Components | MCU Core and Memories | High-Voltage Components

S12 MagniV S12ZVL Smallest Integrated LIN Slave MCU

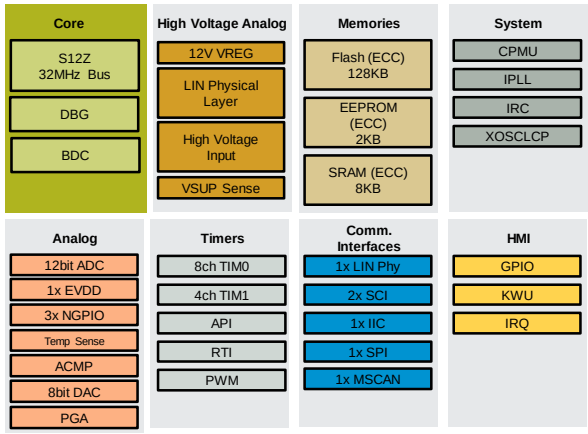
- System in a Package - Highly integrated part which is ideal for space constrained applications such as Actuators, Sensors, LIN nodes etc.
- Low System Cost – Direct connection with Battery, integrated LIN Phy, EVDD and NGPIOs reduce system, qualification and manufacturing cost.
- High Reliability – High immunity to EMI and ESD stresses, LIN 2.x compliant with +/- 8kV ESD capability.
- Enablement – Supported by comprehensive hardware and software system (free low-level drivers to enterprise 3rd party tools) which reduces development costs and time to market.

S12ZVL Specifications			
Flash EEPROM	8 – 128 KB 2 KB	Timer/ PWM	8ch. + 4ch. 16bit/ 8ch 16bit
RAM	8 Kb	12V VREG	12V/70mA, 170mA w ext ballast
Core	S12Z	EVDD	1ch 5V/20mA (source)
Speed	32 MHz	NGPIO	3ch 5V/25mA (sink)
ADC	10ch 12bit	SCI/SPI/IIC	2/1/1
HVI	1	Packages	32LQFP, 32QFN, 48LQFP
LIN Phy	1	Op Range	5.5V – 18V

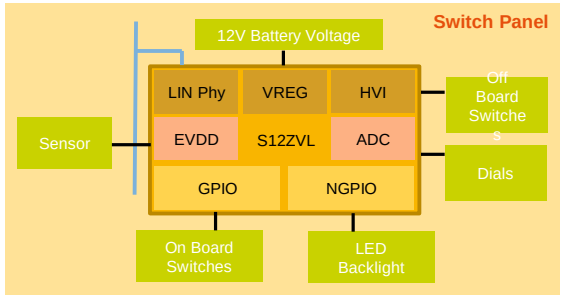
32LQFP	32QFN-EP	48LQFP
S9S12ZVL32F0MLC	S9S12ZVLS3F0MFM	S9S12ZVL32F0MLF
S9S12ZVL16F0MLC	S9S12ZVLS1F0MFM	S9S12ZVL16F0MLF
S9S12ZVL8F0MLC	S9S12ZVLS8F0MFM	S9S12ZVL8F0MLF
S912ZVLA12AF0MLC	S912ZVLA12AF0MFM	S912ZVLA12AF0MLF



Block Diagram



Main Application Diagram



For more information, visit www.NXP.com/PARTNUMBER

Success Stories

- Lin-based User-Interface in Europe and Asia
- Lin-based Immobilizer receiver in US
- Lin-based Mirror control in Europe
- Lin-based Airquality sensor in Europe

Target Applications

- LIN nodes
- LIN switch panel / user interface
- LIN actuators, sensors
- HVAC
- Lighting controls
- Ambient lighting
- Seat positioning
- Ultrasonic Sensors

Enablement Tools

- Evaluation Boards / Hardware
  - TRK-S12ZVL
  - TRK-S12ZVL128
  - DEVKIT-ZVL128
- Reference Solutions
  - Ultrasonic distance measurement
  - LIN RGB LED
- CodeWarrior, Cosmic
- LIN drivers

S12ZVC Family

Integrated Small CAN Nodes

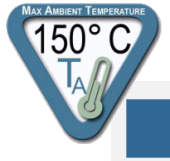
Key Features:

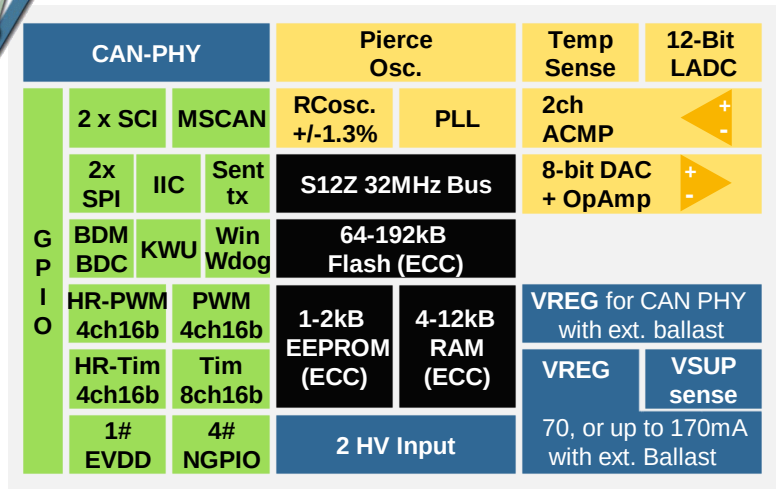
- S12Z core (32MHz)
- On chip CAN PHY:
  - CAN-supply requires ext. Ballast Transistor
  - Dominant Txd timeout
  - OEM emission limits achieved WITHOUT Choke (up to 500kbps)
- 12V VREG (device + ext comp)
  - 70mA total, 170mA with ext. Ballast
  - High Voltage Input (HVI)
    - internal tied ADC for 12V analog measurements
- Specific features for sensor type applications:
  - list-based 12-Bit ADC (LADC)
  - 16ns resolution Timer / PWM
  - 2x Analog Comparator with 8Bit DAC
  - SENT
  - ISO26262 support (FMEDA, safety guide)
- Target Applications:
- Any automotive CAN-node (non-Autosar)
- Powertrain sensors & actuators
- CAN-based user-interfaces











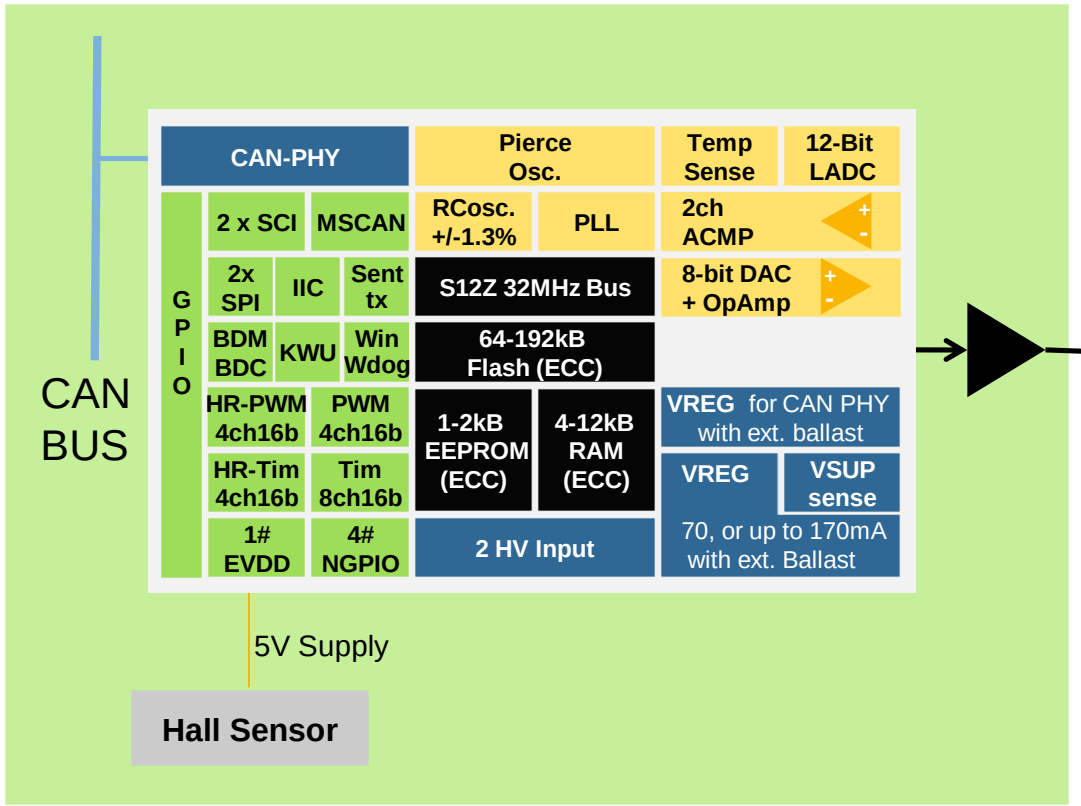
Family Options:

- Flexible Memory Options: 64kB to 128kB Flash version
- 48-LQFP or 64-LQFP-EP Packaging
- C / V / M / W Temperature options (**up to 150°C Ta**)
- Fully featured (S12ZVCAx) or reduced featureset S12ZVCx)

S12ZVC for Seatbelt Pretensioner

S12ZVC Benefits:

- CAN-based (LIN too slow)
- Limited PCB-space
- ASIL-requirements

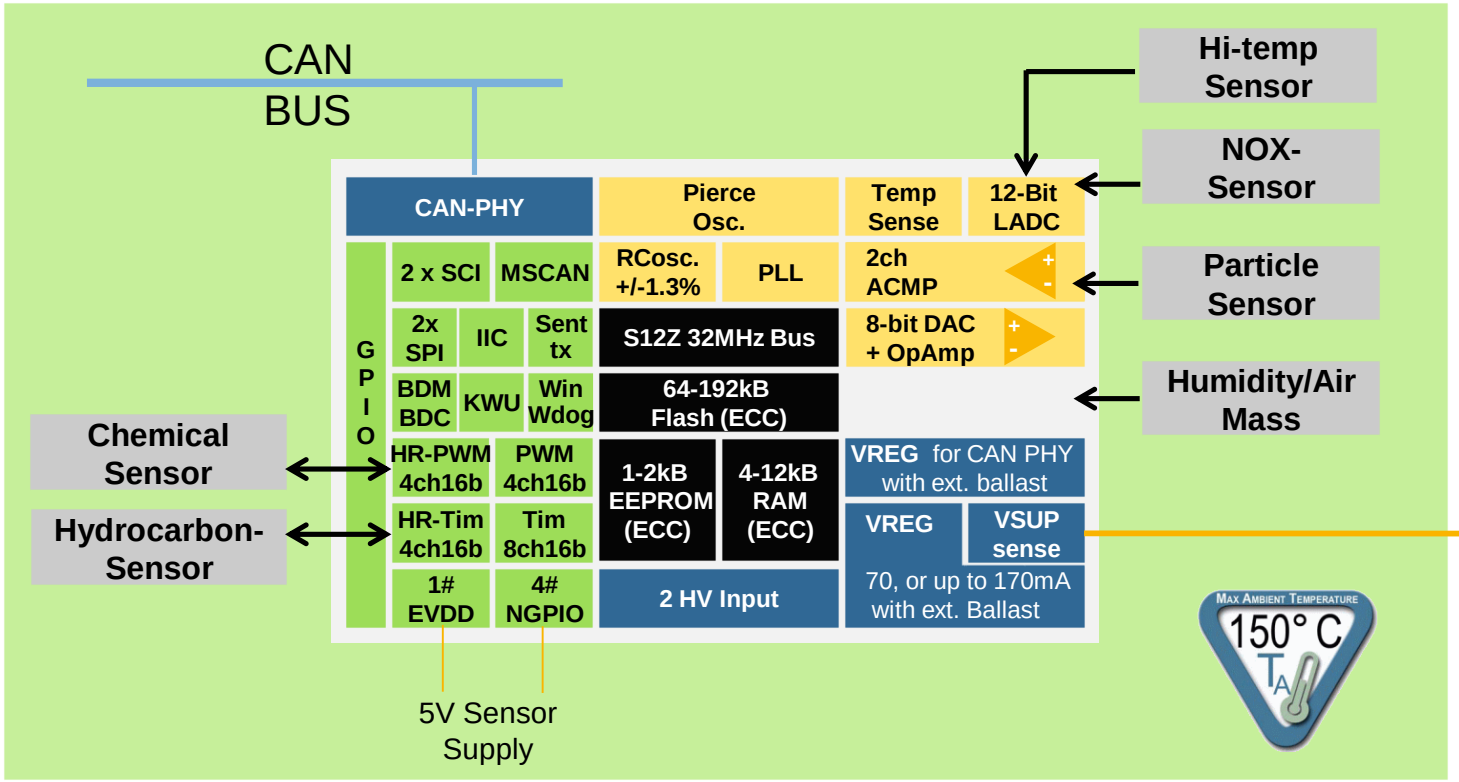




S12ZVC for Powertrain Sensors

S12ZVC Benefits:

- Limited PCB-space
- ASIL-requirements
- High resolution timers and DMA enabled LADC
- On-chip analog comparator and DAC
- EVDD 5V switchable sensor supply





Battery Voltage



3.5 to 40V

S12ZVCA (Hearst-fully Featured) – Key Features

MS-CAN 2.0A/B
linked to CAN Phy

SENT (tx)
Sent Transmitter Module

2SCI, 2SPI, IIC
Interfacing to other Ics (Sensors, ASICs), or for debugging, programming

Up to 34 Wakeup pins
Combined with Analog Input pins and HV pins

4ch+4ch 16Bit PWMs
16ns / 64MHz resolution for ultrasonic signals

4ch+8ch 16Bit Timers
16ns / 64MHz resolution for ultrasonic signals

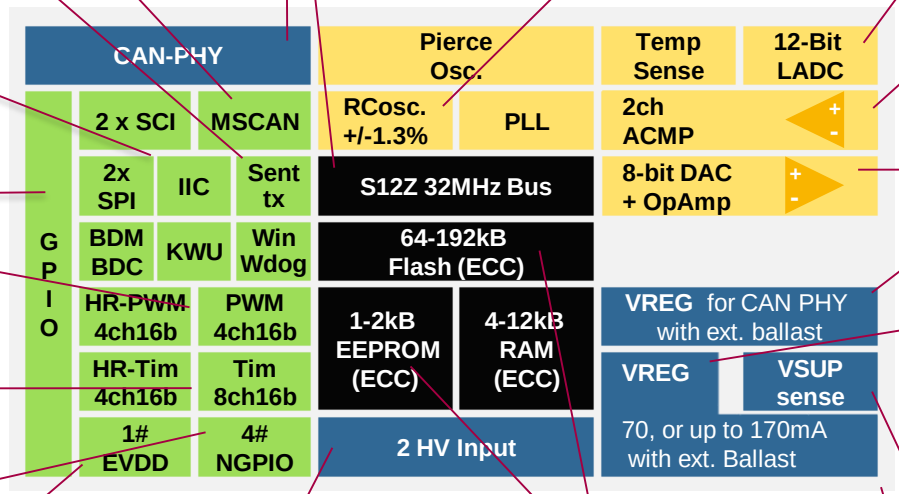
NGPIO (PP1/4/5/6)
4# 5V/25mA sink; Eg. LED

External Supply
5V/20mA switch-able for local (same PCB), over current protected. Eg. Sensor supply

CAN Physical Layer (HighSpeed)
Supporting dominant Txd timeout

S12Z CPU
16-bit, 32b MAC, linear addressing Harvard architec. compatible within MagniV

On chip RC OSC
factory-trimmed to +/- 1.3%



2 High Voltage Inputs
12V Inputs for Switch Monitoring Routable to ADC

EEPROM
4 byte eraseable 100k program/ erase cycles

Flash (64-192k)
512B erasable 10k p/e cycles Can be used for Data (parameter, config, calibr.)

12Bit list based ADC
up to 16 ext. Ch. (+8ch int for temp sense, supply mon., HVI, int. Ref. Voltages)
Executes command list & write result directly to RAM

2# Analog Comparator
With rail to rail input; fast reaction to analog values

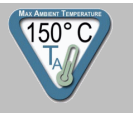
Digital/Analog Converter
Inc. Op-Amp. Eg. feed ACMP

2nd Voltage Regulator
For CAN-Phy-supply

Voltage Regulator
5V/70mA total supply (up to 170mA with ext. ballast for more current and lower power dissipation)

Supply sensing
Monitoring supply voltage (sense after protection)

Packaging Options
48-LQFP (Grade1)
64-LQFP-EP (Grade 0)



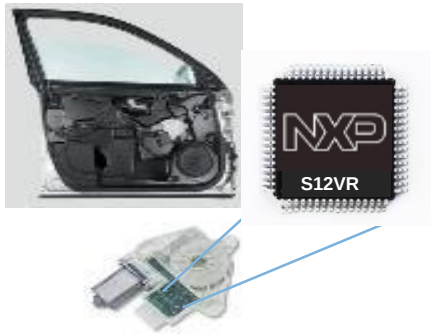
Digital Components
5V Analogue Components
MCU Core and Memories
High-Voltage Components

MagniV: Product Families

MagniV offers a broad portfolio of solutions for motor control or interface nodes

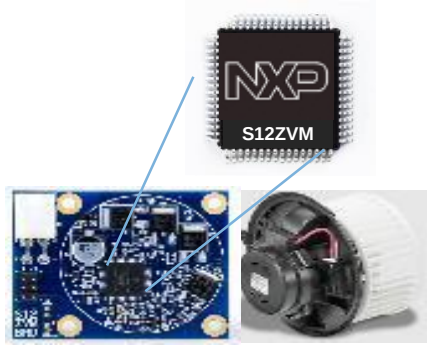
Motor Control focus

S12VR
Relay driven motors



- Window lift
- Sunroof
- Power doors

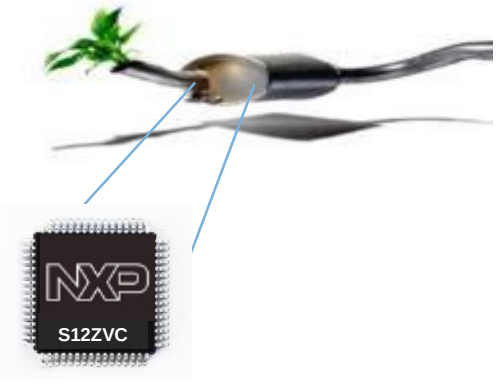
S12ZVM
BLDC/DC motors



- Fuel pump
- Oil pump
- Fans
- Wipers

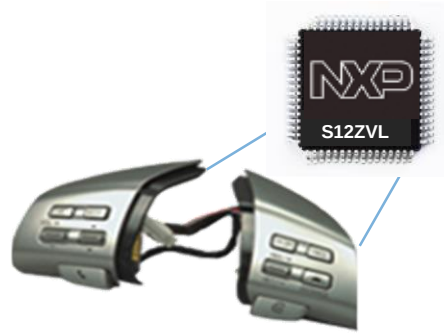
Sensor Interface focus

S12ZVC
CAN nodes



- Safety sensors
- Emission sensors
- Gear shift

S12ZVL
LIN Nodes



- Steering wheel switches
- Door modules
- Sensors

Reduced PCB Space

Reduced Bill of Material

Improved manufacturing efficiency and quality

Simplified development



SECURE CONNECTIONS
FOR A SMARTER WORLD