S12 MagniV Mixed-Signal Microcontrollers Overview

Mixed-signal MCUs for motor & CAN/LIN

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freescale™

External Use

Agenda

- Overview
- Products details
  - S12VR
  - S12ZVM
  - S12ZVL
  - S12ZVC
  - S12ZVH

Overview

S12 MagniV Benefits

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

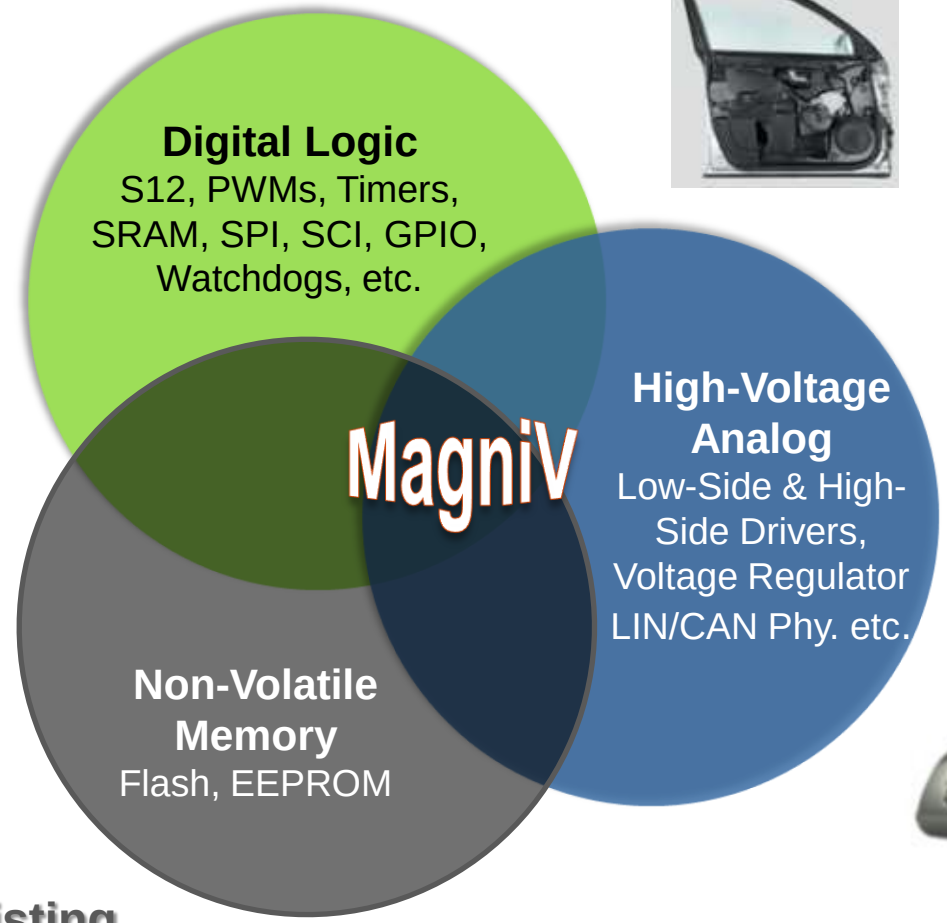
Reduced PCB Space
Up to 30%

Improved manufacturing efficiency
Replacing three ICs with one S12 MagniV mixed-signal MCU 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 six months on development, validation and ISO2 6262 implementation
- Abstract the complexity of 3-phase motor control software development
- Production ready automotive quality software and tools
- SafeAssure program

A Technology Sweet Spot for Sensor and Actuators

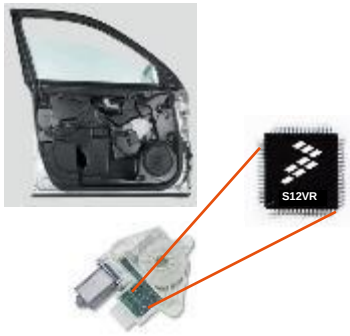
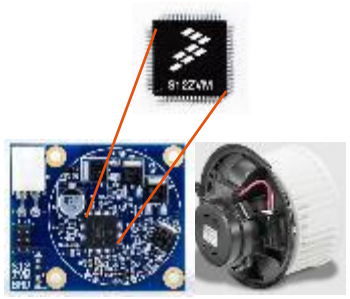
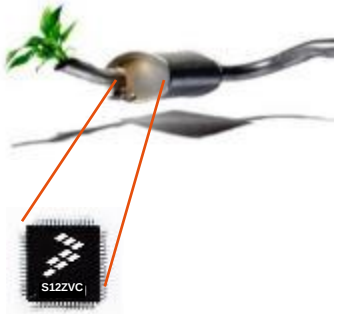


Existing
Low Leakage 180 nm CMOS+NVM

40 V UHV Devices

S12 MagniV Portfolio: Integration Beyond the MCU

Our **S12 MagniV** portfolio simplifies system design with the integration of high-voltage analog features onto MCUs for automotive applications

MM912/S12VR Window Lift	S12ZVM BLDC Motor Control	S12ZVC Small CAN Nodes	S12ZVL LIN Nodes
			

- **Reduced PCB space**
- **Reduced Bill of Material**
- **Improved manufacturing efficiency**
- **Simplified development**

Product Details

S12 CPU with an integrated voltage regulator, LIN physical layer and high-side / low-side drivers for relay driven window lift motor

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

S12VR – *Details*

2 UARTs
One linked to LIN Phy, 2nd as reardoor communication or indep. test Interface

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

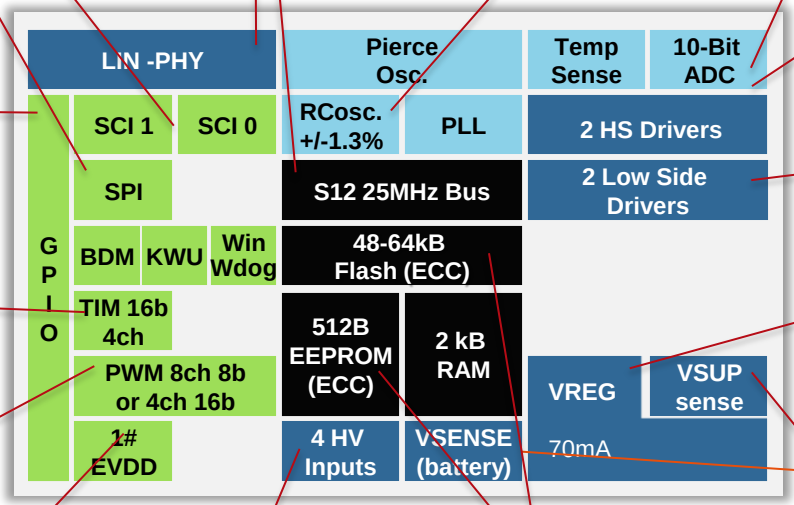
S12 CPU
16-bit, compatible with S12G Family and existing SiP Solutions.

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

ADC - up to 6 ext. Ch.
+4 int. channels for temp sense, supply monitors, HV inputs, internal ref Voltages

SPI
As alternative test Interf.

Up to 2 HS drivers
For LED and Switch supply



Up to 16 Wakeup pins
Combined with Analog Input pins and HV pins

2 Low-Side Drivers
Protected LS Drivers to drive relays directly

4ch 16bit Timer
Hall inputs, SW timing

Voltage Regulator
5V/70mA for the whole system

8ch PWM
Routable to HS and LS outputs, for LED dimming

Supply- and Battery-sensing
Voltage sense before (VSENSE) and after protection diode (VSUP)

External Supply
5V / 20mA switchable for local (same PCB), over current protected.
Eg. supplying Hallsensors

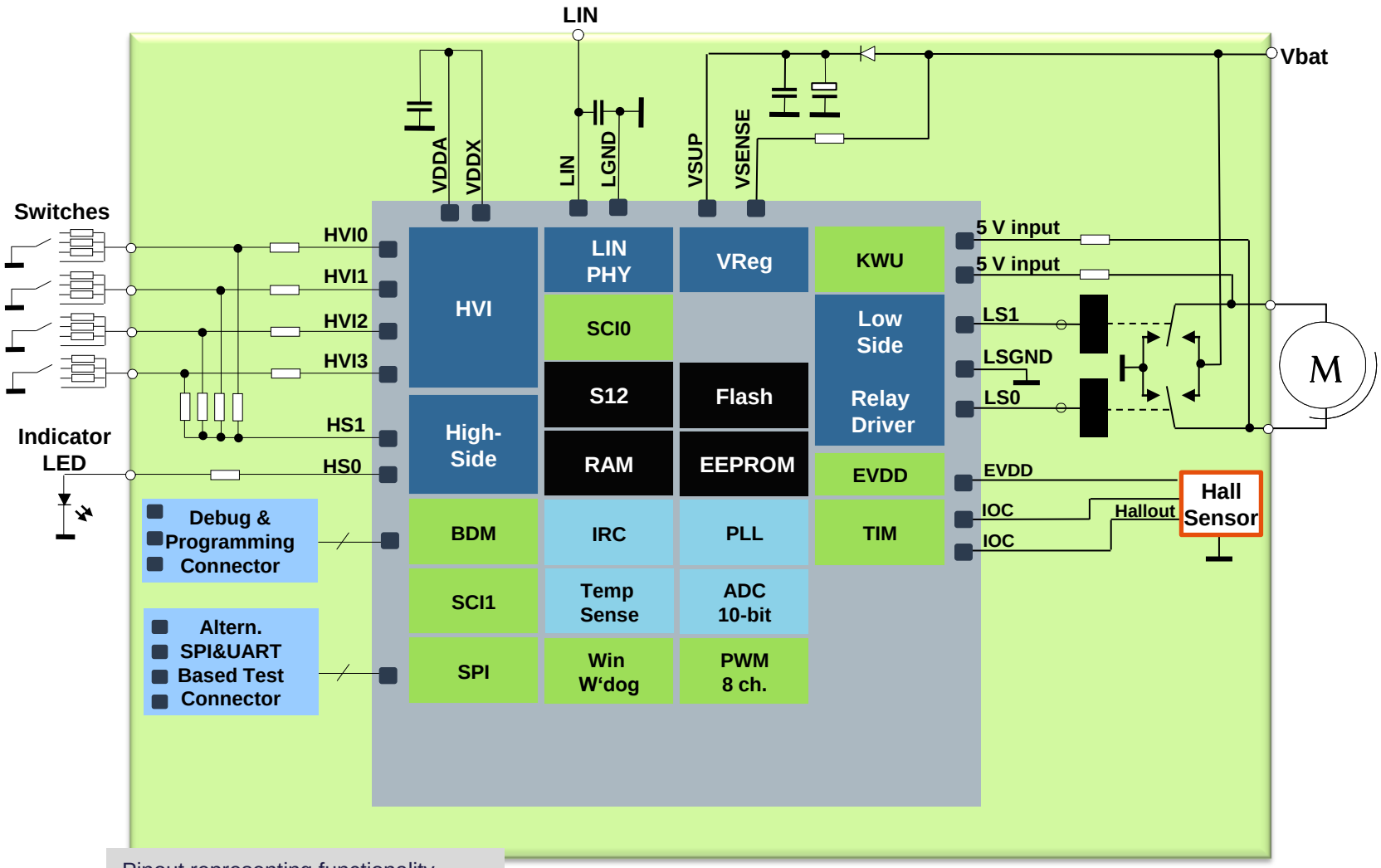
4 High Voltage Inputs
12V Inputs for Switch Monitoring Routable to ADC

EEPROM
4 byte eraseable 100k program/ erase cycles

Flash (48/64kB)
512B erasable, 10k p/e cycles
Can be used for Data (parameter, config, calibr.)

Packaging Options
32LQFP and 48LQFP

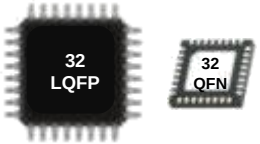
Window Lift with S12VR



Pinout representing functionality, physical pins location is not correct

S12VR Package & Feature Options

Product Name	S12VR		
Package	**32LQFP / QFN**	**32LQFP**	**48-LQFP**
Flash Memory	**32 or 16kB**	**64/48kB**	**64/48kB**
EEPROM	**128B**	**512B**	**512B**
RAM	2kB	2kB	2kB
High Side Drivers	**1**	**1**	**2**
Low Side Drivers	2	2	2
HV Inputs	**2**	**4**	**4**
Sensor Supply (EVDD)	1	1	1
A/D ext. Channels	**2** (+2HVIs)	**2** (+4HVIs)	**6** (+4HVIs)
PWM channels	8 x 8-bit (4x16-bit)	8 x 8-bit (4x16-bit)	8 x 8-bit (4x16-bit)
Timer Channels	4 x 16 Bit	4 x 16 Bit	4 x 16 Bit
SCI modules	1	2	2
SPI modules	-	1	1
Max. 5V GPIOs	**16**	**16**	**28**
Interrupt/Wakeup Inputs	**8**	**8**	**16**
Package Body Size	7x7mm^2 / 5x5mm^2	7x7mm^2	7x7mm^2
Pin Pitch	**0.8mm / 0.5mm**	**0.8mm**	**0.5mm**



16bit MCU with 12/5V voltage regulator, LIN physical layer, and MOSFET pre-drivers for DC, BLDC and PMSM motors

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

S12ZVML *(LIN Version) – Details*

2x UARTs
One linked to LIN Phy, 2nd as independant Test Intf.

SPI
As alternative test Interf or for peripherals (sensors, …)

MSCAN 2.0A/B
CAN Controller

Up to 18 Wakeup pins
Combined with Analog Input pins

4ch 16bit Timer
Hall Inputs, SW timing

6-ch PMF
15bit PWM for motor control with dead time, fault mgmt

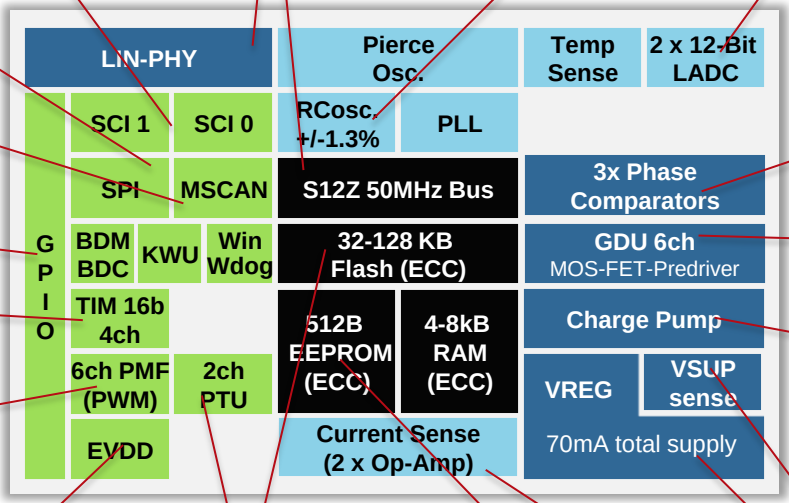
External Supply
5V / 20mA switchable for local (same PCB), over current protected.
Eg. supplying Hallsensors

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

S12Z CPU
16-bit, 32-bit MAC, linear addressing Harvard architech compatible within S12 MagniV

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

2 x 12-bit list based ADC
Simultaneous measurement 5+4ch external. Plus 8ch int (temp sence, GDU phase, Ref voltages) with DMA



3x Phase Comparators
for BEMF zero crossing detection in sensorless BLDC

6-ch GDU
Low side and high side FET pre-drivers for each phase with 100-150nC total gate Charge

Charge Pump
To support reverse battery protection and boostrap assist for 100% duty-cycle

Vsup sense
Monitoring supply voltage

Voltage Regulator
5V/70mA for whole system

2x Op-Amp for current measurement / sensing

PTU
Enables synchronization between PMF and ADC

Flash (32/64/128kB)
512B erasable. 10K p/e cycles. Can be used for Data

EEPROM
4 byte eraseable, 100K program / erase cycles

AEC-Q100 Grade 0
Qual'ed up to 150°C Ta

Packaging Option
64LQFP-EP

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

S12ZVMC *(CAN Version 64-128kB) – Details*

2x UARTs
As independant Test Intf.

SPI
As alternative test Interf or for peripherals (sensors, …)

MSCAN 2.0A/B
CAN Controller

Up to 18 Wakeup pins
Combined with Analog Input pins

4ch 16bit Timer
Hall Inputs, SW timing

6-ch PMF
15bit PWM for motor control with dead time, fault mgmt

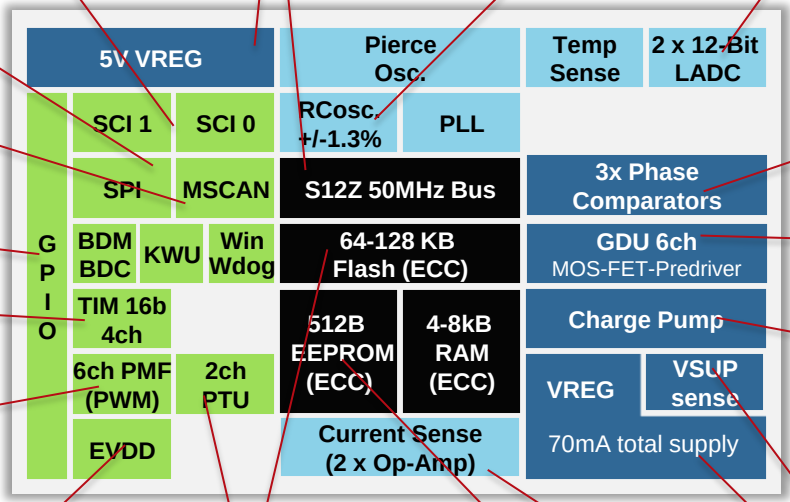
External Supply
5V / 20mA switchable for local (same PCB), over current protected.
Eg. supplying Hallsensors

2nd 5V Vreg
For supplying an external CAN-PHY independant from main VREG

S12Z CPU
16-bit, 32-bit MAC, linear addressing Harvard architech compatible within S12 MagniV

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

2 x 12-bit list based ADC
Simultaneous measurement 5+4ch external. Plus 8ch int (temp sence, GDU phase, Ref voltages) with DMA



3x Phase Comparators
for BEMF zero crossing detection in sensorless BLDC

6-ch GDU
Low side and high side FET pre-drivers for each phase with 100-150nC total gate Charge

Charge Pump
To support reverse battery protection and boostrap assist for 100% duty-cycle

Vsup sense
Monitoring supply voltage

Voltage Regulator
5V/70mA for whole system

2x Op-Amp for current measurement / sensing

PTU
Enables synchronization between PMF and ADC

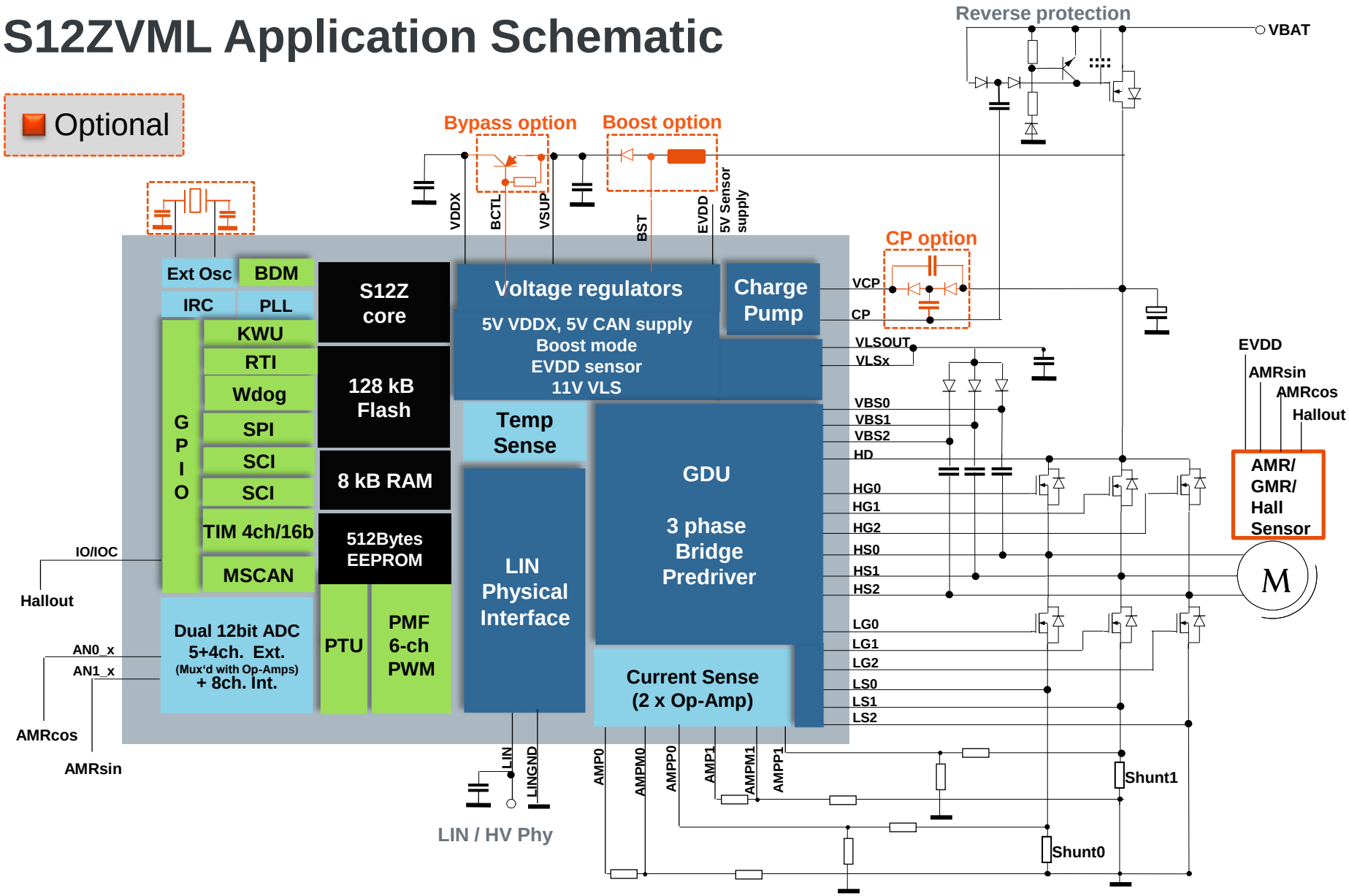
Flash (64/128kB)
512B erasable. 10K p/e cycles. Can be used for Data

EEPROM
4 byte eraseable, 100K program / erase cycles

AEC-Q100 Grade 0
Qual'ed up to 150°C Ta

Packaging Option
64LQFP-EP

S12ZVML Application Schematic



Gate Driver Unit (GDU)

11V LDO

supplies the LS drivers

charges bootstrap cap for the HS drivers

Voltage Monitoring

HD High Voltage Monitor @ typ. 21/27.3 V

VLS Low Voltage trip point: 6.2 .. 7V

Integrated Dividers

HD: divider 12 ; HS : divider 6

Phase Comparators

Compares HS against DCbus/2 in HW

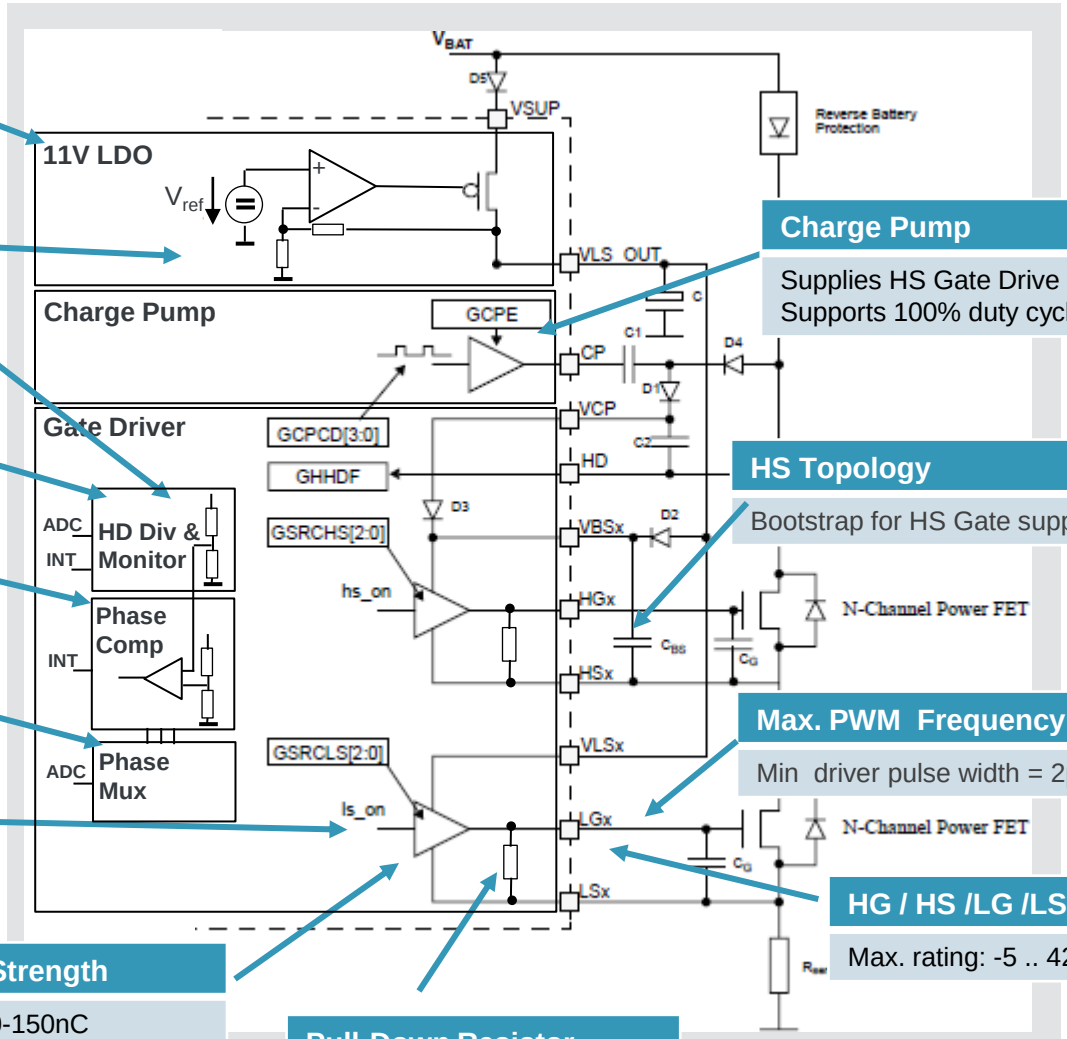
Phase Multiplexer

Switched in each sector

Slew Rate Control

Output current limitation of Iout via selectable Iref

8 selectable slew rates



Charge Pump

Supplies HS Gate Drive

Supports 100% duty cycle

HS Topology

Bootstrap for HS Gate supply

Max. PWM Frequency

Min driver pulse width = 2µs

HG / HS /LG /LS

Max. rating: -5 .. 42V

Drive Strength

Typ 100-150nC

Typ. 6.3 Ohm Switch on

Typ. 16 Ohm Switch off

Pull-Down Resistor

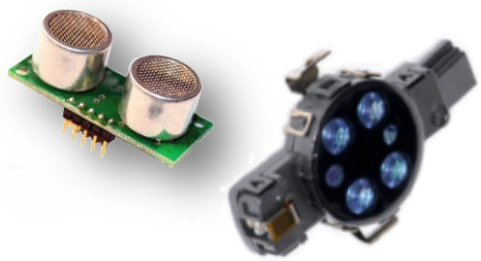
80 kOhm pull down integrated

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)	1 K	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	12 mm x 12 mm	10 mm x 10 mm	10 mm x 10 mm	10 mm x 10 mm	10 mm x 10 mm	10 mm x 10 mm	10 mm x 10 mm	7 mm x 7 mm	10 mm x 10 mm	7 mm x 7 mm	10 mm x 10 mm	7 mm x 7 mm
Samples availability	H2 2015	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

General Purpose S12 MagniV 16bit MCU with 12/5V voltage regulator, LIN-physical layer

Target Applications



LIN-Sensors

Product Function

- Hooking up sensors into automotive LIN-Network (with signal pre-conditioning)

Market Requirements

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

LIN-switch panels

Product Function

- Reading multiple switch-positions and feeding into LIN-network

Market Requirements

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

LIN-Actuator

Product Function

- Converting 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

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

S12ZVL64/96/128 *(VL128) – Details*

2 UARTs
One linked to LIN Phy, 2nd 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

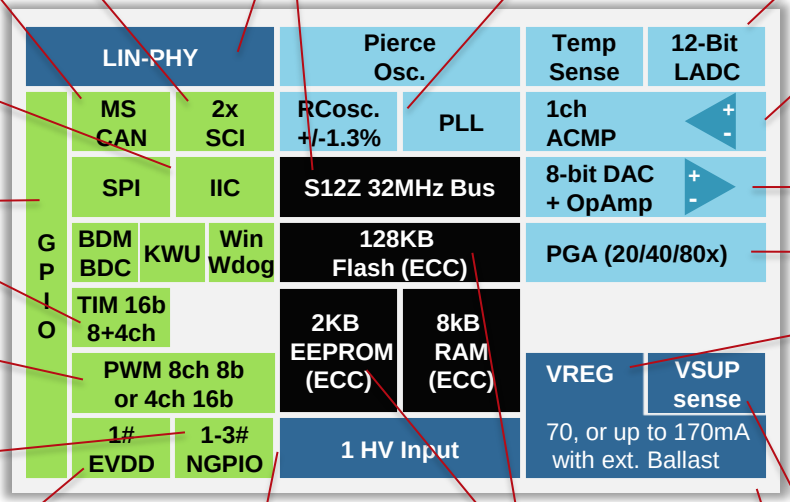
NGPIO (PP1/3/5)
1-3# 5V / 25mA sink
Eg. for RGB-LED

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.)

VL128/96/64 Comparison

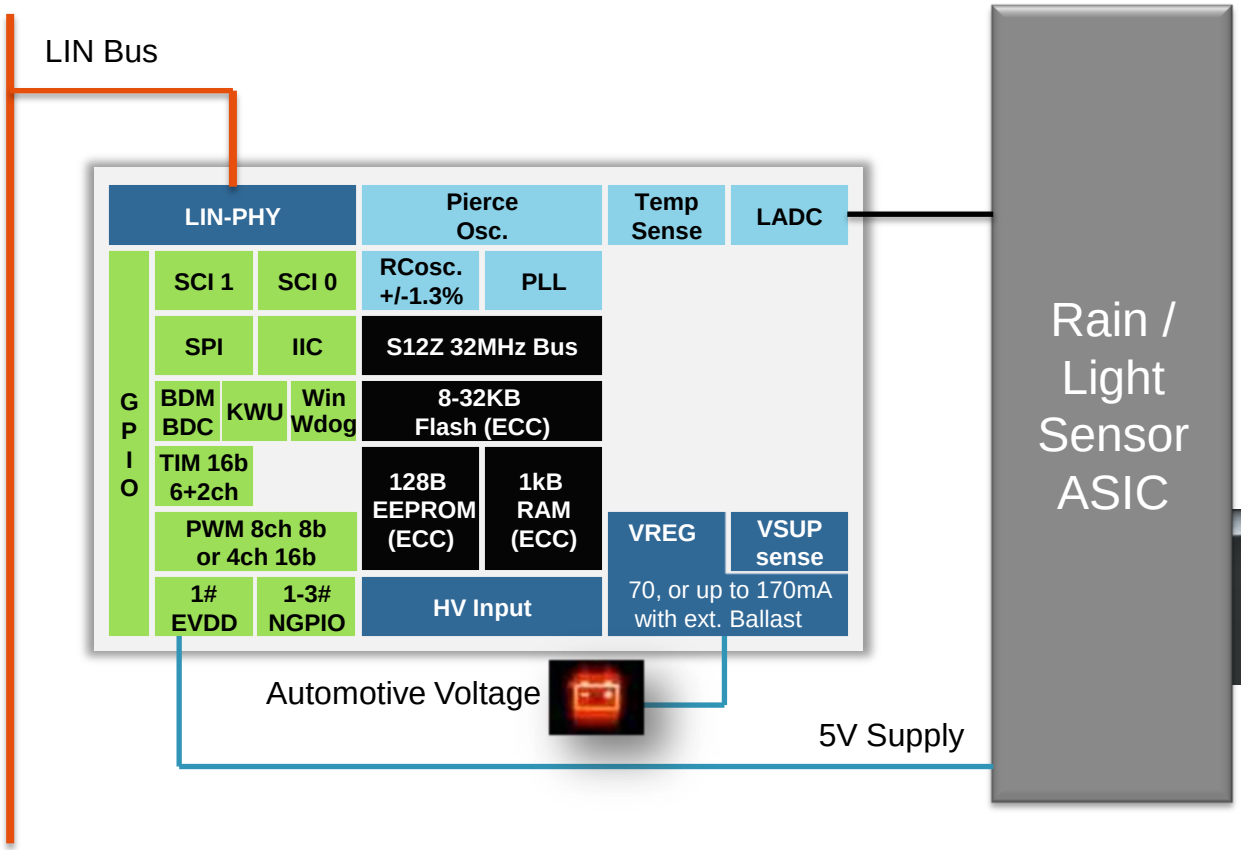
		48-LQFP						32-LQFP						32-QFN		
		S12ZVLA			S12ZVL			S12ZVLA			S12ZVL			S12ZVLA		
Memory	Flash [kB]	128	96	64	128	96	64	128	96	64	128	96	64	128	96	64
	EEPROM [kB]	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1
	RAM [kB]	8	8	4	8	8	4	8	8	4	8	8	4	8	8	4
UHV	V reg	5V / 3.3V ; 70mA or up to 170 (with ballast option / BCTL)														
	V reg tolerance	2%			3%			2%			3%			2%		
	PHY	LIN														
	HVI	1														
Analog	ADC (LB) channel	10						6						7		
	ADC (LB) resolution	12 Bit			10 Bit			12 Bit			10 Bit			12 Bit		
	ACMP with 8Bit DAC	1			-			1			0			1		
	PGA	1			-			1			-			1		
	PGA levels	10/20/40/80x			-			10/20/40/80x			-			10/20/40/80x		
Comms	SCI	2														
	SPI	1														
	IIC	1														
	MSCAN	1						1						1		
Tim	Timer (8+4ch on silicon)	8ch + 4ch (16 Bit)						8ch + 4ch (16 Bit)						8ch + 4ch (16 Bit)		
	PWM	8ch (16Bit)														
I/O	GPIO	35						20						20		
	intrr. Cap. IO (5/12V)	22/1						16/1						16/1		
	eVdd (5V/20mA)	1														
	N-GPIOs (5V / 25mA)	3						1						1		
	Temperature options	V / M														

S12ZVL Family Feature Set Summary

Product Name	S12ZVL		S12ZVLS
Package	**48-LQFP**	**32-LQFP**	**32-QFN**
Flash memory (ECC)	32 / 16 / 8 kB		32 / 16 kB
EEPROM (ECC)	128B		
RAM (ECC)	1kB		
SCI / SPI / IIC	2 / 1 / 1		
LIN-PHY	1		
HVI	1		
V reg	12V/70mA; extendable to 170mA with ext. Ballast		
Timer	6ch + 2ch (16 Bit)		
PWM	8ch 8 Bit (or 4ch 16Bit)		
ADC	10ch 10Bit	6ch 10Bit	
eVdd (5V/20mA)	1ch (source)		
N-GPIOs (5V / 25mA)	3ch (sink)	1ch (sink)	3ch (sink)
Temperature options	C / V / M		

S12ZVL for Sensor Applications

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



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

General Purpose S12 MagniV 16bit MCU with 12/5V voltage regulator, CAN-physical layer

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

S12ZVCA *(Hearst-fully featured) – Details*

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

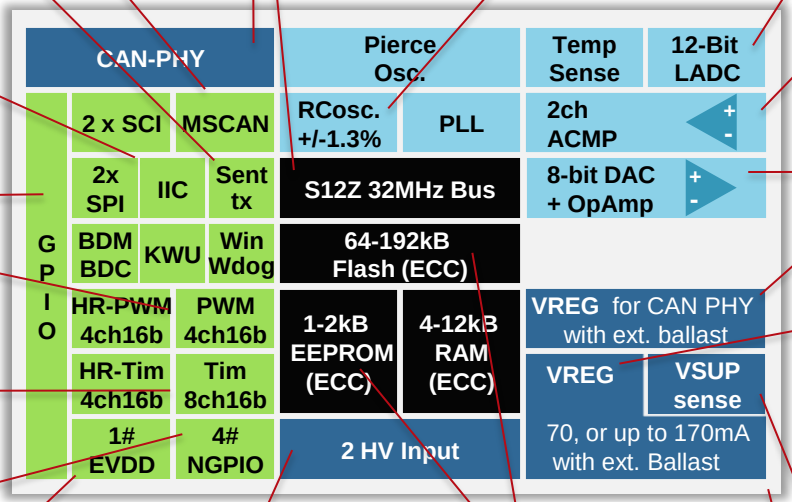
NGPIO (PP1/4/5/6)
4# 5V/25mA sink; Eg. LED

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%



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)

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

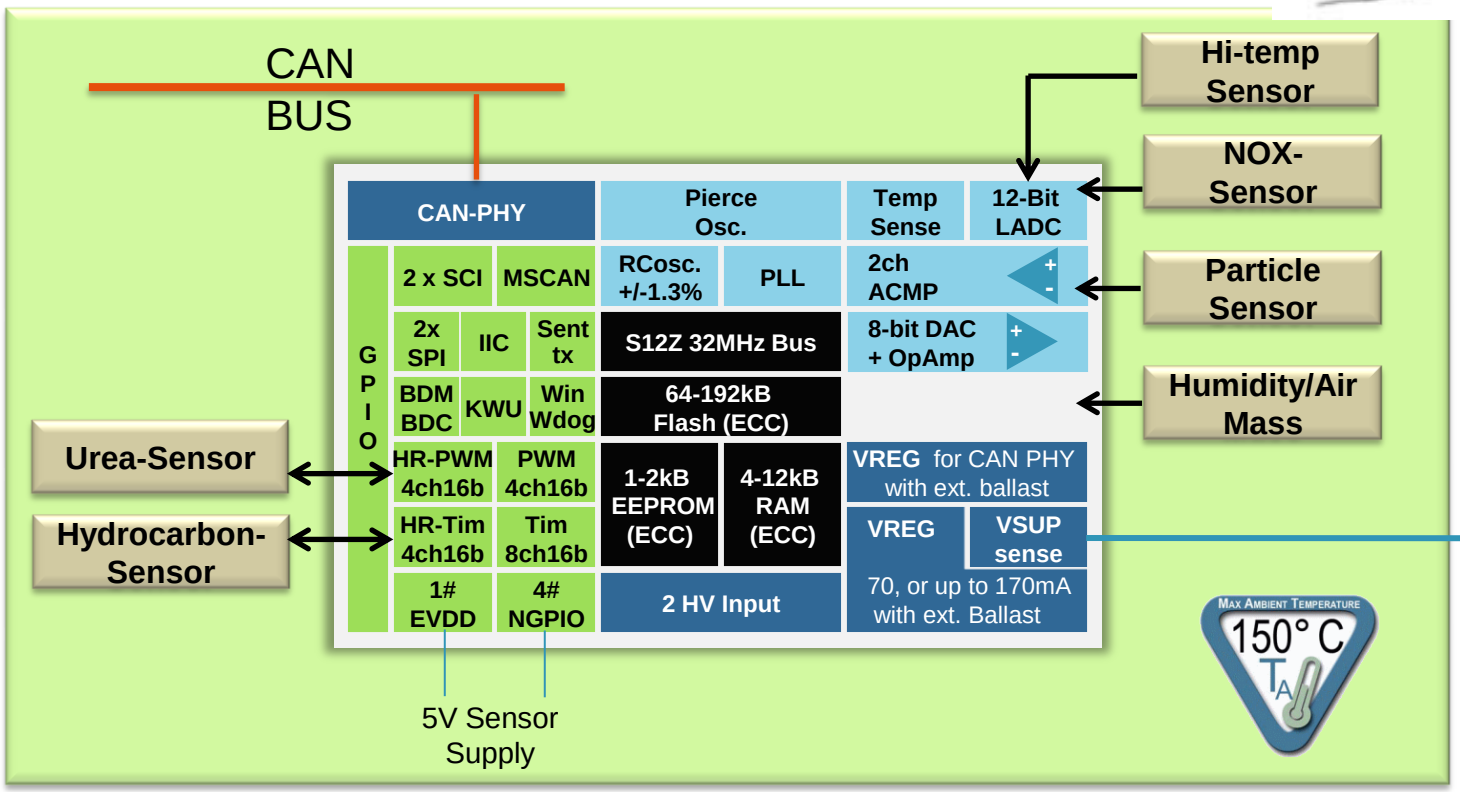
EEPROM
4 byte eraseable 100k program/ erase cycles

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

S12ZVC Family Differences in Feature Set

Product Name	S12ZVCAx (fully featured)				S12ZVCx (reduced feature set)			
Package	64-LQFP-EP		48-LQFP		64-LQFP-EP		48-LQFP	
Flash memory (ECC)	192 / 128 / 96kB	64kB	192 / 128 / 96kB	64kB	192 / 128 / 96kB	64kB	192 / 128 / 96kB	64kB
EEPROM (ECC)	2kB	1kB	2kB	1kB	2kB	1kB	2kB	1kB
RAM (ECC)	12kB	4kB	12kB	4kB	12kB	4kB	12kB	4kB
CAN / SCI / SPI / IIC	1/2/2/1	1/2/2/1	1/1/1/1	1/1/1/1	1/2/2/1	1/2/2/1	1/1/1/1	1/1/1/1
SENT (Tx)	1	1	1	1	1	1	1	1
16Bit Timer (16ns)	4ch	4ch	4ch	4ch	4ch	4ch	4ch	4ch
16Bit Timer (std.)	8ch	8ch	4ch	4ch	8ch	8ch	4ch	4ch
16Bit PWM (16ns)	4ch	4ch	3ch	3ch	4ch	4ch	3ch	3ch
16Bit PWM (std.)	4ch	4ch	4ch	4ch	4ch	4ch	4ch	4ch
LADC	16c/12b	16c/12b	10c/12b	10c/12b	16c/10b	16c/10b	10c/10b	10c/10b
ACMP 5V (rail to rail)	2	2	2	2	-	-	-	-
DAC (8Bit)	1	1	1	1	-	-	-	-

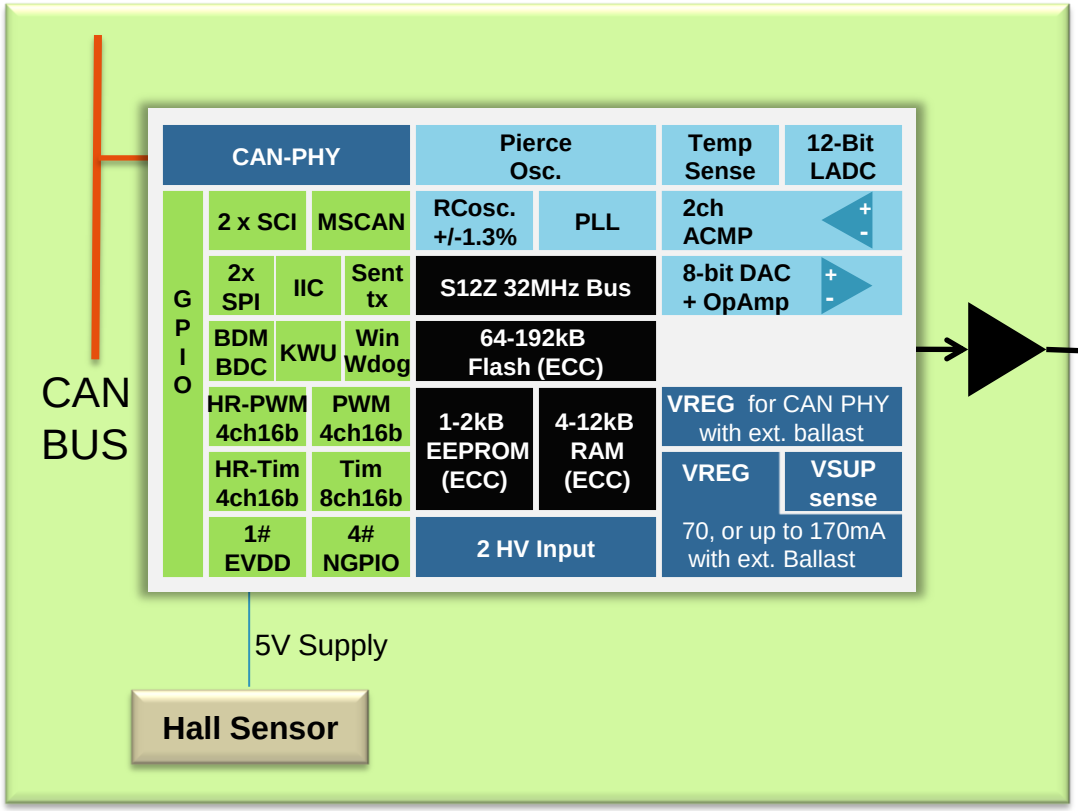
S12ZVC for Sensors in Powertrain



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

S12ZVC for Seatbelt Pre-pretentioner



S12ZVC benefits:

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

S12ZVH Family

Most integrated solution for the instrument cluster market at the best price

S12 MagniV portfolio **simplifies system design** with easy-to-use, expertly integrated **mixed-signal MCUs** for automotive applications

Improved Reliability – Reducing the number of components in a system greatly improves reliability, requires less power which provides a greener footprint

Core Efficiency – S12Z core performance improves code density which reduces system flash requirements

Ease of Use – In addition to excellent support, availability of a full featured reference design and enablement facilitates ease of use and faster time to market

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

S12ZVH – *Details*

MS-CAN 2.0A/B
linked to CAN Phy

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%
Additional 32kHz-Osc. for LCD & RTC in low power

10Bit list basedADC
upto 8 ext. Ch.+ int. channels for temp sense, supply monitors, internal ref Voltages. Executes command list & writesresul directly to RAM (DMA)

2SCI, SPI, IIC
Serial link to other Ics (sensors, peripherals), debugging & programming

2-4 Stepper motor Controller with stall detection (Gauge)

Key wakeup pins
Combined with Analog Input pins

LCD controller
4x32 or 4x40 segment

Realtime Counter with calendar for h/m/s

SGM
Generates monotonic sounds with auto amplitude control

4ch 16bit PWM
Eg. LED Dimming

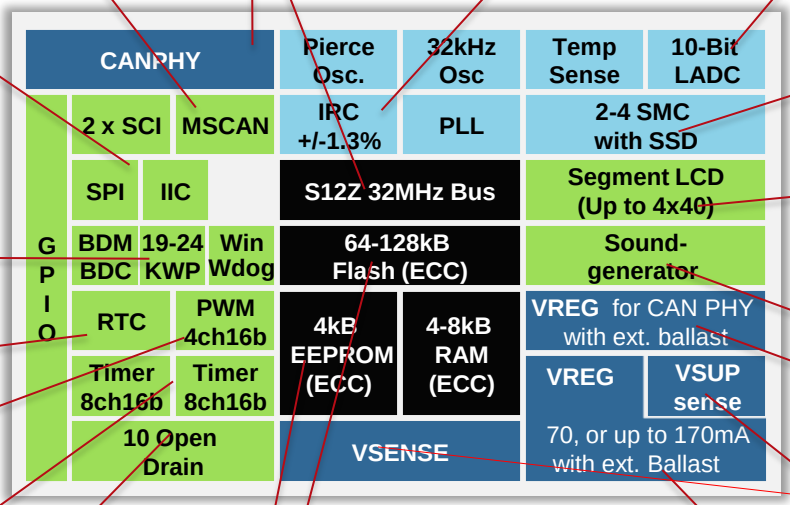
2nd Voltage Regulator
For CAN-Phy-supply

2x 8ch Timer
Sensor inputs, SW Timing

Supply & Battery sensing
Supply sense before and after protection diode

10 Open Drain IO‘s
For connecting external 3.3V peripherals

Voltage Regulator
70mA total supply (upto 170mA with external ballast for more current and lower poer dissipation

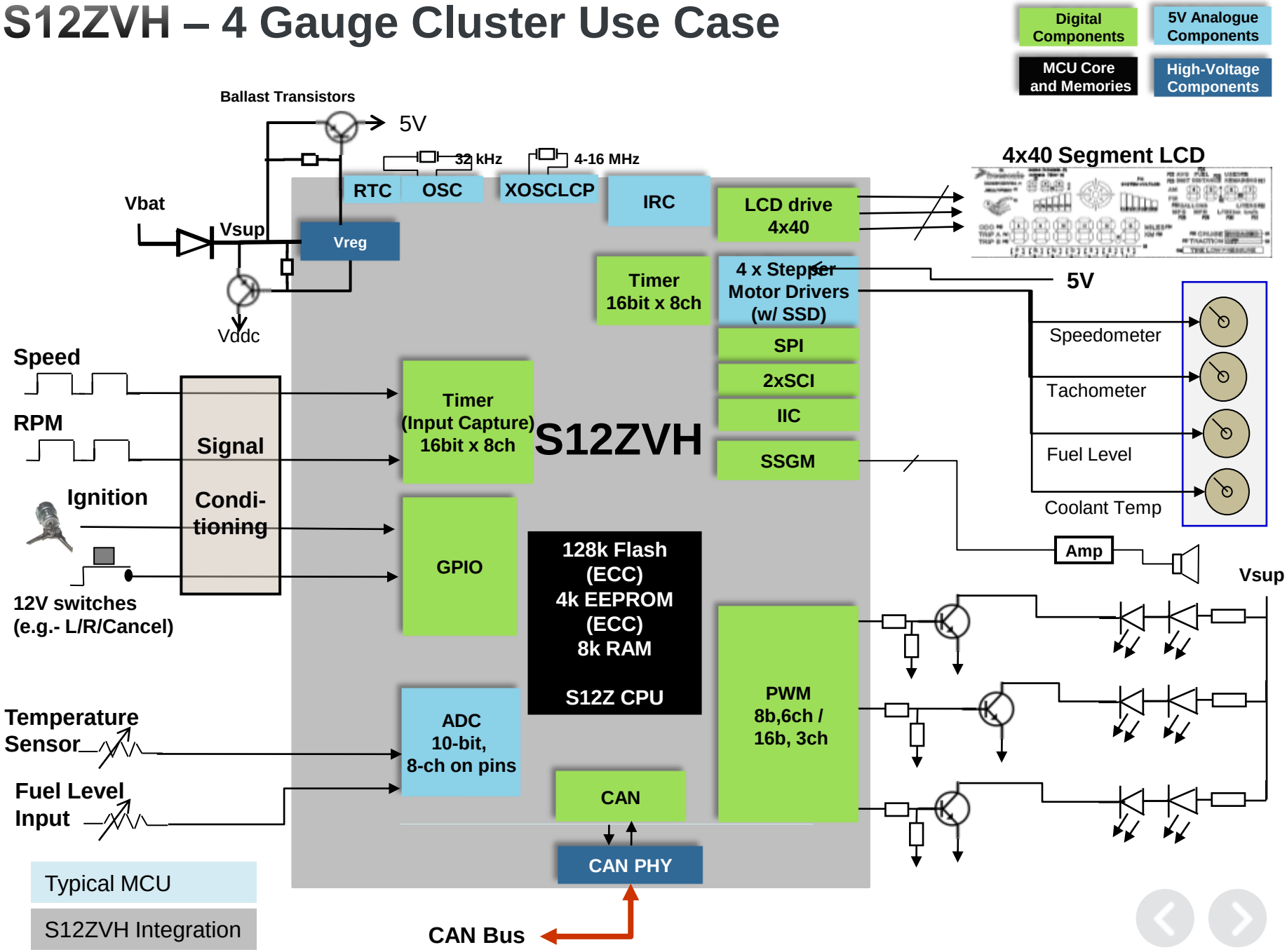


EEPROM
4 byte eraseable 100K program / erase cyctle

Flash 64/128kB
512B erasable 10K p/e cycles. Can be used for Data

Packaging Options
100-LQFP
144-LQFP

S12ZVH – 4 Gauge Cluster Use Case



S12ZVHL – *Details*

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

MS-CAN 2.0A/B
CAN Controller

LIN Physical Layer
LIN 2.2 / 2.1 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%
Additional 32kHz-Osc. for LCD & RTC in low power

10Bit list basedADC
upto 8 ext. Ch.+ int. channels for temp sense, supply monitors, internal ref Voltages. Executes command list & writesresul directly to RAM (DMA)

2SCI, SPI, IIC
Serial link to other Ics (sensors, peripherals), debugging & programming

2 Stepper motor Controller
with stall detection (Gauge)

Key wakeup pins
Combined with Analog Input pins

LCD controller
4x32 or 4x40 segment

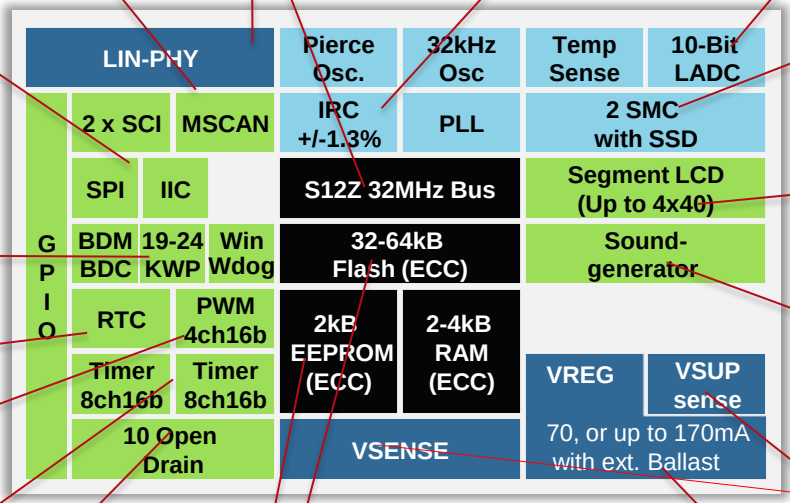
Realtime Counter with calendar for h/m/s

SGM
Generates monotonic sounds with auto amplitude control

4ch 16bit PWM
Eg. LED Dimming

2x 8ch Timer
Sensor inputs, SW Timing

10 Open Drain IO's
For connecting external 3.3V peripherals



Supply & Battery sensing
Supply sense before and after protection diode

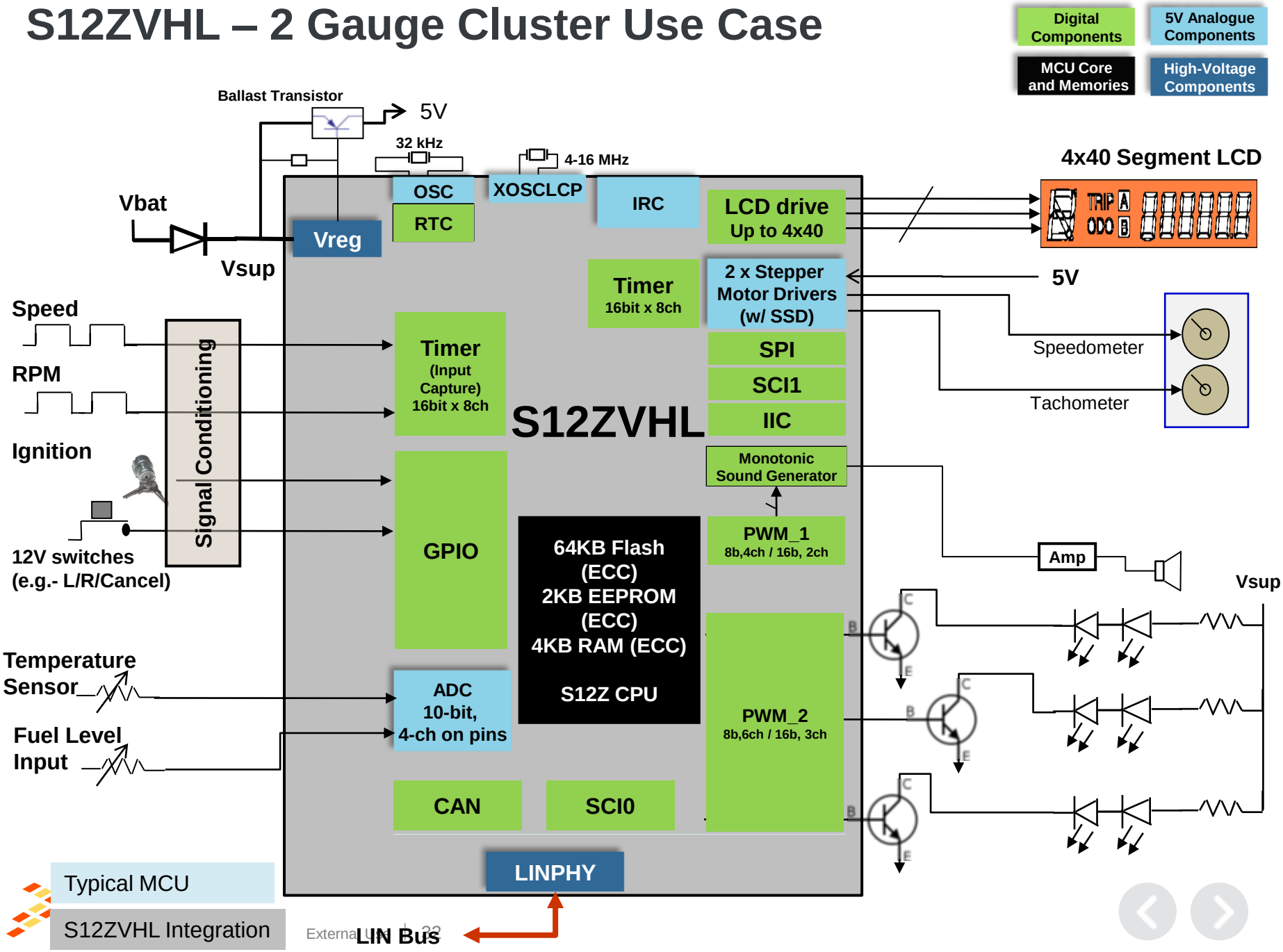
EEPROM
4 byte eraseable 100K program / erase cyctle

Flash 32/64kB
512B erasable 10K p/e cycles. Can be used for Data

Packaging Options
100-LQFP
144-LQFP

Voltage Regulator
70mA total supply (upto 170mA with external ballast for more current and lower poer dissipation

S12ZVHL – 2 Gauge Cluster Use Case



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

S12ZVFP – *Details*

MS-CAN 2.0A/B
CAN Controller

LIN Physical Layer
LIN 2.2 / 2.1 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%
Additional 32kHz-Osc. for LCD

10Bit list basedADC
upto 8 ext. Ch.+ int. channels for temp sense, supply monitors, internal ref Voltages. Executes command list & writesresul directly to RAM (DMA)

2SCI, SPI, IIC
Serial link to other Ics (sensors, peripherals), debugging & programming

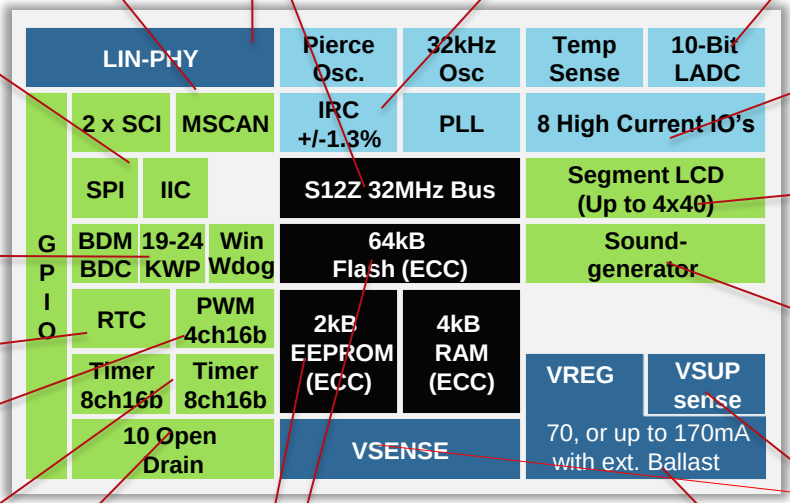
Key wakeup pins
Combined with Analog Input pins

Realtime Counter with calendar for h/m/s

4ch 16bit PWM
Eg. LED Dimming

2x 8ch Timer
Sensor inputs, SW Timing

10 Open Drain IO‘s
For connecting external 3.3V peripherals



8x High Current IO‘s
Direct LED drive with PWM capability

LCD controller
4x32 or 4x40 segment

SGM
Generates monotonic sounds with auto amplitude control

Supply & Battery sensing
Supply sense before and after protection diode

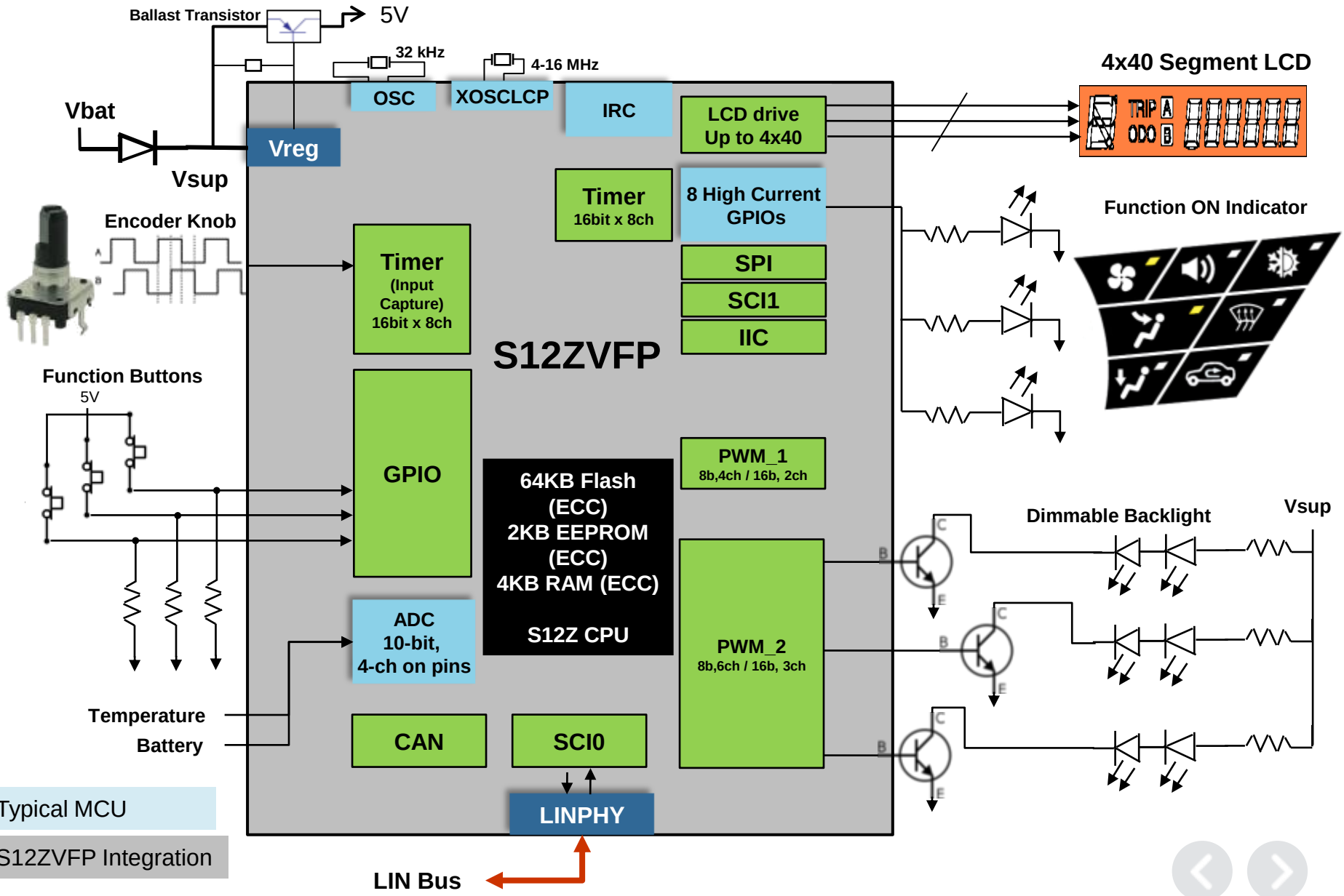
Voltage Regulator
70mA total supply (upto 170mA with external ballast for more current and lower poer dissipation

EEPROM
4 byte eraseable 100K program / erase cyctle

Flash 64kB
512B erasable 10K p/e cycles. Can be used for Data

Packaging Options
100-LQFP
144-LQFP

S12ZVFP - HVAC Use Case



S12ZVH/VHL/VHY/VFP 144 pin Family Feature Set

Product Name	S12ZVH		S12ZVHL		S12ZVHY		S12ZVFP
Package	144-LQFP						
Flash memory (ECC)	128kB	64kB	64kB	32kB	64kB	32kB	64kB
EEPROM (ECC)	4kB	4kB	2kB	2kB	2kB	2kB	2kB
RAM (ECC)	8kB	4kB	4kB	2kB	4kB	2kB	4kB
Stepper Motor Controller (with HW SSD)	4	4	2	2	2	2	-
High Current Output pins (20mA)	-	-	-	-	-	-	8
Segment LCD	4x40	4x40	4x40	4x40	4x40	4x40	4x40
Simple Sound Generator (SSG)	1	1	1	1	1	1	1
CAN / SCI / SPI / IIC	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1
CAN Physical Layer	1	1	-	-	-	-	-
LIN Physical Layer	-	-	1	1	-	-	1
Real Time Clock	1	1	1	1	1	1	1
ADC (external pins)	8ch/10Bit	8ch/10Bit	8ch/10Bit	8ch/10Bit	8ch/10Bit	8ch/10Bit	8ch/10Bit
Key Wakeup Pins-pins	24	24	24	24	24	24	24
Vbat / Vsup sense	1/1	1/1	1/1	1/1	1/1	1/1	1/1

S12ZVH/VHL/VHY/VFP 100 pin Family Feature Set

Product Name	S12ZVH	S12ZVHL		S12ZVHY		S12ZVFP
Package	100-LQFP					
Flash memory (ECC)	128kB	64kB	32kB	64kB	32kB	64kB
EEPROM (ECC)	4kB	2kB	2kB	2kB	2kB	2kB
RAM (ECC)	8kB	4kB	2kB	4kB	2kB	4kB
Stepper Motor Controller (with HW SSD)	2	2	2	2	2	-
High Current Output pins (20mA)	-	-	-	-	-	8
Segment LCD	4x32	4x32	4x32	4x32	4x32	4x32
Simple Sound Generator (SSG)	1	1	1	1	1	1
CAN / SCI / SPI / IIC	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1	1 / 2 / 1 / 1
CAN Physical Layer	-	-	-	-	-	-
LIN Physical Layer	-	1	1	-	-	1
Real Time Clock	1	1	1	1	1	1
ADC (external pins)	4ch/10Bit	4ch/10Bit	4ch/10Bit	4ch/10Bit	4ch/10Bit	4ch/10Bit
Key Wakeup Pins-pins	19	19	19	19	19	19
Vbat / Vsup sense	1/1	1/1	1/1	1/1	1/1	1/1

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