

MCSXSR1CS12ZVM 3-PHASE MOTOR CONTROL EVALUATION BOARD

The MCSXSR1CS12ZVM evaluation board demonstrates the advantages of the NXP® S12ZVM MCU for 3-phase brushless DC motor (BLDC) and permanent magnet synchronous motor (PMSM) control in high-current applications.

OVERVIEW

The MCSXSR1CS12ZVM evaluation board serves as an example of a high-current motor control design using the S12ZVM family of automotive mixed-signal MCUs based on the 16-bit S12 MagniV® S12Z core and integrates an automotive voltage regulator, a LIN physical interface, and a gate driver unit able to drive up to six external MOSFETs.

KEY FEATURES

- **S12ZVM MCU** – 16-bit S12Z-based MCUs with integrated high-voltage capabilities targeted for automotive and high-reliability industrial motor control applications
- **Integrated solution** – Integrated 6-channel gate driver unit to control six power MOSFETs, a 12 V to 5 V voltage regulator and a LIN physical layer
- **Automotive motor control algorithm** – Sensorless control of the PMSM motor based on field-oriented control (FOC) and sensorless control of the BLDC motor based on a six-step commutation control technique that allows torque/speed control with low CPU load
- **Automotive Math and Motor Control Library Set** – control algorithm built on blocks of precompiled software library
- **FreeMASTER and Motor Control Application Tuning (MCAT) support** – application tuning and variables tracking



3-PHASE MOTOR CONTROL HIGH-CURRENT EVALUATION BOARD WITH S12ZVM

S12ZVML128 SPECIFICATIONS

Flash	128 KB	Temp	+150 °C TA/+175 °C TJ
RAM	8 KB	PMF	6-ch., 15-bit PWM
EEPROM	512 B	12 V VREG	12 V/70 mA, 170 mA with ballast, 3.5–20 V capable
Core	S12Z	ADC	2 x 16-ch., 12-bit
Package	LQFP-64	Trigger Unit	2 x PTU
LIN-Phy	1	GDU	3/3
Comms	2 x SCI, 1 x SPI	EVDD	1-ch. 5 V/20 mA (source)

EVb SPECIFICATIONS

Parameter	Min	Typ	Max
Supply voltage (*boost option enabled)	3.5*/8 V	12 V	18 V
Phase current	-	75 A(rms)	120 A(peak)
Ambient temperature	0 °C	20 °C	45 °C
Board temperature (passive heat sink)	-	-	150 °C
Communication (**S12ZVMC used)	LIN/CAN**, USB, SCI, SPI, BDM		
Rotor speed or position sensors	3 Hall switches, resolver		
Digital I/O, debugging	15		

TARGET AUTOMOTIVE APPLICATIONS

- Actuators and valve controls
- Electric fuel, water and oil pumps
- Engine cooling fans
- Windshield wipers
- Heating, ventilation and air conditioning (HVAC)
- Doors, window lift and seat control

ENABLEMENT TOOLS

Development Hardware:

- 3-phase low-voltage high-current power stage up to 18 V/75 A(rms)
- Single-shunt (DC-link) current sensing
- High-efficiency design up to 75 A(rms) phase current/120 A(peak)
- Onboard OSBDM with USB and virtual RS232 port emulation

Runtime Software:

- Sensorless and Hall-based six-step control of the PM motor
- Software example created in the CodeWarrior® for MCUs (Eclipse IDE) - 11.x
- FreeMASTER 3.x project part of software package
- Motor Control Application Tuning (MCAT) tool support

RESOURCES

MCSXSR1CS12ZVM Evaluation Board

nxp.com/MCSXSR1CS12ZVM

S12ZVM Mixed-Signal MCUs

nxp.com/s12zvm

S12ZVM Community

community.nxp.com

MOTOR CONTROL ALGORITHM CONCEPT

