



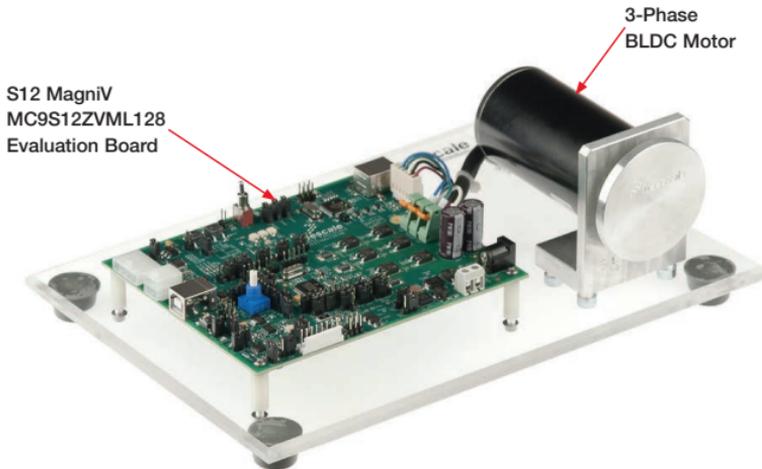
Quick Start Guide

3-Phase Hall Sensor BLDC
S12ZVM Application Using the
MTRCKTSBNZVM128 Dev Kit





3-Phase BLDC Motor Control Development Kit with S12 MagniV MC9S12ZVML128 MCU





3-Phase Hall Sensor BLDC S12ZVM Application Using the MTRCKTSBNZVM128 Development Kit

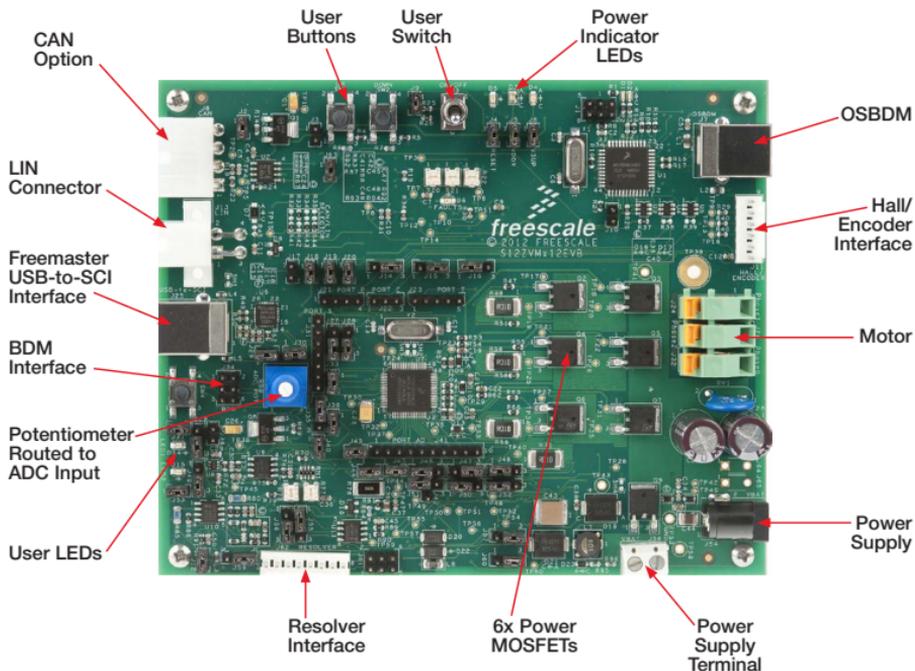
Hardware

- S12 MagniV MC9S12ZVML128 evaluation board with integrated 3-phase 12 V/10 A power stage
- 3-phase BLDC motor with Hall sensor, 24 VDC, 9350 RPM, 90 W, 45ZWN24-90-B
- USB cable
- 12 VDC power supply

Resources

- Application note AN4718 introducing a 3-phase Hall sensor BLDC application using the MTRCKTSBNZVM128 development kit
- Hall sensor-based BLDC motor control application source code AN4718SW
- Automotive math and motor control library set for the MC9S12ZVM
- FreeMASTER installation pack
- FreeMASTER project
- Application quick start guide MTRCKTSBNZVM128HQSG
- Application fact sheet MTRCKTSBNZVM128HFS
- S12 MagniV MC9S12ZVML128 evaluation board user guide

512 MagniV MC9S12ZVML128 Evaluation Board



Step-by-Step Installation Instructions

- 1** Change board jumpers position and update MCU with BLDC Hall-based application source code available at **freescale.com** as AN4718SW.
- 2** Install the FreeMASTER tool. Download the installation package at **freescale.com/freemaster**.
- 3** Install the CP210x virtual COM port driver. The CP210x driver installation package is available in the “Downloads” section at **freescale.com/automcdevkits**.
- 4** Run PC “Device Manager” and check the CP210x COM port driver PC host port.
- 5** Connect the MC9S12ZVM128 evaluation board and the host PC via the supplied USB cable.
- 6** Connect the power supply to the MC9S12ZVM128 evaluation board.

Please ensure the development kit is updated with the latest available application software found at **freescale.com/automcdevkits** before proceeding to step 7.
- 7** Start the FreeMASTER MC9S12ZVM128_BLDC_Hall.pmp control page located in the AN4718SW project.
- 8** Enable communication by pressing the “STOP” button in the FreeMASTER, or by pressing “CTRL+K.” If the communication is not established, check the USB connection, communication port and speed. The communication port and speed can be set in the Project\Options menu (or pressing “CTRL+T”). The communication speed must be set at 9600 Bd.



Application Control

- 1** To start the BLDC motor, either push the EVB user switch “SW1” or set the FreeMASTER “ON/OFF Switch” variable ON.
- 2** The motor speed is manually controlled by EVB user switches “SW1” and “SW2.” When the minimal speed is reached, pressing the the next “SW2” button stops the motor.
- 3** Set the required FreeMASTER speed by clicking the speed gauge or changing the “Required Speed” variable value in the variables watch window.
- 4** Analyze the behaviour of the BLDC motor during transients by opening the “Speed Scope.” The Speed Scope displays the “Required Speed” and “Actual Speed” variable values.
- 5** Stop the motor by the FreeMASTER “ON/OFF Switch” and change the motor rotation direction.
- 6** In the case of a DC bus fault or motor stall, clear the fault flag by setting the “Clear Faults” variable to “YES.” Once the application clears the fault flags, the “Clear Faults” variable is automatically set to “NO.”
- 7** The maximum allowed motor phase current is controlled by variable “Motor Current Limit” available in the variables watch window.
- 8** Monitor actual DC bus voltage and current by the “DC bus Voltage” and “DC bus Current” scopes. The maximum DC bus current is controlled by the “motor current limit variable.” Keep the DC bus voltage within the range of 8 to 16 V. The DC bus voltage value affects the maximum motor speed limit.



512 MagniV MC9S12ZVML128

Jumper Options

The following is a list of all jumper options. The default installed jumper settings are shown in white text within the blue boxes.

Jumper	Option	Setting	Description
J2	CAN Transceiver 5 V supply option	Open	VDDC ballast transistor is supplied from VSUP
		Close	VDDC ballast transistor is supplied from VSUP
J3	VDDC supplied from USB option	Open	VDDC node is not supplied from the USB-to-SCI interface
		Close	VDDC node is supplied from the USB-to-SCI interface
J4	RESET LED indicator option	Open	RESET LED indicator disabled
		Close	RESET LED indicator enabled
J5	VDDX LED indicator option	Open	VDD LED indicator disabled
		Close	VDD LED indicator enabled
J6	VSUP LED indicator option	Open	VSUP LED indicator disabled
		Close	VSUP LED indicator enabled
J9	ON/OFF switch option	Open	ON/OFF switch disabled
		Close	ON/OFF switch enabled



Jumper Options

Continued

Jumper	Option	Setting	Description
J10	OSBDM boot-loader option	Open	OSBDM boot loader disabled
		Close	OSBDM boot loader enabled
J12	Resolver circuit 5 V supply option	Open	Resolver input circuitry (+5 VDC) supply disabled
		Close	Resolver input circuitry (+5 VDC) supply enabled
J14	EVDD or FAULT selector	1-2	FAULT input is connected to port PP0
		2-3	Port PP0 is connected to EVDD at Hall sensor interface
J15	Resolver or Hall/encoder phase A selector	1-2	Phase A from resolver is connected to port PT1
		2-3	Phase A from Hall/encoder interface is connected to port PT1
J16	Resolver or Hall/encoder phase B selector	1-2	Phase B from Hall/encoder interface is connected to port PT2
		2-3	Phase B from resolver is connected to port PT2
J18	USB-to-SCI interface supply option	Open	USB-to-SCI isolator supply disable
		Close	USB-to-SCI isolator supply enable



Jumper Options

Continued

Jumper	Option	Setting	Description
J19	"UP" push-button option	Open	"UP" push button disabled
		Close	"UP" push button enabled
J20	"DOWN" push-button option	Open	"DOWN" push button disabled
		Close	"DOWN" push button enabled
J27	SCI RXD selector	1-2	RXD from OSBDM is connected to port PS2
		2-3	RXD from USB-to-SCI is connected to port PS2
J28	SCI TXD selector	1-2	TXD from OSBDM is connected to port PS3
		2-3	TXD from USB-to-SCI is connected to port PS3
J29	BDM interface supply option	Open	BDM supply disabled
		Close	BDM supply enabled
J30	ADC potentiometer pull-up option	Open	POT 1 (ADC potentiometer) supply disabled
		Close	POT 1 (ADC potentiometer) supply enabled



Jumper Options

Continued

Jumper	Option	Setting	Description
J33	MCU supply option	Open	MCU supply disabled
		Close	MCU supply enabled
J35	ADC mapping PAD0	1-2	Connects PAD0 to AMP0 external gain-setting resistors
		2-3	Connects PAD0 to POS_SIN resolver output
J36	VREF generation supply option	Open	Disconnects VSUP to supply a regulated voltage at VREF2
		Close	Connects VSUP to supply a regulated voltage at VREF2
J37	USER LED1 option	Open	"User LED1" disabled
		Close	"User LED1" enabled
J38	PDO-PDOCLK	Open	PDO-PDOCLK not shorted
		Close	PDO-PDOCLK shorted

Jumper Options

Continued

Jumper	Option	Setting	Description
J39	Resolver phase B selector	1-2	SINCOS I/O connector phase B connected to resolver phase B input
		2-3	POS_COS connected to resolver phase B input
J40	VDDX ballast supply option	Open	VDDX ballast is disconnected
		Close	VDDX ballast is connected
J43	Resolver circuit 12 V supply option	Open	Resolver generator circuit supply disconnected
		Close	Resolver generator circuit supply connected
J44	ADC mapping PAD1	Open	PAD1 is disconnected from the AMPM0 external gain-setting resistors
		Close	PAD1 is connected to the AMPM0 external gain-setting resistors
J45	ADC mapping PAD2	Open	PAD2 is disconnected from the AMPP0 external gain-setting resistors
		Close	PAD2 is connected to the AMPP0 external gain-setting resistors



Jumper Options

Continued

Jumper	Option	Setting	Description
J46	ADC mapping PAD3	1-2	Connects PAD3 to ADC_IA (phase A current sense from external opamp)
		2-3	Connects PAD3 to POS_SIN resolver output
J47	ADC mapping PAD4	1-2	Connects PAD4 to ADC_IB (phase B current sense from external opamp)
		2-3	Connects PAD4 to ADC potentiometer POT1
J48	ADC mapping PAD5	1-2	Connects PAD5 to AMP1 external gain setting resistors
		2-3	Connects PAD5 to ADC_IB (phase B current sense from external opamp)
J49	Resolver phase A selector	1-2	Resolver phase A connected to SINCOS I/O connector phase A input
		2-3	Resolver phase A connected to resolver POS_SIN Schmitt-Trigger
J50	ADC mapping PAD6	1-2	Connects PAD6 to AMPM1 external gain-setting resistors
		2-3	Connects PAD6 to POS_COS resolver output

Jumper Options

Continued

Jumper	Option	Setting	Description
J51/J42	ADC mapping PAD7	J51(1-2)	Connects PAD7 to AMPP1 external gain-setting resistors
		J51(2-3)	Connects PAD7 to POS_SIN resolver output
		J42(1)~J51(2)	Connects PAD7 to ADC potentiometer POT1
J52	ADC mapping PAD8	1-2	Connects PAD8 to ADC_IC (phase C current sense from external opamp)
		2-3	Connects PAD8 to POS_COS resolver output
J53	USER LED2 option	Open	"User LED 2" disabled
		Close	"User LED 2" enabled
J55	VREF selector	1-2	VREF supplied from VDDX
		2-3	VREF supplied from the VREF2 regulator
J56	Resolver COS reference	1-2	Input to POS_COS circuit is from OFFSET1
		2-3	Input to POS_COS circuit is from RES_COS_REF

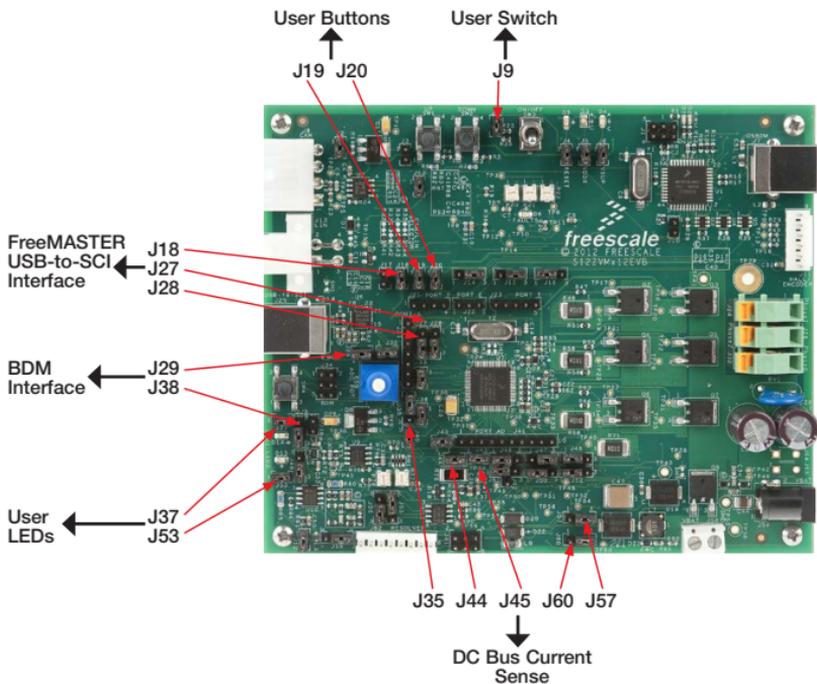


Jumper Options

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Jumper	Option	Setting	Description
J57	Internal AMP0 input selector (inverting)	1-2	Connects DC bus to the internal AMP0 inverting input (phase A current sense)
		2-3	Connects ground to the internal AMP0 inverting input (DC bus current sense)
J59	Resolver SIN reference	1-2	Input to POS_SIN circuit is from RES_SIN_REF
		2-3	Input to POS_SIN circuit is from OFFSET1
J60	Internal AMP0 input selector (non-inverting)	1-2	Connects phase A to the internal AMP0 non-inverting input (phase A Current sense)
		2-3	Connects DC bus as non-inverting input for internal AMP0 (DC bus current sense)
J63	FAULT comparators 5 V supply option	Open	FAULT circuit supply disconnected
		Close	FAULT circuit supply connected

512 MagniV MC9S12ZVML128 Evaluation Board Jumper Position





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