QUICK START GUIDE

S12ZVM 3-PHASE MOTOR CONTROL
EVALUATION BOARD

MCSXSR1CS12ZVM

S12ZVM 3-PHASE MOTOR CONTROL EVALUATION BOARD

Figure 1: S12ZVM 3-phase motor control evaluation board

GET TO KNOW THE MCSXSR1CS12ZVM

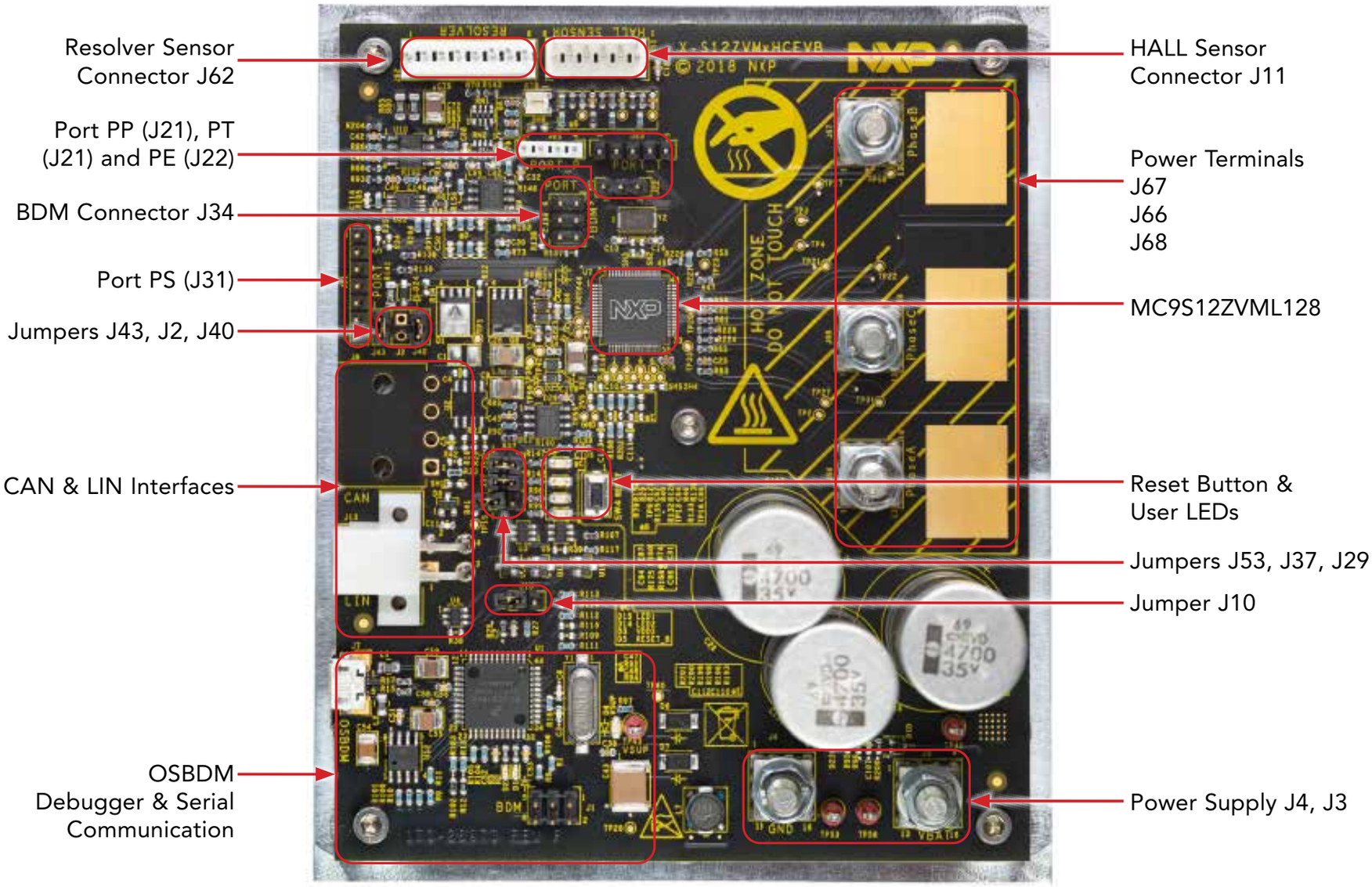

Figure 2: S12ZVM 3-phase motor control evaluation board description

HEADER/PINOUT

MCSXSR1CS12ZVM is designed to control 3-phase AC motors up to 1 kW. Several configuration jumpers have to be set prior to the application

FUNCTION	S12ZVM PIN	PIN
VBAT	-	J3
GND	-	J4
VCC	EVDD	J11-1
GND	-	J11-2
HALL_A	PT1	J11-3
HALL_B	PT2	J11-4
HALL_C	PT3	J11-5
NC	NC	J11-6
GPIO	PP0	J21-1
GPIO	PP1	J21-2
GPIO	PP2	J21-3
GND	-	J21-4
GPIO	PE0	J22-1
GPIO	PE1	J22-2
GND	-	J22-3
GPIO	PS0	J31-1
GPIO	PS1	J31-2
GPIO	PS2	J31-3
GPIO	PS3	J31-4
GPIO	PS4	J31-5
GPIO	PS5	J31-6
GND	-	J31-7

FUNCTION	S12ZVM PIN	PIN
BKGD	BKGD	J34-1
GND	-	J34-2
NC	NC	J34-3
U_RESET	RST	J34-4
NC	NC	J34-5
+5VU	-	J34-6
RES_GENP	-	J62-1
RES_GENM	-	J62-2
RES_SIN	-	J62-3
RES_SIN_REF	-	J62-4
RES_COS	-	J62-5
RES_COS_REF	-	J62-6
GND	-	J62-7
+5VA	-	J62-8
PHASE_A	-	J66
PHASE_B	-	J67
PHASE_C	-	J68

MCSXSR1CS12ZVM FEATURES

HARDWARE

- **MCSXSR1CS12ZVM** —S12ZVM Evaluation board for high power/high performance 3-phase motor control
- **Single PCB hardware design** up to 1 kW of power with optimized switching performance
- **Single-shunt current sensing** design for cost-sensitive applications
- **Resolver hardware** interface
- **Integrated LIN** & optional CAN connectivity support
- **OSBDM** programming/debugging with USB-to-SCI transceiver
- **USB cable**

SOFTWARE

- **Automotive Motor Control Algorithm**
  - Sensorless control of the 3-phase PMSM motor based on Field Oriented Control (FOC) allowing independent control of the magnetic field and torque/speed
- **Evaluation version of the Automotive Math and Motor Control Library Set**
  - control algorithm built on blocks of precompiled software library
- **FreeMASTER and MCAT** application tuning and variables tracking at different levels of the FOC cascade structure
- **CodeWarrior 11.x**—Example software created in CodeWarrior 11.0 or higher

STEP-BY-STEP INSTRUCTIONS

1 Download Software

Download installation software and documentation at **nxp.com/MCSXSR1CS12ZVM**.

2 Install CodeWarrior for MCUs 11.x IDE

Download and install CodeWarrior for MCUs IDE version 11.0 or higher available at nxp.com/codewarrior.

3 Install FreeMASTER

Download and install FreeMASTER run-time debugging tool available at **nxp.com/FreeMASTER**.

4 Jumper Settings

Ensure default MCSXSR1CS12ZVM jumper options (see page 9)

5 Connect the Power Supply

Connect appropriate 12 V power supply (8-18 V range or 3.5-18 V range with boost option enabled) to the power supply terminals J3 and J4 using M5 ring-eye connector and proper wiring (10 A/mm^2 max).

6 Connect the USB Cable

Connect MCSXSR1CS12ZVM to the PC using the USB cable. Allow the PC to automatically configure the USB drivers if needed.

7 Connect the Motor

Connect your motor to the output terminals J66, J67 and J68 using M5 ring-eye connector and proper wiring (10 A/mm^2 max).

STEP-BY-STEP INSTRUCTIONS CONTINUED

8 Re-program the MCU using CodeWarrior for MCUs

Import the installed application software project in the CodeWarrior for MCUs:

- Start CodeWarrior for MCUs application
- Click **File – Import**
- Select General – **Existing Projects into Workspace** and click **Next**
- Select root directory: Navigate to the installed application directory: **MC_DevKits\MCSXSR1CS12ZVM\sw**
- Select either MCSXSR1CS12ZVM_PMSM or MCSXSR1CS12ZVM_BLDC
- Select **Copy project into workspace.** Click **Finish**
- Clear the project, click **Debug** to build and flash the software. Once flashed, **Run** the session and click **Disconnect** to release the USB resources.

9 FreeMASTER 3.0 Setup

- Start the FreeMASTER application
- Open FreeMASTER project **<selected project> FreeMASTER_control\MCSXSR1CS12ZVM_PMSM_SW_CW11.pmp** by clicking **File – Open Project**
- Click the green **GO** button in the FreeMASTER toolbar or press CTRL+G to enable the communication
- Successful communication is signalized in the status bar at the very bottom as “RS232 UART Communication;COMn; speed = 19200”

APPLICATION CONTROL

1. Motor Control Application Tuning (MCAT) tool – tool menu to display the application control page. When the power supply is connected to the board, the application is in **READY** state indicated by a blue LED on the board. The LED diode also indicates:
   - **READY, INIT** states slowly flashing LED
   - **CALIB, ALIGN** states flashing LED
   - **RUN** state lighting LED
   - **FAULT** state fast-flashing LED
2. In case of pending faults, click the fault button **Clear FAULT** on the FreeMASTER MCAT Control Page.
3. Start the application by pressing **ON/OFF** button on the FreeMASTER MCAT control page.
4. Set required speed by changing the **Speed Required** variable value manually in the variable watch window, or by clicking **speed gauge** in the MCAT control tab.
5. To stop the application, click the **ON/OFF** button on the FreeMASTER MCAT control page.

MCSXSR1CS12ZVM JUMPER OPTIONS

JUMPER	OPTION	SETTING	DESCRIPTION
J2	CAN VREG	Open	CAN VREG disabled (default)
		Short	CAN VREG enabled (S12ZVMC version has to be populated)
J10	OSBDM Bootloader	Open	OSBDM Bootloader update disabled (default)
		Short	OSBDM Bootloader update enable
J29	VDDX to BDM	Open	Supply of the OSBDM from VDDX disabled (default)
		Short	Supply of the OSBDM from VDDX enabled
J37	LED2 Enabled	Open	User LED2 (D14) on PS5 disabled
		Short	User LED2 (D14) on PS5 enabled (default)
J40	VDDX Ballast	Open	VSUP ballast transistor on VDDX disabled
		Short	VSUP ballast transistor on VDDX enabled (default)
J43	VSUP to Resolver	Open	VSUP to VSUP2 for resolver disabled
		Short	VSUP to VSUP2 for resolver enabled (default)
J53	LED1 Enabled	Open	User LED1 (D15) on PS4 disabled
		Short	User LED1 (D15) on PS4 enabled (default)

GET STARTED

Download installation software and documentation at **nxp.com/MCSXSR1CS12ZVM**.

SUPPORT

Visit **www.nxp.com/support** for a list of support resources.

WARRANTY

Visit **www.nxp.com/warranty** for complete warranty information.

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