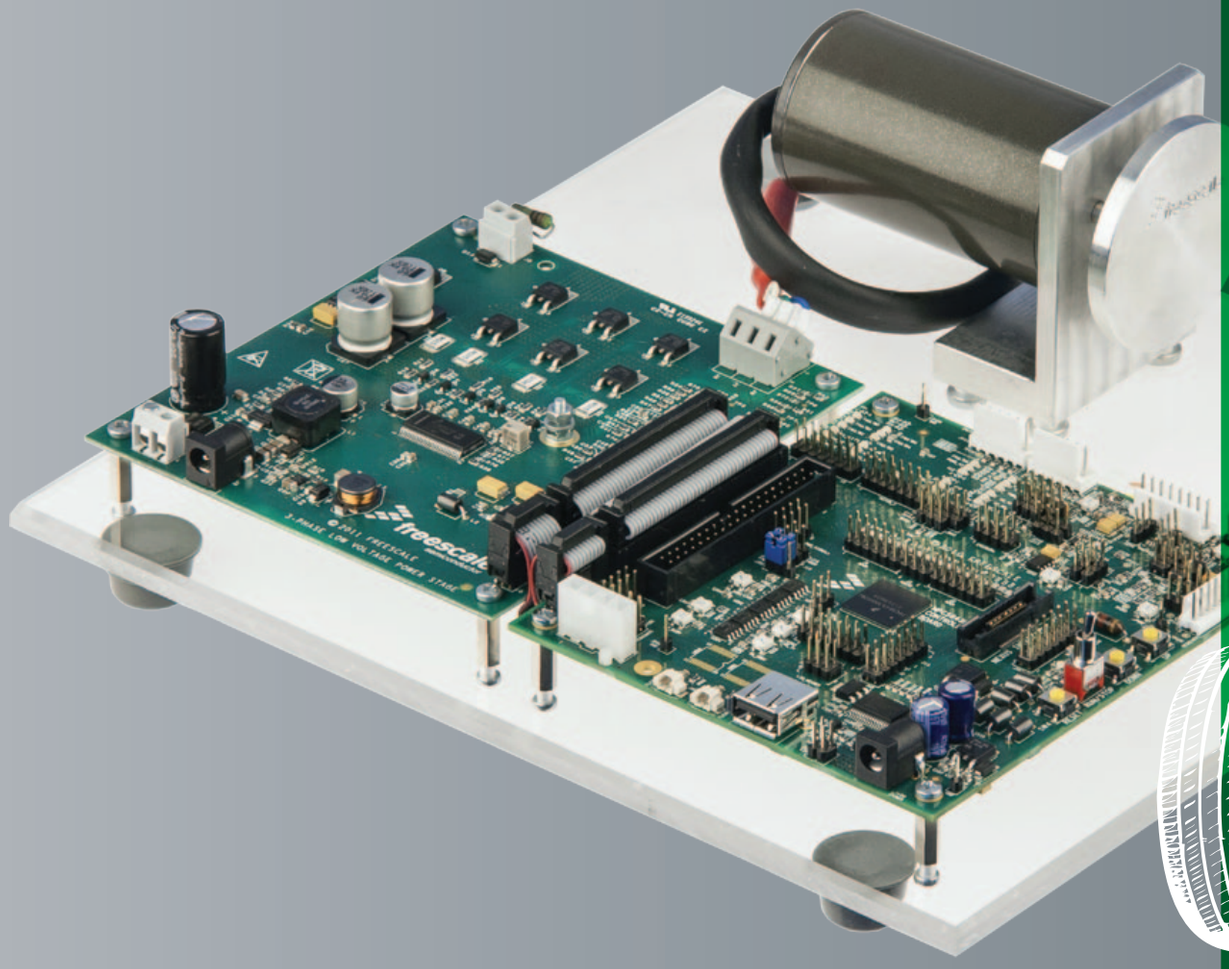

Quick Start Guide

3-Phase Sensorless BLDC
Motor Control Development Kit
with Qorivva MPC5643L MCU

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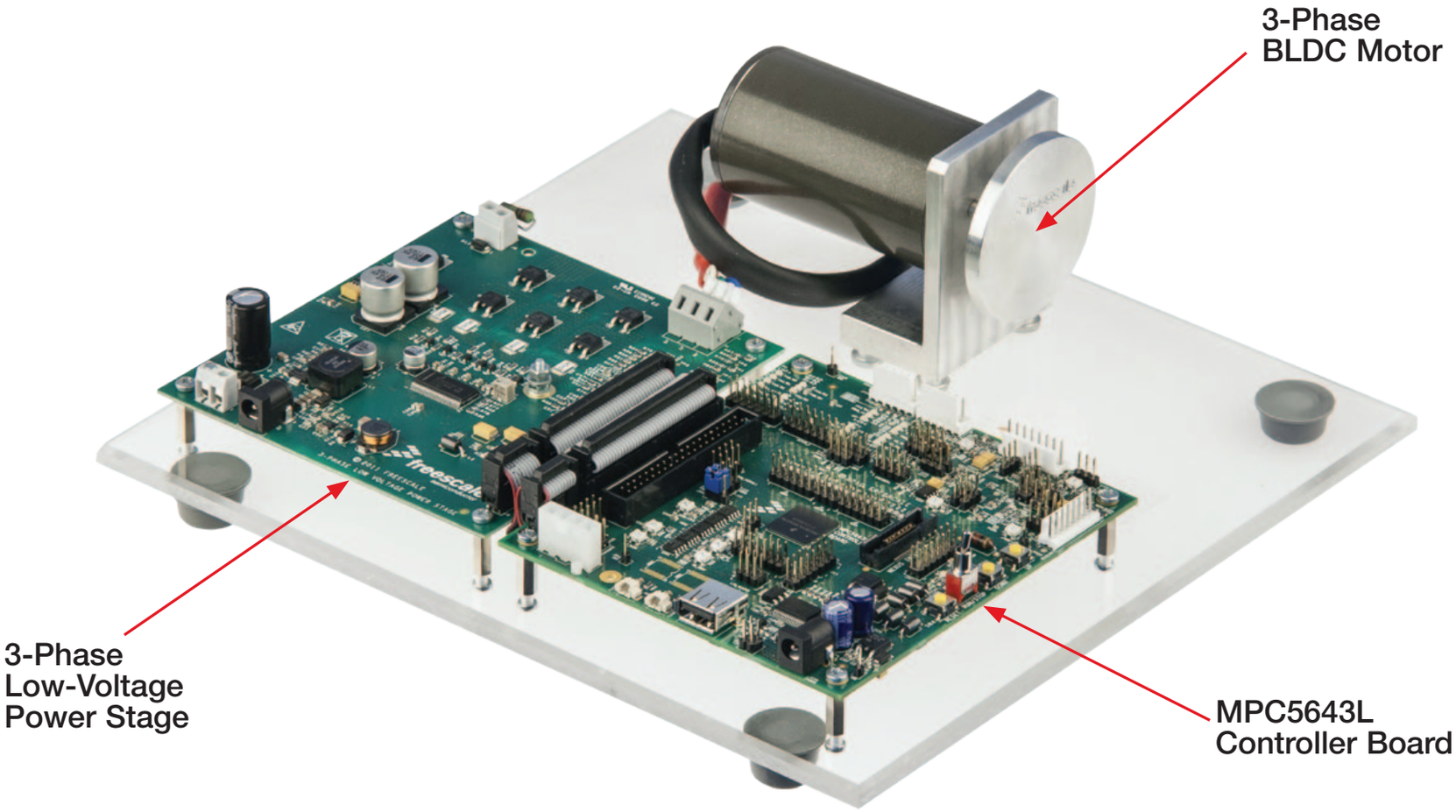
3-Phase Sensorless BLDC Motor Control Development Kit with Qorivva MPC5643L MCU



3-Phase Sensorless BLDC Motor Control Development Kit Contents

Hardware

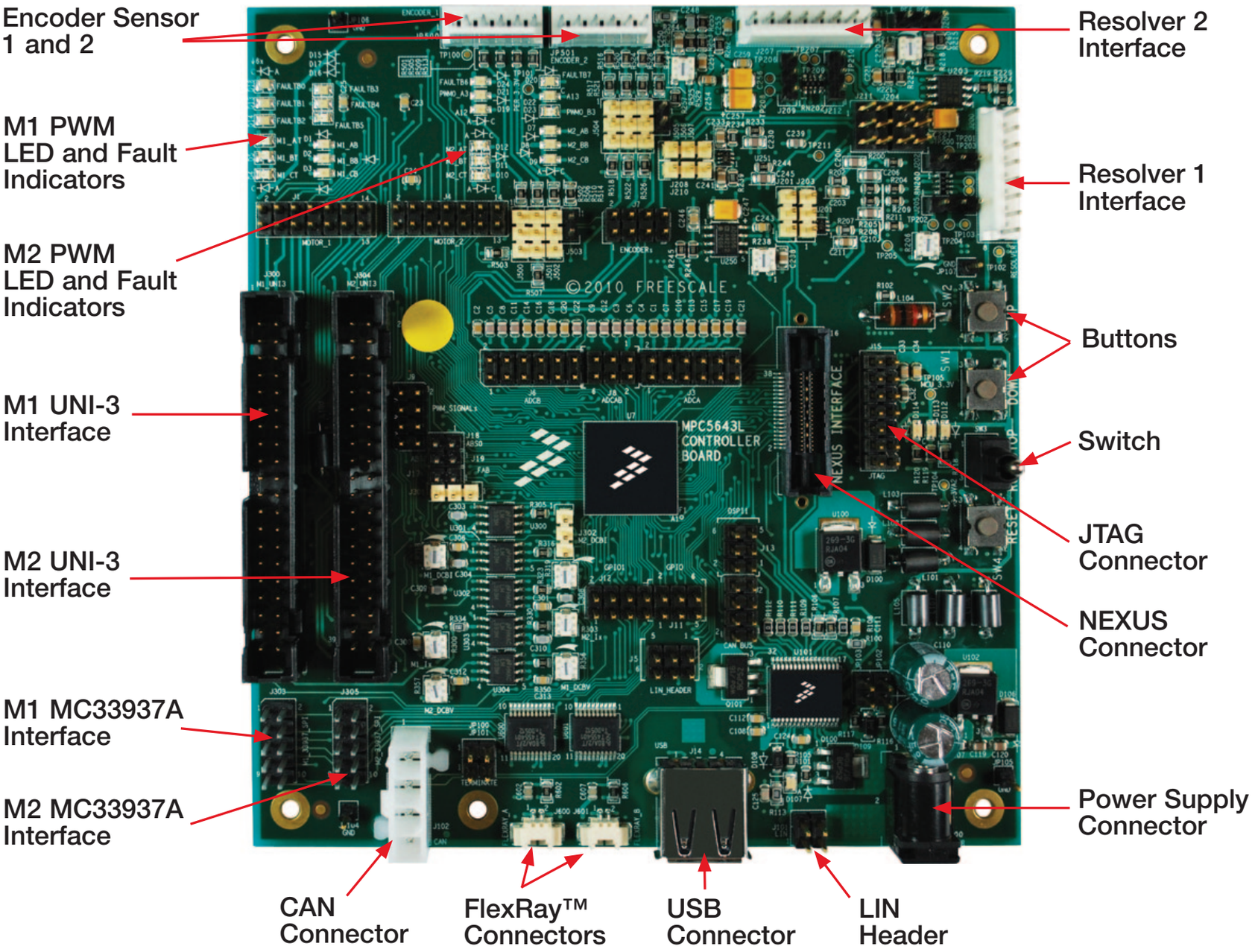
- Qorivva MPC5643L controller board
- 3-phase PMSM/BLDC low-voltage power stages based on the MC33937A pre-driver integrated circuit
- 3-phase BLDC motor 24 V, 9360 RPM, 0.091 Nm, Linix® 45ZWN24-90
- USB cable
- +24 VDC power supply

Resources

- Modular BLDC application source code configured for this development kit
- Automotive math and motor control library set for MPC5643L installation package
- FreeMASTER installation pack
- FreeMASTER project
- 3-phase BLDC development kit quick start guide
- 3-phase BLDC development kit fact sheet
- Dual 3-phase BLDC development kit application note
- Qorivva MPC5643L controller board user guide
- 3-phase BLDC/PMSM low-voltage power stage user guide

3-Phase Low-Voltage Power Stage

Qorivva MPC5643L Controller Board



Software Tools Installation

1 Install the FreeMASTER debugging tool. For FreeMASTER application download, please visit **freescale.com/freemaster**.

2 Install the CP210x virtual COM port driver. For the CP210x virtual COM port driver installation file, please visit **freescale.com/automcdevkits**, Downloads section.

3 Run “Device Manager” on your system and check which COM port was assigned to the CP210x COM port driver.

Kit Installation

1. Connect the USB cable to the MPC5643L controller board and the host PC.

2. Connect the power supply to the power stage. The controller board power supply is taken from the power stage.

3. Download and unzip the application software for the MTRCKTSBN5643L available at **freescale.com/automcdevkits**.

4. Start the FreeMASTER project **MPC5643L_BLDC_Sensorless_Single.pmp** located in **MTRCKTSBN5643L\SW\MPC5643L_BLDC_Sensorless_Single** project directory.

5. In FreeMASTER \Project\Options, choose the RS232 COM port number that was assigned to the CP210x driver and select the communication speed to 19200 Bd.

6. Enable communication by pressing the “STOP” button in the FreeMASTER, or by pressing “CTRL+K.”

7. Successful communication is signalized in the status bar. If the communication is not established, check the USB connection between the PC and Qorivva MPC5643L controller board, communication port and speed, as described in step 5.

Application Control

1 Green LED D19 (GPIO13) related to Motor #1 and green LED D22 (GPIO12) related to Motor #2 (on the Qorivva MPC5643L controller board) have the following functionality:

- OFF if the application is in the READY, INIT states
- SLOW FLASHING if the application is in the CALIB, ALIGN states (flashing with a period of 2 Hz)
- ON if the application is in the RUN state
- FAST FLASHING if the application is in the FAULT state (flashing with a period of 8 Hz)

2 If no actual faults are present in the system, all the LED-like indicators on the FreeMASTER control page will be dark red. If there is a fault present, identify the source of the fault and remove it. Successful removal is signalized by the switching off of the respective LED-like indicator on the FreeMASTER control page.

3 Press the UP + DOWN buttons (SW2+SW1 on the Qorivva MPC5643L controller board) simultaneously to clear the fault status register once in the FAULT state. The application can be restarted by positioning the RUN/STOP switch (SW3 on Qorivva MPC5643L controller board) to the RUN position (transition from STOP to RUN in case the switch was in the RUN state when the fault event occurred).

4 If all the LED-like indicators on the FreeMASTER control page are off, clear pending faults by pressing the green circled button “FAULT CLEAR” on the FreeMASTER control page, or alternatively by pressing the UP+DOWN buttons (SW2+SW1 on the Qorivva MPC5643L controller board) simultaneously. The RUN/STOP switch (SW3 on the Qorivva MPC5643L controller board) must be in STOP position.

Application Control (continued)

5 Start the application by pressing 1- “RUN” on the flip/flop (ON/OFF) switch on the FreeMASTER control page or by positioning the RUN/STOP switch (SW3 on the Qorivva MPC5643L controller board) to the RUN position (transition from STOP to RUN in case the switch was in the RUN state when a fault event occurred).

6 Enter the required speed by assigning this value to the “Nreq” variable in the variables watch window. The value is in revolutions per minute. Alternatively, the rotor speed can be increased/decreased by pressing the UP/DOWN switches on the Qorivva MPC5643L controller board.

7 Stop the single application by pressing 0 - “STOP” on the flip/flop (ON/OFF) switch on the FreeMASTER control page.

8 Stop the dual application by pressing the red circled button “Central Stop” on the FreeMASTER control page, or by positioning the RUN/STOP switch (SW3 on the Qorivva MPC5643L Controller Board) to the STOP position.

9 RESET the application anytime by pressing the blue circled button “H/W. RESET” on the FreeMASTER control page.

Qorivva MPC5643L Controller Board Jumper Options

Jumper	Selector	Functions	Connections
JP100, JP101	CAN Termination	Terminate CAN bus node	closed
JP102	MC33905 Debug Mode	Enter SBC driver MC33905 to debug mode	closed
JP103	MC33905 Save Mode	Enter SBC driver MC33905 to safe mode	closed
JP206	Resolver Enable	Resolver reference input signal from SWG module	1–2
		Resolver reference input signal from eTimer1-channel5	2–3
J202 J209	Resolver SIN Input	Positive input for SIN OPAM is DC offset voltage set up by trimmer R208, R258	1–2
		Positive input for SIN OPAM is REFSIN input of resolver	2–3
J205 J212	Resolver COS Input	Positive input for COS OPAM is DC offset voltage set up by trimmer R208, R258	1–2
		Positive input for COS OPAM is REFCOS input of resolver	2–3
J201 J208	Phase A Digital Signal	Resolver_X Phase A signals is connected to eTimer0-channel[0] resp. eTimer1-channel[1]	closed
		Resolver_X Phase A signals is not connected to eTimer0-channel[0] resp. eTimer1-channel[1]	open
J203 J210	Phase B Digital Signal	Resolver_X Phase B signals is connected to eTimer0-channel[1] resp. eTimer1-channel[1]	closed
		Resolver_X Phase B signals is not connected to eTimer0-channel[1] resp. eTimer1-channel[1]	open

Qorivva MPC5643L Controller Board Jumper Options (continued)

Jumper	Selector	Functions	Connections
J301	FAULT1 Selection	UNI-3 M1 Phase A over-current signal is connected to FAULT1 input G[9]	1–2
		UNI-3 M1 DC-bus over-current signal is connected to FAULT1 input G[9]	2–3
J302	FAULT5 Selection	UNI-3 M2 Phase A over-current signal is connected to FAULT5 input I[1]	1–2
		UNI-3 M2 DC-bus over-current signal is connected to FAULT5 input I[1]	2–3
J17 J18 J19	BOOT Selection	FAB–MPC5643L boot from internal flash ABS0–see MPC5643L documentation ABS1–see MPC5643L documentation	closed
J500	Encoder 1 Phase A	Encoder1 JP500 pin three “PHASE A” is connected to eTimer0-channel[0]	1–2
		UNI-3 “M1_BEMFZCA” is connected to eTimer0-channel[0]	2–3
J501	Encoder 1 Phase B	Encoder1 JP500 pin four “PHASE B” is connected to eTimer0-channel[1]	1–2
		UNI-3 “M1_BEMFZCB” input signal is connected to eTimer0-channel[1]	2–3
J502	Encoder 0 Index	Encoder1 JP500 pin five “INDEX” is connected to eTimer0-channel[4]	1–2
		UNI-3 “M1_BEMFZCC” input signal is connected to eTimer0-channel[4]	2–3
J503	Encoder 1 Home	Encoder1 JP500 pin six “HOME” is connected to eTimer0-channel[5]	closed

Qorivva MPC5643L Controller Board Jumper Options (continued)

Jumper	Selector	Functions	Connections
J504	Encoder 2 Phase A	Encoder2 JP501 pin three “PHASE A” is connected to eTimer1-channel[1]	1–2
		UNI-3 “M2_BEMFZCA” input signal is connected to eTimer1-channel[1]	2–3
J505	Encoder 2 Phase B	Encoder2 JP501 pin four “PHASE B” is connected to eTimer1-channel[2]	1–2
		UNI-3 “M2_BEMFZCB” input signal is connected to eTimer1-channel[2]	2–3
J506	Encoder 2 Index	Encoder2 JP501 pin five “INDEX” is connected to eTimer1-channel[3]	1–2
		UNI-3 “M2_BEMFZCC” input signal is connected to eTimer1-channel[3]	2–3
J507	Encoder 2 Home	Encoder2 JP501 pin six “HOME” is connected to eTimer1-channel[4]	closed
	M1 DC BUS Voltage	M1 DC BUS Voltage signal from UNI-3 is connected to GPIO B[8], ADC0 channel1	R336 populated
	M1 DC BUS Current	M1 DC BUS Current signal from UNI-3 is connected to GPIO B[14], ADC1 channel1	R338 populated
	M2 DC BUS Voltage	M2 DC BUS Voltage signal from UNI-3 is connected to GPIO C[0], ADC0 channel3	R337 populated
	M2 DC BUS Current	M2 DC BUS Current signal from UNI-3 is connected to GPIO C[2], ADC1 channel3	R339 populated

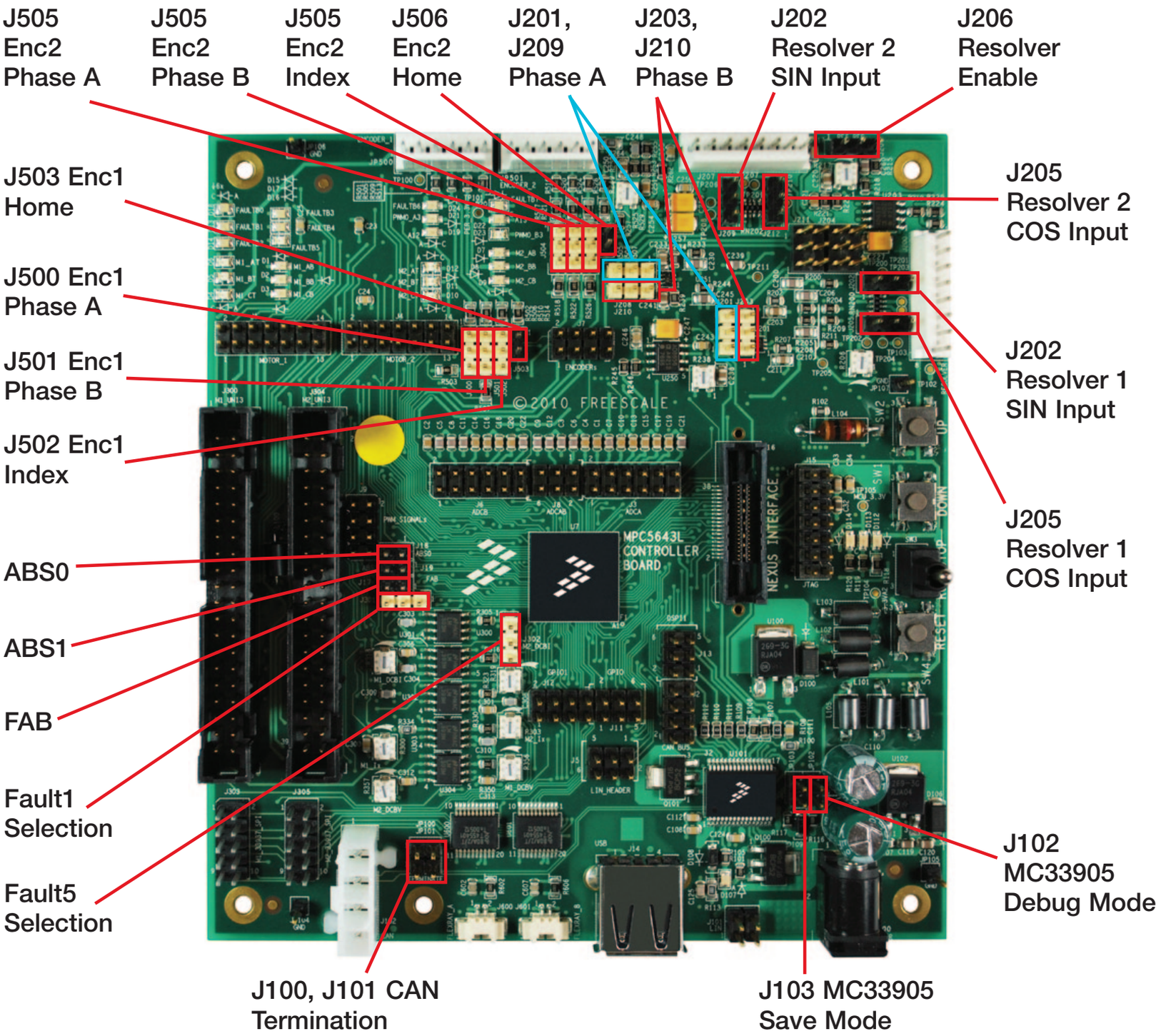
Qorivva MPC5643L Controller Board Jumper Options (continued)

Jumper	Selector	Functions	Connections
	Analog Input 11	UNI-3 M1 Phase A current is connected to GPIO B[9], ADC 0/1 input 11	R343 populated
		UNI-3 M1 Phase A Back-EMF Voltage is connected to GPIO B[9], ADC 0/1 input 11	R348 populated
	Analog Input 12	UNI-3 M1 Phase B current is connected to GPIO B[10], ADC 0/1 input 12	R352 populated
		UNI-3 M1 Phase B Back-EMF Voltage is connected to GPIO B[10]m ADC 0/1 input 12	R354 populated
	ADC0 Analog Input 2	UNI-3 M1 Phase C current is connected to GPIO C[1], ADC 0 input 2	R358 populated
		UNI-3 M1 Phase C Back-EMF Voltage is connected to GPIO C[1]m ADC 0 input 2	R360 populated
	Analog Input 13	UNI-3 M2 Phase A current is connected to GPIO B[11], ADC 0/1 input 13	R344 populated
		UNI-3 M2 Phase A Back-EMF Voltage is connected to GPIO B[11], ADC 0/1 input 13	R349 populated
	Analog Input 14	UNI-3 M2 Phase B current is connected to GPIO B[12], ADC 0/1 input 14	R353 populated
		UNI-3 M2 Phase B Back-EMF Voltage is connected to GPIO B[12]m ADC 0/1 input 14	R355 populated
	ADC1 Analog Input 2	UNI-3 M2 Phase C current is connected to GPIO B[15], ADC 1 input 2	R359 populated
		UNI-3 M2 Phase C Back-EMF Voltage is connected to GPIO B[15]m ADC 1 input 2	R361 populated

Qorivva MPC5643L Controller Board Jumper Options (continued)

Jumper	Selector	Functions	Connections
	M1 TEMP	UNI-3 Temperature signal is connected to ADC0 input four.	R370 populated
	M2 TEMP	UNI-3 Temperature signal is connected to ADC1 input four	R371 populated
	M1 Brake	UNI-3 M1 Brake output signal is connected to GPIO G[6] (PWM0-A3)	R362 populated
	M2 Brake	UNI-3 M2 Brake output signal is connected to GPIO H[14] (PWM1-A3)	R363 populated
	M1 PFC	UNI-3 M1 PFC output signal is connected to GPIO G[7] (PWM0-B3)	R364 populated
	M2 PFC	UNI-3 M2 PFC output signal is connected to GPIO H[15] (PWM1-B3)	R365 populated
	M1 PFC_EN	UNI-3 M1 PFC Enable signal is connected to GPIO C[10]	R366 populated
	M2 PFC_EN	UNI-3 M2 PFC Enable signal is connected to GPIO E[13]	R367 populated

Qorivva MPC5643L Board Jumper Position



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