



Quick Start Guide MTRCKTSPS5744P

3-Phase PMSM Motor Control Development Kit with
MPC5744P MCU

MOTOR CONTROL DEVELOPMENT KIT



3-PHASE PMSM MOTOR CONTROL DEVELOPMENT KIT WITH MPC5744P MCU CONTENTS

Hardware

- MPC5744P controller board
- 3-phase PMSM/BLDC low-voltage power stage based on the MC33937A pre-driver integrated circuit
- 3-phase PMSM motor with resolver, 25V per phase, 3000 RPM, 0.51Nm, 160W, 7.6A, TGN2-0054-30-36
- Motor parameters available @: www.tgdrives.cz/en/servomotors/
- USB cable
- +24 VDC power supply

Resource

- Modular PMSM application source code configured for this development kit
- Automotive Math and Motor Control Library set for MPC5744P installation package
- FreeMASTER installation pack
- FreeMASTER project with MCAT
- 3-phase PMSM development quick start guide
- 3-phase PMSM development fact sheet
- Dual 3-phase PMSM development kit with MPC5744P application note AN12017
- MTRCKTSPS5744P Development Kit user guide

GET TO KNOW THE MPC5744P CONTROLLER BOARD

Block Description:

1. MCU MPC5744P
2. RESET button
3. DEBUG interfaces
4. SBC MC33FS6523
5. USB interface
6. Analog filters
7. SENT bus headers
8. CAN bus header
9. Power LED indicators
10. USER LEDs [1]
11. USER LEDs [2]
12. Motor control interface [1]
13. Motor control interface [2]
14. Test headers
15. Power plug

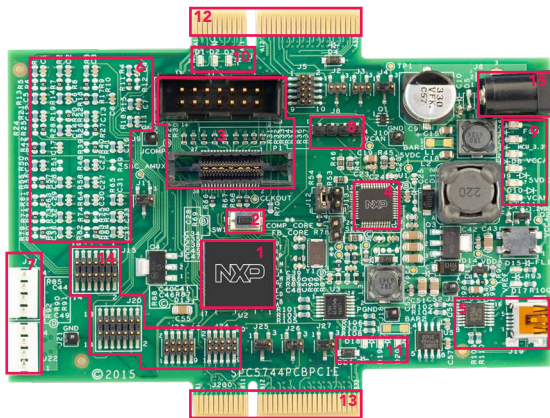


Figure 1: Front side of MPC5744P Controller Board

GET TO KNOW THE 3-PHASE LOW-VOLTAGE POWER STAGE BOARD

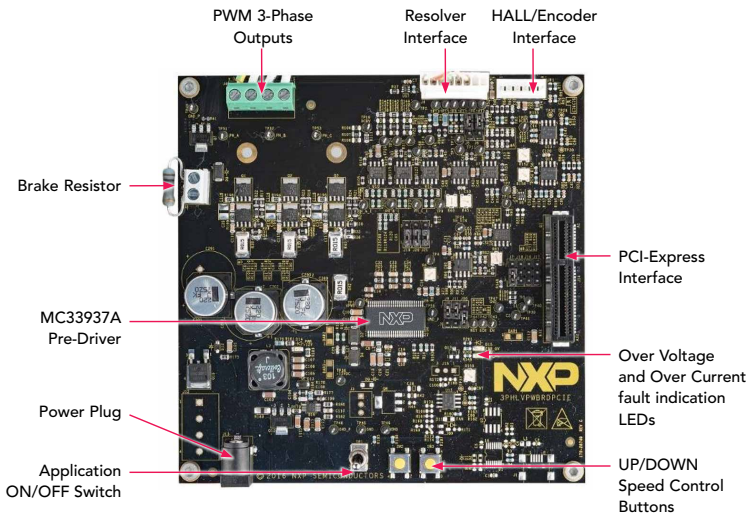


Figure 2: Front side of 3-Phase Low-Voltage Power Stage Board

MTRCKTSPS5744P FEATURES

- NXP MPC5744P MCU Controller Board with JTAG and NEXUS debug interface
- 3-phase low-voltage power stage based on SMARTMOS® MC33937A pre-driver
- Supports low-voltage PMSM motors with resolver position sensor
- DC-bus overvoltage, overcurrent, and undervoltage fault detection
- ANSI-C based example Software and Hardware in S32DS IDE for Power Architecture-based MCUs
- FreeMASTER Tool for Project visualization
- MCAT tool 1.0 part of S/W package
- Extensive documentation for software and hardware

STEP-BY-STEP INSTRUCTIONS

This section covers software download, development kit setup, and application control.

1 Download Software



Download installation software and documentation under “MPC5xxx solutions for 3-phase PMSM and sensorless BLDC” at nxp.com/automcdevkits

2 Download Necessary Drivers

Install the FT230x virtual COM port driver. Visit ftdichip.com/drivers/vcp.htm to download the correct driver.

3 Virtual COM Port Setup

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

STEP-BY-STEP INSTRUCTIONS (CONT.)

4 Kit Setup (Part 1/3)

WARNING: Make sure to perform the following steps in order. The power stage cannot be powered without the controller board when Brake Resistor (J2) is populated. The absence of the controller board leads to a high BRAKE_GATE signal, and a large current flows through the BRAKE_RESISTOR. This creates a considerable burn hazard, as the resistor will dissipate enough heat to harm on contact. If PWM braking is used, software must explicitly control the BRAKE_GATE signal. Thus, the power stage board must always be connected to the controller board.

1. Connect the USB cable to the MPC5744P controller board and the host PC.
2. Connect the controller board (using PCIe connector J1) to the power stage.

3. Connect the power supply to the power stage. The controller board power supply is taken from the power stage. The PMSM motor is designed for phase voltage = 25V.

5 Kit Setup (Part 2/3)

Start the FreeMASTER project **MPC5744P_PMSM_FOC_MCAT.pmp** located in **MTRCKTSP55744P\sw\FreeMASTER_control** project directory.

6 Kit Setup (Part 3/3)

In FreeMASTER\Project\Options, choose the RS232 COM port number that was assigned to the virtual COM port driver and set the communication speed to 115200 Bd. Enable communication by pressing the "STOP" button in FreeMASTER or by pressing "CTRL-K."

STEP-BY-STEP INSTRUCTIONS (CONT.)

7 Application Control (Part 1/8)

Yellow LEDs D18, D19, D20 have the following functionality:

- D18 flashes if application is READY
- D19 and D20 flash if application is in CALIB or ALIGN state
- D18, D19, and D20 are ON if application is in RUN state
- D18, D19, and D20 flash quickly if application is in FAULT state

8 Application Control (Part 2/8)

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. The fault has been successfully removed when the respective LED-like indicator on the FreeMASTER control page turns off.

9 Application Control (Part 3/8)

Press the UP + DOWN buttons (SW2+SW1 on the MPC5774P 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 (SW1 on the Power Stage board) to the RUN position (transition from STOP to RUN in case the switch was in the RUN state when the fault event occurred).

10 Application Control (Part 4/8)

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+SW3 on the Power Stage board) simultaneously. The RUN/STOP switch (SW1 on the Power Stage board) must be in STOP position.

STEP-BY-STEP INSTRUCTIONS (CONT.)

11 Application Control (Part 5/8)

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 (SW1 on the Power Stage board) to the RUN position (transition from STOP to RUN in case the switch was in the RUN state when a fault event occurred)

12 Application Control (Part 6/8)

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 Power Stage Board – SW2/SW3 respectively.

13 Application Control (Part 7/8)

Stop the application by pressing 0 - "STOP" on the flip/flop (ON/OFF) switch on the FreeMASTER control page, or by positioning the RUN/ STOP switch (SW1 on the Power Stage board) to the STOP position.

14 Application Control (Part 8/8)

RESET the application anytime by pressing the SW1 on the MPC5744P controller board.

MPC5744P CONTROLLER BOARD JUMPER OPTIONS

JUMPER	OPTION	SETTING	DESCRIPTION
J2 J3 J4	MCRGM_ABS1 MCRGM_ABS2 MCRGM_FAB	Open	Single Chip Mode configuration
		Open	
		1-2	
J12	SBC	1-2	SBC configured in debug mode
J25	M1_RX M2_RX	1-2	Serial Communications Receive (LINFLEX)
		2-3	
J26	SINE-WAVE	1-2	Resolver excitation from SW_GEN (not used) PCIe connector J1 PCIe connector J200
		2-3	
J27	M1_TX M2_TX	1-2	Serial Communications Transmit (LINFLEX)
		2-3	

3-PHASE LOW-VOLTAGE POWER STAGE JUMPER OPTIONS

JUMPER	OPTION	SETTING	DESCRIPTION
J5	Resolver Sin-Cos	1-2	Resolver S4 output enters operational amplifier (default) DC offset compare value
		2-3	
J6	Resolver Sin-Cos	1-2	Resolver S4 output enters operational amplifier (default) DC offset compare value
		2-3	
J7	Resolver	2-3	Resolver excitation – square signal (default) Resolver excitation – SWG source
		1-2	
J9	DC-bus Current measurement	1-2	By an external operational amplifier (default) By a MC33937
		2-3	
J10	Overcurrent threshold reference	1-2	+5V DC V _{ref}
		2-3	
J11	Over Current fault	1-2	External comparator (default) MC33937 output
		2-3	

3-PHASE LOW-VOLTAGE POWER STAGE JUMPER OPTIONS (CONT.)

JUMPER	OPTION	SETTING	DESCRIPTION
J16	Zero-Cross Detection	2-3	Default: not populated Zero-cross signal from MC33937
		1-2	Encoder / Hall sensors - PhA
J17	Zero-Cross Detection	2-3	Default: not populated Zero-cross signal from MC33937
		1-2	Encoder / Hall sensors - PhB
J18	Zero-Cross Detection	2-3	Default: not populated Zero-cross signal from MC33937
		1-2	Encoder / Hall sensors - PhC
J19 J20 J21	Phase Current measurement	1-2	By an external operational amplifier (default)
		1-2	By an external operational amplifier (default)
		1-2	By an external operational amplifier (default)
			PhA PhB PhC

SUPPORT

Visit www.nxp.com/support for a list of phone numbers within your region.

WARRANTY

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

AUTOMOTIVE COMMUNITY

<https://community.nxp.com/community/s32>

PRODUCT COMMUNITY

<https://community.nxp.com/community/s32/mpc5xxx>



Get Started

Download installation software and documentation under “MPC56xx/MPC57xx Development Kits” at www.nxp.com/automcdevkits.

www.nxp.com

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