AN13731

LPCxpresso55s36 Dual-Motor-Control Demo

Rev. 0 — 14 September 2022 Application note

Document information

Information	Content
Keywords	LPCxpresso55s36, LPC5536,LPC55S36,Dual Motor control,FRDM-MCLVPMSM, FOC, BLDC
Abstract	This application note describes how to use internal OPAM of LPC55S36/ LPC5536 microcontroller on LPCxpresso55s36 development board.

1 LPCxpresso55s36 dual-motor-control demo

This document describes how to run the dual-motor-control demo using the LPCxpresso55s36 EVK. It also provides a guideline on how to modify the FRDM-MC-LVPMSM board to utilize LPC55S36's internal op amps for 3-phase current sensing.

2 References

- "AN13731SW.zip" - package containing MCUXpresso dual-motor-control demo project patch files
- *MCUXpresso SDK Field-Oriented Control (FOC) of 3-Phase PMSM and BLDC motors* (document PMSMLPC55S36EVK)

3 Prerequisites

- MCUXpresso IDE v11.6.0
- LPCXpresso55S36 SDK v2.10.2
  - mc_pmsm_dual demo app

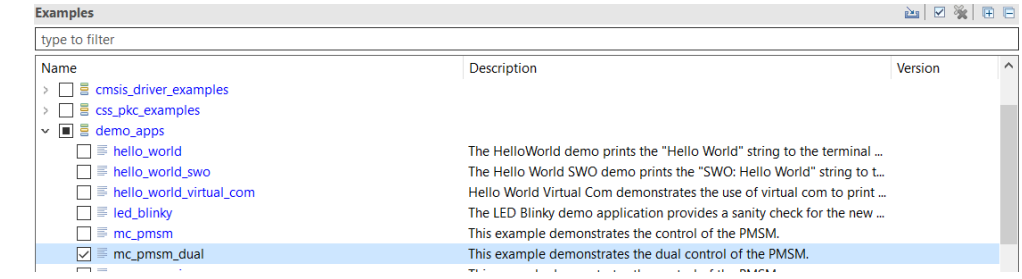

Figure 1. mc_pmsm_dual demo app

- LPCxpresso55S36 EVK board (rev. C)
- 2x FRDM-MC-LVPMSM board
- 2x 24 V capable power supply
- 2x PMSM motor (Linix or Teknic)

4 FRDM-MC-LVPMSM board modifications

This chapter describes the modifications of the FRDM-MC-LVPMSM board required to utilize LPC55S36's internal opamps for 3-phase current sensing.

5 LPCxpresso55s36 development board connectors

LPC55S36's internal op amp inputs are routed via the connector J13 (corresponding connector on the FRDM board – J4):

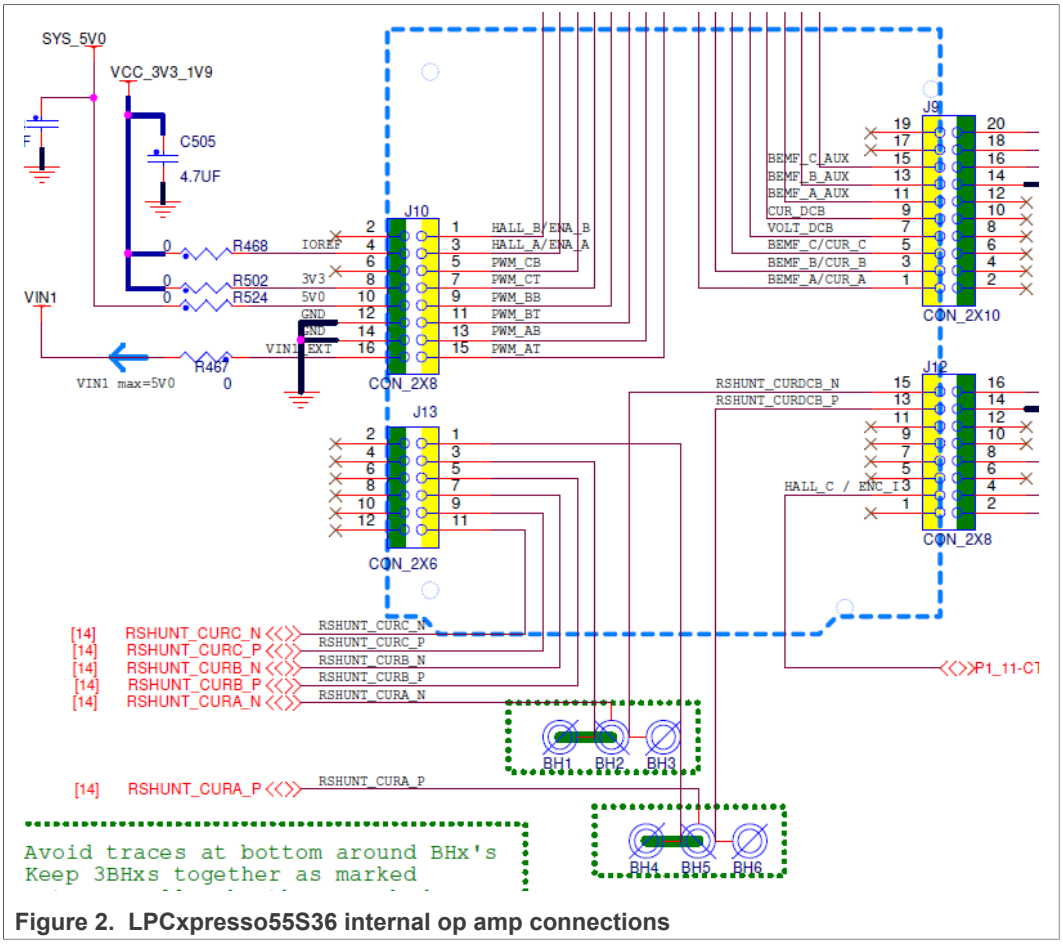

Figure 2. LPCxpresso55S36 internal op amp connections

6 FRDM-MC-LVPMSM board modifications

To measure the voltages on the FRDM onboard shunt resistors, it is necessary to route the shunt voltage signals to the J4 connector as shown in Figure 3.

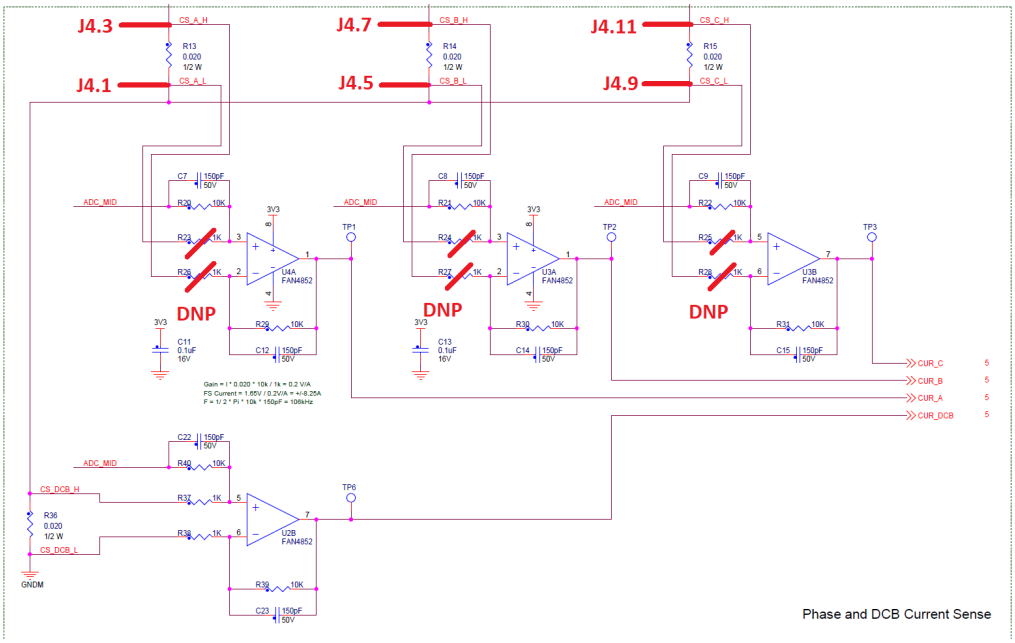

Figure 3. FRDM-MC-LVPMSM modification schematics

Resistors R23 – R28 must be depopulated to decouple the onboard op amp input resistance from the rest of the circuit.

7 FRDM-MC-LVPMSM board modification demonstration

7.1 Original board

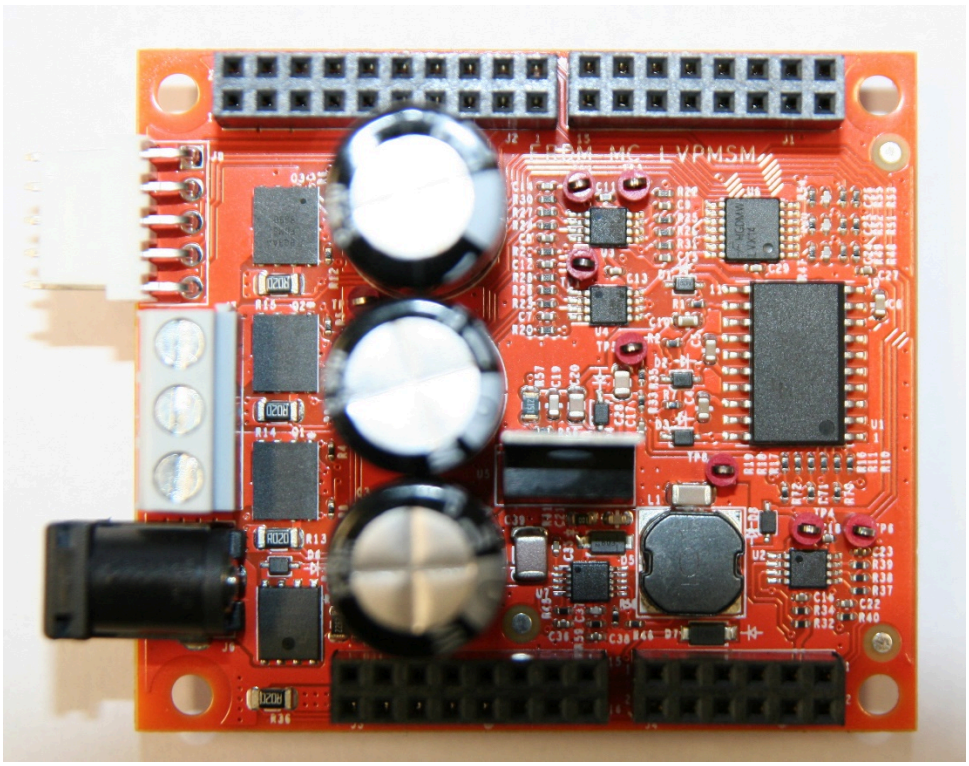

Figure 4. Original (unmodified) FRDM-MC-LVPMSM board

7.2 Modified board

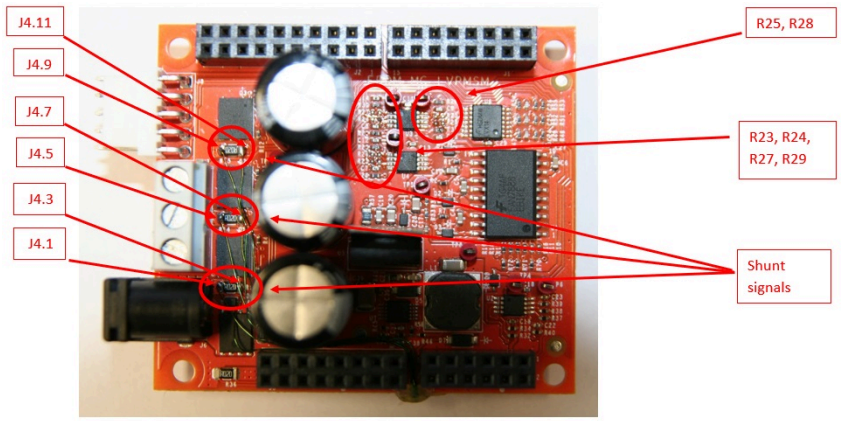

Figure 5. Modified FRDM-MC-LVPMSM board (top)

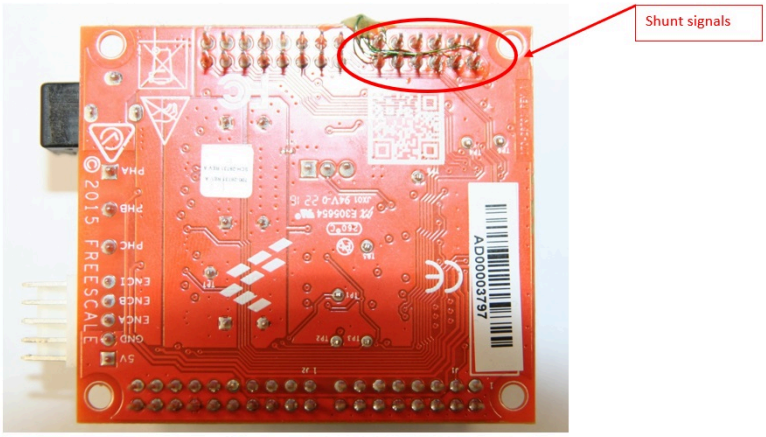

Figure 6. Modified FRDM-MC-LVPMSM board (bottom)

8 Dual motor control demo setup

The following figure shows the full dual motor control demo setup.

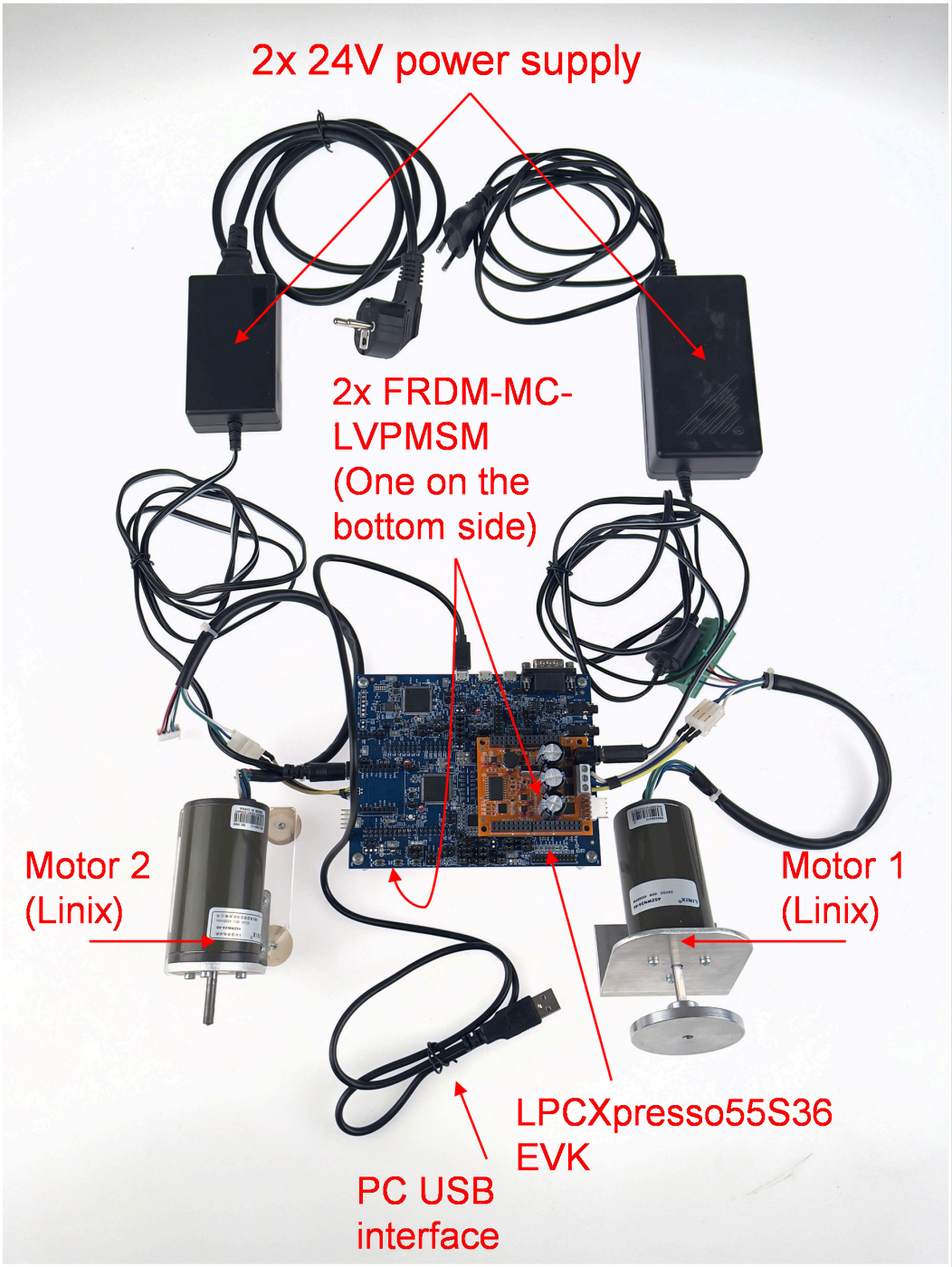

Figure 7. Dual motor control demo setup

9 Configuration

The following files (distributed in the package provided with this application note) are modified when compared to the default SDK dual-motor-control demo:

- m1_pmsm_appconfig.h

- m2_pmsm_appconfig.h
- mc_periph_init.h

These files can be found and replaced in the "${ProjName}/source" folder of the demo project. This modified demo provides the following #defines, allowing the user to select the proper motor type for both motor connectors (1 and 2) and choose between internal (LPC55S36) and external (FRDM-MC-LVPMSM) opamps for shunt voltage signal processing:

Table 1. Dual-motor-control demo configuration #defines

#define	Description	File	Notes
M1_MOTOR_LINIX	Set to “1” to use the LINIX motor on Motor Connector 1.	m1_pmsm_appconfig.h	The M1_MOTOR_LINIX and M1_MOTOR_TEKNIC defines are mutually exclusive. Set only one at a time.
M1_MOTOR_TEKNIC	Set to “1” to use the TEKNIC motor on Motor Connector 1.	m1_pmsm_appconfig.h	
M1_USE_INTERNAL_OPAMPS	Set to “1” to use the LPC55S36’s internal op amp. Set to “0” to use FRDM-MC-LVPMSM onboard opamps.	m1_pmsm_appconfig.h	The FRDM-MC-LVPMSM board must be modified according to Section 6.
M2_MOTOR_LINIX	Set to “1” to use the LINIX motor on Motor Connector 2.	m2_pmsm_appconfig.h	The M2_MOTOR_LINIX and M2_MOTOR_TEKNIC defines are mutually exclusive. Set only one at a time.
M2_MOTOR_TEKNIC	Set to “1” to use the TEKNIX motor on Motor Connector 2.	m2_pmsm_appconfig.h	

For more details, see *MCUXpresso SDK Field-Oriented Control (FOC) of 3-Phase PMSM and BLDC motors* (document PMSMLPC55S36EVK).

10 Revision history

Table 2. Revision history

Revision history	Date	Substantive changes
0	14 September 2022	Initial release

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