

# Freedom FRDM-MC-LVPMSM Development Platform User's Guide

## 1. Introduction

The Freedom development platform is a set of software and hardware tools for evaluation and development. It is ideal for rapid prototyping of microcontroller-based applications.

The FRDM-MC-LVPMSM low-voltage evaluation board, in a shield form factor, effectively turns a Freedom development platform into a complete motor control reference design, compatible with existing Freedom development platforms, FRDM-KV31F and FRDM-KV10Z, and the low cost motor FRDM-MC-LVMTR.

The FRDM-MC-LVPMSM shield board implements a 3-phase Permanent Magnet Synchronous Motor (PMSM) interface platform that adds Field Oriented Control (FOC) motor control capabilities, such as rotational or linear motion, to your design applications.

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## 2. FRDM-MC-LVPMSM Hardware Overview

The features of the FRDM-MC-LVPMSM hardware are as follows:

- Power Supply Input voltage DC: 24-48VDC, via 5.5x2.1mm barrel connector.
- Output current up to 5 amps RMS.
- Power supply reverse polarity protection circuitry.
- 3-phase bridge inverter (6-MOSFET's).
- 3-phase MOSFET gate driver with over current and under voltage protection.
- Analog sensing (DC bus voltage, DC bus current, 3-phase back-EMF voltage).
- 5.5 VDC auxiliary power supply providing FRDM MCU board supplying.
- Motor speed/position sensors interface (Encoder, Hall).
- Freedom motor control headers compatible with Arduino™ R3 pin layout.
- The FRDM-MC-LVPMSM board does not require any hardware configuration or jumpers setting. It contains no jumpers.

The following figure shows the block diagram of the FRDM-MC-LVPMSM design.

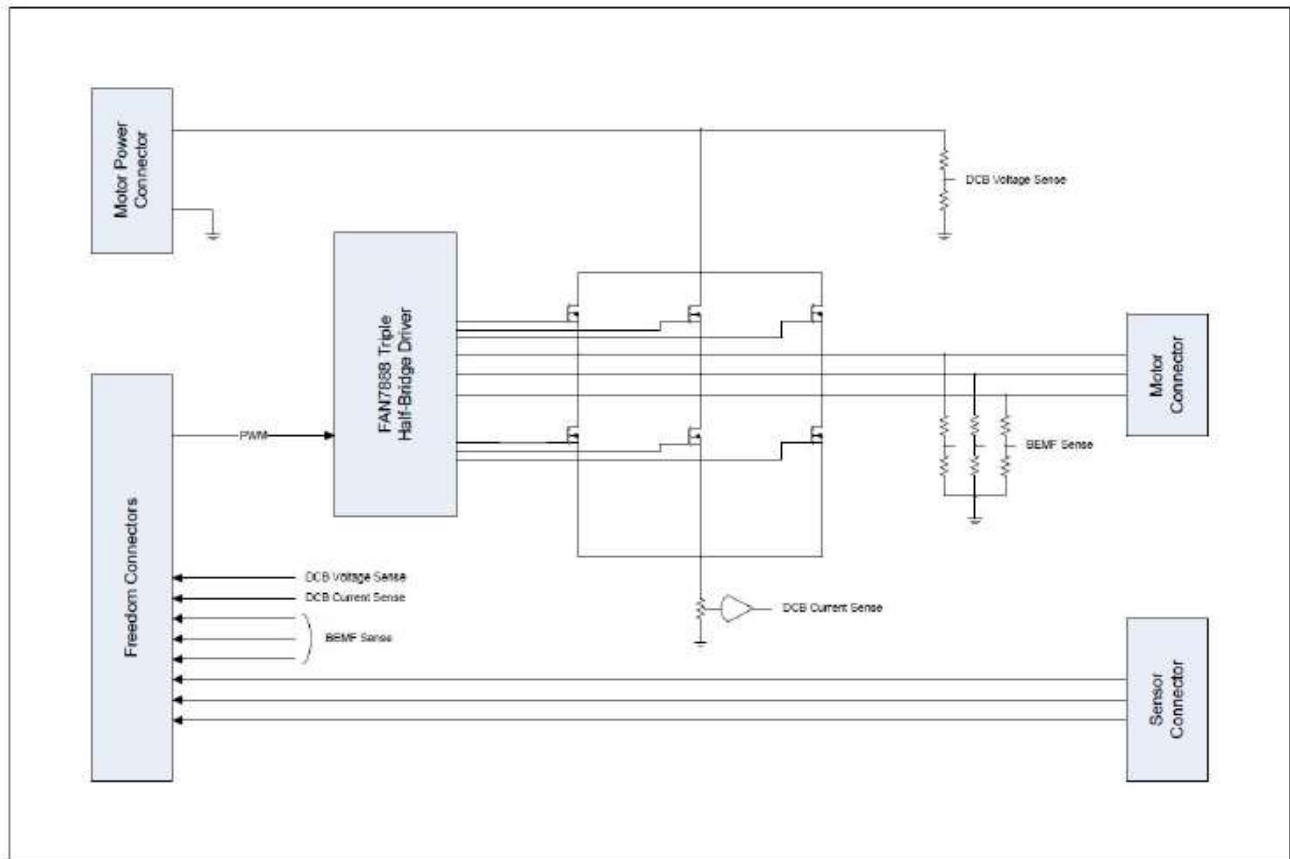


Figure 1. FRDM-MC-LVPMSM platform block diagram

The primary components and their placement on the hardware assembly are explained in the below figure.

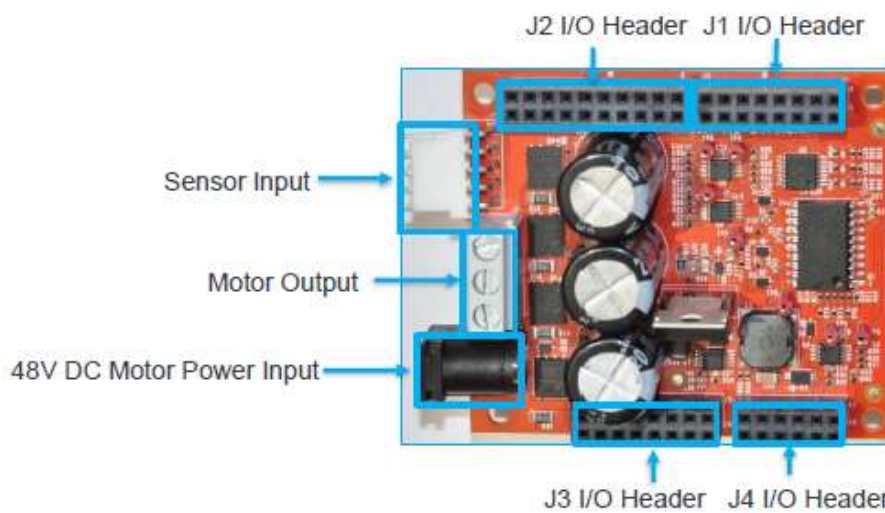


Figure 2. FRDM-MC-LVPMSM main components placement

## 3. FRDM-MC-LVPMSM Hardware Description

### 3.1. Low Voltage 3-Phase PMSM Driver Board (24 V/48 V)

- Suitable for sinusoidal control algorithms (FOC).
- Fairchild half-bridge gate drivers & power MOSFETs:
  - FAN7888MX            3ch half bridge gate driver
  - FDMS8090            100 V dual N-channel power MOSFETs
  - FAN4852IMU8X      low power amplifier

## 4. References

The following references are available on [www.nxp.com](http://www.nxp.com):

- FRDM-KV10Z Quick Reference Guide
- FRDM-KV31F Quick Reference Guide
- FRDM-MC-LVPMSM Pinouts
- FRDM-MC-LVPMSM Schematic
- FRDM-MC-LVPMSM Design Package

## 5. Revision History

Table 1. Revision history

Revision number	Date	Substantive changes
0	02/2016	Initial release

