Stellaris® DK-LM4F-DRV8312

ARM® Cortex™-M4F Motor controlCARD Kit for 3-Phase Brushless DC (BLDC) Motors

Texas Instruments introduces the first floating-point ARM Cortex-M4F sensorless field-oriented control (FOC) motor-control kit that also lets developers instantly spin their BLDC and PMSM motors.

The Texas Instruments Medium Voltage Digital Motor Control Kit for Stellaris® Microcontrollers (DK-LM4F-DRV8312) is a development platform for spinning three-phase brushless DC (BLDC) and permanent magnet synchronous motors (PMSMs).

The low-cost Stellaris LM4F211 microcontroller on the **MDL-LM4F211CNCD** controlCARD module comes pre-programmed with the necessary firmware in Flash memory to run TI's InstaSPIN™-BLDC motor control solution out-of-the-box. The system automatically spins a user's three-phase brushless DC motor (assuming operation with the included 24-V, 2.5-A supply). The kit also includes a project to spin the included PMSM using a sensorless sliding mode observer FOC technique.

The operation of both solutions can be controlled and viewed across a USB interface using an included GUI. Follow the steps in the DK-LM4F-DRV8312 kit's README First document to quickly get up and running.

Medium Voltage Digital Motor Control Kit for Stellaris LM4F MCUs (DK-LM4F-DRV8312)

Features

The DK-LM4F-DRV8312 motor control kit contains a high-performance Stellaris LM4F microcontroller-based controlCARD module compatible with other TI motor-control platforms.

TI's Stellaris Motor controlCARD kit provides an easy-to-use, low-cost, all-inclusive solution for three-phase motor-control application developers.

In addition to instantly spinning your motor, the kit also demonstrates the InstaSPIN-BLDC motor control solution's operational advantages with simplified tuning, immediate acceleration adaptation, reliable low-speed operation, and more.

The DK-LM4F-DRV8312 kit is hardware-compatible with the following TI DRV baseboards:

- DRV8312 EVM RevD+
- DRV8301 or 8302-HC EVM RevC+

Target applications

Target motor control applications for the DK-LM4F-DRV8312 kit include:

- Pumps
- Blowers
- Fans
- Compressors
- Vacuums
- Traction and transport
- Tools
- Robotics

Kit contents

The DK-LM4F-DRV8312 kit is a bundle of the following components:

- Texas Instruments' DRV312 Three-Phase Brushless DC Motor Driver
  - InstaSPIN-BLDC and Sensorless (Sliding Mode Observer, or SMO) FOC
  - 50-V, 3.5-A inverter drive board
  - Supports sub-50-V and 6.5-A peak brushless motors
- Stellaris LM4F211 controlCARD module (MDL-LM4F211CNCD)
  - Stellaris LM4F211 32-bit ARM Cortex-M4F microcontroller
  - 80-MHz floating-point processor core
  - 256 KBytes Flash
  - 32 KBytes SRAM
- 24-V NEMA17 BLDC/PMSM motor
  - Spins 24-V BLDC motors up to 3.5-A continuous)
- 24-V, 2.5-A power supply with worldwide cables
- USB Micro-B to USB-A plug cable
- DVD with tools and documentation
  - Code Composer Studio™ Integrated Development Environment V5
  - InstaSPIN-BLDC and sensorless (SMO) FOC software projects

Why Field-Oriented Control (FOC)?

- Ideal torque control
- Sinewave PWM for quieter operation
- Reduced torque ripple
- Faster dynamic response
- Better speed compensation

SMO FOC benefits

The sensorless sliding mode observer FOC technique allows for full torque control, quieter operation, and better dynamic performance. Using the Stellaris Motor controlCARD kit lets developers spin their motor in seconds, instead of days. By using the controlCARD concept, you can choose the right drive platform for your voltage and current, and then choose the right microcontroller for your control. Additional benefits include:

Software

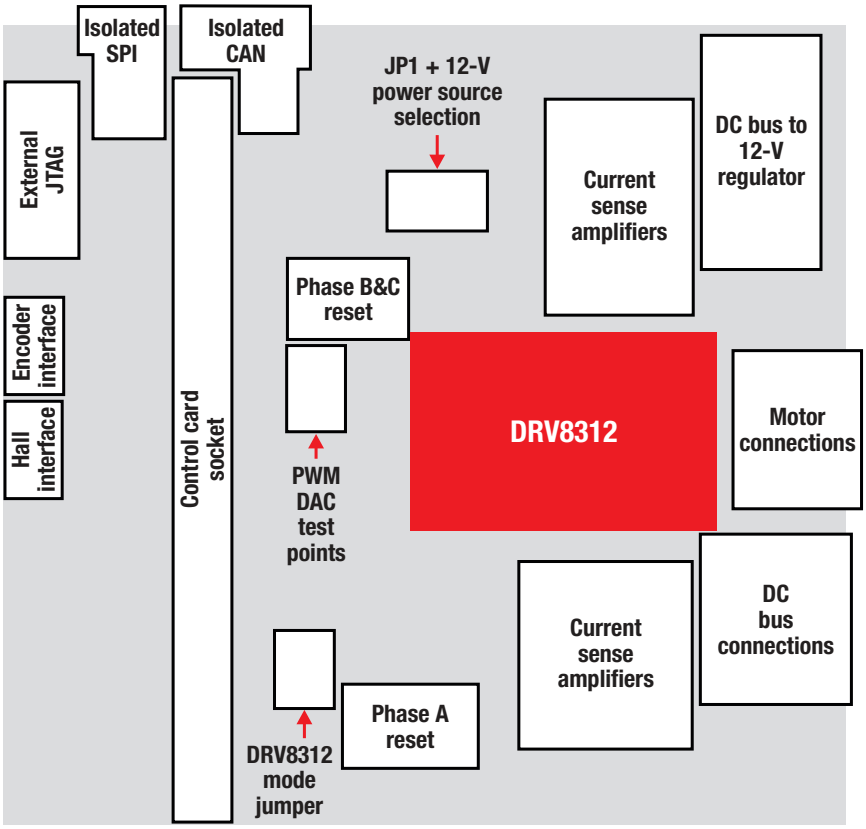
- Object-oriented software APIs are intuitive, re-usable, and portable across solutions.
- All software is written using the latest object-oriented C programming techniques for intuitive use and efficient, robust performance.
- Includes object-oriented functions and drivers that make coding extremely easy and enables easy portability among TI's microcontroller families and motor driver electronics.
- All motor-control software and documentation is free.

Sensorless (sliding mode observer) FOC

- The sensorless sliding mode observer FOC technique allows for full torque control, quieter operation, and better dynamic performance than BLDC trapezoidal control techniques.

InstaSPIN™-BLDC

- The Stellaris® LM4F211 microcontroller on the Stellaris MDL-LM4F211CNCD module has the required firmware pre-programmed in Flash to run the InstaSPIN-BLDC software out-of-the-box.
- Developers can dramatically reduce time-to-market when using InstaSPIN-BLDC because it spins your motor instantly and gives you an easy, graphical way to tune the commutation, current, and speed loops. Get started in seconds/minutes instead of hours/days.
- ARM® Cortex™-M4F-based LM4F211 microcontroller provides all the necessary computational requirements to run TI's InstaSPIN-BLDC or FOC solution with plenty of headroom to add a variety of application and communication functions.



▲ *Medium Voltage Digital Motor Control Kit for Stellaris LM4F MCUs block diagram*

Ordering information

Product number	Description
DK-LM4F-DRV8312	Stellaris Medium Voltage Digital Motor Control Kit for Stellaris LM4F Microcontrollers
MDL-LM4F211CNCD	Stellaris LM4F211 controlCARD Module in single-unit packaging

Additional information

The controlCARD motor control kit includes TI's motor software and sensorless InstaSPIN-BLDC and SMO FOC solutions that allow designers to spin motors instantly. Get started in seconds/minutes instead of hours/days.

For more information, see the following TI web sites:

www.ti.com/stellaris
www.ti.com/tool/dk-lm4f-drv3812
www.ti.com/tool/mdl-lm4f211cncd
www.ti.com/motor

InstaSPIN BLDC

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