

Dual-Axis Motor Control on a Single SoC FPGA

Superior Performance, Reliability, Safety, Security and Integration - Made EASY

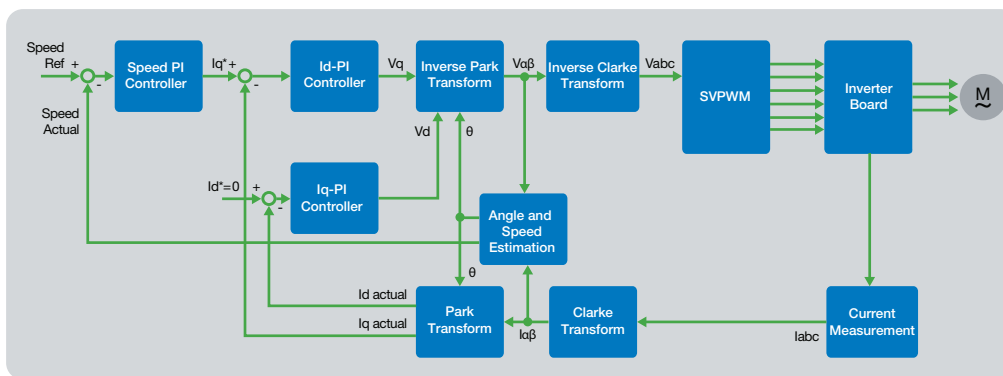
Microsemi's motor control solution is designed specially to meet the challenging industrial requirements of performance, reliability, and safety in an easy-to-use environment. The solution is compliant with industry coding standards for developing safe and reliable software for embedded applications. Microsemi offers a modular intellectual property (IP) portfolio, tools, reference designs, kits, and software to control motors such as permanent-magnet synchronous motor (PMSM)/brushless DC (BLDC) and stepper motors.

Reference Design Features

- Dual-axis motor control on a single system-on-chip (SoC) field programmable gate array (FPGA)
- Efficient, reliable, secured and safe drive/motor control with product longevity.
- A compact solution which saves board space and reduces product size.
- Motor performance is tested for speeds exceeding 30,000 RPM for sensorless field oriented control (FOC).
- Low latency 1.2 μ s for FOC with sensors and 2 μ s sensorless FOC at 100 MHz enabling switching frequencies up to 500 kHz.
- Design flexibility with modular IP suite.
- Has advanced safety features like "Automatic motor restart"

- and "Overcurrent protection"
- SoC integration of system functions to lower 'Total Cost of Ownership (TCO)'.

Motors	Algorithm
PMSM / BLDC Motors	FOC Sensorless
	FOC with HALL
	FOC with Encoder
	FOC with Resolver
Stepper Motor	Speed Control



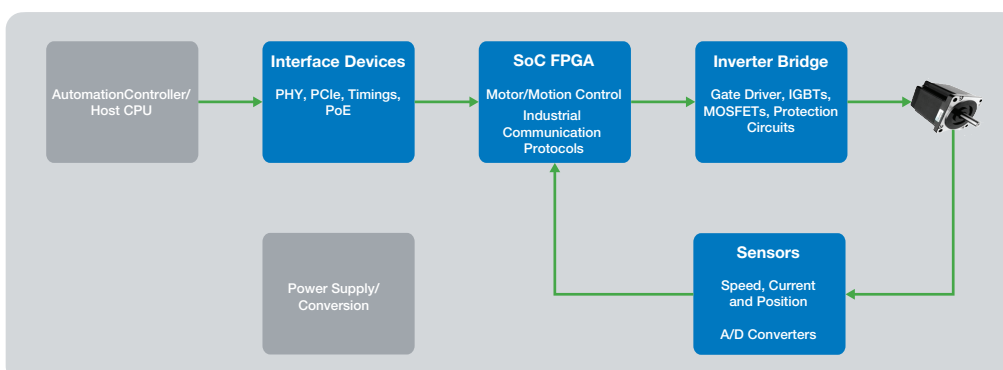
IP Modules

IP blocks offered for the FPGA fabric:

- Space Vector Modulation (SVM)
- Core 3 Phase PWM
- FOC transformation IPs (Clarke, Park, Inverse Clarke and Inverse Park)
- PI Controller
- Rate Limiter
- Position and Speed Estimator
- Encoder Interface
- Stepper Angle Generator

Fully Modular IP Suite

- Quick plug-and-play approach to implement algorithms
- Easy porting and customization through block-based approach
- Precise algorithm for angle estimation in sensorless FOC
- PWM with dead time protection and delay time insertion
- IP blocks are coded for efficient use of FPGA resources
- IP blocks tested in simulations and on actual hardware
- IPs available as MATLAB models, VHDL code for FPGA

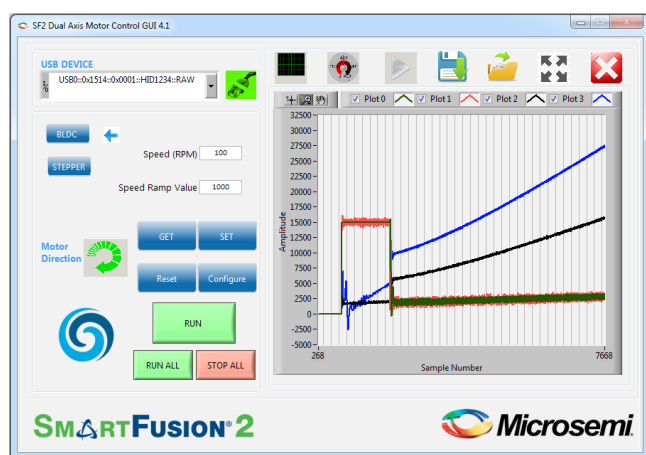


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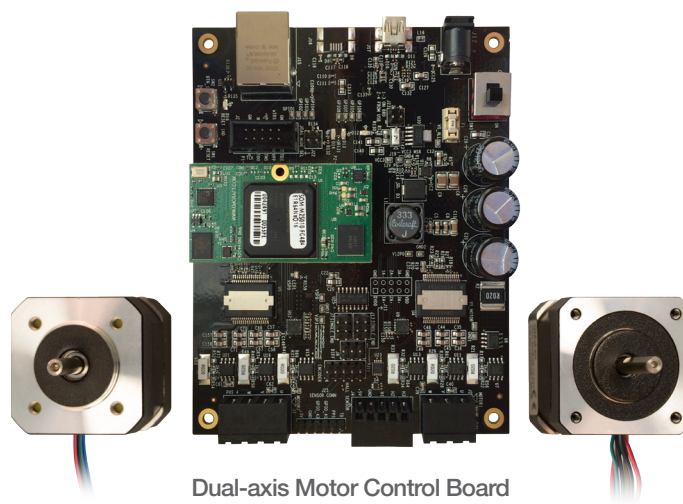
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High Performance, Reliable and Secured Motor Control Solution

Microsemi's SmartFusion®2 SoC-FPGA based solution is an ideal reference platform for developing high performance, reliable and secured dual-axis motor control applications. The solution has algorithms like Sensorless - FOC, FOC with HALL, FOC with Encoder, and FOC with Resolver for PMSM/BLDC motors. The position control algorithm of stepper motor supports up to 1024 micro-steps. The SmartFusion®2 Motor Control GUI allows for the dynamic tuning of parameters such as reference speed, Kp/Ki gains of PI controllers and viewing internal signals for debugging. The kit also supports various communication interfaces including Ethernet, CAN, RS485, USB, and others. SmartFusion®2 SoC FPGAs feature stronger design security than other FPGAs and include differential power analysis (DPA) resistant anti-tamper measures using technology licensed from Cryptography Research Incorporated (CRI). The security architecture was designed with a layered approach in mind, building on top of a foundation of secure hardware.



Software GUI for Motor Control



Dual-axis Motor Control Board

Microsemi offers a one-stop shop with a portfolio of complementary products to meet your motor control needs. Microsemi's product portfolio includes FPGAs, SiC diodes/MOSFETs, power modules, timing, PoE/Midspans, sensors, and more.

Smart Fusion2 dual-axis motor control starter kit; Part number: SF2-MC-STARTER-KIT-SA

For more information, visit www.microsemi.com/applications/motor-control

Please send your questions and comments to motorcontrol@microsemi.com

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