



3-Phase Sensorless BLDC Kit with Qorivva MPC5643L MCU

Overview

This application is designed for the Qorivva MPC5643L controller board with an encoder/resolver interface and 3-phase BLDC/PMSM low-voltage power stage equipped with a 3-phase MC33937A pre-driver. Beside the main control loop, the DC bus current and DC bus and phase voltages are monitored during the control process for overvoltage, undervoltrage and overcurrent drive protection.

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3-Phase BLDC Development Kit: Qorivva MPC5643L MCU



Target Automotive Applications

- Air conditioning units
- Automotive drives
- Compressors
- Fans
- Motor control
- Pumps





Demo Features

- MPC5643L controller board with doubled encoder/resolver interface
- 3-phase BLDC/PMSM low-voltage power stage 12 V/10 A based on a SMARTMOS MC33397A pre-driver
- Low-voltage BLDC motor with Hall encoder sensors
- Parameters:
 - 20 kHz PWM (50 µs period), back-EMF voltage sensing every 50 µs,
 1 ms speed control loop
- Software approach optimized for portability, low maintenance cost and speed
- Application, algorithms and drivers written purely in ANSI-C
- Layered software approach
- Algorithm layer not peripheral dependent
- Faults of DC bus overvoltage, overcurrent and undervoltage are processed
- FreeMASTER visualization support

Qorivva MPC5643L MCU Features

- Up to 120 MHz dual e200z4 32-bit Power Architecture[®] core with 1 MB of flash and 128 KB of SRAM memory
- Dual-core safety platform targeting ISO26262 ASILD and IEC61508 SIL3 integrity levels
- One FlexRay[™], two FlexCAN and two LINFlex modules
- Lock step or decoupled parallel mode configuration
- Floating point unit
- VLE category for reduced code footprint
- Freescale SafeAssure functional safety solution

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MPC5643L Block Diagram



Qorivva MPC5643L MCU Motor Control Units

- 2x FlexPWM, four channels with four fault inputs
- 3x eTimers, including quadrature decode
- 2x 10-bit ADC modules with 2 x 12 channels (including four shared channels)
- Cross triggering unit with 32 input channels (eight events, 24 ADC commands)
- · Fault collection unit

MC33937A Features

- Fully specified from 8 to 40 V (covers 12 and 24 V automotive systems)
- Extended operating range from 6.0 to 58 V (covers 12 and 42 V systems)
- Greater than 1.0 A gate drive capability with protection
- Protection against reverse charge injection from CgD and Cgs of external FETs
- Deadtime is programmable via the SPI port
- Simultaneous output capability enabled via safe SPI command

MC33905 (System Basis Chip) Features

- 5 or 3.3 V voltage regulator with current, temperature and voltage protection
- Configuration and diagnostic accessible through the SPI
- One CAN and up to two LIN transceivers
- Window watchdog, two configurable input/ output pins
- Very low quiescent current in low power modes
- Stop (Vdd on) and sleep (Vdd Off) modes

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