BLDC Motor Sensorless Control Using MC56F8013

Application Usage
> BLDC Motor Applications
> Fan, Pump and Compressor Applications
> Automotive

Application Features
> 3-phase BLDC motor sensorless control, based on trapezodial control with back-EMF sensing
> Designed to fit into fan, pump and compressor applications
> Both direction of rotation
> Speed closed loop with current closed loop at alignment
> Adjustable DC bus current limitation by software
> Automatic pre-calibration of phase back-EMF measurements
> Overvoltage, undervoltage and overcurrent fault protection
> Manual interface and FreeMASTER control page for monitoring, control and tuning
> Easy to tune for different power stages and motors

Target Devices/Platforms
> Brushless DC Motor
> Freescale MC56F8013 Hybrid Controller
> Freescale MC33395 Three-Phase Gate Driver IC
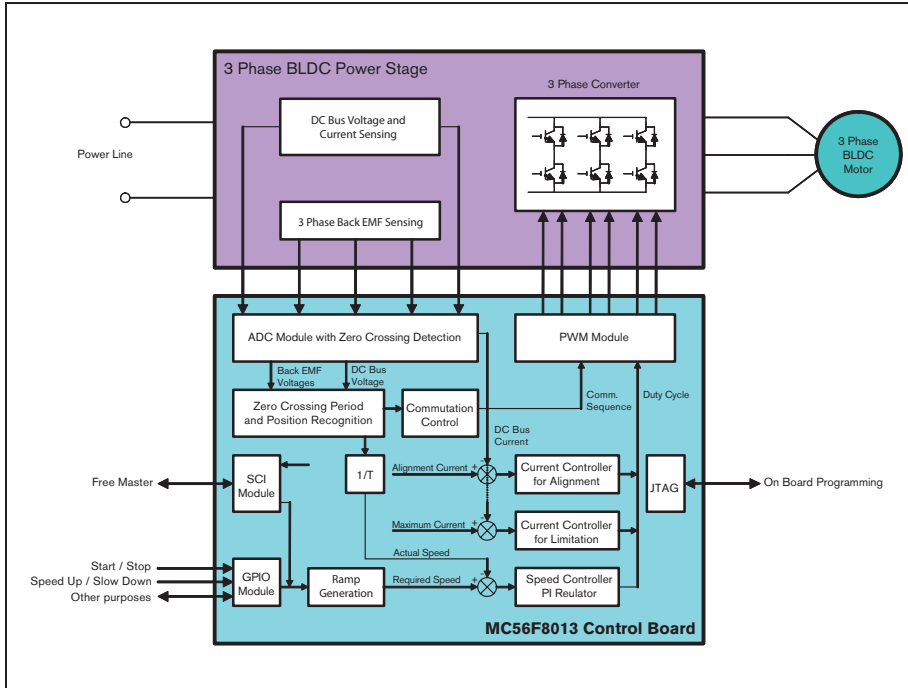> Motor Control Application

Description

The BLDC motor sensorless control demo deals with a 3-phase Brushless DC (BLDC) motor sensorless drive for fans, pumps and compressors. It is based on the Freescale's cost-effective MC56F8013 hybrid controller.

The concept of the application is a speed-closed loop Brushless DC drive without any position or speed sensor needs. The application uses a sensorless control based on back-EMF sensing using dedicated low voltage (automotive 12-volt) power stage boards and controller board of MC56F8013 hybrid controller.

The demo setup is controlled via FreeMASTER control page utilizing RS232 communication.

BLDC MOTOR SENSORLESS CONTROL USING MC56F8013 DEMO SETUP

Available from Freescale Semiconductor

> Reference Design

> Demo setup with 3-phase BLDC Motor, Micro Power Stage and MC56F8013 Evaluation Board

> Application software in C (CodeWarrior™ Development Studio)

> Application support from motor control experts from Freescale Semiconductor, Roznov Czech System Center (Roznov CSC)

Online Resources

> Reference Design at Freescale homepage:
   www.freescale.com

> Freescale Motor Control web page:
   www.freescale.com/motorcontrol

16 KB Internal Program Flash	4 KB On-Chip RAM
JTAG/EOnce	PWM Module with 6 Pin Outputs
Interrupt Controller	ADC Module with 6 Channels
System Clock Generator (OSC and PLL)	Timer Module with 4 Channels
Relaxation Oscilator	I²C
Voltage Regulator	SCI
Integrated Reset and Power Monitoring	SPI
COP	GPIO (all pins muxed)

56F800E Core
32 MIPS @ 32 MHz

MC56F8013 Features

> DSP core
   ▪ Up to 32 MIPS at 32 MHz execution frequency
   ▪ DSP and MCU functionality in a unified, C-efficient architecture
> Internal memory
   ▪ 16 KB program Flash
   ▪ 4 KB Data RAM
> Clock generation
   ▪ On-chip relaxation oscillator operating at 8 MHz
   ▪ Fixed PLL operating at 192 MHz
> On-chip peripherals
   ▪ One SCI, one SPI and one I2C
   ▪ 6 input 12 bit A/D converter
   ▪ 6 output PWM module
   ▪ One 16-bit quad timer
   ▪ All pins are muxed with GPIO
   ▪ COP and integrated power-on reset
> JTAG/EOnCE for unobtrusive, real-time debugging

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