Automotive motor control development solutions

MTRDEVKSPNK144 3-phase PMSM Development Kit with S32K144 MCU

The MTRDEVKSPNK144 motor control development kit is designed to enable rapid prototyping and evaluation of PMSM motor control applications.

OVERVIEW

The MTRDEVKSPNK144 development kit serves as an example of a motor control design using the S32K144 family of automotive microcontrollers based on a 32-bit Arm® Cortex®-M4F core optimized for a full range of automotive applications.

KEY FEATURES

▸ **S32K144 MCU –** 32-bit Arm Cortex-M4F based MCUs targeted for general purpose automotive and ultra-reliable industrial applications

▸ **Low Voltage Power Stage –** 3-phase power stage DEVKIT-MOTORGD based on SMARTMOS GD3000 pre-driver with condition monitoring and fault detection

▸ **Automotive Motor Control Algorithm –** sensorless and sensor control of the PMSM motor based on Field Oriented Control (FOC) extended by Field Weakening (FW).

▸ **Automotive Math and Motor Control Library Set –** control algorithm built on blocks of precompiled software library

▸ **FreeMASTER and MCAT support –** application tuning and variables tracking at different levels of the FOC cascade structure

S32K144 MCU SPECIFICATIONS

Flash	512 KB	Clock	8 MHz – ext.
RAM	64 KB	PWM & Timers	4 x FlexTimer (8-ch.)
Core	ARM Cortex – M4F, 32-bit CPU		1 x LPIT 1 x LPTMR
Speed	80 MHz	ADC	2 modules, 12-bit
Package	LQFP-100	Trigger Unit	2 x PDB + TRGMUX
Temp	+125°C Tj	Comms	3xLPUART, 3xLPSPI 3xFlexCAN (1x with FD)

TARGET AUTOMOTIVE APPLICATIONS

▸ Actuators and valve controls

▸ Electric fuel, water and oil pumps

▸ Engine cooling fans

▸ Windshield wipers

▸ Heating, ventilation and air conditioning (HVAC)

▸ Transmission and gearbox

▸ Doors, window lift and seat control

ENABLEMENT TOOLS

Development Hardware:

▸ 3-phase low-voltage power stage DEVKIT-MOTORGD based on SMARTMOS GD3000 pre-driver up to 18 Volts

▸ S32K144EVB: S32K144 Evaluation Board

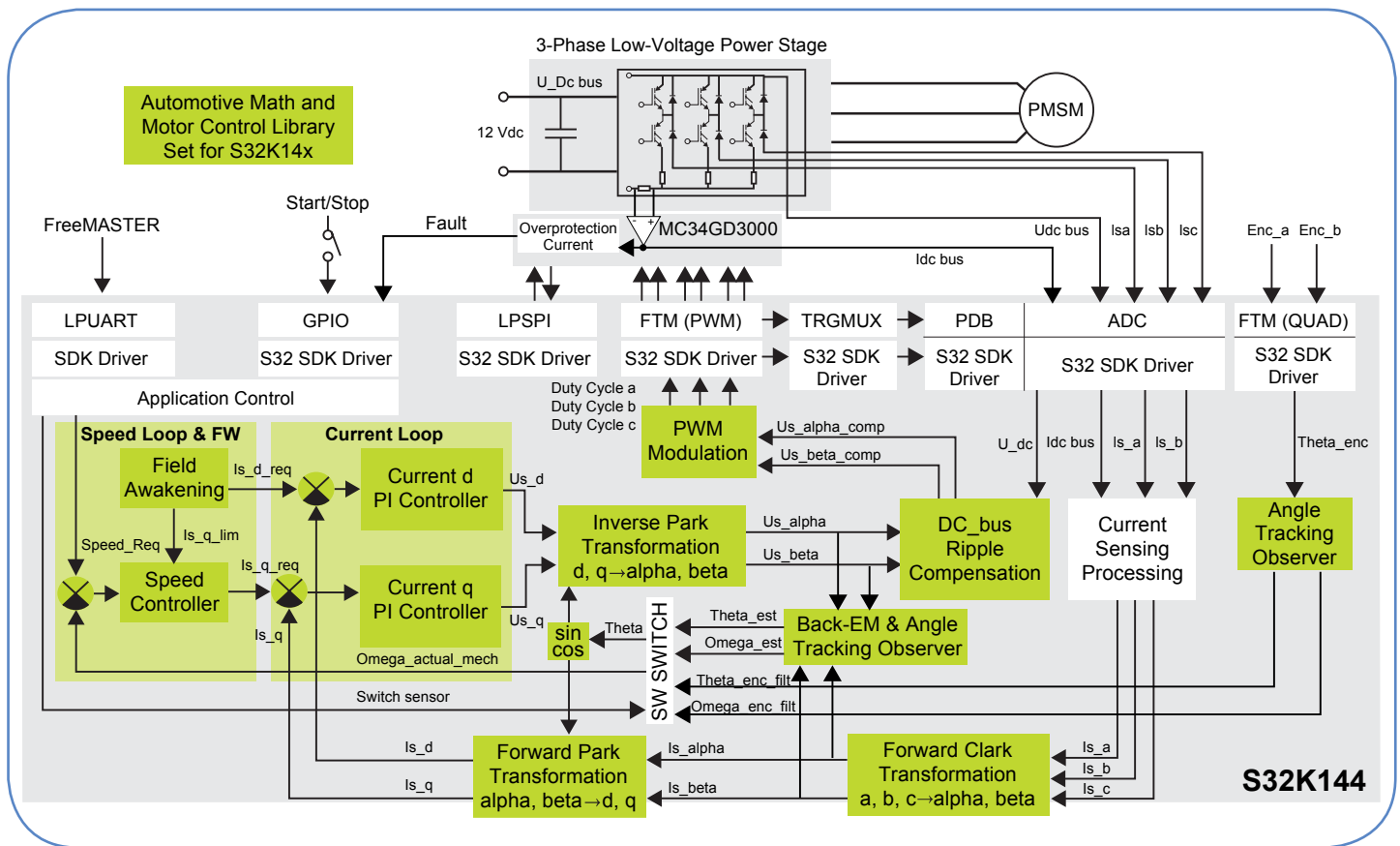▸ 3-phase permanent magnet low-voltage motor

▸ 12 V / 5 A power supply

Runtime Software:

▸ Sensorless control of the PMSM motor with Field Weakening

▸ Software example contains routine for encoder signal processing

▸ Single-shunt and dual-shunt current sensing

▸ Software example created in the S32 Design Studio for Arm built on S32 Software Development Kit (SDK)

▸ MCU peripherals initialization generated by Processor Expert

▸ FreeMASTER project part of software package

▸ Motor Control Application Tuning (MCAT) tool 1.1 available

3-PHASE PMSM DEVELOPMENT KIT WITH THE S32K144 MCU
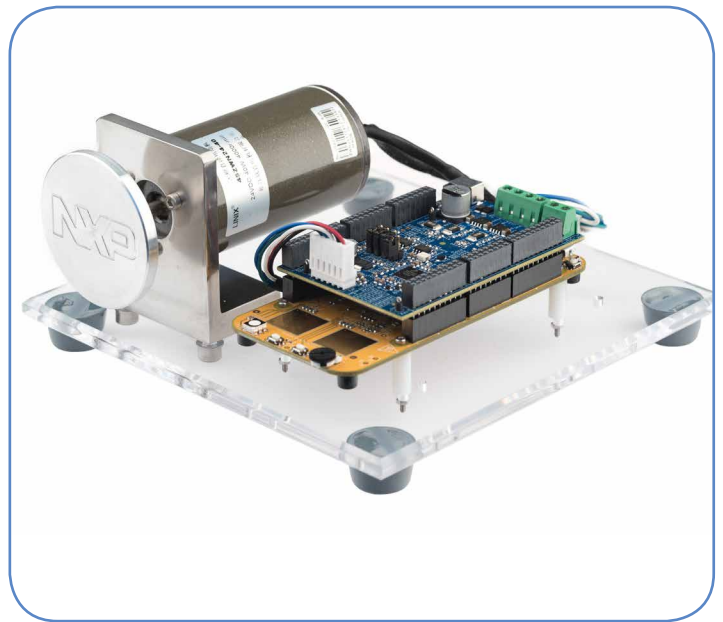
MOTOR CONTROL ALGORITHM CONCEPT