32-bit Kinetis V Series MCUs

Kinetis KV1x Family

ARM Cortex-M0+ processor family for Sensorless BLDC and PMSM motor control

Target Applications

- Sensorless BLDC motor control
- Entry-level sensorless PMSM motor control
- Compressors
- Pumps
- Domestic appliances

Overview

The Kinetis KV1x family of microcontrollers is a high-performance, cost-competitive solution for 3-phase sensorless BLDC and PMSM motor control applications and the entry point into the Kinetis V series—the first Kinetis microcontroller family specifically designed for motor control. Built upon the ARM® Cortex®-M0+ core running at 75 MHz with hardware square root and divide capability, it delivers a 35% increase in performance in math-intensive applications versus comparable MCUs, allowing it to target BLDC as well as more computationally demanding PMSM motors. Additional features include dual 16-bit analog-to-digital controllers (ADCs) sampling at up to 1.2 mega samples per second (MS/s) in 12-bit mode, multiple motor control timers, up to 32 KB of flash memory and a comprehensive enablement suite from Freescale and third-party resources, including reference designs, software libraries and motor configuration tools.

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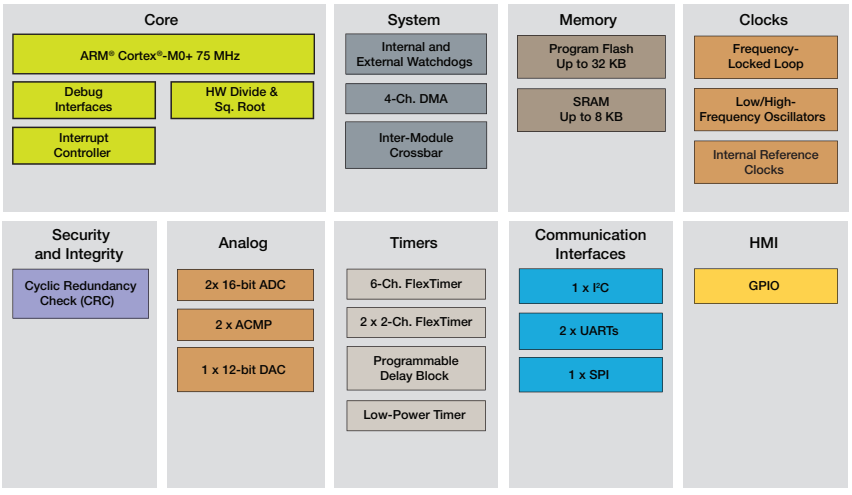

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Features and Benefits

- 75 MHz Cortex-M0+ core with hardware square root and divide block—Improves performance in math-intensive applications (e.g., processing of sensorless field-oriented control (FOC) algorithms)
- 2x 16-bit ADCs with two capture and hold circuits and up to 1.2 MS/s samples rate in 12-bit mode, simultaneous measurement of current and voltage phase, reduced jitter on input values improving system accuracy
- 1 x 6-channel and 2 x 2-channel programmable FlexTimers—High-accuracy PWM generation with integrated power factor correction or speed sensor decoder (incremental decoder/hall sensor)
- 12-bit DAC and 2 x ACPMs (analog comparators)—Overcurrent and overvoltage fault detection, reduced BOM costs. ADC and ACMP interconnect with PWM and PDB (programmable delay) blocks for real-time hardware control.
- 4-channel DMA—Reduced CPU loading for improved application performance
- Dual watchdogs—Compliance with IEC 60730 safety regulation requirements
- Broad family scalability with hardware and software compatibility—Easy migration to more performance, memory and feature integration within the Kinetis V series

Development Tools

TWR-KV10Z32:
The TWR-KV10Z32 Tower System MCU module is a cost-effective, modular development platform that features the KV1x MCU in a 48 LQFP package, integrated OpenSDA debug adapter (requires no external debug interface) and is compatible with the TWR-MC-LV3PH 3-phase motor peripheral module and Freescale FreeMASTER run-time debugging tool.

TWR-MC-LV3PH:
The TWR-MC-LV3PH low-voltage, 3-phase motor control Tower System peripheral provides a complete motor control reference design kit for developing DC, BLDC and PMSM motor solutions. Compatible with the KV1x MCU (and several other Freescale controllers) and includes a 3-phase BLDC motor and driver board. Included in the TWR-KV10Z32 is demonstration software to run the TWR-MC-LV3PH with a BLDC algorithm.

Integrated Development Environments (IDEs):
Kinetis KV1x MCUs are supported by Freescale CodeWarrior Development Studio for Microcontrollers V10.5, IAR Embedded Workbench for ARM and ARM Microcontroller Development Kit. All IDEs support the Freescale Processor Expert auto code generator—a GUI-based, device-aware software generation tool that automatically generates peripheral start-up code and device drivers to dramatically reduce application development time.

FreeMASTER:
Freescale FreeMASTER is a free, simple, yet highly customizable real-time debug monitor and data visualization tool designed for software development that requires real-time data access. Supporting nonintrusive variable monitoring, FreeMASTER allows the monitoring and modifying of multiple variables in real-time through an evolving oscilloscope-like display or in a common text format. Third-party instrumentation components can also be inserted into the tool to create displays of complex, real-time data dashboards.

Motor Control Application Tuning (MCAT) Tool:
Freescale MCAT is a free, GUI-based plug-in for the FreeMASTER tool that is designed for developing PMSM and BLDC applications, real-time control structure parameter tuning and aids motor control users in adapting Freescale's MCUs to their motors without a detailed knowledge of PI controller constant calculations.

Motor Control Toolbox:
Freescale's motor control development toolbox is a comprehensive collection of tools that plug into the MATLAB™/Simulink™ model-based design environment to support rapid application development targeting Freescale MCUs.

Software Libraries:
Freescale provides several advanced software libraries for motor control, math, filter and other general functions; advanced and modular software library for Cortex-M0+ core, including hardware square root and divide; and a core self-test library for IEC 60730 certification.

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Part Number	Max. Freq. (MHz)	Pin Count	Package	Flash (KB)	SRAM (KB)	DMA	FLL	FlexTimers	DAC
MKV10Z32VLF7	75	48	LQFP	32	8	4-ch.	Yes	1x6-ch, 2x2-ch	1
MKV10Z32VLC7	75	32	LQFP	32	8	4-ch.	Yes	1x6-ch, 2x2-ch	1
MKV10Z32VFM7	75	32	QFN	32	8	4-ch.	Yes	1x6-ch, 2x2-ch	1
MKV10Z16VLF7	75	48	LQFP	16	4	4-ch.	Yes	1x6-ch, 2x2-ch	1
MKV10Z16VLC7	75	32	LQFP	16	4	4-ch.	Yes	1x6-ch, 2x2-ch	1
MKV10Z16VFM7	75	32	QFN	16	4	4-ch.	Yes	1x6-ch, 2x2-ch	1

For current information about Kinetis V series MCUs, please visit freescale.com/Kinetis/Vseries

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