Freescale Software

Embedded Software and Motor Control Libraries

For Freescale DSCs, Kinetis ARM® Cortex™-M4 and ColdFire V1 platforms

Target Applications

- Advanced motor control
- Switch mode power supplies
- Uninterruptible power supplies
- Photovoltaic systems
- Advanced lighting
- Signal processing
- Math functions

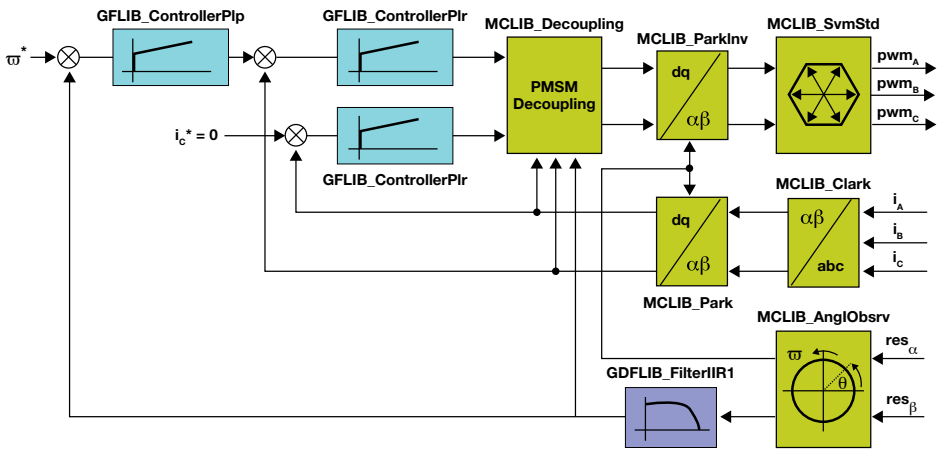
Overview

Freescale Embedded Software Libraries are a complimentary group of algorithms, ranging from basic mathematics operations to advanced transformations and observers, which can be easily incorporated into complex real-time control applications. The complimentary algorithms help to speed development and ease of use in applications that require intensive math computation and control such as advanced high-efficiency motor control and power conversion.

The libraries are highly optimized, tested on Freescale hardware and easy to use as they are implemented with a C-callable function interface. The libraries are broken into the following four main function groups.

- **General Function Library (GFLIB):** Contains the basic building blocks of a real-time control application. Functions for basic mathematical calculations, trigonometric functions, simple look-up table and control functions such as PI and PID controllers.

Typical System Integration of the Algorithms and Functional Blocks



freescale™

- **Motor Control Library (MCLIB):** The fundamental blocks of a motor control application. The library includes vector modulation, Park and Clarke transformations and specific motor related functions to build digitally controlled motor drives.
- **General Digital Filter Library (GDFLIB):** The library includes filter functions for signal conditioning.
- **Advanced Control Library (ACLIB):** Functions that enable the construction of a variable speed AC motor drive system that implements field-oriented control techniques without position or speed sensors to provide the lowest cost solution.

Individual libraries are delivered as stand alone modules with a single interface to reduce the number of files required for integration of the library and to ease development.

The libraries are currently available for Freescale DSCs running on the DSP56800E/ DSP56800EX cores, ColdFire V1 and Kinetis ARM® Cortex™-M4 platforms.

The latest version of the libraries available for the DSP56800E/EX core have been optimized to reduce computation time for each calculation and increase the precision of key algorithms. In addition, the Advanced Control Library has been fully implemented in assembly language to maximize run time performance.

Development Tools

- CodeWarrior for DSC and ColdFire V1
- IAR and CodeWarrior for ARM Cortex-M4

Features

Features	Benefits
Basic math and filter functions	Reduces development time for real-time control applications
Motor control library	Provides the foundations of a motor control application, easing development effort and time to market
Advanced control library	The main components of a complex motor control solution with the lowest cost hardware
C callable functions	Easy to use and integrate into an application
Written in assembler	Optimized for performance and size

Freescale Embedded Software Libraries

Library	Algorithm	Core Supported		
		DSP56800E and DSP56800EX	MCF51	ARM® Cortex™-M4
General Function Library (GFLIB)	Sine	√	√	√
	Cosine	√	√	√
	Tangent	√	√	√
	Arcus Sine	√		√
	Arcus Cosine	√		√
	Arcus Tangent	√		√
	Arcus Tangent YX	√		√
	Sifted Arcus Tangent YX	√		√
	Square Root	√	√	√
	Ramp	√	√	√
	Dynamic Ramp	√		
	Limiter	√	√	√
	Hysteresis	√		√
	Signum	√		√
	Look-up Table	√		√
	PI Controller	√	√	√
	PID Controller	√		
Motor Control Library (MCLIB)	Clarke Transformation	√	√	√
	Inverse Clarke Transformation	√	√	√
	Park Transformation	√	√	√
	Inverse Park Transformation	√	√	√
	Space Vector Modulation	√	√	√
	Vector Limiter	√	√	√
	PMSM Decoupling	√	√	√
	DC Bus Ripple Elimination	√	√	√
General Digital Filter Library (GDFLIB)	IIR Filter	√	√	√
	Moving Avg. Filter	√	√	√
Advanced Control Library (ACLIB)	Angle Tracking Observer	√	√	
	Tracking Observer	√		√
	PMSM BEMF Observer in Alpha/Beta	√	√	√
	PMSM BEMF Observer in D/Q	√		√
	Integrator	√		

For more information, visit freescale.com/controllibrary

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