

dsPIC30F

DSP Library

Summary

The dsPIC30F DSP Library provides a set of speed optimized functions for the most common digital signal processing applications. The DSP Library provides significant performance savings over equivalent functions coded in “C” and allows developers to dramatically shorten their development time. The DSP Library may be used with any dsPIC30F variant.

The DSP Library is written predominantly in assembly language and makes extensive use of the dsPIC30F DSP instruction set and hardware resources, including X and Y memory addressing, modulo addressing, bit-reversed addressing, 9.31 saturation and REPEAT and DO loops.

The DSP Library provides functions for the following

- Vector operations
- Matrix operations
- Filtering operations
- Transform operations
- Window operations

Function Execution Times

Function	Cycle Count Equation	Conditions *	Number of Cycles	Execution Time @30 MIPS
Complex FFT**	—	N=64	3739	124.6 μ s
Complex FFT**	—	N=128	8485	282.8 μ s
Complex FFT**	—	N=256	19055	635.2 μ s
Single Tap FIR	—	—	1	33 ns
Block FIR	$53+N(4+M)$	N=32, M=32	1205	40.2 μ s
Block FIR Lattice	$41+N(4+7M)$	N=32, M=32	7337	244.6 μ s
Block IIR Canonic	$36+N(8+7S)$	N=32, S=4	1188	39.6 μ s
Block IIR Lattice	$46+N(16+7M)$	N=32, M=8	2350	78.3 μ s
Matrix Add	$20+3(C \cdot R)$	C=8, R=8	212	7.1 μ s
Matrix Transpose	$16+C(6+3(R-1))$	C=8, R=8	232	7.7 μ s
Vector Dot Product	$17+3N$	N=32	113	3.8 μ s
Vector Max	$19+7(N-2)$	N=32	229	7.6 μ s
Vector Multiply	$17+4N$	N=32	145	4.8 μ s
Vector Power	$16+2N$	N=32	80	2.7 μ s
PID Loop Core	—	—	7	231 ns
*C= #columns, N=# samples, M=#taps, S=#sections, R=#rows				
**Complex FFT routine inherently prevents overflow				
1 cycle = 33 nanoseconds @ 30 MIPS				

Features

Key features of the dsPIC30F DSP Library include:

- 49 total functions
- Full compliance with the Microchip MPLAB® C30 C Compiler, assembler and linker
- Simple user interface – only one library file and one header file
- Functions are both “C” and assembly callable
- FIR filtering functions include support for lattice, decimating, interpolating and LMS filters
- IIR filtering functions include support for canonic, transposed canonic and lattice filters
- FIR and IIR functions may be used with the filter files generated by the dsPIC® DSC Digital Filter Design Tool
- Transform functions include support for in-place and out-of-place DCT, FFT and IFFT transforms
- Window functions include support for Bartlett, Blackman, Hamming, Hanning and Kaiser windows
- Support for srogram space visibility
- Complete function profile information including register usage, cycle count and function size information

Devices Supported

- All processors in the dsPIC30F family



MICROCHIP
www.microchip.com