

dsPIC[®] DSC DSP Library

Summary

The dsPIC Digital Signal Controller (DSC) DSP Library provides a set of speed optimized functions for the most common digital signal processing applications. The dsPIC DSC DSP Library provides significant performance savings over equivalent functions coded in C and allows developers to dramatically shorten their development time. The dsPIC DSC DSP library may be used with any dsPIC DSC variant.

The dsPIC DSC DSP Library is written predominantly in Assembly language and makes extensive use of the dsPIC DSC 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 dsPIC DSC 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 @40 MIPS
Complex FFT**	—	N=64	3739	93.5 μs
Complex FFT**	—	N=128	8485	212.1 μs
Complex FFT**	—	N=256	19055	476.4 μs
Single Tap FIR	—	—	1	25 ns
Block FIR	53+N(4+M)	N=32, M=32	1205	30.2 μs
Block FIR Lattice	41+N(4+7M)	N=32, M=32	7337	183.5 μs
Block IIR Canonic	36+N(8+7S)	N=32, S=4	1188	29.7 μs
Block IIR Lattice	46+N(16+7M)	N=32, M=8	2350	58.7 μs
Matrix Add	20+3(C*R)	C=8, R=8	212	5.3 μs
Matrix Transpose	16+C(6+3(R-1))	C=8, R=8	232	5.8 μs
Vector Dot Product	17+3N	N=32	113	2.9 μs
Vector Max	19+7(N-2)	N=32	229	5.7 μs
Vector Multiply	17+4N	N=32	145	3.6 μs
Vector Power	16+2N	N=32	80	2.0 μs
*C= #columns, N=# samples, M=#taps, S=#sections, R=#rows				
**Complex FFT routine inherently prevents overflow.				
1 cycle = 25 nanoseconds @ 40 MIPS				

Features

Key features of the dsPIC DSC 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 program space visibility
- Complete function profile information including register usage, cycle count and function size information

Devices Supported

- All processors in the dsPIC DSC families