

SOFTWARE MANUAL

LibAXDSP(AXDSP Support Library)

Version 1.15

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ON Semiconductor®

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1. INTRODUCTION

LibAXDSP is a library providing optimized digital signal processing functions. It contains the following features:

- Finite Impulse Response Filters (signed 16×16→32)
- CORDIC (16 bit)

LibAXDSP is available in source and binary form for SDCC, Keil C51 and IAR ICC.

2. EVALUATION BOARD PERIPHERALS

2.1. LIBAXDSP.H

libaxdsp.h contains the Digital Signal Processing routines.

2.1.1. VOID CORDIC16_VECN(STRUCT CORDIC16 *C)

This function computes the first N stages of a 16 bit angular CORDIC algorithm in vectoring mode. The structure pointed to by c contains both the input and output values. It computes:

$$x_{out} \leftarrow k_N \cdot \sqrt{x_{in}^2 + y_{in}^2}$$

$$y_{out} \leftarrow \approx 0$$

$$p_{out} \leftarrow p_{in} + \frac{2^{15}}{\pi} \cdot \arctan\left(\frac{y_{in}}{x_{in}}\right)$$

The most accurate result is obtained with $N=15$. Lower N result in faster but less accurate computation. The scaling constant k_N depends on the number of stages:

N	k_N
2	1.62980060130066
3	1.64248406575224
4	1.64568891575725
5	1.64649227871248

N	k_N
6	1.64669325427364
7	1.64674350659690
8	1.64675607020488
9	1.64675921113982
10	1.64675999637562

N	k_N
11	1.64676019268469
12	1.64676024176197
13	1.64676025403129
14	1.64676025709862
15	1.64676025786545

2.1.2. VOID CORDIC16_ROT N(STRUCT CORDIC16 *C)

This function computes the first N stages of a 16 bit angular CORDIC algorithm in rotation mode. The structure pointed to by c contains both the input and output values. It computes:

$$x_{out} \leftarrow k_N \cdot [x_{in} \cdot \cos(\frac{p_{in} \cdot \pi}{2^{15}}) - y_{in} \cdot \sin(\frac{p_{in} \cdot \pi}{2^{15}})]$$

$$y_{out} \leftarrow k_N \cdot [x_{in} \cdot \sin(\frac{p_{in} \cdot \pi}{2^{15}}) + y_{in} \cdot \cos(\frac{p_{in} \cdot \pi}{2^{15}})]$$

$$p_{out} \leftarrow \approx 0$$

The most accurate result is obtained with $N=15$. Lower N result in faster but less accurate computation. The scaling constant k_N depends on the number of stages:

N	k_N
2	1.62980060130066
3	1.64248406575224

N	k_N
6	1.64669325427364
7	1.64674350659690
8	1.64675607020488

N	k_N
11	1.64676019268469
12	1.64676024176197
13	1.64676025403129

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4	1.64568891575725
5	1.64649227871248

9	1.64675921113982
10	1.64675999637562

14	1.64676025709862
15	1.64676025786545

```
2.1.3.      INT32_T FIR_XI16_XI16(CONST INT16_T __XDATA *P0, CONST
            INT16_T __XDATA *P1, UINT16_T LEN)
            INT32_T FIR_XI16_CI16(CONST INT16_T __XDATA *P0, CONST INT16_T
            __CODE *P1, UINT16_T LEN)
```

These functions compute a signed 16×16→32 bit finite impulse response filter.

3. CONTACT INFORMATION

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