4 channel microphone module

Summary

The AB0204 four channel mic array for A^{2}B provides an easy and efficient way to experiment with beamforming types of audio applications. Clockworks also offers a 4 channel board with the microphones in a Y configuration, part number AB0105. A larger 8 channel microphone array board is also available.

The AB0204 is phantom powered by the A^{2}B bus. Current draw is 30 mA typical/40 mA max, allowing up to 7 nodes to be phantom powered by the root within the 300 mA A^{2}B limit. (The fine print: cabling and other losses and operational margin may reduce this limit)

A user controllable LED (one on each side of the PCB so that it's visible in all orientations) can provide user feedback during development.

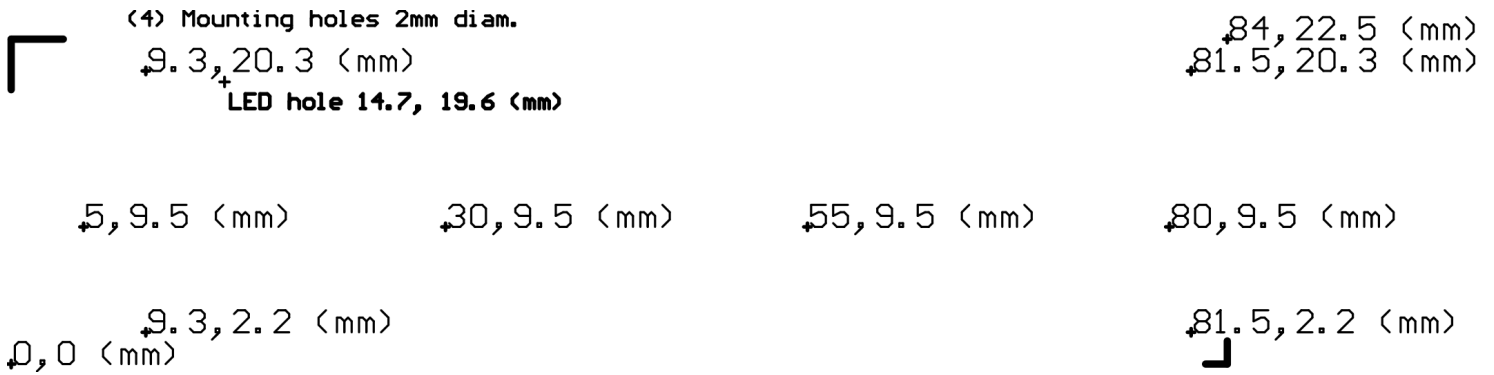As with the other A^{2}B boards, Clockworks offers low NRE cost quick turn custom versions of this microphone board.

Infineon's IM69D120V01 MEMS microphones are used as they offer a relatively high quality audio output and good SNR (69 dB A-wtd) and AOP (120 dBSPL).

Introduction

Analog Devices' A^{2}B system allows up to thirty two 24 bit 48 kHz data (audio) channels to be carried bidirectionally over twisted pair wire between multiple nodes. Supporting up to 15 meters of cable between nodes it provides a low cost way to expand audio and signal processing systems.

Clockwork's A^{2}B modules provide an off the shelf solution to developers and OEMs needing a way to develop and ship products that include A^{2}B but don't want to delay their projects working out their own A^{2}B designs.

A^{2}B, SigmaDSP, SigmaStudio, and SHARC are trademarks of Analog Devices Inc.

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(4) Mounting holes 2mm diam.                                    84,22.5 (mm)
  9.3,20.3 (mm)                                                 81.5,20.3 (mm)
     +
   LED hole 14.7, 19.6 (mm)


 5,9.5 (mm)          30,9.5 (mm)          55,9.5 (mm)          80,9.5 (mm)


     9.3,2.2 (mm)                                             81.5,2.2 (mm)
 0,0 (mm)
```

Microphone and mounting hole locations—top view

Design details

Two 2-pin DuraClik connectors are provided for wiring to other A^{2}B modules. On a phantom powered A^{2}B node the local ground is not at system ground potential; grounded test equipment (scopes, etc.) can not be directly connected to the board. Unlike some of the other A^{2}B modules available from Clockworks this one does not include a EEPROM.

1.9V (20 mA max), I^{2}C and four GPIO are brought to test points that allows extra circuity to be connected if needed. If connecting external circuitry remember that the board's local ground must be used as the circuit reference and can not be connected to any other grounds.
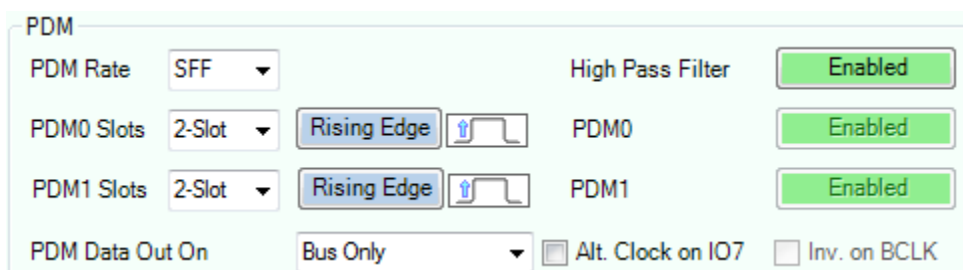
The board schematic is available as part of the user manual and provides full details. The board is 84 x 22.5mm in size. The tallest component is the connector at 6.4mm high. The bottom side of the board (i.e. acoustic entry side) has no components on it so can be flush mounted to a case.
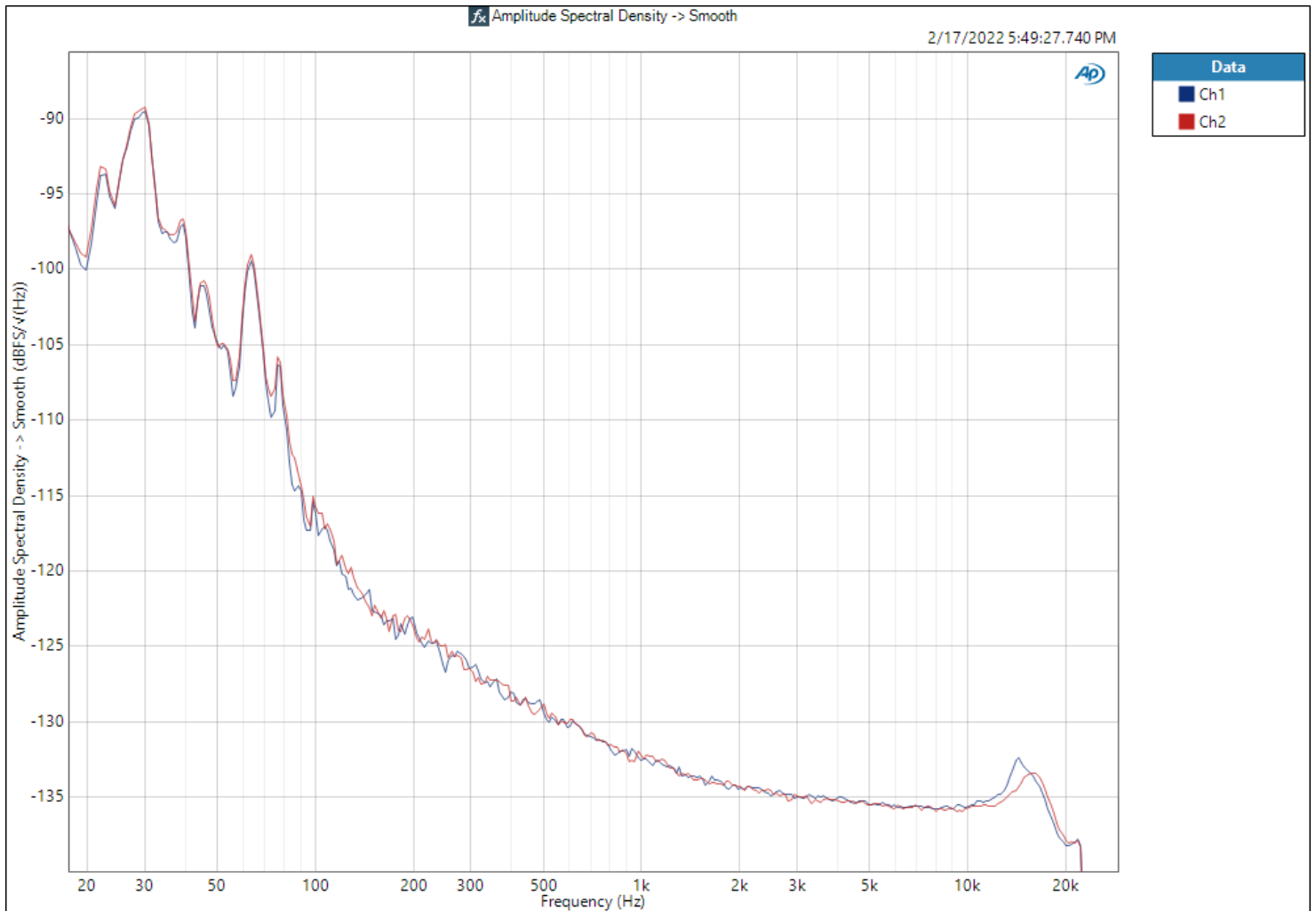
Operation

The provided SigmaStudio example illustrates the settings for PDM microphone operation.

This board uses the AD2427 device. If creating your own SigmaStudio schematics be sure to select that device for the node type.

The AB0204 module operates as an A^{2}B client (slave) node. All A^{2}B system require a root (master) node to operate. Clockworks offers a number of options, including adapters to 3rd party USB interfaces for acquiring data to a PC host.

```
┌─ PDM ──────────────────────────────────────────────────────────────────┐
│                                                                         │
│  PDM Rate    SFF    ▼                High Pass Filter   [ Enabled ]      │
│                                                                         │
│  PDM0 Slots  2-Slot ▼  [Rising Edge ⬆⌐]   PDM0          [ Enabled ]      │
│                                                                         │
│  PDM1 Slots  2-Slot ▼  [Rising Edge ⬆⌐]   PDM1          [ Enabled ]      │
│                                                                         │
│  PDM Data Out On    Bus Only      ▼   ☐ Alt. Clock on IO7  ☐ Inv. on BCLK │
└─────────────────────────────────────────────────────────────────────────┘
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Noise floor from two of the four microphones when acoustically semi-isolated. 32 averages, 1/24 octave smoothed ASD. Approx -93 dBFS A-wtd RMS noise level.

The measured noise values at 200 Hz and 1 kHz are within 3 dB of the mic datasheet values.
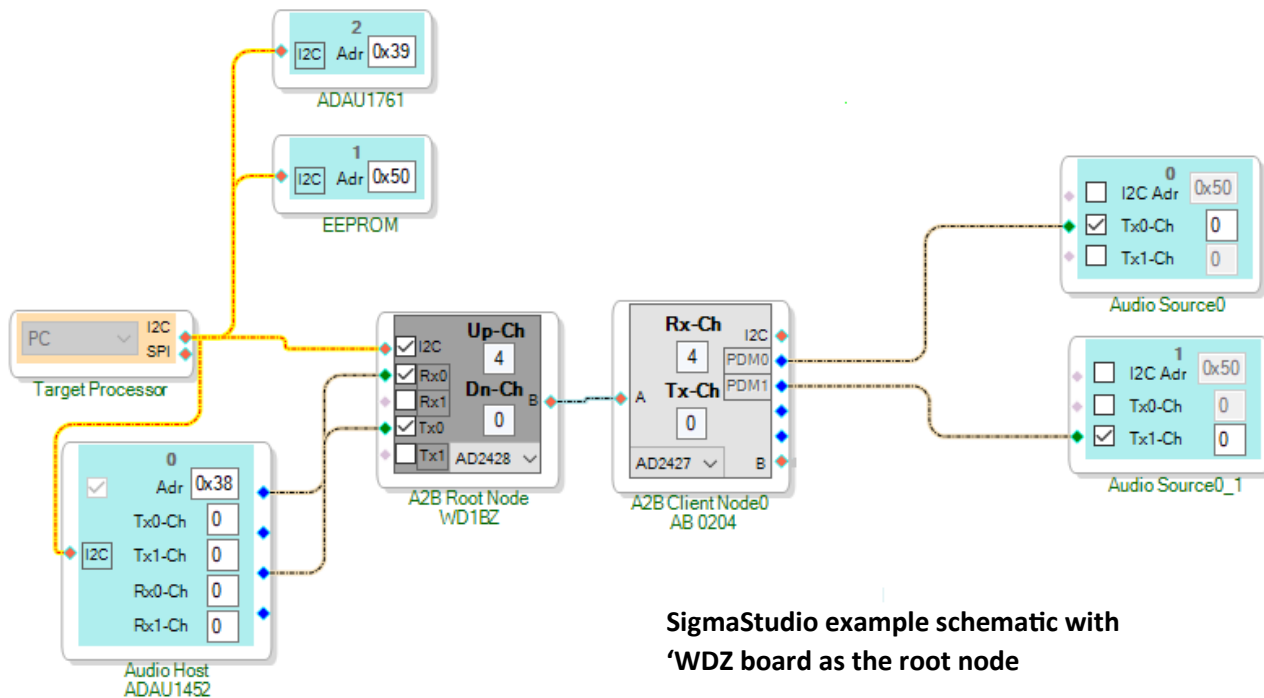
**SigmaStudio example schematic with 'WDZ board as the root node**

r220216   http://clk.works

Use

A^{2}B's low (approx. 2 sample) deterministic latency makes it an excellent choice for active noise control applications, as well as multi microphone applications needing a large number of distributed microphones. Example areas that would use this include automotive and related vehicular cabins, or multiuser voice conferencing.

The four channel microphone board and its related cousins are designed to facilitate rapid prototyping and development of acoustic signal processing software. Typically the A^{2}B network will have one or more nodes that implement the needed signal processing for the application. The specifics of the application may dictate the number and physical placement of the microphones.

Clockworks provides design information for the microphone boards so that they can be modified to meet specific application needs. For developers without in-house design capability Clockworks offers a quick turn prototyping service.

8 channel microphone array board stack for A^{2}B.
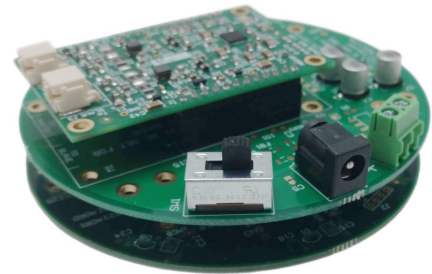
Ordering information

Design information includes schematic (pdf, Altium), layout (Altium), BOM and gerbers for download. A SigmaStudio example is included for demonstrating operation.

SigmaStudio is available directly from Analog Devices at no charge, along with the A^{2}B software add-ons.

Order codes:

AB0204   Four channel linear mic module.

A^{2}B cables in 0.3m, 1m, and 4m lengths are available from the Clockworks webstore.