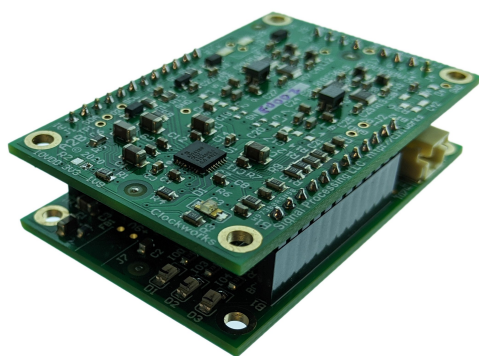
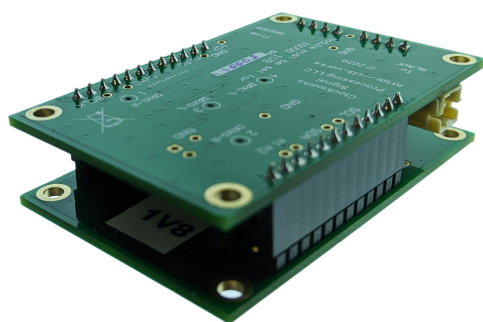


4 channel microphone module  
(component side)

Mates with AB0003P OEM A<sup>2</sup>B module



A<sup>2</sup>B, SigmaDSP, SigmaStudio, and SHARC are trademarks of Analog Devices Inc.

# CLOCKWORKS

## Signal Processing

### 4 CHANNEL A<sup>2</sup>B MICROPHONE COMPACT ARRAY FOR DEVELOPMENT

## Summary

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The AB0105 four channel mic array, when used with Clockworks' AB0003 OEM A<sup>2</sup>B modules, provides an easy and efficient way to experiment with beamforming types of audio applications. Clockworks also offers a larger 8 channel microphone array board.

The AB0105 microphone placement matches the Y pattern used on ADI's 'WCZ board. The AB0105 is normally intended for phantom powered use; as an option it can operate locally powered to increase the total current available to downstream phantom powered nodes.

Three user controllable LEDs are included to provide user feedback during development.

As with the 8 channel board, Clockworks offers low cost quick turn custom versions of this microphone board.

The board mates to the AB0003P A<sup>2</sup>B OEM module, which means this microphone board is relatively simple as the AD2428 A<sup>2</sup>B bus transceiver supports four PDM (MEMS) microphones directly. Infineon's IM69D130V01 MEMS microphone are used as they offer a relatively high quality audio output and good SNR (69 dB) and AOP (128 dB SPL).

## Introduction

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Analog Devices' A<sup>2</sup>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<sup>2</sup>B modules provides an off the shelf solution to developers and OEMs needing a way to develop and ship products that include A<sup>2</sup>B but don't want to delay their projects working out their own A<sup>2</sup>B designs.



Microphone side

## Design details

By default the board is intended to be used in a phantom powered mode. It has two DuraClik connectors for wiring to other A<sup>2</sup>B modules. The matting AB0003P module takes the raw phantom power and provides 1.8V to operate the microphones. The design includes a 32Kx8 EEPROM (default address 0x50) for local node ID information, and a buffer on the PDM clock and data lines. There are three LEDs available (IO0, IO3, IO4). There are also a number of test points to facilitate modification of the board.

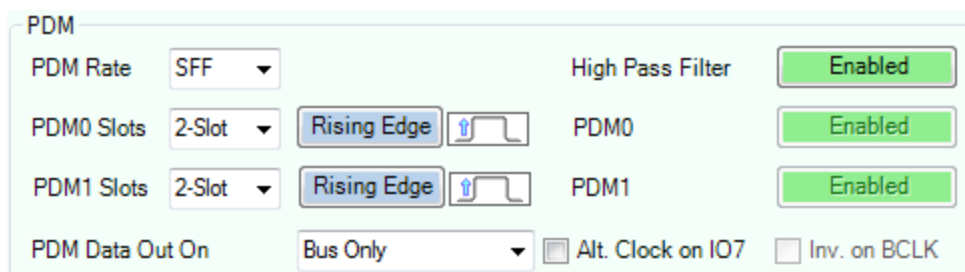
As part of a phantom powered A<sup>2</sup>B node keep in mind the local ground is not at system ground potential so grounded test equipment (scopes, etc.) can not be connected to it. Using the locally powered version is suggested for use with external equipment.

The board schematic provides the full details. For more information about signal assignment on the two 12 pin connectors please see the A<sup>2</sup>B OEM Module User Guide.

## Operation

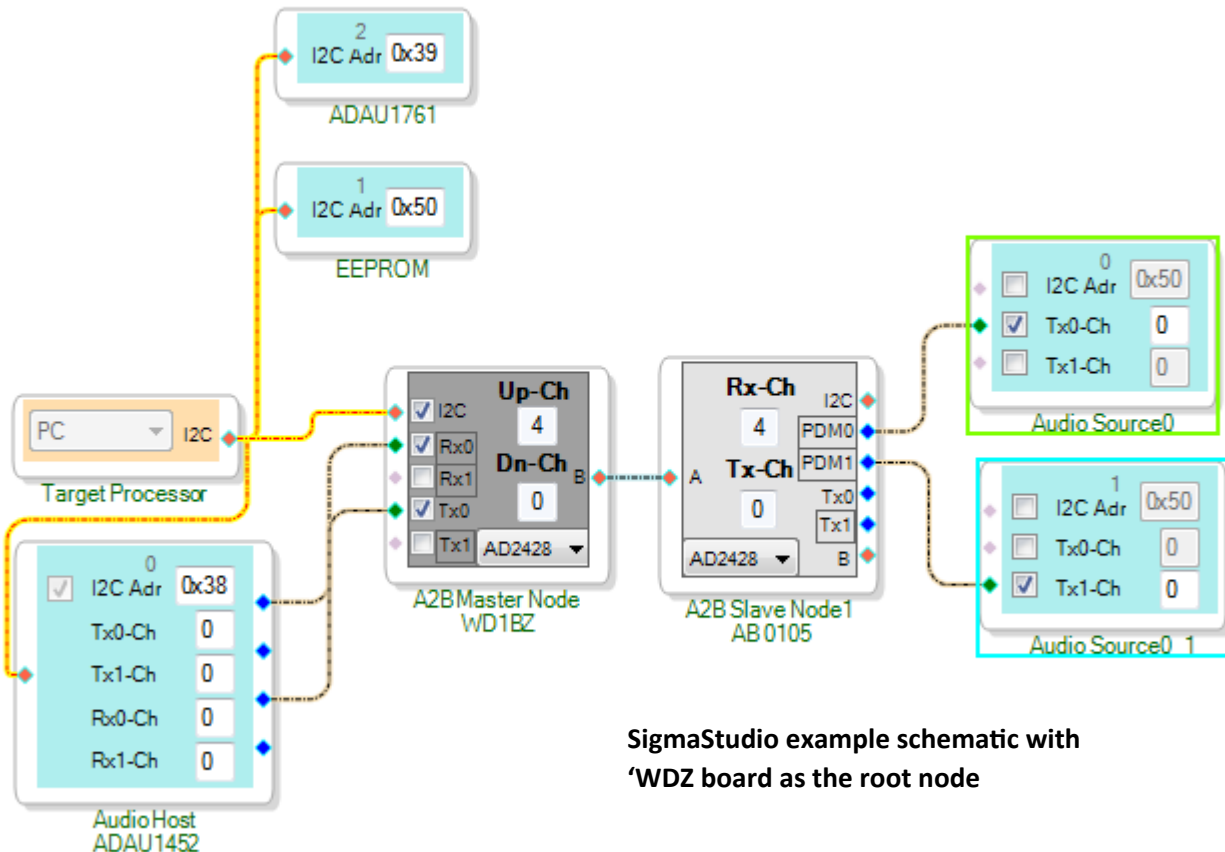
The mating A<sup>2</sup>B OEM Module must be set for IOVDD of 1.8V, this is achieved with a zero ohm jumper as covered in the module user guide. When ordered from Clockworks as a 2 board kit it is already configured correctly. Plug the mic module in to the A<sup>2</sup>B OEM Module and then connect it to your A<sup>2</sup>B network.

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





Typical noise floor from two of the four microphones when acoustically semi-isolated. 16K point FFT, 16 averages. Approx -85 dBFS RMS signal level.



SigmaStudio example schematic with 'WDZ board as the root node

## Use

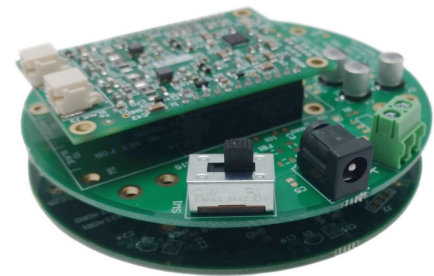
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A<sup>2</sup>B's low (approx. 2 sample) deterministic latency makes it an excellent choice for active noise control applications, as well as multi microphone applications needing a large number of distributed microphones. Example areas that would use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

The four channel microphone board and its larger 8 channel cousin are designed to facilitate rapid prototyping and development of acoustic signal processing software. Typically the A<sup>2</sup>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 all 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<sup>2</sup>B.**



## Ordering information

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

SigmaStudio is available directly from Analog Devices at no charge, along with the A<sup>2</sup>B software add-ons.

### Order codes:

AB0105	Four channel mic module.
EVMA2B05	Complete kit with AB0105 mic module, AB0003P A <sup>2</sup> B interface, and 1m A <sup>2</sup> B cable.