



## EVAL-AD2428WC1BZ A<sup>2</sup>B Evaluation Board User Guide

Contributed by A<sup>2</sup>B Applications Team

Rev 1 – October 8, 2019

### Features

- Bus-Powered A<sup>2</sup>B<sup>®</sup> Slave Transceiver (AD2428W)
- Four Stereo MEMS Microphones
- LED on GPIO

### Included Equipment

- 1.8 m Twisted-Pair Cable (CAT5e-Rated, with DuraClik<sup>™</sup> Connectors)
- Rubber Feet

### Equipment Needed

- EVAL-AD2428WD1BZ A<sup>2</sup>B Master Node Evaluation Board
- Additional A<sup>2</sup>B Slave Nodes (Optional)
  - EVAL-AD2428WG1BZ
  - EVAL-AD2428WB1BZ

### Documents Needed

- Transceiver Data Sheet<sup>[1]</sup>
- Transceiver Technical Reference<sup>[2]</sup>
- EVAL-AD2428WC1BZ Hardware Design Files<sup>[3]</sup>

### Software Needed

- SigmaStudio<sup>®</sup> Rev. 4.4 or later
- Software Distribution for A<sup>2</sup>B Rev 19.3.0 or later, DLLs

### General Description

This evaluation board provides A<sup>2</sup>B bus-powered slave node functionality for an A<sup>2</sup>B network, including support for PDM microphone input. Bus-powered slave nodes derive power from the bias voltage on the A<sup>2</sup>B wires.

The EVAL-AD2428WC1BZ board’s four digital INMP621 MEMS microphones with PDM output can feed the upstream or downstream slots on the A<sup>2</sup>B bus. Adding multiple microphone signals increases the acoustic dynamic range. This four microphone array also lends itself well to static or adaptive beamforming techniques used to introduce directionality to the otherwise omnidirectional MEMS microphones.

For the board schematics, assembly/layout files, and bill of materials (BOM), see the EVAL-AD2428WC1BZ Hardware Design Files ZIP archive associated with this EE-note<sup>[3]</sup>

### Evaluation Board Hardware

[Figure 1](#) identifies the important components and connection points on the EVAL-AD2428WC1BZ evaluation board.

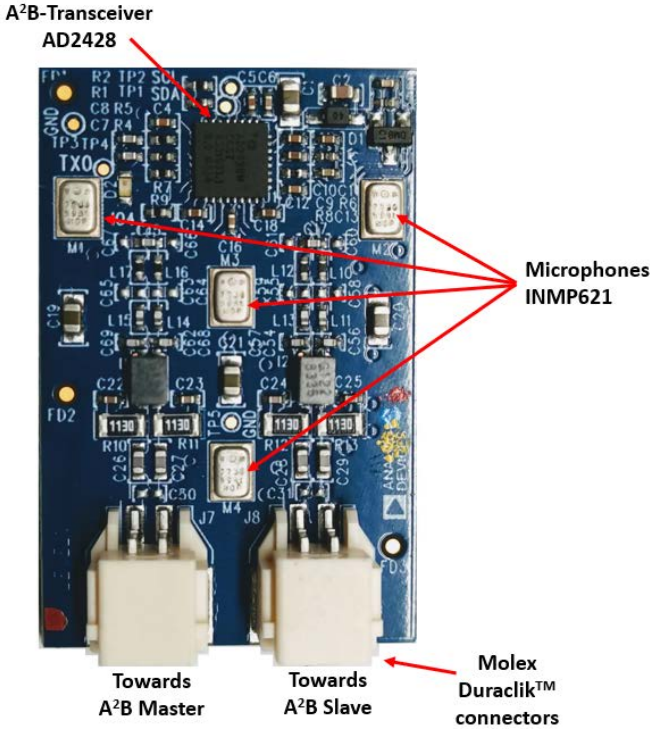


Figure 1. Board Overview

### A<sup>2</sup>B Bus Connections (J7 and J8)

The 2-pin Molex DuraClik connector (J7) allows a single twisted-pair A<sup>2</sup>B cable to attach to the A-side of the AD2428W transceiver such that the opposite end of the A<sup>2</sup>B cable can attach to the B-side of either the master transceiver or the next slave node transceiver closer to the master node.

The 2-pin Molex DuraClik connector (J8) allows a single twisted-pair A<sup>2</sup>B cable to attach to the B-side of the AD2428W transceiver. The opposite end of the A<sup>2</sup>B cable can attach to the A-side of the next slave node transceiver, including the last-in-line slave.

### PDM Microphones (INMP621)

There are four digital MEMS microphones connected directly to the transceiver through PDM.

### LED (D2)

The D2 LED reflects the status of the DTX1/IO3 pin when used as a GPIO pin.

### Test Points (TP1 – TP10)

The test points are well-marked on the silkscreen of the PCB, providing access to signals and power supplies, as summarized in [Table 1](#). Refer to the schematics to locate the probe points.

Test Point	Provides Access To
TP1	AD2428W I2C Serial Clock Signal (SCL)
TP2	AD2428W I2C Serial Data Signal (SDA)
TP3	EVAL-AD2428WC1BZ Board Ground Potential
TP4	AD2428W I2S/TDM Primary Data Signal (DTX0/IO3)
TP5	EVAL-AD2428WC1BZ Board Ground Potential
TP6	AD2428W IO1 Signal (ADR1/IO1)
TP7	AD2428W VOUT1 Output Voltage (PLLVDD/DVDD)
TP8	AD2428W VOUT2 Output Voltage (ATRXVDD/BTRXVDD)
TP9	AD2428W Next Slave Power Sense (SENSE)
TP10	AD2428W Return Current for Next Slave (VSSN)

*Table 1. EVAL-AD2428WC1BZ Evaluation Board Test Points*

### I<sup>2</sup>C Device Addresses in 7-bit Format

The I<sup>2</sup>C device address in 7-bit format does not include the read-write (R/W) bit. The schematics tab in the SigmaStudio A<sup>2</sup>B window uses the 7-bit address representation for configuration of and access to the AD2428W A<sup>2</sup>B transceiver registers.

### Evaluation Board Software Quick Start Procedure

The EVAL-AD2428WC1BZ evaluation board is intended to be connected within an existing A<sup>2</sup>B system, where at least a master node exists for the on-board AD2428W transceiver to be a slave to on the A<sup>2</sup>B bus. A host processor on the master node interfaces directly with the A<sup>2</sup>B master transceiver, through which it programs and reads the register spaces of all discovered slave transceivers. This configuration allows a full system initialization at start-up and status monitoring during operation.

The examples furnished with the complementary EVAL-AD2428WD1BZ A<sup>2</sup>B master evaluation board assume a connection to specific slave boards, as noted in the following sections.

### Connection to EVAL-AD2428WD1BZ Master Board

For master board setup instructions, please refer to the *EVAL-AD2428WD1BZ A<sup>2</sup>B Evaluation Board Manual*<sup>[4]</sup>. Ensure that the master board jumpers are all installed in their default positions.

### Hardware Setup for a 3-Node A<sup>2</sup>B System

1. Assemble the example A<sup>2</sup>B system by connecting the indicated A<sup>2</sup>B evaluation boards as follows:
  - Master (EVAL-AD2428WD1BZ) – Connect the B-side (P2) to the A-side on the slave0 board (J7)
  - Slave0 (EVAL-AD2428WC1BZ) – Connect the B-side (J8) to the A-side on the slave1 board (J7)
  - Slave1 (EVAL-AD2428WB1BZ)
2. Connect the PC over a USB cable and through the EVAL-ADUSB2EBZ USBi I<sup>2</sup>C programmer to the SigmaStudio header (P1) on the master board.
3. Connect an audio source to the stereo line input of the slave1 board (J2).
4. Connect headphones to the audio output of the master board (J4).
5. Plug the wall-mount 12V power supply (1.5 A) into an outlet and connect it to the power jack on the master board (P4).

### Software Setup and Operation

1. Install the SigmaStudio (Rev. 4.4 or later) and A<sup>2</sup>B Software for Windows/Baremetal (Rev 19.3.0) software from the [EVAL-AD2428WC1BZ product page](#).
2. Copy the A2B.dll and A2Bstack.dll driver files from the installation directory (default C:\Analog Devices\ADI\_A2B\_Software-Rel19.3.0\GUI\x86\_x64) into the SigmaStudio installation (default C:\Program Files\Analog Devices\SigmaStudio 4.4). Start SigmaStudio and verify that the A2B.dll file is selected under Tools→AddInsBrowser. Save before exiting.
3. Open the adi\_a2b\_3NodeSampleDemo.dspproj example project, which is located in the (default) C:\Analog Devices\ADI\_A2B\_Software-Rel19.3.0\Schematics\BF\A2BSchematics directory. Click the *Link-Compile-Download* icon, as shown in [Figure 2](#).
4. If a headset is connected to slave1, then the signals from the two slave0 microphones can be heard from the left and right ears, respectively.
5. The AD2428W DRX0/IO5 and DRX1/IO6 pins are multiplexed to support either I<sup>2</sup>S/TDM receive functionality (default) or PDM input (PDM0 and PDM1, respectively). Ensure that PDM functionality is enabled using the SigmaStudio GUI, as shown in [Figure 3](#).

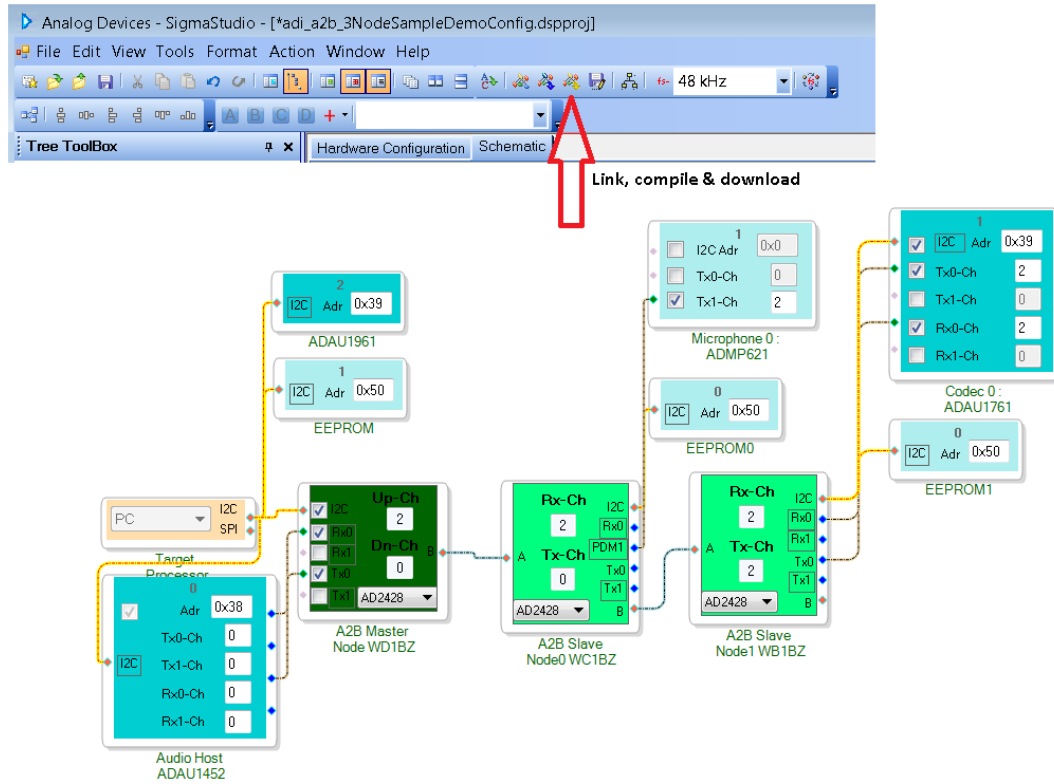


Figure 2. Software Schematic for `adi_a2b_3NodeSampleDemoConfig.dspproj` A<sup>2</sup>B Example Project

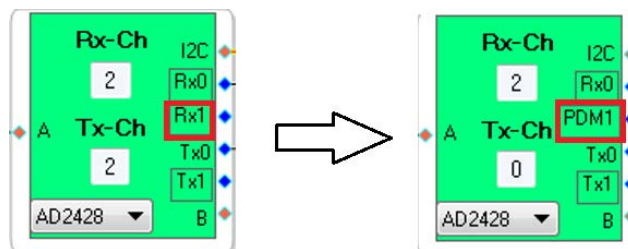


Figure 3. Changing AD2428W Pin Function from DRX1 to PDM1

- The microphone data from slave0 is played out of the headset connected to slave1. Select the source and destination in the *A2B Stream Configuration* window to change the routing. The *Stream Config* tab (right-click on *Target Processor* → *Device Properties* → *Stream Config*) to define audio streams across the nodes, as shown in [Figure 4](#). When the *Apply* button is clicked, the stream assignments configure the upstream and downstream slots accordingly across the nodes.

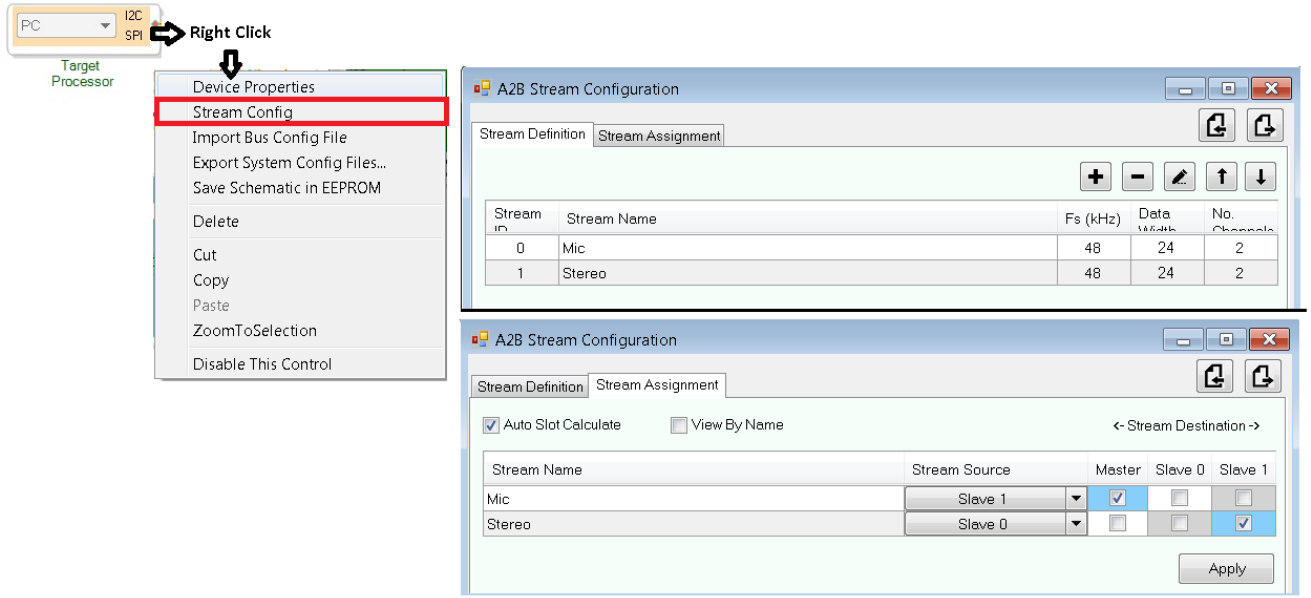


Figure 4: Stream Configuration

Refer to the *Quick Start Guide*<sup>[5]</sup> from the A<sup>2</sup>B software distribution for guidance regarding the modification of the software.

## References

- [1] *AD2420(W)/AD2426(W)/AD2427(W)/AD2428(W)/AD2429(W) Automotive Audio Bus A<sup>2</sup>B Transceiver Data Sheet*. Rev A, October 2019. Analog Devices, Inc.
- [2] *AD2420(W)/6(W)/7(W)/8(W)/9(W) Automotive Audio Bus A<sup>2</sup>B Transceiver Technical Reference*. Rev 1.1, October 2019. Analog Devices, Inc.
- [3] *Associated ZIP File (EE420v01.zip) for EVAL-AD2428WC1BZ A<sup>2</sup>B Evaluation Board User Guide (EE-420)*. October 2019. Analog Devices, Inc.
- [4] *EVAL-AD2428WD1BZ A<sup>2</sup>B Evaluation Board Manual*. Rev 1.1, October 2019. Analog Devices, Inc.
- [5] *A<sup>2</sup>B Quick Start Guide*. Revision 25.0, October 2019. Analog Devices, Inc.

## Document History

Revision	Description
<i>Rev 1 – October 17, 2019 by A<sup>2</sup>B Applications Team</i>	Initial Release