


AKU-EP1

Digital Output Microphone Evaluation Board



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	AKU-EP1 Digital Output Microphone Evaluation Board	Application Note
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AKU-EP1 Rev2 Evaluation Board for Akustica Digital Output Microphones

The AKU-EP1 Rev2 is a stand alone evaluation platform that can be used for both quick and convenient performance verification, as well as for portable demonstrations of Akustica digital-output microphones. With the option of analog or digital data output formats, the AKU-EP1 Rev2 interfaces easily to standard audio test equipment. An on-board oscillator provides a standard Direct Stream Digital (DSD[®]) clock (2.8224 MHz). In addition, the AKU-EP1 Rev2 utilizes two coupon board sockets to interface to Akustica digital-output microphone samples in single or multiplexed modes of operation.

The three digital output formats supported by the AKU-EP1 Rev2 evaluation board are:

- Buffered pulse-density-modulated (PDM) digital-output from the digital-microphone output
- Pulse-code-modulated (PCM) digital-output generated by the on-board 24-bit converter
- AES3 output for direct connection to an Audio Precision[®] analyzer

Analog line out (pin header and SMB jack) and a headphone jack with volume control are also provided.

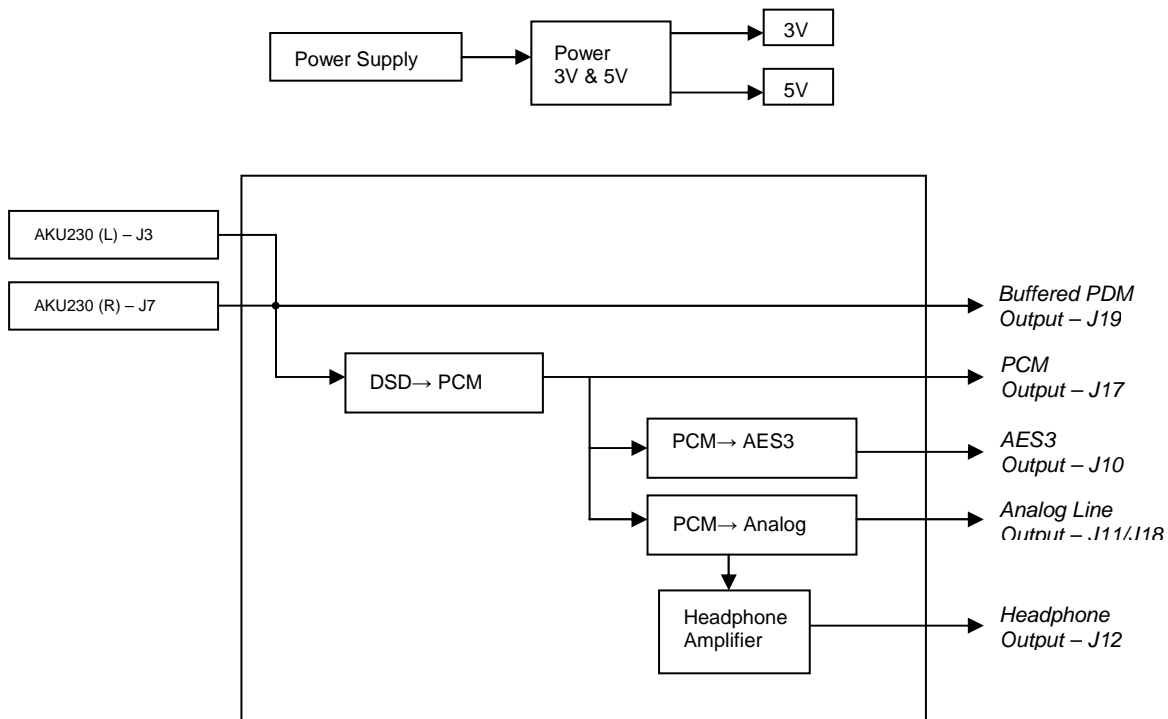



Figure 1: AKU-EP1 Rev2 Evaluation Board Block Diagram

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1. Board Overview

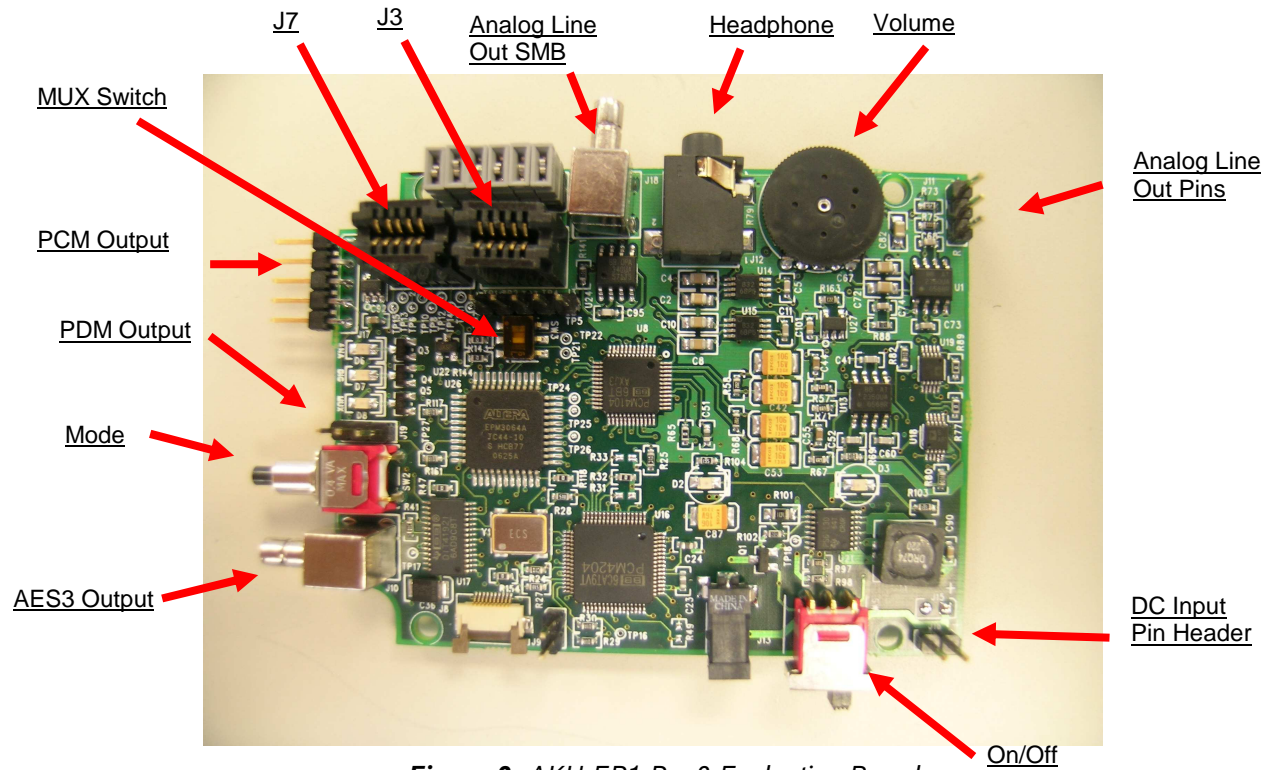


Figure 2: AKU-EP1 Rev2 Evaluation Board

2. INTERFACE SPECIFICATIONS

AES3 Output

- Reformat PCM signal to AES3
- 24-bit resolution with 44.1 kHz sampling rate
- SMB – 50 Ohm jack

PDM Output


- Buffered output of digital microphone
- Buffered clock output

PCM Output

- PCM conversion of PDM signal
- 24-bit resolution with 44.1 kHz sampling rate
- Pin header interface
- Full scale = 75% 1's density PDM
- Note: The AKU230 and other digital mics are specified using a full scale level of 100% 1's density, so the PCM output of the EP1 will be 6 dBFS greater than specified by the AKU230 datasheet.

Power Specifications

- DC Input: 3V min to 5V max, 500mA

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3. GENERAL OPERATION

To use the AKU-EP1 Rev2, place the sample coupon(s) containing the Akustica digital-output microphone into the coupon connector(s) of the evaluation board. The coupon may be inserted in either direction. It is advised that all connections are made before the board is powered. Power the board by applying 3-5V DC to J16. The positive terminal of the power supply should be connected to the pin closest to the corner of the evaluation platform. After switching the board on, there are two green LED's that will illuminate: D3 indicates that the board has power and D6/D7/D8 indicate which mode the evaluation board is in. The AKU-EP1 Rev2 will operate in one of three modes: Multiplexed, Digital, Analog.


- Multiplexed Mode (MUX):** This is the default mode of the evaluation board. This is used for the evaluation of Akustica digital microphone products capable of multiplexed operation (AKU230). The microphone allows the realization of a two microphone array using a single data line. One of the microphones is clocked on the rising edge of the clock, while the other microphone is clocked on the falling edge. The output from both microphone coupon connectors are combined into one data line input to the codec. *Note: To use this mode the MUX Switch must be in the position farthest away from the coupon socket.*
- Digital Mode (DIG):** This mode is implemented for legacy Akustica digital microphones and is not capable of multiplexed operation. In this mode, the outputs of the two microphone coupon connectors are fed independently to the codec. *Note: To use this mode, the MUX Switch must be in the position closest to the coupon socket.*
- Analog Mode (ANA):** This mode is not supported for the AKU230 digital microphones. It is reserved for future products.

4. BASIC MICROPHONE DEMONSTRATION

The AKU-EP1 Rev2 provides the audio system design engineer the ability to quickly observe the performance of the Akustica family of digital microphones. This can be done through the analog headphone jack (J12) or by monitoring the signals on the analog line out pin header (J11). The pin assignments for the analog line out are silk screened on the EP1 board and can be found below in Table 1.

Jumper	Pin	Purpose
J11	1	L Mic / J3 Analog Output
	2	GND
	3	R Mic / J7 Analog Output

Table 1: Analog Line Out (J11) Pin Assignment

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5. MEASURING THE ACOUSTIC PERFORMANCE OF THE MICROPHONE

NOTE: Disconnect headphones before testing microphone performance with the digital outputs. Some headphones can load the evaluation board system power supply and cause degraded acoustic results.

The AKU-EP1 Rev2 can be used for precise acoustic performance verification of an Akustica digital microphone. A typical acoustic test involves placing an acoustic pressure source in front of the sample coupon connected to the AKU-EP1 Rev2 evaluation board. In this configuration, the output of the device under test (DUT) can be observed in any of the three provided output formats. The following describes the various digital outputs supported by the AKU-EP1 Rev2 evaluation board.

5.1 PDM OUTPUT

The evaluation board comes configured to measure the PDM output of the microphone using the on-board DSD clock at 2.8224MHz. This output is a buffered version of the native output from the digital microphones. Table 2 shows the pin assignments for the PDM output found at J19.

Jumper	Pin	Purpose
J19	1	L Mic / J3 Output
	2	R Mic / J7 Output
	3	GND

Table 2: PDM (J19) Pin Assignments

5.2 AES3 OUTPUT


The AES3 format is a standard test interface for the Audio Precision dual domain audio analyzer. The AKU-EP1 Rev2 presents this output on J10. Use a SMB- 50 Ohm to BNC cable to connect the AKU-EP1 Rev2 to an AES3 or SPDIF digital input on an audio analyzer or other device which accepts digital input.

5.3 PCM OUTPUT

The PCM output of the AKU-EP1 Rev2 evaluation board is 24-bit, right justified, with the most significant bit first. The PCM output can be measured through J17 with the pin assignments shown in Table 3.

Jumper	Pin	Purpose
J17	1	Data Channels 1 and 2
	2	GND
	3	Left/Right Clock (Sync)
	4	System Clock
	5	Bit Clock

Table 2: PCM (J17) Pin Assignments

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Akustica, Inc.
2835 E Carson St. Suite 301
Pittsburgh, PA / USA 15203
For technical support contact support@akustica.com
www.akustica.com