Evaluation Board User Guide
UG-362

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EVAL-ADMP441Z SDP Daughter Board for the ADMP441 I²S MEMS Microphone

EVALUATION KIT CONTENTS

EVAL-ADMP441Z daughter board
EVAL-ADMP441Z-FLEX board
5 V power supply

SUPPORTING DOCUMENTS

ADMP441 data sheet
UG-303 user guide for the EVAL-ADMP441Z-FLEX
UG-277 user guide for the SDP-B controller board

GENERAL DESCRIPTION

The EVAL-ADMP441Z is an evaluation board that works with the EVAL-ADMP441Z-FLEX and the system demonstration platform (SDP) to allow quick evaluation of the performance of the ADMP441 MEMS microphone. This evaluation system can be used to stream two channels of audio from two ADMP441 microphones to a PC over a USB connection. The system identifies itself to a PC as a standard USB audio interface; therefore, no additional drivers or software are required to run the system. One EVAL-ADMP441Z-FLEX board is included in the evaluation kit. The SDP-B controller board is purchased separately.

The EVAL-ADMP441Z board also provides hardware control and probe/test points to examine the digital signals of the ADMP441.

QUICK START GUIDE

To quickly start up the evaluation board and capture audio on a PC, follow these steps. These steps are described in greater detail in the rest of this user guide.

1. Connect at least one EVAL-ADMP441Z-FLEX board to the EVAL-ADMP441Z daughter board (see Figure 1).
2. Connect the EVAL-ADMP441Z daughter board to the SDP-B controller board.
3. Connect a jumper across J9 and make sure that J8 is not populated.
4. Push both switches of S1 to the right (enable) position.
5. Provide a 5 V to 6 V supply to J4.
6. Connect a mini-USB cable from a PC to J1 on the SDP-B controller board.

The PC should recognize the system as an audio interface using standard audio drivers. You can now use the microphones to record one or two channels of audio with any software that uses the standard audio driver (see the Software Setup section).

HARDWARE OVERVIEW

Figure 1 shows a photo of the EVAL-ADMP441Z daughter board with one EVAL-ADMP441Z-FLEX board plugged into the ZIF connector. Figure 2 shows the dimensions of the evaluation board.

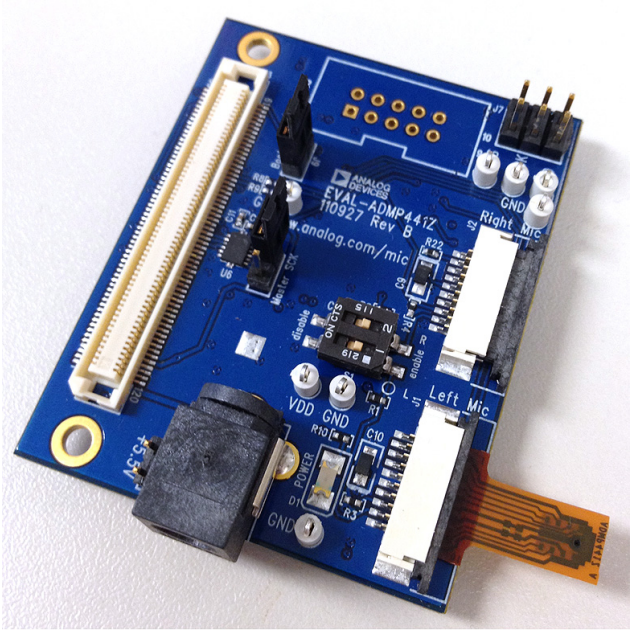

Figure 1. Evaluation Board Photo

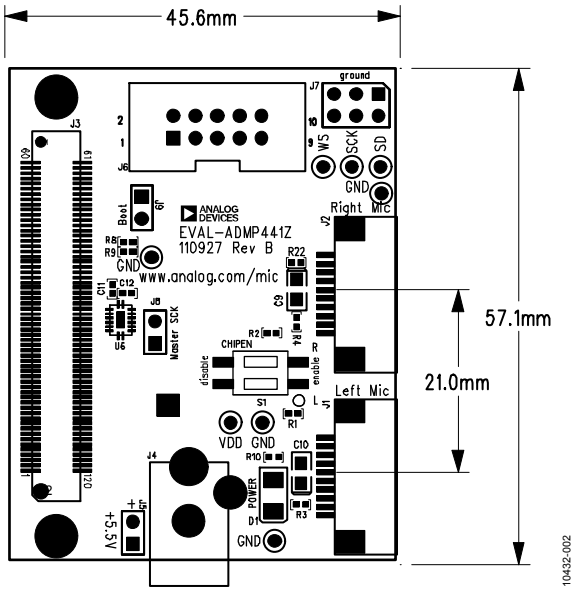

Figure 2. Evaluation Board Dimensions in mm

TABLE OF CONTENTS

REVISION HISTORY

1/12—Revision 0: Initial Version

SETTING UP THE EVALUATION BOARD

HARDWARE SETUP

Power

The EVAL-ADMP441Z board is powered with a single 5 V to 6 V supply from either Barrel Connector J4 or Pin Header J5. The dc supply connected to J4 should be positive-tip. The microphones are configured to run with a single 1.8 V supply, but the supply can be set to either 2.5 V or 3.3 V by mounting a 0 Ω resistor on R17 or R11, respectively, and removing R18.

LED D1 is illuminated when the board is powered on. With V_{DD} = 1.8 V, the LED is only faintly lit.

Power is supplied to the EVAL-ADMP441Z-FLEX board through Voltage Regulator U5.

The power supply connected to the EVAL-ADMP441Z board also powers the SDP-B controller board through Connector J3. The microphone board requires only a few milliamps of current, but the SDP-B controller board requires up to 200 mA at 5 V.

Jumpers

The J8 and J9 jumper headers on the EVAL-ADMP441Z board set the clock source and select the boot code.

Header J8 does not need to be shorted with a jumper for the default clocking configuration. When J8 is populated, the 3.072 MHz crystal on the EVAL-ADMP441Z board generates the master clock for the SPORT interface of the Blackfin® processor. By default, however, the microphone clocks are generated on the Blackfin processor.

Header J9 selects the source of the code to boot the Blackfin processor on the SDP-B controller board. To use the evaluation system to stream USB audio to a PC, a jumper must be shorted across Header J9. Without the jumper present, the Blackfin processor boots the standard SDP code and does not perform USB streaming audio.

These settings for J8 and J9 are illustrated in Figure 3.

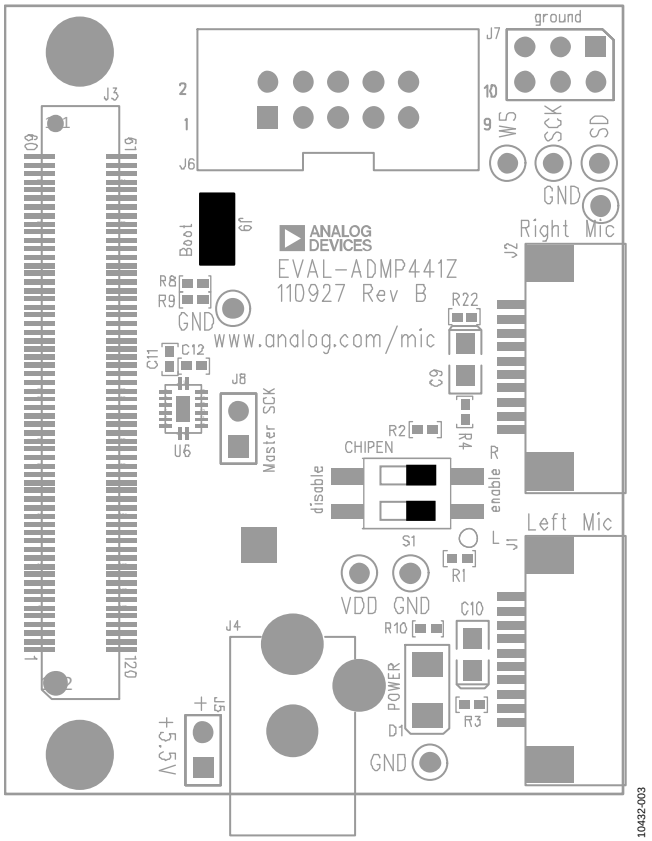

Figure 3. Top View of EVAL-ADMP441Z Board with Default Switch and Jumper Settings

Switches

Switch Block S1 has two SPST switches to control the CHIPEN pins of the two ADMP441 microphones. When the switches are in the left position, the microphones are disabled; when the switches are in the right position, the microphones are enabled. Switch 1 (bottom switch) controls the left microphone, and Switch 2 (top switch) controls the right microphone. The switch settings in Figure 3 show the microphones enabled.

Flex Board Connections

The EVAL-ADMP441Z daughter board includes two headers, J1 and J2, to connect two ADMP441 microphone flex boards (EVAL-ADMP441Z-FLEX). The EVAL-ADMP441Z-FLEX board connects all the pins of the ADMP441 to copper contacts on the edge of the flex board.

The EVAL-ADMP441Z-FLEX board can be inserted directly into a ZIF connector, such as J1 or J2 on the EVAL-ADMP441Z board. A microphone connected to Header J1 is configured to output its data to the left channel of the I²S data stream, and the microphone connected to Header J2 is configured to output its data to the right channel.

The EVAL-ADMP441Z-FLEX boards slide easily into the ZIF connectors on the EVAL-ADMP441Z board. Follow these steps to install the flex boards.

1. Loosen the black clamp on the J1 or J2 connector by pulling it to the right.
2. Insert the flex board into the connector with the copper contacts facing down.
3. After the flex board is fully inserted, tighten the black clamp to fasten the flex board in the connector.

When properly connected, the sound port of the microphone is pointed up (see Figure 4). When two flex boards are connected, the microphone sound ports are spaced 21 mm apart.

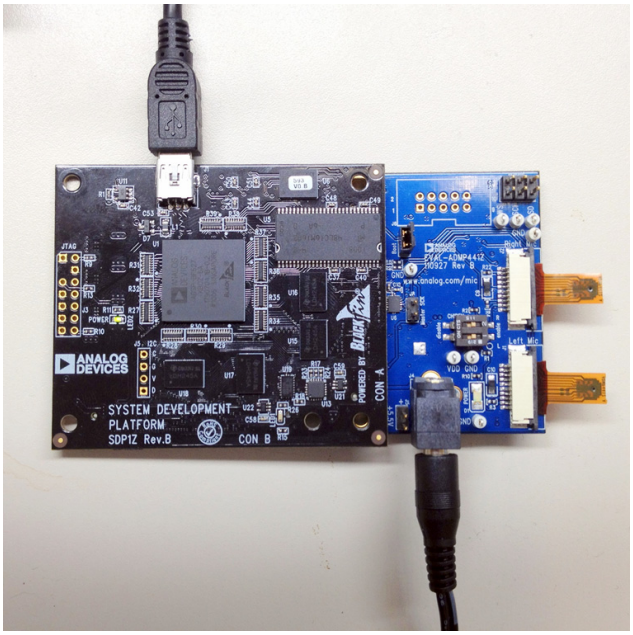

Figure 4. EVAL-ADMP441Z with Two Flex Boards Connected to an SDP-B Controller Board

SDP-B Connection

The EVAL-ADMP441Z board connects to the Blackfin SDP-B controller board through Connector J3. The EVAL-ADMP441Z board can be connected to either CON A or CON B on the SDP-B controller board; these two connectors provide identical functionality. After you connect the EVAL-ADMP441Z board to the SDP-B controller board but before you connect the USB jack of the SDP-B board to a PC, connect the power to the EVAL-ADMP441Z board. After the system is powered on, you can connect the USB cable between the PC and J1 on the SDP-B controller board.

The EVAL-ADMP441Z board connects to the SDP-B controller board using a Hirose FX8-120P-SV1(91) connector on the SDP-B board. For more information about the SDP-B controller board, see the SDP User Guide (UG-277).

The ADSP-BF527 Blackfin DSP on the SDP-B controller board is booted from code stored in the SPI flash memory IC (U7) on the EVAL-ADMP441Z board.

I²S Monitoring Header

The I²S signal output from the ADMP441 microphones can be monitored on Header J7. The WS and SCK clock signals are supplied from the SDP-B controller board, whereas the SD data signal is output from the microphones. Note that Header J7 cannot be used to supply clocks directly to the microphones because the level translator (U6) is configured to always drive the clock signals.

SOFTWARE SETUP

The SDP-B/EVAL-ADMP441Z system does not require new software to be installed on the PC. The system identifies itself as a standard audio class device and uses the standard Windows® audio drivers. Therefore, the system can be used by any PC software that can record audio through the standard drivers.

The EVAL-ADMP441Z board is identified in the Windows **Device Manager** as **ADMP441 USB Audio** (see Figure 5). One or two channels of audio can be recorded at a sample rate of 48 kHz.

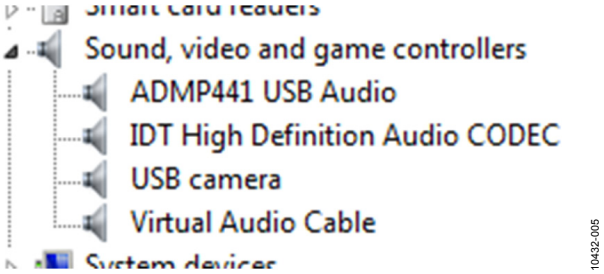

Figure 5. Windows Device Manager

The evaluation system functions as a USB audio device in Windows XP, Windows Vista®, and Windows 7. The PC audio settings show both a **Microphone** and a **Line** setting for **ADMP441 USB Audio**. These items have identical functionality; either can be selected with no functional differences.

The sensitivity of the ADMP441 is −26 dBFS. If the microphone is used to record voices at normal conversational levels, the level of the recording may be somewhat low. To boost the level of the recorded audio, try applying gain to the signal in the record path of the recording software (a gain of 10 dB to 20 dB is recommended).

The following sections provide instructions for setting up several popular software tools to listen and record with the EVAL-ADMP441Z system.

Windows Sound Settings

You can control the properties of the ADMP441 USB audio device in Windows as follows. (The following steps and the screenshot in Figure 6 are for Windows 7. For other versions of Windows software, this procedure may vary.)

1. Right-click the speaker icon in the taskbar and select **Recording devices**.
2. Ensure that the ADMP441 USB audio microphone device is enabled and active.
3. Select **Properties** for the device to display the **Microphone Properties** window.
4. In the **Microphone Properties** window, click the **Listen** tab (see Figure 6).

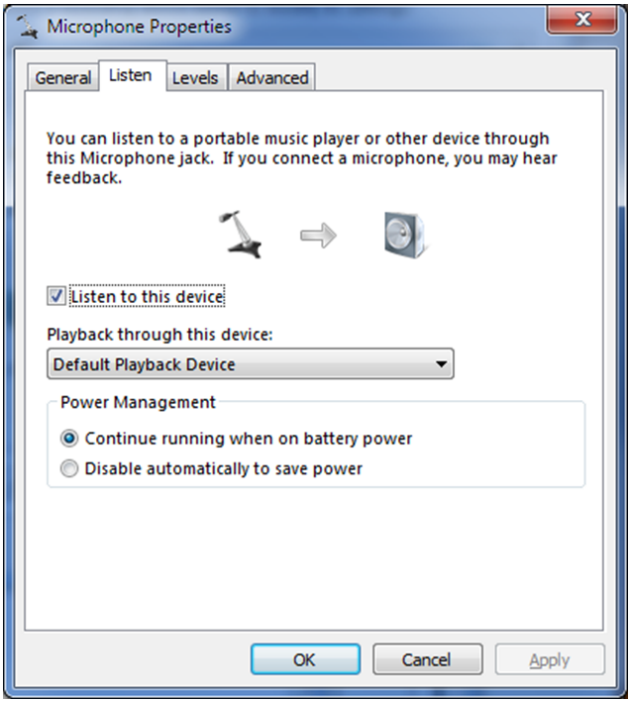

Figure 6. Windows Microphone Properties Window

5. Select the box labeled **Listen to this device** and click **Apply**. The **Listen to this device** option allows you to loop the microphone audio back to the audio output of the PC, either through the internal speakers or through externally connected headphones or speakers.

You should now be able to hear the microphone audio directly on the PC audio output. If you are using speakers instead of headphones with your PC, do not place the microphones too close to the speakers because audible feedback can be created.

Audacity Sound Settings

Audacity® is a free audio recording and editing tool. To record audio using the EVAL-ADMP441Z system, you can select either **Microphone (ADMP441 USB Audio)** or **Line (ADMP441 USB Audio)** as the recording device in the **Audacity Preferences** window (see Figure 7). The version tested was Audacity 1.3.

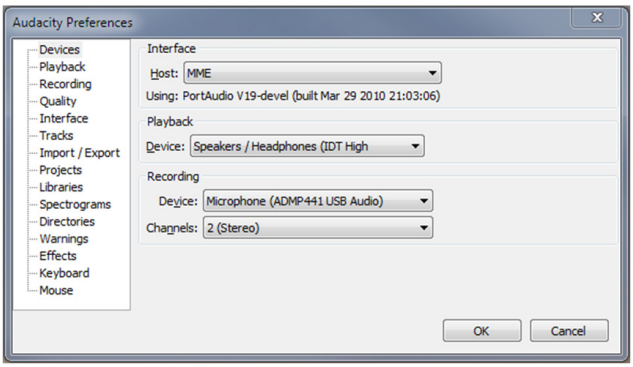

Figure 7. Audacity Preferences Window

Adobe Audition Settings

Audition® is the Adobe® multitrack audio recording tool. To record audio using the EVAL-ADMP441Z system, you can select either **Microphone (ADMP441 USB Audio)** or **Line (ADMP441 USB Audio)** as the default input in the Audition **Preferences** window (see Figure 8). The version tested was Adobe Audition CS5.5.

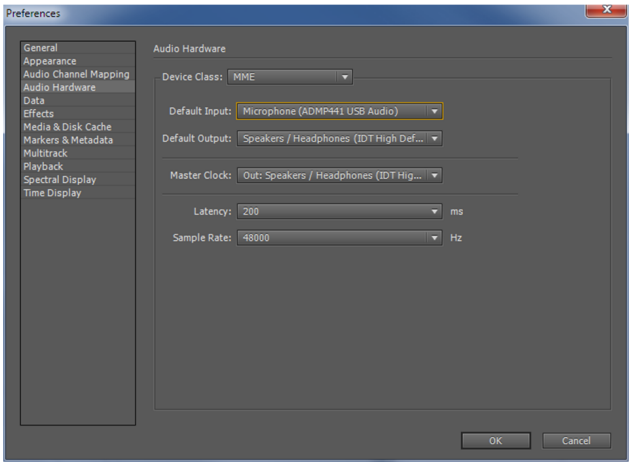

Figure 8. Adobe Audition Preferences Window

EVALUATION BOARD SCHEMATIC

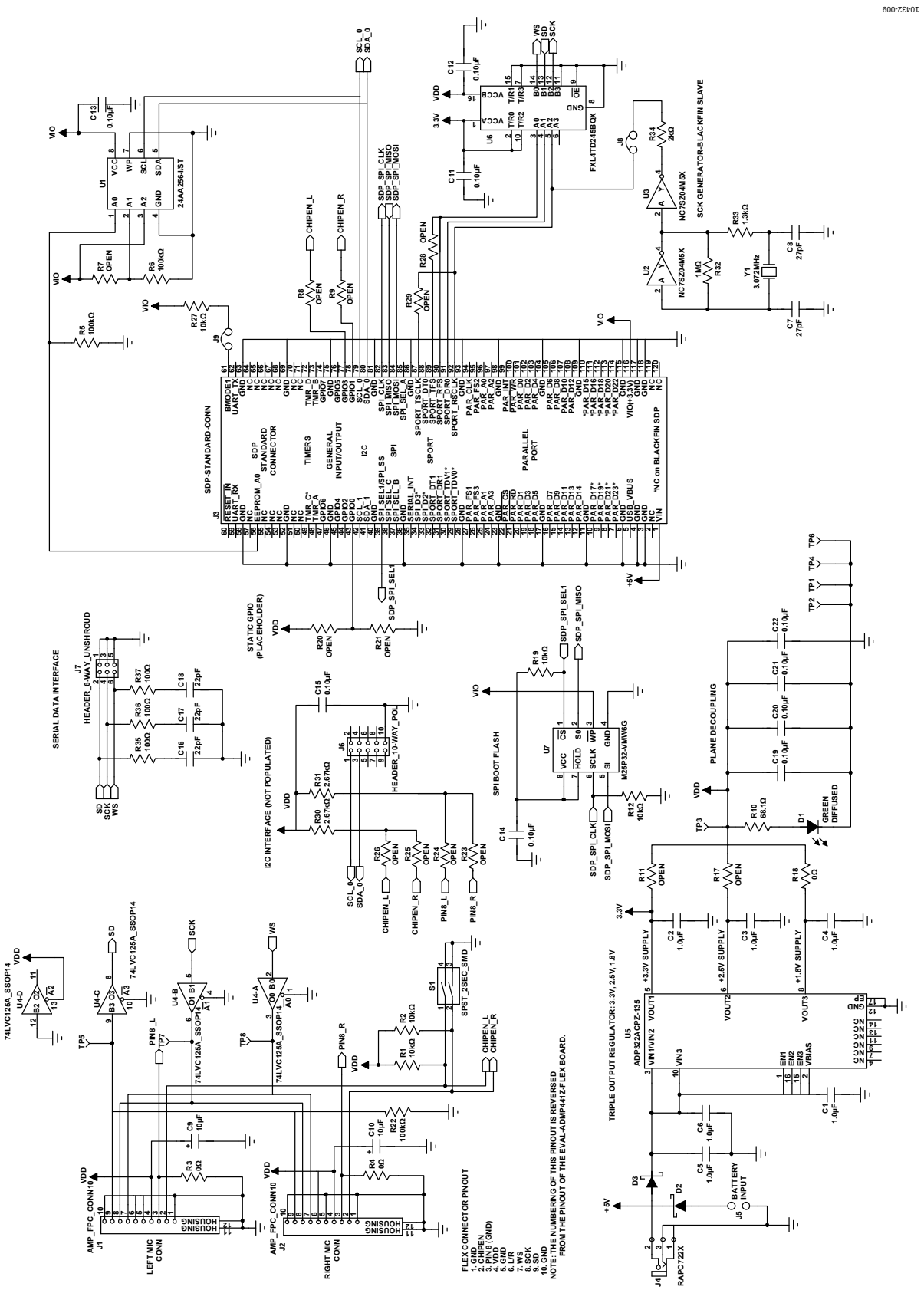

Figure 9. Schematic of the Evaluation Board

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Qty	Reference	Description	Manufacturer	Part No.
6	C1 to C6	Capacitor, multilayer ceramic, 1 µF, 16 V, X7R, 0603	Taiyo Yuden	EMK107BJ105KA-TR
2	C7, C8	Capacitor, multilayer ceramic, 27 pF, 50 V, NP0, 0402	Murata ENA	GRM1555C1H270JZ01D
2	C9, C10	Capacitor, SMD tantalum, 10 µF, 6.3 V, 0805	Rohm	TCP0J106M8R
8	C11 to C14, C19 to C22	Capacitor, multilayer ceramic, 0.10 µF, 16 V, X7R, 0402	Panasonic EC	ECJ-0EX1C104K
1	C15	Capacitor, multilayer ceramic, 0.10 µF, 16 V, X7R, 0402 (not installed)	Panasonic EC	ECJ-0EX1C104K
3	C16 to C18	Capacitor, multilayer ceramic, 22 pF, 50 V, NP0, 0402	Murata ENA	GRM1555C1H220JZ01D
1	D1	Diode, green diffused, 10 mcd, 565 nm, 1206	Lumex Opto	SML-LX1206GW-TR
2	D2, D3	Schottky diode, 30 V, 0.5 A, SOD-123	On Semiconductor	MBR0530T1G
2	J1, J2	FPC connector, 1 × 10-pin, surface mount, horizontal	AMP	1-84952-0
1	J3	120-way connector, 0.6 mm pitch	Hirose	FX8-120S-SV
1	J4	Mini power jack, 0.08", R/A, T/H	Switchcraft, Inc.	RAPC722X
1	J5	2-pin header, unshrouded jumper, 0.10"	Sullins Connector Solutions	PBC02SAAN
1	J6	10-way, shrouded polarized header, 2 × 5 (not installed)	3M	N2510-6002RB
1	J7	6-way, unshrouded header, 2 × 3	Sullins Connector Solutions	PBC03DAAN
2	J8, J9	2-pin header, unshrouded jumper, 0.10"; use shunt Tyco 881545-2	Sullins Connector Solutions	PBC02SAAN
5	R1, R2, R12, R19, R27	Chip resistor, 10 kΩ, 1%, 63 mW, thick film, 0402	Rohm	MCR01MZPF1002
3	R3, R4, R18	Chip resistor, 0 Ω, 5%, 100 mW, thick film, 0402	Panasonic EC	ERJ-2GE0R00X
3	R5, R6, R22	Chip resistor, 100 kΩ, 1%, 63 mW, thick film, 0402	Rohm	MCR01MZPF1003
13	R7 to R9, R11, R17, R20, R21, R23 to R26, R28, R29	Do not install		
1	R10	Chip resistor, 68.1 Ω, 1%, 63 mW, thick film, 0402	Yageo	RC0402FR-0768R1L
2	R30, R31	Chip resistor, 2.67 kΩ, 1%, 63 mW, thick film, 0402; do not install	Vishay/Dale	CRCW04022K67FKED
1	R32	Chip resistor, 1 MΩ, 1%, 63 mW, thick film, 0402	Rohm	MCR01MZPF1004
1	R33	Chip resistor, 1.3 kΩ, 1%, 63 mW, thick film, 0402	Vishay/Dale	CRCW04021K30FKED
1	R34	Chip resistor, 2 kΩ, 1%, 100 mW, thick film, 0402	Panasonic EC	ERJ-2RKF2001X
3	R35 to R37	Chip resistor, 100 Ω, 1%, 63 mW, thick film, 0402	Rohm	MCR01MZPF1000
1	S1	2-section SPST SMD dip switch, raised actuator	CTS Corp	219-2LPST
8	TP1 to TP8	Mini test point, white, 0.1" OD	Keystone Electronics	5002
1	U1	256 kb I^2C CMOS serial EEPROM	Microchip	24AA256-I/ST
2	U2, U3	Inverter, SGL TinyLogic, SOT-23	Fairchild Semiconductor	NC7SZ04M5X
1	U4	IC, quad buffer, three-state, 14-TSSOP	Texas Instruments	74LVC125APWT
1	U5	Fixed triple-output low dropout voltage regulator	Analog Devices, Inc.	ADP322ACPZ-135-R7
1	U6	IC, bidirectional volt-level translator, 16-DQFN	Fairchild Semiconductor	FXL4TD245BQX
1	U7	32 Mb serial flash	Numonyx (Micron)	M25P32-VMW6G
1	Y1	Crystal, 3.072 MHz, SMT, 18 pF	Abracon	ABLS-LR-3.072MHZ-T

RELATED LINKS

Resource	Description
ADMP441	Product Page, Omnidirectional Microphone with Bottom Port and I²S Digital Output
UG-303	User Guide, EVAL-ADMP441Z-FLEX: Bottom-Port I²S Output MEMS Microphone Evaluation Board
UG-277	User Guide, SDP-B Controller Board