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ADAU1373 Evaluation Board User Guide

PACKAGE CONTENTS

ADAU1373 evaluation board
5 V ac-to-dc power adapter
Evaluation board user guide

DOCUMENTS NEEDED

ADAU1373 data sheet
AN-1006 Application Note, *Using the EVAL-ADUSB2EBZ*

GENERAL DESCRIPTION

The ADAU1373 is a low power audio codec that supports stereo record and playback. It provides eight single-ended or four differential analog inputs with PGA for adjusting the gain. The support for two stereo digital microphone inputs is provided so that, in total, four digital microphones can be connected. In addition, three serial digital audio in/out ports are provided with ASRCs to support various sampling rates at the input/output ports, allowing flexible system design.

The analog output side consists of line outputs, a headphone output, a speaker output, and a receiver output. The two stereo single-ended line level outputs are included, which can be configured as two differential outputs. The headphone output is stereo true-ground-centered with efficient Class-G architecture. The efficient stereo filterless Class-D switching amplifier provides around 1 W stereo power for speakers. The differential receiver amplifier can be used to connect the separate receiver speaker.

The ADAU1373 evaluation board includes the complete application circuit for the ADAU1373. The board is featured with USBi connection to the SigmaStudio™ graphical development tool running on a host PC, which is used to program the ADAU1373.

Included in this user guide is a detailed description for the ADAU1373 evaluation board. It is recommended that the ADAU1373 data sheet be read along with this user guide. Full details about the part are available in the ADAU1373 data sheet, which provides more detailed information about the specifications, internal block diagrams, and application guidance for the codec IC.

TABLE OF CONTENTS

REVISION HISTORY

6/11—Revision 0: Initial Version

SETTING UP THE BOARD—QUICK START

SigmaStudio SOFTWARE INSTALLATION

To install the SigmaStudio software, follow these steps:

1. Open the provided .zip file and extract the files to your PC. Alternatively, insert the SigmaStudio CD into the PC optical drive and locate the SigmaStudio folder on the CD.
2. If Microsoft .NET Framework Version 3.5 is not already installed on the PC, install it by double-clicking **dotnetfx.exe**.
3. Install SigmaStudio by double-clicking **setup.exe** and following the prompts. A computer restart is not required.

HARDWARE SETUP, USBi

To set up the USBi hardware, follow these steps:

1. Plug the USBi ribbon cable into Header J23.
2. Connect the USB cable to your computer and to the USBi.
3. When prompted for drivers, follow these steps:
   a) Select **Install from a list or a specific location**.
   b) Select **Search for the best driver in these locations**.
   c) Select the box for **Include this location in the search**. The USBi driver is located in C:\Program Files\Analog Devices Inc\Sigma Studio\USB drivers.
   d) Click **Next**.
   e) If prompted to choose a driver, select **CyUSB.sys**.
   f) If the PC is running Windows® XP and you receive the message that the software has not passed Windows logo testing, click **Continue Anyway**.

POWERING THE BOARD

1. Plug the external dc power adapter into J34 to input 5 V dc power to the board.
2. Short Jumpers J40, J33, J31, and J32 to select the on-board LDO-generated voltages that are connected to SPKVDD, HPVDD, AVDD, and DVDD, respectively.
3. Set Jumpers J43, J36, J39, J37, and J38 to select the required voltage (1.8 V, 2.4 V, or 3.3 V) connected to each IOVDDx (x = 1 to 5).

SETTING UP THE REGISTERS IN SigmaStudio

The codec is configured with SigmaStudio software. To set up the registers in SigmaStudio, follow these steps:

1. Create a new project. Select **New Project** under the **File** menu. The **Hardware Configuration** tab opens.
2. Click and drag an ADAU1373 cell and a USBi cell into the blank work area.
3. Connect the USBi cell to the ADAU1373 cell by clicking and dragging from the top blue output pin of the USBi cell to the green input pin of the ADAU1373 cell. The window should now resemble Figure 1.
4. In the **IC 1 - ADAU1373_REVB_V1.13** tab, configure the ADAU1373 registers by clicking the intuitive graphic user interface (GUI) elements in the **Input A** to **Input D**, **Analog Input Signal Routing**, and **Mic Bias Control** sections to set up the proper datapath (see Figure 2).

The SigmaStudio software includes help information. Press the F1 key to open the help window.

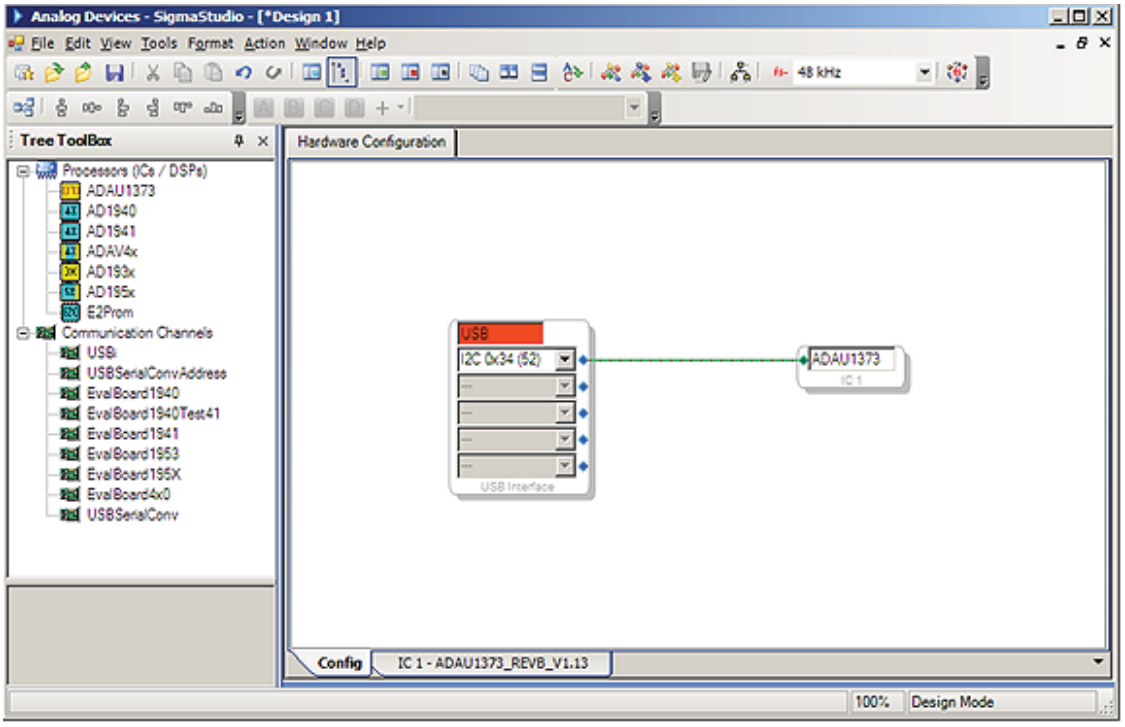

Figure 1. Hardware Configuration Tab—USBi Connection

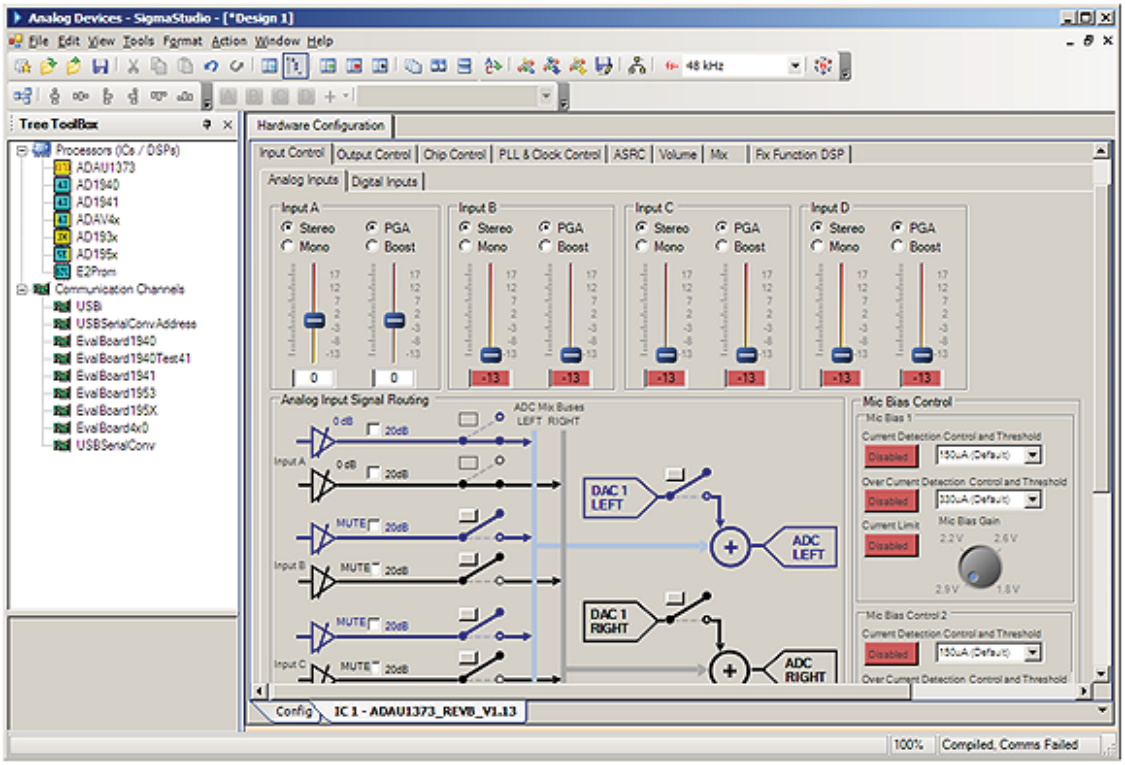

Figure 2. Hardware Configuration Tab—Register Setup

EVALUATION BOARD HARDWARE

POWER SUPPLIES

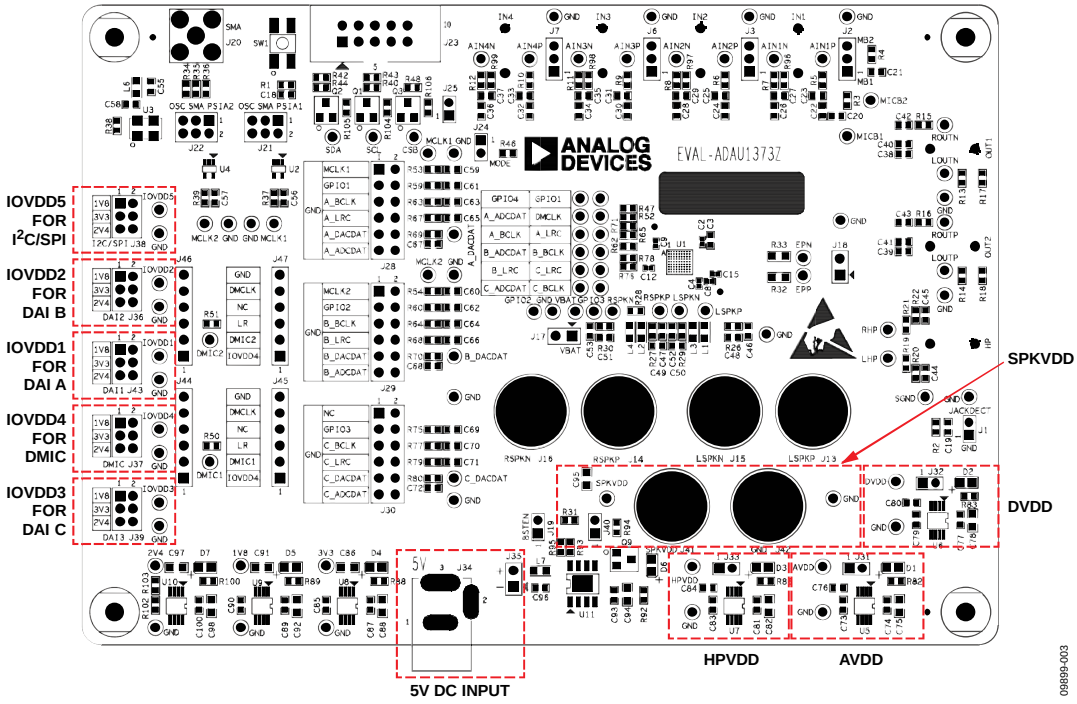

Figure 3. Power Supply

The evaluation board requires an external 5 V dc power adapter plugged into J34. This 5 V dc input drives the on-board LDOs to generate 1.5 V, 1.8 V, 2.4 V, 3.3 V, or 3.6 V, which feeds into the ADAU1373 and other on-board circuits. The power supplies the ADAU1373 requires are listed in Table 1.

Table 1. ADAU1373 Power Supplies

Power Supply	LDO Voltage
AVDD	1.8 V
HPVDD	1.8 V
SPKVDD	3.6 V
DVDD	1.5 V
IOVDD1 to IOVDD5	1.8 V, 2.4 V, or 3.3 V

If voltages other than the default LDO output are needed, external power supplies can be used for this purpose. Each power supply for the ADAU1373 has a set of jumpers to select the LDO output or external power supply.

J31 is for AVDD power supply selection. The selection options are shown in Table 2.

Table 2. J31

Jumper Position	Function
On	On-board LDO-generated 1.8 V connected to AVDD
Off	External power supply connected to Test Pin AVDD and Test Pin GND

J33 is for HPVDD power supply selection. The selection table is shown in Table 3.

Table 3. J33

Jumper Position	Function
On	On-board LDO-generated 1.8 V connected to HPVDD
Off	External power supply connected to Test Pin HPVDD and Test Pin GND

J32 is for DVDD power supply selection. The selection options are shown in Table 4.

Table 4. J32

Jumper Position	Function
On	On-board LDO-generated 1.5 V connected to DVDD
Off	External power supply connected to Test Pin DVDD and Test Pin GND

J40 is for SPKVDD power supply selection. The selection options are shown in Table 5.

Table 5. J40

Jumper Position	Function
On	On-board LDO-generated 3.6 V connected to SPKVDD
Off	External power supply connected to SPKVDD: J41 for SPKVDD and J42 for GND

J43 is for IOVDD1 power supply selection, which powers Digital Audio Interface A. The selection options are shown in Table 6.

Table 6. J43

Jumper Position[1]	Function
1-2	On-board LDO-generated 1.8 V connected to IOVDD1
3-4	On-board LDO-generated 3.3 V connected to IOVDD1
5-6	On-board LDO-generated 2.4 V connected to IOVDD1
Off	External power supply connected to Test Pin IOVDD1 and Test Pin GND

[1] Jumper Position x-y means Pin x and Pin y are connected together via a jumper capacitor.

J36 is for IOVDD2 power supply selection, which powers digital Audio Interface B. The selection options are shown in Table 7.

Table 7. J36

Jumper Position[1]	Function
1-2	On-board LDO-generated 1.8 V connected to IOVDD2
3-4	On-board LDO-generated 3.3 V connected to IOVDD2
5-6	On-board LDO-generated 2.4 V connected to IOVDD2
Off	External power supply connected to Test Pin IOVDD2 and Test Pin GND

[1] Jumper Position x-y means Pin x and Pin y are connected together via a jumper capacitor.

J39 is for IOVDD3 power supply selection, which powers digital Audio Interface C. The selection options are shown in Table 8.

Table 8. J39

Jumper Position[1]	Function
1-2	On-board LDO-generated 1.8 V connected to IOVDD3
3-4	On-board LDO-generated 3.3 V connected to IOVDD3
5-6	On-board LDO-generated 2.4 V connected to IOVDD3
Off	External power supply connected to Test Pin IOVDD3 and Test Pin GND

[1] Jumper Position x-y means Pin x and Pin y are connected together via a jumper capacitor.

J37 is for IOVDD4 power supply selection, which powers the digital microphone interface. The selection options are shown in Table 9.

Table 9. J37

Jumper Position[1]	Function
1-2	On-board LDO-generated 1.8 V connected to IOVDD4
3-4	On-board LDO-generated 3.3 V connected to IOVDD4
5-6	On-board LDO-generated 2.4 V connected to IOVDD4
Off	External power supply connected to Test Pin IOVDD4 and Test Pin GND

[1] Jumper Position x-y means Pin x and Pin y are connected together via a jumper capacitor.

J38 is for IOVDD5 power supply selection, which powers the I^2C/SPI port. The selection options are shown in Table 10.

Table 10. J38

Jumper Position[1]	Function
1-2	On-board LDO-generated 1.8 V connected to IOVDD5
3-4	On-board LDO-generated 3.3 V connected to IOVDD5
5-6	On-board LDO-generated 2.4 V connected to IOVDD5
Off	External power supply connected to Test Pin IOVDD5 and Test Pin GND

[1] Jumper Position x-y means Pin x and Pin y are connected together via a jumper capacitor.

DIGITAL AUDIO INTERFACE AND DIGITAL MICROPHONE INTERFACE

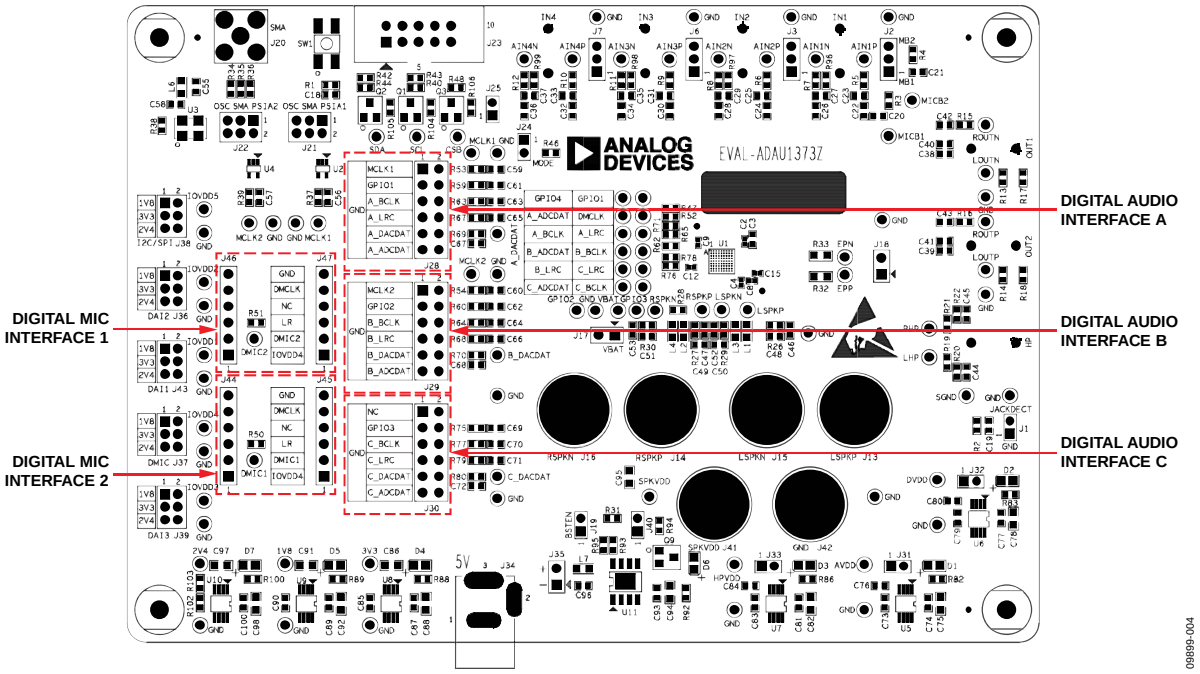

Figure 4. Digital Audio Interface and Digital Microphone Interface

The evaluation board provides three digital audio interfaces (J28 to J30) and two digital microphone interfaces (J44/J45 and J46/J47).

The pin definitions for J28, J29, and J30 are shown in Figure 5, Figure 6, and Figure 7, respectively.

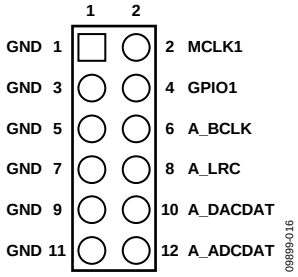

Figure 5. Pin Definitions for J28

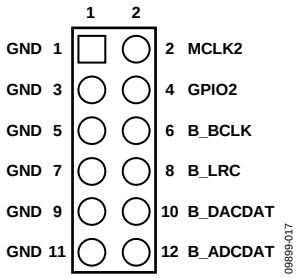

Figure 6. Pin Definitions for J29

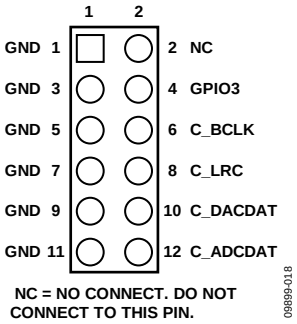

Figure 7. Pin Definitions for J30

The pin definitions for J44 are listed in Table 11.

Table 11. J44

Pin No.	Signal
1	IOVDD4
2	DMIC_DATA1
3	LR_SEL (high)
4	NC
5	DMIC_CLK
6	GND

The pin definitions for J45 are listed in Table 12.

Table 12. J45

Pin No.	Signal
1	IOVDD4
2	DMIC_DATA1
3	LR_SEL (low)
4	NC
5	DMIC_CLK
6	GND

The pin definitions for J46 are listed in Table 13.

Table 13. J46

Pin No.	Signal
1	IOVDD4
2	DMIC_DATA1
3	LR_SEL (high)
4	NC
5	DMIC_CLK
6	GND

The pin definitions for J47 are listed in Table 14.

Table 14. J47

Pin No.	Signal
1	IOVDD4
2	DMIC_DATA1
3	LR_SEL (low)
4	NC
5	DMIC_CLK
6	GND

ANALOG INPUT AND OUTPUT

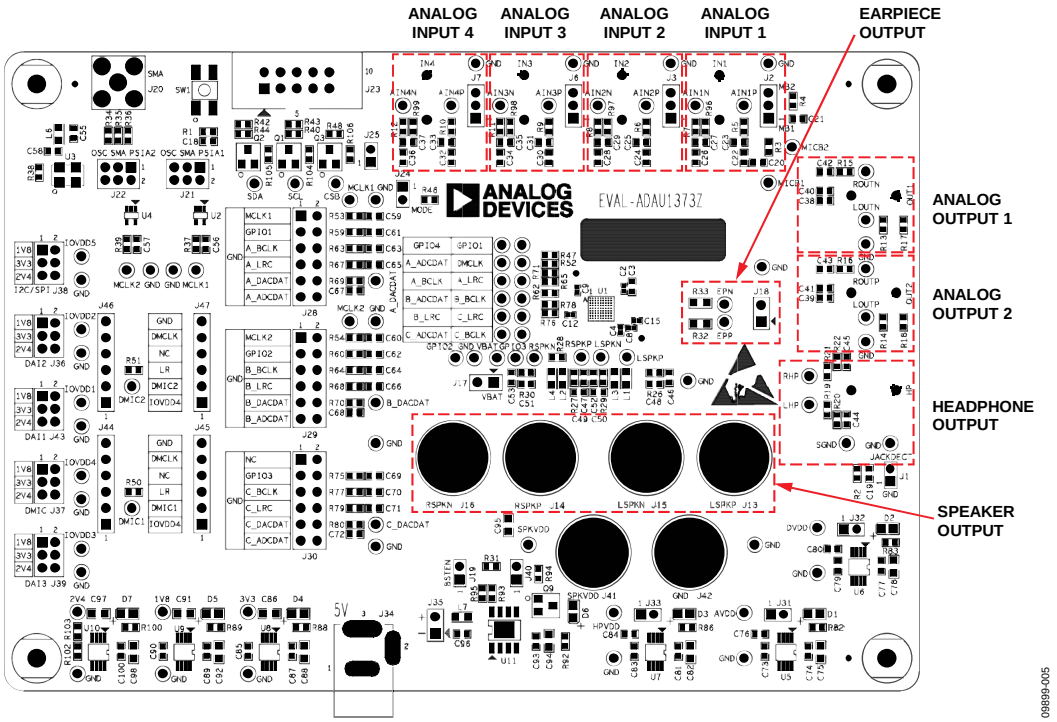

Figure 8. Analog Input and Output Interface

On the board, there are four analog inputs (J4, J5, J8, and J9). Near each input, there is a three-way jumper that selects which bias voltage is routed to this input pair. These jumpers are J2, J3, J6, and J7. The configurations are shown in Figure 9, and the definitions of these jumper configurations are listed in Table 15, Table 16, Table 17, and Table 18, respectively.

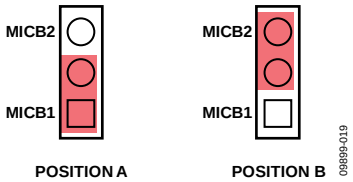

Figure 9. Configuration for Jumpers J2, J3, J6, and J7

Table 15. J2

Position	Function
A	Microphone Bias 1 connected to Analog Input 1
B	Microphone Bias 2 connected to Analog Input 1

Table 16. J3

Position	Function
A	Microphone Bias 1 connected to Analog Input 2
B	Microphone Bias 2 connected to Analog Input 2

Table 17. J6

Position	Function
A	Microphone Bias 1 connected to Analog Input 3
B	Microphone Bias 2 connected to Analog Input 3

Table 18. J7

Position	Function
A	Microphone Bias 1 connected to Analog Input 4
B	Microphone Bias 2 connected to Analog Input 4

On the board, there are two analog outputs (J10 and J11), one earpiece output for mono differential signals (J18), one headphone output (J12), and two pairs of speaker outputs (J13/J14 and J15/J16).

CLOCK AND CONTROL PORT

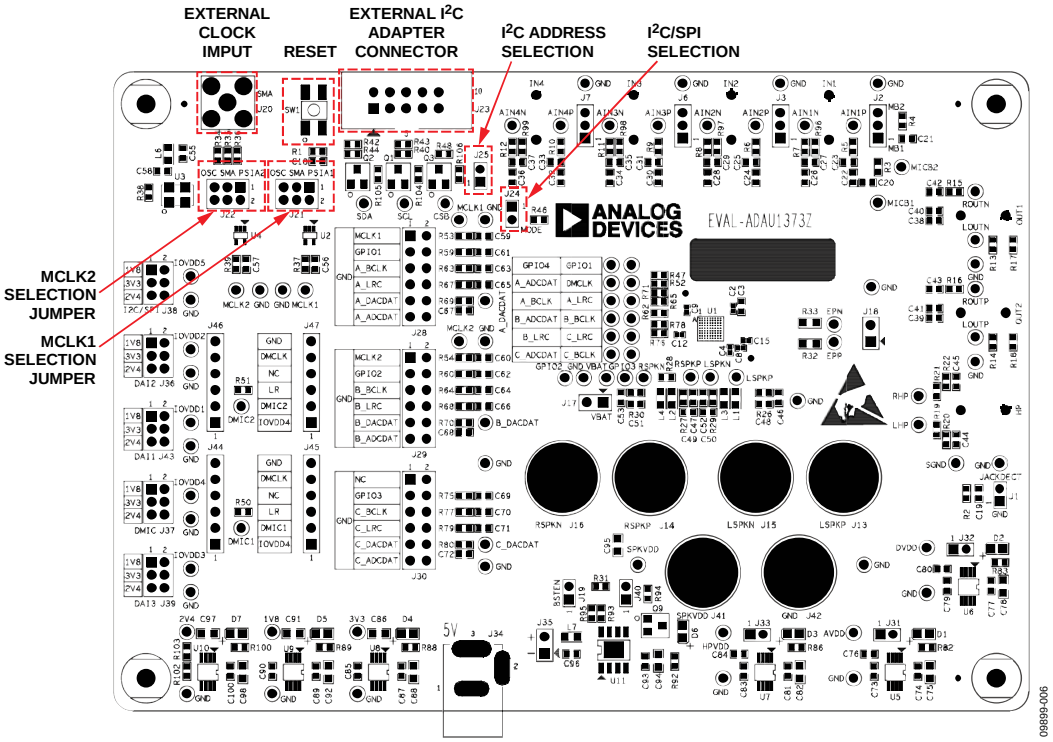

Figure 10. Clock and Control Port

There are two master clock input pins for the ADAU1373: MCLK1 and MCLK2. For each master clock, there are three clock sources that can be selected by Jumper 21 and Jumper 22.

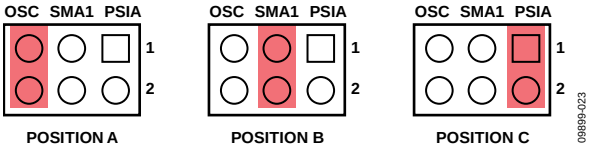

Figure 11. Configuration for Jumpers 21 and 22

J21 is for MCLK1 selection. The position definitions are shown Figure 11 and Table 19.

Table 19. J21

Jumper Position	Function
A	Use an on-board 12.288 MHz oscillator as MCLK1.
B	Use an external SMA clock input as MCLK1.
C	Use an audio precision PSIA MCLK input connected to J28 as MCLK1.

J22 is for MCLK2 selection. The position definitions are shown in Figure 11 and Table 20.

Table 20. J22

Jumper Position	Function
A	Use an on-board 12.288 MHz oscillator as MCLK2.
B	Use an external SMA clock input as MCLK2.
C	Use an audio precision PSIA MCLK input connected to J29 as MCLK2.

J23 is for the external I²C/SPI controller (USBi board) connection. J24 selects the control port mode of the ADAU1373. The position definitions of this jumper are shown in Table 21.

Table 21. J24

Jumper Position	Function
On	I²C mode
Off	SPI mode

J25 selects the I²C device address of the ADAU1373. The position definitions of this jumper are shown in Table 22.

Table 22. J25

Jumper Position	Function
On	I²C devices address = 0x1C.
Off	I²C devices address = 0x1A.

EVALUATION BOARD SCHEMATICS AND ARTWORK

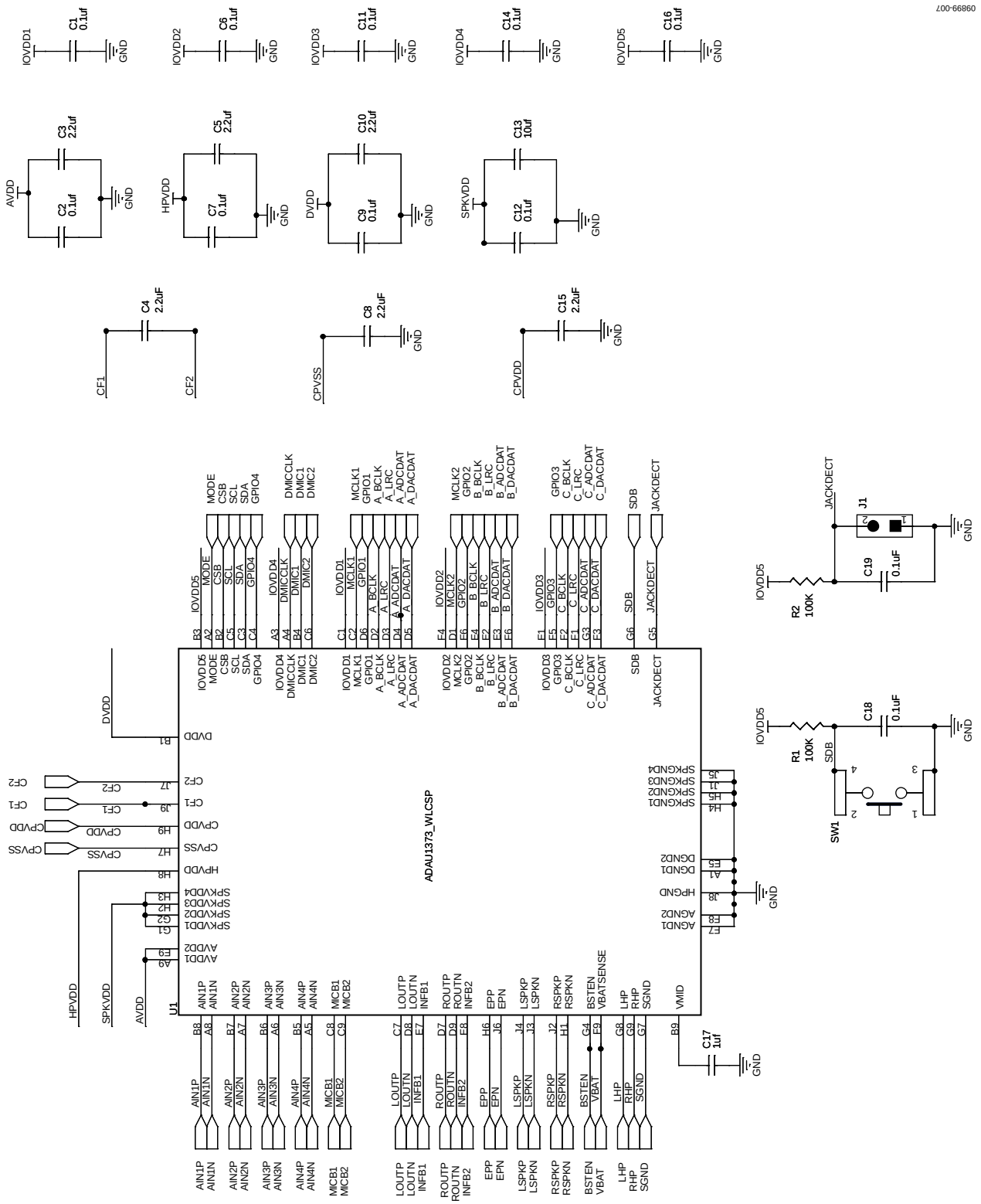

Figure 12. Schematic of the ADAU1373 Evaluation Board, ADAU1373 Chip

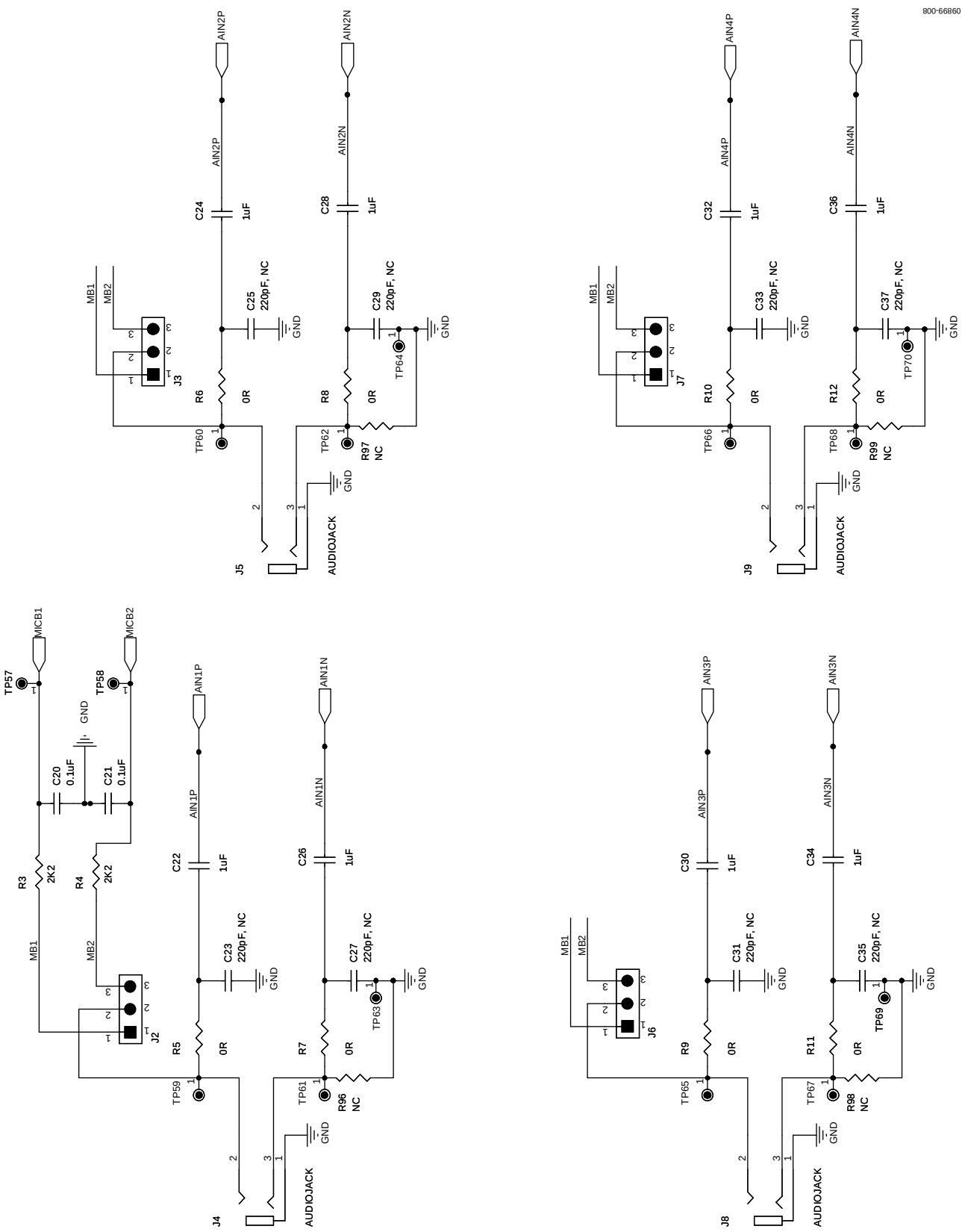

Figure 13. Schematic of the ADAU1373 Evaluation Board—Line Input

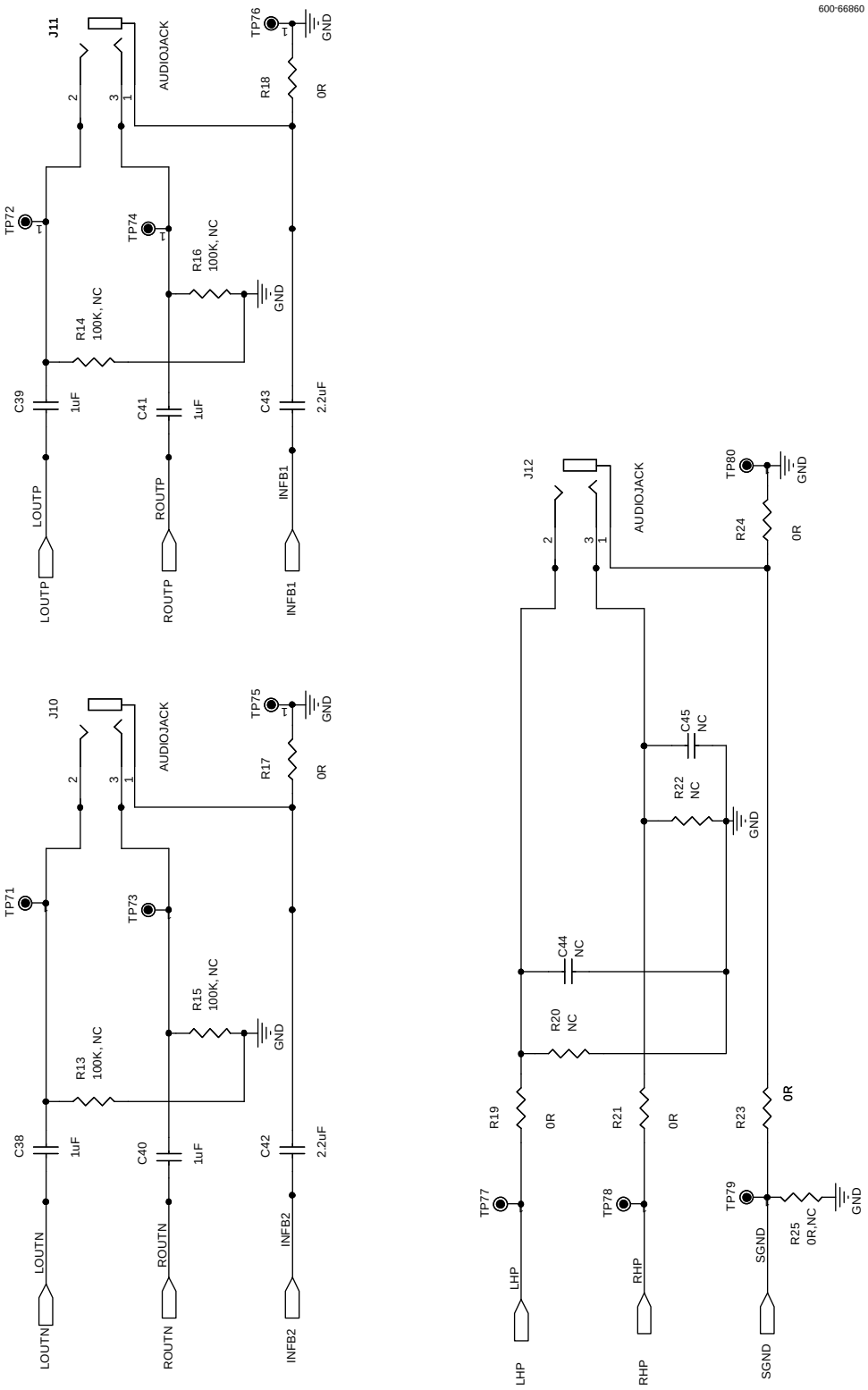

Figure 14. Schematic of the ADAU1373 Evaluation Board—Line and Headphone Output

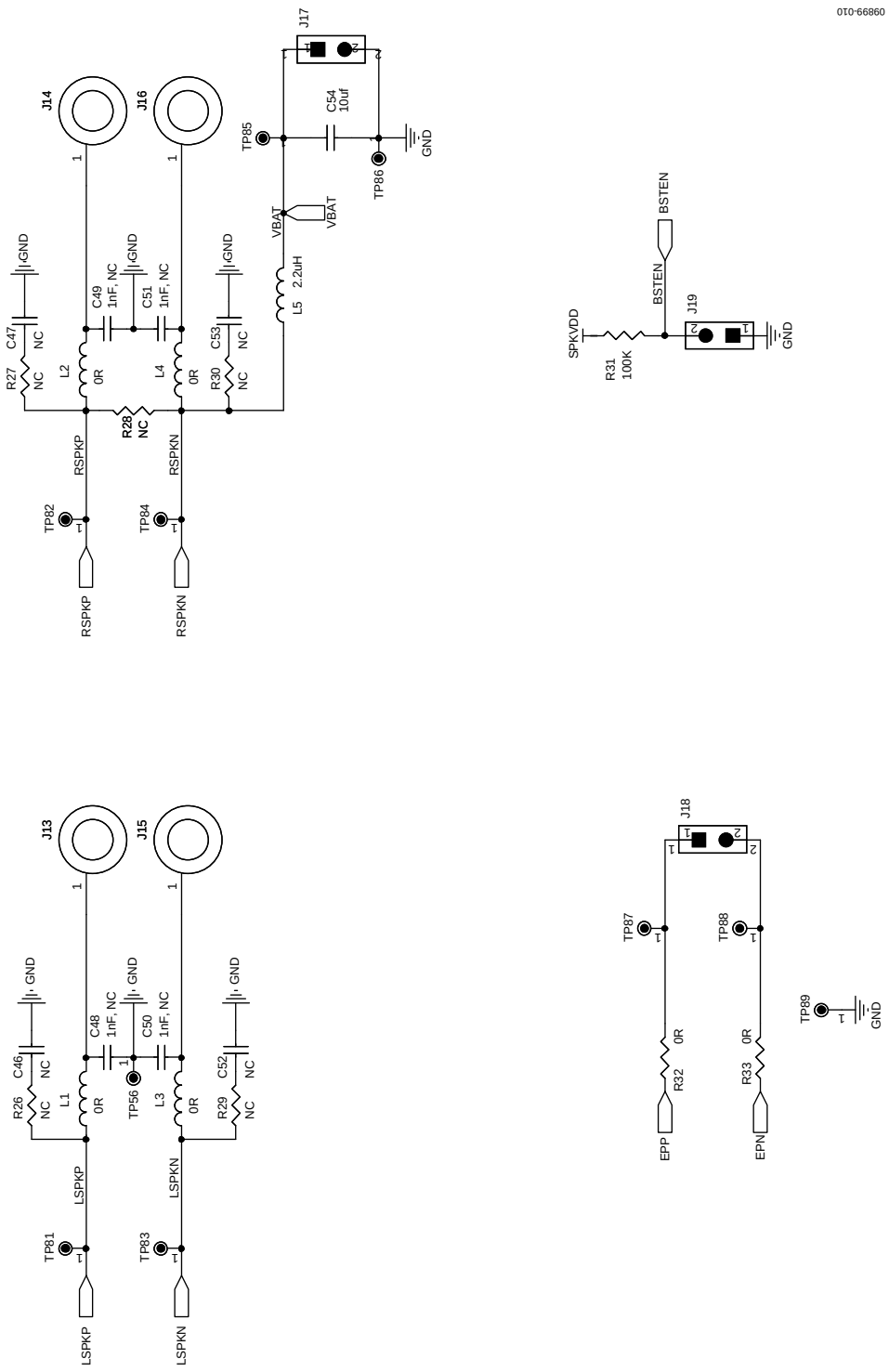

Figure 15. Schematic of the ADAU1373 Evaluation Board—Speaker and Receiver Output

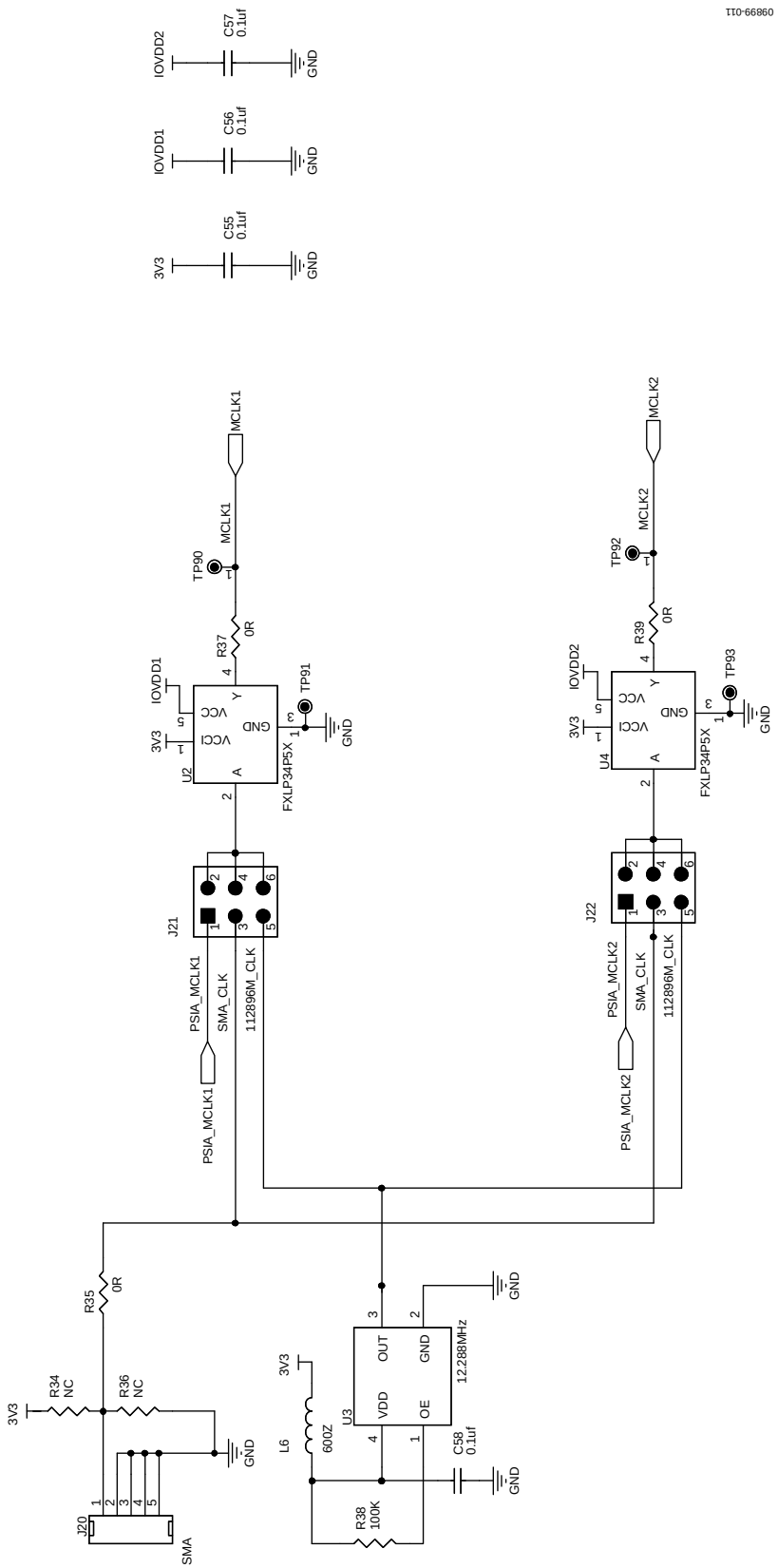

Figure 16. Schematic of the ADAU1373 Evaluation Board—Clock

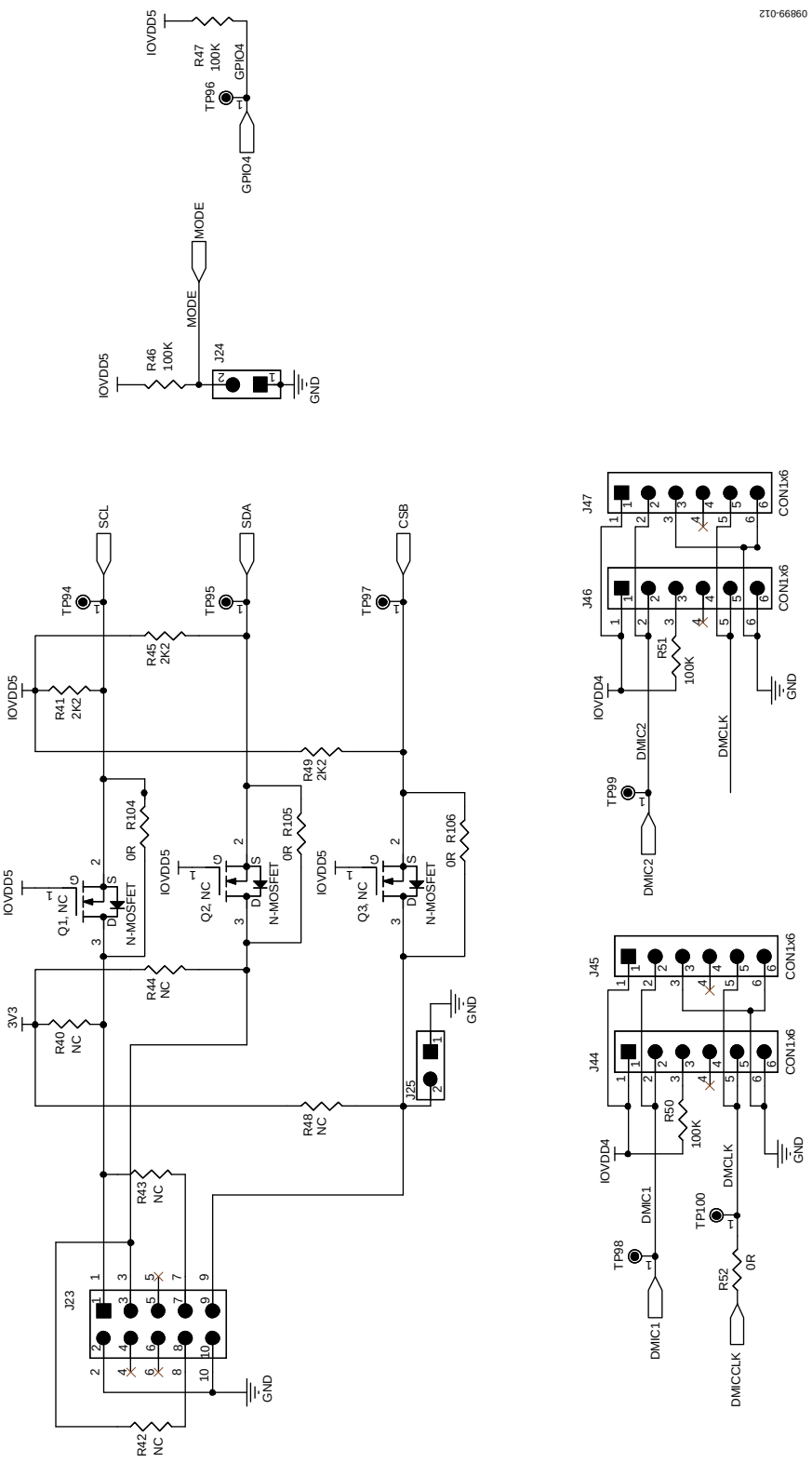

Figure 17. Schematic of the ADAU1373 Evaluation Board—I²C Port and Digital Microphone Interface

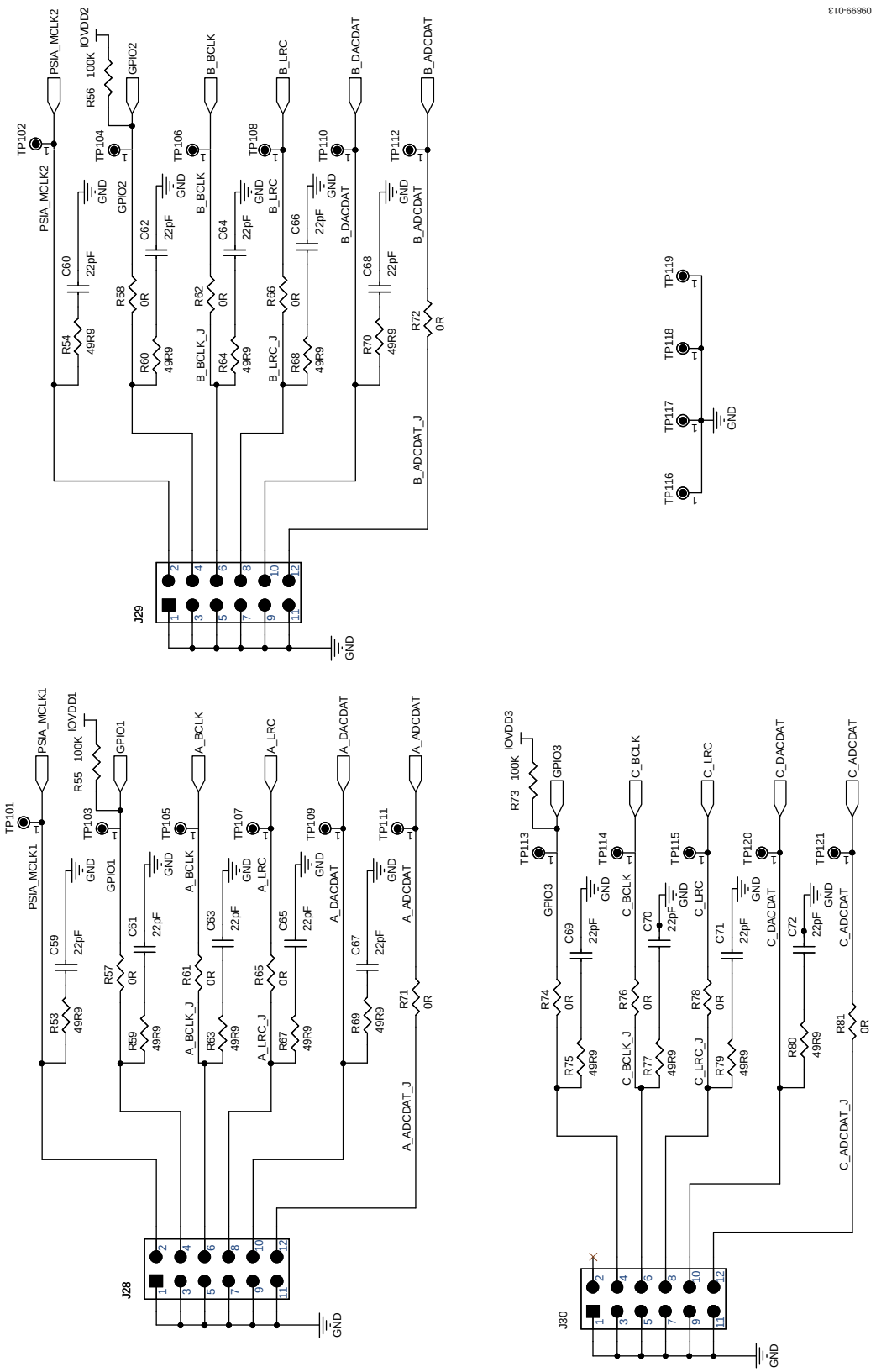

Figure 18. Schematic of the ADAU1373 Evaluation Board—Digital Audio Interface

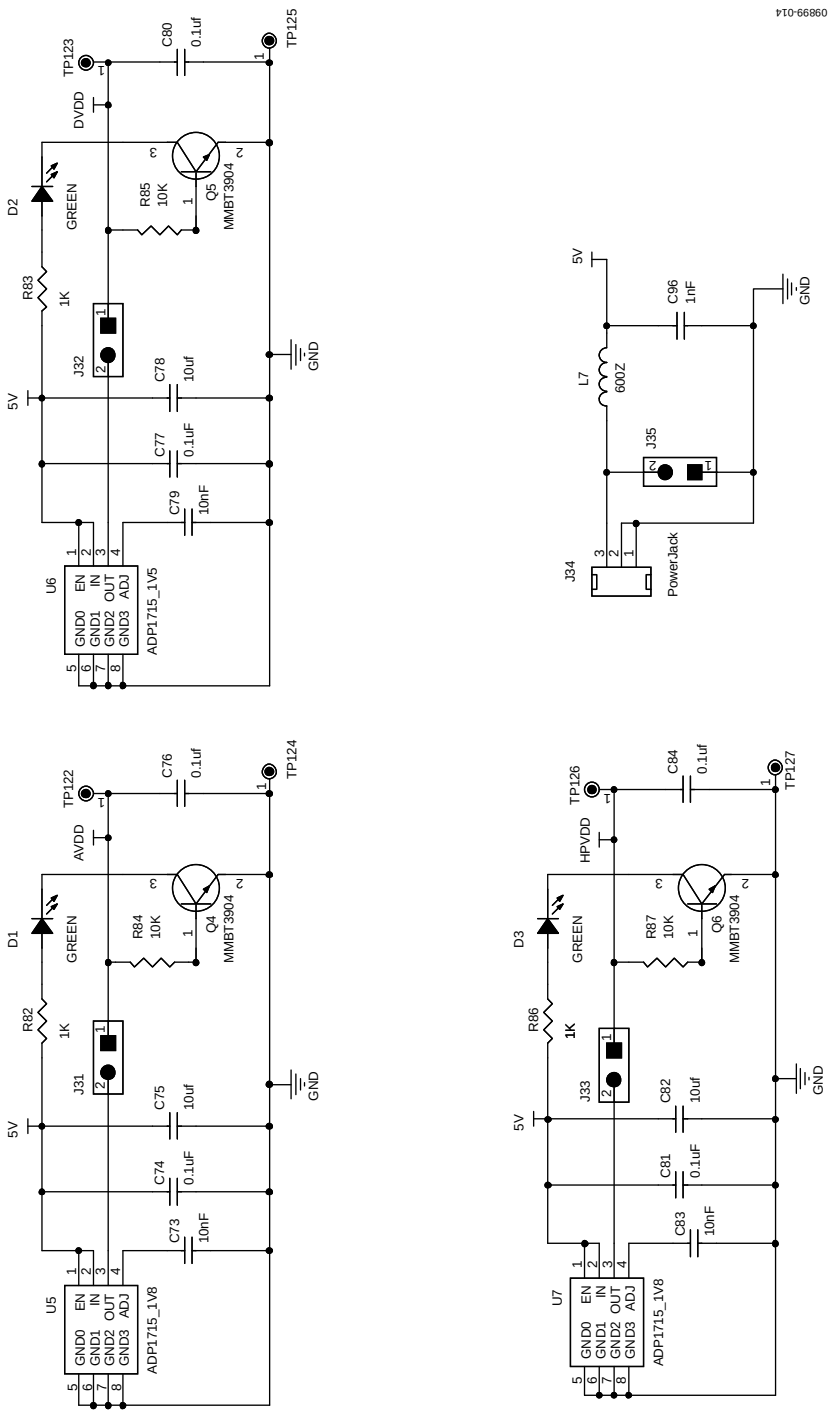

Figure 19. Schematic of the ADAU1373 Evaluation Board—Power Supply

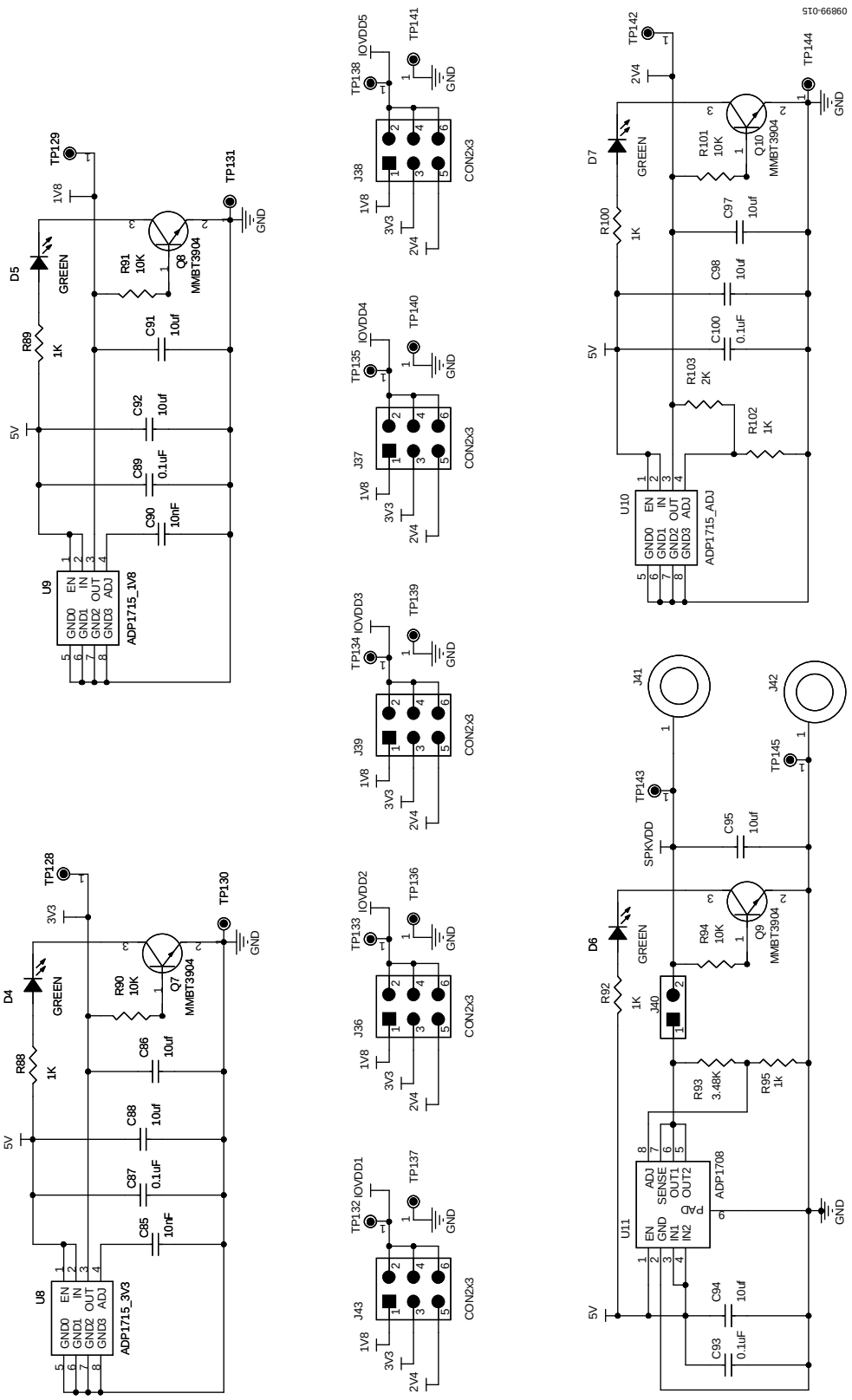

Figure 20. Schematic of the ADAU1373 Evaluation Board—Power Supply

ORDERING INFORMATION

BILL OF MATERIALS

Table 23.

Qty	Part Reference	Description	Manufacturer	Part Number
9	C1, C11, C12, C14, C16, C2, C6, C7, C9	MLCC, 0.1 µF, 0402	Panasonic	ECJ-0EX1C104K
3	C10, C3, C5,	MLCC, 2.2 µF, 0603	Panasonic	ECJ-1VB1A225K
13	C13, C54, C75, C78, C82, C86, C88, C91, C92, C94, C95, C97, C98	MLCC, 10 µF, 0805	Panasonic	ECJ-2FF1A106Z
1	C17	MLCC, 1 µF, 0402	Panasonic	ECJ-0EB1A105M
12	C22, C24, C26, C28, C30, C32, C34, C36, C38, C39, C40, C41	MLCC, 1 µF, 0603	Panasonic	ECJ-1VB1A105K
21	C18, C19, C20, C21, C42, C43, C55, C56, C57, C58, C74, C76, C77, C80, C81, C84, C87, C89, C93, C96, C100	MLCC, 0.1 µF, 0603	Panasonic	ECJ-1VB1H104K
3	C4, C8, C15	MLCC, 2.2 µF, 0402	Panasonic	ECJ-0EB0J225M
6	C44, C45, C46, C47, C52, C53	Capacitor (open)		
4	C48, C49, C50, C51	Capacitor (open)		
8	C23, C25, C27, C29, C31, C33, C35, C37	Capacitor (open)		
14	C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72	Capacitor (open)		
5	C73, C79, C83, C85, C90	MLCC, 10 nF, 0603	Panasonic	ECJ-1VB1H103K
7	D1, D2, D3, D4, D5, D6, D7,	LED, green	Lumex	SML-LXT0805GW-TR
8	J1, J19, J24, J25, J31, J32, J33, J40	Jumper, 2 mm pitch		
7	J10, J11, J12, J4, J5, J8, J9	Stereo audio jack	CUI	SJ-3523-SMT
6	J13, J14, J15, J16, J41, J42	Binding post connector	Johnson/Emerson	111-2223-001
3	J17, J18, J35	Jumper, 2.54 mm pitch		
4	J2, J3, J6, J7	Header, 3-way (1 × 3)		
1	J20	SMA header	MULTICOMP	60-04 TGG
7	J21, J22, J36, J37, J38, J39, J43	Header, 6-way (2 × 3)		
1	J23	Header, 10-way (2 × 5), polarized		
3	J28, J29, J30	Header, 12-way (2 × 6)		
1	J34	Power jack	Switchcraft Inc.	RAPC712
4	J44, J45, J46, J47	Header, 6-way (1 × 6)		
4	L1, L2, L3, L4	Chip resistor, 0 Ω, 0805	Panasonic	ERJ-6GEY0R00V
1	L5	Inductor (open)		
2	L6, L7	Chip ferrite bead, 600 Ω at 100 MHz	TDK	MPZ1608S601A
3	Q1, Q2, Q3	N-MOSFET (open)		
7	Q10, Q4, Q5, Q6, Q7, Q8, Q9	Transistor, NPN, SOT23	ON Semiconductor	MMBT3904LT1G
11	R1, R2, R31, R38, R46, R47, R50, R51, R55, R56, R73	Chip resistor, 100 kΩ, 0603	Panasonic	ERJ-3EKF1003V
33	R10, R104, R105, R106, R11, R12, R17, R18, R19, R21, R23, R24, R35, R37, R39, R5, R52, R57, R58, R6, R61, R62, R65, R66, R7, R71, R72, R74, R76, R78, R8, R81, R9	Chip resistor, 0 Ω, 0603	Panasonic	ERJ-3GEY0R00V
9	R100, R102, R82, R83, R86, R88, R89, R92, R95	Chip resistor, 1 kΩ, 0603	Panasonic	ERJ-3EKF1001V
7	R101, R84, R85, R87, R90, R91, R94	Chip resistor, 10 kΩ, 0603	Panasonic	ERJ-3EKF1002V
1	R103	Chip resistor, 2 kΩ, 0603	Panasonic	ERJ-3EKF2001V
4	R13, R14, R15, R16	Chip resistor (open)		
18	R20, R22, R26, R27, R28, R29, R30, R34, R36, R40, R42, R43, R44, R48, R96, R97, R98, R99	Chip resistor (open)		
1	R25	Chip resistor (open)		
5	R3, R4, R41, R45, R49	Chip resistor, 2.2 kΩ, 0603	Panasonic	ERJ-3EKF2201V
2	R32, R33	Chip resistor, 0 Ω, 0805	Panasonic	ERJ-6GEY0R00V

Qty	Part Reference	Description	Manufacturer	Part Number
14	R53, R54, R59, R60, R63, R64, R67, R68, R69, R70, R75, R77, R79, R80,	Chip resistor (open)		
1	R93	3.48 kΩ	Panasonic	ERJ-3EKF3481V
1	SW1	Push-button		
1	U1	ADAU1373	ADI	
1	U10	Low dropout voltage regulator	ADI	ADP1715_ADJ
1	U11	Low dropout voltage regulator	ADI	ADP1708
2	U2, U4	Translator, 1-bit, unidirectional	Fairchild	FXLP34P5X
1	U3	Oscillator, 12.288 MHz	Abracon	ASFL1-12.288MHZ-EC-T
3	U5, U7, U9	Low dropout voltage regulator	ADI	ADP1715_1V8
1	U6	Low dropout voltage regulator	ADI	ADP1715_1V5
1	U8	Low dropout voltage regulator	ADI	ADP1715_3V3

RELATED LINKS

Resource	Description
ADAU1373	Product Page, Low Power Codec with Speaker and Headphone Amplifier
AN-1006	Application Note, Using the EVAL-ADUSB2EBZ
ADP1715	Product Page, 500 mA Low-Dropout CMOS Linear Regulator with Soft Start
ADP1708	Product Page, 1 A, Low Dropout, CMOS Linear Regulator

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ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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