Audio Codec Snap On Board

Reference Manual

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About this Manual

Introduction

This manual provides information about the Audio Codec Snap On Board.

Table below shows the revision history of Audio Codec Snap On Board reference manual.

Version	Date	Description
1.2	January 2009	Corrected J9.11 and J9.13 signal names.
1.1	January 2008	Added document part no.
1.0	October 2006	First Publication of the Audio Codec Snap On Board Reference Manual

How to find Information

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Typographic Conventions

The Audio Codec Snap On Board Reference Manual uses the typographic conventions as shown below:

Visual Cue	Meaning
Bold Type with Initial Capital letters	All headings and Sub headings Titles in a document are displayed in bold type with initial capital letters; Example: **Audio Codec Convertors, Introduction.**
Bold Type with Italic Letters	All Definitions, Figure and Table Headings are displayed in Italics. Examples: ***Figure 2-1. Audio Codec Snap On Board Side View,*** *Table 2-1. Audio Codec Convertor - TLV320AIC23 (U1) Signal Descriptions*
1., 2.	Numbered steps are used in a list of items, when the sequence of items is important. such as steps listed in procedure.
•	Bullets are used in a list of items when the sequence of items is not important.
	The hand points to special information that requires special attention
	The caution indicates required information that needs special consideration and understanding and should be read prior to starting or continuing with the procedure or process.
	The warning indicates information that should be read prior to starting or continuing the procedure or processes.
	The feet direct you to more information on a particular topic.

Contents

1. Introduction

This document describes the hardware features of the SLS Audio Codec snap on board including all pin-out configuration to create the custom FPGA system for Audio processing. The Audio Codec Snap On Board provides a digital audio interface to all FPGA Development board having santa cruz connector.

Features

Audio Codec Board has following features:

- Two Audio Codec Convertors are available TLV320AIC23 (I2S) and LM4550 (AC'97 Compliant)
- On Board Oscillator (24.45 MHz Oscillator)
- 26 General purpose user IO
- Both Audio Codecs provide Line In, Line Out, Headphone, and Microphone jack
- LM4550 Audio Codec also provides CD_In, AUX_In header

Figure 1-1. shows the Audio Codec Snap On Board angle view.

Figure 1-1. Audio Codec Snap On Board Angle View

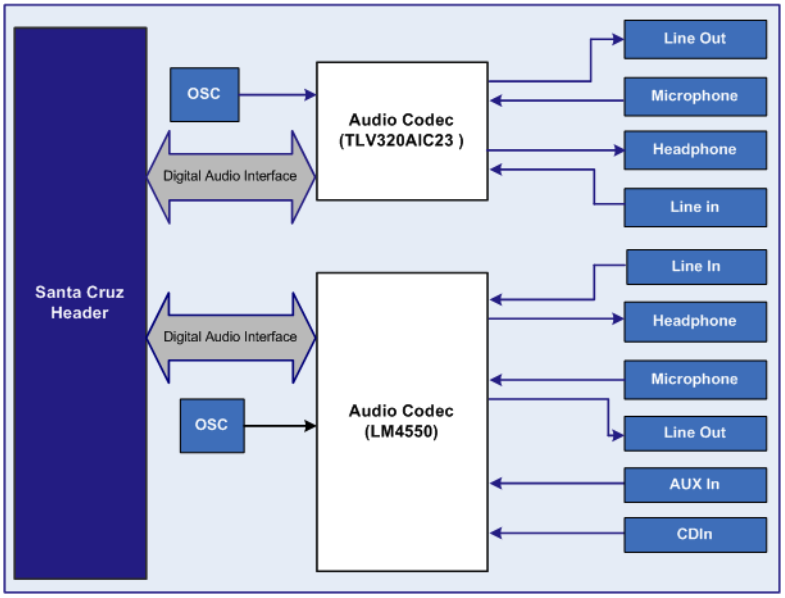
Block Diagram

Audio Codec Snap On board includes following components:

- Audio Codec (TLV320AIC23 and LM4550)
- Crystal Oscillators of 24 MHZ for both Audio Codecs
- Level Shifter for TLV320AIC23 Audio Codec
- Line In, Line Out, Head Phone, Microphone Jack for both Audio Codec
- Headers (M), JP1,JP2, JP3
- Headers(F), JP7,JP8,JP9

The Three headers JP7, JP8, JP9 are Female headers of Audio Codec Snap On board which snaps on Santacruz Connectors (M) J2, J3, J4 of UP3 board respectively. Figure 1-2. below shows block diagram of Audio Codec Snap On Board.

Figure 1-2. Audio Codec Snap On Board Block Diagram

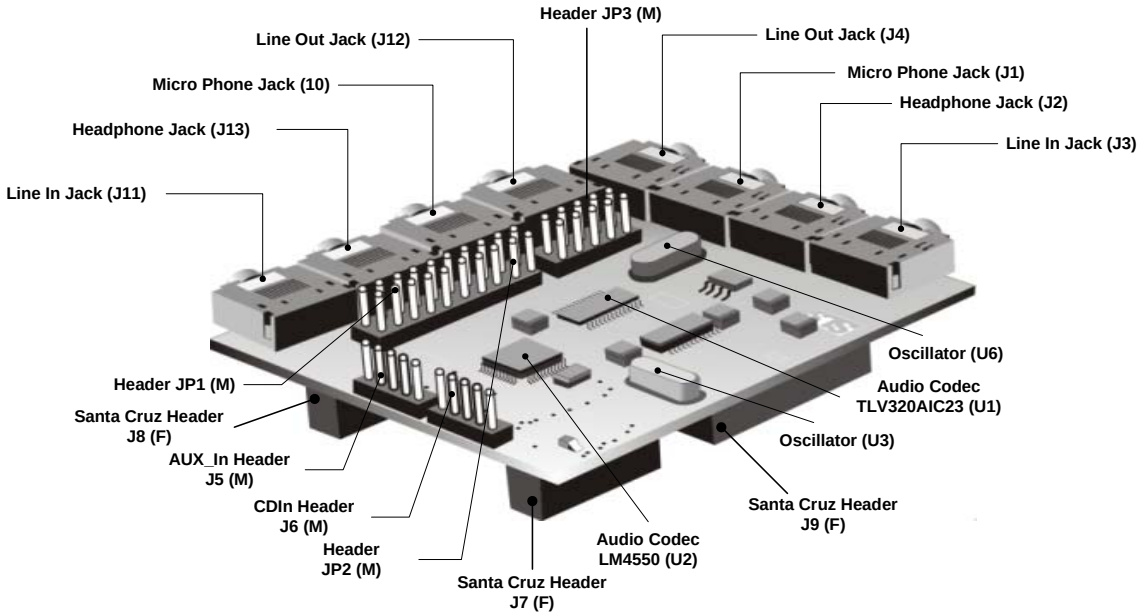


Next chapter explains overview of all the board components.

2. Board Components

This section contains brief overview of important components of the Audio Codec Snap On Board. Figure 2-1. below shows the components on the Audio Codec Snap On Board.

Figure 2-1. Audio Codec Snap On Board - Components



Audio Codec Convertors

Audio Codec Snap On Board contains two audio codec convertors namely TLV320AIC23 and LM4550. Each audio codec convertor provides one stereo output, one stereo input, one amplified stereo headphone output and one Microphone Input.

Audio Codec Convertor - TLV320AIC23(U1)

TLV320AIC23 is high performance stereo codec convertor with high integrity analog functionality. It supports Data- transfer word length of 16,20,24,32 bits, with sample rates from 8 KHz to 96 KHz. It is compatible with I2S format for digital audio data input and output and supports 2-wire or SPI serial port protocol for software control.

Figure 2-2. Audio Codec Convertors

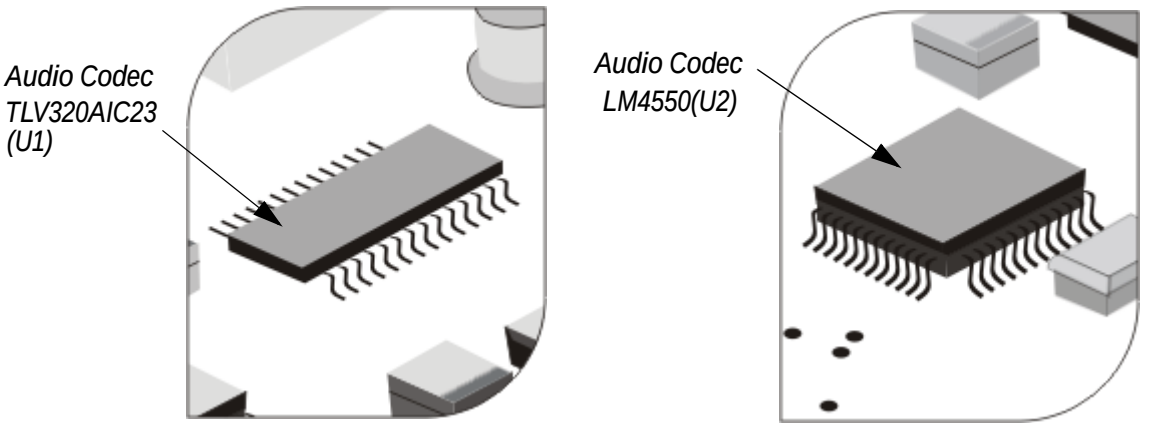


Table 2-1 below shows signal description and pin mapping of Audio Codec convertor with santacruz Header.

Table 2-1. Audio Codec Convertor - TLV320AIC23 (U1) Pin Table

Pin No	Pin Name	Type	Header(F) Pin No.	Description
1	BVDD	-	-	Buffer Supply input
2	CLKOUT	-	-	Clock Out

Table 2-1. Audio Codec Convertor - TLV320AIC23 (U1) Pin Table

Pin No	Pin Name	Type	Header(F) Pin No.	Description
3	BCLK	I/O	J7.7	I2S Serial Bit clk. In Master mode, BCLK is generated by audio codec and in slave mode it is generated by I2S core.
4	DIN	I	J7.14	I2S Format serial data input to codec
5	LRCIN	I/O	J7.13	I2S DAC word clock signal. In master mode, it is generated by audio codec and in slave mode it is generated by I2S core.
6	DOUT	O	J7.5	I2S format serial data input to the audio codec DAC
7	LRCOUT	I/O	J7.11	I2S ADC word clock signal. In master mode, audio codec generates this signal and in slave mode, I2S core generates this signal
8	HPVDD	-	-	Analog headphone amplifier supply input.
9	LHPOUT	O	-	Left stereo channel headphone output
10	RHPOUT	O	-	Right stereo channel headphone output
11	HPGND	-	-	Analog Headphone amplifier supply return
12	LOUT	O	-	Left stereo channel line output
13	ROUT	O	-	Right stereo channel line output
14	AVDD	-	-	Analog supply input voltage
15	AGND	-	-	Analog supply return
16	VMID	I	-	Midrail voltage decoupling input. 10uF and 0.1 uF capacitors are connected in parallel to this terminal
17	MICBIAS	O	-	Low noise voltage output for microphone biasing.
18	MICIN	I	-	Buffered amplifier input suitable for use with electric microphone
19	RLINEIN	I	-	Right stereo line input channel
20	LLINEIN	I	-	Left stereo line input channel
21	CS#	I	J7.12	Control select. For SPI control mode, this input acts as the data latch control.For 2 wire control mode, this input defines the seventh bit in the device address field
22	MODE	I	-	Serial interface mode input
23	SDIN	I	J7.9	Control port serial data input

Table 2-1. Audio Codec Convertor - TLV320AIC23 (U1) Pin Table				
Pin No	Pin Name	Type	Header(F) Pin No.	Description
24	SCLK	I	J7.10	Control port serial data clock
25	XTI/MCLK	I	-	Crystal or external clock input
26	XTO	O	-	Crystal output.
27	DVDD	-	-	Digital supply input
28	DGND	-	-	Digital supply return

Audio Codec Convertor - LM4550 (U2)

LM4550 is designed specifically to provide a high quality audio path and to provide all analog functionality in audio system. It features full duplex stereo ADCs and DACs and analog mixers with access to 4 stereo and 4 mono inputs.

LM4550 provides a stereo headphone amplifier as one of its stereo outputs and also supports National's 3D Sound stereo enhancement. Sample rate can be programmed separately with resolution of 1 Hz to convert any rate in range 4KHz-48KHz.

Table 2-2 below shows the Signal Description and pin mapping of Audio Codec Convertor (U2).

Table 2-2. Audio Codec Convertor - LM4550 (U1) Pin Table				
Pin No.	Pin Name	Type	Header(F) Pin No.	Description
1	DV_{DD1}	-	-	Digital Supply
2	XTL_IN	I	-	24.576 MHz crypstal input
3	XTL_OUT	O	-	24.576 MHz crystal output
4	DVss1	-	-	Not Connected
5	SDATA_OUT	I	J8.7	Input to codec

Table 2-2. Audio Codec Convertor - LM4550 (U1) Pin Table

Pin No.	Pin Name	Type	Header(F) Pin No.	Description
6	BIT_CLK	I/O	J8.4	AC Link Clock An output when in primary codec mode. This pin provides a 12.288 MHz clock for the AC Link. This pin is an input when the codec is configured in any or the secondary codec modes.
7	DVss2	-	-	Not Connected
8	SDATA_IN	O	J8.5	Output from codec
9	DV_{DD2}	-	-	Not Connected
10	SYNC	I	J8.2	AC Link frame marker and Warm Reset
11	RESET#	I	J8.1	Cold Reset
12	PC_BEEP	I	J8.3	Mono Input
13	PHONE	I	-	Mono Input
14	AUX_L	I	J5.1	Left Stereo Channel Input
15	AUX_R	I	J5.4	Right Stereo Channel Input
16	VIDEO_L	I	-	Left Stereo Channel Input
17	VIDEO_R	I	-	Right Stereo Channel Input
18	CD_L	I	J6.1	Left Stereo Channel Input
19	CD_GND	I	J6.3	AC Ground Reference
20	CD_R	I	J6.4	Right Stereo Channel Input
21	MIC1	I	-	Mono microphone input
22	MIC2	I	-	Mono microphone input
23	LINE_IN_L	I	-	Left Stereo Channel Input
24	LINE_IN_R	I	-	Right stereo channel input
25	AV_{DD}	-	-	Analog supply
26	AV_{SS}	-	-	Analog Ground
27	V_{REF}	-	-	2.2 V internal reference
28	V_{REF_OUT}	-	-	2.2 V reference output
29	NC	-	-	Not Connected

Table 2-2. Audio Codec Convertor - LM4550 (U1) Pin Table

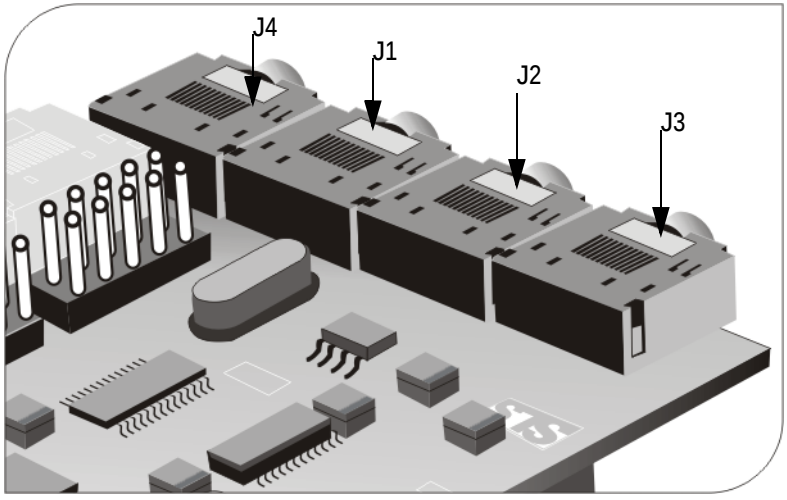
Pin No.	Pin Name	Type	Header(F) Pin No.	Description
30	NC	-	-	Not Connected
31	NC	-	-	Not Connected
32	NC	-	-	Not Connected
33	3DN	O	-	These pins are used to complete the National 3D sound stereo enhancement circuit.
34	3DP	-	-	Not Connected
35	LINE_OUT_L	O	-	Left Stereo Channel Output
36	LINE_OUT_R	O	-	Right Stereo Channel Output
37	MONO_OUT	O	-	Mono Output
38	NC	-	-	Not Connected
39	HP_OUT_L	O	-	Left Stereo Channel Output
40	HP_OUT_C	I	-	AC Ground Reference
41	HP_OUT_R	O	-	Right Stereo Channel Output
42	NC	-	-	Not Connected
43	NC	-	-	Not Connected
44	NC	-	-	Not Connected
45	ID0#	I	-	Codec Identity
46	ID1#	I	-	Codec Identity
47	EAPD	O	-	External Amplifier Power Down control signal
48	CIN	I	-	Chain In

TLV320AIC23 Audio Codec Jacks (J1,J2,J3,J4)

The Audio Codec Snap On Board contains the following audio connectors connected to the TLV320AIC23 Stereo Audio Codec(U1):

- J1— a Microphone input
- J2—an amplified audio connector output for headphones
- J3—an audio connector for line-in
- J4—an audio connector for line-out

Figure 2-3. Audio Codec Jacks (J1, J2, J3, J4)



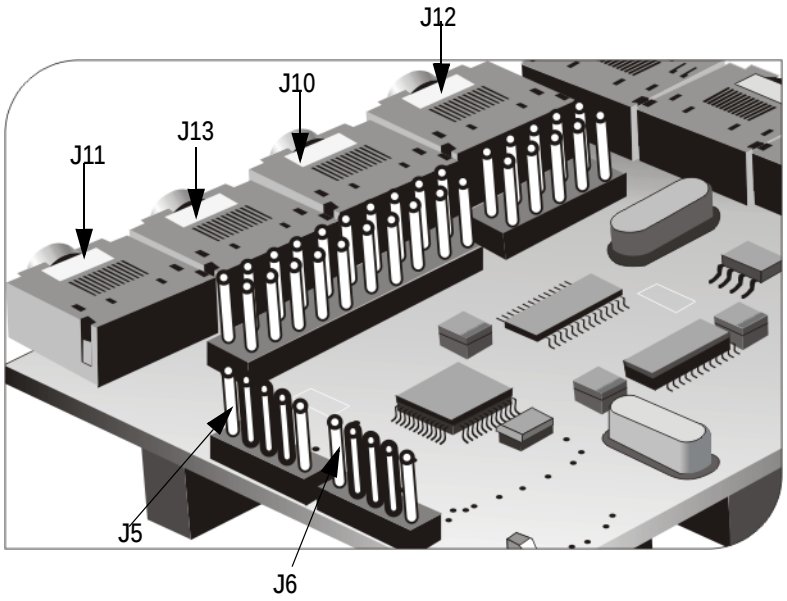
The TLV320AIC23 stereo audio CODEC (U1) controls volume and balance levels and connections. See “Audio Codec Converter (U1)”.

LM4550 Audio Codec Jacks (J10,J11, J12,J13,J5,J6)

The Audio Codec Snap On Board contains the following audio connectors connected to the LM4550 stereo audio CODEC (U2):

- J10— a Microphone input
- J11—an audio connector for line-in
- J12—an audio connector for line-out
- J13—an amplified audio connector output for headphones
- J5— AUXIn Header
- J6—CDIn Header

Figure 2-4. Audio Codec Jacks(J10, J11,J12, J13, J5, J6)

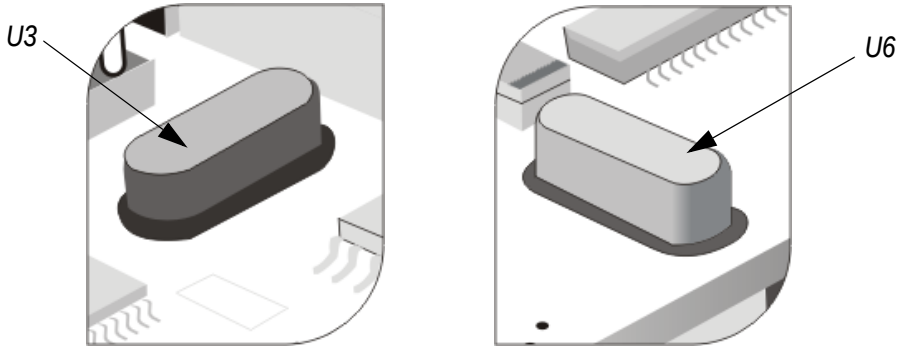


The LM4550 Stereo Audio Codec (U2) controls volume and balance levels and connections. See “Audio Codec Converter (U2)”.

Crystal Oscillator (U3, U6)

The Audio Codec Snap On Board includes two 24.5 MHz Crystal Oscillator which are used to provide reference clock for two audio codecs. U6 Crystal oscillator is used for audio codec-TLV320AIC23 (U1)and U3 crystal oscillator is used for Audio codec - LM4550(U2).

Figure 2-5. Crystal Oscillator



Header (JP1,JP2, JP3)

Headers JP1(M), JP2(M) and JP3 (M) of Audio codec snap on board are directly connected to the Header J8 (F) which directly snaps on to santa cruz header (M) on UP3 board.

Figure 2-6. Header JP1, JP2, JP3

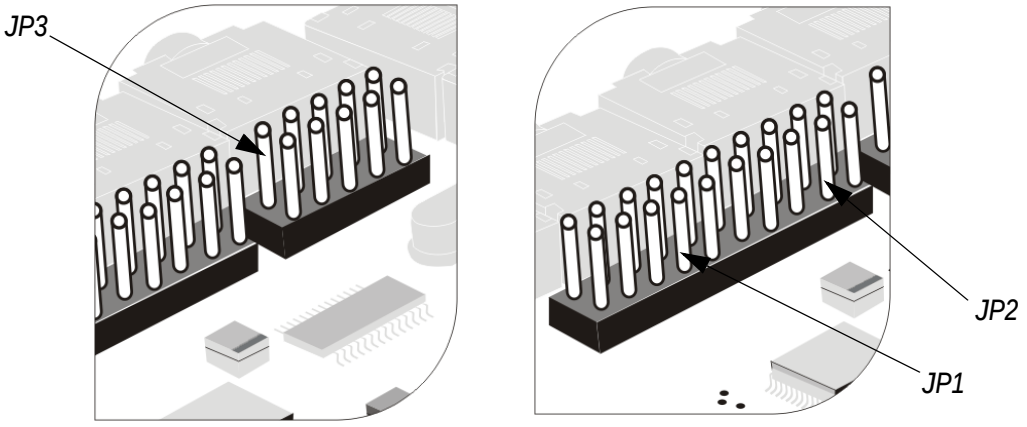


Table 2-3 below shows the Pin Mapping of header JP1, JP2, JP3 with Santa Cruz Header.

Table 2-3. Headers JP1, JP2, JP3 Pin Mapping

Pin No	Pin Name	Pin No.
JP1.2	IO_18	J7.8
JP1.4	IO_01	J8.8
JP1.5	IO_02	J8.9
JP1.6	IO_03	J8.10
JP1.7	IO_04	J8.11
JP1.8	IO_05	J8.12
JP1.9	IO_06	J8.13
JP1.10	IO_07	J8.14
JP2.1	IO_08	J8.15
JP2.2	IO_09	J8.16
JP2.3	IO_10	J8.17
JP2.4	IO_11	J8.18
JP2.5	IO_12	J8.12
JP2.6	IO_13	J8.23
JP2.7	IO_14	J8.25
JP2.8	IO_15	J8.27
JP2.9	IO_16	J8.28
JP3.1	IO_17	J8.29
JP3.3	IO_26	J8.31
JP3.4	IO_19	J8.32
JP3.5	IO_25	J8.33
JP3.6	IO_20	J8.36
JP3.7	IO_24	J8.35
JP3.8	IO_21	J8.38
JP3.9	IO_22	J8.39
JP3.10	IO_23	J8.37

3. Signal Mapping

The three (F) headers (JP7,JP9,JP8) on Audio Codec Snap On board snaps on to three (M) SantaCruz headers (J2,J4,J3) of UP3 Board as shown in Figure 3-1.

Figure 3-1. Connection of Audio Codec Snap On Board with UP3 Board

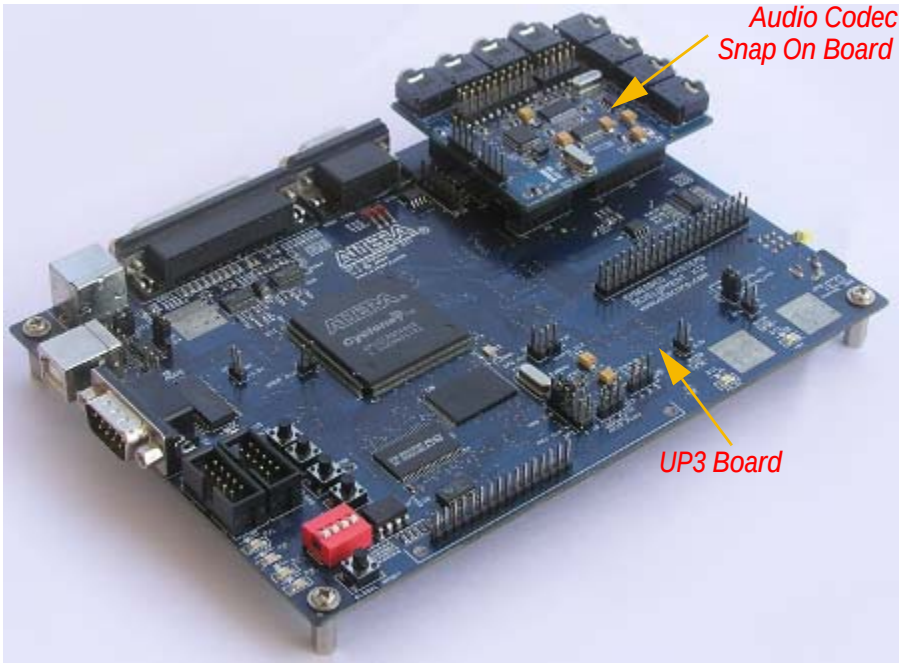


Figure 3-2. ,Figure 3-3. , Figure 3-4. shows the Audio Codec Signals to the Santa Cruz Header (F).

Figure 3-2. Mapping Audio Codec Signals to Header(F) - JP1

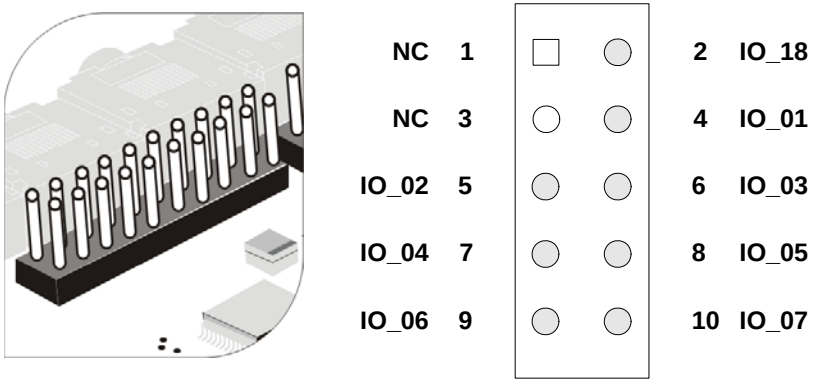


Figure 3-3. Mapping Audio Codec Signals to Header(F) -JP2

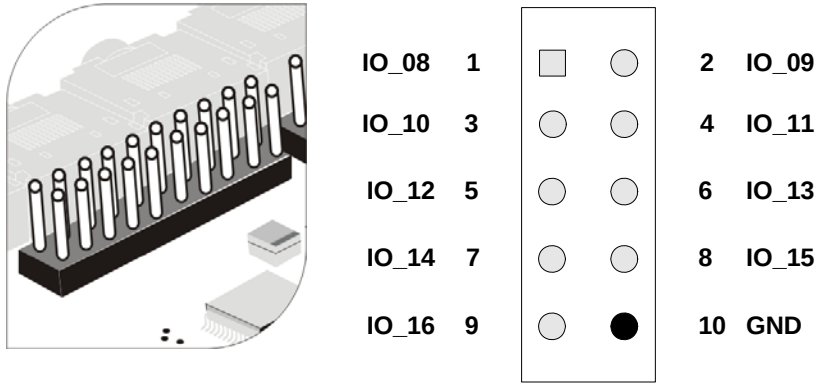


Figure 3-4. Mapping Audio Codec Signals to Header (F) -JP3

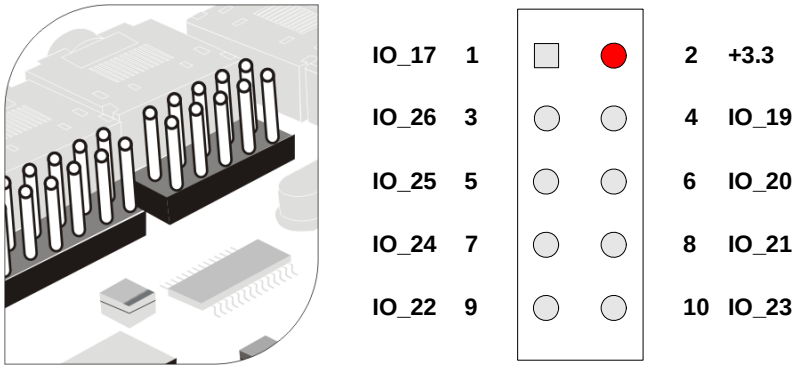


Figure 3-5. , Figure 3-6. , Figure 3-7. shows the Audio Codec Signals to the Santa Cruz Header (F).

Figure 3-5. Mapping Audio Codec Signals to Santa Cruz Header (F) -J7

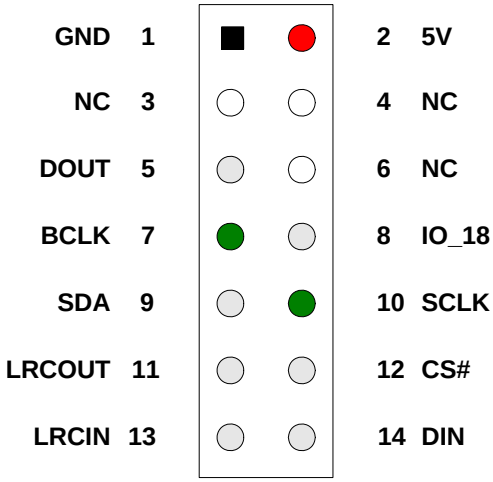


Figure 3-6. Mapping Audio Codec Signals to Santa Cruz Header (F) -J9

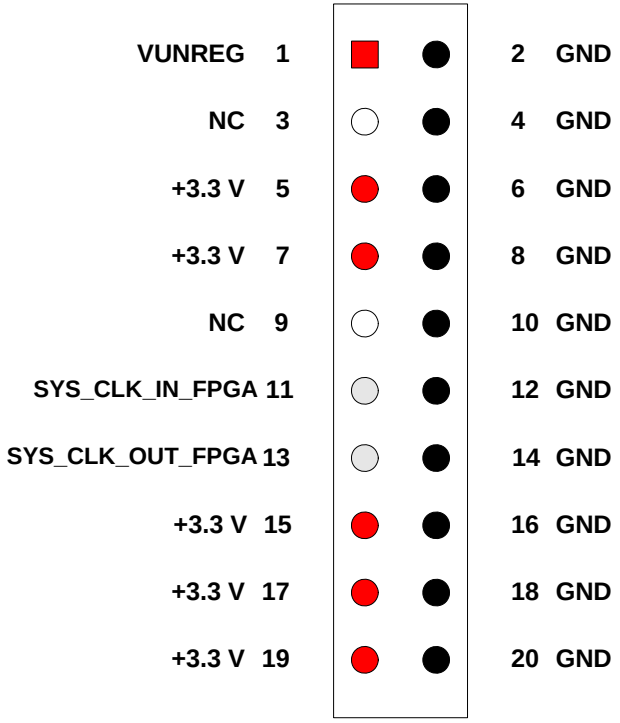


Figure 3-7. Mapping Audio Codec Signals to Santa Cruz Header (F) -J8

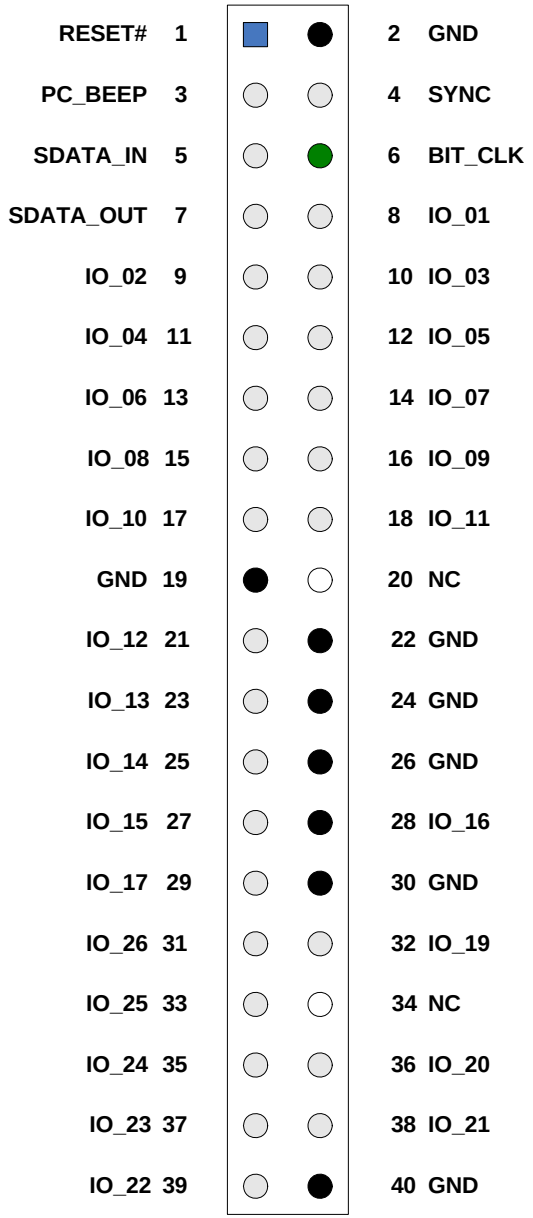


Figure 3-8. ,Figure 3-9. shows the Audio Codec Signals to Header CDIn and AUXIn(M).

Figure 3-8. Mapping Audio Codec Signals to CDIn Header (F) -J5

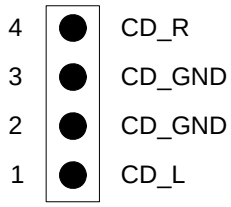


Figure 3-9. Mapping Audio Codec Signals to AUXIn Header (F) -J6