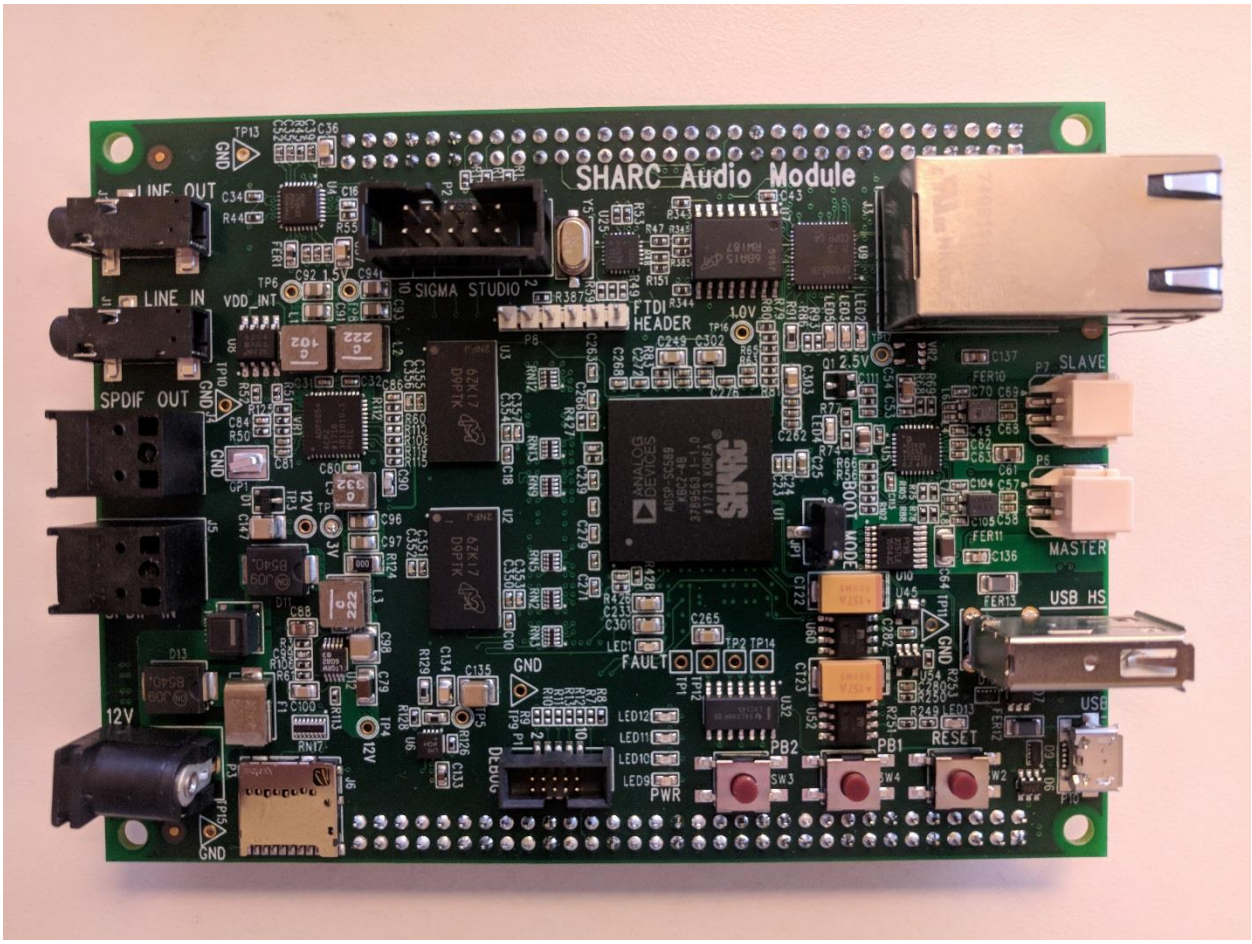
SHARC Audio Module

Hardware Overview

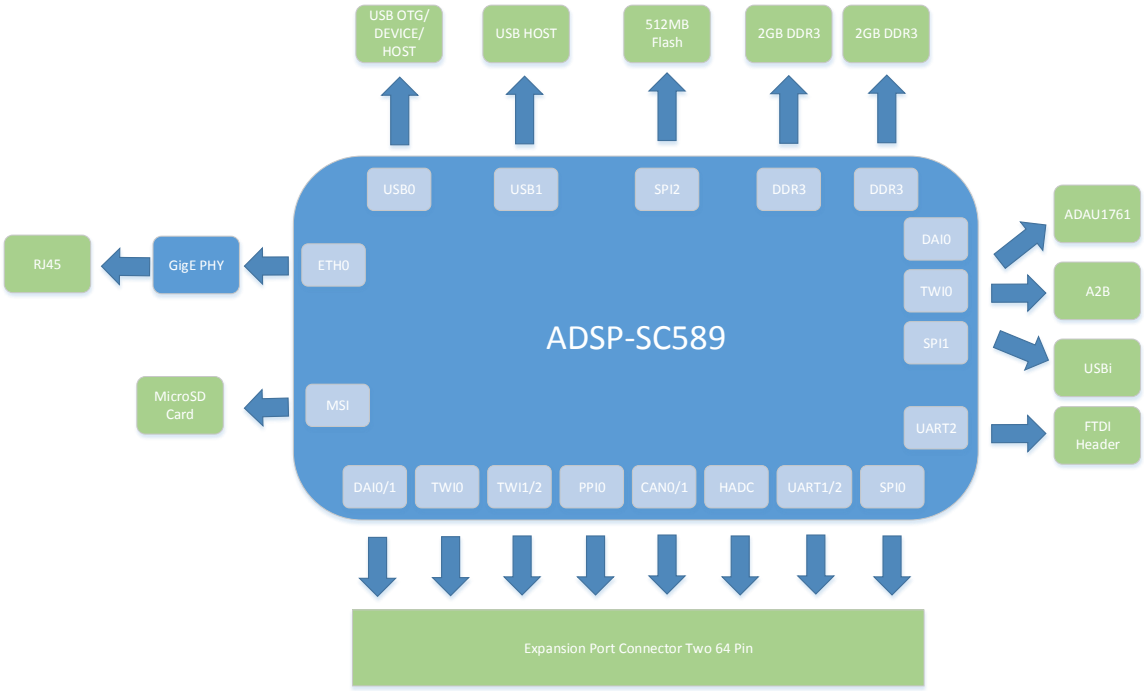
The SHARC Audio Module uses the ADSP-SC589 SHARC processor along with an ADAU1761 SigmaDSP audio codec and A2B in a compact form for audio development.

The SHARC Audio Module has the following hardware features:

- ADSP-SC589 SHARC DSP
- DDR3 2x 2GB
- 512Mb SPI Flash
- 10/100/1000 Ethernet
- USB Type A Host Port and USB MicroAB Host/Device/OTG Port
- Expansion Ports (**P4, P5**)
- FTDI Header (**P8**)
- Automotive Audio Bus (A2B) Interface Duraclick (**P6, P7**)
- SigmaDSP ADAU1761 Audio Codec
- 3.5mm Audio In/Out Jacks (**J1, J2**)
- SPDIF In/Out Jacks (**J4, J5**)
- USBi Connector for SigmaStudio (**P2**)
- +12v Input Power Jack (**P3**)
- MicroSD Card Slot (**J6**)
- JTAG Interface (**P1**)
- Boot Mode Jumper (**JP1**)
- Pushbuttons (**PB1, PB2**)
- Reset Button (**RESET**)
- GPIO LEDs (**LED10, LED11, LED12**)
- TWI Switch


SHARC Audio Module
LINE OUT
LINE IN
SPDIF OUT
12V
SIGMA STUDIO
FTDI
HEADER
SLAVE
MASTER
USB HS
USB
FAULT
PB2
PB1
RESET
PWR
DEBUG
GND

Block Diagram of the SHARC Audio Module



ADSP-SC589 SHARC DSP

The SHARC Audio Module is powered by the Analog Devices, Inc. ADSP-SC589 SHARC DSP. The ADSP-SC589 contains an ARM A5 @ 450 MHz and Dual SHARC+ @ 450 MHz.

Linux on the SHARC Audio Module runs on the ARM core and audio processing is done on the SHARC+ cores.

Information on the ADSP-SC589 DSP can be found here at the Analog.com website: http://www.analog.com/en/products/processors-dsp/sharc/adsp-sc589.html

DDR3 2x 2GB

There are two DDR3 channels on the SHARC Audio Module, each with a 2Gbit DDR3 module. In the default SHARC Audio Module configuration, one DDR3 module is used for Linux and the other used by the SHARC+ cores for audio processing.

512Mb SPI Flash

A 512Mbit SPI Flash on the SHARC Audio Module contains a preloaded uBoot application that will launch the SHARC Audio Module Linux distribution off the MicroSD card.

10/100/1000 Ethernet

The SHARC Audio Module has a 10/100/1000 Ethernet module to provide network and internet access to the board. The default IP address for this board, while running the official SHARC Audio Module Linux OS is 192.168.1.9.

USB Type A Host Port and USB MicroAB Host/Device/OTG Port

The USB Type A port is Host mode only, and is for USB WiFi, Bluetooth and USB memory devices.

The USB MicroAB can be a Host/Device or OTG connection. This interface can be used for USB Audio, along with the USBi Emulator.

Expansion Ports (P4, P5)

Expansion Port 64 Pin Connector P4

+12v	1	2	+12v
GND	3	4	GND
TWI1_SCL	5	6	PB_00
TWI1_SDA	7	8	PB_01
GND	9	10	PB_02
DAI0_PIN13	11	12	PB_03
DAI0_PIN14	13	14	GND
DAI0_PIN15	15	16	PB_04
GND	17	18	PB_05
DAI0_PIN16	19	20	PD_14
DAI0_PIN17	21	22	PD_15
DAI0_PIN18	23	24	GND
+3.3v	25	26	PE_00
GND	27	28	PE_01
HADC0_VIN0	29	30	PE_02
HADC0_VIN1	31	32	PE_03
GND	33	34	GND
HADC0_VIN2	35	36	PE_04
HADCO_VIN3	37	38	PE_05
GND	39	40	PE_06
HADC0_VIN4	41	42	PE_07
HADC0_VIN5	43	44	PE_08
GND	45	46	GND
HADC0_VIN6	47	48	PE_09
HADC0_VIN7	49	50	PE_10
GND	51	52	PE_11/SPI1_SEL3
PD_12/UART2_TX	53	54	PE_12/SPI1_SEL4
PD_13/UART2_RX	55	56	PE_13/SPI1_CLK
TWI2_SCL	57	58	PE_14/SPI1_MISO
TWI2_SDA	49	60	PE_15/SPI1_MOSI
PB_11	61	62	PB_13
PB_12	63	64	PB_14

Expansion Port 64 Pin Connector P5

DAI1_PIN01	1	2	DAI1_PIN11
DAI1_PIN02	3	4	DAI1_PIN12
DAI1_PIN03	5	6	DAI1_PIN13
GND	7	8	GND
DAI1_PIN04	9	10	DAI1_PIN14
DAI1_PIN05	11	12	DAI1_PIN15
DAI1_PIN06	13	14	DAI1_PIN16
GND	15	16	GND
DAI1_PIN07	17	18	DAI1_PINI17
DAI1_PIN08	19	20	DAI1_PIN18
DAI1_PIN09	21	22	DAI1_PIN19
DAI1_PIN10	23	24	DAI1_PIN20
GND	25	26	GND
PD_04	27	28	PD_06
PD_05	29	30	PD_07
PC_07/CAN0_RX	31	32	PB_09/CAN1_TX
PC_08/CAN0_TX	33	34	PB_10/CAN1_RX
PC_09/SPI0_CLK	35	36	PC_00
PC_10/SPI0_MISO	37	38	PB_15
PC_11/SPI1_MOSI	39	40	GND
PC_12/SPI1_SEL3	41	42	+3.3v
PG_00	43	44	PF_14
PG_01	45	46	PF_15
PG_02	47	48	PG_03
TWI0_SCL	49	50	PG_04
TWI0_SDA	51	52	PG_05
GND	53	54	GND
ADAU1761_RAUX	55	56	ADAU1761_RHP
GND	57	58	GND
ADAU1761_LAUX	49	60	ADAU1761_LHP
PD_08	61	62	PD_10
PD_09	63	64	PD_11

FTDI Header (P8)

This connector is compatible with most FTDI 3.3v UART to USB adapters.

1	GND
2	PD_00/UART0_CTS
3	N/C
4	PC_14/UART0_RX
5	PC_13/UART0_TX
6	PC_15/UART0_RTS

Automotive Audio Bus (A2B) Interface Duraclick (P6, P7)

The A2B bus uses crossover cables to connect nodes to each other. P6 connects to upstream towards the Master Node in the network and P7 connects downstream to the next slave in the network.

The SHARC Audio Module uses the AD2425W IC.

http://www.analog.com/en/products/audio-video/automotive-audio-bus/ad2425w.html

SigmaDSP ADAU1761 Audio Codec

The ADAU1761 is a low power, stereo audio codec with integrated digital audio processing that supports stereo 48 kHz record and playback. The stereo audio ADCs and DACs support sample rates from 8 kHz to 96 kHz as well as a digital volume control.

The SigmaDSP® core features 28-bit processing (56-bit double precision). The processor allows system designers to compensate for the real-world limitations of microphones, speakers, amplifiers, and listening environments, resulting in a dramatic improvement in the perceived audio quality through equalization, multiband compression, limiting, and third-party branded algorithms.

The ADAU1761 is connected to the DAI ports on the ADSP-SC589.

DAC_SDATA is connected to DAI0_PIN01
ADC_SDATA is connected to DAI0_PIN02
BCLK is connected to DAI0_PIN03
LRCLK is connected to DAI0_PIN04

http://www.analog.com/en/products/audio-video/audio-codecs/adau1761.html

3.5mm Audio In/Out Jacks (J1, J2)

The 3.5mm Audio In/Out jacks are connected to the ADAU1761 SigmaDSP.

The impedance of the 3.5mm signals is 16 ohms. The HP output pins to the expansion connectors are also 16 ohms.

SPDIF In/Out Jacks (J4, J5)

The SPDIF jacks are connected to the DAI ports on the ADSP-SC589.
SPDIF Input is connected to DAI0_PIN19.
SPDIF Output is connector to DAI0_PIIN20.

USBi Connector for SigmaStudio (P2)

The USBi Connector on the SHARC Audio module allows for the use of the USBi adapter for Sigma Studio and bare metal programming.

+12v Input Power Jack (P3)

The SHARC Audio Module was design for a 12V DC input, but can operated from 10v to 20v input to the barrel jack. A 12v 1.5A DC power supply is recommended. The barrel connector on the SHARC Audio Module can handle up to 3A current.

MicroSD Card Slot (J6)

The MicroSD card slot on the SHARC Audio Module is used for the MicroSD card that contains the SHARC Audio Module Linux OS. uBoot is flashed to the onboard SPI Flash unit and by default will boot into the Linux OS stored on the MicroSD card.

JTAG Interface (P1)

The JTAG interface allows for programming and debugging of the ADSP-SC589 using an ICE-1000 or an ICE-2000 emulator and CrossCore Embedded Studios.

Boot Mode Jumper (JP1)

The ADSP-SC589 has multiple boots modes. This jumper allows for three of the supported boot modes on the DSP, depending on jumper setting.

Jumper Set between pins 1-2: SPI Boot
Jumper Set between pins 2-3: UART Boot
Jumper removed: No Boot

Pushbuttons (PB1, PB2)

Two GPIO pushbuttons are provided on the SHARC Audio Model. They are connected as follows:

PB1 is connected to PF_00
PB2 is connected to PF_01

Reset Button (RESET)

The Reset button resets all the hardware on the SHARC Audio Module. It will not reset anything on connected to the Expansion connectors.

GPIO LEDs (LED10, LED11, LED12)

There are three GPIO controlled LEDs on the SHARC Audio Module. They are connected as follows:

LED10 is connected to PD_01
LED11 is connected to PD_02
LED12 is connected to PD_03

TWI Switch

The SHARC Audio Module has a TWI switch the can connect TWI0 or TWI1 on the ADSP-SC589 to the A2B and ADAU1761 on the board. This allows either the ARM core or the SHARC+ cores to access the A2B and ADAU1761 TWI control lines.

PB_08 controls the switch.
PB_08 = Low: TWI0 Connected
PB_08 = High: TWI1 Connected