

ADAA24XX-EV-B2BX Manual

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Part Number
ADAA24XX-EV-B2BX

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Regulatory Compliance

The *ADAA24XX-EV-B2BX* evaluation board is designed to be used solely in a laboratory environment. The board is not intended for use as a consumer-end product or as a portion of a consumer-end product. The board is an open system design, which does not include a shielded enclosure and, therefore, may cause interference to other electrical devices in close proximity. This board should not be used in or near any medical equipment or RF devices.

The *ADAA24XX-EV-B2BX* evaluation board contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused boards in the protective shipping package.



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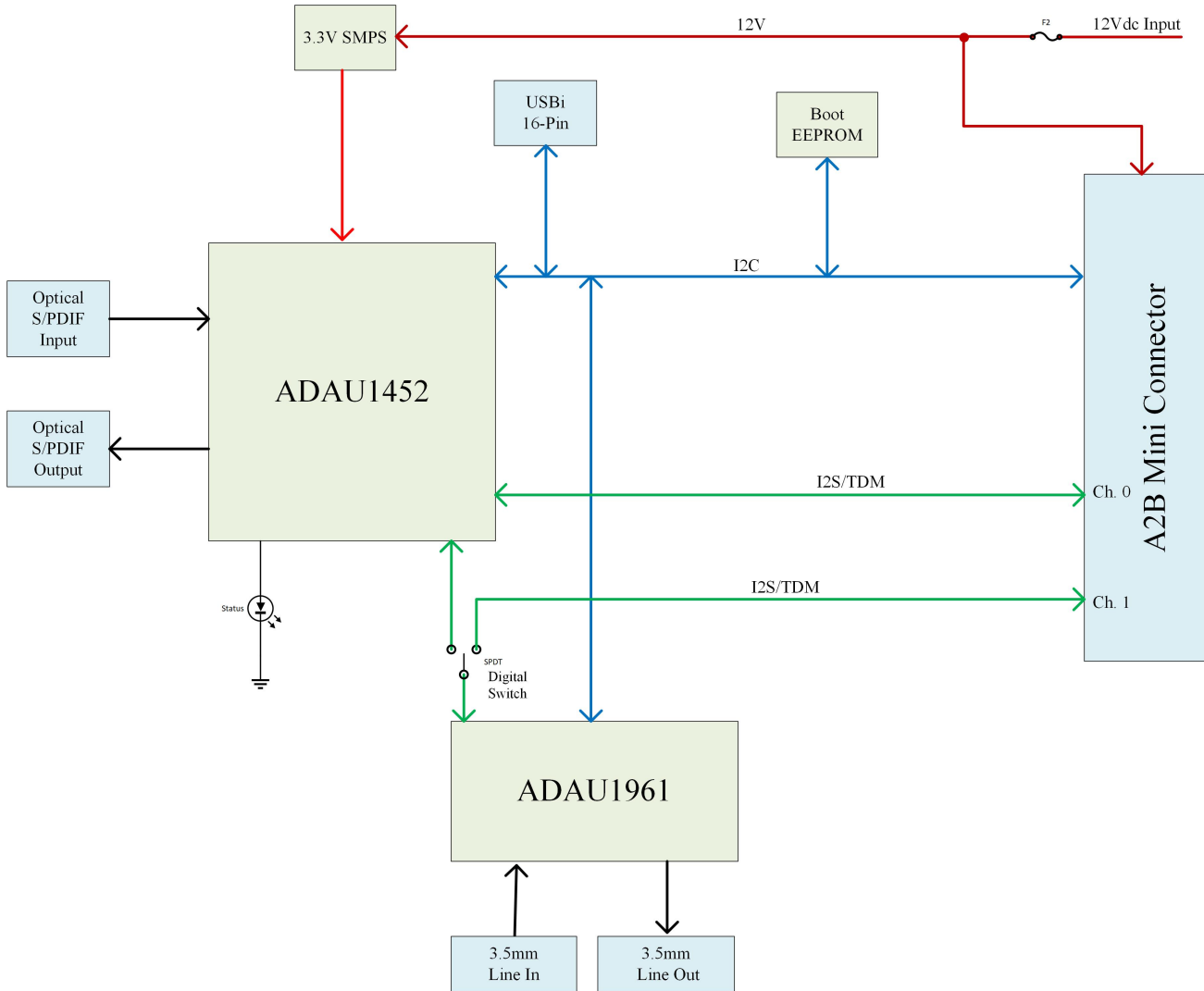
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1 Preface

Thank you for purchasing the Analog Devices, Inc. *ADAA24XX-EV-B2BX* evaluation board.

The *ADAA24XX-EV-B2BX* is an validation/evaluation board to evaluate various peripherals of A²B (Automotive Audio Bus) Transceivers. The *ADAA24XX-EV-B2BX* can interface with any A²B MINI Board in the 24xx product line. The *ADAA24XX-EV-B2BX* was designed to be fully compatible with A²B 2.0 and A²B 1.0 products.

Block Diagram of Evaluation Board:



The SigmaStudio+[®] graphical development tool is the programming, development, and tuning software for the SigmaDSP, A²B, and Sharc processors. Familiar audio processing blocks can be wired together as in a schematic, and the compiler generates DSP-ready code and a control surface for setting and tuning parameters. This tool allows engineers with no DSP code writing experience to easily implement a DSP into their design and yet is still powerful enough to satisfy the demands of experienced DSP designers. SigmaStudio+ links with both Analog Devices evaluation boards and production designs to provide full in-circuit real-time IC control.

SigmaStudio+ includes an extensive library of algorithms to perform audio processing such as filtering, mixing, and dynamics processing, as well as basic low-level DSP functions and control blocks. Advanced record-side processing algorithms such as Enhanced Stereo Capture and wind noise detection are included in the standard libraries. Plug-in algorithms from Analog Devices and 3rd party partners can be added to SigmaStudio+'s drag-and-drop library.

Along with its graphical DSP signal flow development, SigmaStudio+ also includes other features to speed up the design cycle from product concept to release. SigmaStudio+ includes tools for intuitively setting control registers,

calculating tables of filter coefficients, visualizing filter magnitude and phase responses, generating C header files, and sequencing a series of controls to ease your transition from SigmaStudio+ to system implementation on your microcontroller.

Purpose of This Manual

This manual provides instructions for installing the product hardware (board). This manual describes the operation and configuration of board components and provides guidelines for running code on the board.

Manual Contents

The manual consists of:

- *Using the board*

Provides basic board information.

- *Hardware Reference*

Provides information about the hardware aspects of the board.

- *Bill of Materials*

A companion file in PDF format that lists all of the components used on the board is available on the website at <https://my.analog.com/en/myanalog/a2b/a2b-technology.html>.

- *Schematic*

A companion file in PDF format documenting all of the circuits used on the board is available on the website at <https://my.analog.com/en/myanalog/a2b/a2b-technology.html>.

Technical Support

You can reach Analog Devices technical support in one of the following ways:

- Post your questions in the A²B support community at EngineerZone[®]:

<http://ez.analog.com/a2b/>

- Submit your questions to technical support directly at:

<http://www.analog.com/support>

- E-mail your questions about A²B transceiver applications to:

A2B.auto.support@analog.com

- For SigmaStudio+ support send your email to:

ssplus_support@analog.com

- Contact your Analog Devices sales office or authorized distributor. Locate one at:
<http://www.analog.com/adi-sales>

Supported Integrated Circuit

This evaluation system supports the Analog Devices ADAA24XX IC.

Supported Tools

Information about SigmaStudio+ and the A²B software plug-in for the *ADAA24XX-EV-B2BX* evaluation board is available at: www.analog.com/SigmaStudio+.

Product Information

Information about the ADAA24XX product family is available at: www.analog.com/A2B

Analog Devices Website

The Analog Devices website, <http://www.analog.com>, provides information about a broad range of products - analog integrated circuits, amplifiers, converters, transceivers, and digital signal processors.

Also note, MyAnalog.com is a free feature of the Analog Devices website that allows customization of a web page to display only the latest information about products you are interested in. You can choose to receive weekly e-mail notifications containing updates to the web pages that meet your interests, including documentation errata against all manuals. MyAnalog.com provides access to books, application notes, data sheets, code examples, and more.

Visit MyAnalog.com to sign up. If you are a registered user, just log on. Your user name is your e-mail address.

EngineerZone

EngineerZone is a technical support forum from Analog Devices, Inc. It allows you direct access to ADI technical support engineers. You can search FAQs and technical information to get quick answers to your embedded processing and DSP design questions.

Use EngineerZone to connect with other DSP developers who face similar design challenges. You can also use this open forum to share knowledge and collaborate with the ADI support team and your peers. Visit <http://ez.analog.com> to sign up.

2 Using the Board

This chapter provides information on the major components and peripherals on the board, along with instructions for installing and setting up the emulation software.

Product Overview

The board features:

- Analog Devices [ADAU1452](#) - SigmaDSP Digital Audio Processor
- Analog Devices [ADAU1761](#) - SigmaDSP Stereo, Low Power, 96 kHz, 24-Bit Audio Codec with Integrated PLL
- Analog Devices [MAX4948](#) - Hex SPDT Data Switch
- Analog Devices [MAX77504](#) - 14V Input, 3A High-Efficiency Buck Converter in WLP or QFN
- Analog Devices [ADM6315](#) - Open-Drain Microprocessor Supervisory Circuit
- Microchip [24AA512T](#) - 512K I²C Serial EEPROM

Package Contents

Your *ADAA24XX-EV-B2BX* package contains the following items.

- *ADAA24XX-EV-B2BX* board
- EVAL-A2B-USB1
- A2B Software - Online Request Document
- 12V Barrel-Jack Power Supply
- Standard 3.5mm Stereo Audio Male Cable

Contact the vendor where you purchased your *ADAA24XX-EV-B2BX* evaluation board or contact Analog Devices, Inc. if any item is missing.

Default Configuration

The *Default Hardware Setup* figure shows the default settings for jumpers and switches and the location of the jumpers, switches, connectors, and LEDs. Confirm that your board is in the default configuration before using the board.

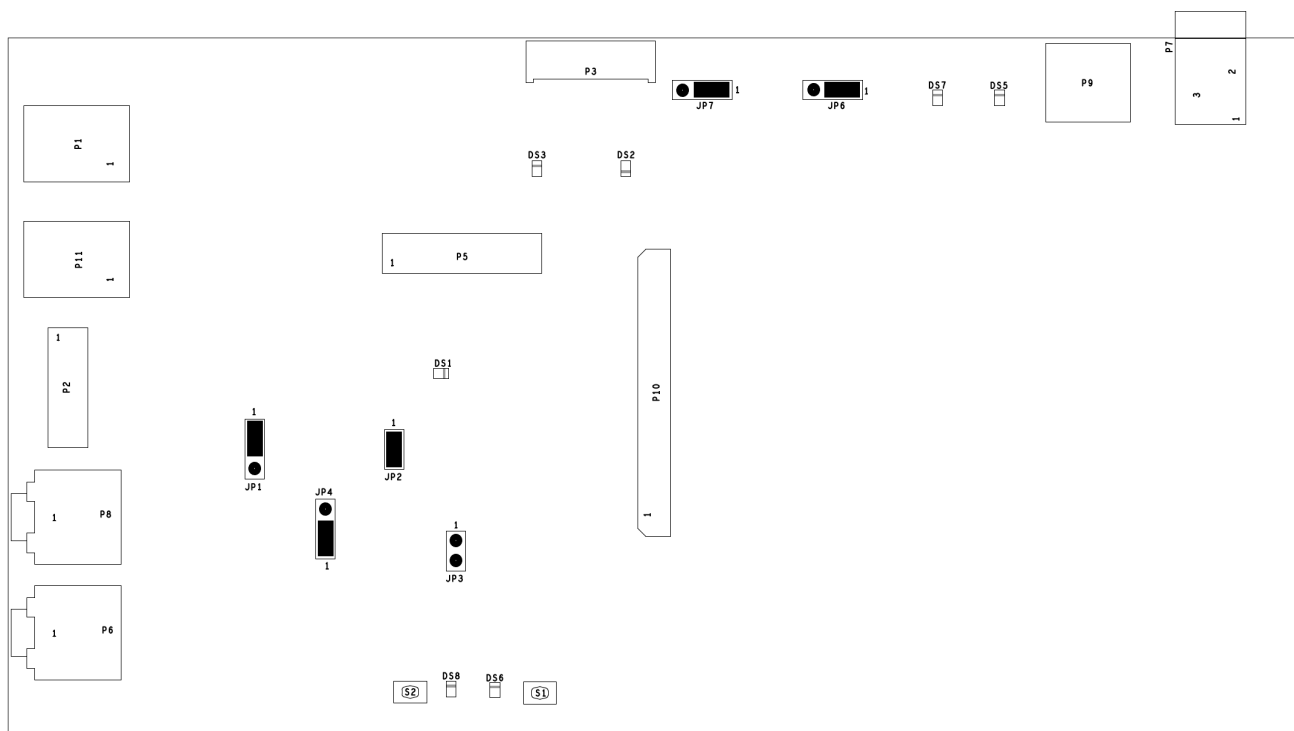


Figure 2-1: Default Hardware Setup

Reference Design Information

A reference design info package is available for download on the Analog Devices Web site. The package provides information on the schematic design, layout, fabrication, and assembly of the board.

The information can be found at:

<https://my.analog.com/en/myanalog/a2b/a2b-technology.html>

24AA512T - 512K I²C Serial EEPROM

The Microchip Technology Inc. 24AA512 is a 512Kb (64K x 8) Serial Electrically Erasable PROM (EEPROM), capable of operation across a broad voltage range (1.7V to 5.5V). It has been developed for advanced, low-power applications such as personal communications and data acquisition. This device also has a page write capability of up to 128 bytes of data. This device is capable of both random and sequential reads up to the 512K boundary. Functional address lines allow up to eight devices on the same bus, for up to 4 Mbit address space. This device is available in the standard 8-pin plastic DIP, SOIJ and DFN packages.

ADAU1452 - SigmaDSP Digital Audio Processor

The [ADAU1452](#) is an automotive qualified audio processor that far exceeds the digital signal processing capabilities of earlier SigmaDSP® devices. The restructured hardware architecture is optimized for efficient audio processing. The audio processing algorithms are realized in sample-by-sample and block-by-block paradigms that can both be executed simultaneously in a signal processing flow created using the graphical programming tool, SigmaStudio®. The restructured digital signal processor (DSP) core architecture enables some types of audio processing algorithms to be executed using significantly fewer instructions than were required on previous SigmaDSP generations, leading to vastly improved code efficiency.

The 1.2 V, 32-bit DSP core can run at frequencies of up to 294.912 MHz and execute up to 6144 instructions per sample at the standard sample rate of 48 kHz. However, in addition to industry standard rates, a wide range of sample rates are available. The integer PLL and flexible clock generator hardware can generate up to 15 audio sample rates simultaneously. These clock generators, along with the on board asynchronous sample rate converters (ASRCs) and a flexible hardware audio routing matrix, make the ADAU1452 ideal audio hubs that greatly simplify the design of complex multirate audio systems.

The ADAU1452 interfaces with a wide range of ADCs, DACs, digital audio devices, amplifiers, and control circuitry, due to their highly configurable serial ports, S/PDIF interfaces, and multipurpose input/output pins. They can also directly interface with PDM output MEMS microphones, thanks to integrated decimation filters specifically designed for that purpose.

Independent slave and master I2C/SPI control ports allow the ADAU1452 not only to be programmed and configured by an external master device, but also to act as a masters that can program and configure external slave devices directly. This flexibility, combined with self boot functionality, enables the design of standalone systems that do not require any external input to operate.

The power efficient DSP core executes full programs while consuming only a few hundred milliwatts (mW) of power and can run at a maximum program load while consuming less than a watt, even in worst case temperatures exceeding 100°C. This relatively low power consumption and small footprint make the ADAU1452 ideal replacements for large, general-purpose DSPs that consume more power at the same processing load.

ADAU1761 - SigmaDSP Stereo, Low Power, 96 kHz, 24-Bit Audio Codec with Integrated PLL

The [ADAU1761](#) is a low power, stereo audio codec with integrated digital audio processing that supports stereo 48 kHz record and playback at 14 mW from a 1.8 V analog supply. 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 SigmaStudio[®] graphical development tool is used to program the ADAU1761. This software includes audio processing blocks such as filters, dynamics processors, mixers, and low level DSP functions for fast development of custom signal flows.

The record path includes an integrated microphone bias circuit and six inputs. The inputs can be mixed and muxed before the ADC, or they can be configured to bypass the ADC. The ADAU1761 includes a stereo digital microphone input.

The ADAU1761 includes five high power output drivers (two differential and three single-ended), supporting stereo head-phones, an earpiece, or other output transducer. AC-coupled or capless configurations are supported. Individual fine level controls are supported on all analog outputs. The output mixer stage allows for flexible routing of audio.

ADM6315 - Open-Drain Microprocessor Supervisory Circuit

The [ADM6315](#) is a reliable voltage-monitoring device that is suitable for use in most voltage-monitoring applications.

The ADM6315 is designed to monitor as little as a 1.8% degradation of a power supply voltage. The ADM6315 can monitor all voltages (at 100 mV increments) from 2.5 V to 5 V.

Included in this circuit is a debounced manual reset input. RESET can be activated using an ordinary switch (pulling MR low), a low input from another digital device, or a degradation of the supply voltage.

The manual reset function is very useful, especially if the circuit in which the ADM6315 is operating enters into a state that can be detected only by the user. Allowing the user to reset a system manually can reduce the damage or danger that could otherwise be caused by an out-of-control or locked-up system.

MAX4948 - Hex SPDT Data Switch

The [MAX4947/MAX4948](#) analog switches operate from a single +1.8V to +5.5V supply. These switches feature a low 30pF (typ) capacitance for high-speed data switching applications. The MAX4947 is a triple double-pole/double-throw (DPDT) switch, and the MAX4948 is a hex single-pole/double-throw (SPDT) switch with one control logic input. The MAX4947 has three logic inputs to control the switches in pairs. The MAX4948 has one logic input and an enable input (EN) to disable the switches.

MAX77504 - 14V Input, 3A High-Efficiency Buck Converter in WLP or QFN

The [MAX77504](#) is a synchronous 3A step-down DC-DC converter optimized for portable 2-cell and 3-cell battery-operated applications. The converter operates on an input supply between 2.6V and 14V. Output voltage is adjustable between 0.6V and 6V with external feedback resistors. The device features a low-IQ SKIP mode that allows excellent efficiency at light loads. The MAX77504 can be synchronized by driving the FPWM pin with an external clock. Dedicated enable, power-OK, and FPWM pins allow simple hardware control. The SEL input easily

configures switching frequency, gain, and output active discharge option. Built-in undervoltage lockout (UVLO), output active discharge, cycle-by-cycle inductor current limit, thermal shutdown, and short-circuit protection ensure safe operation under abnormal operating conditions

3 Hardware Reference

This chapter describes the hardware design of the *ADAA24XX-EV-B2BX* evaluation board.

Switches

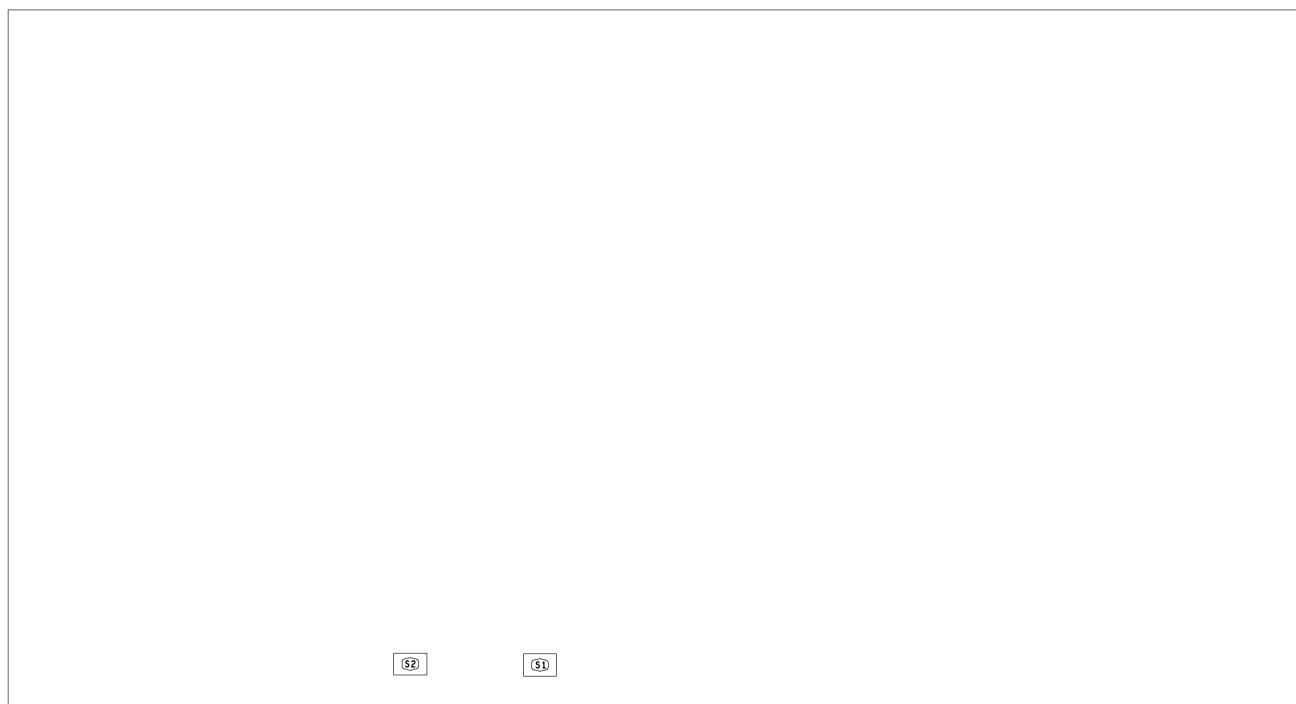


Figure 3-1: Switch Locations

Reset Pushbutton (S1)

The Reset Pushbutton resets the ADAU1452 and sends RESET signal to A[@]B MINI Connector Interface (P10). The Reset LED (DS6) is used to indicate when the board is in reset.

SIO0 Pushbutton (S2)

The SIO0 Pushbutton allows the user to manually set SIO0 LOW (pushbutton depressed) or HIGH (pushbutton in normal state). Depressing the SIO0 Pushbutton will also turn on the SIO0 LED (DS8)

Connectors

This section describes connector functionality and provides information about mating connectors. The connector locations are shown in the *Connector Locations* figure.

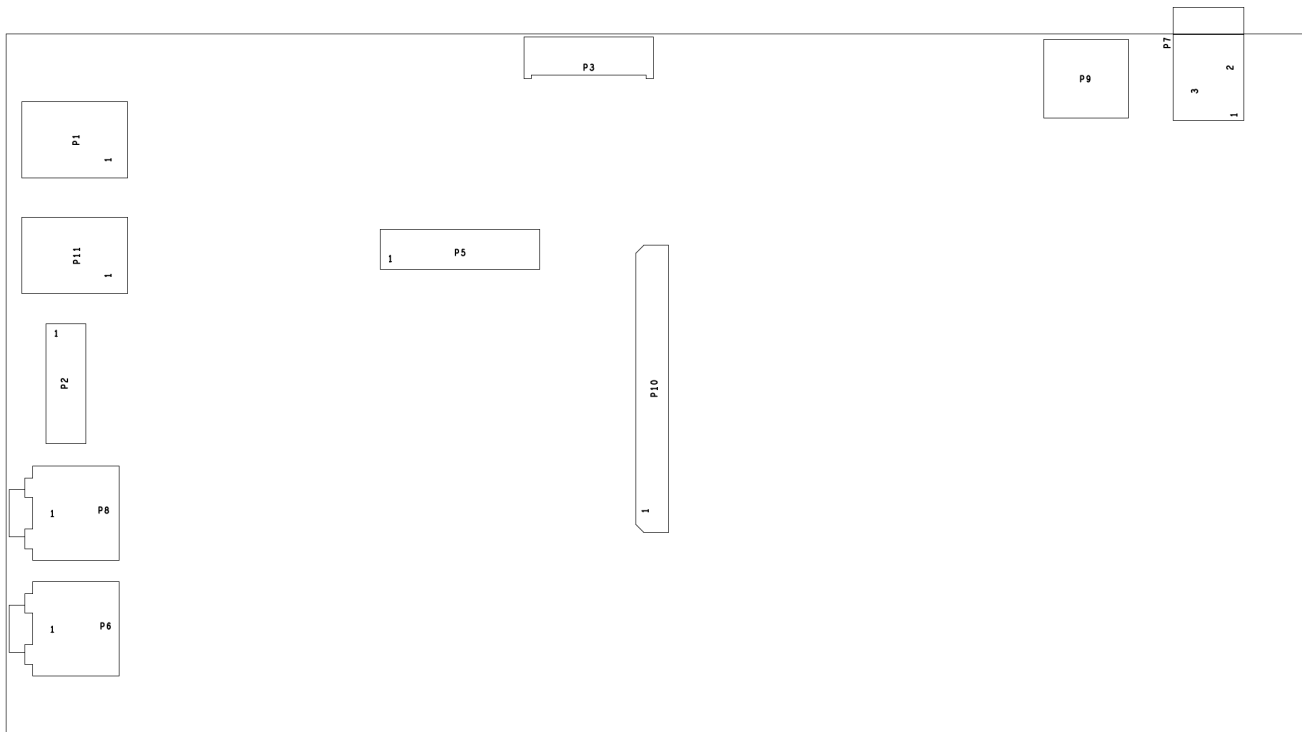


Figure 3-2: Connector Locations TOP

S/PDIF Optical Input (P1)

The S/PDIF Input connector is connected to the SPDIFIN on the [ADAU1452 - SigmaDSP Digital Audio Processor](#). The S/PDIF connection offers optical isolation for equipment safety.

Part Description	Manufacturer	Part Number
OPTICAL JACK RECEIVER	CLIFF Electronic Components Ltd	FCR684208R
Mating Cable		
Standard Optical S/PDIF cable		

S/PDIF Optical Output (P11)

The S/PDIF Output connector is connected to the SPDIFOUT on the [ADAU1452 - SigmaDSP Digital Audio Processor](#). The S/PDIF connection offers optical isolation for equipment safety.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
OPTICAL JACK TRANSMITTER	CLIFF Electronic Components Ltd	FCR684208T
<i>Mating Cable</i>		
Standard Optical S/PDIF cable		

ADAU1452 Auxiliary ADC Breakout Header (P2)

This connector breaks out the auxiliary ADC pins from ADAU1452 SigmaDSP. Allows probing or interfacing with external custom boards if required. The connector is a 0.1" header.

Signal	Pin	Pin	Signal
ADAU1452_AUXADC0	1	2	GND
ADAU1452_AUXADC1	3	4	GND
ADAU1452_AUXADC2	5	6	GND
ADAU1452_AUXADC3	7	8	GND
ADAU1452_AUXADC4	9	10	GND
ADAU1452_AUXADC5	11	12	GND

SigmaStudio+ (P3)

This connector interfaces with SigmaStudio+ through the EVAL-A2B-USBi board; the pinout can be found in the schematic. The [EVAL-ADUSB2EBZ](#) board can also be used to interface SigmaStudio+ with the board with the use of an additional adapter (EVAL-A2B-USBEBZ-ADAPTER).

ADAU1452 Breakout Header (P5)

This connector breaks out I2S and Multi-Purpose signals from ADAU1452 SigmaDSP. Allow probing or interfacing with external custom boards if required. The connector is a 0.1" header.

Signal	Pin	Pin	Signal
MP7	1	2	GND
MP6	3	4	GND
BCLK_IN2	5	6	GND
LRCLK_IN2	7	8	GND
SDATA_IN2	9	10	GND
BCLK_OUT2	11	12	GND
LRCLK_OUT2	13	14	GND
SDATA_OUT2	15	16	GND

Audio Input/Output (P6 and P8)

The analog audio ADC input P8 and DAC output P6 connectors are configured as a stereo single ended signal for connection to the first two inputs and outputs of the ADAU1761.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
3.5mm Stereo Jack	CUI	SJ1-3525NG
<i>Mating Cable</i>		
Standard 3.5mm stereo audio male cable		

Power Plug (P7)

This powers up the board with a 12V supply. Power is required when the board is operating in both main and sub mode.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
2.1 mm power jack	CUI	PJ-102AH
<i>Mating Cable</i>		
12.0VDC@1.6A power supply	CUI	SMI18-12-V-P5R

Wire-to-Board Terminal (P9)

This powers up the board with a wire to board supply. Power is required when the board is operating in both main and sub mode.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
5.08mm power jack	Weidmuller	1716020000
<i>Mating Cable</i>		
12.0VDC discrete wires		

A²B Interface (P10)

This connector has A²B transceiver signals. It can be interfaced with external custom boards if required. The pinout can be found in the schematic.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
A2B MINI Connector	Samtec	LSS-150-02-L-DV-A-K

Jumpers

This section describes functionality of the configuration jumpers. The *Jumper Locations* figures shows the jumper locations.

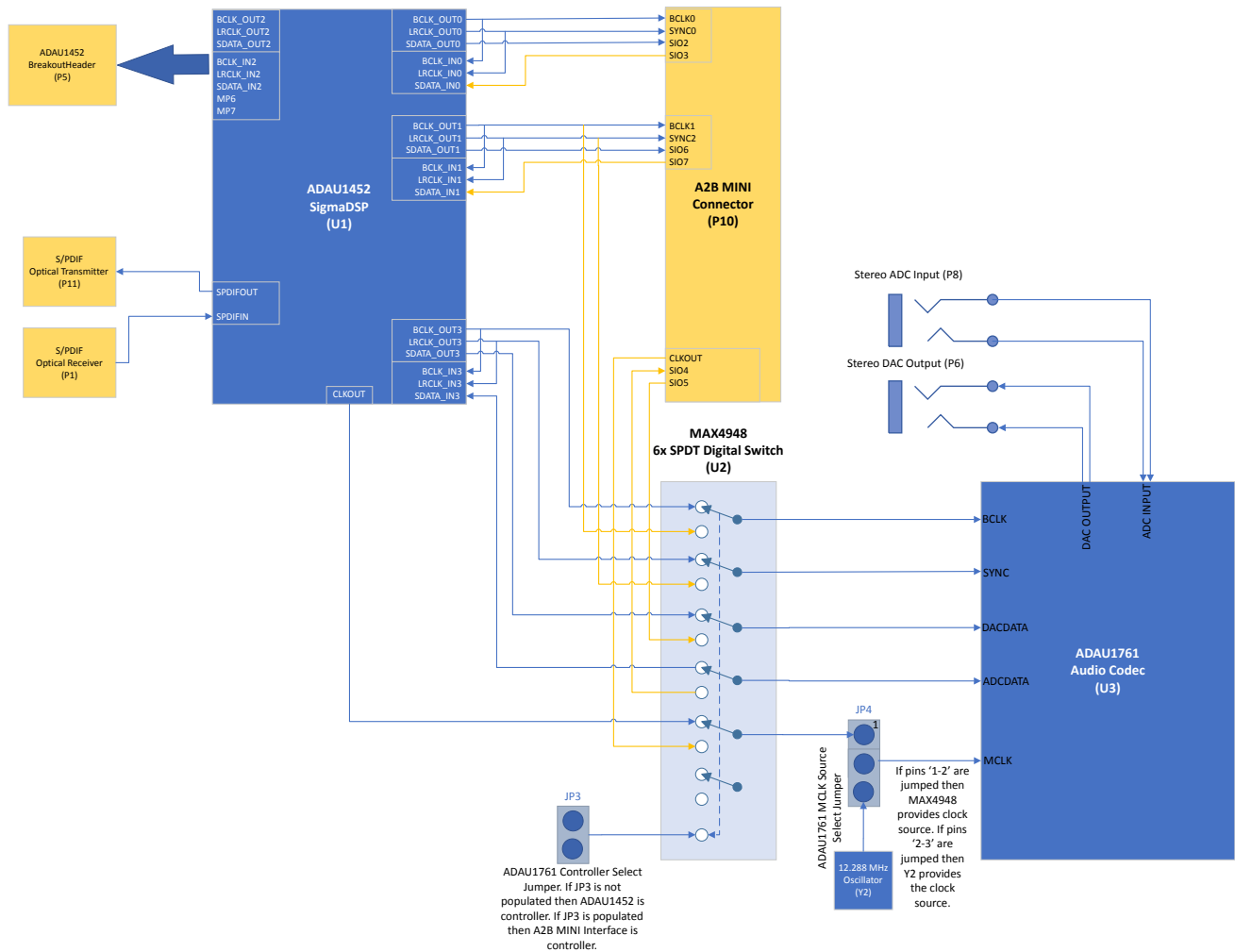


Figure 3-3: Audio Routing Diagram

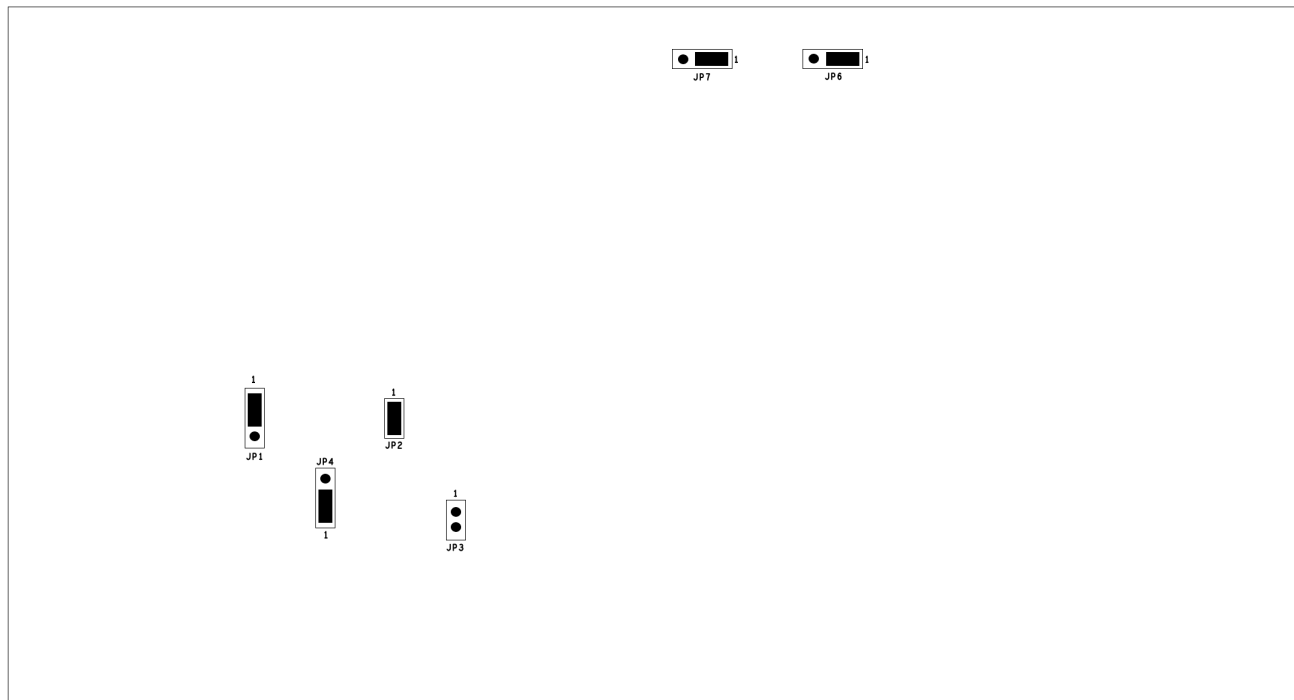


Figure 3-4: Configured as a Main Node with ADAU1452 as Codec Controller

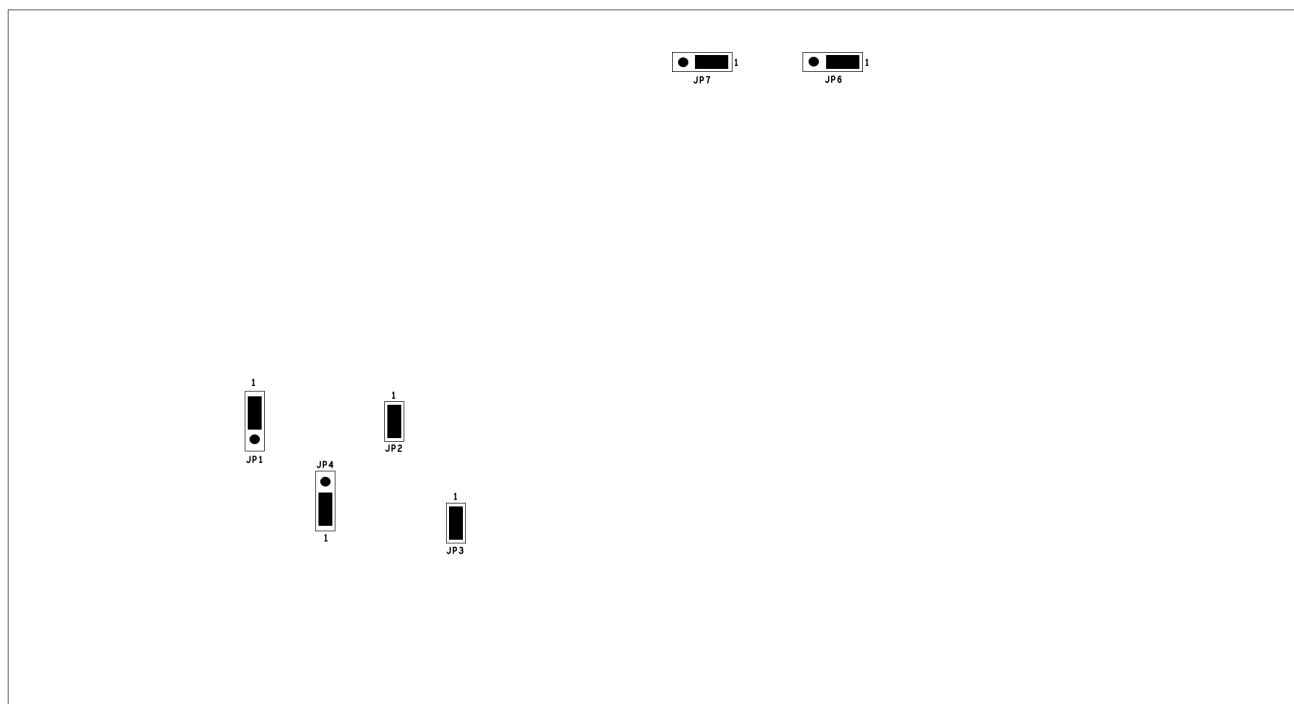


Figure 3-5: Configured as a Main Node with A²B MINI Interface as Codec Controller

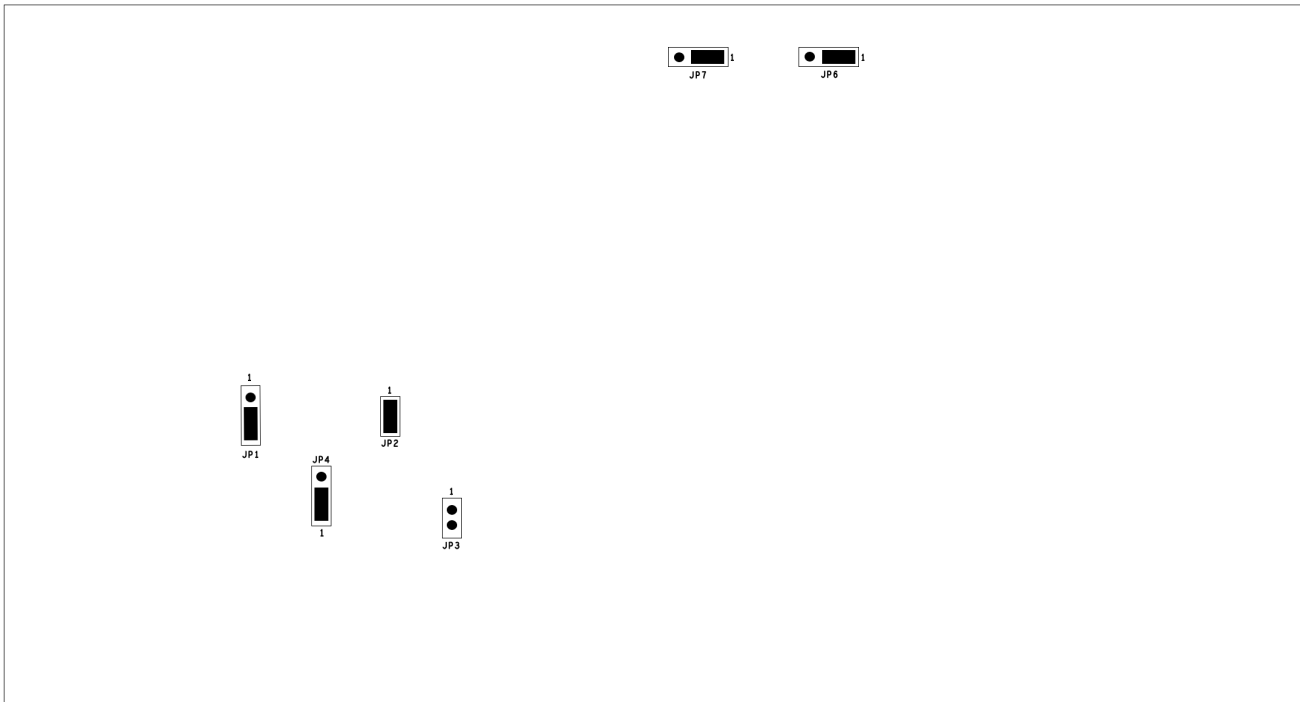


Figure 3-6: Configured as a Sub Node with ADAU1452 as Codec Controller

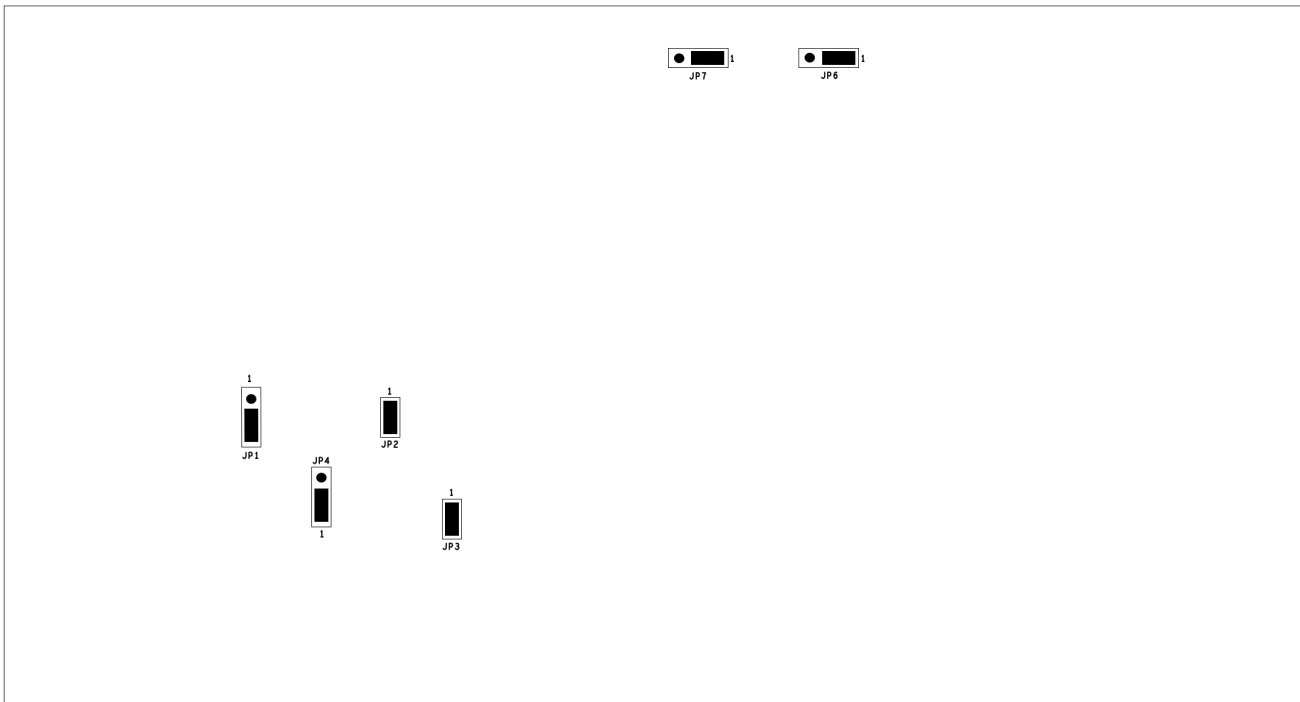


Figure 3-7: Configured as a Sub Node with A²B MINI Interface as Codec Controller

ADAU1452 Clock Source Select (JP1)

The ADAU1452 Clock Source Select Jumper allows the user to choose the clock source for the ADAU1452. The user can choose between an on-board 24.576MHz oscillator or source the clock from the A2B MINI Connector (P10).

Pins	Function
1-2	Oscillator (Default)
2-3	MINI-Board Clock

Self-Boot Disable (JP2)

When the Self-Boot Disable Jumper is not populated the ADAU1452 will attempt to boot off of the memory stored in EEPROM with address 0x50. When a jumper is populated on the Self-Boot Disable Jumper the ADAU1452 will not attempt to enter Boot-Mode (see [datasheet for ADAU1452](#) for more information).

Pins	Function
1-2	Disabled (Default)
DNP	Enabled

ADAU1761 I2S/TDM Controller Select (JP3)

The ADAU1761 I2S/TDM Controller Select Jumper allows the user to choose the controller for the ADAU1761. The controller selected provides BCLK, LRCLK, and Master Clock, along with a Data-IN and Data-OUT lines. The switching of the controller is performed by a [MAX4948](#) Data Switch. With no jumper populated on JP3 the ADAU1761 interfaces with the ADAU1452. If a jumper is populated on JP3 the device interfacing on A2B MINI Connector is the controller.

Pins	Function
1-2	Device Interfacing on A2B MINI Connector is Controller
DNP	ADAU1452 Is Controller (Default)

ADAU1761 Clock Source Select (JP4)

The ADAU1761 Clock Source Select Jumper allows the user to choose between two clock sources for the ADAU1761's MCLK pin. The user can chose between the device which is controlling the ADAU1761 (determined by jumper JP3) or an on-board 12.288 MHz oscillator.

Pins	Function
1-2	Sourced from MAX4948 MCLK_OUTPUT Signal (Default)
2-3	Local 12.288 MHz Oscillator

IOVDD Voltage Select (JP6)

The IOVDD Voltage Select Jumper allows the user to choose between two voltages for IOVDD: 3.3V and 1.8V.

Pins	Function
1-2	+3.3V (Default)
2-3	+1.8V

Wake-Up Source Select (JP7)

The Wake-Up Source Select Jumper allows the user to choose between two sources for enabling the on-board power supplies (+1.8V and +3.3V). The user can select for the power supplies to be enabled by either the 12V Power Plug (P7) or via the WAKEUP pin from the board interfacing on the A2B MINI Connector (P10)

Pins	Function
1-2	Local 12V (Default)
2-3	A2B MINI Board

LEDs

This section describes the on-board LEDs. The *LED Locations* figure shows the LED locations.

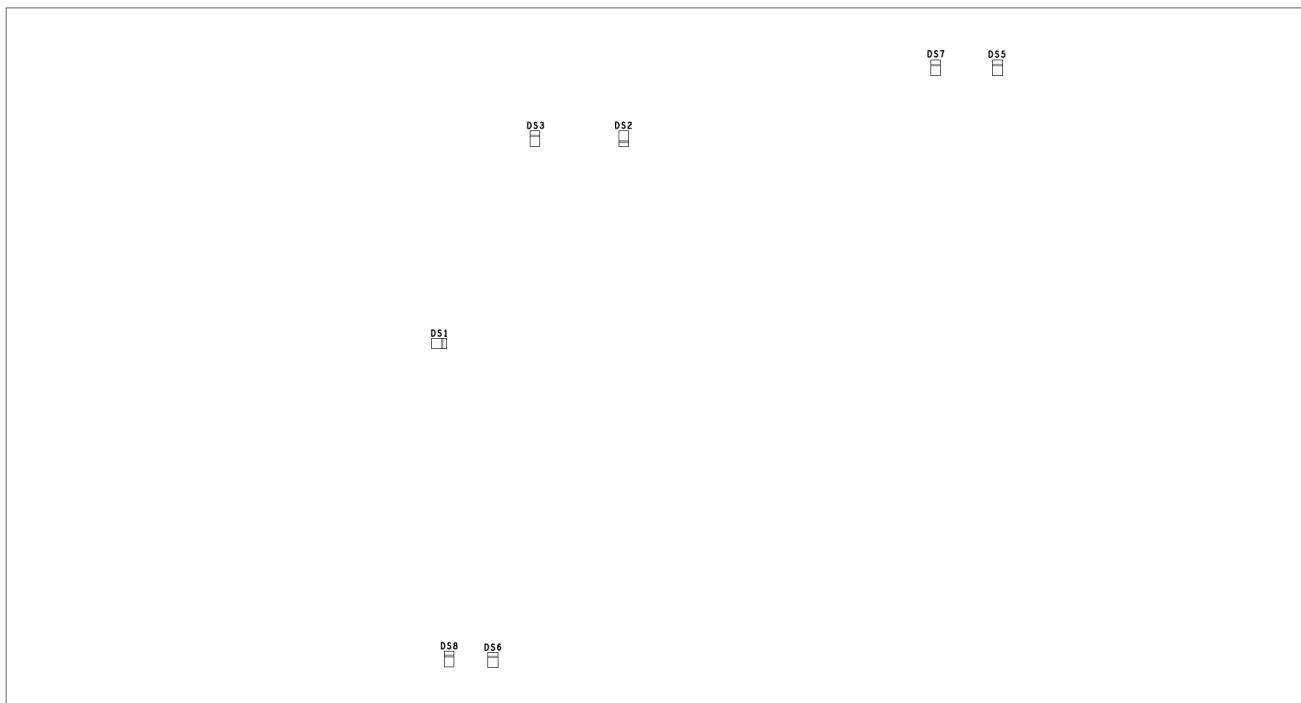


Figure 3-8: LED Locations

ADAU1452 Status LED (DS1)

The ADAU1452 Status is used to indicate the ADAU1452 has been successfully programmed when it is lit. The ADAU1452 Status LED is connected to pin MP6 of the ADAU1452. Refer to the [ADAU1452 Datasheet](#) for more information on MP6.

USBi LED (DS2)

The USBi LED indicates that USBi or Aardvark is connected and on.

A2B Interrupt LED (DS3)

The A2B interrupt LED is driven by the A2B Transceiver connected to the A2B MINI Connector. The LED is turned on when the IRQ pin drives it high. Refer to the Transceiver Reference Manual for further info on using interrupts.

Reset LED (DS6)

When ON, the Rest LED indicates that the board is in reset. A master reset is asserted by pressing the Reset Pushbutton (S1), which activates the Reset LED. The LED can also come on if activated via a HW_RESET or USB_RESET. For more information, see Reset Pushbutton (S1).

SIO0 LED (DS8)

The SIO0 LED will be ON when SIO0 is HIGH, and will be OFF when SIO0 is LOW.

Power Status Indicator LEDs (DS5, DS7)

The Status Indicators indicate Supplies health i.e. They will be on when respective supply will be available on board.

DS5: +12V

DS7: +3.3V

