

ADAA245X-EV-A1CA Manual

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Part Number
ADAA245X-EV-A1CA

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Regulatory Compliance

The *ADAA245X-EV-A1CA* 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 *ADAA245X-EV-A1CA* 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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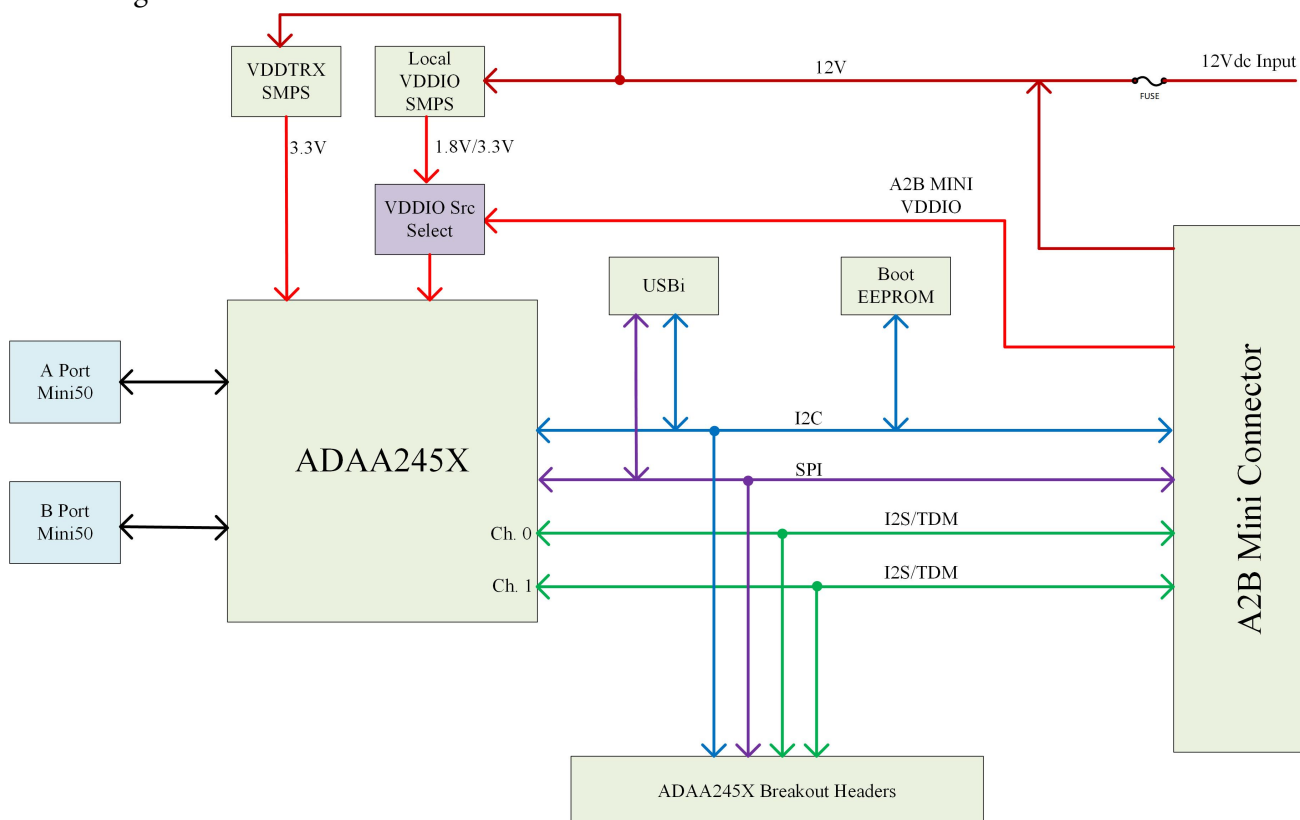
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1 Preface

Thank you for purchasing the Analog Devices, Inc. *ADAA245X-EV-A1CA* evaluation board.

The *ADAA245X-EV-A1CA* is an validation/evaluation board to evaluate various peripherals of ADAA2457 A²B (Automotive Audio Bus) transceiver. Refer to datasheet/manual to get more details about ADAA2457. The *ADAA245X-EV-A1CA* can be configured as a Main Node or a Local Powered Sub (LPS) node. These evaluation boards are intended to be used with the SigmaStudio+[®] graphical development tool.

Block Diagram of Evaluation Board:



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 ADAA2457 IC.

Supported Tools

Information about SigmaStudio+ and the A²B software plug-in for the *ADAA245X-EV-A1CA* evaluation board is available at: www.analog.com/SigmaStudio+.

Product Information

Information about the ADAA2457 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 [ADAA2457](#) - Automotive Audio Bus (A²B 2.0) Transceiver
- Analog Devices [MAX20075D](#) - 36V, 600mA/1.2A Mini Buck Converter with 3.5μA IQ
- Analog Devices [ADM6315](#) - Open-Drain Microprocessor Supervisory Circuit
- Microchip [24AA512T](#) - 512K I²C Serial EEPROM

Package Contents

Your *ADAA245X-EV-A1CA* package contains the following items.

- *ADAA245X-EV-A1CA* board
- EVAL-A2B-USBI
- Mini50 0.5M cable
- A2B Software - Online Request Document
- 12V Barrel-Jack Power Supply

Contact the vendor where you purchased your *ADAA245X-EV-A1CA* 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.

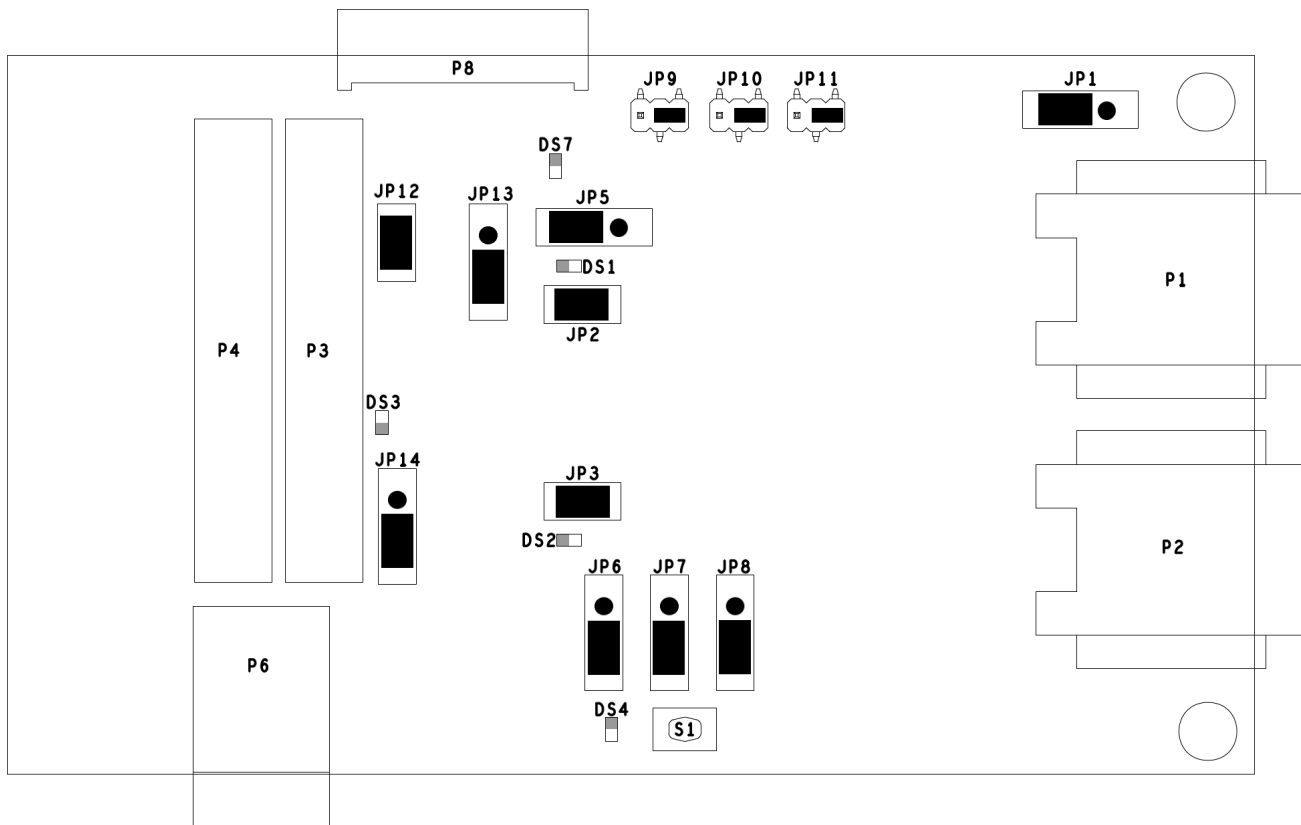


Figure 2-1: Default Hardware Setup

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.

ADAA2457 - Automotive Audio Bus (A²B 2.0) Transceiver

Automotive Audio Bus (A²B® 2.0) devices are the next generation of transceivers ([ADAA245x](#)) that quadruple the available bus bandwidth relative to existing A²B 1.0 devices making them particularly well suited for high definition (HD) audio transport in ECU connectivity applications. A²B 2.0 devices are not compatible with A²B 1.0 line coding but ADAA245x devices are compatible with existing A²B 1.0 cabling and connector infrastructure.

A²B provides a multichannel, multistream digital audio link over distances of up to 15 m between nodes. It embeds bidirectional synchronous pulse code modulation (PCM) data (for example, digital audio from I2S/TDM interface), clock, and synchronization signals, as well as asynchronous data (for example, Ethernet packets) onto a single differential wire pair. A²B supports a direct point to point or line connection and allows multiple, daisy-chained nodes at different locations to contribute and/or use time division multiplexed channel content.

A²B is a single main node, multiple subordinate node system where the transceiver at the host controller is part of the main node. The main node generates clock, synchronization, and framing for all subordinate nodes. The main A²B transceiver is programmable over a control bus (I2C or SPI) for configuration and read back. An extension of this control bus is embedded in the A²B data stream, which grants direct access to registers and status information on subordinate transceivers, as well as I2C to I2C, SPI to SPI, SPI to I2C and GPIO to GPIO communication over distance.

The transceiver can connect directly to general-purpose digital signal processors (DSPs) or microprocessors, field-programmable gate arrays (FPGAs), application specific integrated circuits (ASICs), microphones, accelerometers, analog-to-digital converters (ADCs), digital-to-analog converters (DACs), and codecs through a multichannel I2S/TDM interface. It also provides a pulse density modulation (PDM) interface for direct connection of up to four PDM digital microphones. The transceiver's pulse width modulated (PWM) outputs can control LED drivers or voltage regulators. GPIO status and control is directly conveyed between nodes.

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.

MAX20075D - 36V, 600mA/1.2A Mini Buck Converter with 3.5µA IQ

The [MAX20075D/MAX20076D/MAX25276D](#) are small, synchronous buck converters with integrated high-side and low-side switches. The MAX20076D/MAX25276D are designed to deliver up to 1.2A and the MAX20075D up to 0.6A, with 3.5V to 36V input voltages, while using only 3.5 μ A quiescent current at no load. The devices provide an accurate output voltage of $\pm 2\%$ within the normal operation input range of 6V to 18V. With 20ns minimum on time capability, the converter is capable of large input-to output conversion ratios. Voltage quality can be monitored by observing the PGOOD signal. The devices can operate in dropout by running at 99% duty cycle, making them ideal for automotive and industrial applications. The devices offer two fixed output voltages of 5V and 3.3V. In addition, the devices can be configured for 1V to 10V output voltages using an external resistor-divider. Frequency is internally fixed at 2.1MHz, which allows for small external components and reduced output ripple, and guarantees no AM interference. The devices automatically enter skip mode at light loads with ultra-low quiescent current of 3.5 μ A at no load. The devices offer pin-enabled spread-spectrum frequency modulation designed to minimize EMI-radiated emissions due to the modulation frequency. The MAX20075D/MAX20076D/MAX25276D are available in small (3mm x 3mm) 12-pin TDFN and side-wettable TDFN packages with an exposed pad, and use very few external components.

3 Hardware Reference

This chapter describes the hardware design of the *ADAA245X-EV-A1CA* evaluation board.

Switches

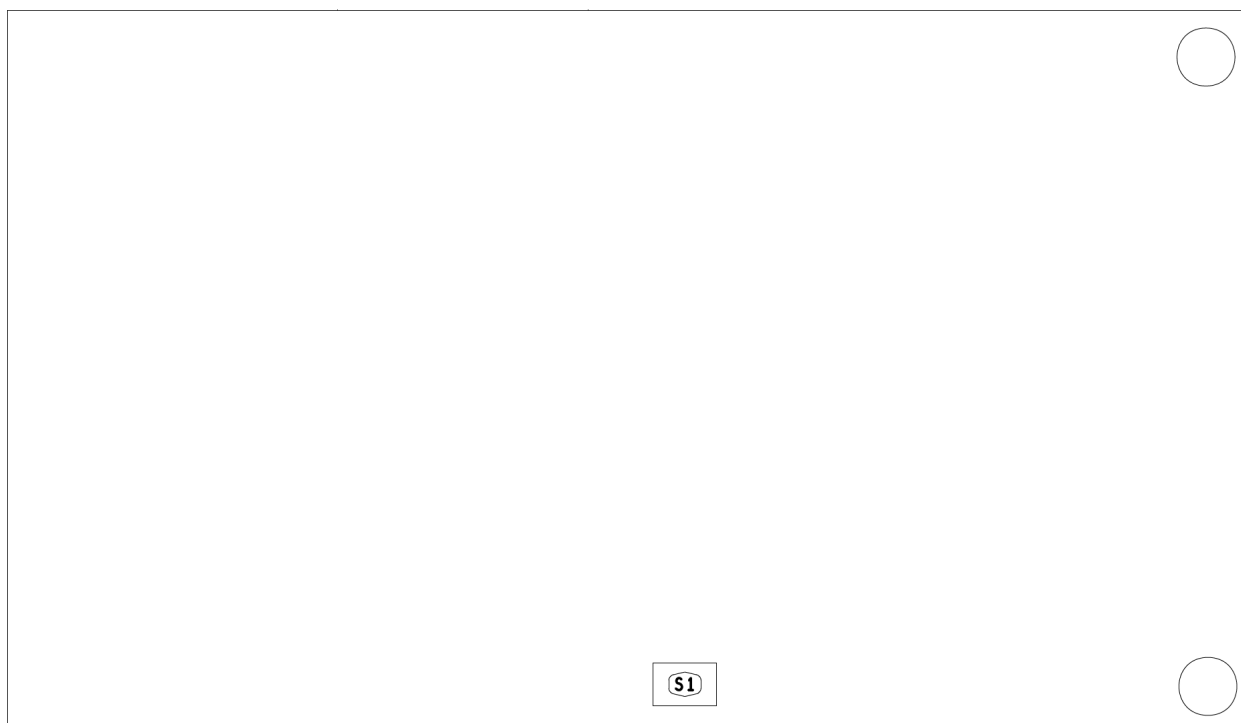


Figure 3-1: Switch Locations

Reset Pushbutton (S1)

The Reset Pushbutton is used to reset the A²B transceiver. The [Reset LED \(DS4\)](#) is used to indicate when the board is in reset.

Connectors

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

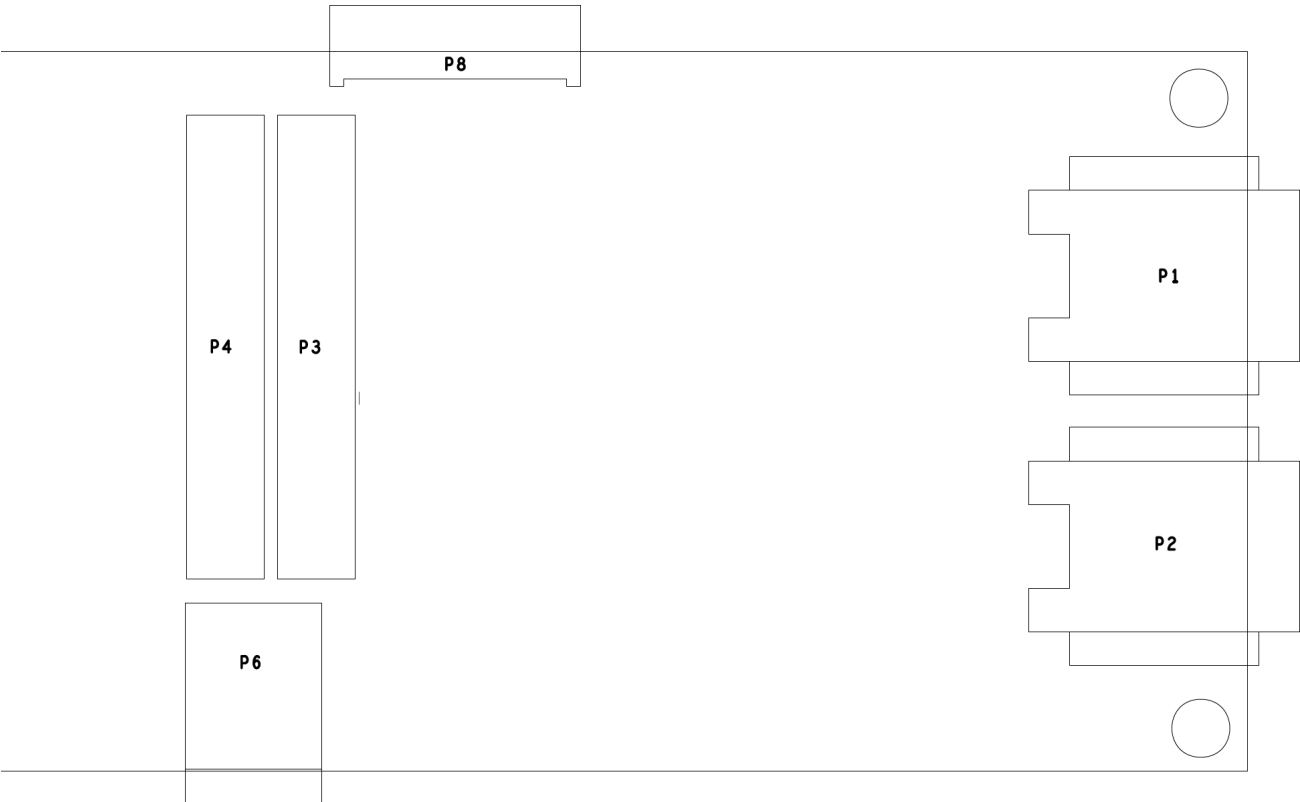


Figure 3-2: Connector Locations TOP



Figure 3-3: Connector Locations BOTTOM

A²B Connectors (P1 , P2)

P1 , P2 are used to connect upstream towards a main node, or downstream towards a sub node in the A²B chain. These connectors allow the ADAA2457 on the *ADAA245X-EV-A1CA* board to communicate to other A²B devices on the bus.

<i>Part Description</i>	<i>Manufacturer</i>	<i>Part Number</i>
Mini50	Molex	34912-8020
<i>Mating Cable</i>		
A ² B Cable		

A²B Breakout Header 1 (P3)

The A²B Breakout Header is a 0.1" header that used for probing purposes or connecting the *ADAA245X-EV-A1CA* to other boards. This connector breaks out the signals for TDM/I2S pins from the ADAA2457. Refer to the schematic for the connector's pinout.

A²B Breakout Header 2 (P4)

The A²B Breakout Header is a 0.1" header that used for probing purposes or connecting the *ADAA245X-EV-A1CA* to other boards. Refer to the schematic for the connector's pinout.

A²B MINI (P5)

The A2B Interface is a high speed connection that allows for interfacing with some other boards such as the ADAA24XX-EV-B2BX. This connector brings out the signals for I²S, I²C, SPI, GPIO, 1.8v power, 3.3v power, and an optional +12v input for the *ADAA245X-EV-A1CA*. The following table contains the pinout for the A²B MINI Connector:

Signal	Pin	Pin	Signal	Signal	Pin	Pin	Signal
GND	1	2	GND	NC	51	52	NC
BCLK0	3	4	BCLK1	GND	53	54	GND
GND	5	6	GND	RESET*	55	56	NC
SYNC0	7	8	SYNC1	GND	57	58	GND
GND	9	10	GND	IRQ0	59	60	NC
SIO0	11	12	CLKOUT	GND	61	62	GND
GND	13	14	GND	CITO0	63	64	CITO1
SIO1	15	16	CLKIN	GND	65	66	GND
GND	17	18	GND	COTI0	67	68	COTI1
SIO2	19	20	MDO/IRQE	GND	69	70	GND
GND	21	22	GND	SCLK0	71	72	SCLK1
SIO3	23	24	MD1/TS6	GND	73	74	GND
GND	25	26	GND	TS0*	75	76	TS6
SIO4	27	28	MD2/TS7	GND	77	78	GND
GND	29	30	GND	IRQE	79	80	TS7
SIO5	31	32	WAKEUP	GND	81	82	GND
GND	33	34	GND	SDA	83	84	VDDIO
SIO6	35	36	ADC0	GND	85	86	NC
GND	37	38	GND	SCL	87	88	NC
SIO7	39	40	ADC1	GND	89	90	GND
GND	41	42	GND	GND	91	92	GND
NC	43	44	NC	GND	93	94	GND
GND	45	46	GND	NC	95	96	+12V
NC	47	48	NC	NC	97	98	+12V
GND	49	50	GND	NC	99	100	+12V

Barrel-Jack Input (P6)

This connector is used to power the board with a provided 12V power supply. Power is required when the board is operating in both Main and Local-Powered Sub modes. Alternatively the *ADAA245X-EV-A1CA* can receive power from the Wire-to-Board connector () or from the board interfaced using the A2B MINI Connector (P5).

<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

SigmaStudio+(P8)

This connector interfaces with SigmaStudio+ through the [EVAL-A2B-USB1](#) board. The pinout can be found in the schematic.

Jumpers

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

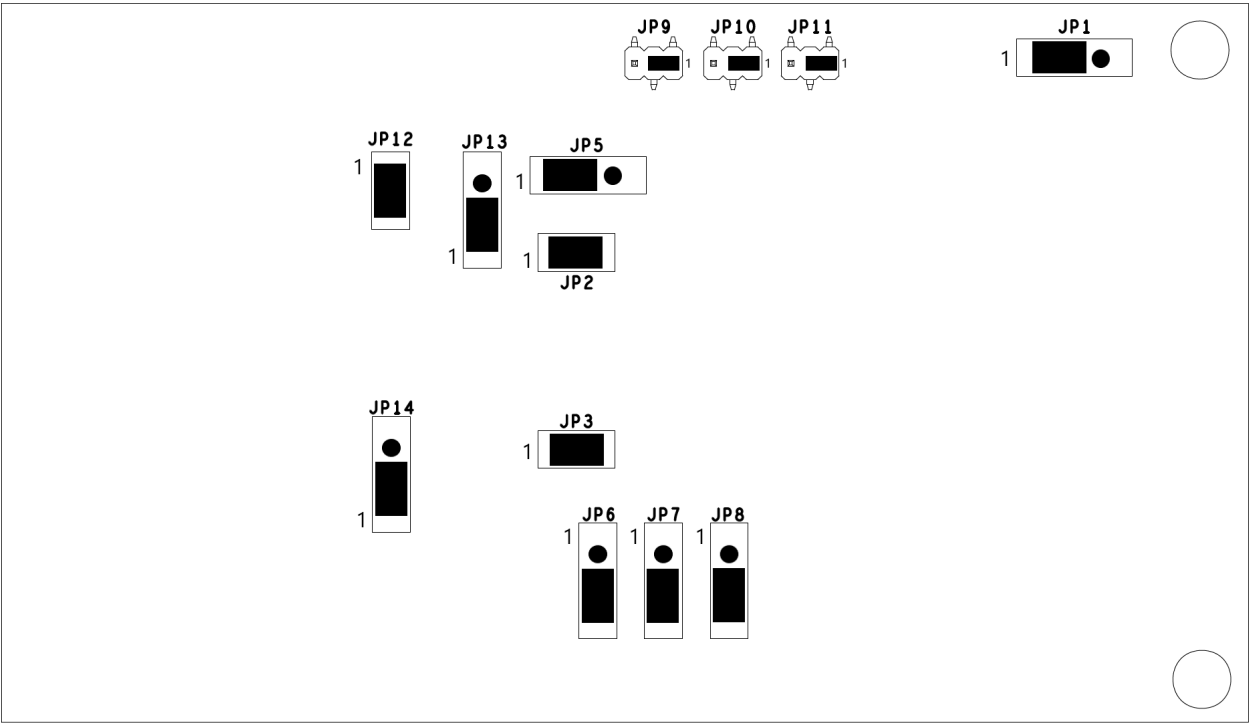


Figure 3-4: Jumper Locations

Wakeup Select (JP1)

The Wakeup Select Jumper allows the user to select if the ADAA245X-EV-A1CA Board (and potentially any boards interfacing through P5) will wake upon A2B bus activity. The user has the choice of either enabling or disabling the Wakeup feature.

Pins	Function
1-2	Disabled (Default)
2-3	Enabled

SIO6 LED Enable (JP2)

The SIO6 LED Enable Jumper allows the user to Enable/Disable the ability for SIO6 pin of ADAA245x to control a LED (DS1).

Pins	Function
1-2	Enabled (Default)
Not Populated	Disabled

SIO7 LED Enable (JP3)

The SIO7 LED Enable Jumper allows the user to Enable/Disable the ability for SIO7 pin of ADAA245x to control a LED (DS2).

Pins	Function
1-2	Enabled (Default)
Not Populated	Disabled

Clock Source Select (JP5)

The Clock Source Select Jumper allows the user to select how the clock source for the ADAA245x. The user can select between the on board 24.576MHz Oscillator or source the clock from the A2B MINI Connector interface.

Pins	Function
1-2	A2B MINI Connector (Default)
2-3	Local Oscillator

Mode Select Pins (JP6 , JP7 , and JP8)

The Mode Select Pin Jumpers allows the user to select how the Mode of Operation for the ADAA245x. The user can select between tying the pin to HIGH or LOW via the jumpers. By not populating the jumper the pin is left floating. Mode ID 0 is the default setting for the board.

Mode ID	Mode Pins			Function Options		
	JP6 MD0	JP7 MD1	JP8 MD2	Transceiver Mode	ADR2:ADR1	CLKOUT
0	LOW	LOW	LOW	Main Node	[0 0]	Disabled
1	LOW	LOW	FLOAT	Main Node	[0 1]	Disabled
2	LOW	LOW	HIGH	Main Node	[1 0]	Disabled
3	LOW	FLOAT	LOW	Main Node	[1 1]	Disabled
5	LOW	FLOAT	HIGH	Main Node	[1 1]	CLKIN
6	LOW	HIGH	LOW	Main Node	[0 0]	CLKIN
7	LOW	HIGH	FLOAT	Main Node	[0 1]	CLKIN
8	LOW	HIGH	HIGH	Main Node	[1 0]	CLKIN
9	FLOAT	LOW	LOW	Subordinate Node	[0 0]	Disabled
10	FLOAT	LOW	FLOAT	Subordinate Node	[0 1]	Disabled
11	FLOAT	LOW	HIGH	Subordinate Node	[1 0]	Disabled
12	FLOAT	FLOAT	LOW	Subordinate Node	[1 1]	24.576 MHz
13	FLOAT	FLOAT	FLOAT	Subordinate Node	[1 1]	Disabled
14	FLOAT	FLOAT	HIGH	Subordinate Node	[1 1]	12.288 MHz
15	FLOAT	HIGH	LOW	Subordinate Node	[0 0]	Disabled
16	FLOAT	HIGH	FLOAT	Subordinate Node	[0 1]	Disabled
17	FLOAT	HIGH	HIGH	Subordinate Node	[1 0]	Disabled
18	HIGH	LOW	LOW	Subordinate Node	[0 0]	24.576 MHz
19	HIGH	LOW	FLOAT	Subordinate Node	[0 1]	24.576 MHz
20	HIGH	LOW	HIGH	Subordinate Node	[1 0]	24.576 MHz
21	HIGH	FLOAT	LOW	Subordinate Node	[0 0]	12.288 MHz
22	HIGH	FLOAT	FLOAT	Subordinate Node	[0 1]	12.288 MHz
23	HIGH	FLOAT	HIGH	Subordinate Node	[1 0]	12.288 MHz
24	HIGH	HIGH	LOW	Subordinate Node	[0 0]	CLKIN
25	HIGH	HIGH	FLOAT	Subordinate Node	[0 1]	CLKIN
26	HIGH	HIGH	HIGH	Subordinate Node	[1 0]	CLKIN

OA-SPI Select (JP9 , JP10 , and JP11)

The OA-SPI Select Jumper allows the user to select between using the SIO0, SIO1, and SIO2 pins of the with their default Audio function (I2S/TDM) or their alternate OA_SPI function.

Pins	Function
1-2	Audio Routing (Default)
2-3	OA-SPI Mode

Local VDDIO Voltage Select (JP12)

The Local VDDIO Voltage Select Jumper allows the user to choose the output voltage of the Local VDDIO Regulator.

Pins	Function
1-2	3.3V (Default)
Not Populated	1.8V

VDDIO Source Select (JP13)

The VDDIO Source Select Jumper allows the user to select the VDDIO voltage Source for the *ADAA245X-EV-A1CA* Board. The user can choose between the local MAX20075D Regulator, or choose to use the A2B MINI Connector (P5) Interface (Pin 84) as the source . If choosing not to source VDDIO from the A2B MINI Connector (P5) Interface, care should be taken to ensure that VDDIO is chosen with respect to any boards the *ADAA245X-EV-A1CA* may interface with.

Pins	Function
1-2	Local Regulator (Default)
2-3	Local 3.3V Regulator

Local VDDIO Wakeup Source (JP14)

The Local VDDIO Wakeup Source Jumper allows the user to choose how the Local VDDIO Regulator is Enabled/Activated. The user can choose have the Local VDDIO regulator Enabled/Activated via the 12V Input (Barrel-Jack Connector) or Enabled/Activated via the WAKEUP signal from

Pins	Function
1-2	3.3V (Default)
Not Populated	1.8V

LEDs

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

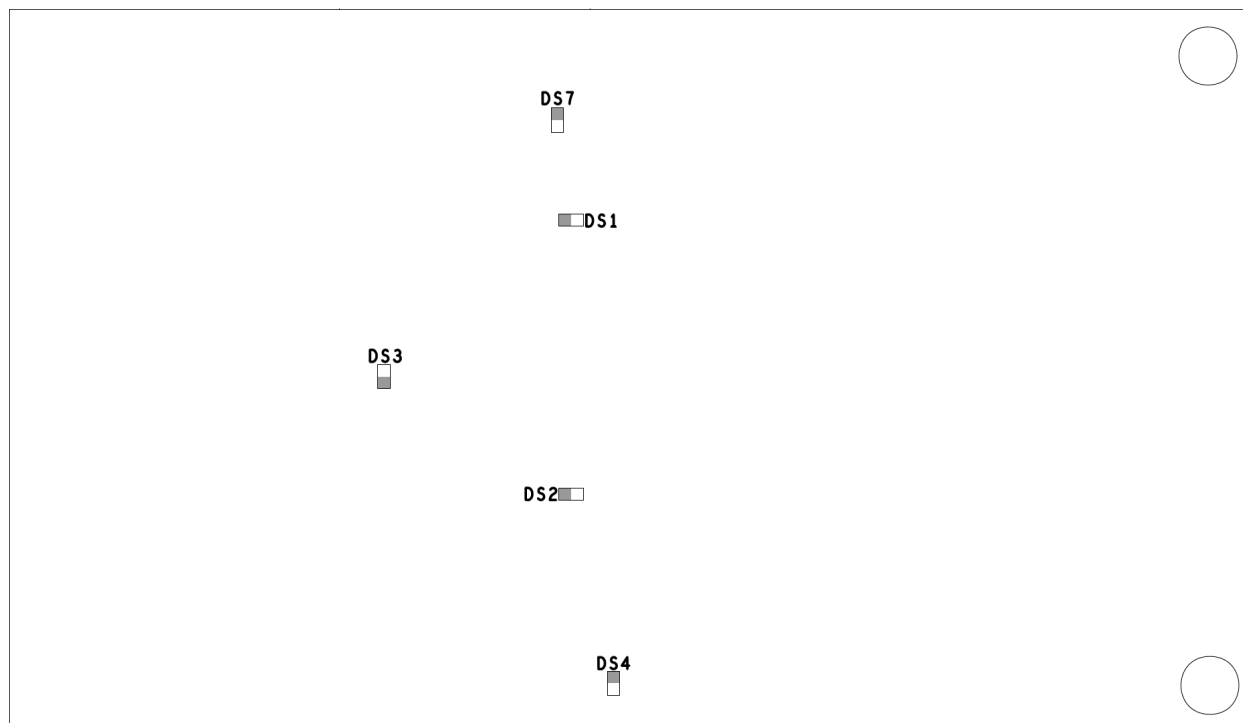


Figure 3-5: LED Locations

SIO6 LED (DS1)

When enabled via [SIO6 LED Enable \(JP2\)](#), the SIO6 LED can be controlled by the ADAA245x's SIO6 pin.

SIO7 LED (DS2)

When enabled via [SIO7 LED Enable \(JP3\)](#), the SIO7 LED can be controlled by the ADAA245x's SIO7 pin.

VDDIO Power Status LED Indicator (DS3)

LED indication for Local VDDIO Regulator.

DS3: +1.8V/+3.3V

Reset LED (DS4)

When ON, it indicates that the board is in reset. A master reset is asserted by pressing S1, which activates the LED. The LED can also come on if activated via a HW_RESET or USB_RESET. For more information, see Reset Push-button (SW1). The LED can also come on if a reset is asserted by any board interfacing through the A2B MINI Connector (P5).

USBi LED (DS7)

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

