ADSP-21371 EZ-KIT Lite®
Evaluation System Manual

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ANALOG DEVICES

Copyright Information

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Regulatory Compliance

The ADSP-21371 EZ-KIT Lite 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 ADSP-21371 EZ-KIT Lite is currently being processed for certification that it complies with the essential requirements of the European EMC directive 89/336/EEC amended by 93/68/EEC and therefore carries the "CE" mark.

CE

The EZ-KIT Lite evaluation system 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 EZ-KIT Lite boards in the protective shipping package.

CONTENTS

PREFACE

Thank you for purchasing the ADSP-21371 EZ-KIT Lite®, Analog Devices, Inc. evaluation system for SHARC® processors.

SHARC processors are based on a 32-bit super Harvard architecture that includes a unique memory architecture comprised of two large on-chip, dual-ported SRAM blocks coupled with a sophisticated I/O processor, which gives a SHARC processor the bandwidth for sustained high-speed computations. SHARC processors represents today's de facto standard for floating-point processing, targeted toward premium audio applications.

The evaluation system is designed to be used in conjunction with the VisualDSP++® development environment to test capabilities of the ADSP-21371 SHARC processors. The VisualDSP++ development environment aides advanced application code development and debug, such as:

- Create, compile, assemble, and link application programs written in C++, C, and ADSP-21371 assembly
- Load, run, step, halt, and set breakpoints in application program
- Read and write data and program memory
- Read and write core and peripheral registers
- Plot memory

Access to the ADSP-21371 processor from a personal computer (PC) is achieved through a USB port or an external JTAG emulator. The USB interface provides unrestricted access to the ADSP-21371 processor and

evaluation board peripherals. Analog Devices JTAG emulators offer faster communication between the host PC and target hardware. Analog Devices carries a wide range of in-circuit emulation products. To learn more about Analog Devices emulators and processor development tools, go to http://www.analog.com/dsp/tools/.

The ADSP-21371 EZ-KIT Lite installation is part of the VisualDSP++ installation. The EZ-KIT Lite is a licensed product that offers an unrestricted evaluation license for the first 90 days. For details about evaluation license restrictions after the 90 days, refer to "Evaluation License Restrictions" on page 1-7 and the *VisualDSP++ Installation Quick Reference Card*.

The ADSP-21371 EZ-KIT Lite provides example programs to demonstrate capabilities of the evaluation board.

Product Overview

The board features:

- Analog Devices ADSP-21371 processor
  - 208-pin MQFP package
  - 266 MHz core clock speed
- Synchronous dynamic random access memory (SDRAM)
  - 1M x 32-bit x 4 banks
- Flash memory
  - 1M x 8-bit
- Serial peripheral interface (SPI) flash memory
  - 2 Mbit

- Analog audio interface
  - Analog Devices AD1835A audio codec
  - 4 x 2 RCA phono jack for four channels of stereo output
  - 2 x 1 RCA phono jack for one channel of stereo input
  - 3.5 mm headphone jack for one channel stereo output
- Universal asynchronous receiver/transmitter (UART)
  - ADM3202 RS-232 driver/receiver
  - DB9 female connector
- National Instruments Educational Laboratory Virtual Instrumentation Suite (ELVIS) Interface
  - LabVIEW™-based virtual instruments
  - Multifunction data acquisition device
  - Bench-top workstation and prototype board
- LEDs
  - Eleven LEDs: one power (green), one board reset (red), one USB monitor (amber), and eight general-purpose (amber)
- Push buttons
  - Five push buttons: one reset, two connected to DAI, and two connected to the FLAG pins of the processor
- Expansion interface (type A)
  - Parallel port, FLAG pins, DPI, DAI

- Other features
  - JTAG ICE 14-pin header
  - Test points for processor current measurement
  - DPI header
  - DAI header

The EZ-KIT Lite board has a total of 1 MB of parallel flash memory and 2 Mbit of SPI flash memory. Flash memories can store user-specific boot code and allow the board to run as a stand-alone unit. For more information, see "External Memory" on page 1-7 and "Boot Mode and Clock Ratio Select Switch (SW2)" on page 2-9. The board has 16 MB of SDRAM, which can be used at runtime or from which code can be executed.

The DAI port of the processor is connected to the AD1835A audio codec and an external phase lock loop (PLL). The DAI interface facilitates development of digital and analog audio signal-processing applications. See "Analog Audio" on page 1-10 for more information.

The DPI port of the processor is connected to the UART and SPI interfaces. The UART interface can connect to a standard RS-232, while the SPI connects to the 2 Mbit of serial flash memory.

Additionally, the EZ-KIT Lite board provides access to all of the processor's peripheral ports. Access is provided in the form of a three-connector expansion interface. See "Expansion Interface" on page 2-7 for details.

Purpose of This Manual

The *ADSP-21371 EZ-KIT Lite Evaluation System Manual* provides instructions for installing the product hardware (board). The text describes operation and configuration of the board components and provides guidelines for running your own code on the ADSP-21371 EZ-KIT Lite. Finally, a schematic and a bill of materials are provided for reference.

Intended Audience

The primary audience for this manual is a programmer who is familiar with Analog Devices processors. This manual assumes that the audience has a working knowledge of the appropriate processor architecture and instruction set. Programmers who are unfamiliar with Analog Devices processors can use this manual but should supplement it with other texts, such as the *ADSP-2136x SHARC Processor Programming Reference* and *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21371) that describe your target architecture.

Programmers who are unfamiliar with VisualDSP++ should refer to the VisualDSP++ online Help and user's or getting started guides. For the locations of these documents, see "Related Documents".

Manual Contents

The manual consists of:

- Chapter 1, "Using ADSP-21371 EZ-KIT Lite" on page 1-1
  Describes EZ-KIT Lite functionality from a programmer's perspective and provides an easy-to-access memory map.
- Chapter 2, "ADSP-21371 EZ-KIT Lite Hardware Reference" on page 2-1
  Provides information on the EZ-KIT Lite hardware components.
- Appendix A, "ADSP-21371 EZ-KIT Lite Bill Of Materials" on page A-1
  Provides a list of components used to manufacture the EZ-KIT Lite board.
- Appendix B, "ADSP-21371 EZ-KIT Lite Schematic" on page B-1
  Provides the resources to allow board-level debugging or to use as a reference guide. Appendix B is part of the online Help.

What's New in This Manual

This is the first edition of the *ADSP-21371 EZ-KIT Lite Evaluation System Manual*.

Technical or Customer Support

You can reach Analog Devices, Inc. Customer Support in the following ways:

- Visit the Embedded Processing and DSP products Web site at
  http://www.analog.com/processors/technicalSupport
- E-mail tools questions to
  processor.tools.support@analog.com
- E-mail processor questions to
  processor.support@analog.com (World wide support)
  processor.europe@analog.com (Europe support)
  processor.china@analog.com (China support)
- Phone questions to **1-800-ANALOGD**
- Contact your Analog Devices, Inc. local sales office or authorized distributor
- Send questions by mail to:
  Analog Devices, Inc.
  One Technology Way
  P.O. Box 9106
  Norwood, MA 02062-9106
  USA

Supported Processors

The ADSP-21371 EZ-KIT Lite evaluation system supports Analog Devices ADSP-21371 SHARC processors.

Product Information

Product information can be obtained from the Analog Devices Web site, VisualDSP++ online Help system, and a technical library CD.

Analog Devices Web Site

The Analog Devices Web site, www.analog.com, provides information about a broad range of products—analog integrated circuits, amplifiers, converters, and digital signal processors.

To access a complete technical library for each processor family, go to http://www.analog.com/processors/technical_library. The manuals selection opens a list of current manuals related to the product as well as a link to the previous revisions of the manuals. When locating your manual title, note a possible errata check mark next to the title that leads to the current correction report against the manual.

Also note, MyAnalog.com is a free feature of the Analog Devices Web site 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.

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VisualDSP++ Online Documentation

Online documentation comprises the VisualDSP++ Help system, software tools manuals, hardware tools manuals, processor manuals, Dinkum Abridged C++ library, and FLEXnet License Tools software documentation. You can search easily across the entire VisualDSP++ documentation set for any topic of interest.

For easy printing, supplementary Portable Documentation Format (`.pdf`) files for all manuals are provided on the VisualDSP++ installation CD.

Each documentation file type is described as follows.

File	Description
`.chm`	Help system files and manuals in Microsoft help format
`.htm` or `.html`	Dinkum Abridged C++ library and FLEXnet License Tools software documentation. Viewing and printing the `.html` files requires a browser, such as Internet Explorer 6.0 (or higher).
`.pdf`	VisualDSP++ and processor manuals in PDF format. Viewing and printing the `.pdf` files requires a PDF reader, such as Adobe Acrobat Reader (4.0 or higher).

Technical Library CD

The technical library CD contains seminar materials, product highlights, a selection guide, and documentation files of processor manuals, VisualDSP++ software manuals, and hardware tools manuals for the following processor families: Blackfin, SHARC, TigerSHARC, ADSP-218x, and ADSP-219x.

To order the technical library CD, go to `http://www.analog.com/processors/technical_library`, navigate to the manuals page for your processor, click the request CD check mark, and fill out the order form.

Data sheets, which can be downloaded from the Analog Devices Web site, change rapidly, and therefore are not included on the technical library CD. Technical manuals change periodically. Check the Web site for the latest manual revisions and associated documentation errata.

Related Documents

For information on product related development software and hardware, see these publications:

Table 1. Related Processor Publications

Title	Description
ADSP-21371/ADSP-21375 SHARC Processor Data Sheet	General functional description, pinout, and timing of the processor
ADSP-21368 SHARC Processor Hardware Reference (Includes ADSP-21367, ADSP-21368, ADSP-21369, ADSP-21371, ADSP-21375)	Description of the internal processor architecture, registers, and all peripheral functions
ADSP-2136x SHARC Processor Programming Reference	Description of all allowed processor assembly instructions

Table 2. Related VisualDSP++ Publications

VisualDSP++ User's Guide	Detailed description of the VisualDSP++ features and usage
VisualDSP++ Assembler and Preprocessor Manual	Description of the assembler function and commands
VisualDSP++ C/C++ Complier Manual for SHARC Processors	Description of the complier function and commands for SHARC processors
VisualDSP++ Run-Time Library Manual for SHARC Processors	Description of the run-time library functions for SHARC processors

Table 2. Related VisualDSP++ Publications (Cont'd)

VisualDSP++ Linker and Utilities Manual	Description of the linker function and commands
VisualDSP++ Loader and Utilities Manual	Description of the loader function and commands

Notation Conventions

Text conventions used in this manual are identified and described as follows.

Example	Description
Close command (**File** menu)	Titles in reference sections indicate the location of an item within the VisualDSP++ environment's menu system (for example, the **Close** command appears on the **File** menu).
`{this | that}`	Alternative required items in syntax descriptions appear within curly brackets and separated by vertical bars; read the example as `this` or `that`. One or the other is required.
`[this | that]`	Optional items in syntax descriptions appear within brackets and separated by vertical bars; read the example as an optional `this` or `that`.
`[this,…]`	Optional item lists in syntax descriptions appear within brackets delimited by commas and terminated with an ellipse; read the example as an optional comma-separated list of `this`.
`.SECTION`	Commands, directives, keywords, and feature names are in text with `letter gothic` font.
`filename`	Non-keyword placeholders appear in text with italic style format.

Example	Description
	**Note:** For correct operation, ... A Note provides supplementary information on a related topic. In the online version of this book, the word **Note** appears instead of this symbol.
	**Caution:** Incorrect device operation may result if ... **Caution:** Device damage may result if ... A Caution identifies conditions or inappropriate usage of the product that could lead to undesirable results or product damage. In the online version of this book, the word **Caution** appears instead of this symbol.
	**Warning:** Injury to device users may result if ... A Warning identifies conditions or inappropriate usage of the product that could lead to conditions that are potentially hazardous for the devices users. In the online version of this book, the word **Warning** appears instead of this symbol.

1 USING ADSP-21371 EZ-KIT LITE

This chapter provides information to assist you with development of programs for the ADSP-21371 EZ-KIT Lite evaluation system.

The following topics are covered.

- "Package Contents" on page 1-2
  Lists items contained in your EZ-KIT Lite package.
- "Default Configuration" on page 1-3
  Shows the default configuration of the EZ-KIT Lite board.
- "Installation and Session Startup" on page 1-5
  Instructs how to start a new or open an existing EZ-KIT Lite session using VisualDSP++.
- "Evaluation License Restrictions" on page 1-7
  Describes the VisualDSP++ license restrictions; the VisualDSP++ license is shipped with the EZ-KIT Lite.
- "External Memory" on page 1-7
  Defines the memory map of the EZ-KIT Lite; describes how to access external memory.
- "ELVIS Interface" on page 1-9
  Describes the on-board National Instruments Educational Laboratory Virtual Instrumentation Suite (NI ELVIS) interface.
- "Analog Audio" on page 1-10
  Describes how to set up and communicate with the on-board audio codec.

- "LEDs and Push Buttons" on page 1-11
  Describes the board's general-purpose I/O pins and buttons.
- "Example Programs" on page 1-13
  Provides information about example programs included in the evaluation system.
- "Background Telemetry Channel" on page 1-13
  Highlights the advantages of the Background Telemetry Channel feature of VisualDSP++.
- "Reference Design Information" on page 1-13
  Highlights the available technical resources for the design, layout, fabrication, and assembly of the EZ-KIT Lite.

For information on the graphical user interface, including the boot loading, target options, and other facilities of the EZ-KIT Lite system, refer to the online Help.

For detailed information on how to program the ADSP-21371 SHARC processor, refer to the documents referenced in "Related Documents".

Package Contents

Your ADSP-21371 EZ-KIT Lite evaluation system package contains the following items.

- ADSP-21371 EZ-KIT Lite board
- *VisualDSP++ Installation Quick Reference Card*
- CD containing:
  - VisualDSP++ software
  - ADSP-21371 EZ-KIT Lite debug software
  - USB driver files

  - Example programs
  - ADSP-21371 *EZ-KIT Lite Evaluation System Manual* (this document)
- Universal 7V DC power supply
- USB 2.0 cable
- 3.5 mm stereo headphones
- 6-foot RCA audio cable
- 6-foot 3.5 mm/RCA x 2 Y-cable

If any item is missing, contact the vendor where you purchased your EZ-KIT Lite or contact Analog Devices, Inc.

Default Configuration

The EZ-KIT Lite evaluation system 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 EZ-KIT Lite boards in the protective shipping package.

The ADSP-21371 EZ-KIT Lite board is designed to run outside your personal computer as a stand-alone unit. You do not have to open your computer case.

When removing the EZ-KIT Lite board from the package, handle the board carefully to avoid the discharge of static electricity, which may damage some components.

To connect the EZ-KIT Lite board:

1. Remove the EZ-KIT Lite board from the package. Be careful when handling the board to avoid the discharge of static electricity, which may damage some components.
2. Figure 1-1 shows the default jumper settings, DIP switch, connector locations, and LEDs used in installation. Confirm that your board is set up in the default configuration before continuing.

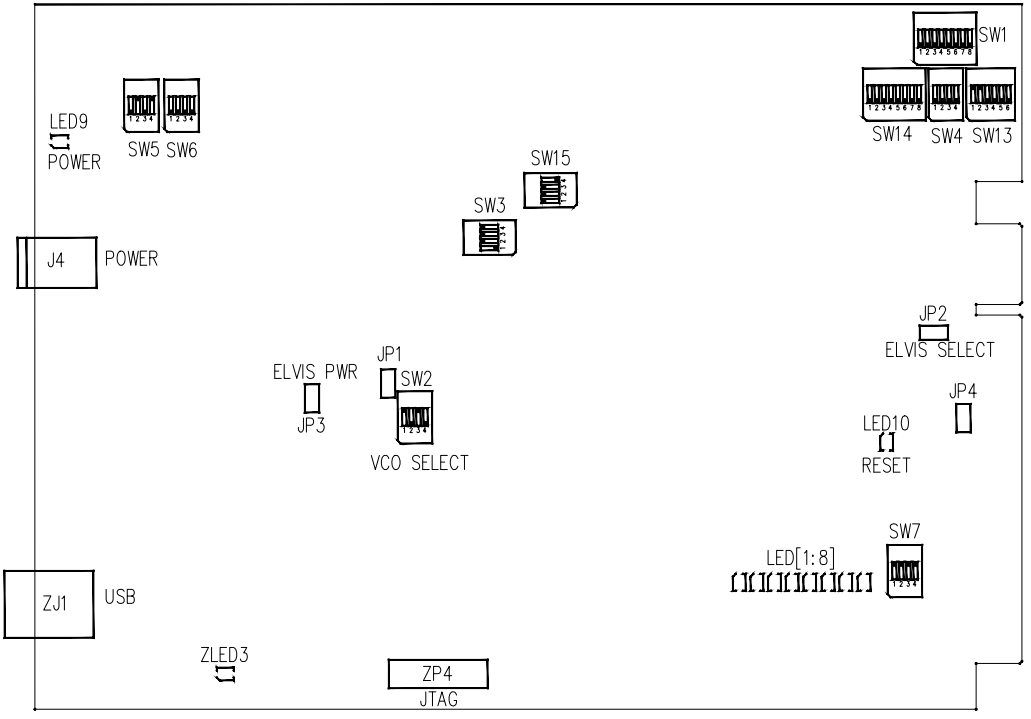

Figure 1-1. EZ-KIT Lite Hardware Setup

3. Plug the provided power supply into J4 on the EZ-KIT Lite board. Visually verify that the green power LED (LED9) is on. Also verify that the red reset LED (LED10) goes on for a moment and then goes off, and, finally, LED1 through LED8 are sequentially blinking.
4. Connect one end of the USB cable to an available full speed USB port on your PC and the other end to ZJ1 on the ADSP-21371 EZ-KIT Lite board.

Installation and Session Startup

For correct operation, install the software and hardware in the order presented in the *VisualDSP++ Installation Quick Reference Card*.

1. Verify that the yellow USB monitor LED (ZLED3, located near the USB connector) is lit. This signifies that the board is communicating properly with the host PC and is ready to run VisualDSP++.
2. If you are running VisualDSP++ for the first time, navigate to the VisualDSP++ environment via the **Start** –> **Programs** menu. The main window appears. Note that VisualDSP++ does not connect to any session. Skip the rest of this step to step 3.

   If you have run VisualDSP++ previously, the last opened session appears on the screen. You can override the default behavior and force VisualDSP++ to start a new session by pressing and holding down the **Ctrl** key while starting VisualDSP++. Do not release the **Ctrl** key until the **Session Wizard** appears on the screen. Go to step 4.

3. To connect to a new EZ-KIT Lite session, start **Session Wizard** by selecting one of the following.
    - From the **Session** menu, **New Session**.
    - From the **Session** menu, **Session List**. Then click **New Session** from the **Session List** dialog box.
    - From the **Session** menu, **Connect to Target**.
4. The **Select Processor** page of the wizard appears on the screen. Ensure **SHARC** is selected in **Processor family**. In **Choose a target processor**, select **ADSP-21371**. Click **Next**.
5. The **Select Connection Type** page of the wizard appears on the screen. Select **EZ-KIT Lite** and click **Next**.
6. The **Select Platform** page of the wizard appears on the screen. Ensure that the selected platform is **ADSP-21371 EZ-KIT Lite via Debug Agent**. Specify your own **Session name** for your session or accept the default name.

    The session name can be a string of any length; although, the box displays approximately 32 characters. The session name can include space characters. If you do not specify a session name, VisualDSP++ creates a session name by combining the name of the selected platform with the selected processor. The only way to change a session name later is to delete the session and open a new session. Click **Next**.
7. The **Finish** page of the wizard appears on the screen. The page displays your selections. Check the selections. If you are not satisfied, click **Back** to make changes; otherwise, click **Finish**. VisualDSP++

creates the new session and connects to the EZ-KIT Lite. Once connected, the main window's title is changed to include the session name set in step 6.

To disconnect from a session, click the disconnect button  or select **Session–>Disconnect from Target**.

To delete a session, select **Session –> Session List**. Select the session name from the list and click **Delete**. Click **OK**.

Evaluation License Restrictions

The ADSP-21371 EZ-KIT Lite installation is part of the VisualDSP++ installation. The EZ-KIT Lite is a licensed product that offers an unrestricted evaluation license for the first 90 days. Once the initial unrestricted 90-day evaluation license expires:

1. VisualDSP++ allows a connection to the ADSP-21371 EZ-KIT Lite via the USB Debug Agent interface only. Connections to simulators and emulation products are no longer allowed.
2. The linker restricts a user program to 5325 words of memory for code space with no restrictions for data space.

Refer to the *VisualDSP++ Installation Quick Reference Card* for details.

External Memory

The EZ-KIT Lite contains three types of memory: parallel flash (1 MB), SPI flash (2 Mbit), and SDRAM (128 Mbit). Flash memories can store user-specific boot code and allow the board to run as a stand-alone unit. For information on how to select a boot device for the processor, see "Boot Mode and Clock Ratio Select Switch (SW2)" on page 2-9.

Table 1-1 provides start and end addresses of the on-board external memories.

Table 1-1. EZ-KIT Lite Evaluation Board External Memory

Start Address	End Address	Content
0x00200000	0x9FFFFF	SDRAM memory (~MS0)
0x04000000	0x040FFFFF	Flash memory (~MS1)
0x08000000 0x08000000	0x08FFFFFF 0x0BFFFFFF	Unused chip select (~MS2) for non-SDRAM addresses Unused chip select (~MS2) for SDRAM address
0x0C000000 0x0C000000	0x0CFFFFFF 0x0FFFFFFF	Unused chip select (~MS3) for non-SDRAM addresses Unused chip select (~MS3) for SDRAM addresses

Parallel flash memory and SDRAM are connected to the external memory of the processor.

SDRAM memory is connected to the SDRAM controller of the processor. A set of programmable timing parameters is available to configure the SDRAM banks to support slower memory accesses. Care must be taken when configuring the SDRAM control registers. For more information regarding the SDRAM controller setup, refer to the *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21371).

An example program is included in the EZ-KIT Lite installation directory to demonstrate the controller setup.

SPI flash memory is connected to the SPI port of the processor; SPI flash designates:

- DPI pin 5 (DPI5) as a chip select
- DPI pin 3 (DPI3) as the SPI clock
- DPI pin 1 (DPI1) as the MOSI
- DPI pin 2 (DPI2) as the MISO

By default, the DPI is set up for SPI flash, and any required changes to SPI flash can be made by modifying the DPI interface of the processor. An example program is included in the EZ-KIT Lite installation directory to demonstrate SPI flash memory reads and writes.

Parallel flash memory is connected to the asynchronous memory controller of the processor. Each of their respective memory banks can be programmed independently with different timing parameters. For more information on changing wait states to speed up or slow down the asynchronous controller and other setup information, refer to the *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21371).

Example programs are included in the EZ-KIT Lite installation directory to demonstrate flash memory reads and writes.

ELVIS Interface

The ADSP-21371 EZ-KIT Lite board contains the National Instruments Educational Laboratory Virtual Instrumentation Suite interface. The interface features the DC voltage and current measurement modules, oscilloscope and bode analyzer modules, function generator, arbitrary waveform generator, and digital I/O.

The ELVIS interface is a LabVIEW-based design and prototype environment for university science and engineering laboratories. The ELVIS interface consists of LabVIEW-based virtual instruments, a multifunction data acquisition (DAQ) device, and a custom-designed bench-top workstation and prototype board. This combination provides a ready-to-use suite of instruments found in most educational laboratories. Because the interface is based on LabVIEW and provides complete data acquisition and prototyping capabilities, the system is ideal for academic coursework that range from lower-division classes to advanced project-based curriculums.

For more information on ELVIS and example demonstration programs, visit National Instruments Web site at www.ni.com.

Analog Audio

The AD1835A device is a high-performance, single-chip codec featuring four stereo digital-to-analog converters (DACs) for audio output and one stereo analog-to-digital converters (ADCs) for audio input. The codec can input and output data with a sample rate of up to 96 kHz on all channels. A 192 kHz sample rate can be used with one of the DAC channels.

The processor is interfaced with the AD1835A codec via the DAI port. The DAI pins can be configured to transfer serial data from the codec in either time-division multiplexed (TDM) or 2-wire interface mode (TWI). For more information about the AD1835A connection to the DAI, see "DAI Interface" on page 2-3.

The master input clock (MCLK) for the AD1835A codec can be generated by the on-board 12.288 MHz oscillator or supplied by one of the DAI pins of the processor. Using a DAI pin to generate the MCLK, as opposed to the on-board oscillator, allows synchronization of multiple devices in the system. It is possible to disable the on-board audio oscillator from driving the audio codec and the processor's input pin. For instructions on how to configure the clock, refer to "Codec Setup Switch (SW3)" on page 2-10.

The AD1835A codec can be configured as a master or a slave, depending on the DIP switch settings. In master mode, the codec drives the serial port clock and frame sync signals to the processor. In slave mode, the processor must generate and drive all of the serial port clock and frame sync signals. For more information, refer to "Codec Setup Switch (SW3)" on page 2-10.

The internal configuration registers of the AD1835A codec are configured using the SPI port of the processor. The DPI pin 4 (DPI4 register) is used as the select for the device. For information on how to configure the multichannel codec, refer to the product datasheet at http://www.analog.com/en/prod/0,2877,AD1835A,00.html.

The RCA connector (J10) is used to input analog audio. When using an electret microphone on this connector, configure switch SW4 according to the instructions in "Electret Microphone Select Switch (SW4)" on page 2-11. The four output channels are connected to the RCA connector (J5). Channel 4 of the codec connects to the headphone jack (J9). For more information, see "Connectors" on page 2-20.

Example programs are included in the EZ-KIT Lite installation directory to demonstrate how to configure and use the on-board analog audio interface.

LEDs and Push Buttons

The EZ-KIT Lite has eight general-purpose user LEDs and four general-purpose push buttons.

Two general-purpose push buttons are attached to the FLAG pins of the processor, while the other two are attached to the DAI pins. All of the push buttons are connected to the processor through a DIP switch (SW7). The DIP switch can disconnect the processor pins connected to the push buttons. See "Push Button Enable Switch (SW7)" on page 2-12 for instructions on how to disable a push button from driving its associated processor pin.

The state of the push buttons connected to the FLAG pins can be determined by reading the FLAG register. The push buttons connected to the DAI pins must be configured as interrupts. It is necessary to set up an

interrupt routine to determine each pin's state. Table 1-2 shows the push button and processor connections. Refer to the related example program shipped with the EZ-KIT Lite for more information.

Table 1-2. Push Button Connections

Push Button Label	Push Button Reference Designator	Processor Pin
PB1	SW8	FLAG1/~IRQ1
PB2	SW11	FLAG0/~IRQ0
PB3	SW10	DAI19
PB4	SW9	DAI20

Table 1-3 summarizes the LED connections to the processor. To use the LEDs connected to the DAI or DPI pins, configure the respective processor's registers. For more information, refer to the *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21371).

Table 1-3. LED Connections

LED Reference Designator	Processor Pin
LED1	DPI6
LED2	DPI7
LED3	DPI8
LED4	DPI13
LED5	DPI14
LED6	DAI15
LED7	DAI16
LED8	FLAG3/~MS3/~IRQ3

An example program is included in the EZ-KIT Lite installation directory to demonstrate functionality of the LEDs and push buttons.

Example Programs

Example programs are provided with the ADSP-21371 EZ-KIT Lite to demonstrate various capabilities of the product. The programs are installed with the VisualDSP++ software and can be found in the `<install_path>\213xx\Examples\ADSP-21371 EZ-KIT Lite` directory. Refer to a readme file provided with each example for more information.

Background Telemetry Channel

The USB debug agent supports the background telemetry channel (BTC), which facilitates data exchange between VisualDSP++ and the processor without interrupting processor execution.

The BTC allows you to read and write data in real time while the processor continues to execute. For increased performance of the BTC, including faster reading and writing, please check our latest line of processor emulators at: `http://www.analog.com/en/embedded-processing-dsp/sharc/USB-EMULATOR/products/product.html`. For more information about BTC, see the online help.

Reference Design Information

A reference design info package is available for download on the Analog Devices Web site. The package provides information on the design, layout, fabrication, and assembly of the EZ-KIT Lite and EZ-Board products.

The information can be found at: `http://www.analog.com/en/embedded-processing-dsp/sharc/processors/ez-kit-lite-design-database/resources/index.html`.

2 ADSP-21371 EZ-KIT LITE HARDWARE REFERENCE

This chapter describes the hardware design of the ADSP-21371 EZ-KIT Lite board.

The following topics are covered.

- "System Architecture" on page 2-2
  Describes the ADSP-21371 board configuration and explains how the board components interface with the processor.
- "Switches" on page 2-8
  Shows the locations and describes the on-board switches.
- "LEDs and Push Buttons" on page 2-14
  Shows the locations and describes the on-board LEDs and push buttons.
- "Jumpers" on page 2-17
  Shows the locations and describes the on-board configuration jumpers.
- "Connectors" on page 2-20
  Shows the locations and provides part numbers for the on-board connectors. In addition, the manufacturer and part number information is provided for the mating parts.

System Architecture

This section describes the processor's configuration on the EZ-KIT Lite board (Figure 2-1).

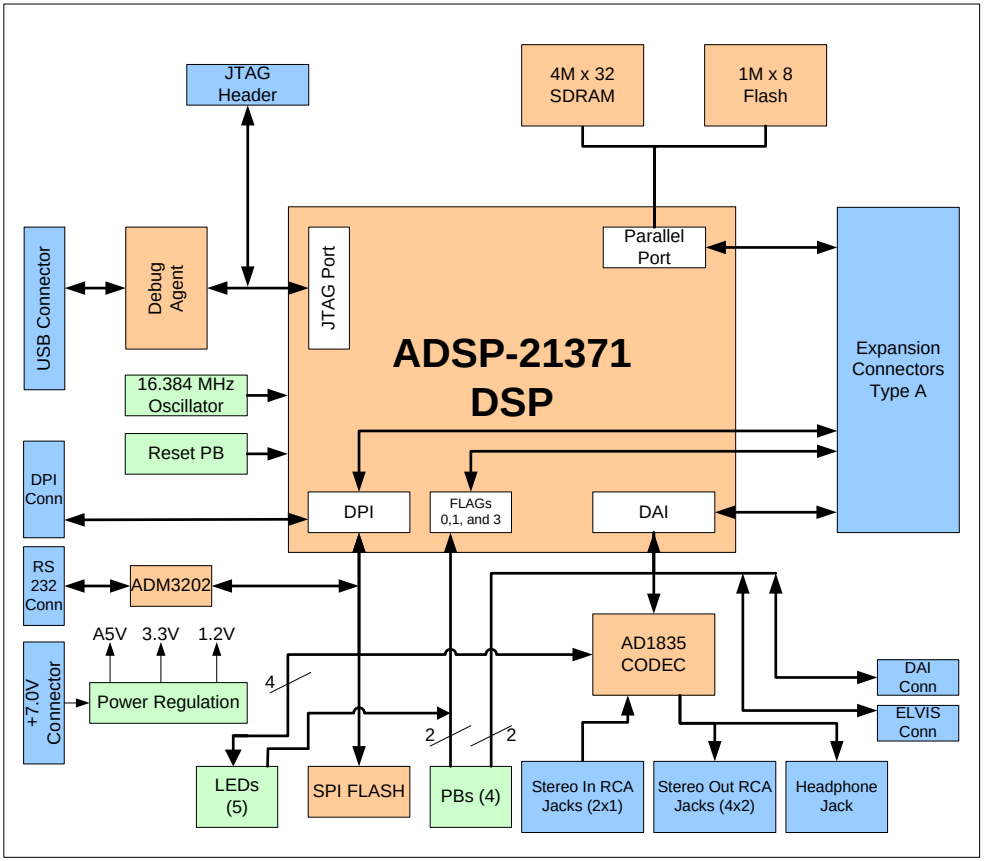

Figure 2-1. System Architecture Block Diagram

The EZ-KIT Lite is designed to demonstrate the ADSP-21371 processor capabilities. The processor core is powered at 1.2V, and the I/O is powered at 3.3V.

The CLKIN pin of the processor connects to a 16.384 MHz oscillator. The core frequency of the processor is derived by multiplying the frequency at the CLKIN pin by a value determined by the state of the processor pins CLKCFG1 and CLKCFG0. The value at these pins is determined by the state of switch SW2 (see "Boot Mode and Clock Ratio Select Switch (SW2)" on page 2-9). By default, the EZ-KIT Lite provides a core frequency of 262.144 MHz. It is possible to change the speed of the processor by changing the value of the PMCTL register.

The SW2 switch also configures the boot mode of the processor. The EZ-KIT Lite is capable of EPROM/flash boot and SPI boot. By default, the EZ-KIT Lite boots from flash memory. For details, see "Boot Mode and Clock Ratio Select Switch (SW2)" on page 2-9.

External Port

The external port of the ADSP-21371 processor consists of a 24-bit address bus, 16-bit data memory bus, and control lines. The control lines are used to select, read, and write to external memory devices.

The external port connects to an 8-bit parallel flash memory and a 16-bit SDRAM memory. See "External Memory" on page 1-7 for more information about accessing flash and SDRAM memories.

All of the external port signals are available externally via the expansion interface connectors (J1–3). The pinout of the connectors can be found in "ADSP-21371 EZ-KIT Lite Schematic" on page B-1.

DAI Interface

The digital application interface (DAI) pins are connected to the signal routing unit (SRU) of the processor. The SRU is a flexible routing system, providing a large system of signal flows within the processor. In general, the SRU can route the DAI pins to different internal peripherals in various combinations.

The DAI pins are connected to the AD1835A audio codec, a 26-pin header, two RCA connectors, audio oscillator output, an external phase lock loop (PLL) circuit, two LEDs, and two push buttons. Figure 2-2 illustrates the EZ-KIT Lite's connections to the DAI interface.

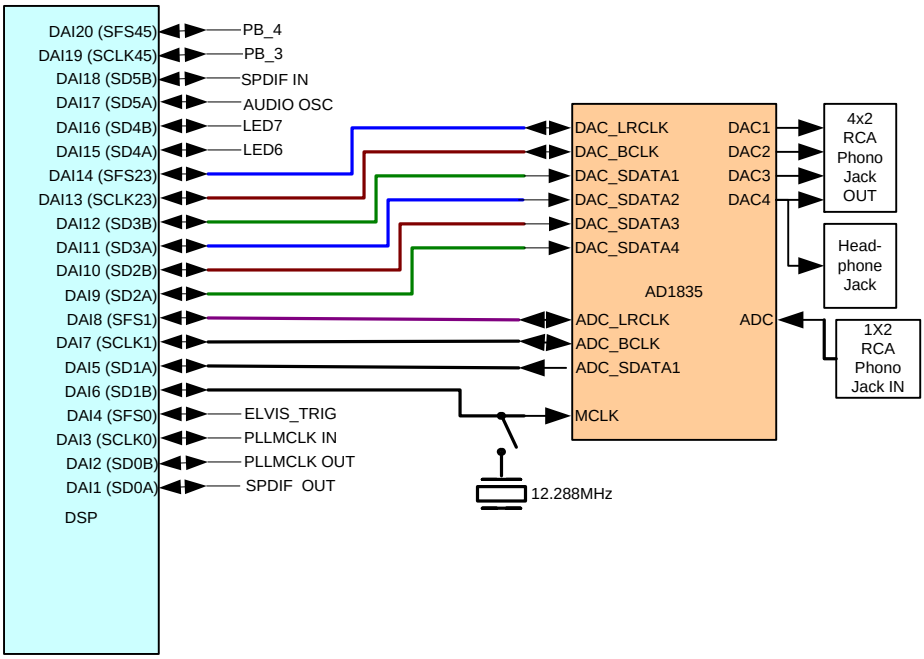

Figure 2-2. DAI Connections Block Diagram

To use the DAI for a different purpose, disable any signal driving a DAI pin with a switch (see "Codec Setup Switch (SW3)" on page 2-10). In addition, SW3 enables flexible routing of the 12.288 MHz audio oscillator's output signal. By default, the SW3 signal is used as the master clock (MCLK) for the AD1835A codec.

All of the DAI signals are available externally via the expansion interface connectors (J1–3) and 0.1" spaced header (P4). The pinout of the connectors can be found in "ADSP-21371 EZ-KIT Lite Schematic" on page B-1.

DPI Interface

The digital peripheral interface (DPI) pins are connected to a second signal routing unit of the processor (SRU2). The SRU2 unit, similar to the SRU, is a flexible routing system, providing a large system of signal flows within the processor. In general, the SRU2 can route the DPI pins to different internal peripherals in various combinations.

The DPI pins are connected to the SPI flash memory, SPI of the AD1835A codec, a UART, a 20-pin header, and five LEDs. Figure 2-3 illustrates the EZ-KIT Lite's connections to the DPI interface.

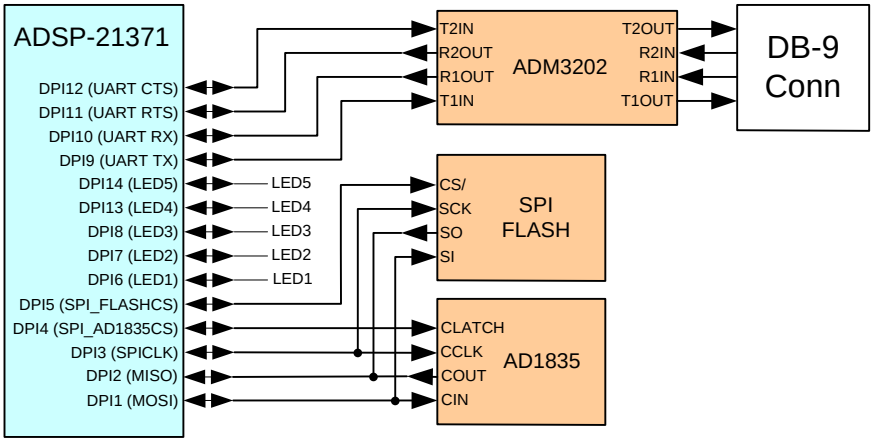

Figure 2-3. DPI Connections Block Diagram

To use the DPI for a different purpose, disable any signal driving a DPI pin with a switch (see "UART Enable Switch (SW5)" on page 2-11). Any DPI pin connected to a LED can be used without having to disconnect the pin. You can, however, see the respective LED turn ON and OFF when the signal is used elsewhere on the board.

All of the DPI signals are available externally via the expansion interface connectors (J1–3) and 0.1" spaced header (P3). The pinout of the connectors can be found in "ADSP-21371 EZ-KIT Lite Schematic" on page B-1.

FLAG Pins

The processor has four general-purpose I/O flag pins. Table 2-1 describes the flag pin connections.

Table 2-1. I/O FLAG Pins

Processor FLAG Pin	EZ-KIT Lite Function
FLAG0	Push button (SW2) input
FLAG1	Push button (SW2) input
FLAG2	SDRAM chip select
FLAG3	LED8

For information on how to disable a push button from driving its associated flag pin, see "Push Button Enable Switch (SW7)" on page 2-12.

The FLAG signals are available externally via the expansion interface connectors (J1–3). The pinout of the connectors can be found in "ADSP-21371 EZ-KIT Lite Schematic" on page B-1.

External PLL

The ADSP-21371 EZ-KIT Lite contains an external phase lock loop to help generate a faster and more stable master input clock, MCLK. The PLL uses DAI pin 3 as an input clock from the ADSP-21371 processor. The new clock generated by PLL connects to the processor via DAI pin 2.

Example programs are included in the EZ-KIT Lite installation directory to demonstrate how to configure and use the board's external PLL.

Expansion Interface

The expansion interface consists of three 90-pin connectors. Table 2-2 shows the interfaces each connector provides. For the exact pinout of the connectors, refer to "ADSP-21371 EZ-KIT Lite Schematic" on page B-1. The mechanical dimensions of the connectors can be obtained from Technical or Customer Support.

Table 2-2. Expansion Interface Connectors

Connector	Interfaces
J1	5V, ADDR23-0, DATA31-0
J2	3.3V, FLAG3-0, DAIP20-1, DPI14-1, SDRAM control signals
J3	5V, 3.3V, reset, parallel port control signals

Limits to current and interface speed must be taken into consideration when using the expansion interface. The maximum current limit is dependent on the capabilities of the used regulator. Additional circuitry also can add extra loading to signals, decreasing their maximum effective speed.

Analog Devices does not support and is not responsible for the effects of additional circuitry.

JTAG Emulation Port

The JTAG emulation port allows an emulator to access the internal and external memory of the processor through a 6-pin interface. The JTAG emulation port of the processor also connects to the USB debugging interface. When an emulator connects to the board at ZP4, the USB debugging interface is disabled. This is not a standard connection of the JTAG interface.

For information about the standard connection of the interface, see *EE-68* published on the Analog Devices Web site. For more information about the JTAG connector, see "JTAG Header (ZP4)" on page 2-24. To learn more about SHARC processor emulators, go to `http://www.analog.com/processors/sharc/evaluationDevelopment/crosscore/index.html`.

Switches

This section describes operation of the on-board switches. The switch locations and default settings are shown in Figure 2-4.

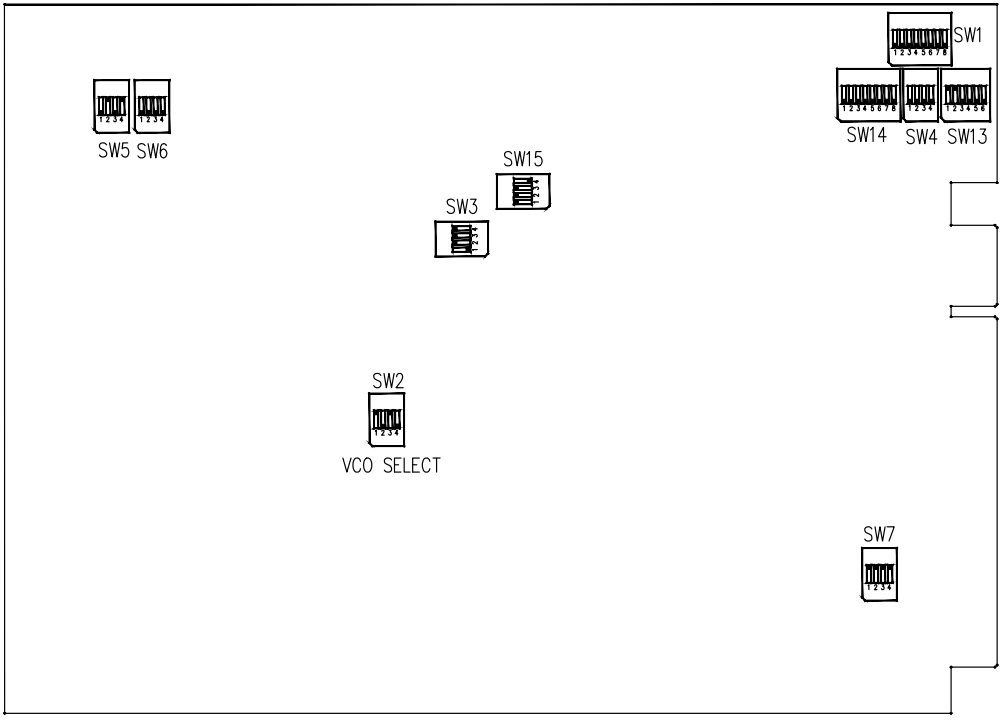

Figure 2-4. Switch Locations and Default Settings

Boot Mode and Clock Ratio Select Switch (SW2)

The SW2 switch sets the boot mode and lock multiplier ratio of the processor. Table 2-3 shows how to set up the boot mode using SW2 positions 1 and 2. By default, the EZ-KIT Lite boots in external port mode from flash memory.

Table 2-3. Boot Mode Configuration

BOOTCFG0 Pin (Position 1)	BOOTCFG1 Pin (Position 2)	Boot Mode
ON	ON	SPI slave boot
ON	**OFF**	**Parallel flash boot (default)**
OFF	ON	SPI master boot
OFF	OFF	Reserved

Table 2-4 shows how to set up the clock multiply ratio using SW2 positions 3 and 4. By default, the processor increases the clock multiply ratio by sixteen, setting the core clock to 262.144 MHz.

Table 2-4. Core Clock Rate Configuration

CLKCFG0 (Position 3)	CLKCFG1 (Position 4)	Core to CLKIN Ratio
ON	ON	6:1
ON	**OFF**	**16:1 (default)**
OFF	ON	32:1
OFF	OFF	Reserved

The core clock frequency can be increased or decreased via software by writing to the PMCTL register. For more information on changing the core clock frequency and other setup information, refer to the *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21371).

Codec Setup Switch (SW3)

The codec setup switch (SW3) can be used to change the routing of some signals going to the AD1835A codec and set up the communication protocol of the codec.

SW3 positions 1 and 2 determine the clock routing for the audio oscillator to the codec and processor. Figure 2-5 illustrates how the switch positions 1 and 2 connect on the board. In the default position, route the DAI_P17 pin to DAI_P6 (in software) to clock the codec.

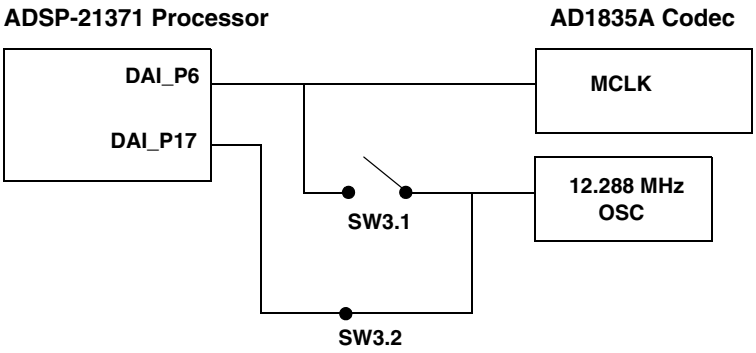

Figure 2-5. Audio Clock Routing

SW3 position 3 determines if the AD1835A device is a master or a slave. If the AD1835A is a master, the device's serial interface generates the frame sync and clock signals necessary to transfer data. When the device is a slave, the processor must generate the frame sync and clock signals. By default, position 3 is ON, and the AD1835A codec generates the control signals.

SW3 position 4 disconnects the AD1835A's ADC_DATA pin from the DAI. This is useful when the DAI is connected to another device.

Electret Microphone Select Switch (SW4)

To connect an electret microphone to audio input, place all positions of SW4 ON. The default switch position is all OFF. When SW4 is all ON, a DC offset of 2.5V is added to the signal, and gain of the input amplifiers is changed from 1x to 10x.

UART Enable Switch (SW5)

The UART enable switch (SW5) disconnects the UART signals from the DPI pins of the processor. When SW5 is OFF, its associated DPI signal (see Table 2-5) can be used on the expansion interface.

Table 2-5. UART Enable Switch (SW5)

Switch Position	EZ-KIT Lite Signal	Processor Signal
1 (**OFF**[1])	CTS	DPI12
2 (**ON**)	RX	DPI10
3 (**OFF**)	RTS	DPI11
4 (**ON**)	T2IN tied to R2OUT	N/A

1 Bold typeface denotes the default setting.

Loopback Test Switches (SW6 and SW14)

The loopback test switch (SW6) is located at the top left side of the board. The second loopback test switch (SW14) is located at the top right side of the board. These switches are used for testing only; all switch positions should remain OFF.

Push Button Enable Switch (SW7)

The push button enable switch (SW7) disconnects the push buttons from their respective processor pins. This allows the signals to be used elsewhere on the board. Table 2-6 shows the switch connections. By default, all positions of SW7 are ON, and the push buttons function as designed.

Table 2-6. Push Button Enable Switch (SW7)

Switch Position	Push Button Label	Push Button Reference Designator	Processor Pin
1	PB1	SW8	FLAG1/~IRQ
2	PB2	SW11	FLAG0/~IRQ0
3	PB3	SW10	DAI19
4	PB4	SW9	DAI20

ELVIS Oscilloscope Configuration Switch (SW1)

The oscilloscope configuration switch (SW1) determines which audio circuit signals connect to channels A and B of the oscilloscope. The switch is used only when the board is connected to the Educational Laboratory Virtual Instrumentation Suite (ELVIS) station; see "ELVIS Interface" on page 1-9. Each channel must have only one signal selected at a time, as described in Table 2-7.

Table 2-7. Oscilloscope Configuration Switch (SW1)

Channel	Switch Position	Audio Circuit Signal
A	1 (**OFF**[1])	AMP_LEFT_IN
A	2 (**OFF**)	AMP_RIGHT_IN
A	3 (**OFF**)	LEFT_OUT
A	4 (**OFF**)	RIGHT_OUT
B	5 (**OFF**)	AMP_LEFT_IN

Table 2-7. Oscilloscope Configuration Switch (SW1) (Cont'd)

Channel	Switch Position	Audio Circuit Signal
B	6 (**OFF**)	AMP_RIGHT_IN
B	7 (**OFF**)	LEFT_OUT
B	8 (**OFF**)	RIGHT_OUT

1 Bold typeface denotes the default settings.

ELVIS Function Generator Configuration Switch (SW13)

The function generator configuration switch (SW13) controls which signals connect to the left and right input signals of the audio interface. The SW13 switch is used only when the board is connected to the ELVIS station; see "ELVIS Interface" on page 1-9. Each channel must have only one signal selected at a time, as described in Table 2-8.

Table 2-8. ELVIS Function Generator Configuration Switch (SW13)

Channel	Switch Position	Audio Signal
AMP_LEFT_IN	1 (**ON**[1])	LEFT_IN
AMP_RIGHT_IN	2 (**ON**)	RIGHT_IN
AMP_LEFT_IN	3 (**OFF**)	DAC0
AMP_RIGHT_IN	4 (**OFF**)	DAC1
AMP_LEFT_IN	5 (**OFF**)	FUNCT_OUT
AMP_RIGHT_IN	6 (**OFF**)	FUNCT_OUT

1 Bold typeface denotes the default settings.

AD1835A and Flash Disconnect Switch (SW15)

The AD1835A and flash disconnect switch (SW15) disconnects the following signals: DPI4_SPI_AD1835_CS, DAIP8_ADC_LRCLK, and DPI5_SPI_FLASH_CS. The switch is used only on the expansion interface. By default, SW15 positions 1–3 are ON and position 4 is OFF.

LEDs and Push Buttons

This section describes the on-board LEDs and push buttons. The LED and push button locations are shown in Figure 2-6.

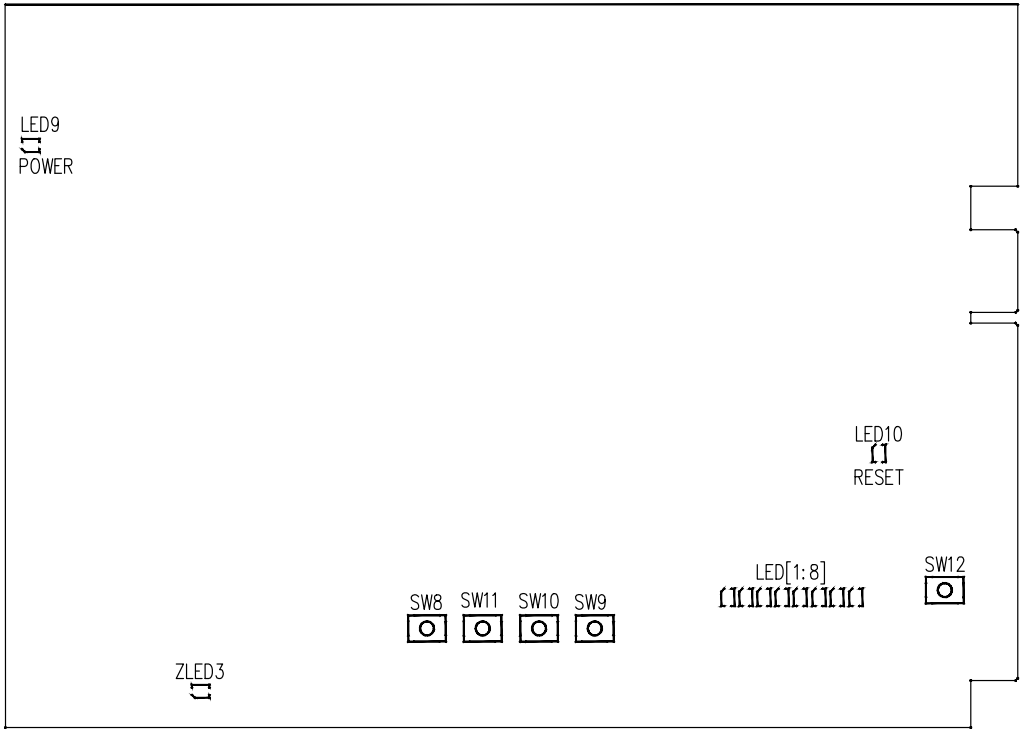

Figure 2-6. LED and Push Button Locations

General Purpose LEDs (LED1–8)

There are eight general-purpose LEDs on the board. Five LEDs are connected to the DPI interface, two LEDs are connected to the DAI interface, and one LED is connected to FLAG3 of the processor. "LEDs and Push Buttons" on page 1-11 summarizes the LED connections. To use an LED connected to the DAI or DPI, program its respective register on the processor. For more information on how to program the registers, refer to the *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21371).

Power LED (LED9)

When LED9 is lit (green), it indicates that power is supplied to the board.

Reset LED (LED10)

When LED10 is lit (red), a master reset of all the major ICs is active.

USB Monitor LED (ZLED3)

The USB monitor LED (ZLED3) indicates that USB communication has been initialized successfully, and you can connect to the processor using a VisualDSP++ EZ-KIT Lite session. Once the USB cable is plugged into the board, it takes approximately 15 seconds for the USB monitor LED to light. If the LED does not light, try cycling power on the board and/or reinstalling the USB driver (see the *VisualDSP++ Installation Quick Reference Card*).

When VisualDSP++ is actively communicating with the EZ-KIT Lite target board, the LED can flicker, indicating communications handshake.

Push Buttons (SW8–11)

Four push buttons (SW8–11) are provided for general-purpose user input. Two push buttons are connected to the FLAG pins of the processor, while the other two are connected to the DAI of the processor. The push buttons are active high and, when pressed, send a high (1) to the processor. Refer to "LEDs and Push Buttons" on page 1-11 for more information. The push button enable switch (SW7) is capable of disconnecting the push buttons from corresponding processor pins. Refer to "Push Button Enable Switch (SW7)" on page 2-12 for more information.

The push buttons and corresponding processor signals are summarized in Table 2-9.

Table 2-9. Push Button Connections

Push Button Label	Push Button Reference Designator	Processor Pin
PB1	SW8	FLAG1/~IRQ1
PB2	SW11	FLAG0/~IRQ0
PB3	SW10	DAI19
PB4	SW9	DAI20

Board Reset Push Button (SW12)

The RESET push button (SW12) resets all of the ICs on the board. The only exception is the USB interface chip. The chip is not reset when the push button is pressed after the USB cable has been plugged in and communication initialized correctly with the PC. After USB communication has been initialized, the only way to reset the USB is by powering down the board.

Jumpers

This section describes functionality of the configuration jumpers. The jumper locations are shown in Figure 2-7.

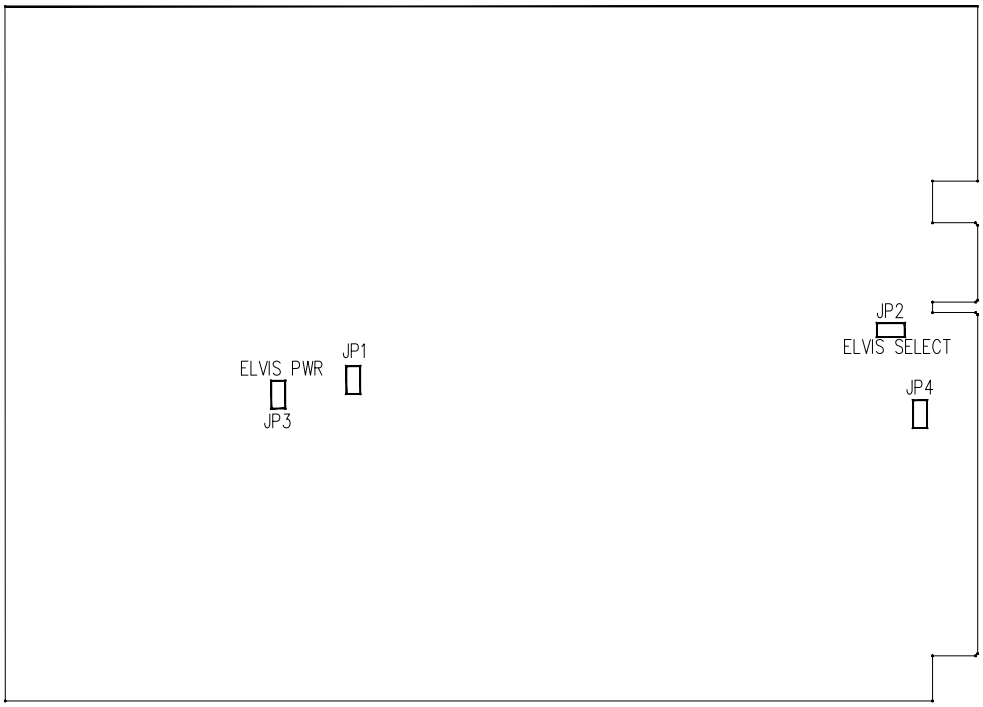

Figure 2-7. Jumper Locations

VCO Select Jumper (JP1)

The voltage-controlled oscillator (VCO) select jumper (JP1) configures the frequency selection of the on-board external PLL (U39). When JP1 is installed, the VCO output frequency is multiplied by a factor of 1.0. Conversely, when uninstalled, the VCO output frequency is multiplied by a factor of 0.5 or divided in half. The jumper settings are shown in Table 2-10.

Table 2-10. VCO Select Jumper (JP1)

JP1 Setting	Mode
OFF	**VCO output frequency x ½ (default)**
ON	VCO output frequency x 1.0

ELVIS Select Jumper (JP2)

The ELVIS select jumper (JP2) configures the EZ-KIT Lite's connection to an ELVIS station (see "ELVIS Interface" on page 1-9). When JP2 is installed, connections to the push buttons and LED are re-directed to the ELVIS station instead of the processor. The jumper settings are shown in Table 2-11.

Table 2-11. ELVIS Select Jumper (JP2)

JP2 Setting	Mode
OFF	**Not connected to an ELVIS station (default)**
ON	Connected to an ELVIS station

ELVIS Voltage Selection Jumper (JP3)

The ELVIS voltage selection jumper (JP3) is used to select the power source for the EZ-KIT Lite. In a standard mode of operation, the board receives its power from an external power supply. When JP3 is installed, the board is powered from an ELVIS station, and no external power supply is required. The jumper settings are shown in Table 2-12.

Table 2-12. ELVIS Voltage Selection Jumper (JP3)

JP3 Setting	Mode
OFF	**Powered from an external power supply (default)**
ON	Powered from an ELVIS station

The external power supply must be disconnected from the board when JP3 is installed to avoid potential damage to the EZ-KIT Lite board and ELVIS unit.

ELVIS Programmable Flag Jumper (JP4)

The ELVIS programmable flag jumper (JP4) connects the ADSP-21371 processor's DAI4 pin to the ELVIS trigger pin. When JP4 is installed, the pin is connected to the ELVIS TRIG1_2 pin directly. Conversely, when JP4 is uninstalled, the pin is disconnected and can be used for another non-ELVIS operation. The jumper settings are shown in Table 2-13.

Table 2-13. ELVIS Select Jumper (JP4)

JP4 Setting	Mode
OFF	**DAI4 disconnected from the ELVIS TRIG pin (default)**
ON	DAI4 connected to the ELVIS TRIG pin

Connectors

This section describes connector functionality and provides information about mating connectors. The connector locations are shown in Figure 2-8.

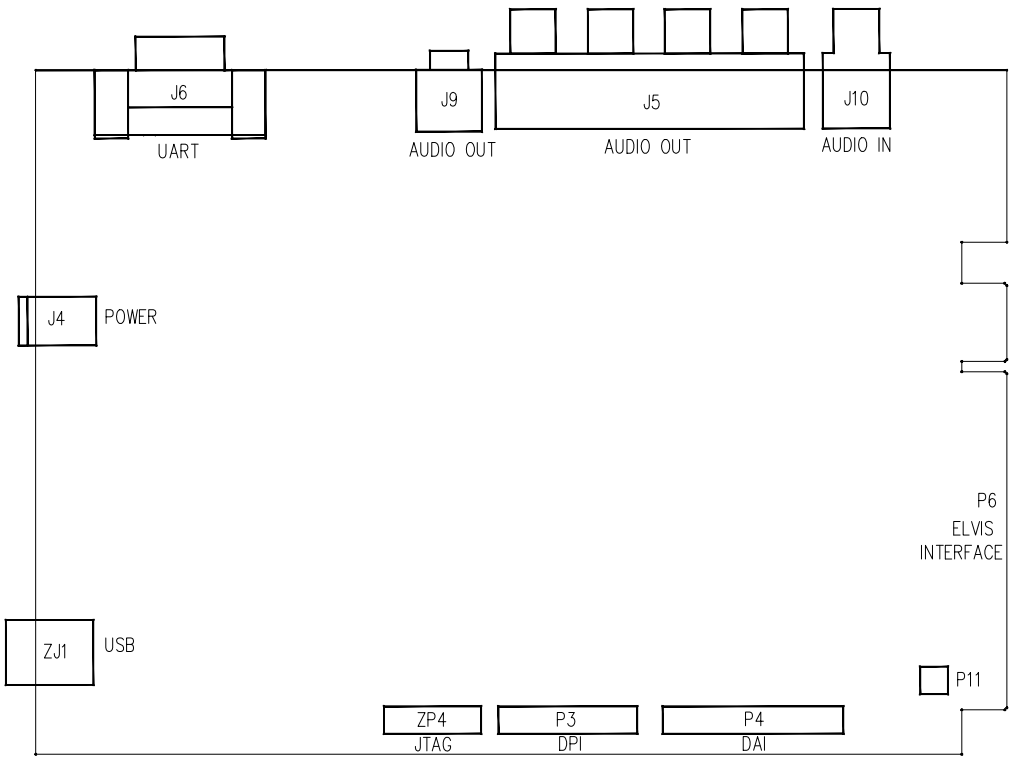

Figure 2-8. Connector Locations

Expansion Interface Connectors (J1–3)

Three board-to-board connectors (J1–3) provide signals for most peripheral interfaces of the processor. The connectors are located at the bottom of the board. For more information about the expansion interface, see "Expansion Interface" on page 2-7. For the connector availability and pricing, contact Samtec.

Part Description	Manufacturer	Part Number
90-position 0.05" spacing, SMT	SAMTEC	SFC-145-T2-F-D-A
Mating Connectors		
90-position 0.05" spacing (through hole)	SAMTEC	TFM-145-x1 series
90-position 0.05" spacing (surface mount)	SAMTEC	TFM-145-x2 series
90-position 0.05" spacing (low cost)	SAMTEC	TFC-145 series

Audio In RCA Connector (J10)

Part Description	Manufacturer	Part Number
Two-channel right angle RCA jack	SWITCHCRAFT	PJRAS1X2S02
Mating Cable		
Two-channel RCA interconnect cable	MONSTER CABLE	BI100-1M

Audio Out RCA Connector (J5)

Part Description	Manufacturer	Part Number
Four-channel right angle RCA jack	SWITCHCRAFT	PJRAS4X2U01

Part Description	Manufacturer	Part Number
Mating Cable		
Two-channel RCA interconnect cable	MONSTER CABLE	BI100-1M

Headphone Out Jack (J9)

Part Description	Manufacturer	Part Number
3.5 mm stereo jack	A/D ELECTRONICS	ST-323-5

Power Jack (J4)

The power connector (J4) provides all of the power necessary to operate the EZ-KIT Lite board.

Part Description	Manufacturer	Part Number
2.5 mm power jack	SWITCHCRAFT DIGI-KEY	RAPC712X-ND
Mating Power Supply (shipped with EZ-KIT Lite)		
7V power supply	CUI INC.	DMS070214-P6P-SZ

The power connector supplies DC power to the EZ-KIT Lite board. The power supply specifications are shown in Table 2-14.

Table 2-14. Power Supply Specifications

Terminal	Connection
Center pin	+7 VDC@2.14A
Outer ring	GND

S/PDIF Coax Connectors (J7 and J8)

Part Description	Manufacturer	Part Number
Coaxial	SWITCHCRAFT	PJRAN1X1U01
Mating Cable		
Two-channel RCA interconnect cable	MONSTER CABLE	BI100-1M

DPI Header (P3)

The DPI connector (P3) provides access to all of the DPI signals in the from of a .1" spacing header. When using the header to access the DPI pins of the processor, ensure that signals, which normally drive the DPI pins, are disabled. For more information, see "DPI Interface" on page 2-5.

Part Description	Manufacturer	Part Number
20-pin IDC header	FCI	68737-420HLF

DAI Header (P4)

The DAI connector (P4) provides access to all of the DAI signals in the from of a .1" spacing header. When using the header to access the DAI pins of the processor, ensure that signals, which normally drive the DAI pins, are disabled. Refer to "Codec Setup Switch (SW3)" on page 2-10 for more information on how to disable signals already being driven from elsewhere on the EZ-KIT Lite.

Part Description	Manufacturer	Part Number
26-pin IDC header	BERG	4102-T08-13LF

JTAG Header (ZP4)

The JTAG header (ZP4) is the connecting point for a JTAG in-circuit emulator pod. When an emulator connects to the JTAG header, the USB debug interface is disabled.

Pin 3 is missing to provide keying. Pin 3 in the mating connector should have a plug.

When using an emulator with the EZ-KIT Lite board, follow the connection instructions provided with the emulator.

Part Description	Manufacturer	Part Number
14-pin IDC header	FCI	68737-414HLF

A ADSP-21371 EZ-KIT LITE BILL OF MATERIALS

The bill of materials corresponds to "ADSP-21371 EZ-KIT Lite Schematic" on page B-1.

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
1	1	74LVC14A SOIC14	U40	TI	74LVC14AD
2	1	IDT74FCT3244A PY SSOP20	U37	IDT	IDT74FCT3244APYG
3	1	12.288MHZ OSC003	U1	EPSON	SG-8002CA MP
4	1	LT1765 SOIC8	VR1	LINEAR TECH	LT1765ES8#PBF
5	1	MT48LC4M32B2 TSOP86	U36	DIGI-KEY	557-1196-1-ND
6	1	GTL2002 TSSOP8	U39	PHILIPS	GTL2002DP-T
7	1	SN74LVC1G08 SOT23-5	U18	TI	SN74LVC1G08DBVR
8	1	TLC2932 TSSOP14	U38	TI	TLC2932IPWG4
9	1	SN65LVDS2D SOIC8	U2	NATIONAL SEMI	DS90LV018ATM
10	1	16.384MHZ OSC003	U28	EPSON	SG-8002CA-MPT
11	1	FDC658P SOT23-6	U3	FAIRCHILD	FDC658P

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
12	1	SI7601DN ICS010	U45	VISHAY	SI7601DN
13	1	21371 M25P20 U29	U29	ST	M25P20-VMN6TP
14	1	21371 AM29LV081B U35	U35	AMD	AM29LV081-70ED
15	1	ADM708SARZ SOIC8	U23	ANALOG DEVICES	ADM708SARZ
16	1	AD8532ARZ SOIC8	U19	ANALOG DEVICES	AD8532ARZ
17	2	ADP3336ARMZ MSOP8	VR3-4	ANALOG DEVICES	ADP3336ARMZ-REEL7
18	1	ADM3202ARNZ SOIC16	U32	ANALOG DEVICES	ADM3202ARNZ
19	8	AD8606ARZ SOIC8	U8-15	ANALOG DEVICES	AD8606ARZ
20	1	AD1835AASZ MQFP52	U31	ANALOG DEVICES	AD1835AASZ
21	2	AD623ARMZ USOIC8	U5-6	ANALOG DEVICES	AD623ARMZ
22	2	AD820ARZ SOIC8	U33-34	ANALOG DEVICES	AD820ARZ
23	1	ADSP-21371KSWZ MQFP208	U44	ANALOG DEVICES	ADSP-21371KSWZ-2B
24	2	ADG774ABRQZ QSOP16	U24-25	ANALOG DEVICES	ADG774ABRQZ
25	2	ADP1864AUJZ SOT23-6	VR5-6	ANALOG DEVICES	ADP1864AUJZ-R7
26	5	RUBBER FOOT	M1-5	MOUSER	517-SJ-5018BK

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
27	1	PWR 2.5MM_JACK CON005	J4	SWITCH-CRAFT	RAPC712X
28	1	RCA 4X2 CON011	J5	SWITCH-CRAFT	PJRAS4X2U01X
29	1	RCA 1X1 CON012	J8	SWITCH-CRAFT	PJRAN1X1U01X
30	5	MOMENTARY SWT013	SW8-12	PANASONIC	EVQ-PAD04M
31	3	.05 45X2 CON019	J1-3	SAMTEC	SFC-145-T2-F-D-A
32	2	DIP8 SWT016	SW1,SW14	C&K	TDA08H0SB1
33	1	DIP6 SWT017	SW13	CTS	218-6LPST
34	7	DIP4 SWT018	SW2-7,SW15	ITT	TDA04HOSB1
35	1	DB9 9PIN DB9F	J6	TYCO	5747844-4
36	1	RCA RCA_1X2 CON031	J10	SWITCH-CRAFT	PJRAS1X2S02X
37	4	IDC 2X1 IDC2X1	JP1-4	FCI	90726-402HLF
38	1	IDC 10X2 IDC10X2	P3	BURG-FCI	54102-T08-10LF
39	1	2.5A RESETABLE FUS001	F1	RAYCHEM	SMD250F-2
40	1	IDC 2X2 IDC2X2	P11	FCI	68737-404HLF
41	1	3.5MM STEREO_JACK CON001	J9	DIGI-KEY	CP1-3525NG-ND
42	1	IDC 13X2 IDC13X2	P4	BERG	54102-T08-13LF

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
43	8	YELLOW LED001	LED1-8	PANASONIC	LN1461C
44	10	0.22UF 25V 10% 0805	C77,C91-92,C118-119, C152-154,C185-186	AVX	08053C224KAT2A
45	1	0.1UF 50V 10% 0805	C216	AVX	08055C104KAT
46	4	600 100MHZ 200MA 0603	FER2-5	DIGI-KEY	490-1014-2-ND
47	2	2A S2A DO-214AA	D3-4	VISHAY	S2A-E3
48	4	1UF 16V 10% 0805	C204,C207-209	KEMET	C0805C105K4RAC TU
49	1	10UF 25V +80-20% 1210	C215	DIGI-KEY	587-1393-2-ND
50	2	68UF 25V 20% CAP003	CT1-2	PANASONIC	EEE-FC1E680P
51	1	2A SL22 DO-214AA	D1	DIGI-KEY	SL22-E3/1GI-ND
52	2	0 1/10W 5% 0805	R195-196	VISHAY	CRCW08050000Z0EA
53	1	190 100MHZ 5A FER002	FER7	MURATA	DLW5BSN191SQ2
54	20	10UF 6.3V 10% 0805	C23-24,C57-58,C84-85, C111-114,C144-147, C151,C162-163,C176, C205-206	AVX	08056D106KAT2A
55	3	6.04K 1/10W 1% 0805	R28-30	DIGI-KEY	311-6.04KCRCT-ND
56	1	4.7UF 6.3V 10% 0805	C221	AVX	08056D475KAT2A
57	6	0.1UF 10V 10% 0402	C75-76,C168-171	AVX	0402ZD104KAT2A

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
58	82	0.01UF 16V 10% 0402	C4,C6-22,C25-30,C32-56,C59-63,C68-70,C78-83,C86-87,C90,C93, C100,C173,C177-178, C183,C188,C190-196, C201-202	AVX	0402YC103KAT2A
59	22	10K 1/16W 5% 0402	R5,R19-23,R25-26,R32-34,R132,R152-156, R161-162,R173-175	VISHAY	CRCW040210K0FKED
60	2	4.7K 1/16W 5% 0402	R1,R180	VISHAY	CRCW04024K70JNED
61	13	0 1/16W 5% 0402	R2-4,R7-8,R11-15,R107, R121,R138	PANASONIC	ERJ-2GE0R00X
62	2	22 1/16W 5% 0402	R124,R133	PANASONIC	ERJ-2GEJ220X
63	2	33 1/16W 5% 0402	R6,R27	VISHAY	CRCW040233R0JNEA
64	1	1.5UH 20% IND003	L2	COIL CRAFT	DO1608C-152MLC
65	1	100MA CMDSH-3 SOD-323	D2	GENERAL-SEMI	CMDSH-3-E3
66	1	0.18UF 25V 10% 0805	C218	AVX	08053C184KAT2A
67	1	100UF 10V 10% C	CT3	AVX	TPSC107K010R0075
68	2	1000PF 50V 5% 0402	C213-214	AVX	04025C102JAT2A
69	2	64.9K 1/10W 1% 0805	R190,R194	VISHAY	CRCW080564K9FKEA
70	2	210.0K 1/4W 1% 0805	R191,R193	VISHAY	CRCW0805210KFKEA

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
71	2	0.1UF 16V 10% 0603	C187,C189	AVX	0603YC104KAT2A
72	1	1UF 16V 10% 0603	C179	PANASONIC	ECJ-1VB1C105K
73	2	4.7UF 25V 20% 0805	C217,C220	AVX	0805ZD475KAT2A
74	2	68PF 50V 5% 0603	C2,C224	AVX	06035A680JAT2A
75	8	330PF 50V 5% 0603	C95,C101,C107,C116, C123,C129,C134,C142	AVX	06035A331JAT2A
76	2	470PF 50V 5% 0603	C5,C223	AVX	06033A471JAT2A
77	10	330 1/10W 5% 0603	R163-164,R168-172, R176-178	VISHAY	CRCW0603330RJNEA
78	7	0 1/10W 5% 0603	R18,R31,R126,R184, R186,R192,R202	PHYCOMP	232270296001L
79	4	10 1/10W 5% 0603	R157-160	VISHAY	CRCW060310R0JNEA
80	3	10.0K 1/16W 1% 0603	R125,R142,R148	DALE	CRCW060310K0FKEA
81	1	75.0K 1/16W 1% 0603	R131	VISHAY	CRCW060375K0FKEA
82	1	200.0K 1/16W 1% 0603	R134	VISHAY	CRCW0603200KFKEA
83	1	25.5K 1/16W 1% 0603	R150	DIGI-KEY	311-25.5KHRTR-ND
84	1	51.1K 1/16W 1% 0603	R197	VISHAY	CRCW060351K1FKEA
85	4	237.0 1/10W 1% 0603	R108-109,R122-123	DIGI-KEY	311-237HRTR-ND
86	2	750.0K 1/10W 1% 0603	R110,R116	DIGI-KEY	311-750KHRTR-ND

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
87	11	11.0K 1/10W 1% 0603	R39-40,R50,R58,R73, R81,R86,R97,R102, R115,R144	DIGI-KEY	311-11.0KHRTR-ND
88	20	5.49K 1/10W 1% 0603	R37,R41-42,R48,R51, R56,R59,R67,R72,R75, R80,R83-84,R87,R96, R99,R103-104,R113-114	DIGI-KEY	311-5.49KHRTR-ND
89	9	3.32K 1/10W 1% 0603	R36,R43,R49,R57,R74, R82,R85,R94,R130	DIGI-KEY	311-3.32KHRTR-ND
90	8	1.65K 1/10W 1% 0603	R44,R52,R60,R64,R71, R79,R88,R95	DIGI-KEY	311-1.65KHRTR-ND
91	10	49.9K 1/10W 1% 0603	R46,R55,R63,R66,R68, R76,R91-92,R119-120	DIGI-KEY	311-49.9KHRTR-ND
92	8	604.0 1/10W 1% 0603	R45,R54,R62,R65,R69, R77,R90,R93	NIC COM-PONENTS	NRC06F6040TRF
93	2	90.9K 1/10W 1% 0603	R146,R151	DIGI-KEY	311-90.9KHRTR-ND
94	2	0.1 1/10W 1% 0603	R143,R149	PANASONIC	ERJ-3RSFR10V
95	3	10.0K 1/10W 1% 0603	R145,R147,R182	DIGI-KEY	311-10.0KHRTR-ND
96	4	5.76K 1/10W 1% 0603	R111-112,R117-118	DIGI-KEY	311-5.76KHRTR-ND
97	12	100PF 50V 5% 0603	C94,C99,C105,C117, C125,C131-132,C140, C155,C161,C166-167	AVX	06035A101JAT2A
98	4	1000PF 50V 5% 0603	C156-157,C164-165	PANASONIC	ECJ-1VC1H102J
99	1	47.5K 1/10W 1% 0603	R183	DIGI-KEY	311-47.5KHRTR-ND
100	8	220PF 50V 5% 0603	C89,C97,C103,C109, C121,C127,C136,C139	PANASONIC	ECJ-1VC1H221J

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
101	12	680PF 50V 5% 0603	C96,C102,C108,C115, C122,C128,C135,C141, C148-149,C158,C160	PANASONIC	ECJ-1VC1H681J
102	9	2200PF 50V 5% 0603	C88,C98,C104,C110, C120,C126,C137-138, C219	PANASONIC	ECJ-1VB1H222K
103	8	2.74K 1/10W 1% 0603	R38,R47,R53,R61,R70, R78,R89,R98	DIGI-KEY	311-2.74KHRTR-ND
104	1	75.0 1/10W 1% 0603	R141	DALE	CRCW060375R0FKEA
105	4	1UF 6.3V 20% 0402	C197-200	PANASONIC	ECJ-0EB0J105M
106	4	100 1/16W 5% 0402	R165-167,R179	DIGI-KEY	311-100JRTR-ND
107	1	0.027UF 25V 5% 0603	C181	AVX	06033C273JAT2A
108	2	0.27UF 16V 20% 0603	C180,C182	AVX	0603YG274ZAT2A
109	2	2.05K 1/16W 1% 0402	R100-101	VISHAY	CRCW04022K05FKED
110	1	15.0K 1/16W 1% 0603	R140	DIGI-KEY	311-15.0KHRTR-ND
111	1	232.0 1/16W 1% 0603	R129	DIGI-KEY	311-232HRTR-ND
112	2	301.0 1/16W 1% 0603	R105-106	DIGI-KEY	311-301HRTR-ND
113	2	24.9K 1/10W 1% 0603	R17,R198	DIGI-KEY	311-24.9KHTR-ND
114	1	47UF 6.3V 10% B	CT5	NIC COMPONENTS	NTC-T476K6.3TRBF
115	1	511.0 1/16W 1% 0402	R135	DIGI-KEY	311-511LCT-ND

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
116	1	0.05 1/2W 1% 1206	R16	SEI	CSF 1/2 0.05 1%R
117	2	10UF 16V 10% 1210	C3,C225	AVX	1210YD106KAT2A
118	1	GREEN LED001	LED9	PANASONIC	LN1361CTR
119	1	RED LED001	LED10	PANASONIC	LN1261CTR
120	1	255.0K 1/10W 1% 0603	R35	VISHAY	CRCW06032553FK
121	2	80.6K 1/10W 1% 0603	R181,R199	DIGI-KEY	311-80.6KHRCT-ND
122	1	6.8UH 25% IND009	L3	DIGI-KEY	308-1328-1-ND
123	1	4A SSB43L DO-214AA	D5	VISHAY	SSB43L
124	4	5A MBRS540T3G SMC	D11-14	ON SEMI	MBRS540T3G
125	1	2.5UH 30% IND013	L4	COILCRAFT	MSS1038-252NLB
126	1	470UF 2.5V 20% D2E	CT7	SANYO	2R5TPE470MF
127	3	30A GSOT05 SOT23-3	D7-9	VISHAY	GSOT05-GS08
128	1	30A GSOT03 SOT23-3	D10	VISHAY	GSOT03-GS08
129	1	7A VESD01-02V-GS08 SOD-52	D6	VISHAY	VESD01-02V-GS08
130	2	0.03 1/2W 1% 1206	R200-201	SEI	CSF 1/2 0.03 1%R

ADSP-21371 EZ-KIT Lite Schematic

ANALOG DEVICES
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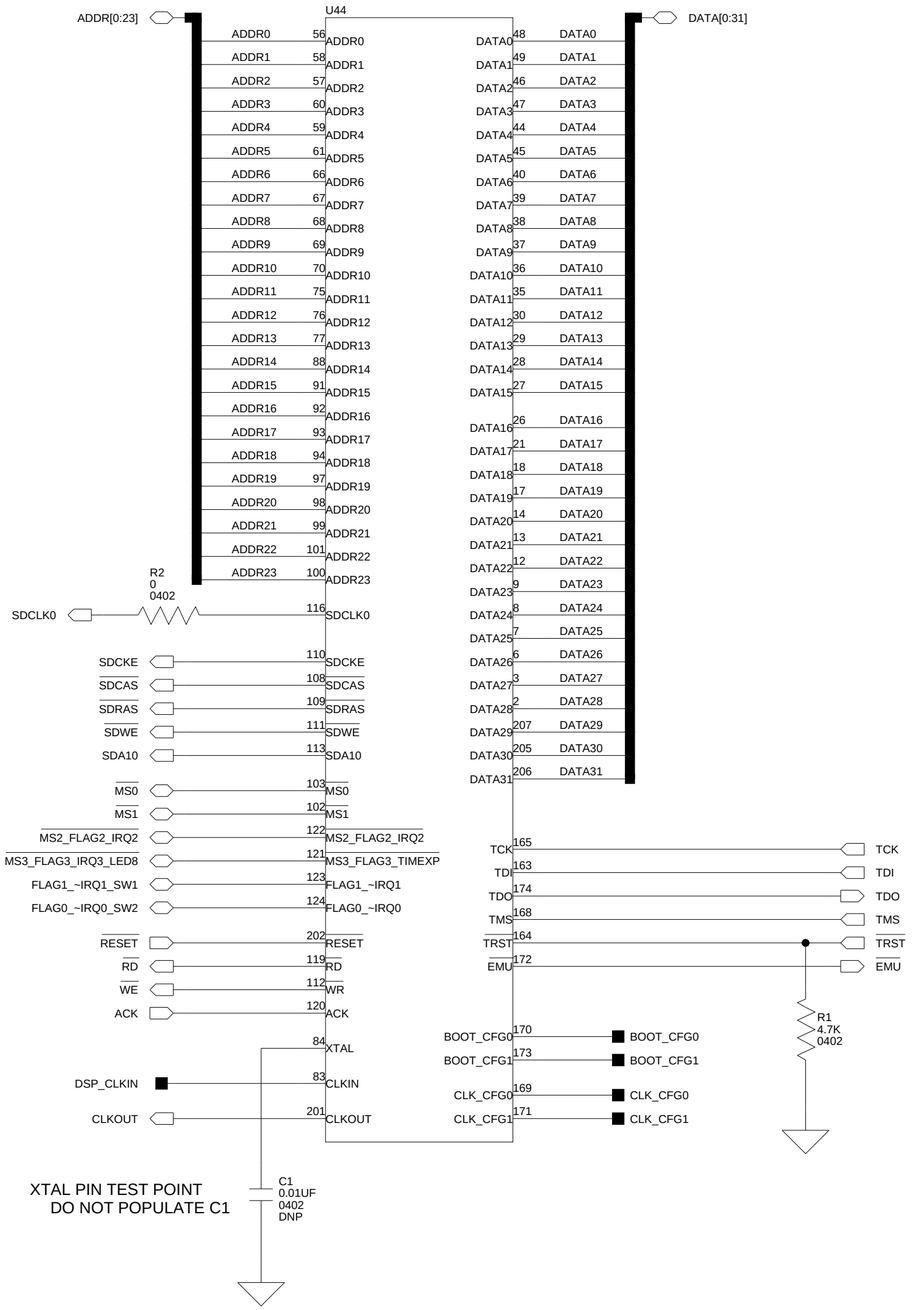
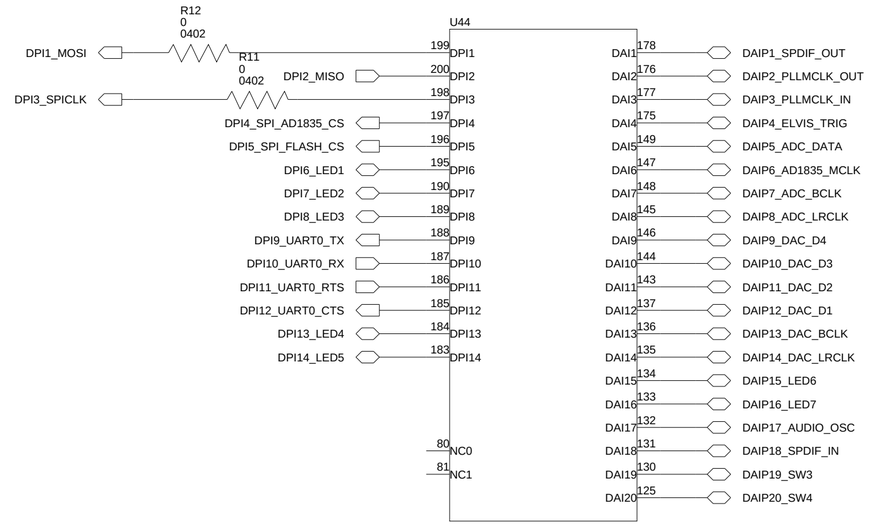
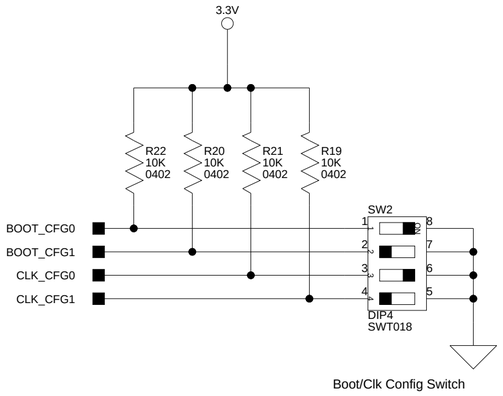
Title	ADSP-21371 EZ-KIT Lite TITLE		
Size C	**Board No.** AA0230-2009		**Rev** 1.0
Date 6-18-2009_9:54		**Sheet** 1 **of** 13	





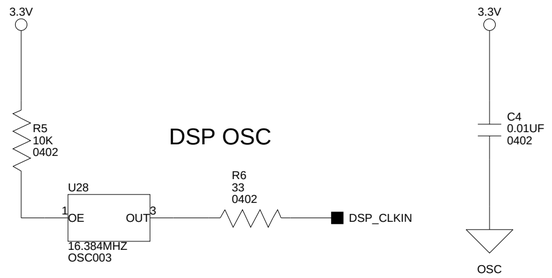
When designing your JTAG interface
please refer to the Engineer to Engineer
Note EE-68 which can be found at
http://www.analog.com



Boot/Clk Config Switch

SW2: BOOT/CLOCK RATIO SELECT
(Default: 1=ON, 2=OFF, 3=ON, 4=OFF)

1	2		
BOOTCFG0	BOOTCFG1	BOOTMODE	
ON	ON	SPI SLAVE BOOT	
ON	OFF	EPROM/FLASH BOOT	DEFAULT
OFF	ON	SPI MASTER BOOT	
OFF	OFF	RESERVED	
3	4	CLOCK RATIO	
CLKCFG0	CLKCFG1	CORE:CLKIN	
ON	ON	6:1	
ON	OFF	16:1	DEFAULT
OFF	ON	32:1	
OFF	OFF	RESERVED	



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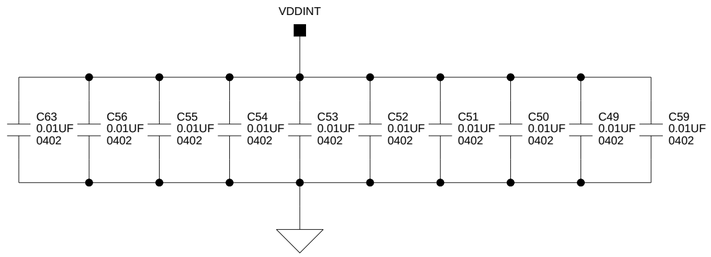
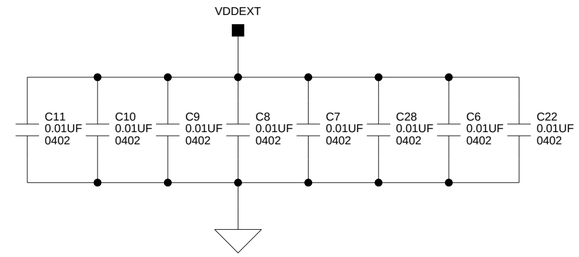
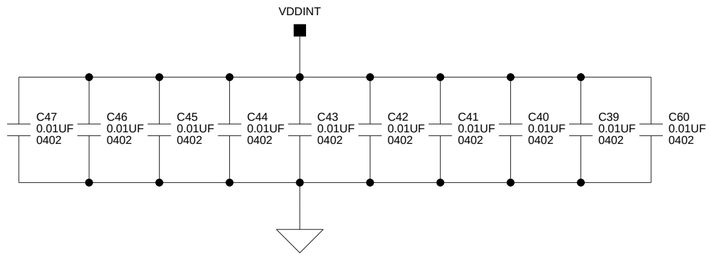
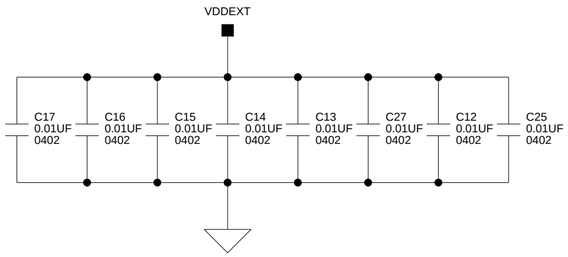
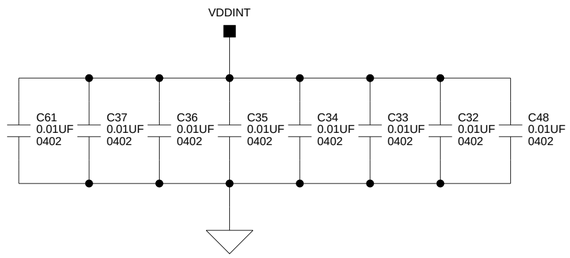
Title	ADSP-21371 EZ-KIT Lite DSP		
Size C	**Board No.** AA0230-2009		**Rev** 1.0
Date 6-18-2009_9:54		**Sheet** 2 **of** 13	

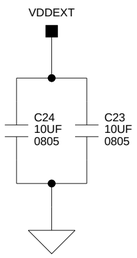


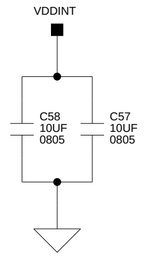


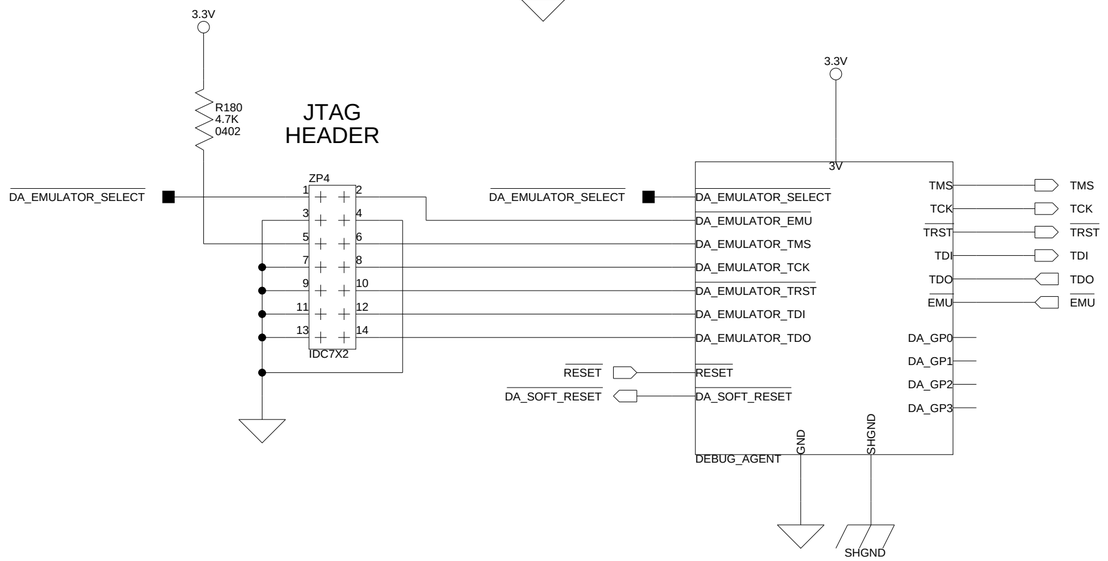










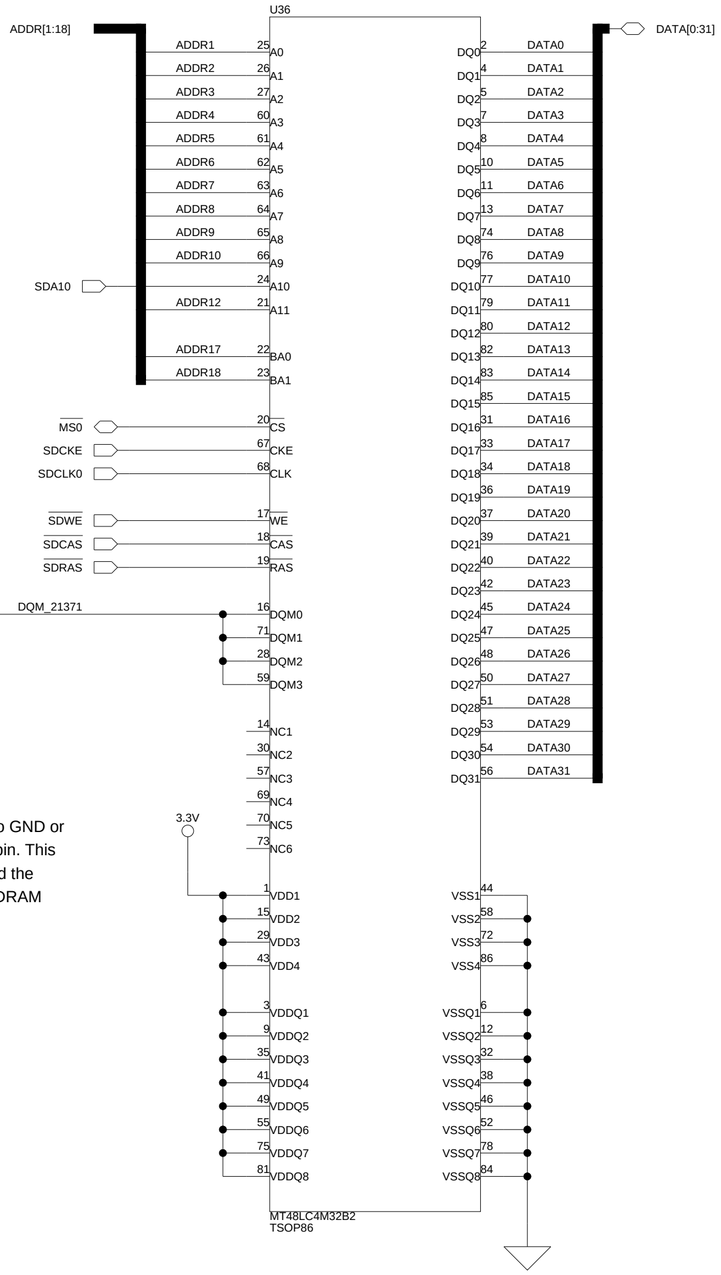


All USB interface circuitry is considered proprietary and has been omitted from this schematic.

When designing your JTAG interface please refer to the Engineer to Engineer Note EE-68 which can be found at http://www.analog.com

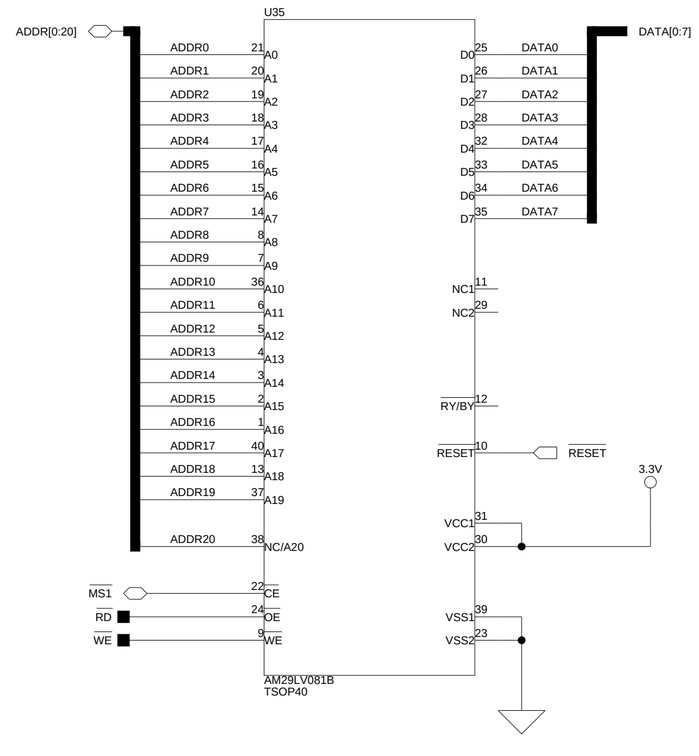
ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
Title	ADSP-21371 EZ-KIT Lite DSP 2	
Size C	**Board No.** AA0230-2009	**Rev** 1.0
Date 6-18-2009_9:54	**Sheet** 3 **of** 13	

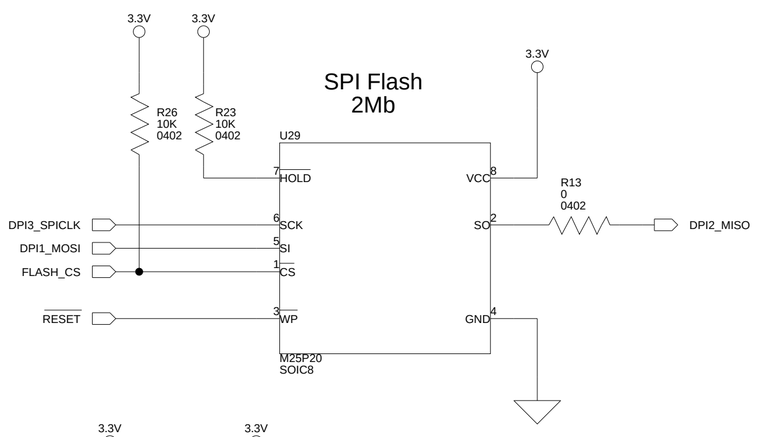
SDRAM
128Mb (1M x 32-bit x 4 Banks)

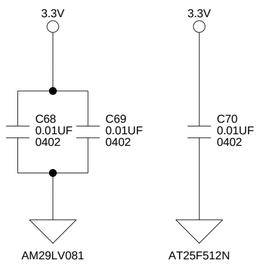


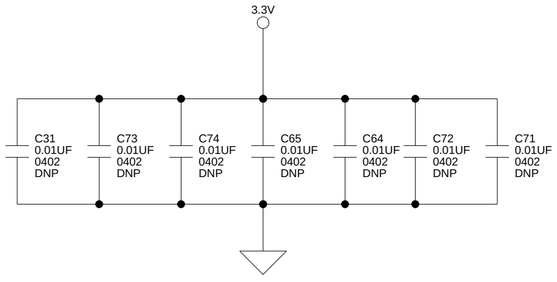
DQM signals are either tied to GND or driven by processor's FLAG pin. This is SDRAM device specific and the requirement is specified in SDRAM datasheets

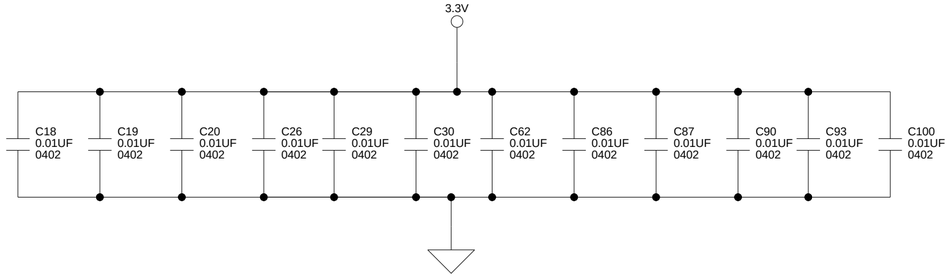
Flash
8Mb (1M x 8-bit)











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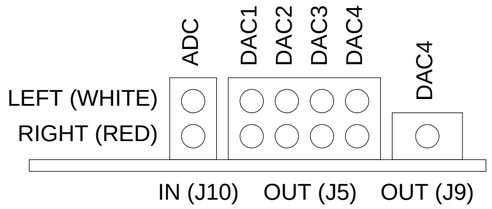
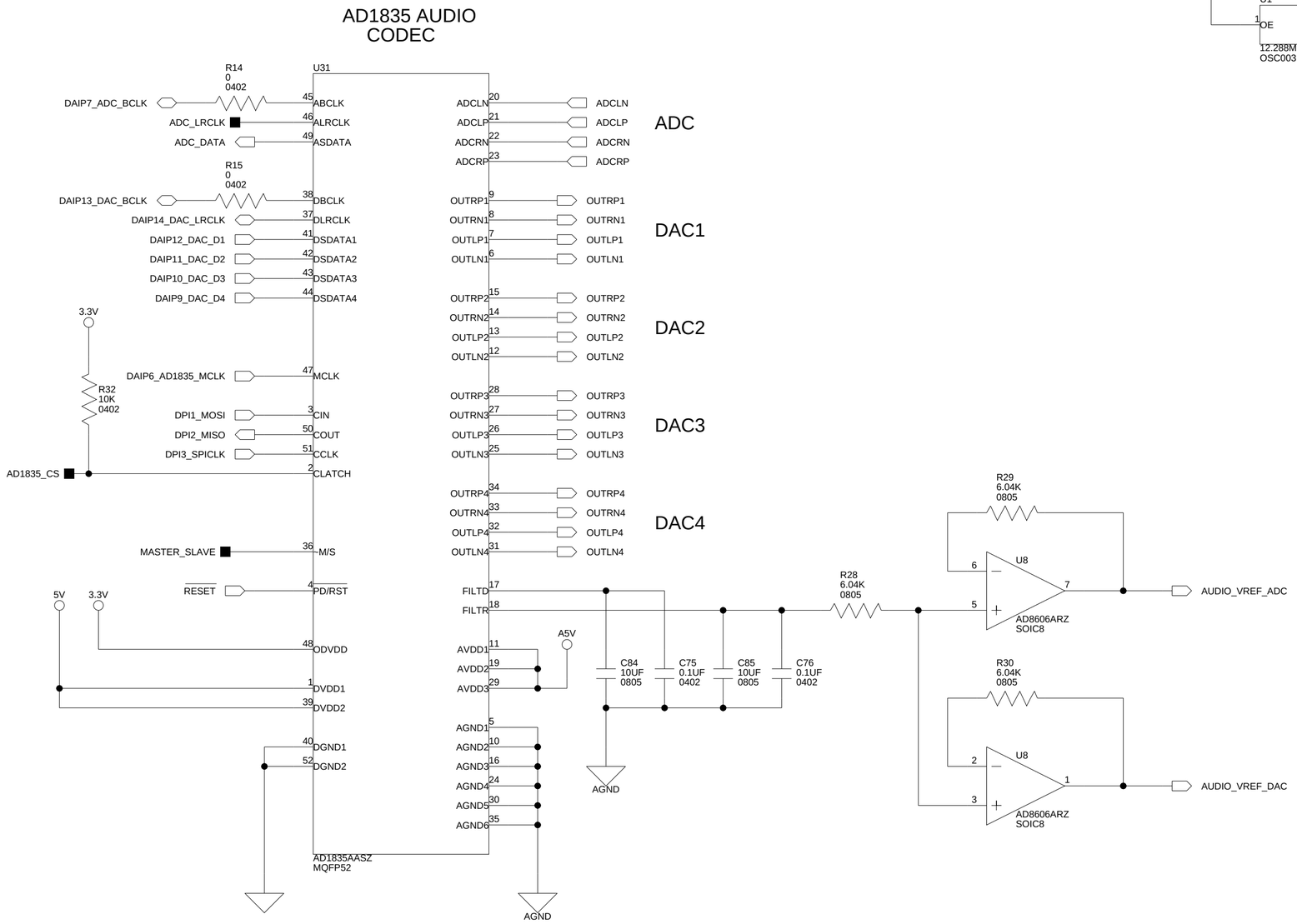
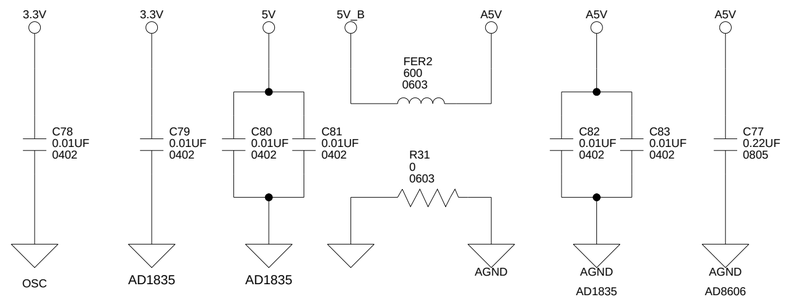
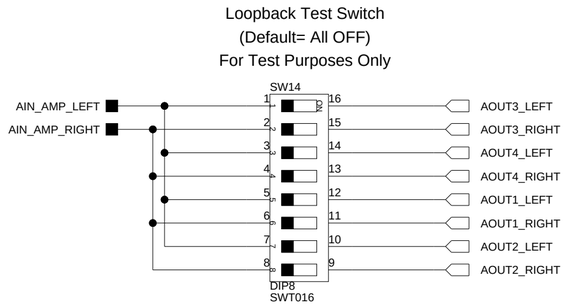
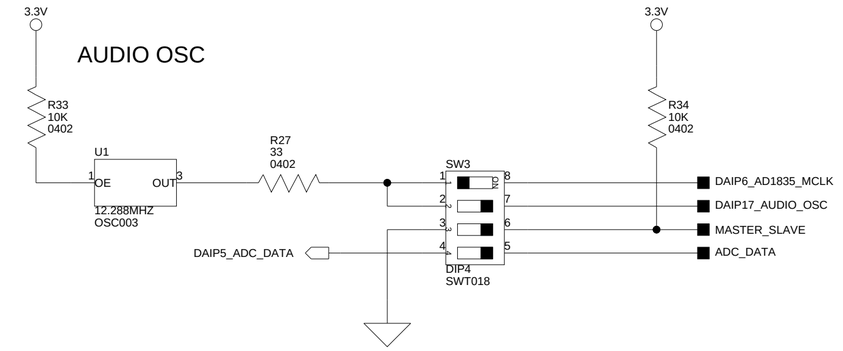
Title	ADSP-21371 EZ-KIT Lite MEMORY		
Size C	**Board No.** AA0230-2009		**Rev** 1.0
Date 8-12-2009_15:49		**Sheet** 4 **of** 13	







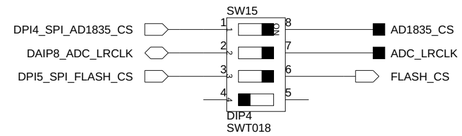




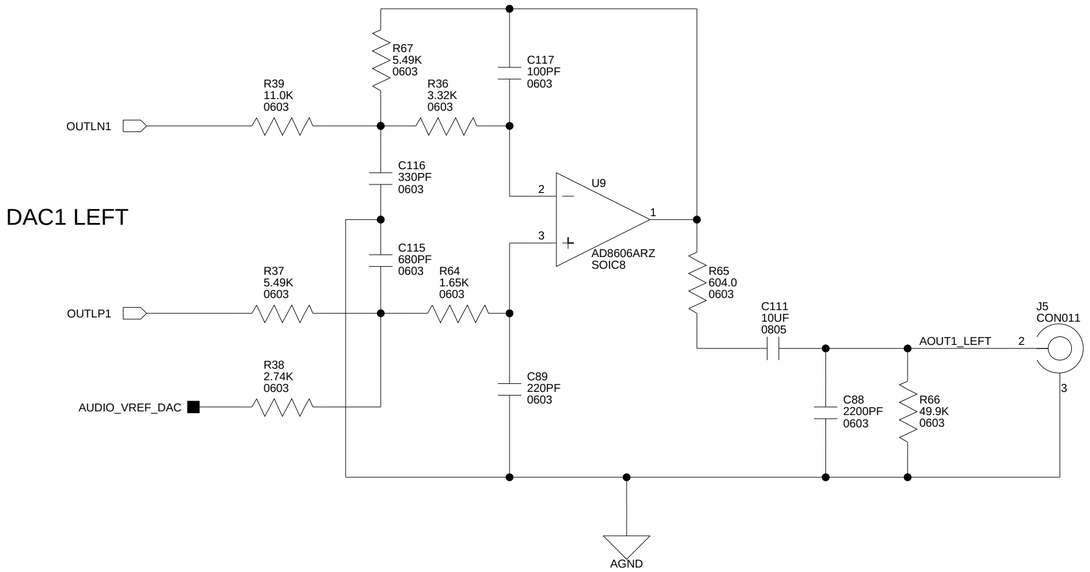
SW3: CODEC SETUP SWITCH
(Default: 1=OFF, 2=ON, 3=ON, 4=ON)

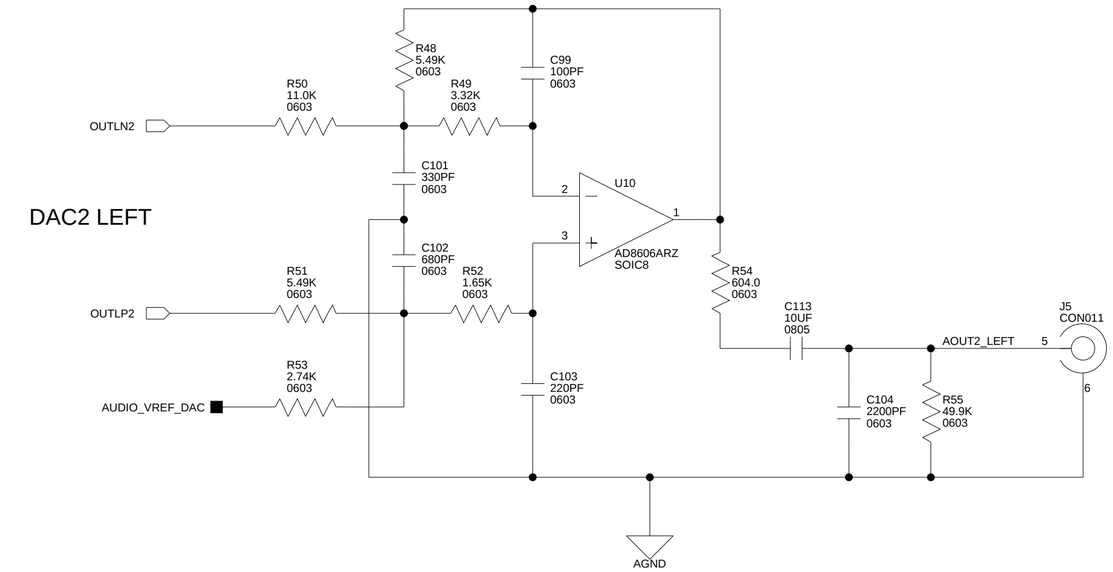
1-2	Connects or disconnects the audio oscillator depending on how the system is setup. See users manual for more information.
3	OFF = AD1835 is SLAVE ON = AD1835 is MASTER
4	Disconnects ADC_DATA signal from driving the corresponding DAI signal. Useful if using this DAI pin for another purpose.

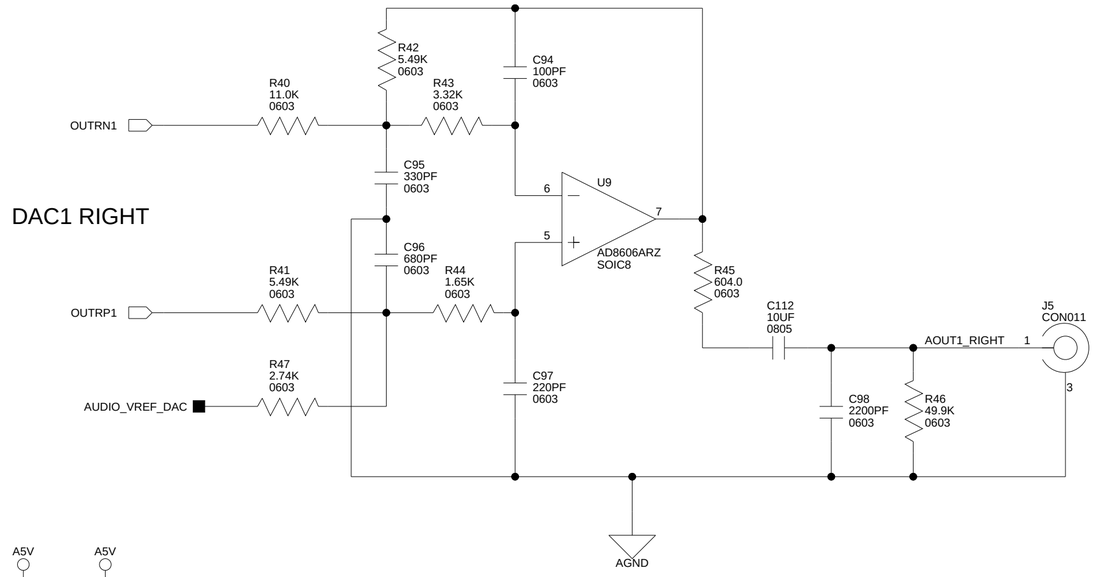
DISCONNECTS SPI FROM FLASH AND AD1835

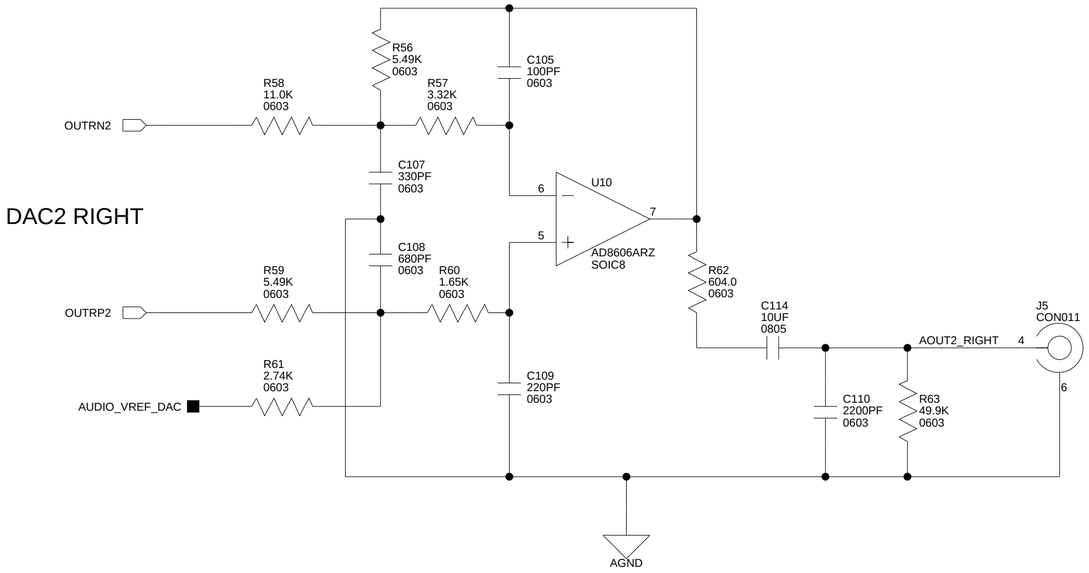


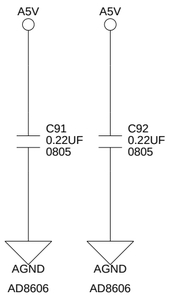
ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD		
Title	ADSP-21371 EZ-KIT Lite ANALOG AUDIO		
Size C	Board No. AA0230-2009		Rev 1.0
Date 6-18-2009_9:54		Sheet 5 of 13	





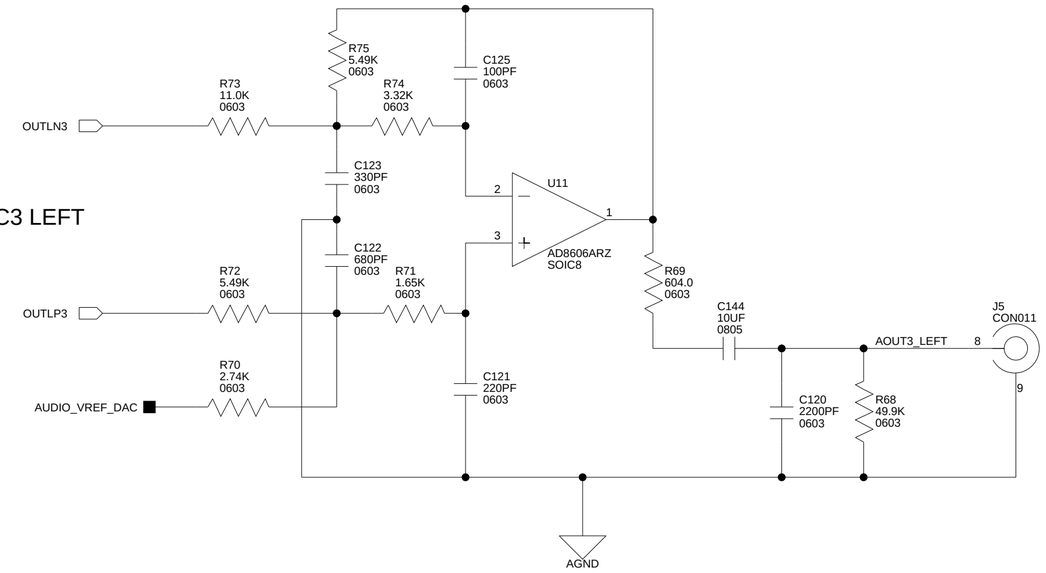






ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
Title	ADSP-21371 EZ-KIT Lite AUDIO OUT 1	
Size C	**Board No.** AA0230-2009	**Rev** 1.0
Date 6-18-2009_9:54	**Sheet** 6 **of** 13	

DAC3 LEFT



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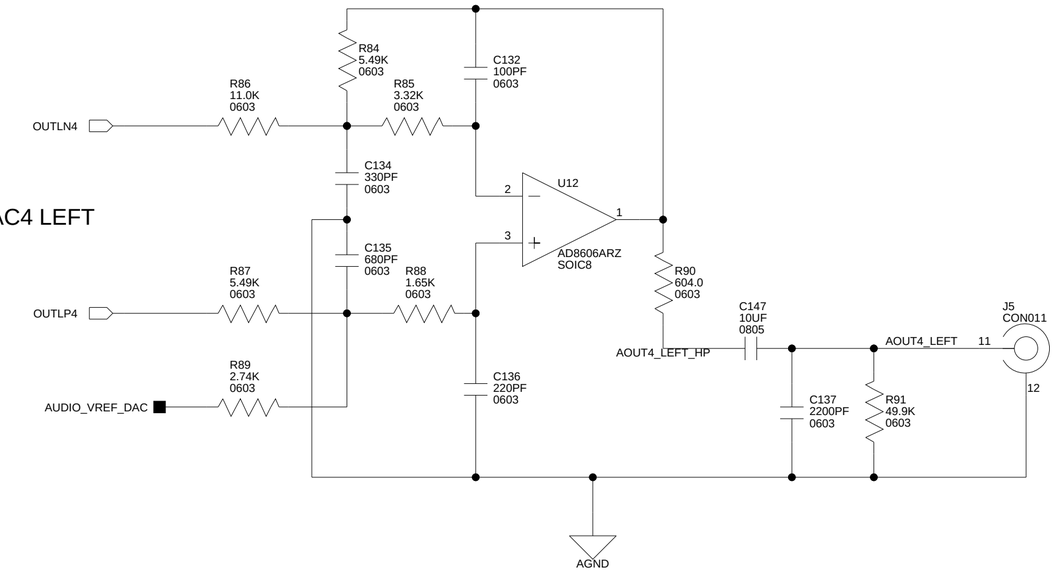

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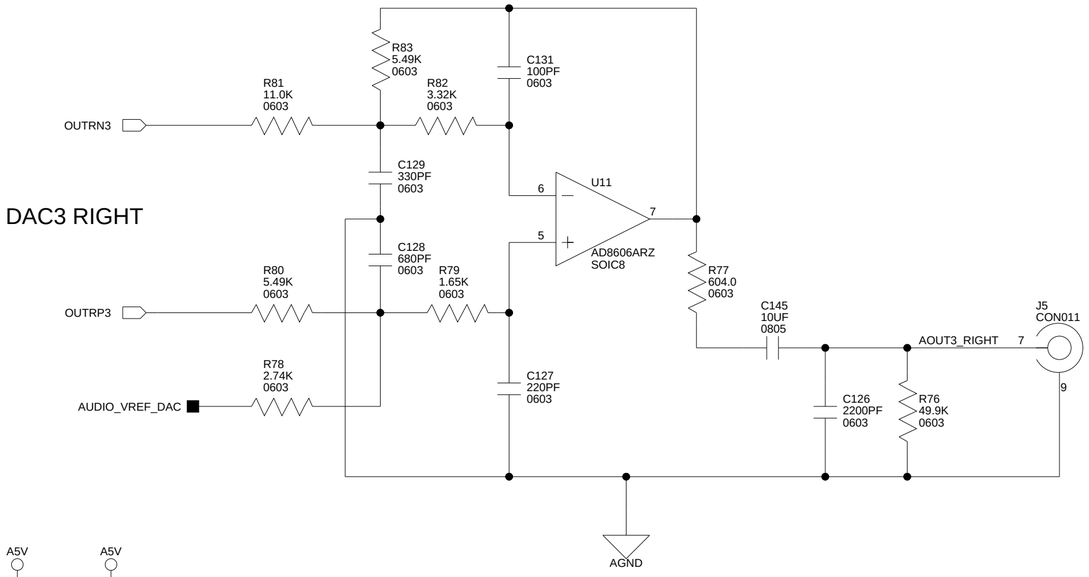

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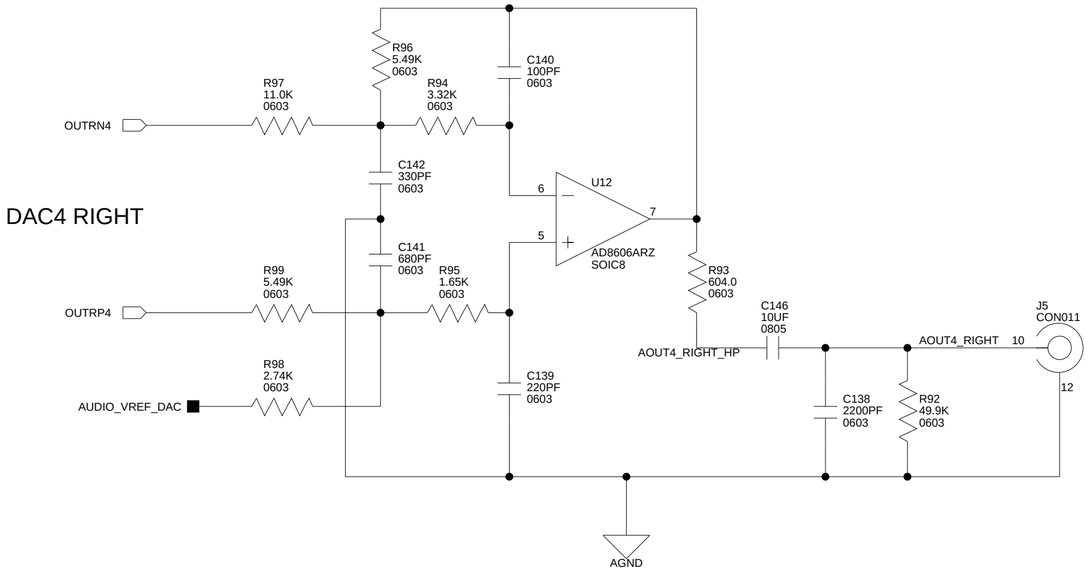
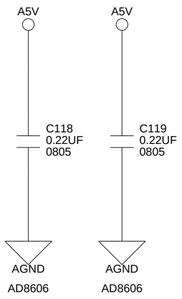
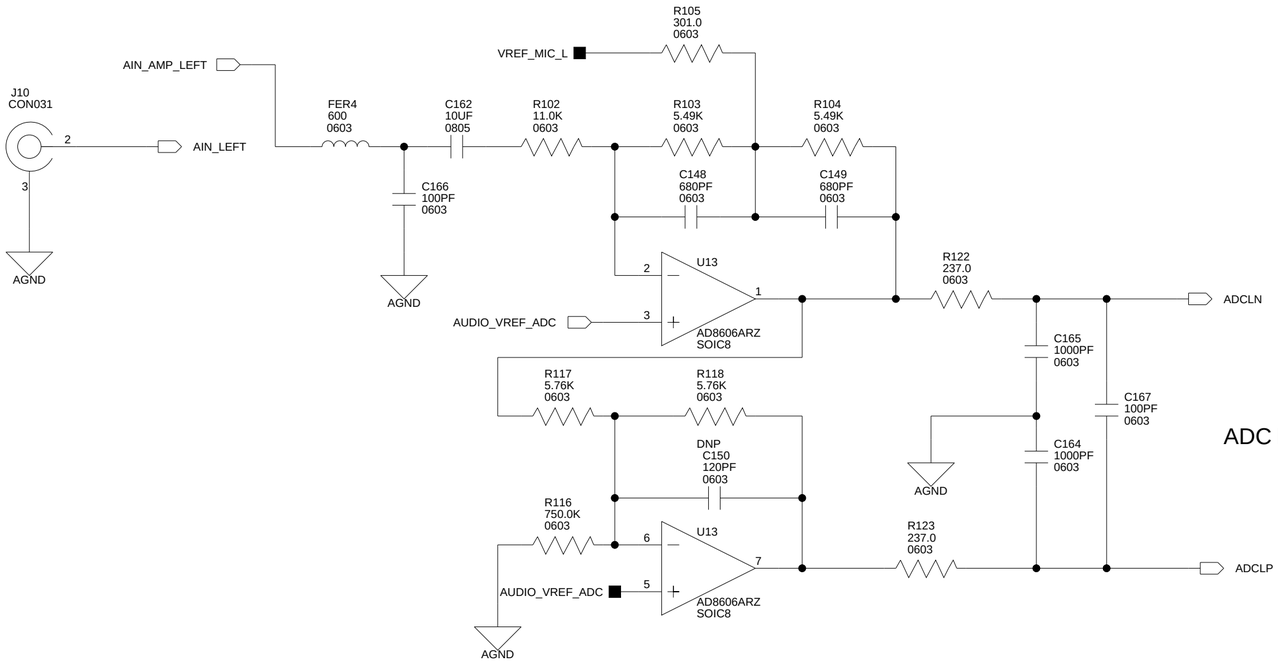




ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
Title	ADSP-21371 EZ-KIT Lite AUDIO OUT 2	
Size C	**Board No.** AA0230-2009	**Rev** 1.0
Date 6-18-2009_9:54	**Sheet** 7 **of** 13	



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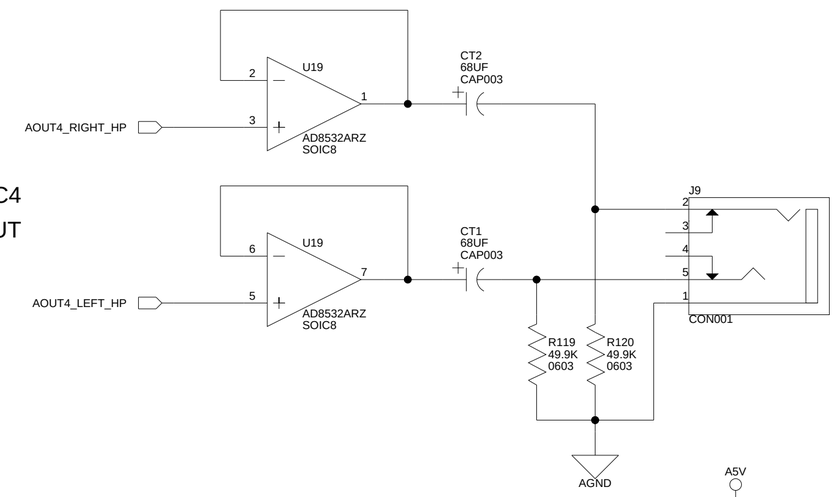

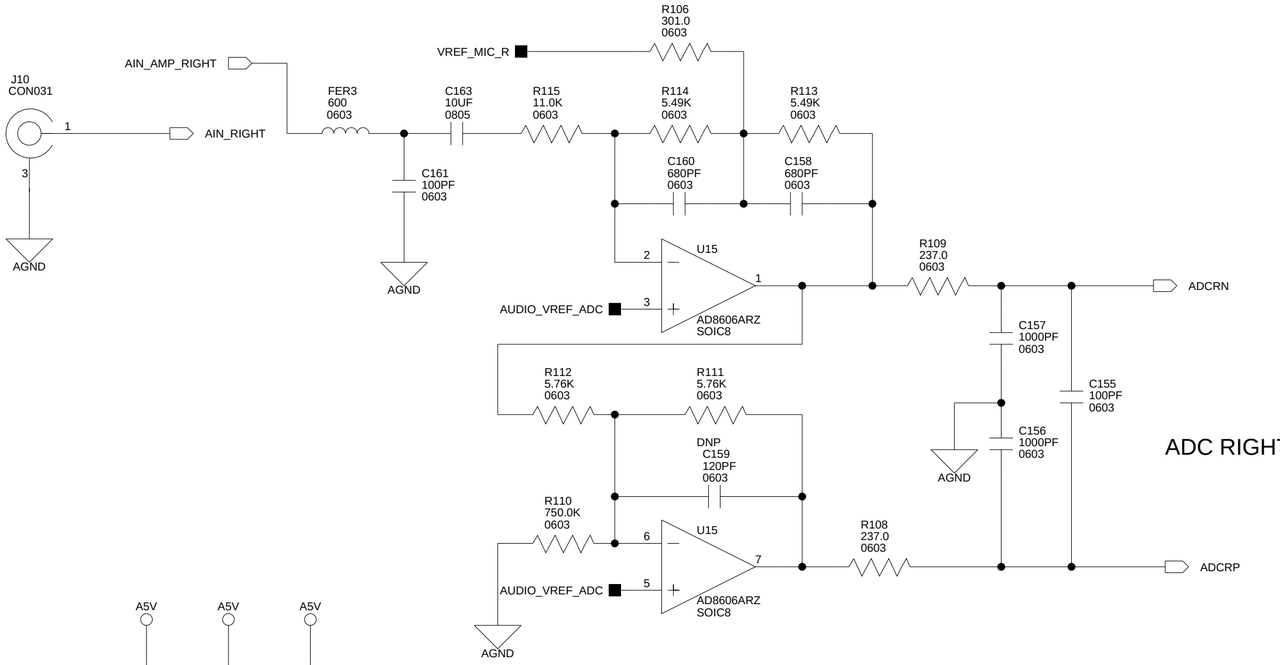

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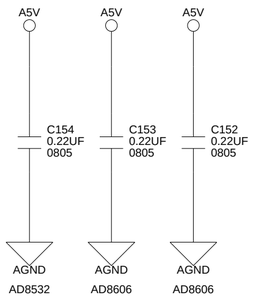

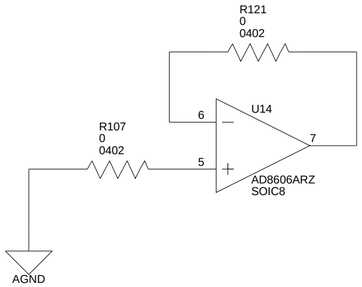

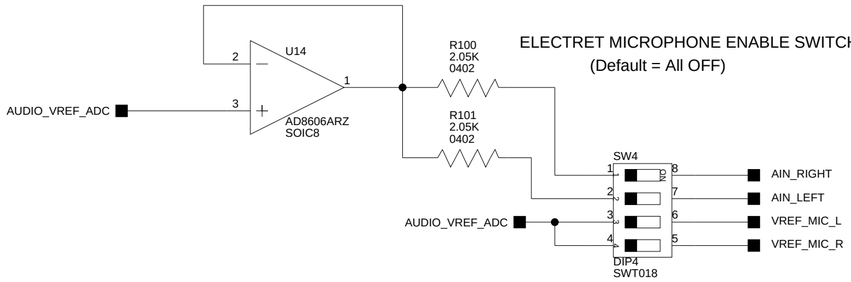

WHEN USING AN ELECTRET MICROPHONE
PLACE ALL SWITCHES IN ON POSITION

ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
Title	ADSP-21371 EZ-KIT Lite AUDIO IN & HEADPHONE OUT	
Size C	**Board No.** AA0230-2009	**Rev** 1.0
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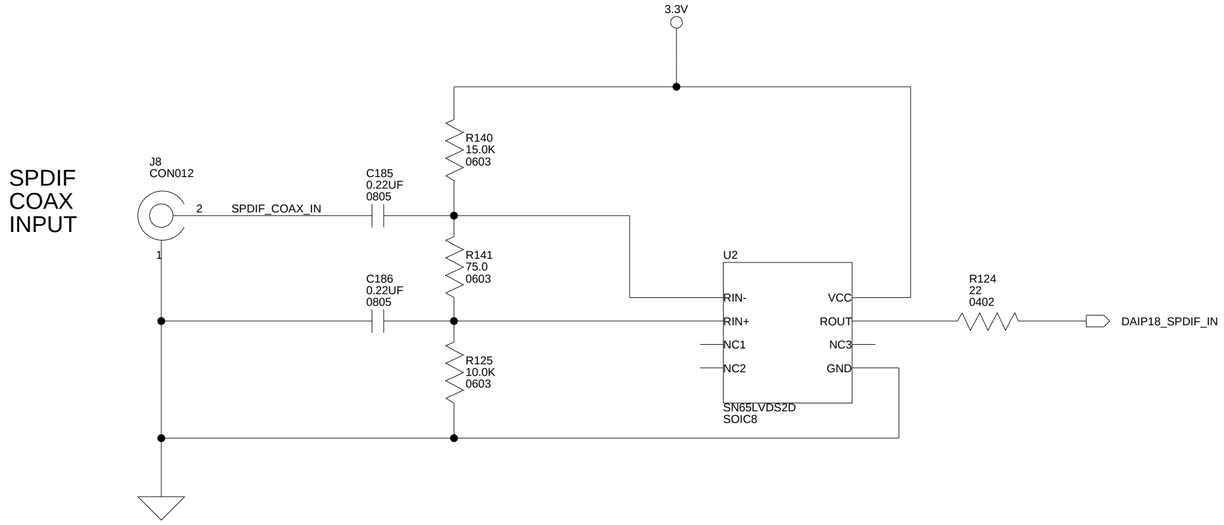

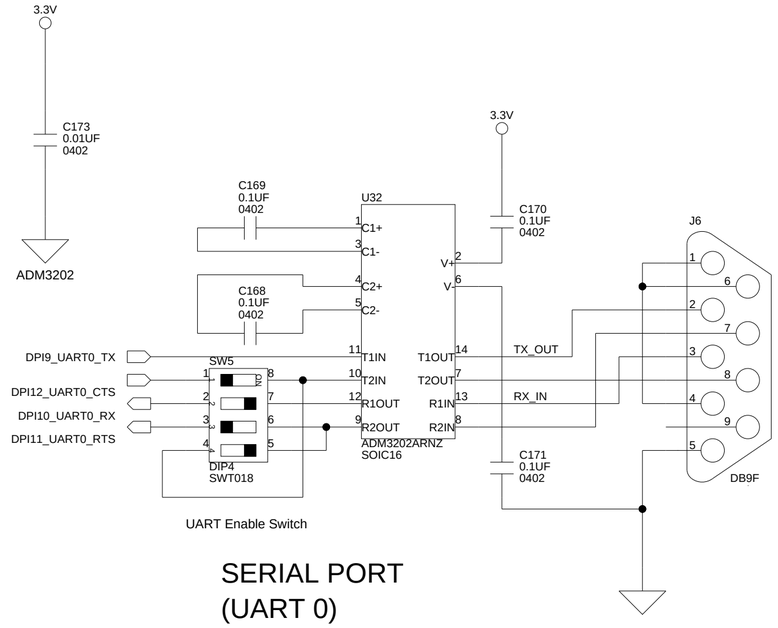

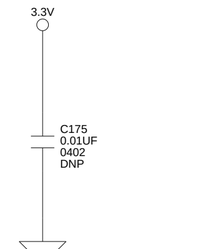

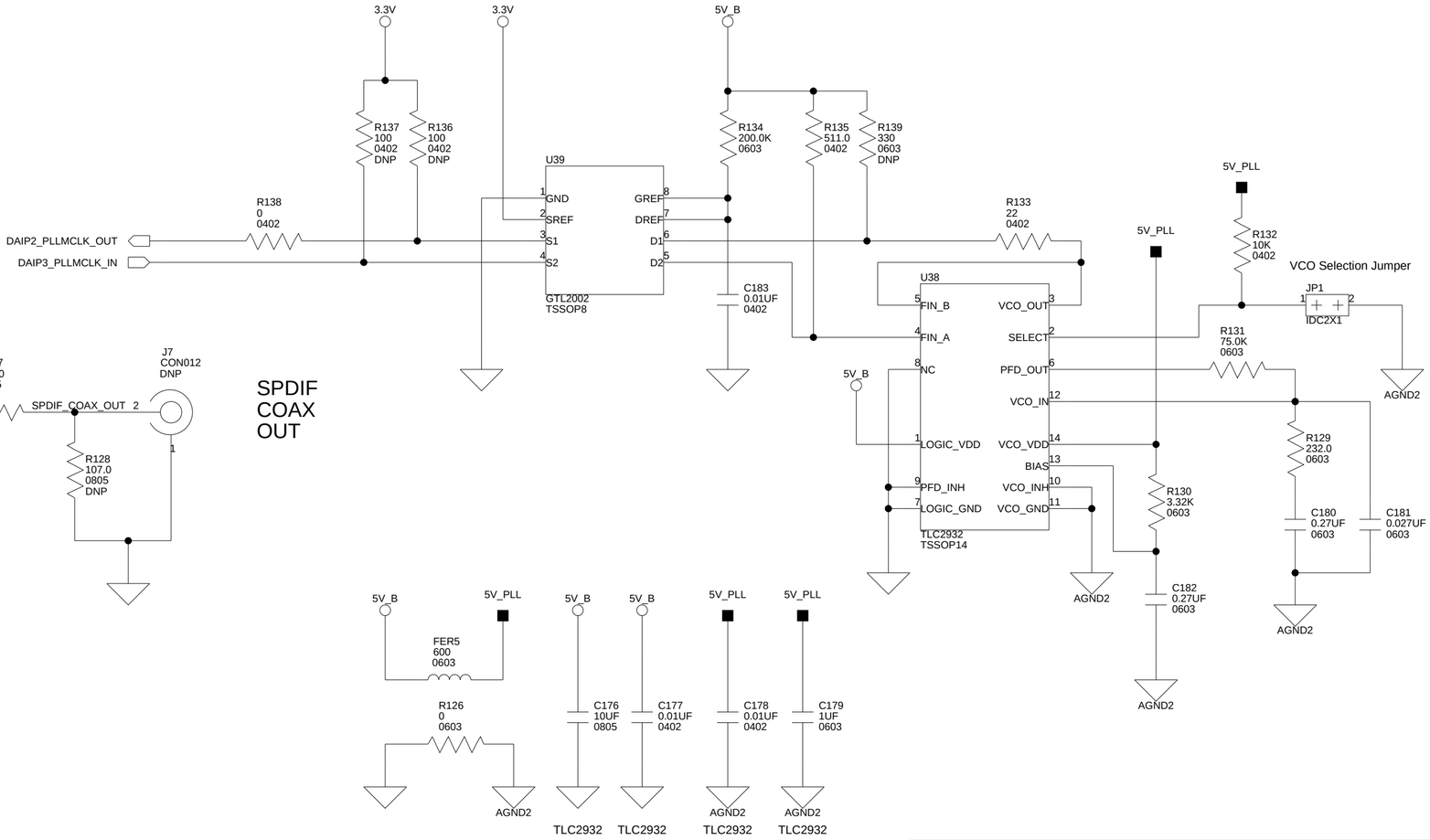

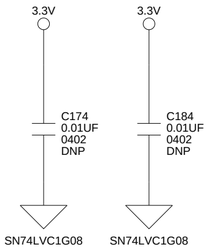

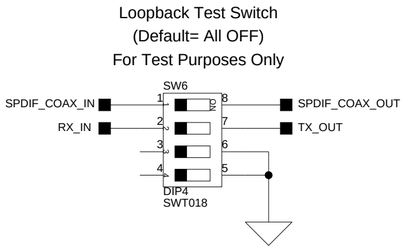

ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
PH: 1-800-ANALOGD

Title	ADSP-21371 EZ-KIT Lite EXTERNAL PLL, SPDIF, & RS-232	
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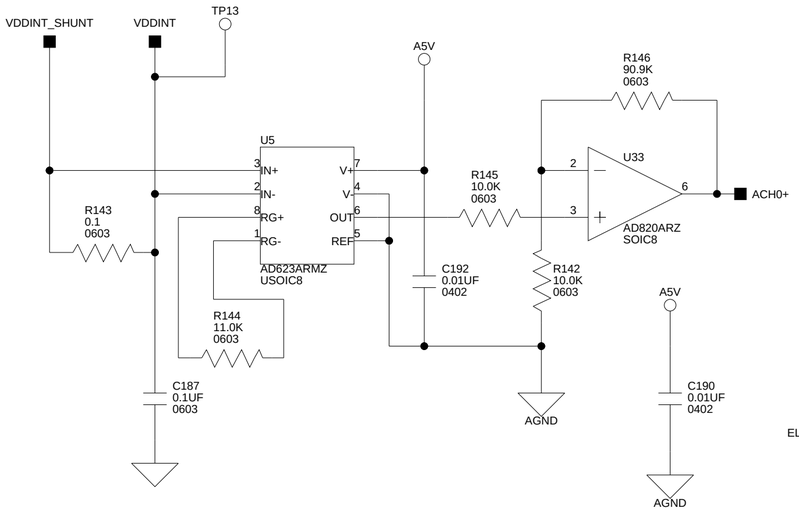
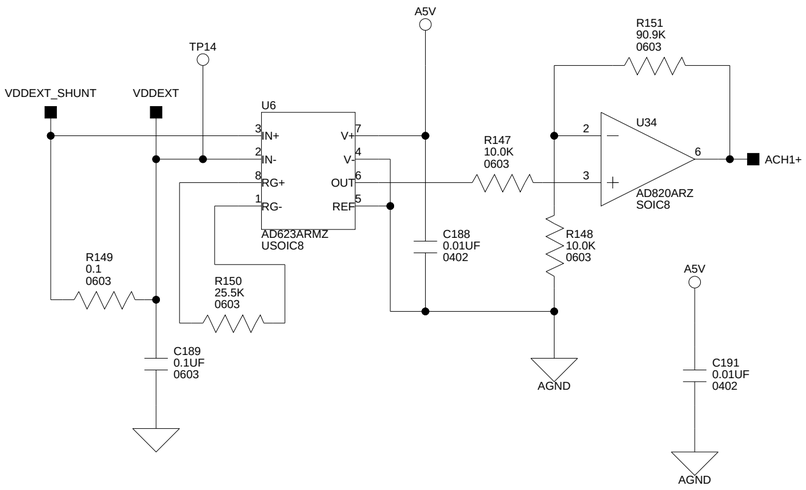


DSP CORE CURRENT



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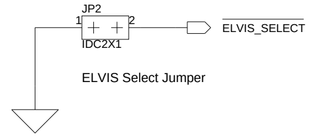
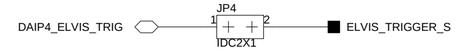
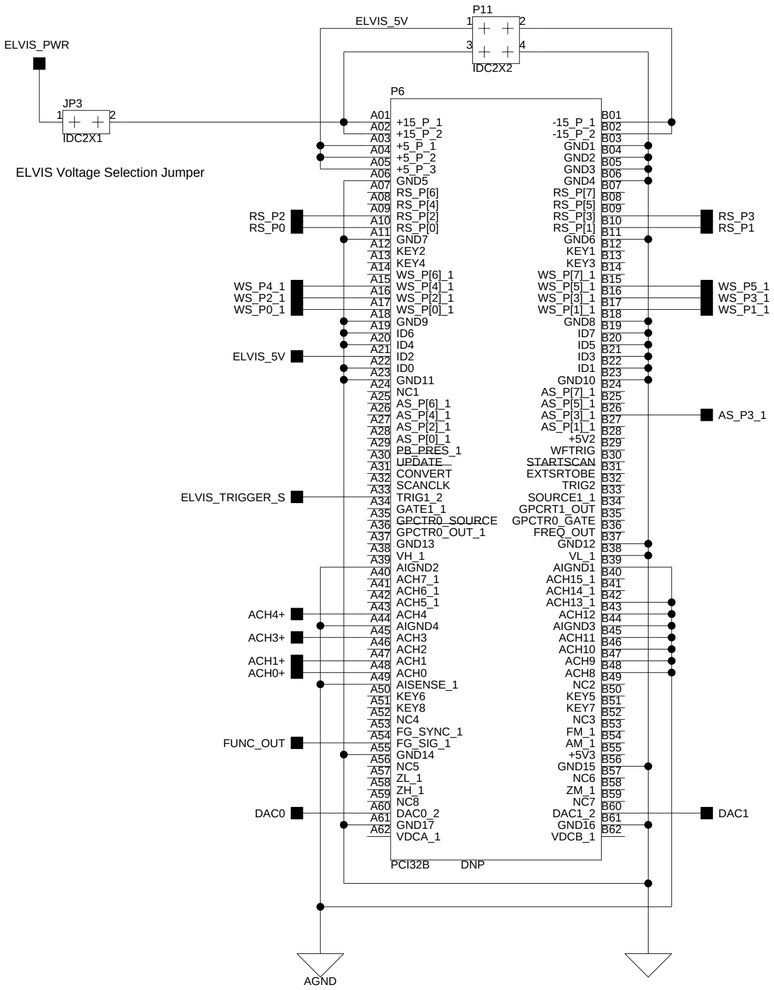


ELVIS Select Jumper



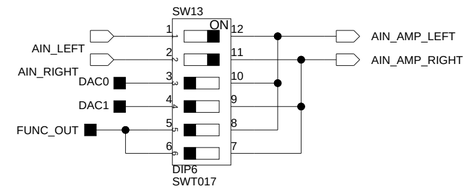
ELVIS Programmable Flag Jumper



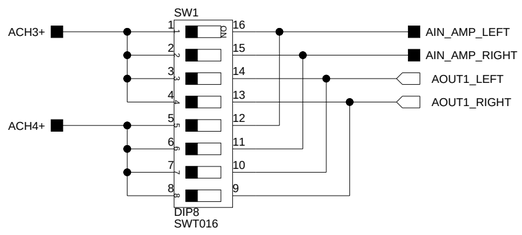
ELVIS Voltage Selection Jumper

ELVIS CONNECTOR

NI ELVIS ID 32 (0010 0000)



Function Generator Switch



Oscilloscope Select Switch

ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
PH: 1-800-ANALOGD

Title	ADSP-21371 EZ-KIT Lite ELVIS INTERFACE		
Size: C	Board No.: AA0230-2009		Rev: 1.0
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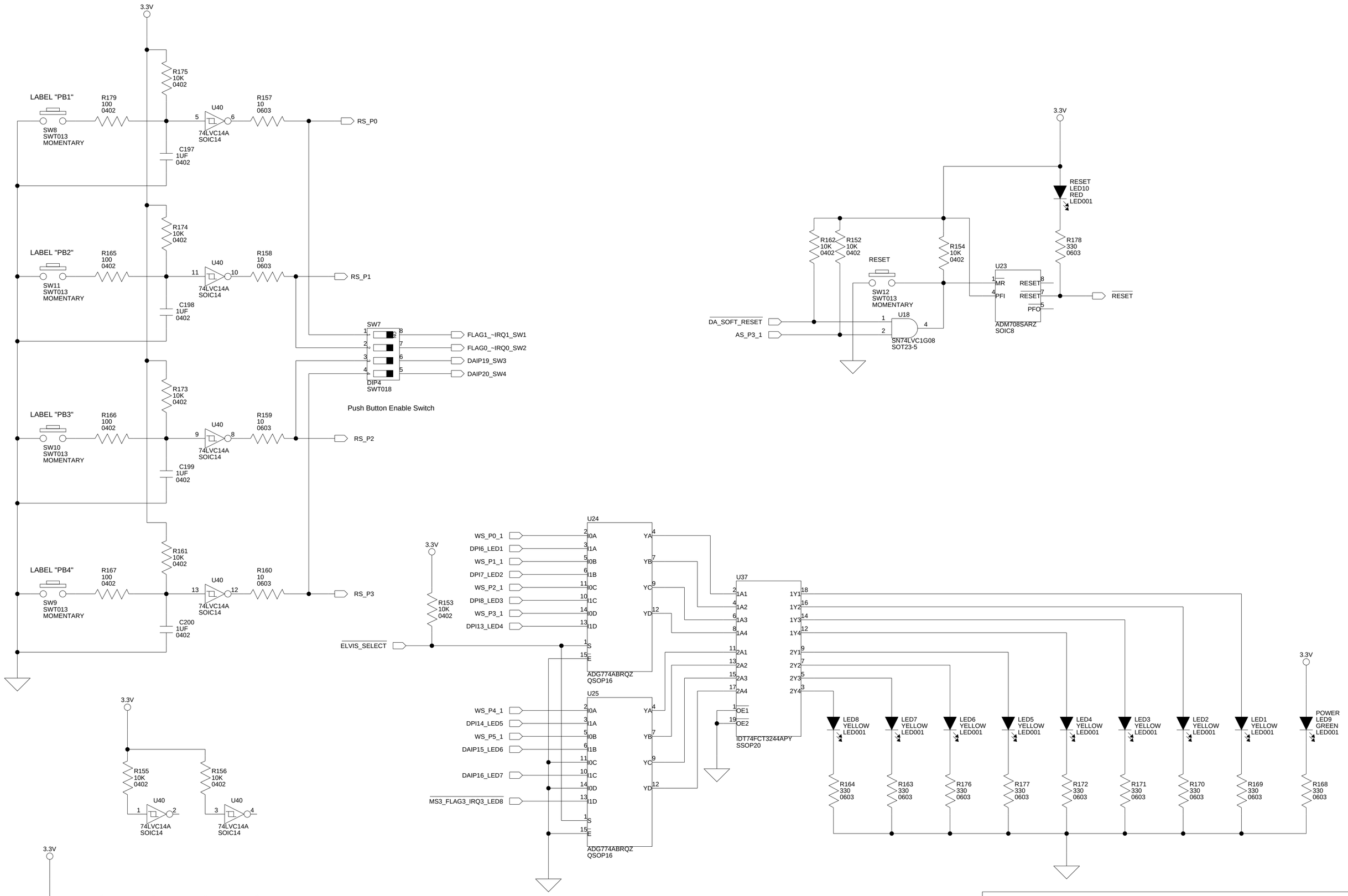

ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD
Title	ADSP-21371 EZ-KIT Lite PUSHBUTTONS, LEDS, & RESET
Size C	**Board No.** AA0230-2009 **Rev** 1.0
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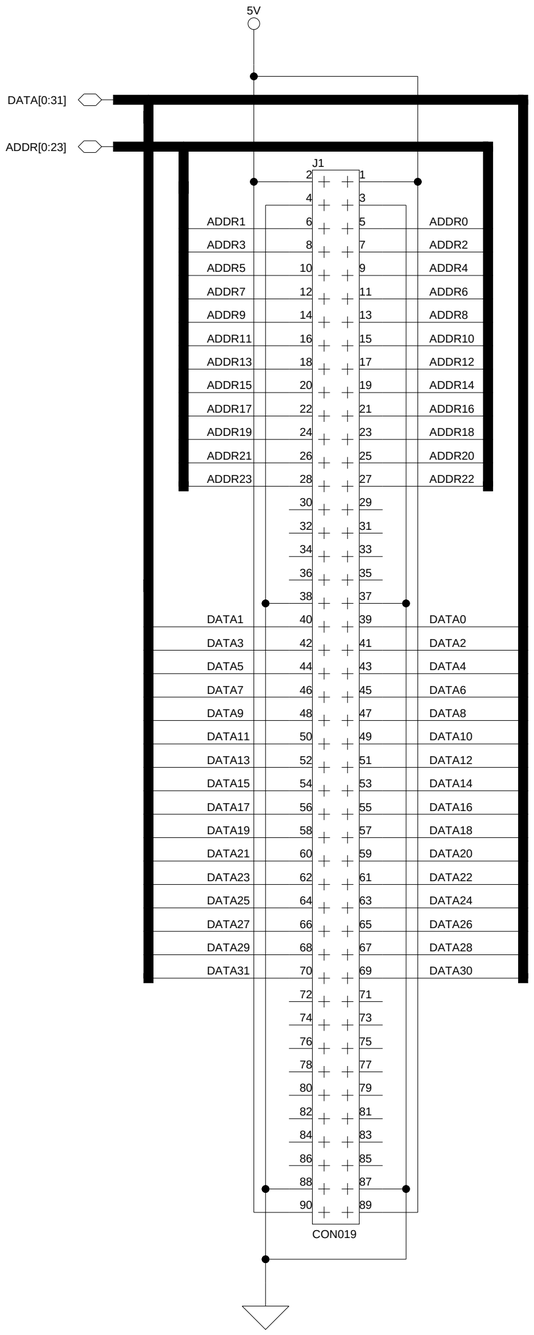
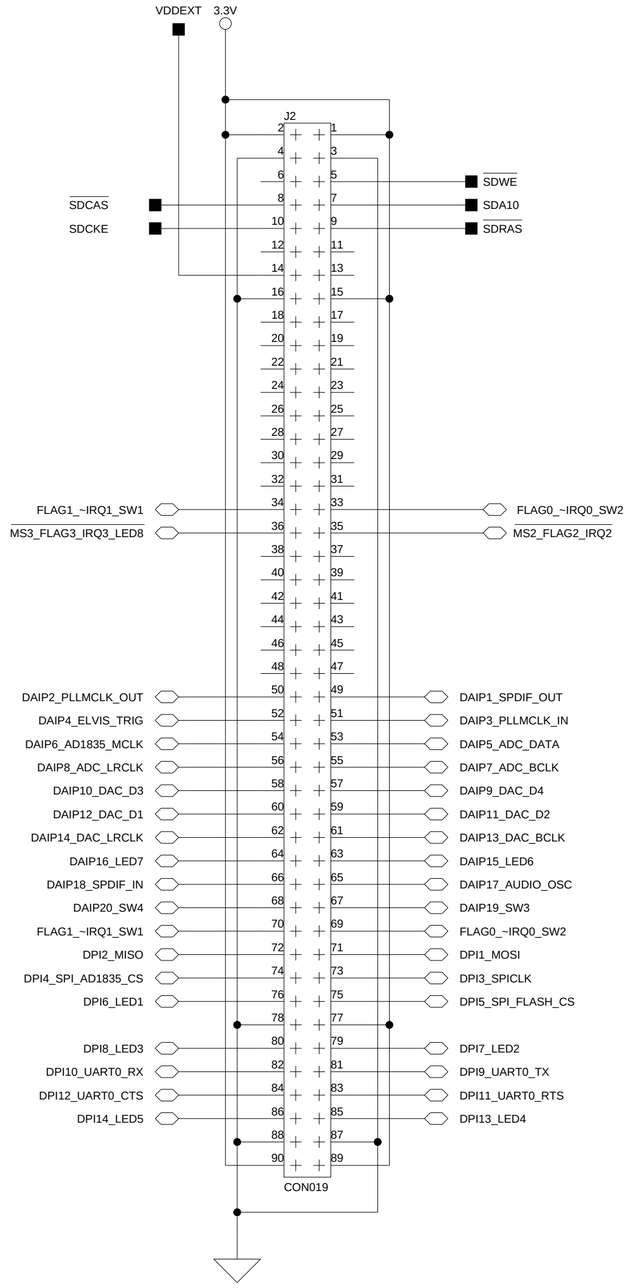
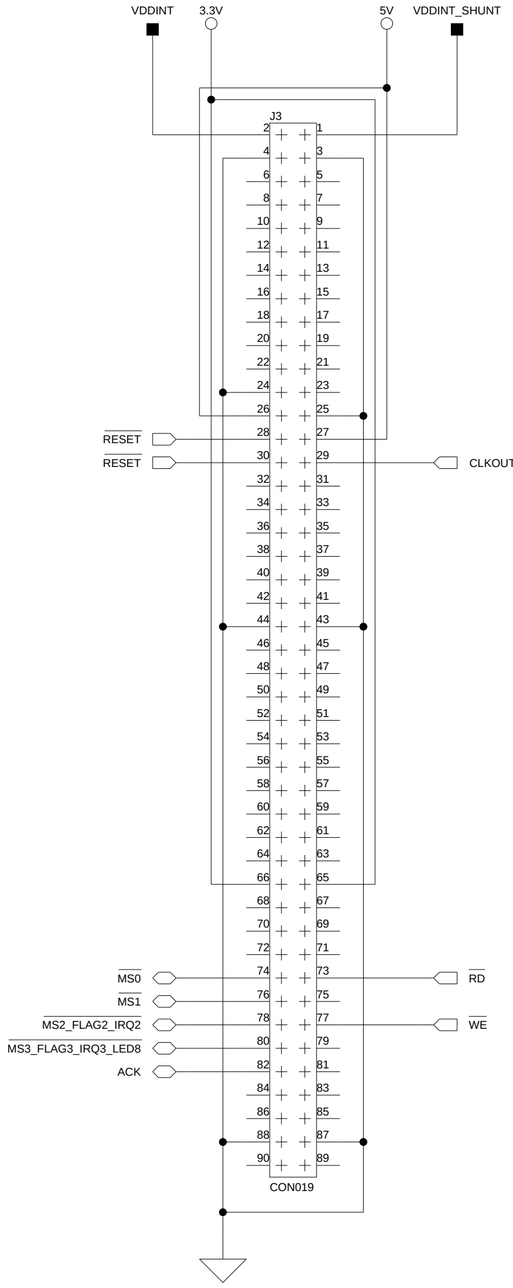
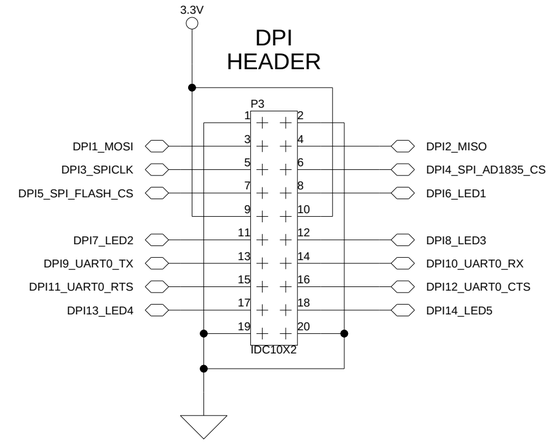
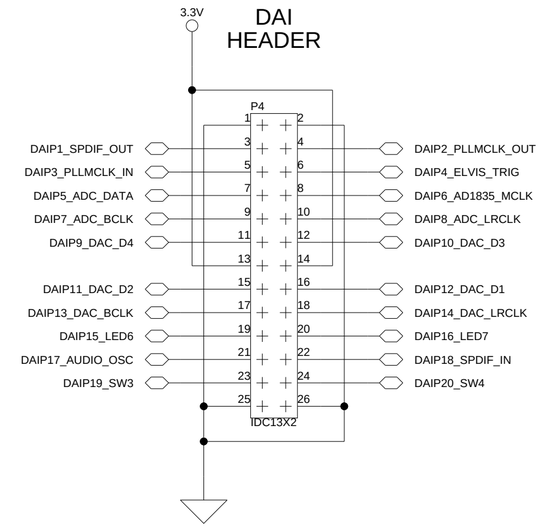
EXPANSION INTERFACE (TYPE A)











ANALOG DEVICES
20 Cotton Road
Nashua, NH 03063
PH: 1-800-ANALOGD

Title	ADSP-21371 EZ-KIT Lite EXPANSION INTERFACE	
Size C	**Board No.** AA0230-2009	**Rev** 1.0
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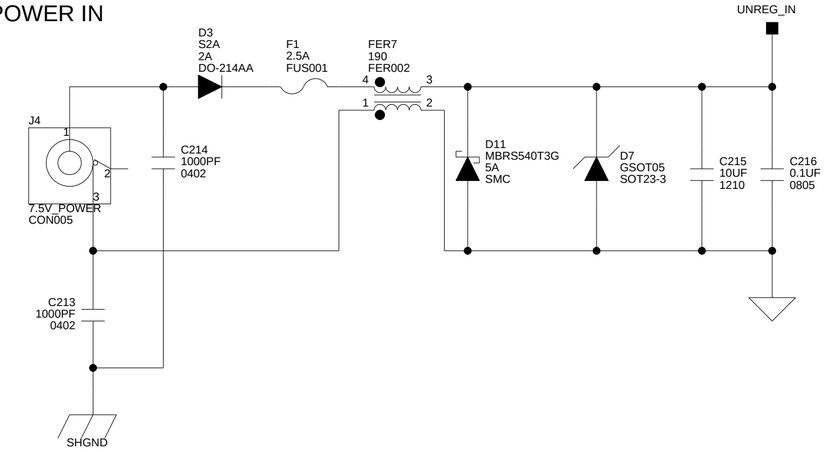
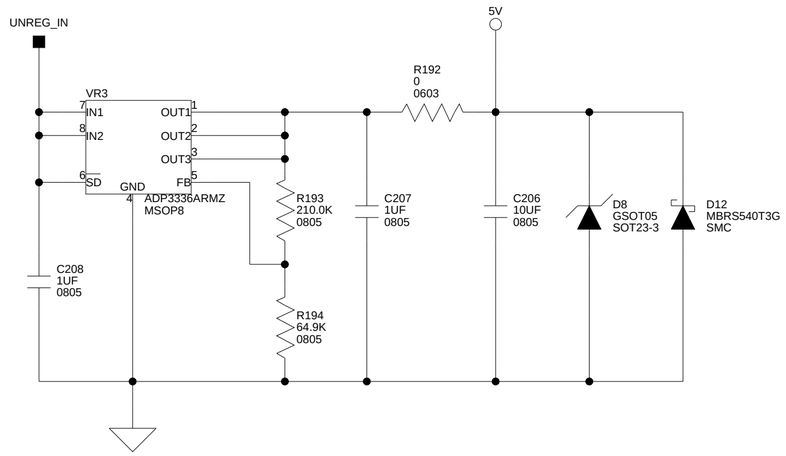
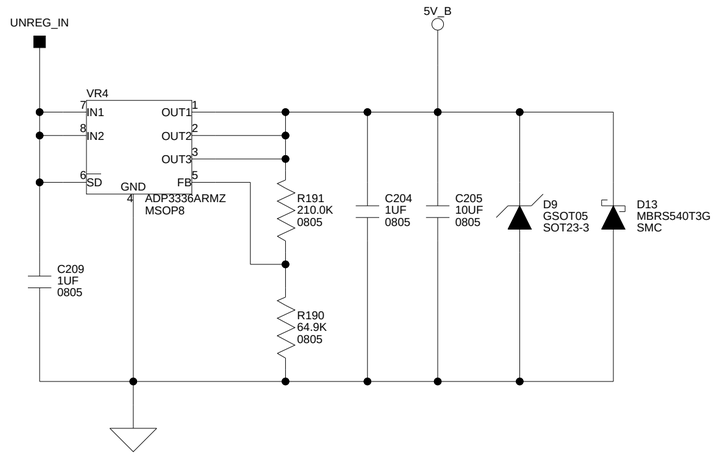
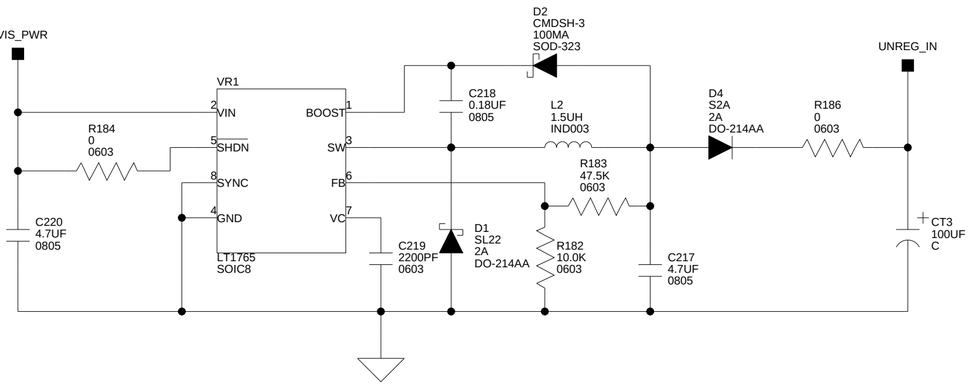
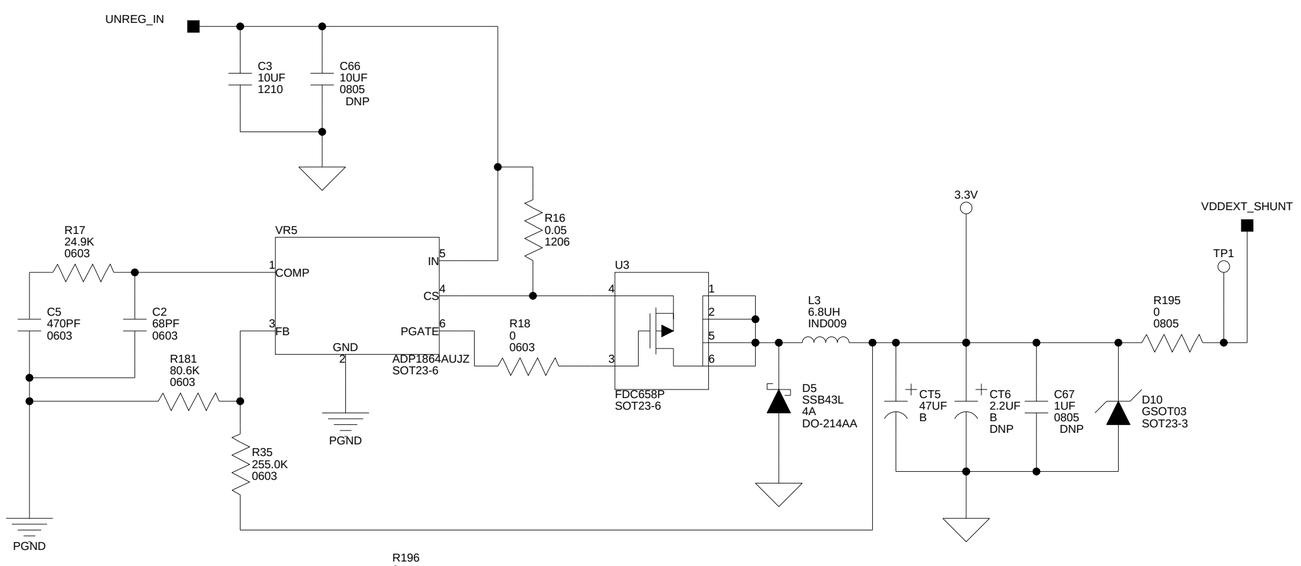
POWER IN

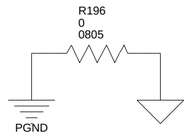


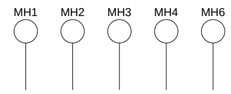


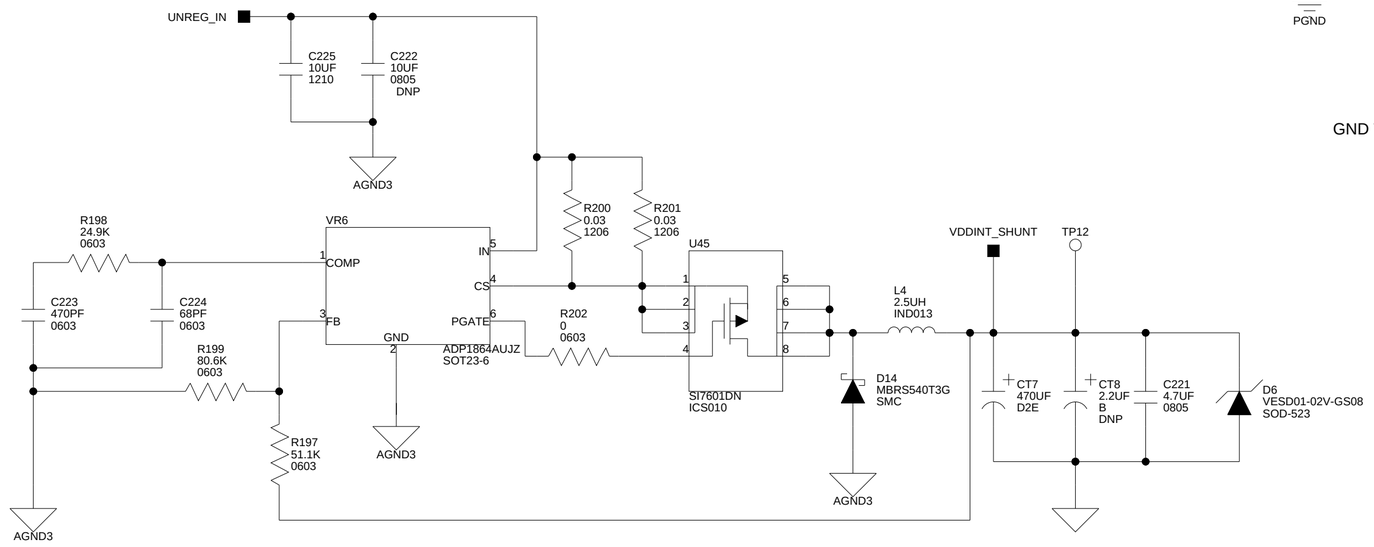






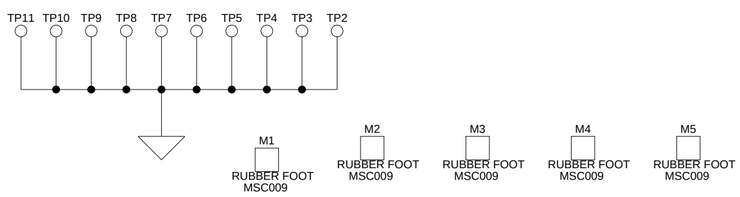






GND Test Points are scattered on PCB for Test Measurement Purposes.

LABEL "GND" ON ALL TPs



ANALOG DEVICES	20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
Title	ADSP-21371 EZ-KIT Lite POWER	
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