

ADSP-21369 EZ-KIT Lite®

Evaluation System Manual

Revision 2.2, September 2009

Part Number
82-000196-01

Analog Devices, Inc.
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Regulatory Compliance

The ADSP-21369 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-21369 EZ-KIT Lite has been certified to comply with the essential requirements of the European EMC directive 2004/108/EC and therefore carries the “CE” mark.

The ADSP-21369 EZ-KIT Lite has been appended to Analog Devices, Inc. EMC Technical File (EMC TF) referenced **DSPTOOLS1**, issue 2 dated June 4, 2008 and was declared CE compliant by an appointed Notified Body (No.0673) as listed below.

Notified Body Statement of Compliance: Z600ANA1.025 dated
December 19, 2005



Issued by: Technology International (Europe) Limited
60 Shrivenham Hundred Business Park
Shrivenham, Swindon, SN6 8TY, UK

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.



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PREFACE

Thank you for purchasing the ADSP-21369 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-21369 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-21369 assembly
- Load, run, step, halt, and set breakpoints in application programs
- Read and write data and program memory
- Read and write core and peripheral registers
- Plot memory

Access to the ADSP-21369 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-21369 processor and

Product Overview

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-21369 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-21369 EZ-KIT Lite provides example programs to demonstrate the product capabilities.

Product Overview

The board features:

- Analog Devices ADSP-21369 SHARC processor
 - ✓ 256-pin SBGA package
 - ✓ 400 MHz core clock speed
- Synchronous dynamic random access memory (SDRAM)
 - ✓ 1M x 32-bit x 4 banks
- Synchronous random access memory (SRAM)
 - ✓ 512 Kbit x 8-bit
- Flash memory
 - ✓ 1M x 8-bit

- Serial peripheral interface (SPI) flash memory
 - ✓ 2 Mbit
- Analog audio interface
 - ✓ AD1835A codec
 - ✓ 4 x 2 RCA phono jack for 4 channels of stereo output
 - ✓ 2 x 1 RCA phono jack for 1 channel of stereo input
 - ✓ 3.5 mm headphone jack for 1 channel stereo output
- Digital audio interface
 - ✓ RCA phono jack output
 - ✓ RCA phono jack input
- 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)

Product Overview

- 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 2-10](#). The board also has 512 KB of SRAM and 16 MB of SDRAM, which can be used at runtime.

The DAI port of the processor is connected to the AD1835A audio codec, Sony/Philips Digital Interface (S/PDIF), 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](#) and [“S/PDIF Coax Connectors \(J7 and J8\)” on page 2-24](#) 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 connector, while the SPI connects to 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-21369 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-21369 EZ-KIT Lite. Finally, a schematic and a bill of materials are provided for reference.

The product software component is detailed in the *VisualDSP++ Installation Quick Reference Card*.

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*) 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-21369 EZ-KIT Lite” on page 1-1](#)
Describes EZ-KIT Lite operation from a programmer’s perspective and provides an easy-to-access memory map.
- Chapter 2, [“ADSP-21369 EZ-KIT Lite Hardware Reference” on page 2-1](#)
Provides information on the EZ-KIT Lite hardware components
- Appendix A, [“ADSP-21369 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-21369 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

The *ADSP-21369 EZ-KIT Lite Evaluation System Manual* has been updated to reflect the latest board revision. In addition, modifications and corrections based on errata reports against the previous manual revision have been made.

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-21369 EZ-KIT Lite evaluation system supports Analog Devices ADSP-21369 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](http://www.analog.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](http://www.analog.com) provides access to books, application notes, data sheets, code examples, and more.

Visit [MyAnalog.com](http://www.analog.com) to sign up. If you are a registered user, just log on. Your user name is your e-mail address.

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.

Related Documents

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

Table 2. Related VisualDSP++ Publications

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

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

<i>VisualDSP++ Linker and Utilities Manual</i>	Description of the linker function and commands
<i>VisualDSP++ Loader and Utilities Manual</i>	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 <i>this</i> or <i>that</i> . 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 <i>this</i> or <i>that</i> .
[this,...]	Optional item lists in syntax descriptions appear within brackets delimited by commas and terminated with an ellipsis; read the example as an optional comma-separated list of <i>this</i> .
.SECTION	Commands, directives, keywords, and feature names are in text with letter gothic font.
<i>filename</i>	Non-keyword placeholders appear in text with italic style format.

Notation Conventions

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-21369 EZ-KIT LITE

This chapter provides information to assist you with development of programs for the ADSP-21369 EZ-KIT Lite evaluation system.

The information appears in the following sections.

- [“Package Contents” on page 1-2](#)
Lists the 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 Visual DSP++ licence is shipped with the EZ-KIT Lite.
- [“External Memory” on page 1-7](#)
Describes 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.

Package Contents

- [“LEDs and Push Buttons” on page 1-12](#)
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 1-14](#)
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-21369 SHARC processor, refer to the documents referenced in [“Related Documents”](#).

Package Contents

Your ADSP-21369 EZ-KIT Lite evaluation system package contains the following items.

- ADSP-21369 EZ-KIT Lite board
- *VisualDSP++ Installation Quick Reference Card*
- CD containing:
 - ✓ VisualDSP++ software
 - ✓ ADSP-21369 EZ-KIT Lite debug software
 - ✓ USB driver files

- ✓ Example programs
 - ✓ *ADSP-21369 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-21369 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.

Default Configuration

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.

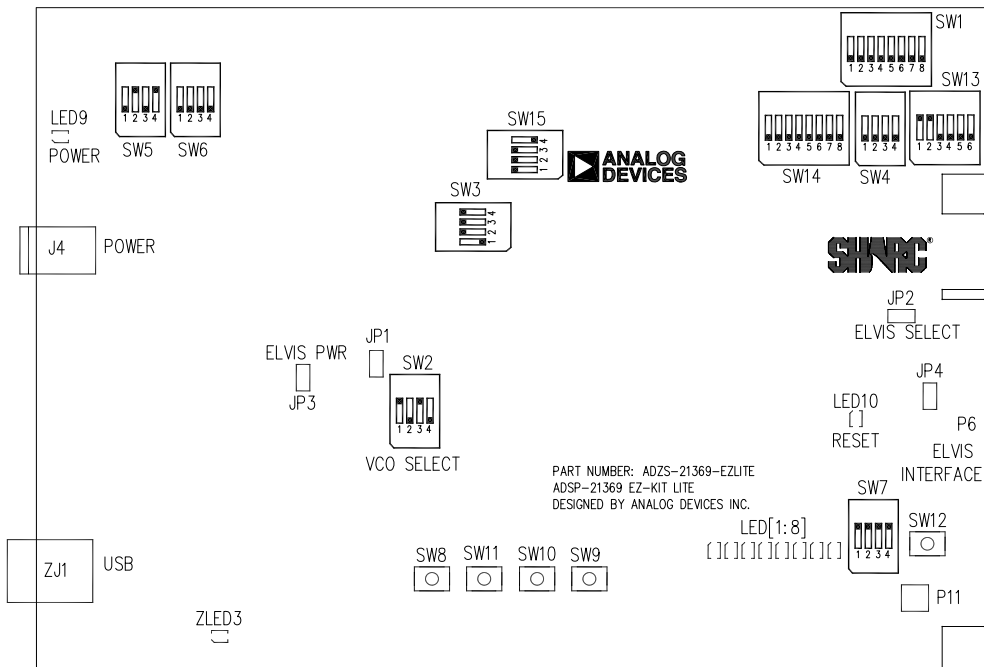


Figure 1-1. EZ-KIT Lite Hardware Setup

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-21369 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.

Installation and Session Startup

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-21369**. 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-21369 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-21369 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-21369 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 7281 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 four types of memory: parallel flash (1 MB), SPI flash (2 Mbit), SRAM (512 Kbit), and SDRAM (128 Mbit). Flash memories can store user-specific boot code and allow the board to run as a stand-alone unit. For more information on how to select a boot device for the processor, see [“Boot Mode and Clock Ratio Select Switch \(SW2\)” on page 2-10](#).

External Memory

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
0x0020 0000	0x0027 FFFF	SRAM memory (~MS0)
0x0400 0000	0x040F FFFF	Flash memory (~MS1)
0x0800 0000	0x083F 0000	SDRAM memory (~MS2)
0x0C00 0000	0x0CFF FFFF	Unused chip select (~MS3) for non-SDRAM addresses
0x0C00 0000	0x0FFF FFFF	Unused chip select (~MS3) for SDRAM addresses

Parallel flash memory, SDRAM, and SRAM are connected to the external memory of the processor. To access SRAM and flash memories, use memory addressing via the respective memory bank or use the DMA controller.

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 setup of the SDRAM controller, refer to the *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21369).

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

Asynchronous SRAM memory and parallel flash memory are 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-21369).

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

ELVIS Interface

The ADSP-21369 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.

Analog Audio

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 on the AD1835A connection to the DAI, see [“DAI Interface” on page 2-4](#).

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. This is done on the EZ-KIT Lite when data is coming from the Sony/Philips Digital Interface (S/PDIF) receiver and being output through the codec. The S/PDIF MCLK is routed to the AD1835A's MCLK in the processor's signal routing unit (SRU). 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 2-11](#).

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 2-11](#).

The internal configuration registers of the 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 2-12](#). The four output channels connect to the RCA connector (J5). Channel 4 of the codec connects to the headphone jack (J9). For more information, see “[Connectors](#)” on [page 2-21](#).

Example programs are included in the EZ-KIT Lite installation directory to demonstrate how to configure and use the board’s 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 2-13](#) for instructions on how to disable a push button from driving its corresponding 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 registers of the processor. For more information, refer to the *ADSP-21368 SHARC Processor Hardware Reference* (includes ADSP-21369).

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-21369 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-21369 EZ-KIT Lite` directory. Refer to a readme file provided with each example for more information.

Background Telemetry Channel

The ADSP-21369 USB debug agent supports the background telemetry channel (BTC), which facilitates data exchange between VisualDSP++ and the processor without interrupting processor execution.

Reference Design Information

The BTC allows the user to view a variable as it is updated or changed, all while the processor continues to execute. For increased performance of the BTC, including faster reading and writing, please check our latest line of SHARC processor emulators at <http://www.analog.com/processors/sharc/evaluationDevelopment/crosscore/index.html>. For more information about the background telemetry channel, see the *VisualDSP++ User's Guide* or 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-21369 EZ-KIT LITE

HARDWARE REFERENCE

This chapter describes the hardware design of the ADSP-21369 EZ-KIT Lite board.

The following topics are covered.

- [“System Architecture” on page 2-2](#)
Describes the ADSP-21369 board configuration and explains how the board components interface with the processor.
- [“Switches” on page 2-9](#)
Shows the locations and describes the on-board switches.
- [“LEDs and Push Buttons” on page 2-15](#)
Shows the locations and describes the on-board LEDs and push buttons.
- [“Jumpers” on page 2-18](#)
Shows the locations and describes the on-board configuration jumpers.
- [“Connectors” on page 2-21](#)
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).

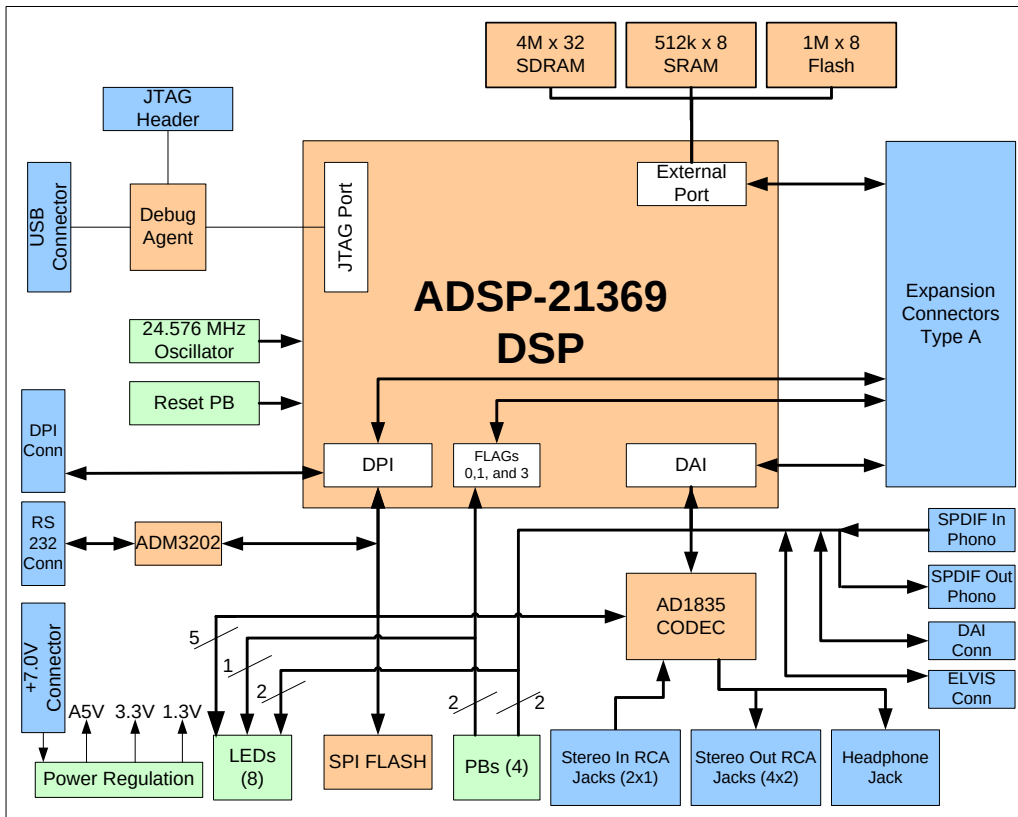


Figure 2-1. System Architecture Block Diagram

The EZ-KIT Lite is designed to demonstrate the ADSP-21369 processor capabilities. The processor core is powered at 1.3V, and the I/O is powered at 3.3V.

The CLKIN pin of the processor connects to a 24.576 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 state (see [“Boot Mode and Clock Ratio Select Switch \(SW2\)” on page 2-10](#)). By default, the EZ-KIT Lite provides a core frequency of 393.216 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 2-10](#).

External Port

The external port of the ADSP-21369 processor consists of a 24-bit address bus, 32-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, an 8-bit SRAM memory, and a 32-bit SDRAM memory. See [“External Memory” on page 1-7](#) for more information about accessing flash memory and SDRAM memory.

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-21369 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 allows to 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.

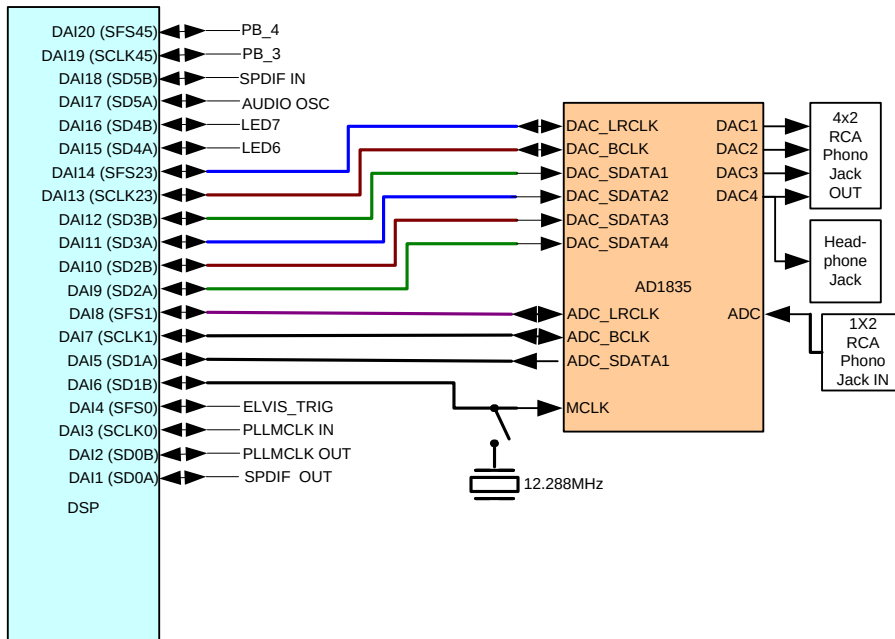


Figure 2-2. DAI Connections Block Diagram

To use the DAI for a different purpose, disable any signal driving the DAI pin with a switch (see [“Codec Setup Switch \(SW3\)”](#) on page 2-11). 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-21369 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.

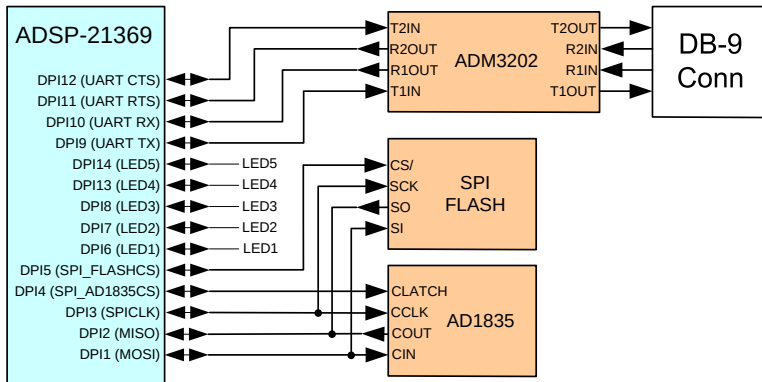


Figure 2-3. DPI Connections Block Diagram

System Architecture

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.

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 2-12). 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-21369 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 corresponding flag pin, see [“Push Button Enable Switch \(SW7\)”](#) on page 2-13.

The FLAG signals are available externally via the expansion interface connectors (J1–3). The pinout of the connectors can be found in [“ADSP-21369 EZ-KIT Lite Schematic”](#) on page B-1.

External PLL

The ADSP-21369 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-21369 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-21369 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 the 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.



Analogue 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 2-25. To learn more about available SHARC emulators, go to Analog Devices Web site: <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](#).

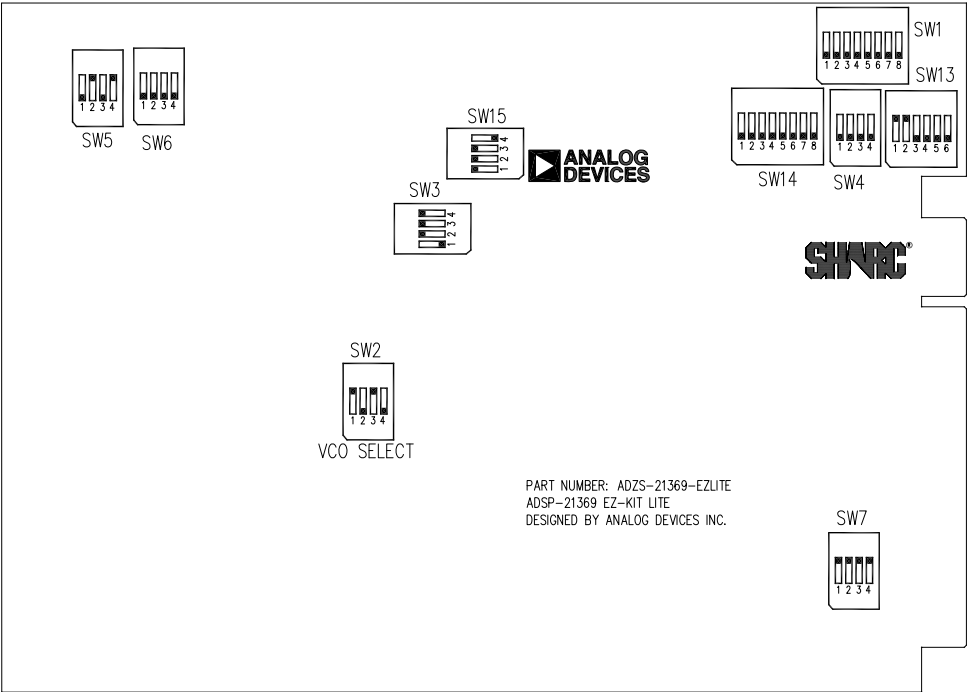


Figure 2-4. Switch Locations and Default Settings

Boot Mode and Clock Ratio Select Switch (SW2)

The SW2 switch sets the boot mode and clock 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 Switch (SW2)

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 393.216 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-21369).

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 to 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 to the 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 AD1835A codec.

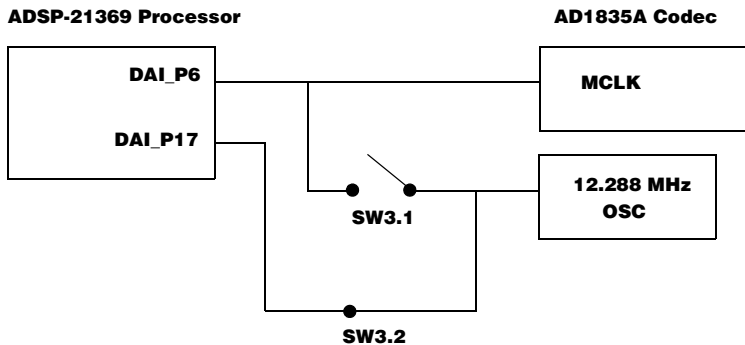


Figure 2-5. Audio Clock Routing

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 codec's ADC_DATA pin from the DAI. This is useful when the DAI is connected to another device.

Switches

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 the respective processor pins. This allows the signals to be used elsewhere on the board. [Table 2-6](#) shows switch SW7 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

SPI Disable Switch (SW15)

The SPI interface switch (SW15) disables the SPI chip select lines connected to SPI flash memory and AD1835A audio codec. The switch allows you to re-use the same pins on the SPI interface and expansion interface. By default, SW15 positions 1–3 are ON and position 4 is OFF unless any of the SPI interface signals are used on the expansion connector or via an EZ-Extender®.

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](#).

Switches

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
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

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

Channel	Switch Position	Audio Signal
AMP_LEFT_IN	5 (OFF)	FUNCT_OUT
AMP_RIGHT_IN	6 (OFF)	FUNCT_OUT

1 Bold typeface denotes the default settings.

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](#).

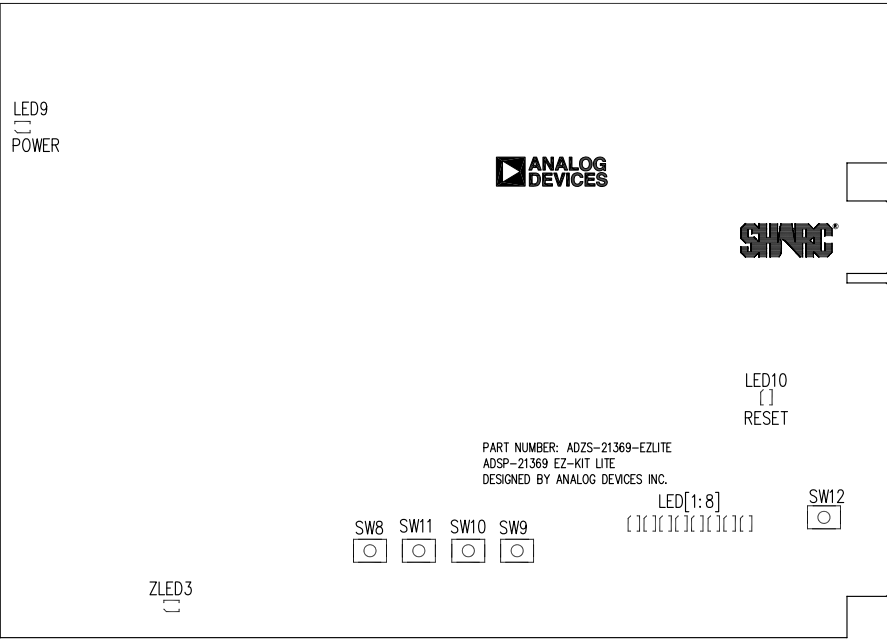


Figure 2-6. LED and Push Button Locations

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 1-12 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-21369).

Power LED (LED9)

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

Reset LEDs (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 1-12](#) for more information. The push button enable switch (SW7) is capable of disconnecting the push buttons from the corresponding processor pins. Refer to [“Push Button Enable Switch \(SW7\)” on page 2-13](#) 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 (U4). 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](#).

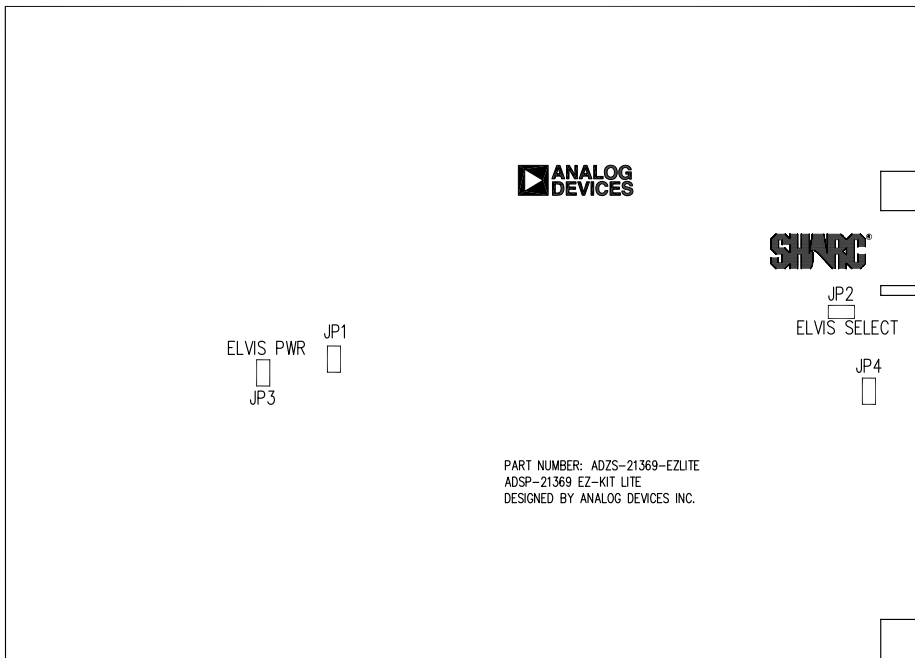


Figure 2-7. Jumper Locations

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, the 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-21369 processor's DAI4 pin to the ELVIS trigger pin. When JP4 is installed, DAI4 connects to the ELVIS TRIG1_2 pin directly. Conversely, when JP4 is uninstalled, DAI4 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](#).

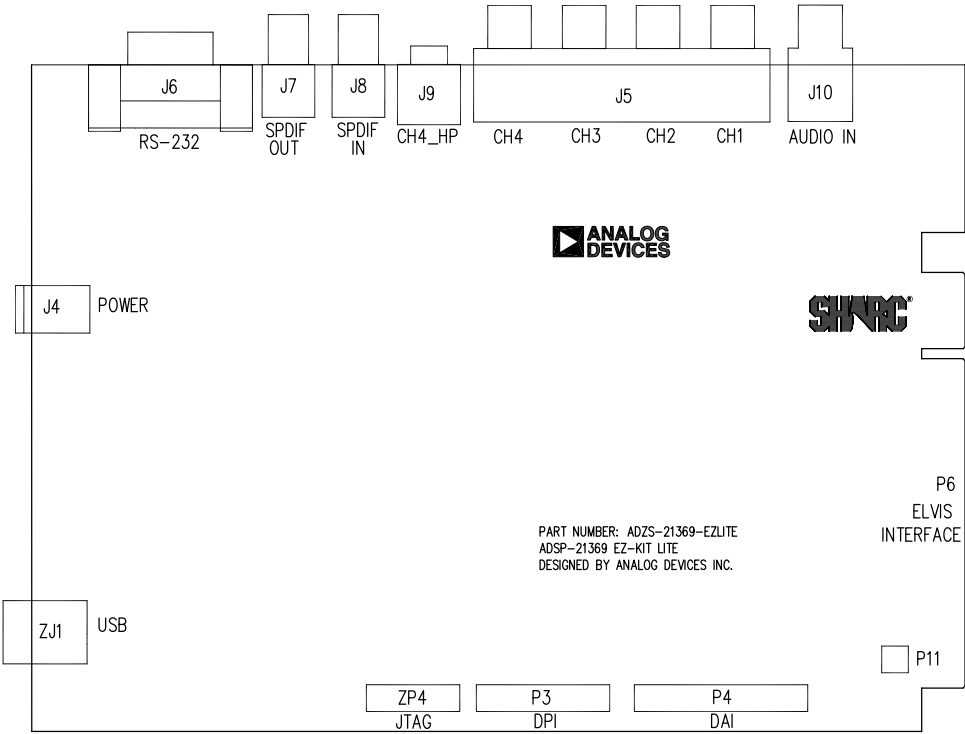


Figure 2-8. Connector Locations

Connectors

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 connectors 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
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

Connectors

The power connector supplies DC power to the EZ-KIT Lite board. [Table 2-14](#) shows the power supply specifications.

Table 2-14. Power Supply Specifications

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

RS-232 Connector (J6)

Part Description	Manufacturer	Part Number
DB9, female, right angle	AMP/TYCO	5745781-4
Mating Cable		
Cable DB9M to DB9F 6 feet	DIGI-KEY	45-0308-0000-ND

S/PDIF Coax Connectors (J7 and J8)

Part Description	Manufacturer	Part Number
Coaxial	SWITCHCRAFT	PJ1RAN1X1U01
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 form 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 form 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 2-11](#) 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-21369 EZ-KIT LITE BILL OF MATERIALS

The bill of materials corresponds to “ADSP-21369 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	IDT74FCT3244 APY 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	MT48LC4M32B 2 TSOP86	U36	DIGI-KEY	557-1196-1-ND
6	1	GTL2002 TSSOP8	U39	PHILIPS	GTL2002DP-T
7	1	IS61LV5128AL TSOP44	U30	ISSI	IS61LV5128AL-10TLI
8	2	SN74LVC1G08 SOT23-5	U16,U18	TI	SN74LVC1G08DBVR
9	1	TLC2932 TSSOP14	U38	TI	TLC2932IPWG4
10	1	24.576MHZ OSC003	U28	EPSON	SG-8002CA MP

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
11	1	21369 AM29LV081B "U35"	U35	AND	AM29LV081-120ED
12	1	SN65LVDS2D SOIC8	U2	NATIONAL SEMI	DS90LV018ATM
13	1	FDC658P SOT23-6	U3	FAIRCHILD	FDC658P
14	1	21369 M25P20 "U29"	U29	ST MICRO	M25P20-VMN6TP
15	1	SI7601DN ICS010	U45	VISHAY	SI7601DN
16	1	ADM708SARZ SOIC8	U23	ANALOG DEVICES	ADM708SARZ
17	1	AD8532ARZ SOIC8	U19	ANALOG DEVICES	AD8532ARZ
18	2	ADP3336ARMZ MSOP8	VR3-4	ANALOG DEVICES	ADP3336ARMZ-REEL7
19	1	ADM3202ARN Z SOIC16	U32	ANALOG DEVICES	ADM3202ARNZ
20	8	AD8606ARZ SOIC8	U8-15	ANALOG DEVICES	AD8606ARZ
21	1	AD1835AASZ MQFP52	U31	ANALOG DEVICES	AD1835AASZ
22	2	AD623ARMZ USOIC8	U5-6	ANALOG DEVICES	AD623ARMZ
23	2	AD820ARZ SOIC8	U33-34	ANALOG DEVICES	AD820ARZ
24	1	ADSP-21369 SBGA256	U44	ANALOG DEVICES	ADSP-21369KBPZ-3A
25	2	ADG774ABRQ ZQSOP16	U24-25	ANALOG DEVICES	ADG774ABRQZ

ADSP-21369 EZ-KIT Lite Bill Of Materials

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
26	2	ADP1864AUJZ SOT23-6	VR2,VR5	ANALOG DEVICES	ADP1864AUJZ-R7
27	5	RUBBER FOOT	M1-5	MOUSER	517-SJ-5018BK
28	1	PWR 2.5MM_JACK CON005	J4	SWITCH- CRAFT	RAPC712X
29	1	RCA 4X2 CON011	J5	SWITCH- CRAFT	PJRS4X2U01X
30	2	RCA 1X1 CON012	J7-8	SWITCH- CRAFT	PJRN1X1U01X
31	5	MOMENTARY SWT013	SW8-12	PANASONIC	EVQ-PAD04M
32	3	.05 45X2 CON019	J1-3	SAMTEC	SFC-145-T2-F-D-A
33	2	DIP8 SWT016	SW1,SW14	C&K	TDA08H0SB1
34	1	DIP6 SWT017	SW13	CTS	218-6LPST
35	7	DIP4 SWT018	SW2-7,SW15	ITT	TDA04HOSB1
36	1	DB9 9PIN DB9F	J6	TYCO	5747844-4
37	1	RCA RCA_1X2 CON031	J10	SWITCH- CRAFT	PJRS1X2S02X
38	4	IDC 2X1 IDC2X1	JP1-4	FCI	90726-402HLF
39	1	IDC 10X2 IDC10X2	P3	BURG-FCI	54102-T08-10LF
40	1	IDC 2X2 IDC2X2	P11	FCI	68737-404HLF
41	1	3.5MM STEREO_JACK CON001	J9	DIGI-KEY	CP1-3525NG-ND

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
42	1	IDC 13X2 IDC13X2	P4	BERG	54102-T08-13LF
43	1	5A RESETABLE FUS005	F1	MOUSER	650-RGEF500
44	8	YELLOW LED001	LED1-8	PANASONIC	LN1461C
45	10	0.22UF 25V 10% 0805	C77,C91-92,C118-11 9,C152-154,C185- 186	AVX	08053C224KAT2A
46	2	0.1UF 50V 10% 0805	C172,C216	AVX	08055C104KAT
47	5	600 100MHZ 200MA 0603	FER1-5	DIGI-KEY	490-1014-2-ND
48	1	2A S2A DO-214AA	D4	VISHAY	S2A-E3
49	4	1UF 16V 10% 0805	C204,C207-209	KEMET	C0805C105K4RAC TU
50	1	10UF 25V +80-20% 1210	C215	DIGI-KEY	587-1393-2-ND
51	2	68UF 25V 20% CAP003	CT1-2	PANASONIC	EEE-FC1E680P
52	1	2A SL22 DO-214AA	D1	DIGI-KEY	SL22-E3/1GI-ND
53	1	0 1/10W 5% 0805	R14	VISHAY	CRCW08050000Z0EA
54	1	190 100MHZ 5A FER002	FER7	MURATA	DLW5BSN191SQ2
55	20	10UF 6.3V 10% 0805	C23-24,C57-58,C84- 85,C111-114,C144- 147,C151,C162-163, C176,C205-206	AVX	08056D106KAT2A
56	3	6.04K 1/10W 1% 0805	R28-30	DIGI-KEY	311-6.04KCRCT-ND

ADSP-21369 EZ-KIT Lite Bill Of Materials

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
57	1	4.7UF 6.3V 10% 0805	C225	AVX	08056D475KAT2A
58	7	0.1UF 10V 10% 0402	C3,C75-76,C168-171	AVX	0402ZD104KAT2A
59	89	0.01UF 16V 10% 0402	C4-22,C25-56,C59-74,C78-83,C173-175,C177-178,C183,C188,C190-196,C201-202	AVX	0402YC103KAT2A
60	22	10K 1/16W 5% 0402	R5,R19-23,R25-26,R32-34,R132,R152-156,R161-162,R173-175	VISHAY	CRCW040210K0FKED
61	3	4.7K 1/16W 5% 0402	R4,R180,R202	VISHAY	CRCW04024K70JNED
62	9	0 1/16W 5% 0402	R1-3,R7-9,R107,R121,R138	PANASONIC	ERJ-2GE0R00X
63	2	22 1/16W 5% 0402	R124,R133	PANASONIC	ERJ-2GEJ220X
64	2	33 1/16W 5% 0402	R6,R27	VISHAY	CRCW040233R0JNEA
65	1	1.5UH 20% IND003	L2	COIL CRAFT	DO1608C-152MLC
66	1	100MA CMDSH-3 SOD-323	D2	GEN-ERAL-SEMI	CMDSH-3-E3
67	1	0.18UF 25V 10% 0805	C218	AVX	08053C184KAT2A
68	1	100UF 10V 10% C	CT3	AVX	TPSC107K010R0075
69	2	64.9K 1/10W 1% 0805	R190,R194	VISHAY	CRCW080564K9FKEA

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
70	2	210.0K 1/4W 1% 0805	R191,R193	VISHAY	CRCW0805210KFKEA
71	1	107.0 1/10W 1% 0805	R128	DIGI-KEY	311-107CRTR-ND
72	1	249.0 1/10W 1% 0805	R127	DIGI-KEY	311-249CRTR-ND
73	2	0.1UF 16V 10%0603	C187,C189	AVX	0603YC104KAT2A
74	1	1UF 16V 10% 0603	C179	PANASONIC	ECJ-1VB1C105K
75	2	4.7UF 25V 20% 0805	C217,C220	AVX	0805ZD475KAT2A
76	2	68PF 50V 5% 0603	C93,C223	AVX	06035A680JAT2A
77	8	330PF 50V 5% 0603	C95,C101,C107, C116,C123,C129, C134,C142	AVX	06035A331JAT2A
78	2	470PF 50V 5% 0603	C90,C222	AVX	06033A471JAT2A
79	10	330 1/10W 5% 0603	R163-164,R168-172, R176-178	VISHAY	CRCW0603330RJNEA
80	8	0 1/10W 5% 0603	R12,R31,R126,R143, R184,R186,R192, R200	PHYCOMP	232270296001L
81	4	10 1/10W 5% 0603	R157-160	VISHAY	CRCW060310R0JNEA
82	3	10.0K 1/16W 1% 0603	R125,R142,R148	DALE	CRCW060310K0FKEA
83	1	75.0K 1/16W 1% 0603	R131	VISHAY	CRCW060375K0FKEA
84	1	200.0K 1/16W 1% 0603	R134	VISHAY	CRCW0603200KFKEA

ADSP-21369 EZ-KIT Lite Bill Of Materials

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
85	1	25.5K 1/16W 1% 0603	R150	DIGI-KEY	311-25.5KHRTR-ND
86	1	51.1K 1/16W 1% 0603	R198	VISHAY	CRCW060351K1FKEA
87	4	237.0 1/10W 1% 0603	R108-109,R122-123	DIGI-KEY	311-237HRTR-ND
88	2	750.0K 1/10W 1% 0603	R110,R116	DIGI-KEY	311-750KHRTR-ND
89	11	11.0K 1/10W 1% 0603	R39-40,R50,R58, R73,R81,R86,R97, R102,R115,R144	DIGI-KEY	311-11.0KHRTR-ND
90	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
91	9	3.32K 1/10W 1% 0603	R36,R43,R49,R57, R74,R82,R85,R94, R130	DIGI-KEY	311-3.32KHRTR-ND
92	8	1.65K 1/10W 1% 0603	R44,R52,R60,R64, R71,R79,R88,R95	DIGI-KEY	311-1.65KHRTR-ND
93	10	49.9K 1/10W 1% 0603	R46,R55,R63,R66, R68,R76,R91-92, R119-120	DIGI-KEY	311-49.9KHRTR-ND
94	8	604.0 1/10W 1% 0603	R45,R54,R62,R65, R69,R77,R90,R93	NIC COMPO- NENTS	NRC06F6040TRF
95	2	90.9K 1/10W 1% 0603	R146,R151	DIGI-KEY	311-90.9KHRTR-ND
96	1	0.1 1/10W 1% 0603	R149	PANASONIC	ERJ-3RSFR10V
97	3	10.0K 1/10W 1% 0603	R145,R147,R182	DIGI-KEY	311-10.0KHRTR-ND

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
98	4	5.76K 1/10W 1% 0603	R111-112,R117-118	DIGI-KEY	311-5.76KHRTR-ND
99	12	100PF 50V 5% 0603	C94,C99,C105, C117,C125,C131- 132,C140,C155, C161,C166-167	AVX	06035A101JAT2A
100	5	1000PF 50V 5% 0603	C2,C156-157,C164- 165	PANASONIC	ECJ-1VC1H102J
101	1	47.5K 1/10W 1% 0603	R183	DIGI-KEY	311-47.5KHRTR-ND
102	8	220PF 50V 5% 0603	C89,C97,C103, C109,C121,C127, C136,C139	PANASONIC	ECJ-1VC1H221J
103	12	680PF 50V 5% 0603	C96,C102,C108, C115,C122,C128, C135,C141,C148- 149,C158,C160	PANASONIC	ECJ-1VC1H681J
104	9	2200PF 50V 5% 0603	C88,C98,C104, C110,C120,C126, C137-138,C219	PANASONIC	ECJ-1VB1H222K
105	1	33.0 1/10W 1% 0603	R195	DIGI-KEY	311-33.0HRTR-ND
106	8	2.74K 1/10W 1% 0603	R38,R47,R53,R61, R70,R78,R89,R98	DIGI-KEY	311-2.74KHRTR-ND
107	1	75.0 1/10W 1% 0603	R141	DALE	CRCW060375R0FKEA
108	4	1UF 6.3V 20% 0402	C197-200	PANASONIC	ECJ-0EB0J105M
109	4	100 1/16W 5% 0402	R165-167,R179	DIGI-KEY	311-100JRTR-ND
110	1	0.027UF 25V 5% 0603	C181	AVX	06033C273JAT2A

ADSP-21369 EZ-KIT Lite Bill Of Materials

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
111	2	0.27UF 16V 20% 0603	C180,C182	AVX	0603YG274ZAT2A
112	2	2.05K 1/16W 1% 0402	R100-101	VISHAY	CRCW04022K05FKED
113	1	15.0K 1/16W 1% 0603	R140	DIGI-KEY	311-15.0KHRTR-ND
114	1	232.0 1/16W 1% 0603	R129	DIGI-KEY	311-232HRTR-ND
115	2	301.0 1/16W 1% 0603	R105-106	DIGI-KEY	311-301HRTR-ND
116	2	24.9K 1/10W 1% 0603	R11,R196	DIGI-KEY	311-24.9KHTR-ND
117	1	47UF 6.3V 10% B	CT5	NIC COMPO- NENTS	NTC-T476K6.3TRBF
118	1	511.0 1/16W 1% 0402	R135	DIGI-KEY	311-511LCT-ND
119	1	0.05 1/2W 1% 1206	R13	SEI	CSF 1/2 0.05 1%R
120	2	10UF 16V 10% 1210	C100,C224	AVX	1210YD106KAT2A
121	1	GREEN LED001	LED9	PANASONIC	LN1361CTR
122	1	RED LED001	LED10	PANASONIC	LN1261CTR
123	2	1000PF 50V 5% 1206	C213-214	AVX	12065A102JAT2A
124	1	255.0K 1/10W 1% 0603	R16	VISHAY	CRCW06032553FK
125	2	80.6K 1/10W 1% 0603	R15,R197	DIGI-KEY	311-80.6KHRCT-ND
126	1	6.8UH 25% IND009	L3	DIGI-KEY	308-1328-1-ND

Ref.	Qty.	Description	Reference Designator	Manufacturer	Part Number
127	1	4A SSB43L DO-214AA	D5	VISHAY	SSB43L
128	5	5A MBRS540T3G SMC	D3,D6-7,D13-14	ON SEMI	MBRS540T3G
129	1	2.5UH 30% IND013	L1	COILCRAFT	MSS1038-252NLB
130	1	470UF 2.5V 20% D2E	CT7	SANYO	2R5TPE470MF
131	3	30A GSOT05 SOT23-3	D9-11	VISHAY	GSOT05-GS08
132	1	30A GSOT03 SOT23-3	D12	VISHAY	GSOT03-GS08
133	1	7A VESD01- 02V-GS08 SOD-52	D8	VISHAY	VESD01-02V-GS08
134	2	0.03 1/2W 1% 1206	R199,R201	SEI	CSF 1/2 0.03 1%R

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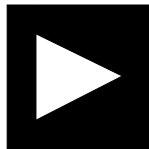
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ADSP-21369 EZ-KIT Lite Schematic



**ANALOG
DEVICES**

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

Title ADSP-21369 EZ-KIT Lite
TITLE

Size C	Board No. A0196-2005	Rev 2.2
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Date 5-28-2009_15:27	Sheet 1 of 13
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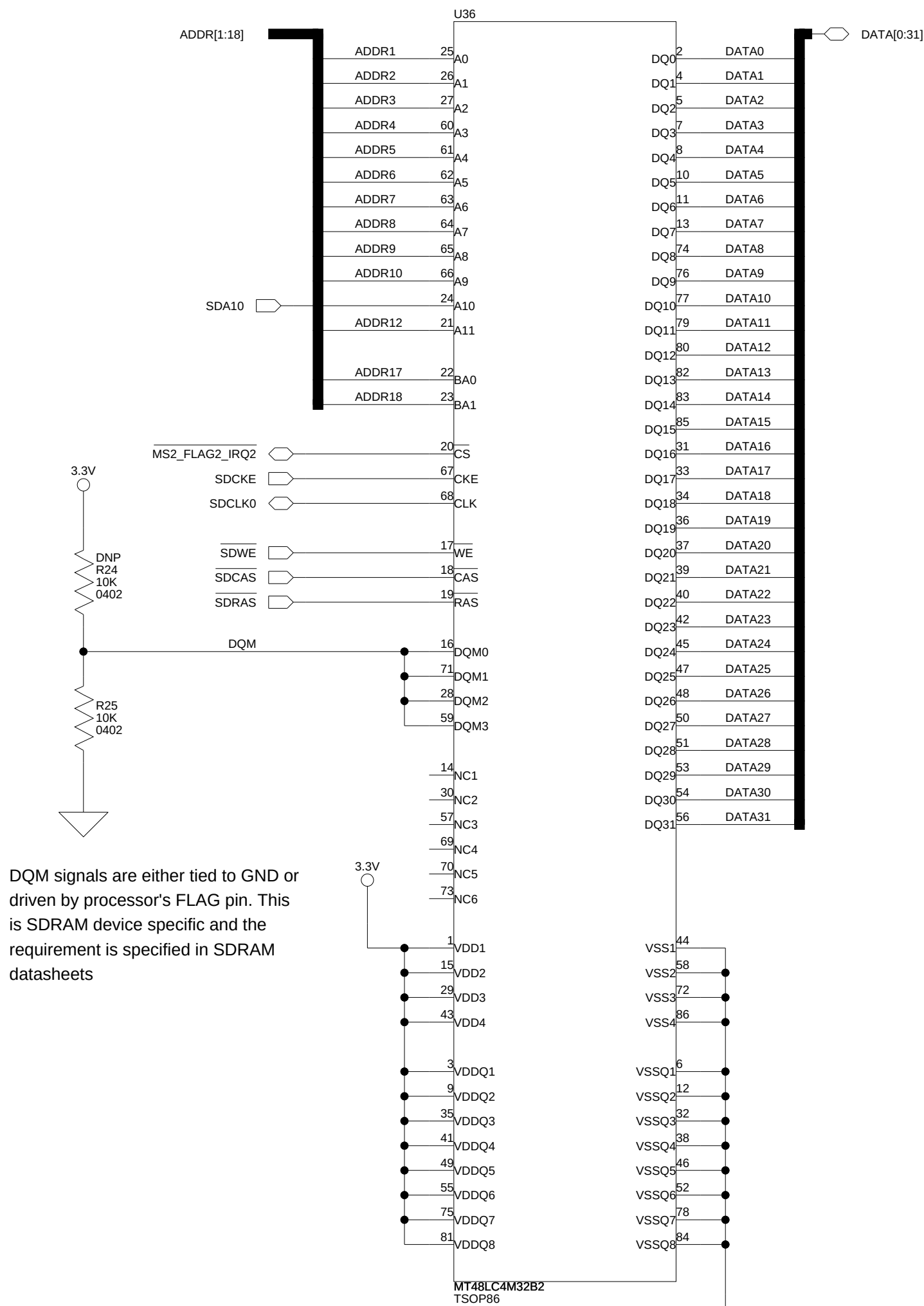
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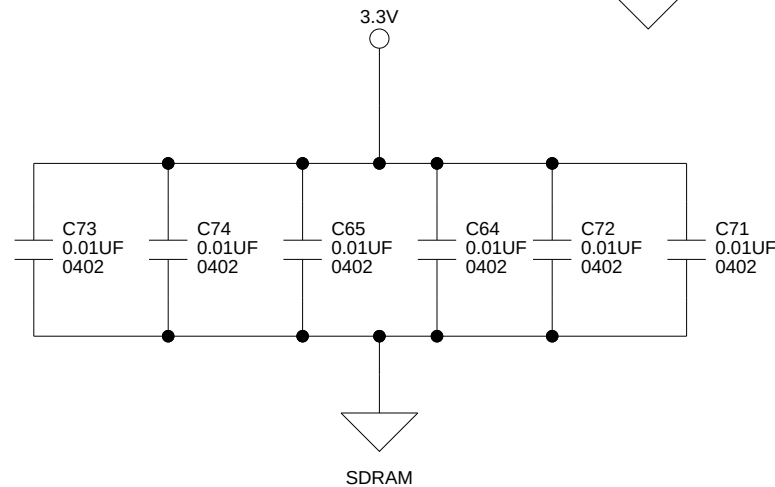
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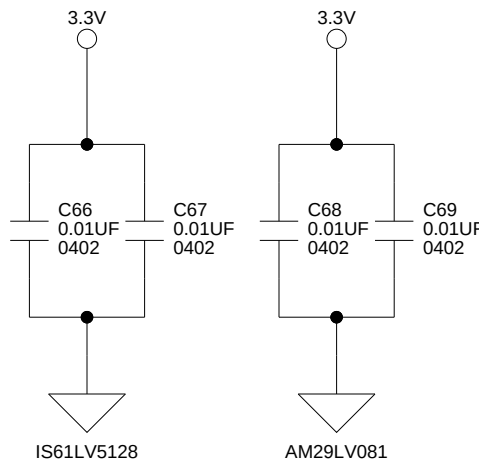
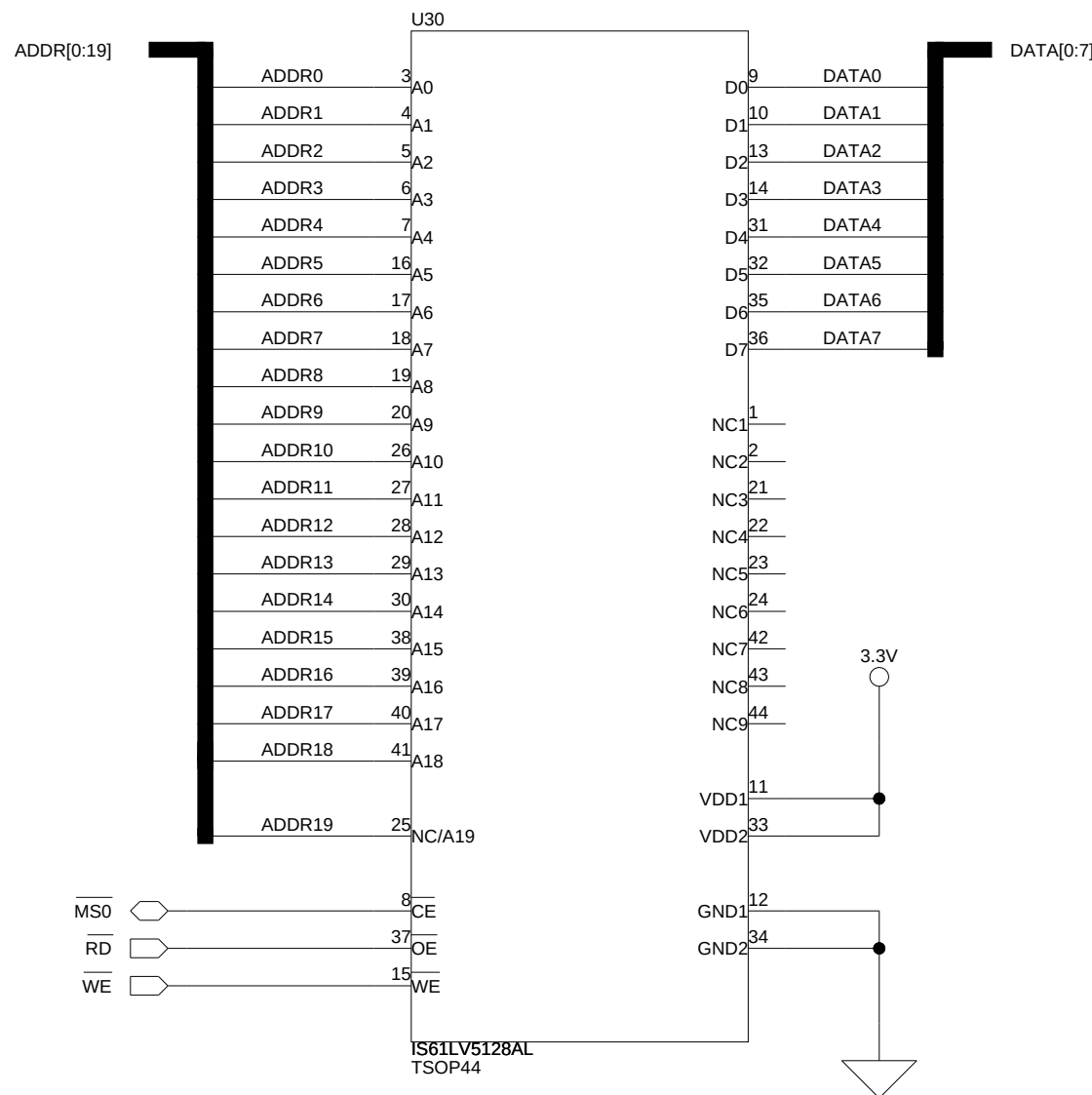
SDRAM
128Mb (1M x 32-bit x 4 Banks)



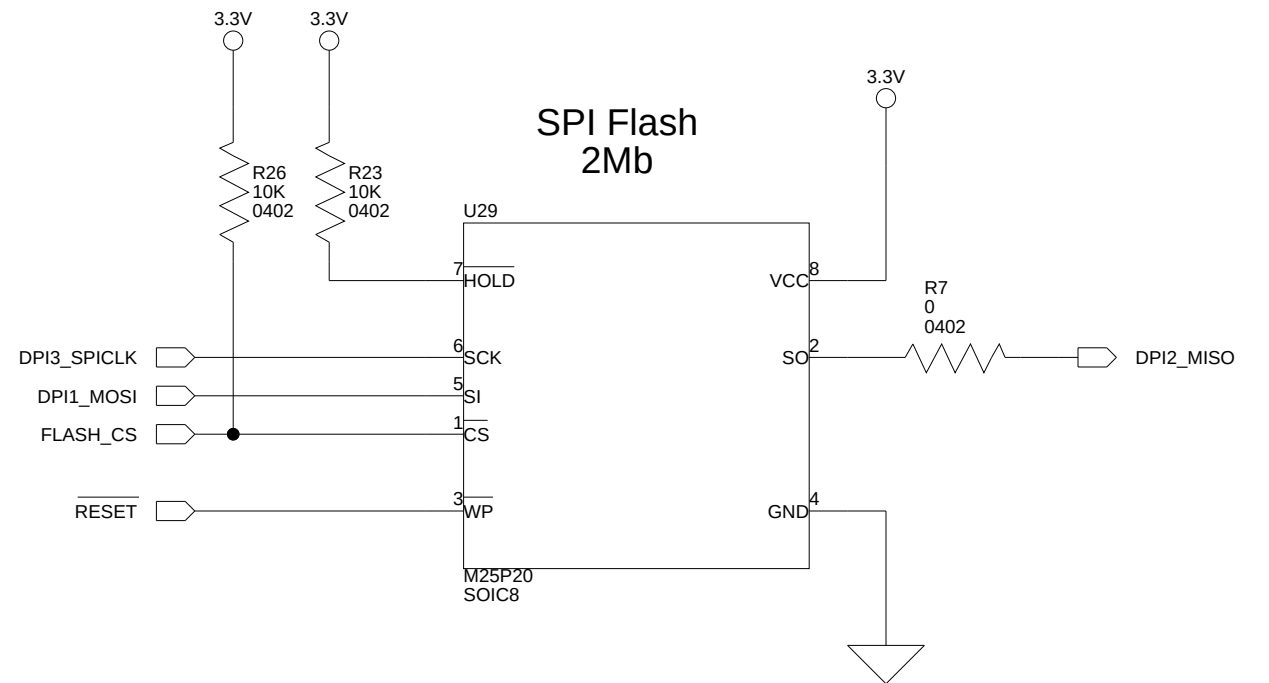
DQM signals are either tied to GND or driven by processor's FLAG pin. This is SDRAM device specific and the requirement is specified in SDRAM datasheets



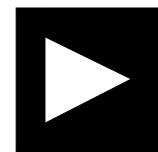
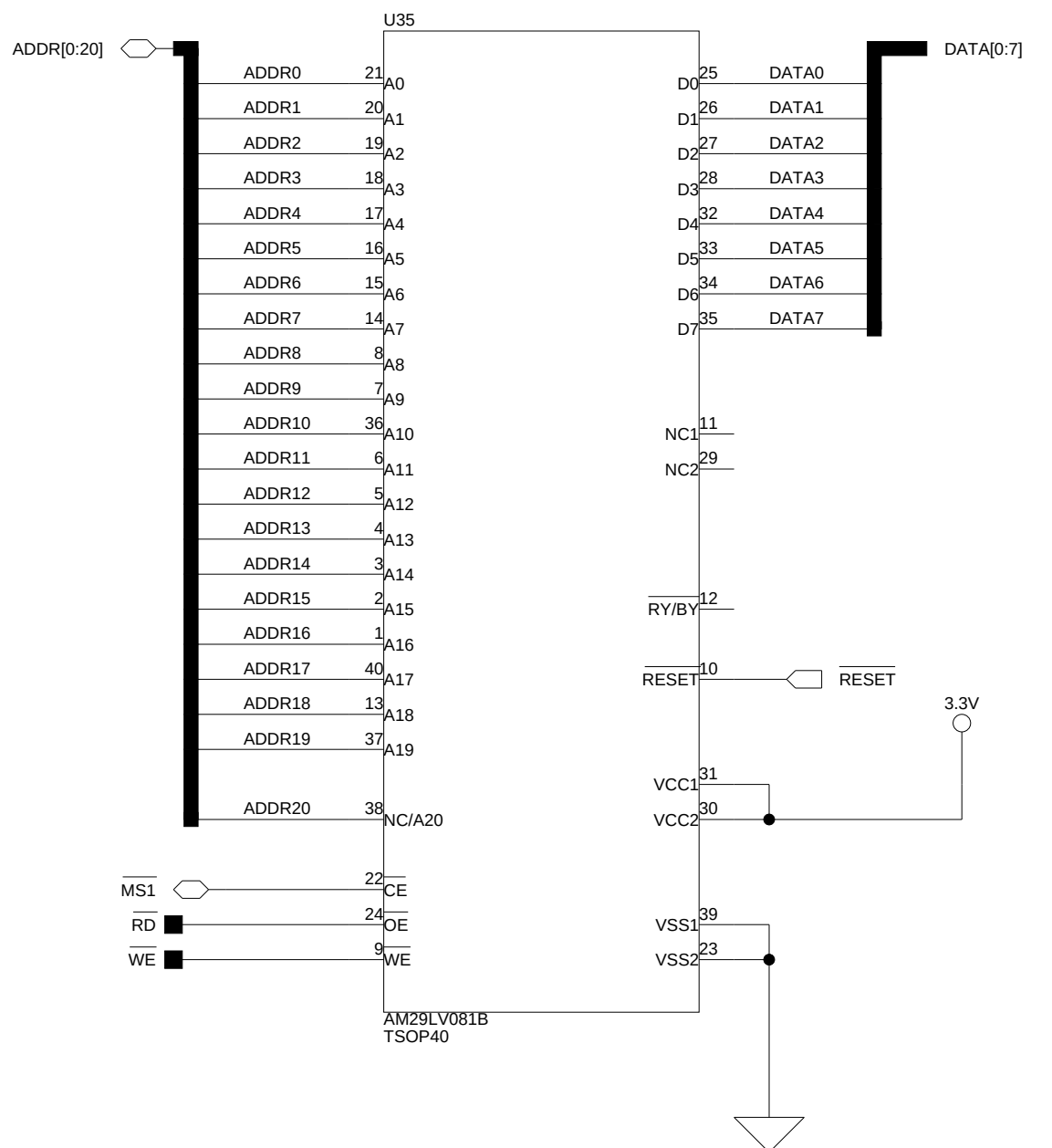
Asynchronous SRAM
4Mb (512K x 8-bit)



SPI Flash
2Mb



Flash
8Mb (1M x 8-bit)



**ANALOG
DEVICES**

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

Title **ADSP-21369 EZ-KIT Lite
MEMORY**

Size C	Board No.	Rev
	A0196-2005	2.2
Date	5-28-2009 15:27	Sheet 4 of 13

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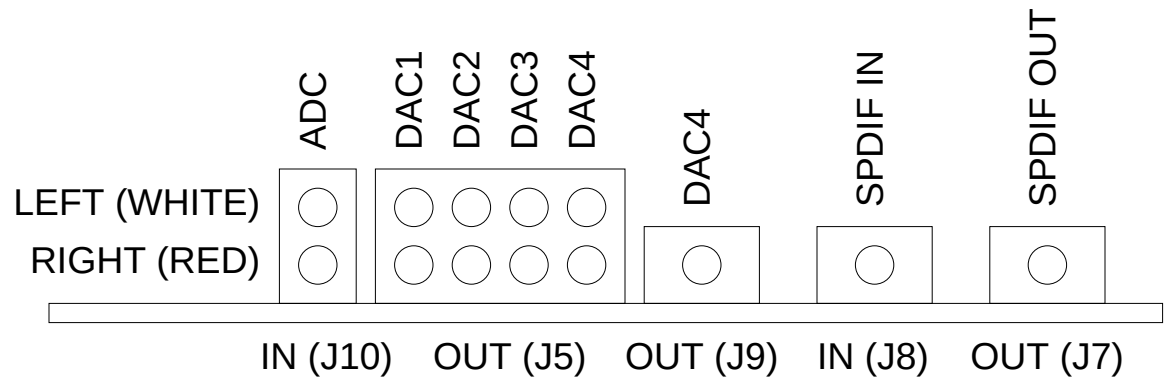
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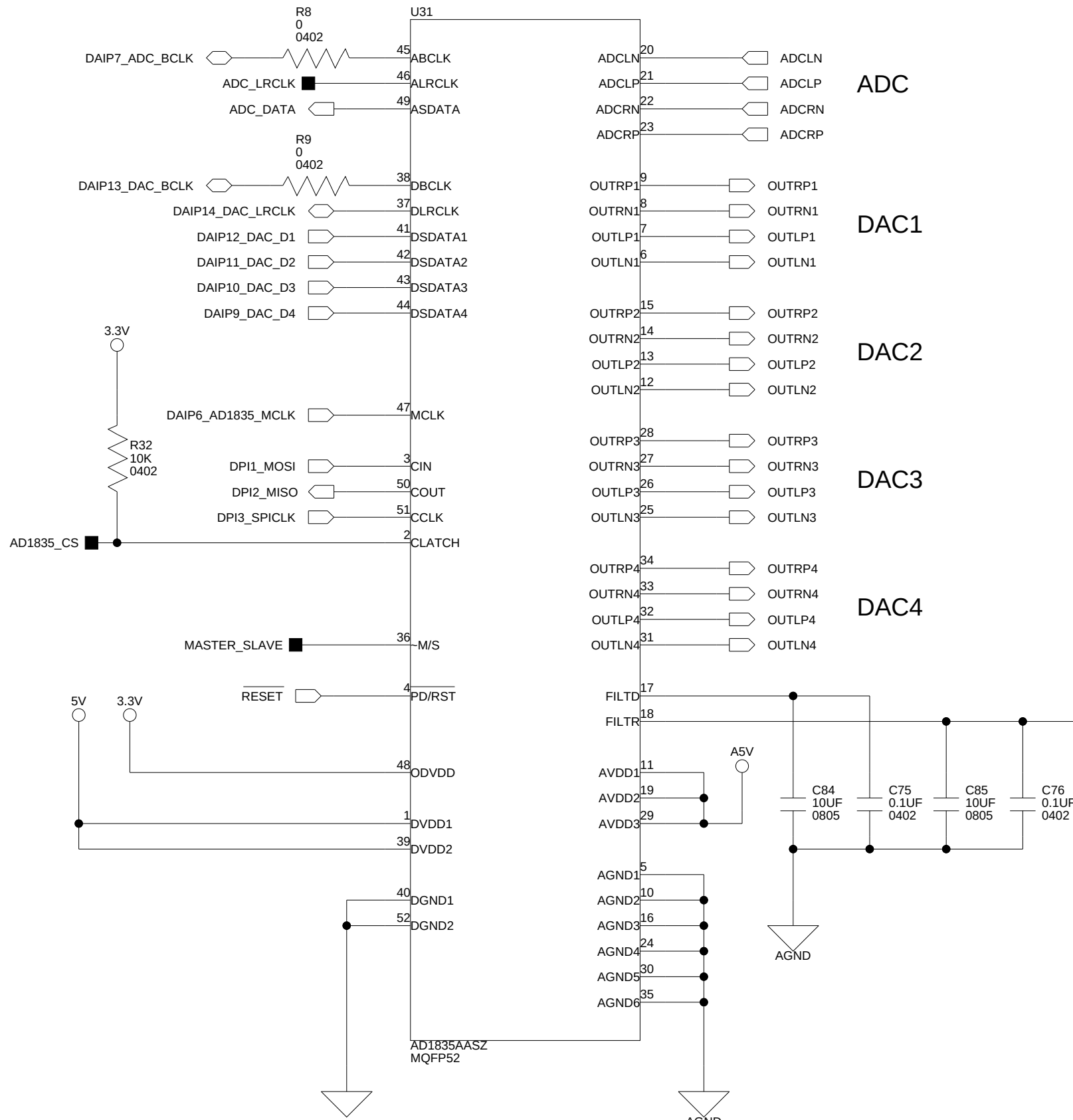
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AD1835 AUDIO CODEC



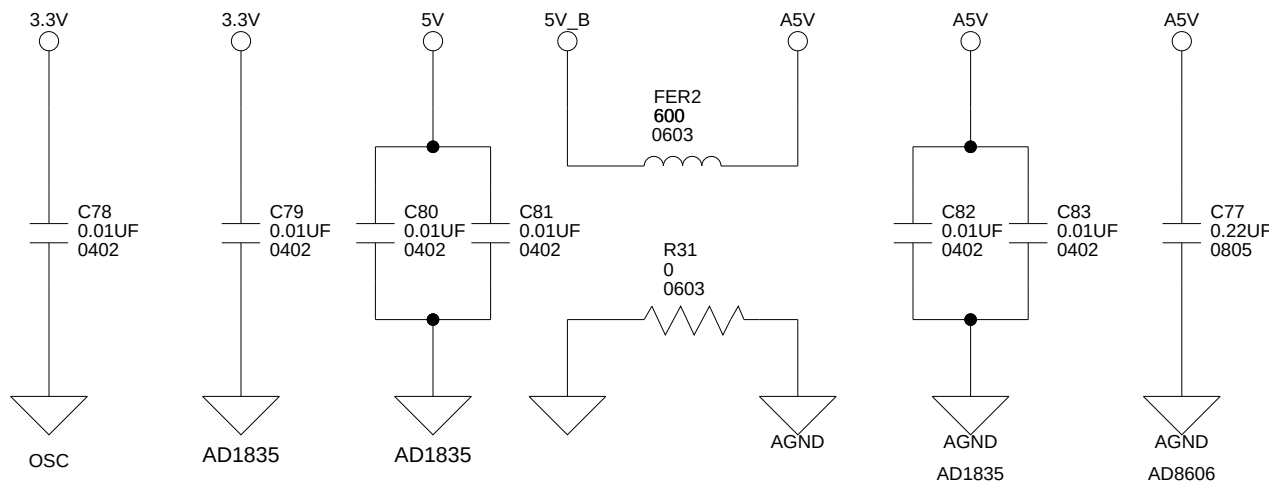
ADC

DAC1

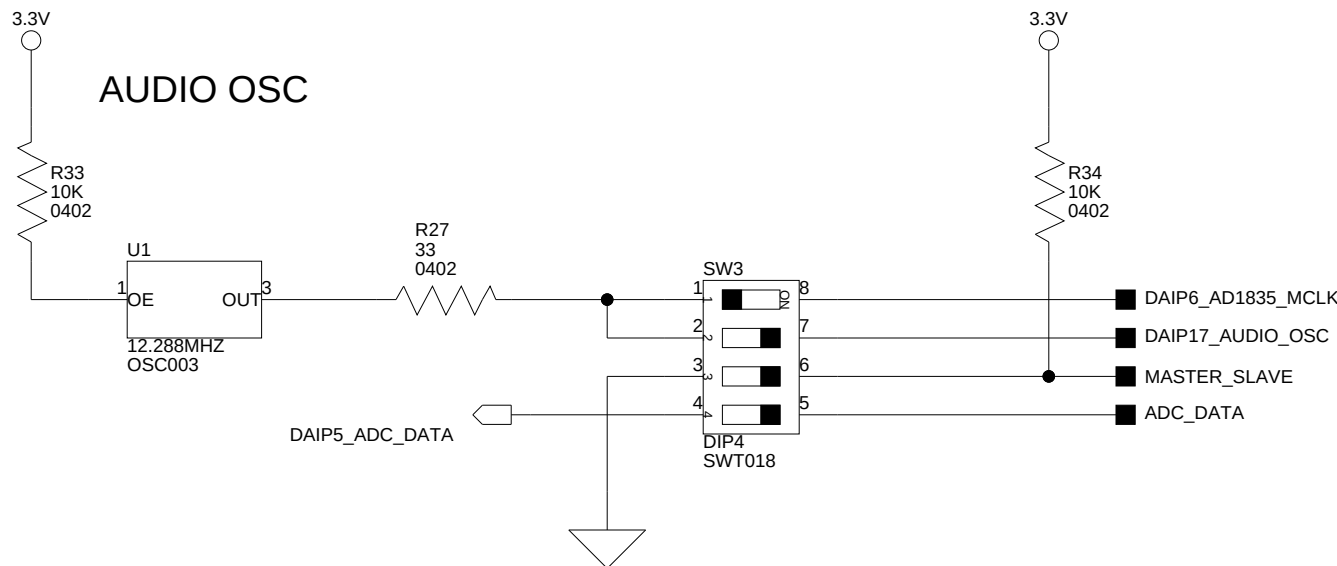
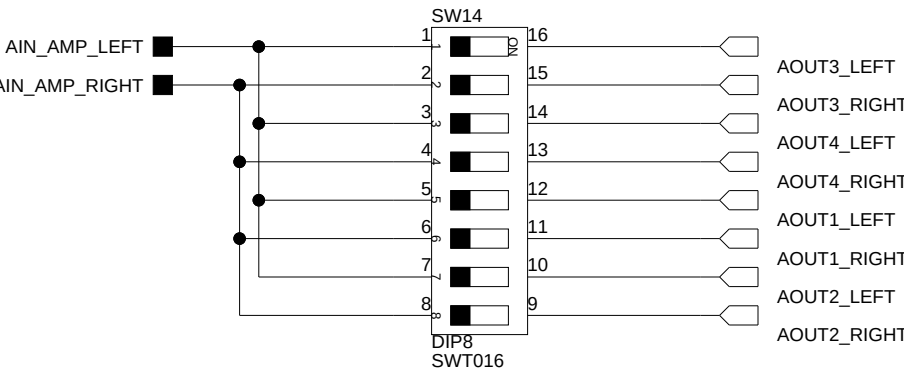
DAC2

DAC3

DAC4



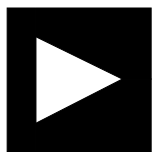
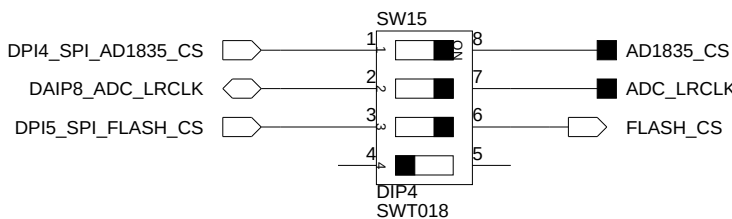
Loopback Test Switch
(Default= All OFF)
For Test Purposes Only



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 Audio and SPI chip selects, also ALRCLK



**ANALOG
DEVICES**

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Title
**ADSP-21369 EZ-KIT Lite
ANALOG AUDIO**

Size C	Board No. A0196-2005	Rev 2.2
Date 5-28-2009_15:27	Sheet 5 of	13

1

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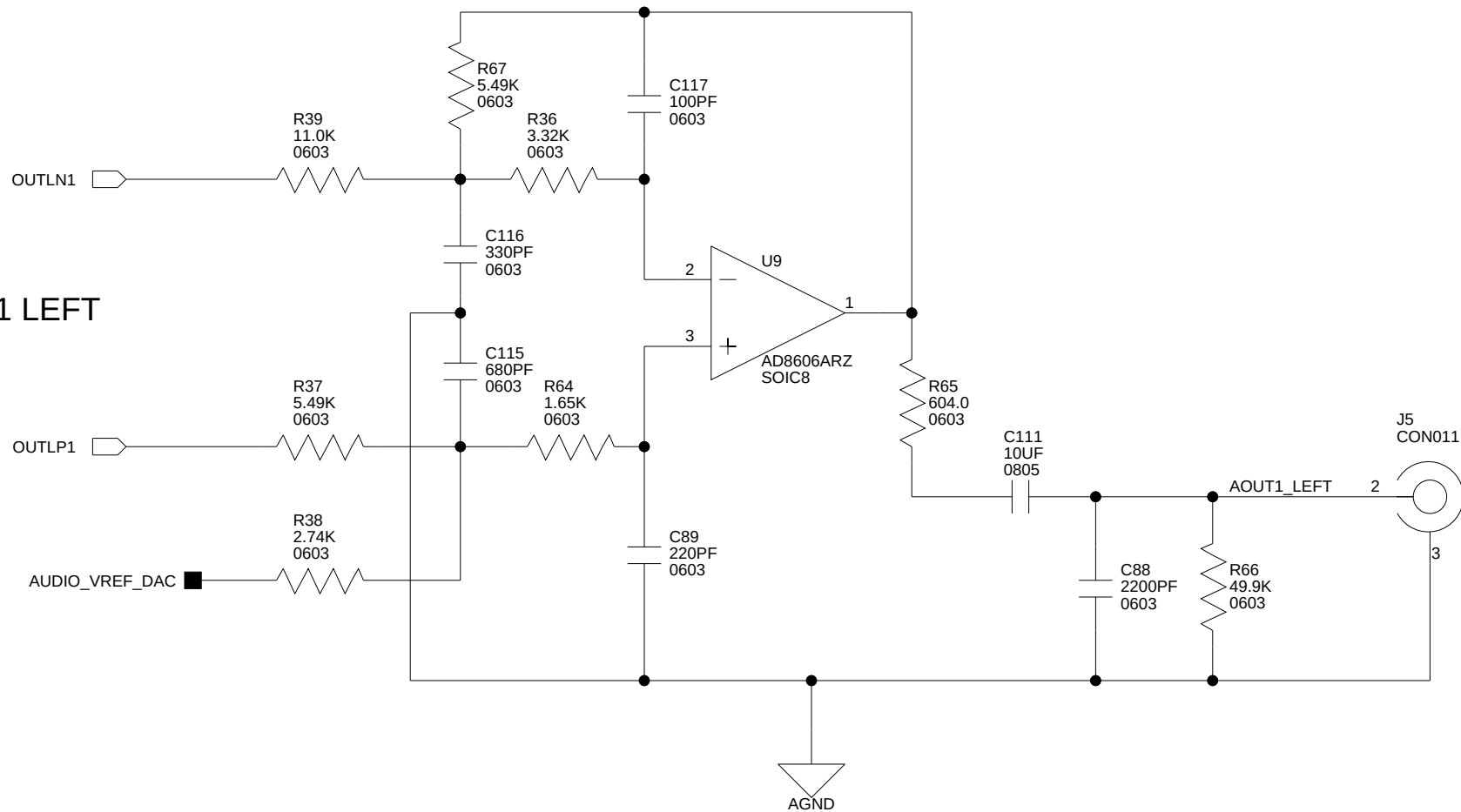
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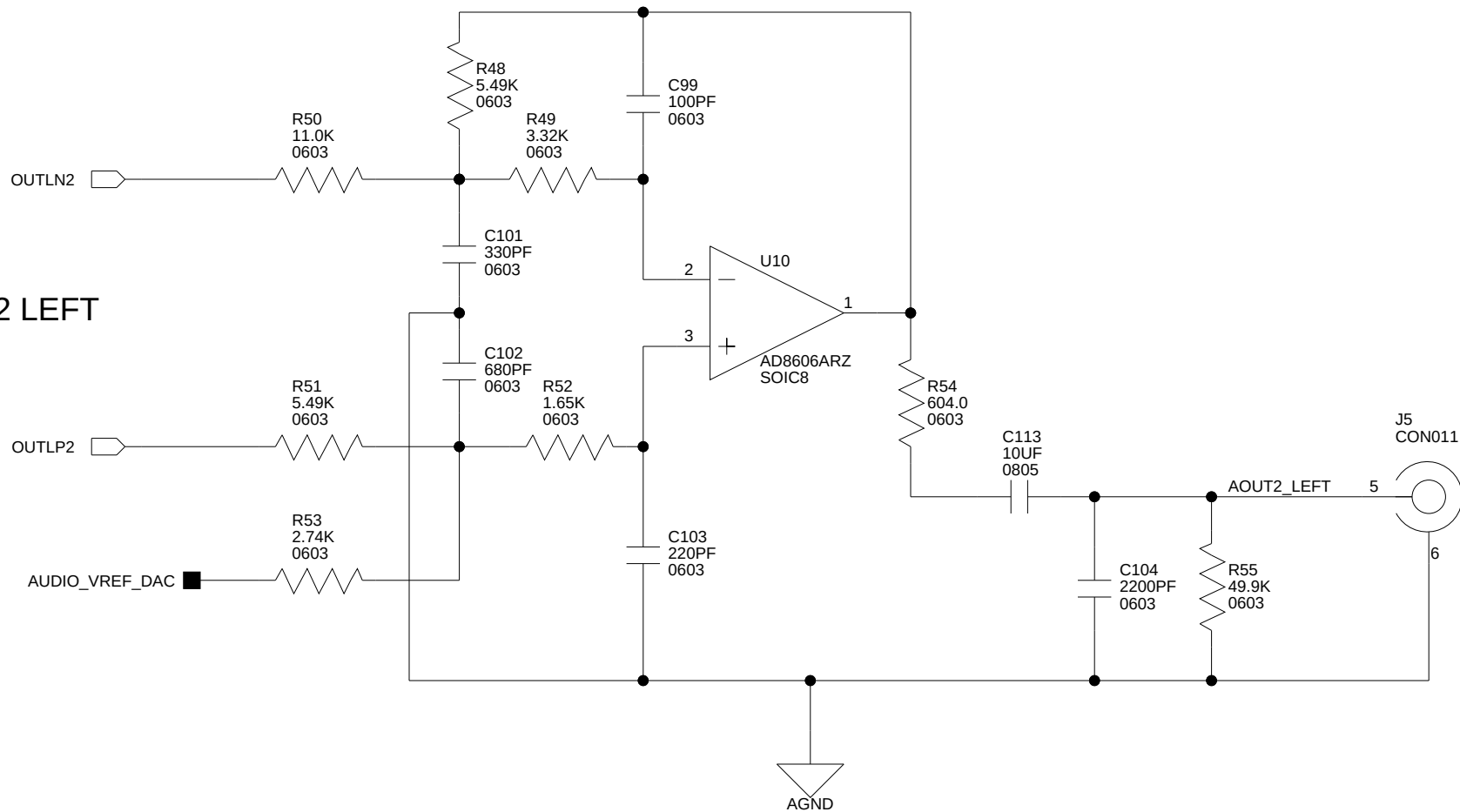
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4

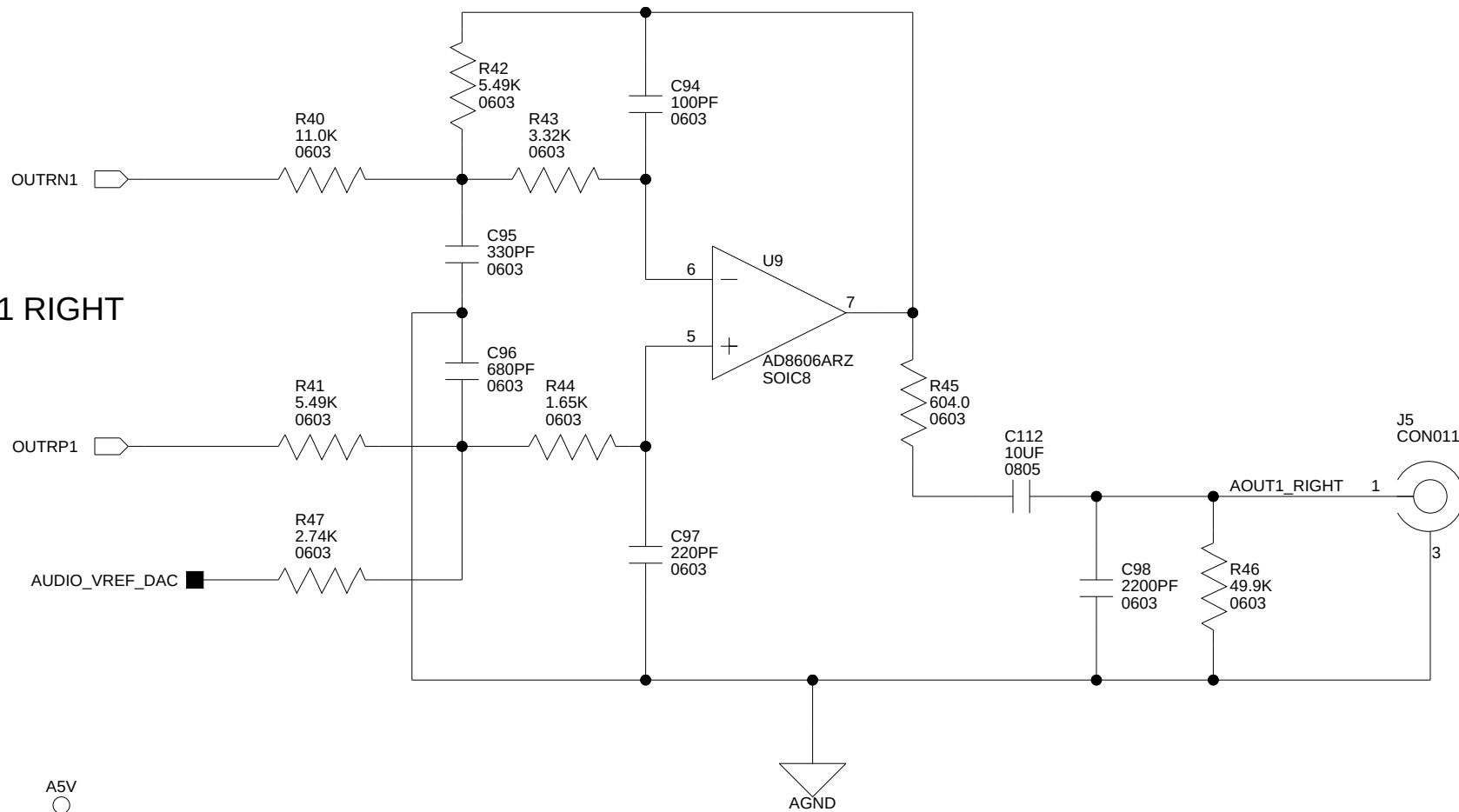
DAC1 LEFT



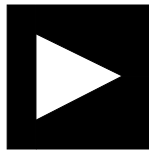
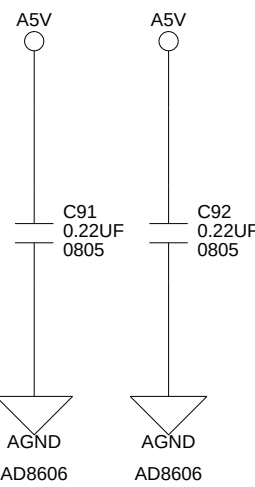
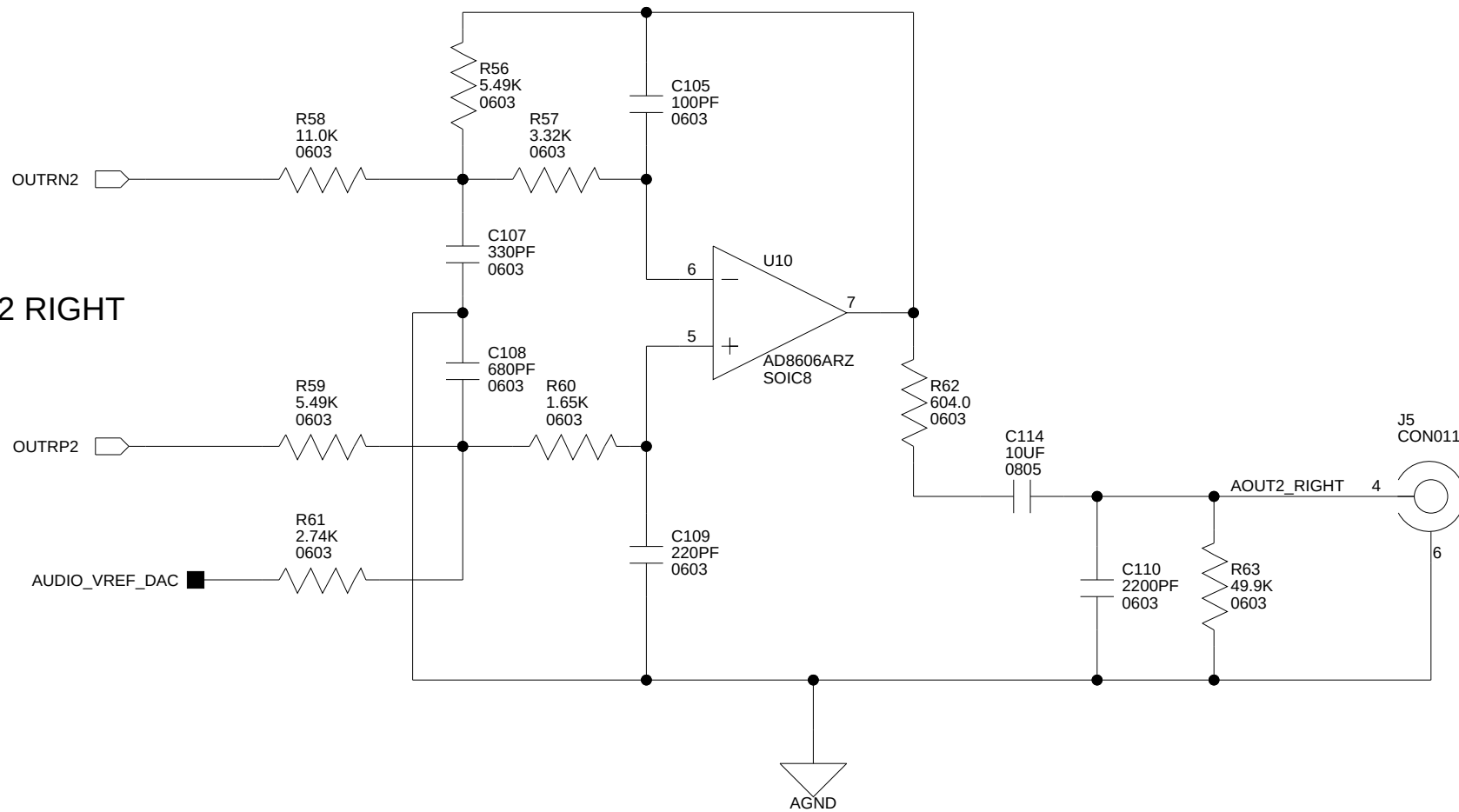
DAC2 LEFT



DAC1 RIGHT



DAC2 RIGHT



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Title			ADSP-21369 EZ-KIT Lite AUDIO OUT 1		
Size C	Board No.		A0196-2005		Rev 2.2
Date	5-28-2009_15:27		Sheet	6 of	13

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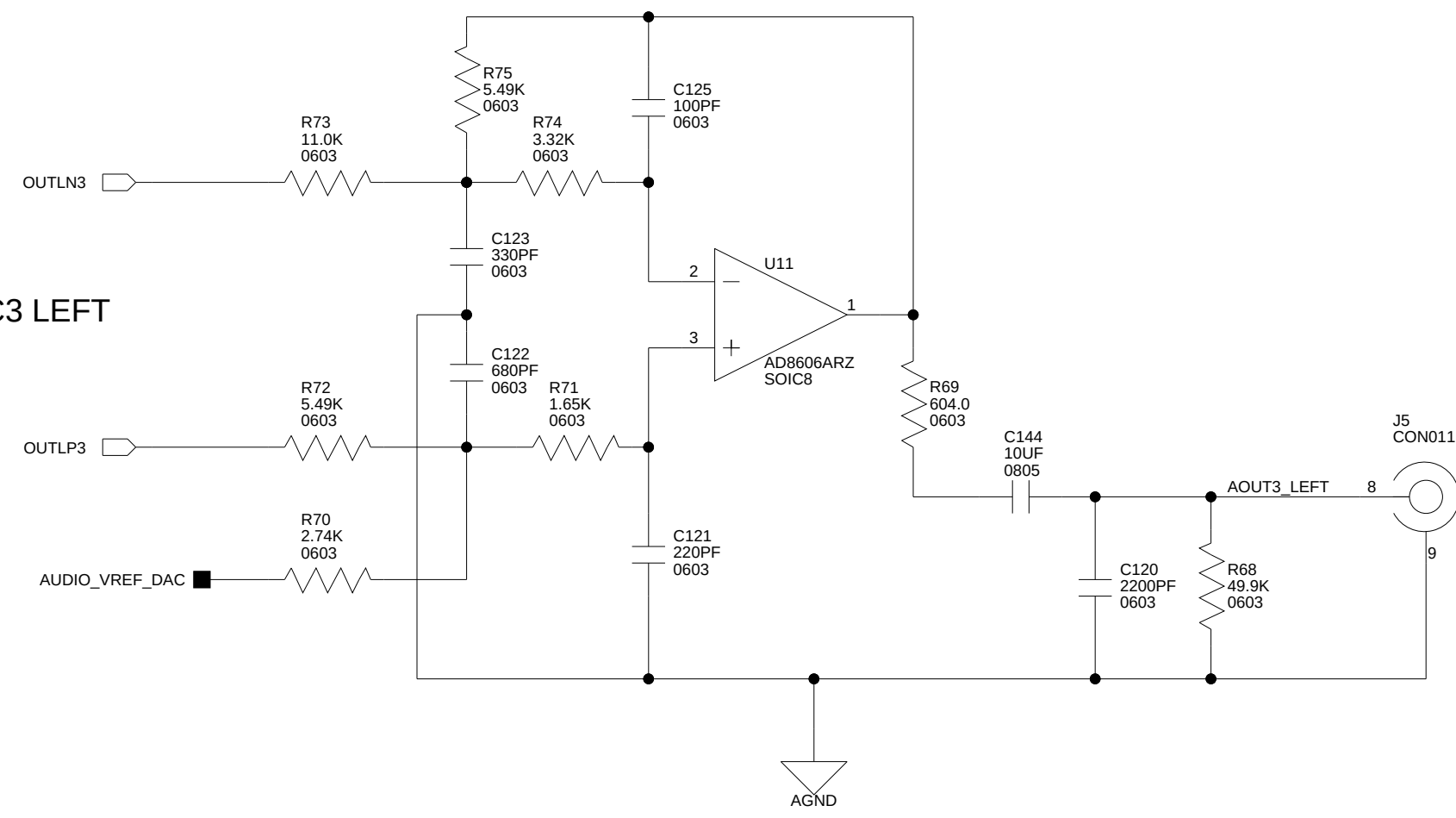
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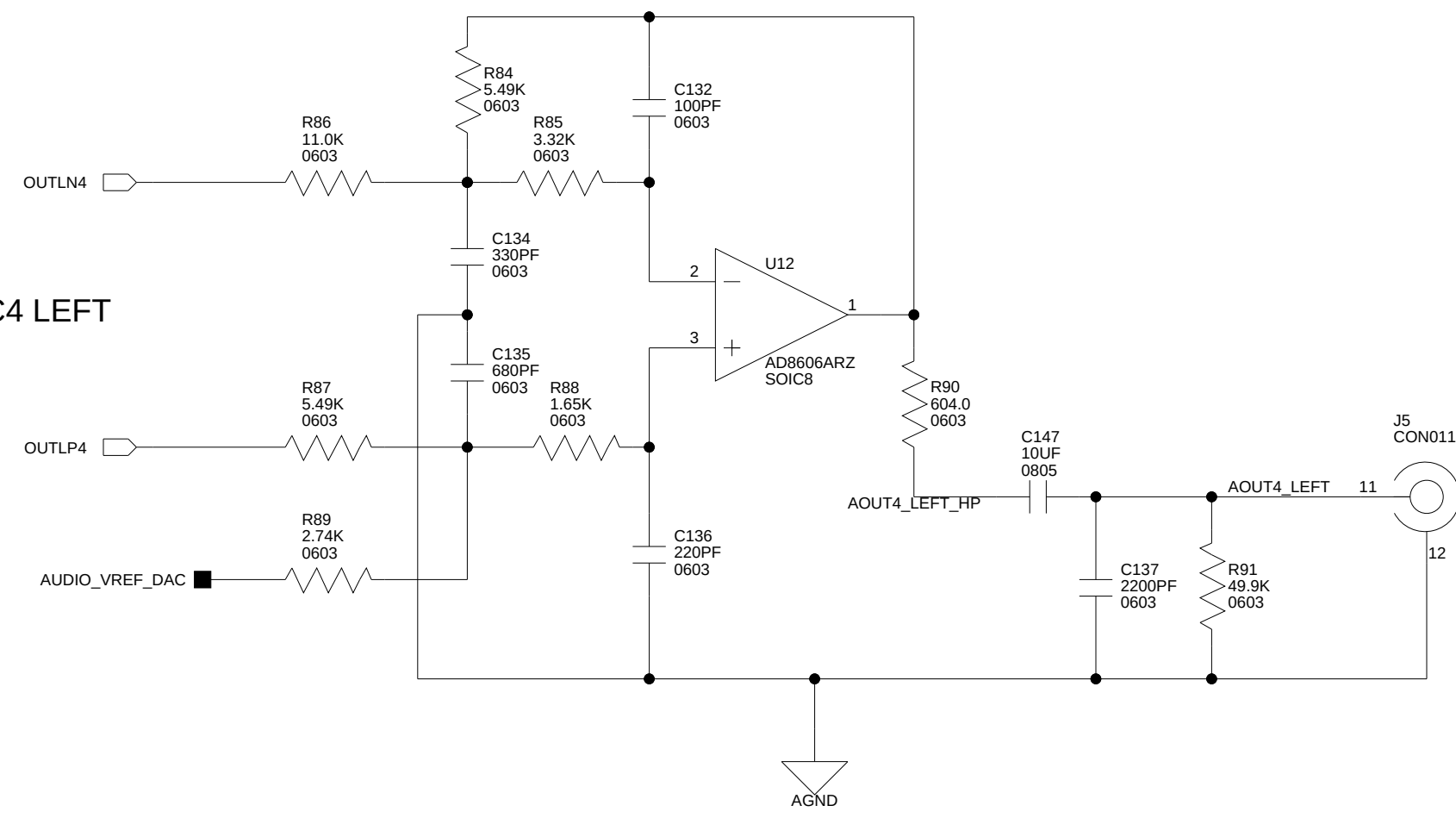
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4

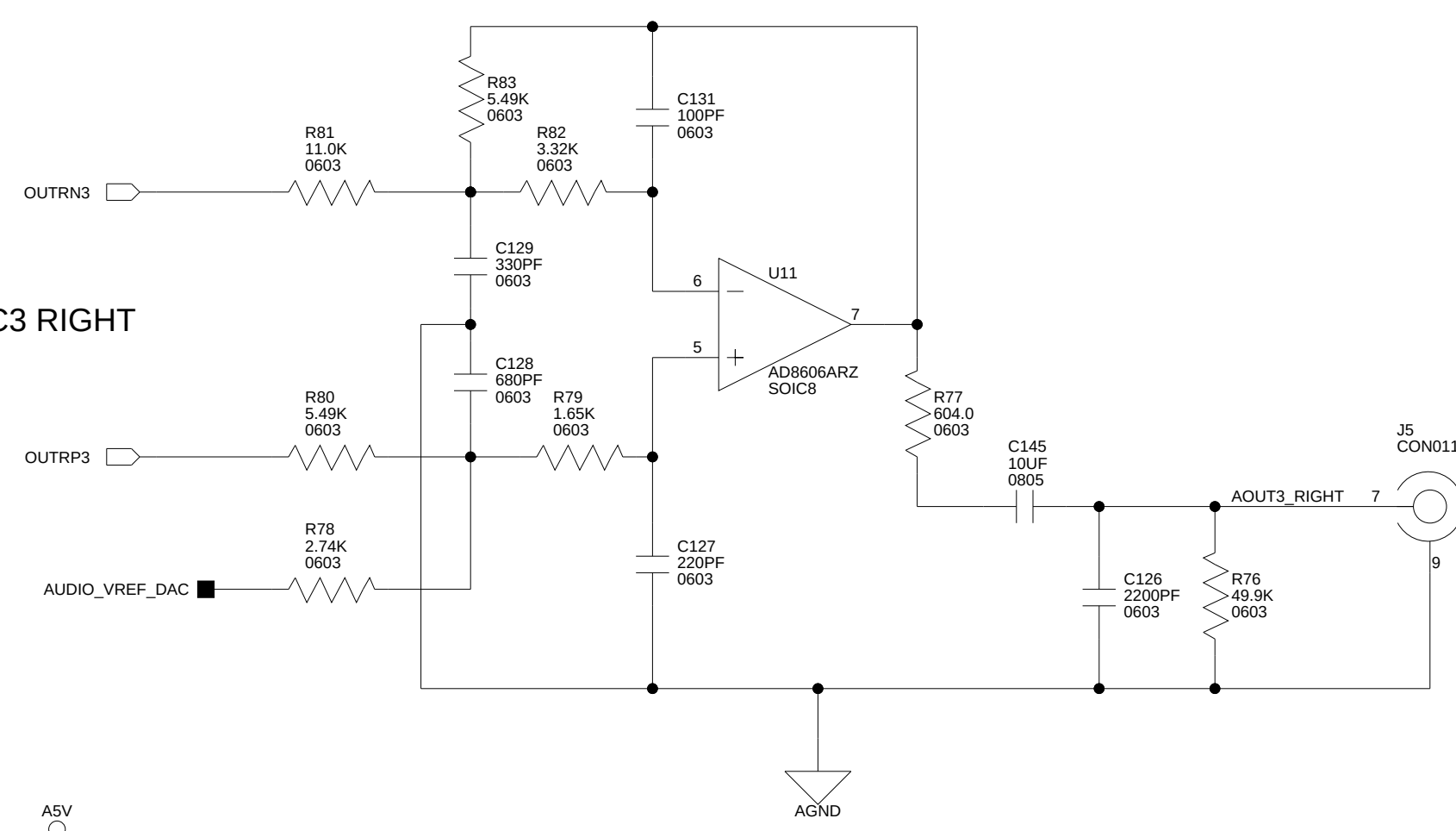
DAC3 LEFT



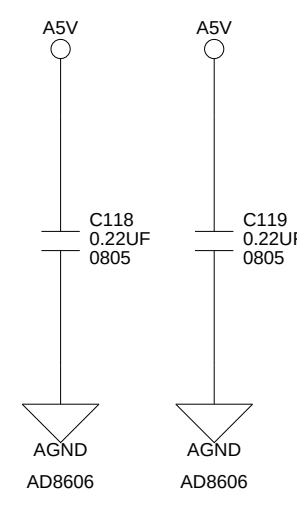
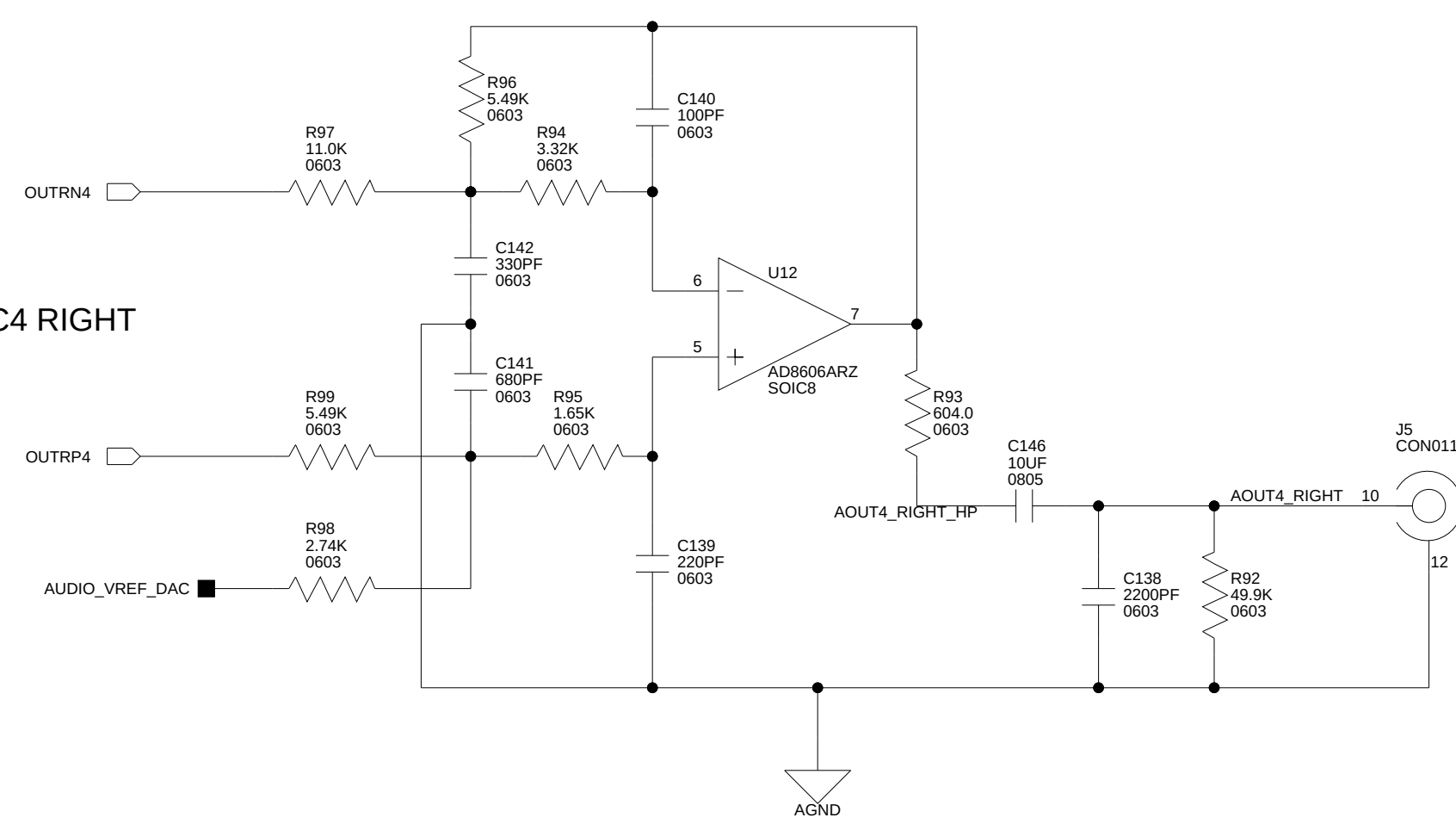
DAC4 LEFT

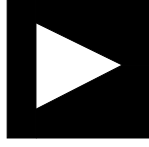


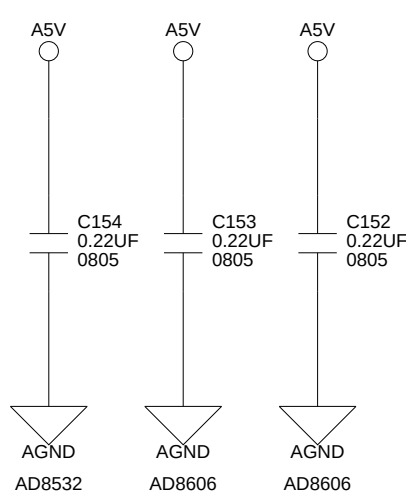
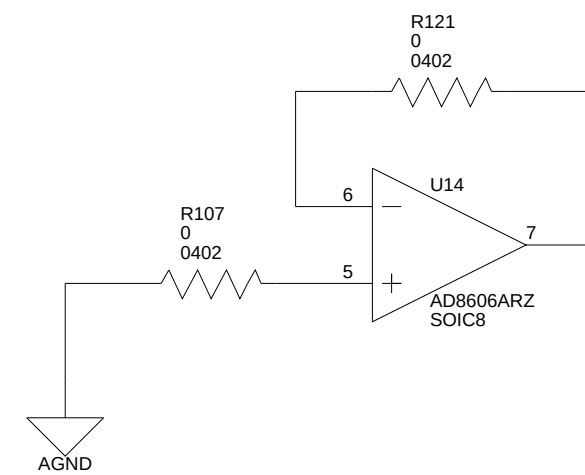
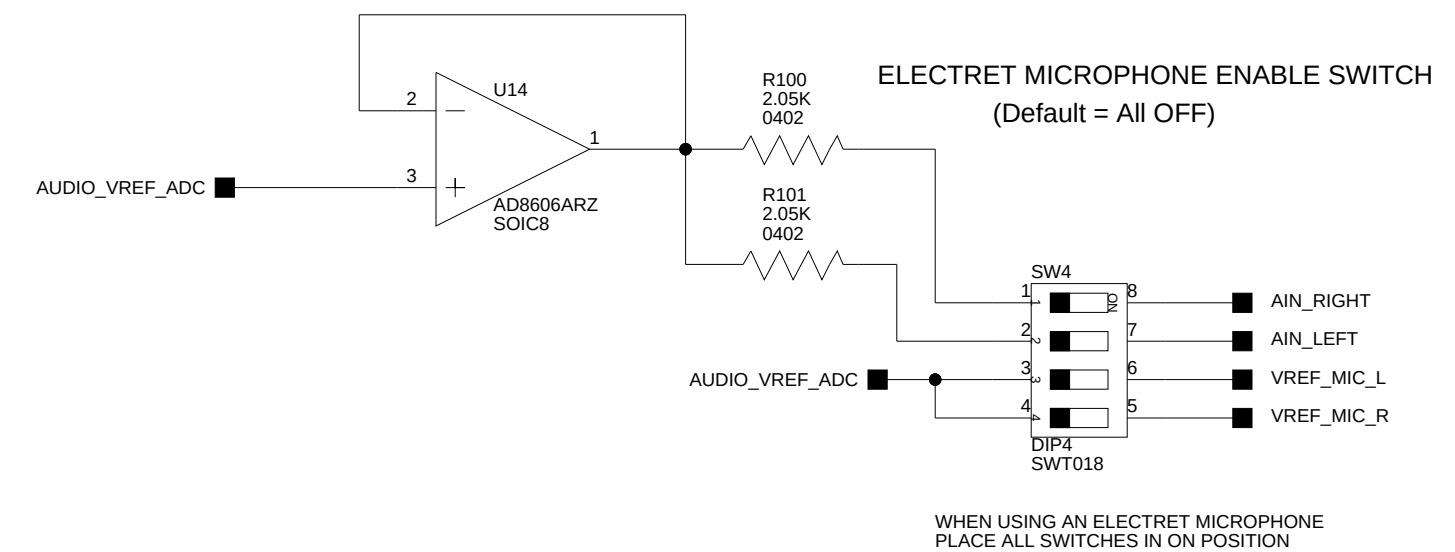
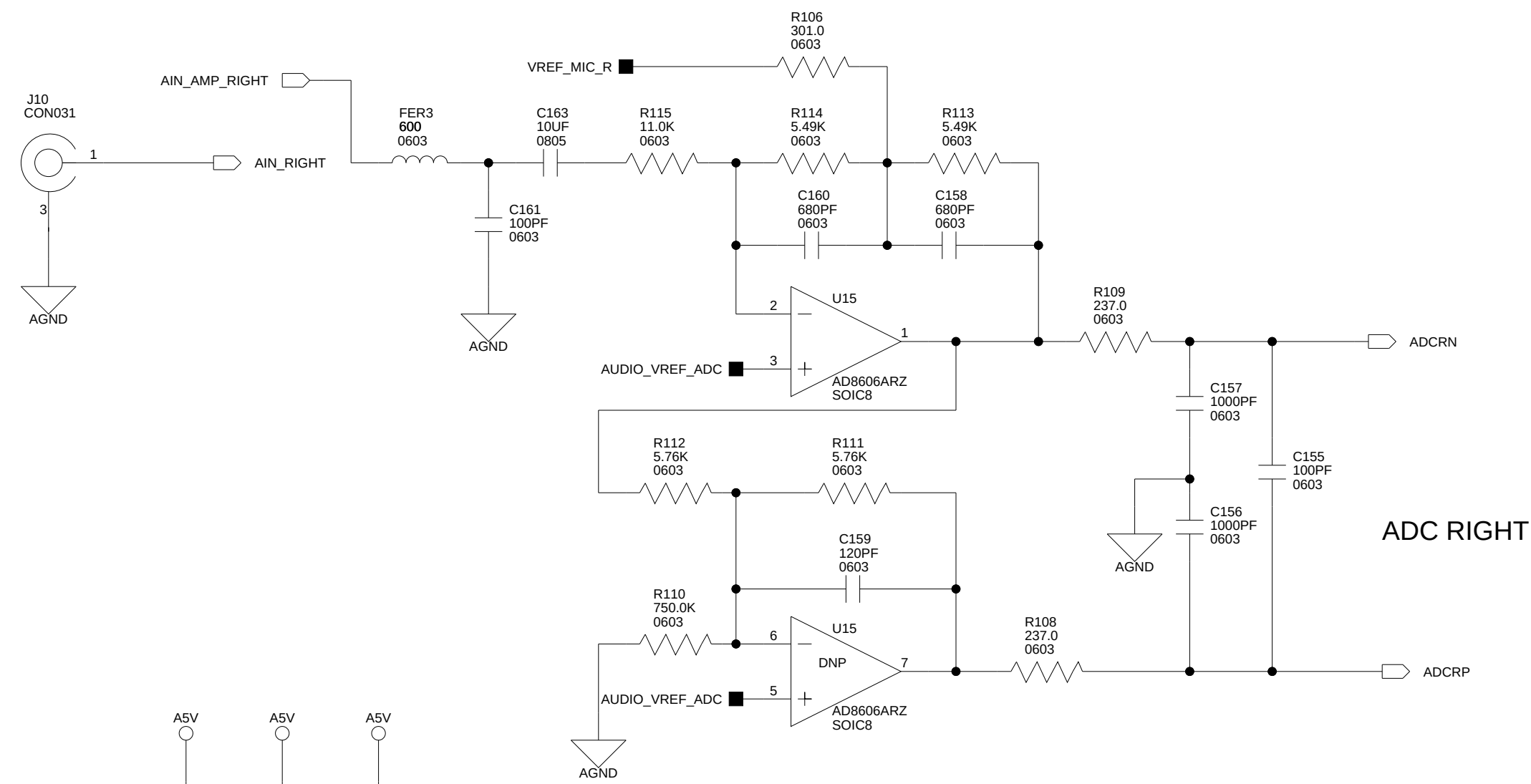
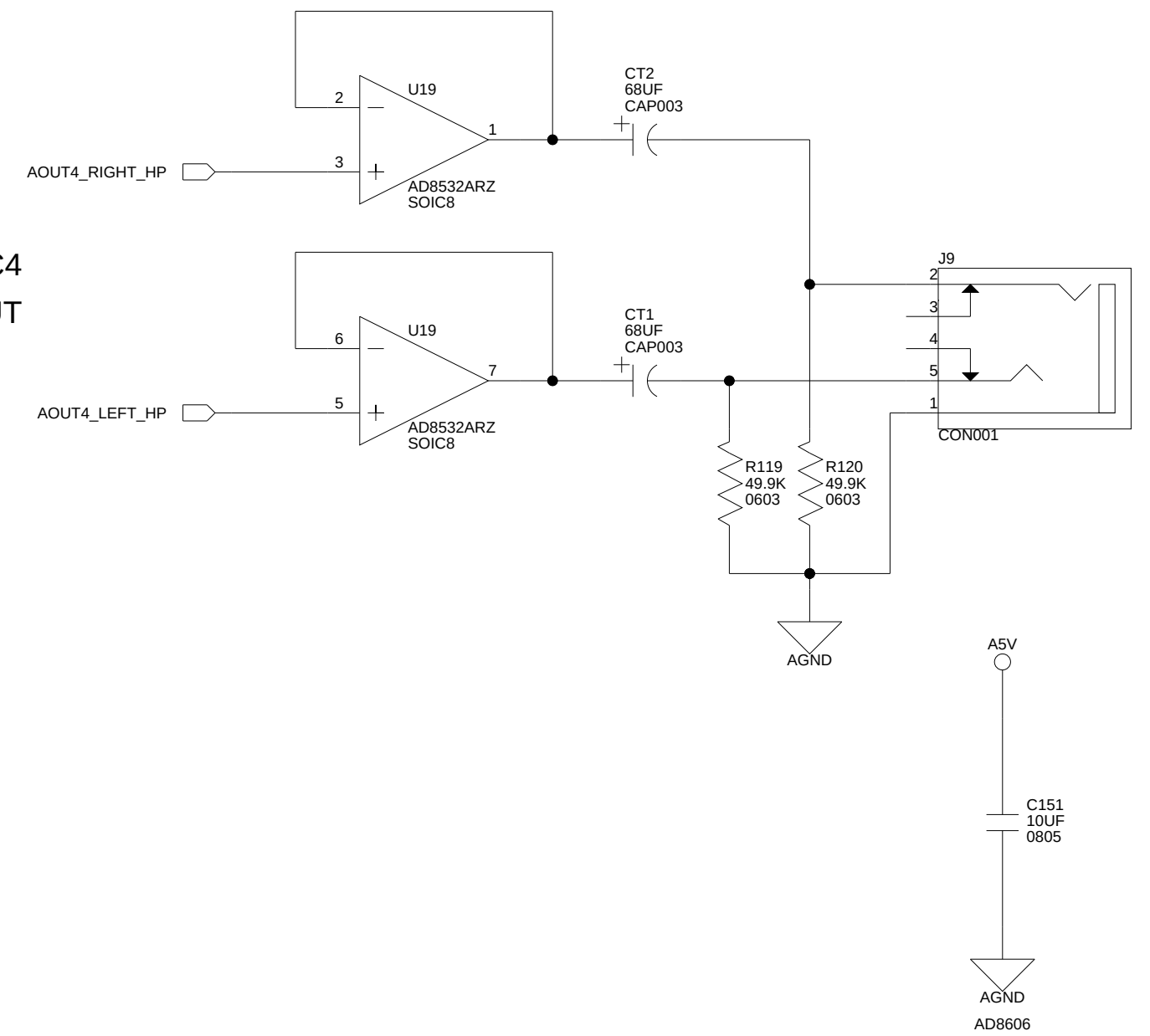
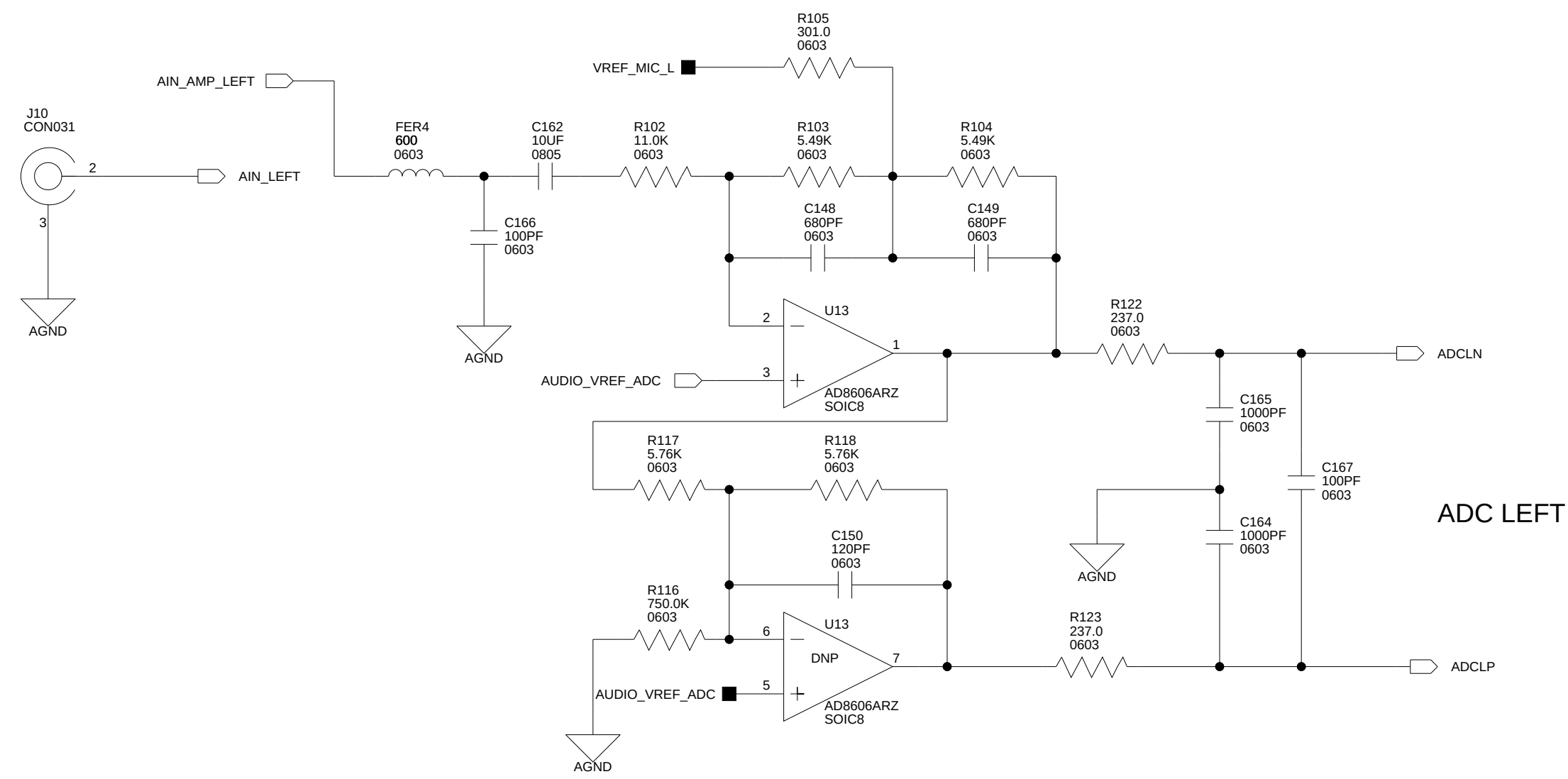
DAC3 RIGHT



DAC4 RIGHT



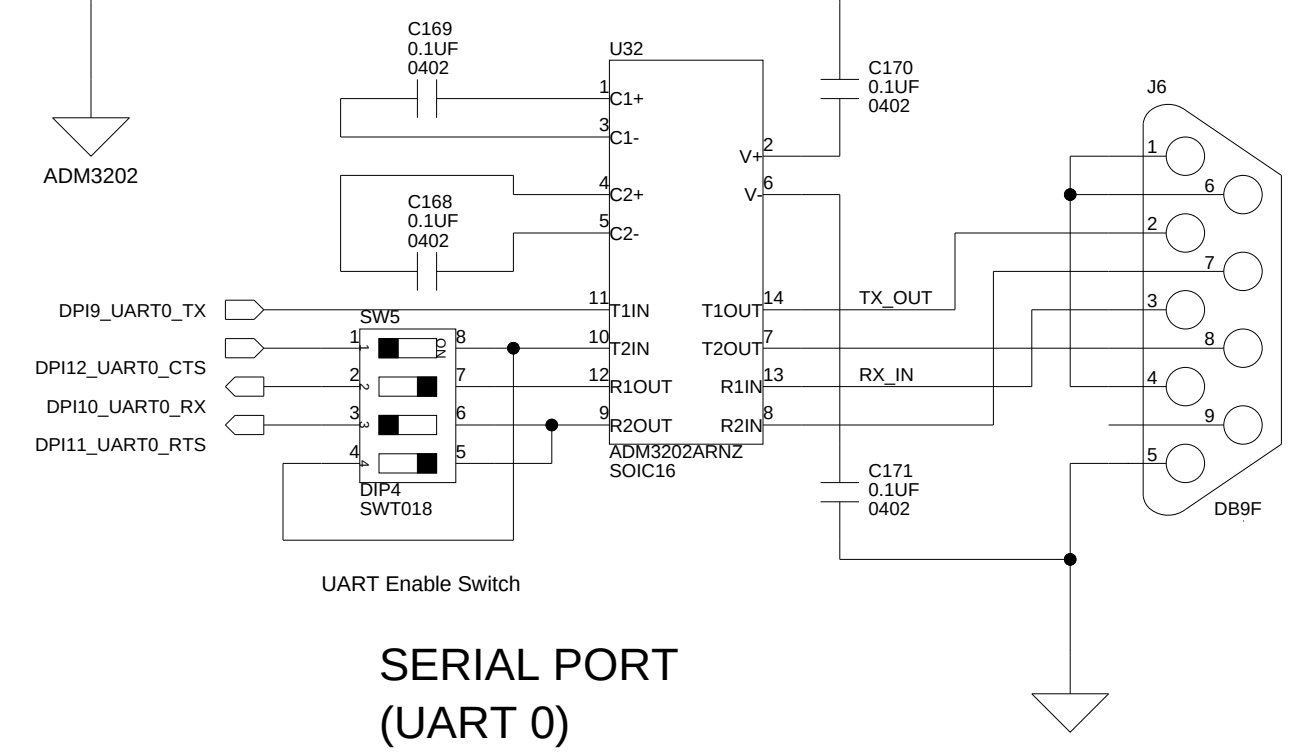
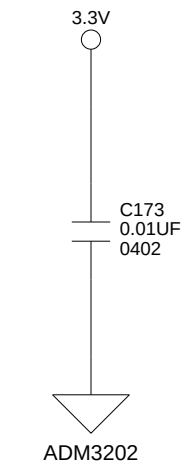
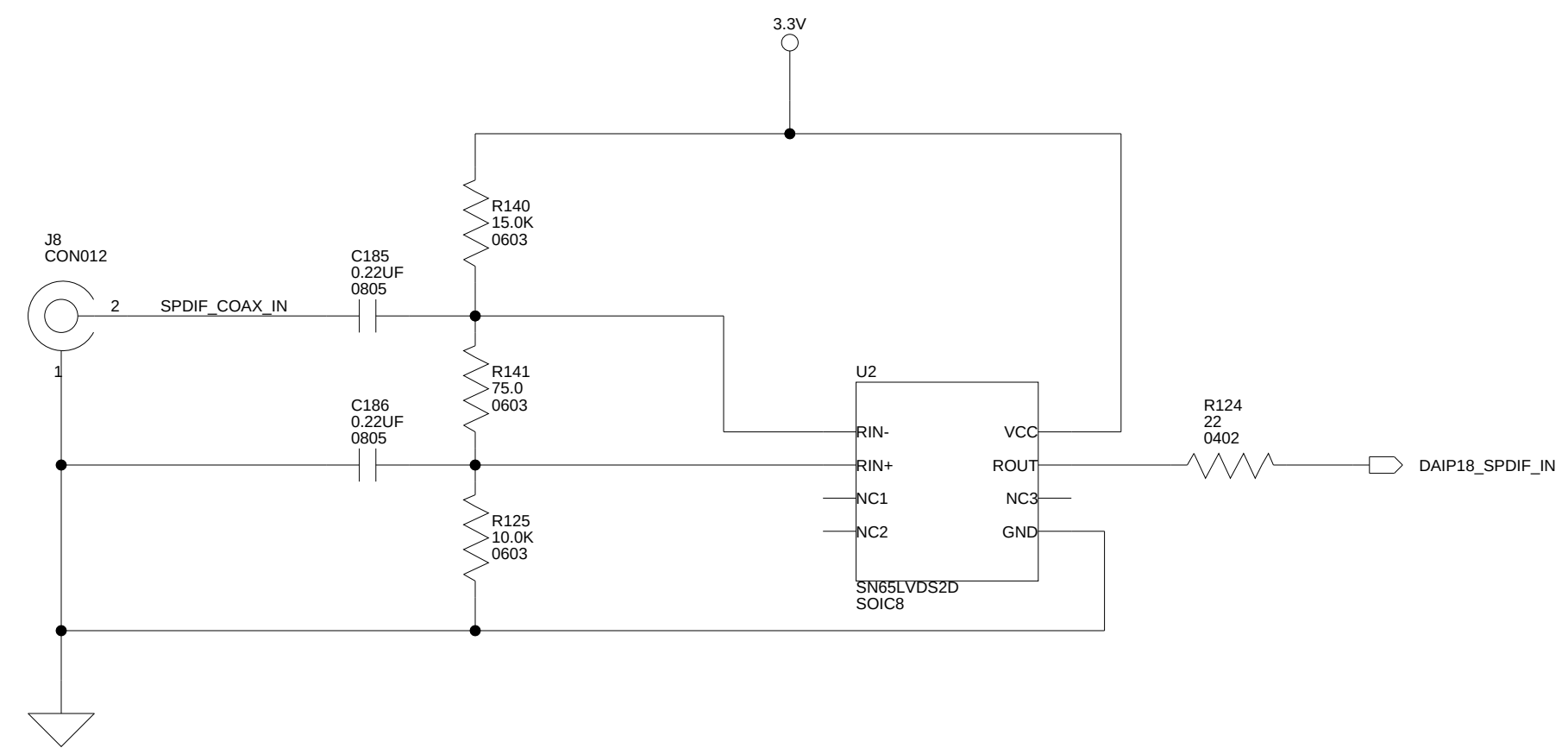
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Title ADSP-21369 EZ-KIT Lite AUDIO OUT 2					
Size C	Board No. A0196-2005			Rev 2.2	
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ANALOG
DEVICES

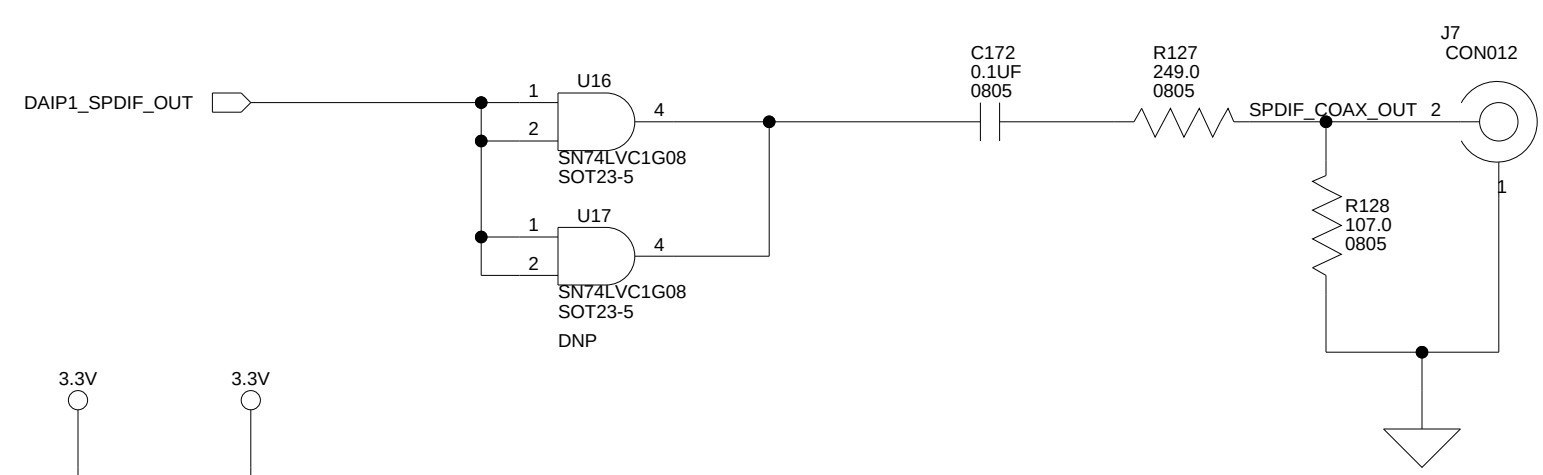
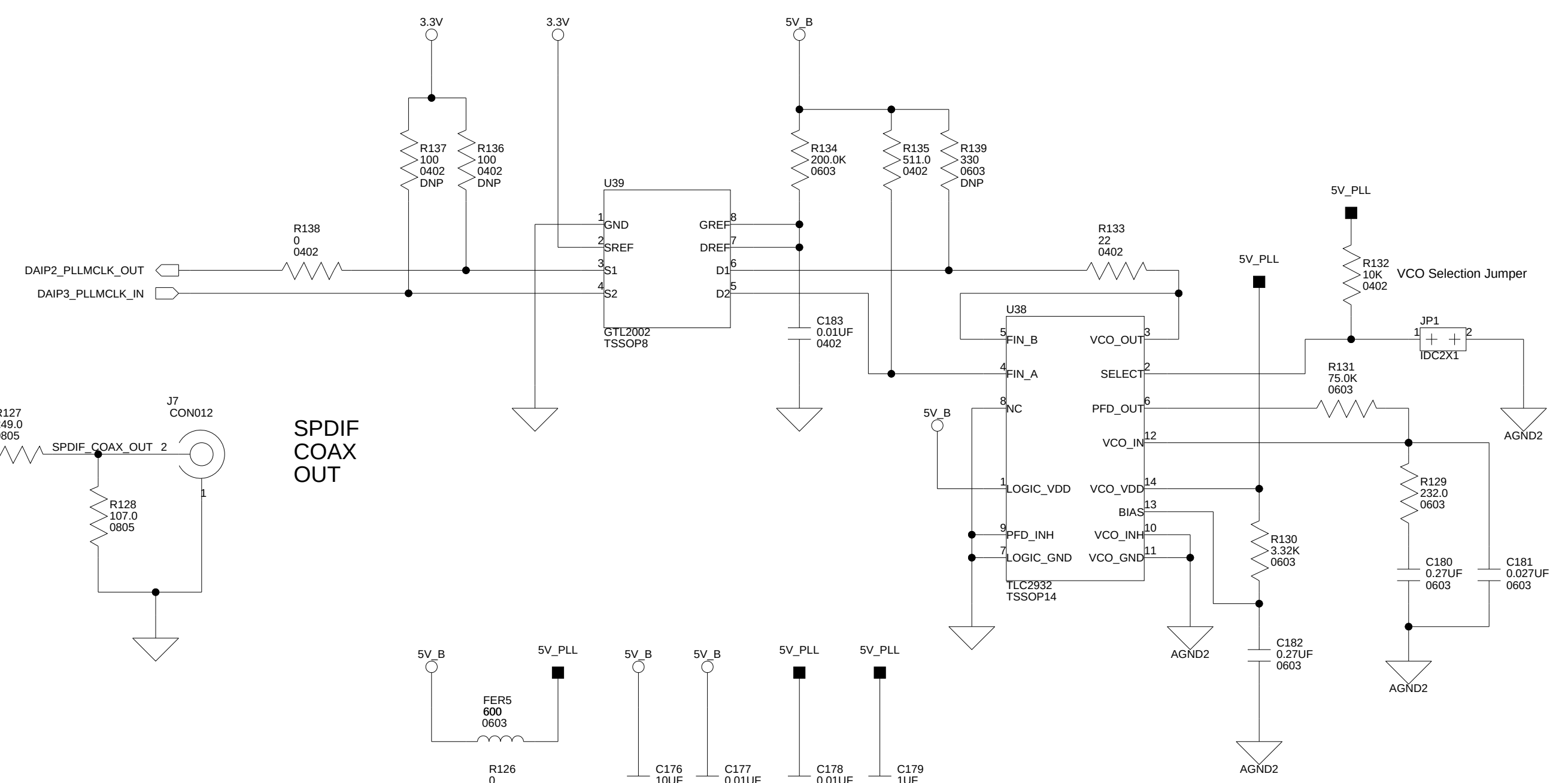
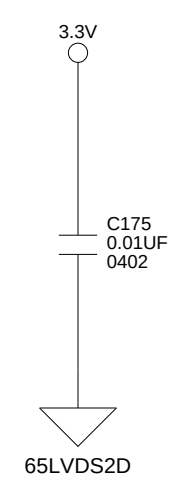
20 Cotton Road
Nashua, NH 03063
PH: 1-800-ANALOGD

Title	ADSP-21369 EZ-KIT Lite AUDIO IN & HEADPHONE OUT
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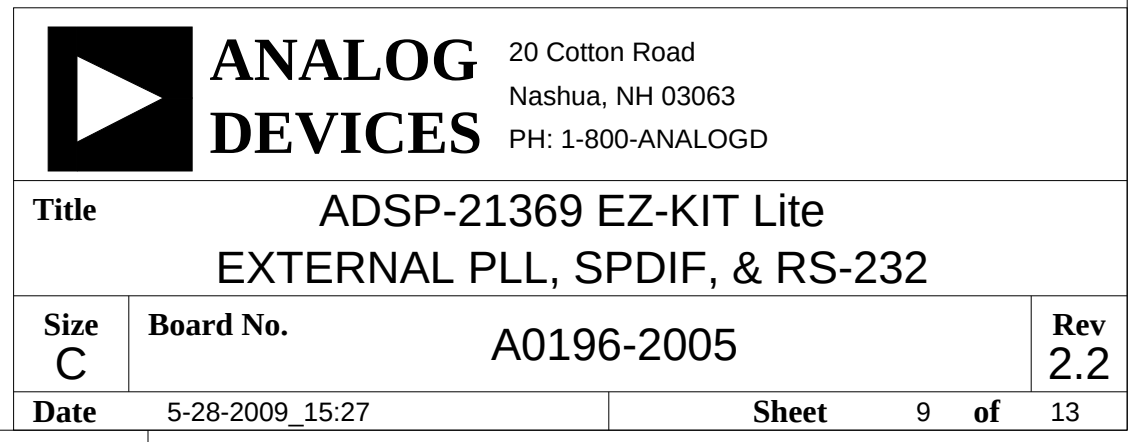
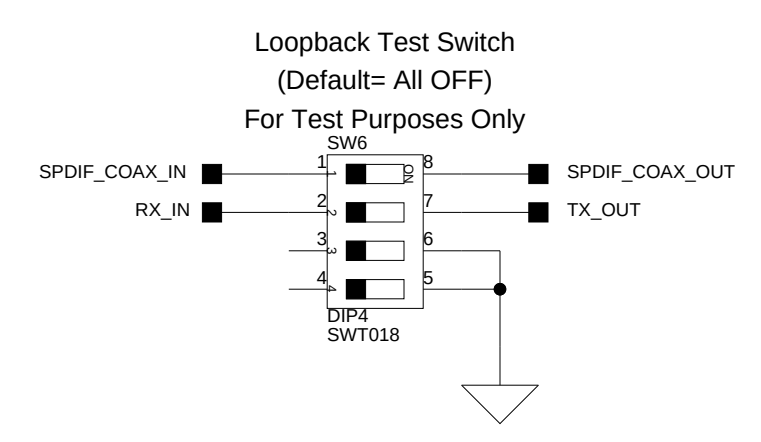
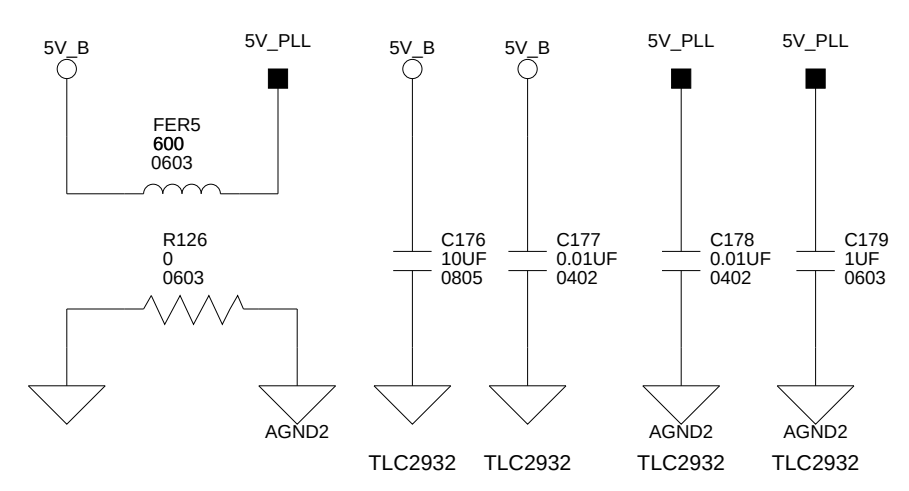
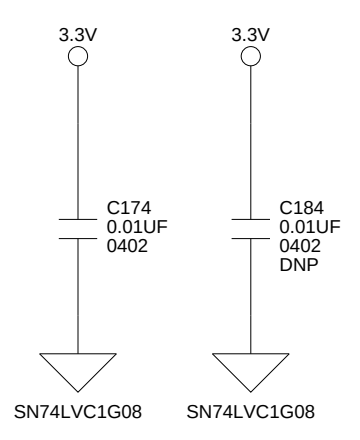
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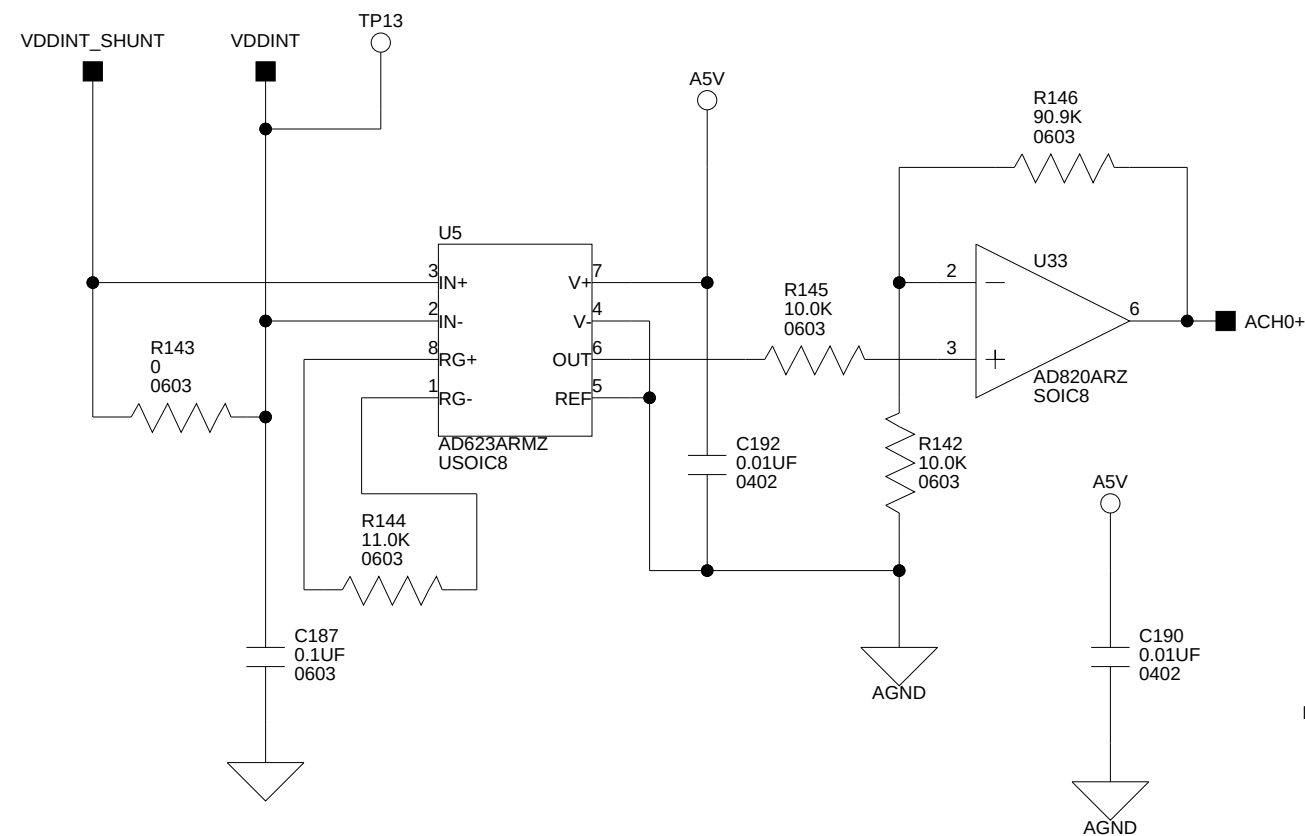


SERIAL PORT (UART 0)



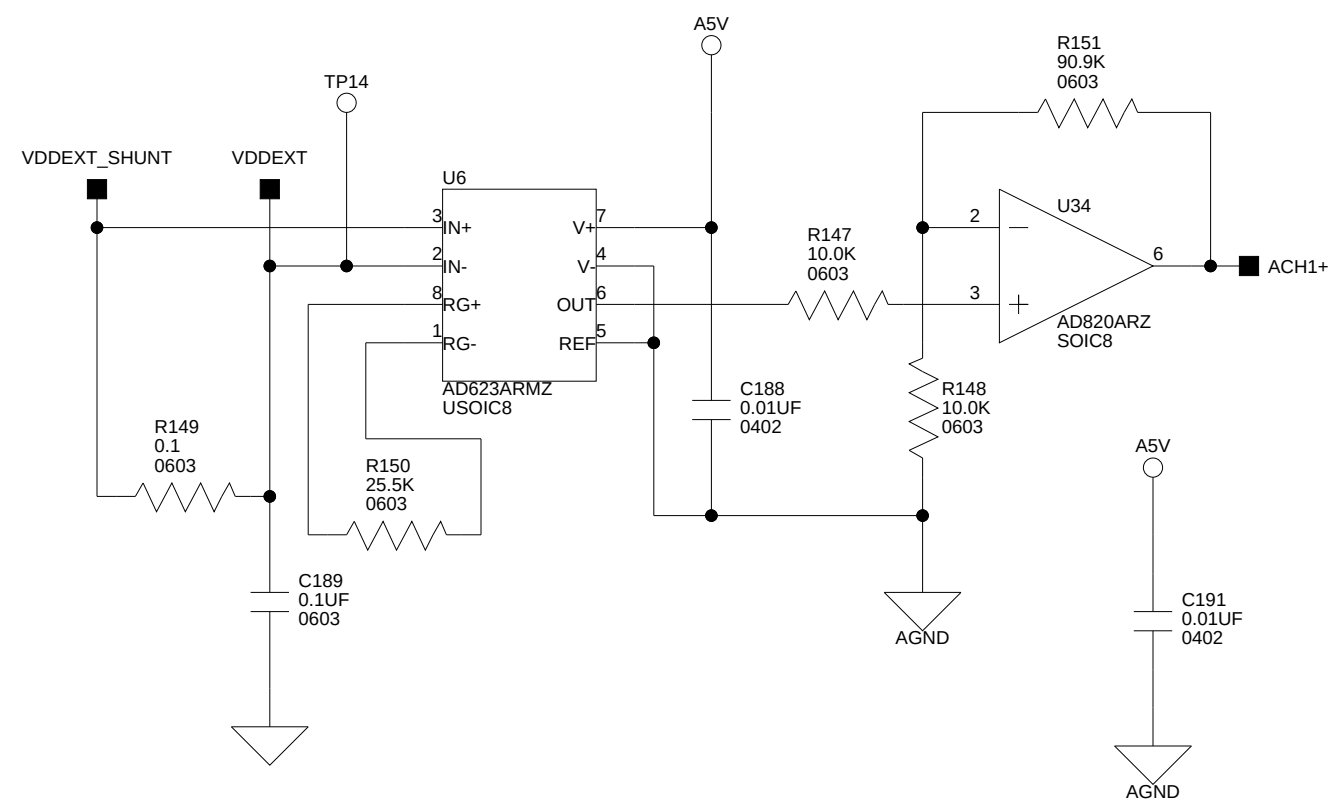
SPDIF
COAX
OUT



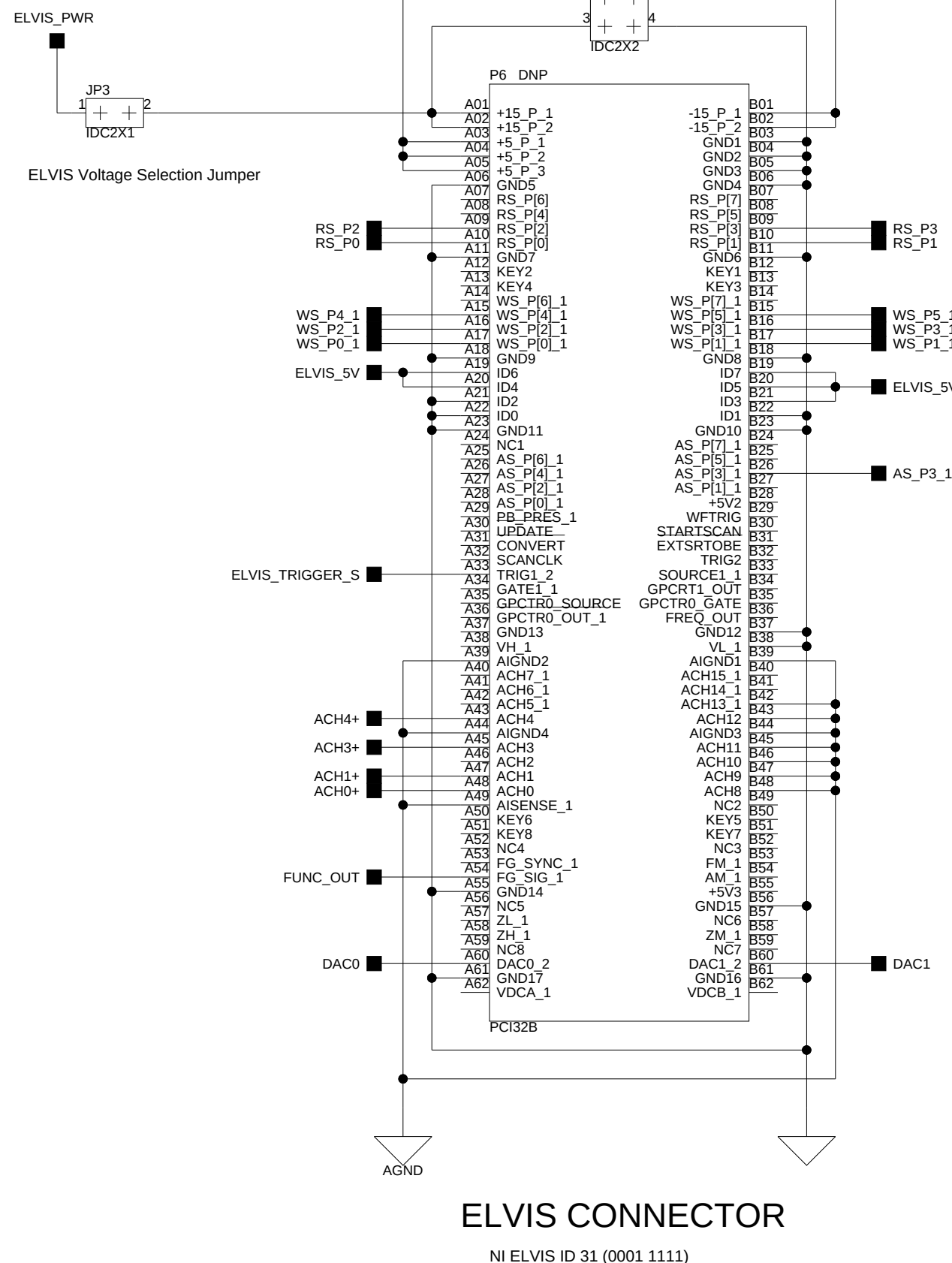
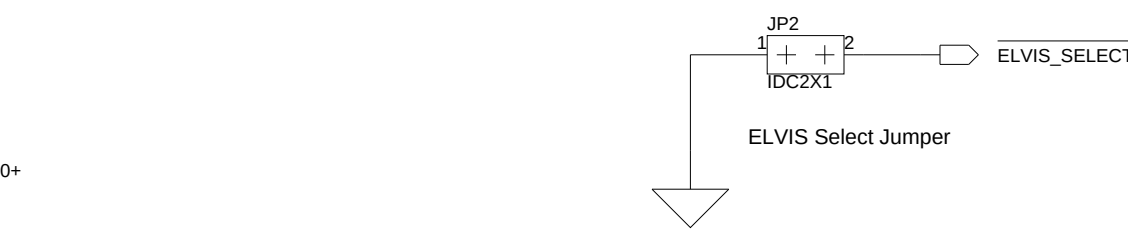


DSP CORE CURRENT

NOTE:
R143 needs to be replaced with 0.1 OHM resistor,
if this circuit is to work for ELVIS power measurements.

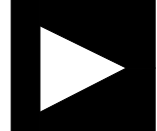
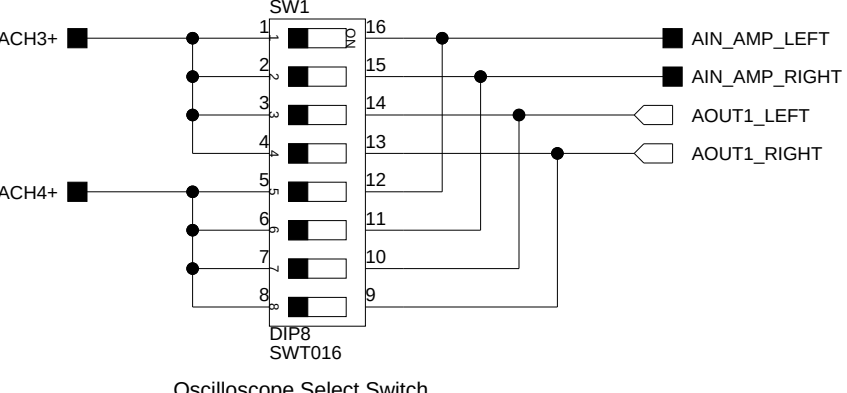
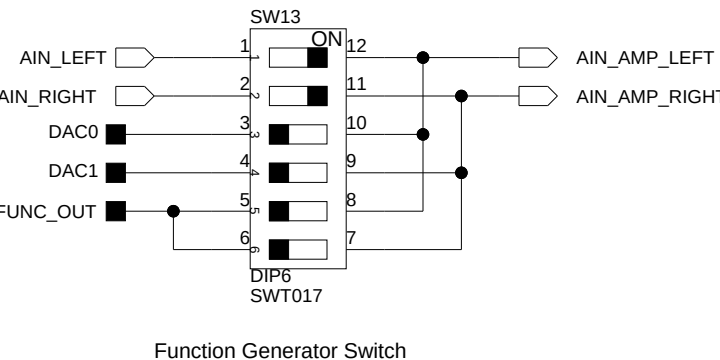
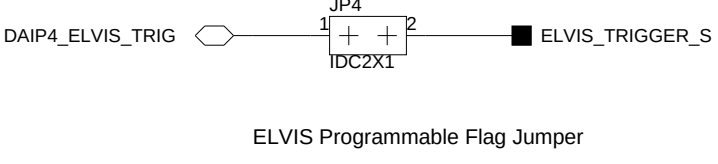


DSP IO CURRENT



ELVIS CONNECTOR

NI ELVIS ID 31 (0001 1111)



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Title			ADSP-21369 EZ-KIT Lite ELVIS INTERFACE		
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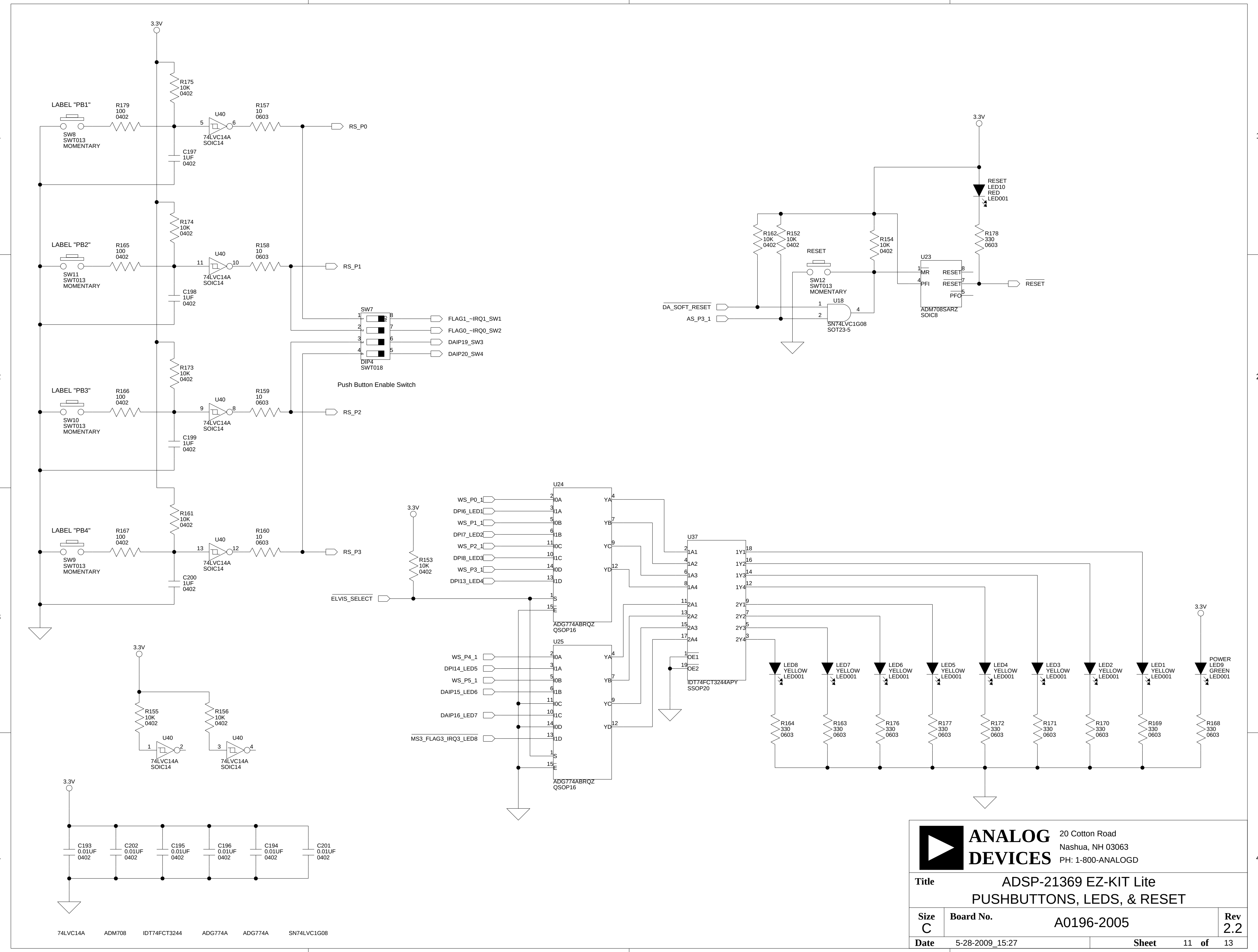
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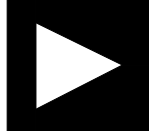
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		ANALOG DEVICES		20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
Title ADSP-21369 EZ-KIT Lite PUSHBUTTONS, LEDS, & RESET					
Size C	Board No. A0196-2005			Rev 2.2	
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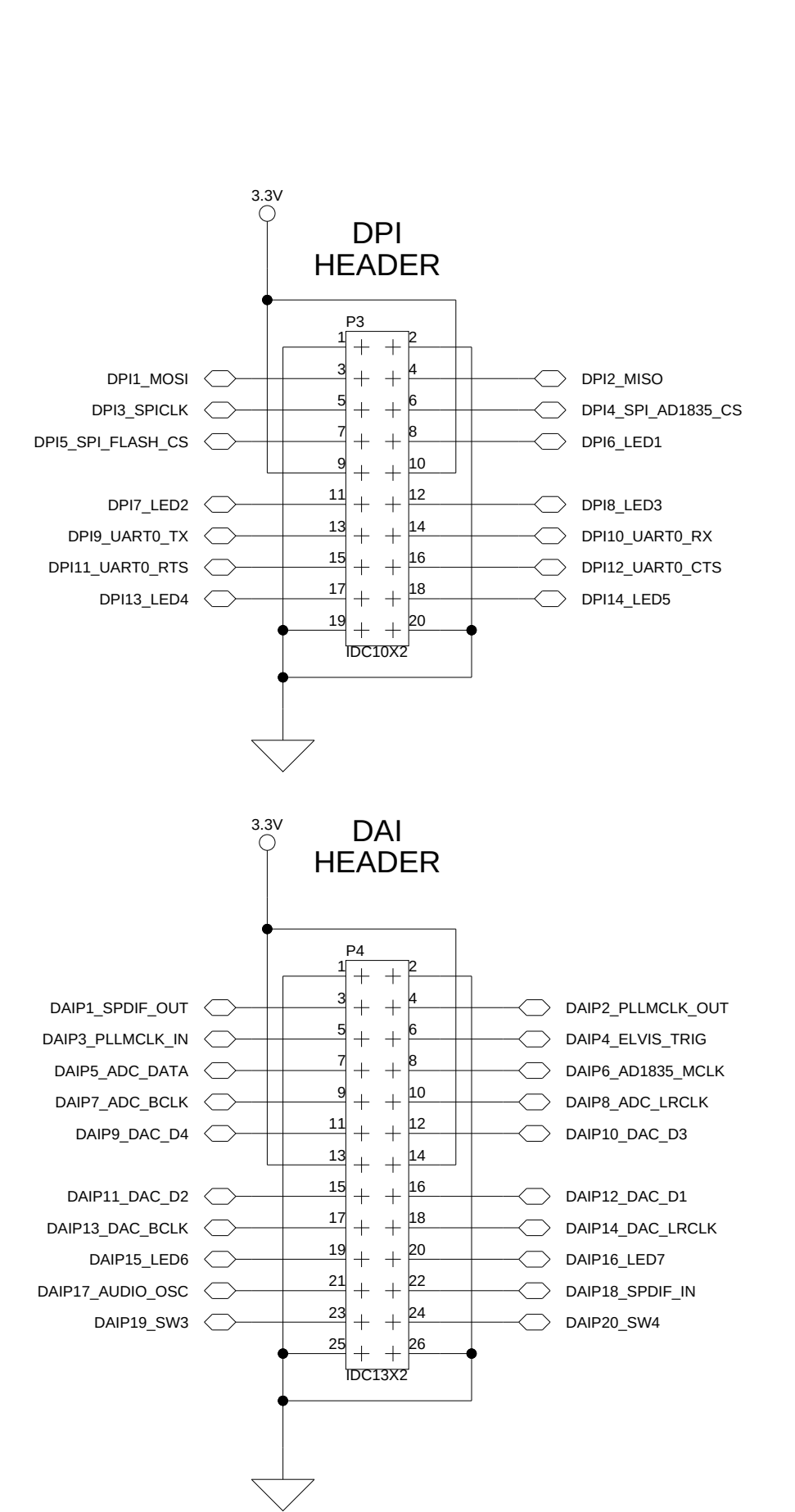
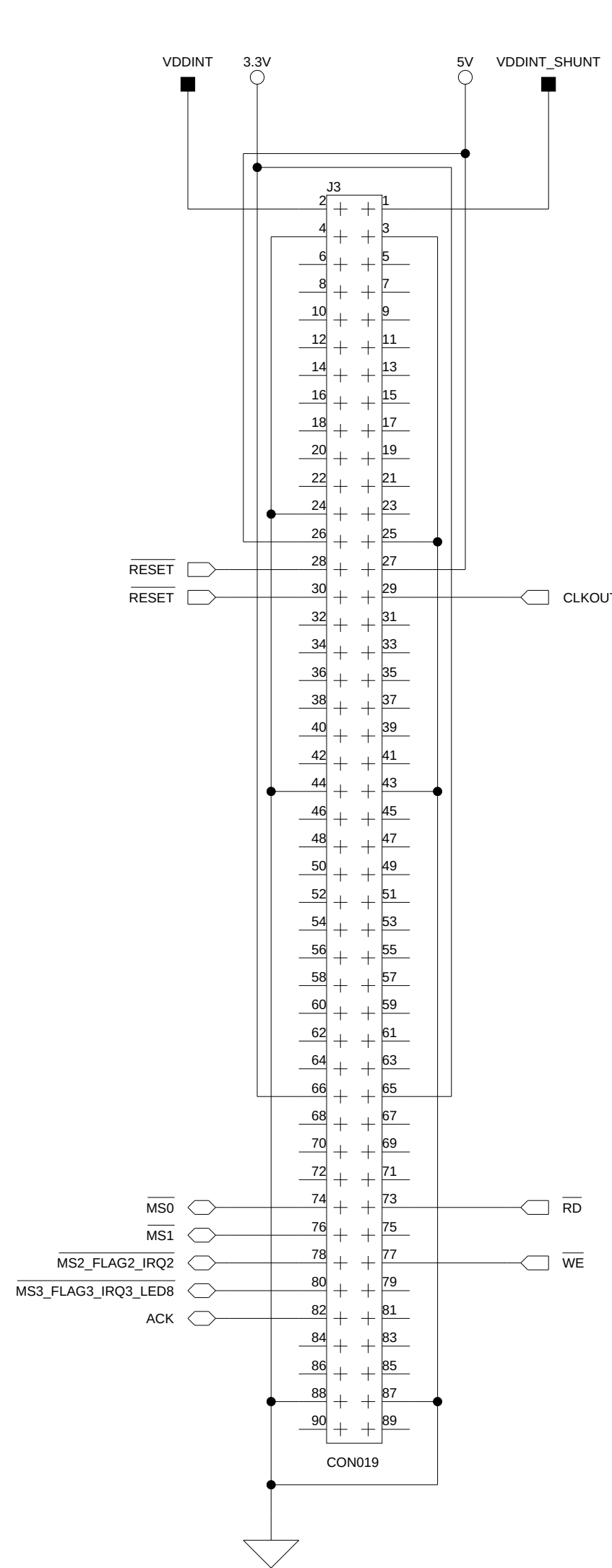
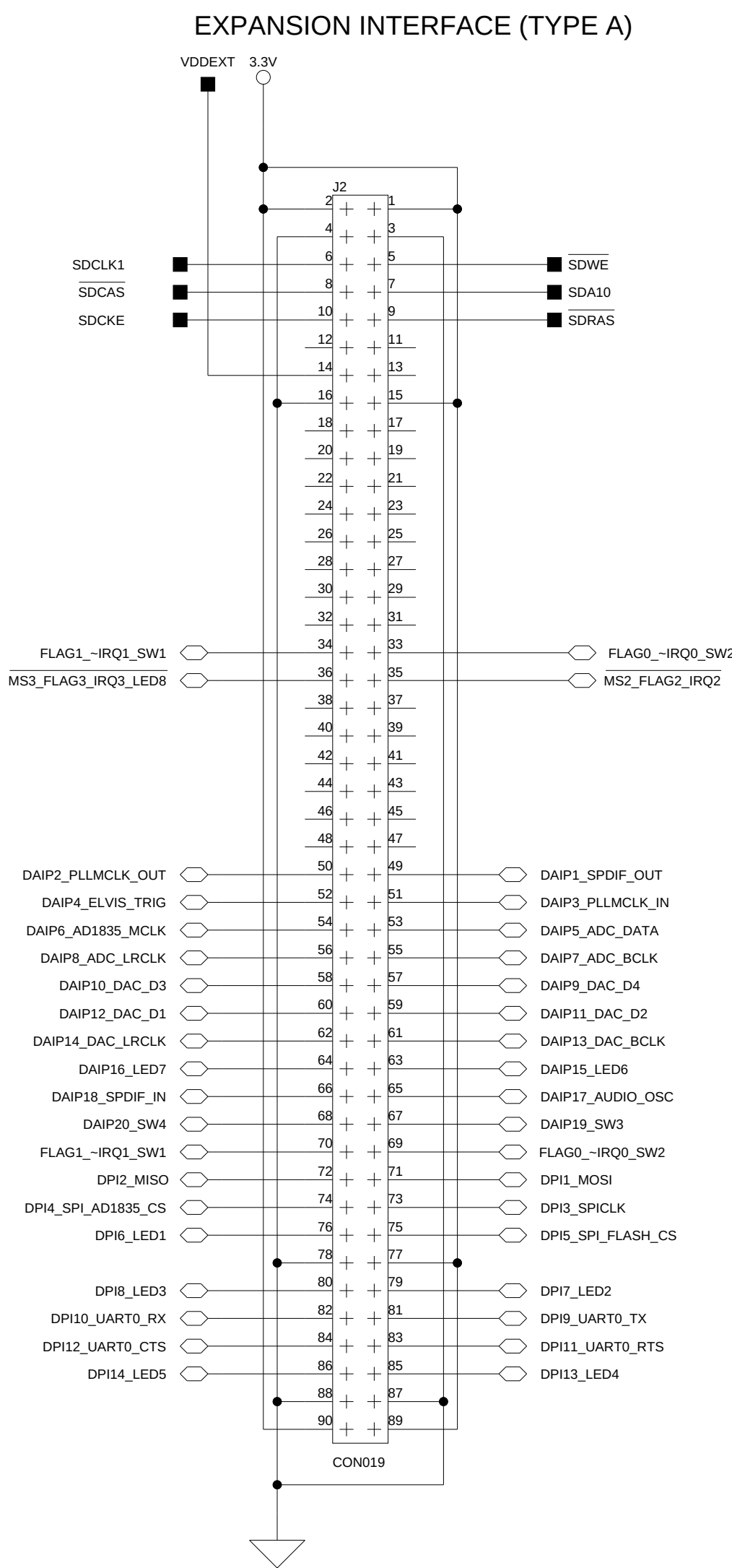
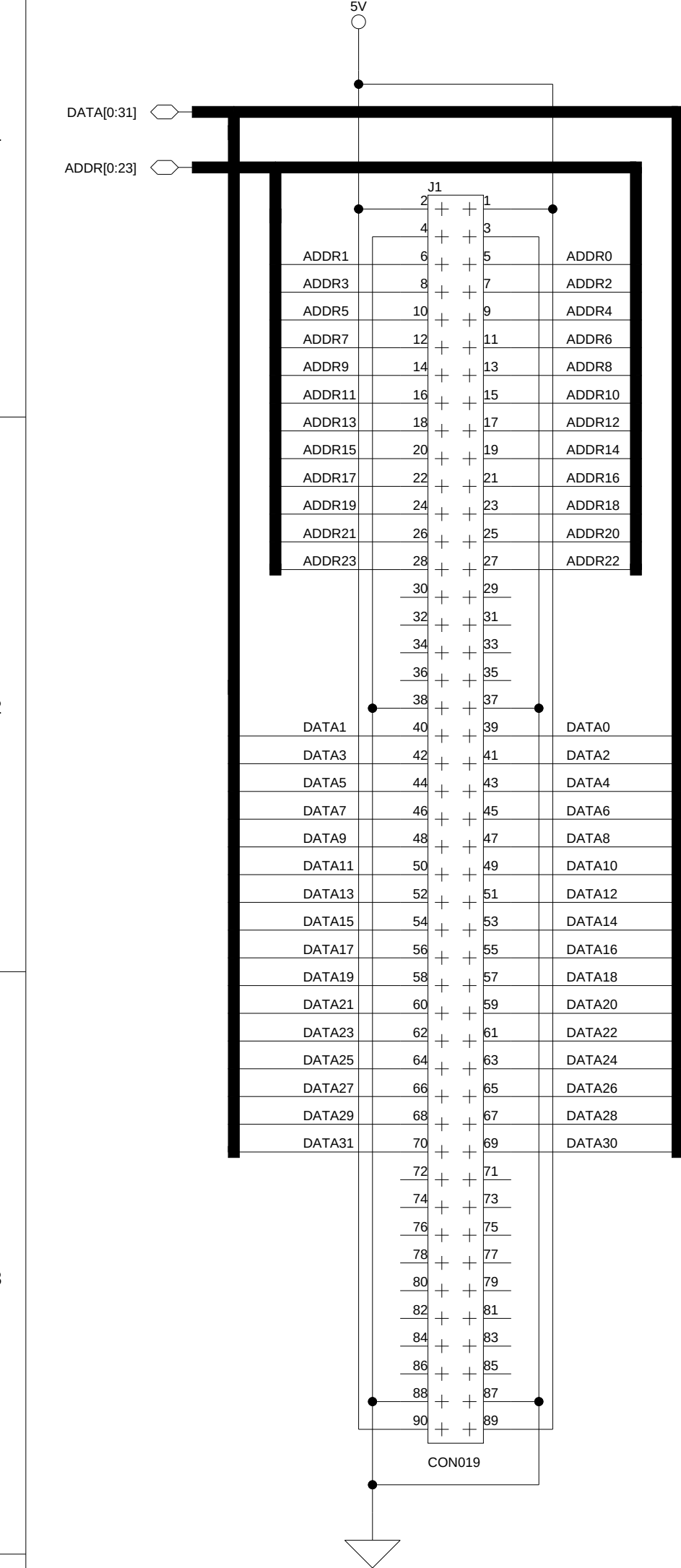
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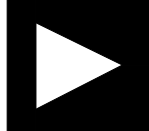
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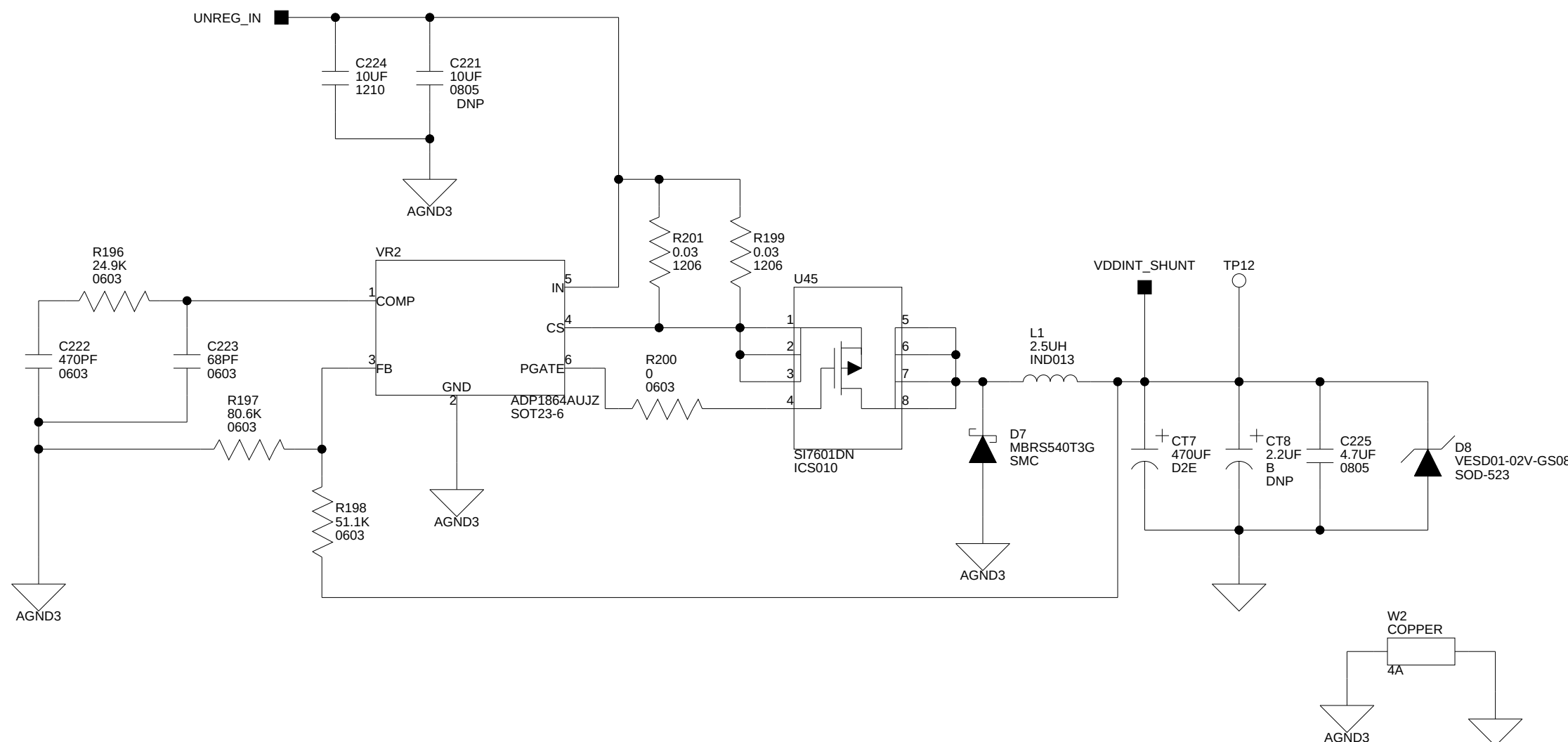
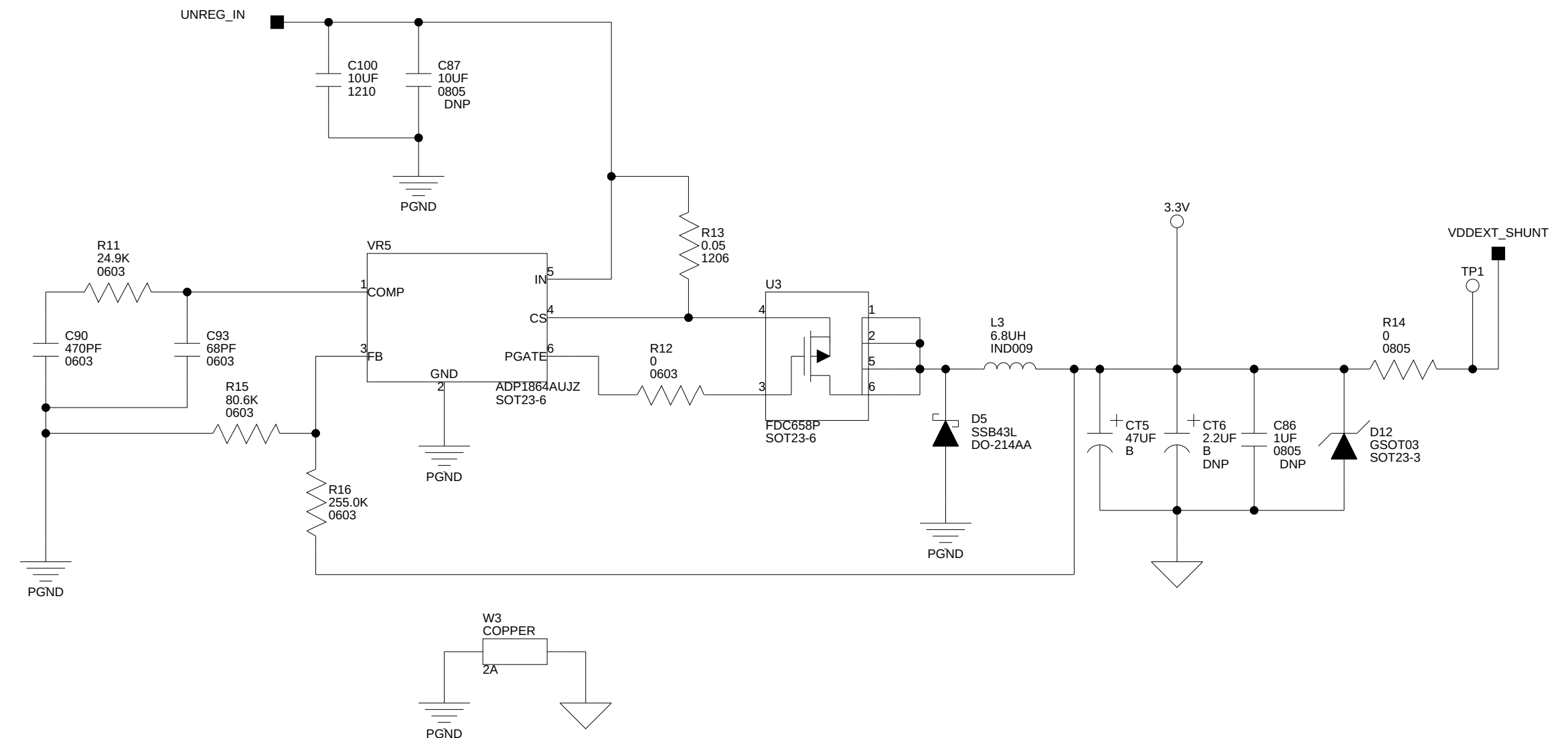
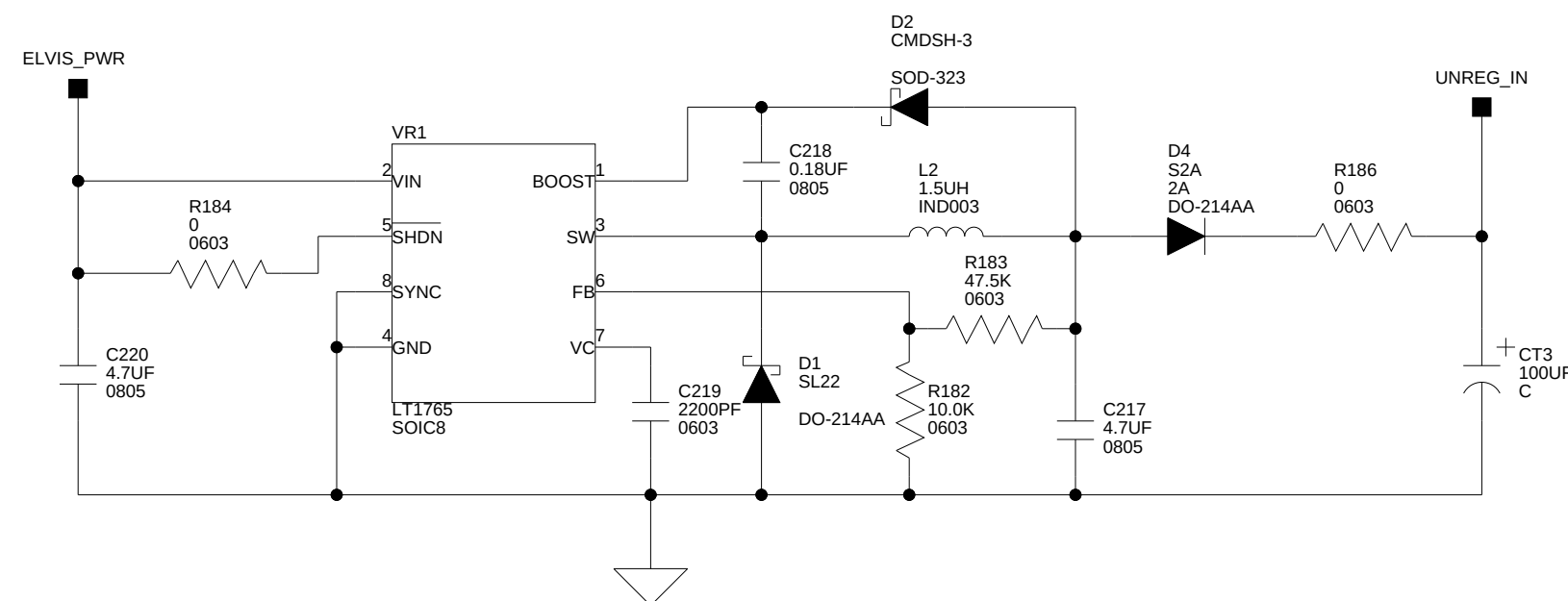
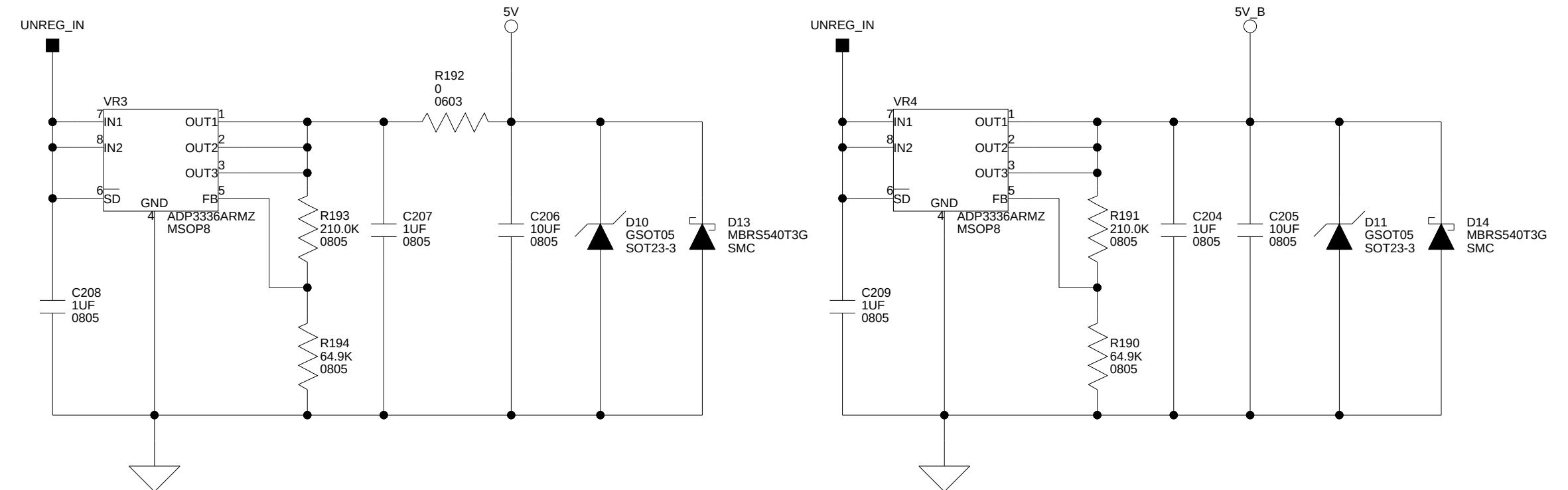
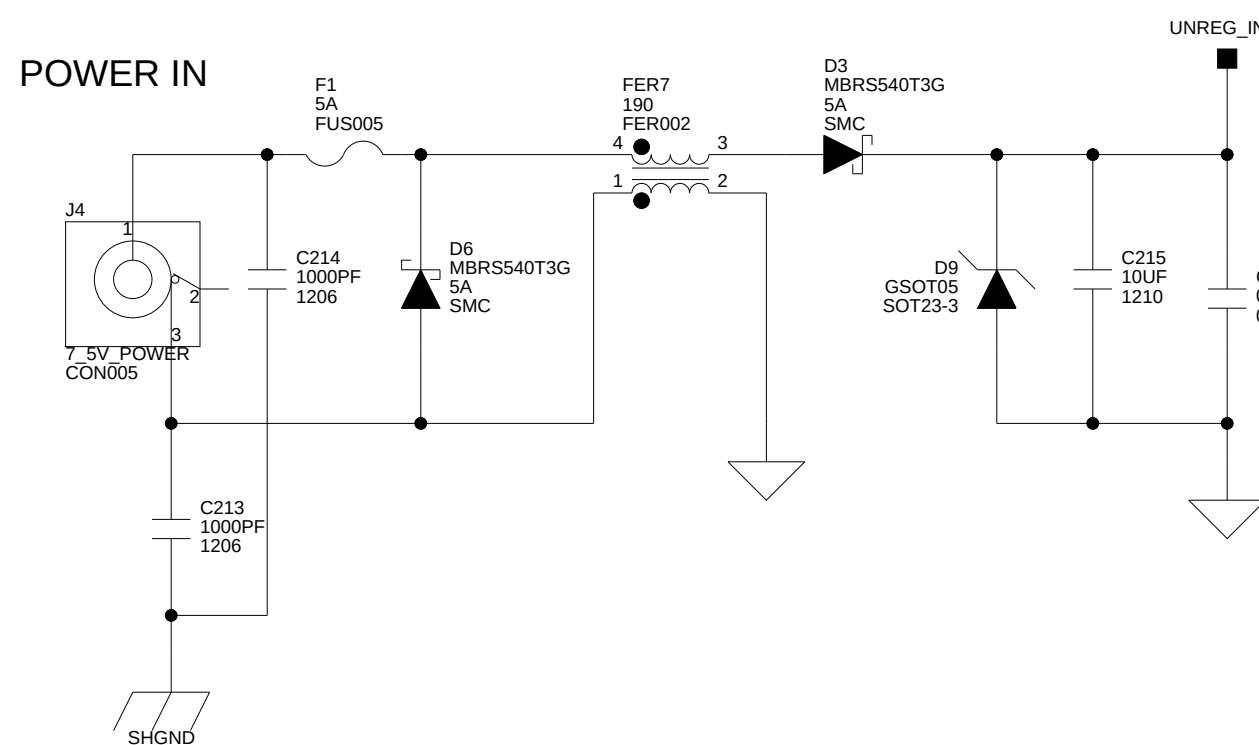
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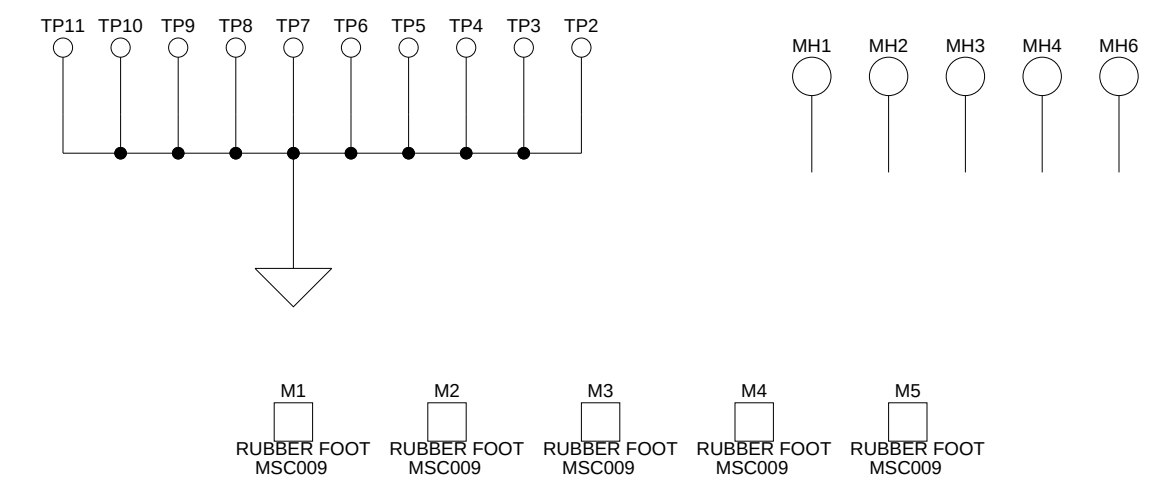


		ANALOG DEVICES		20 Cotton Road Nashua, NH 03063 PH: 1-800-ANALOGD	
Title ADSP-21369 EZ-KIT Lite EXPANSION INTERFACE					
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GND Test Points are scattered on PCB for Test Measurement Purposes.

LABEL "GND" ON ALL TPs

ANALOG
DEVICES

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Title	ADSP-21369 EZ-KIT Lite POWER
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